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TREAARSEXPEDITIONEN TIL CHRISTIAN DEN X's LAND 1931–34
Under Ledelse af Lauge Koch

THE MARINE ALGAE OF EAST GREENLAND

I. TAXONOMICAL PART

BY

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WITH 42 FIGURES IN THE TEXT

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BIANCO LUNOS BOGTRYKKERI A/S
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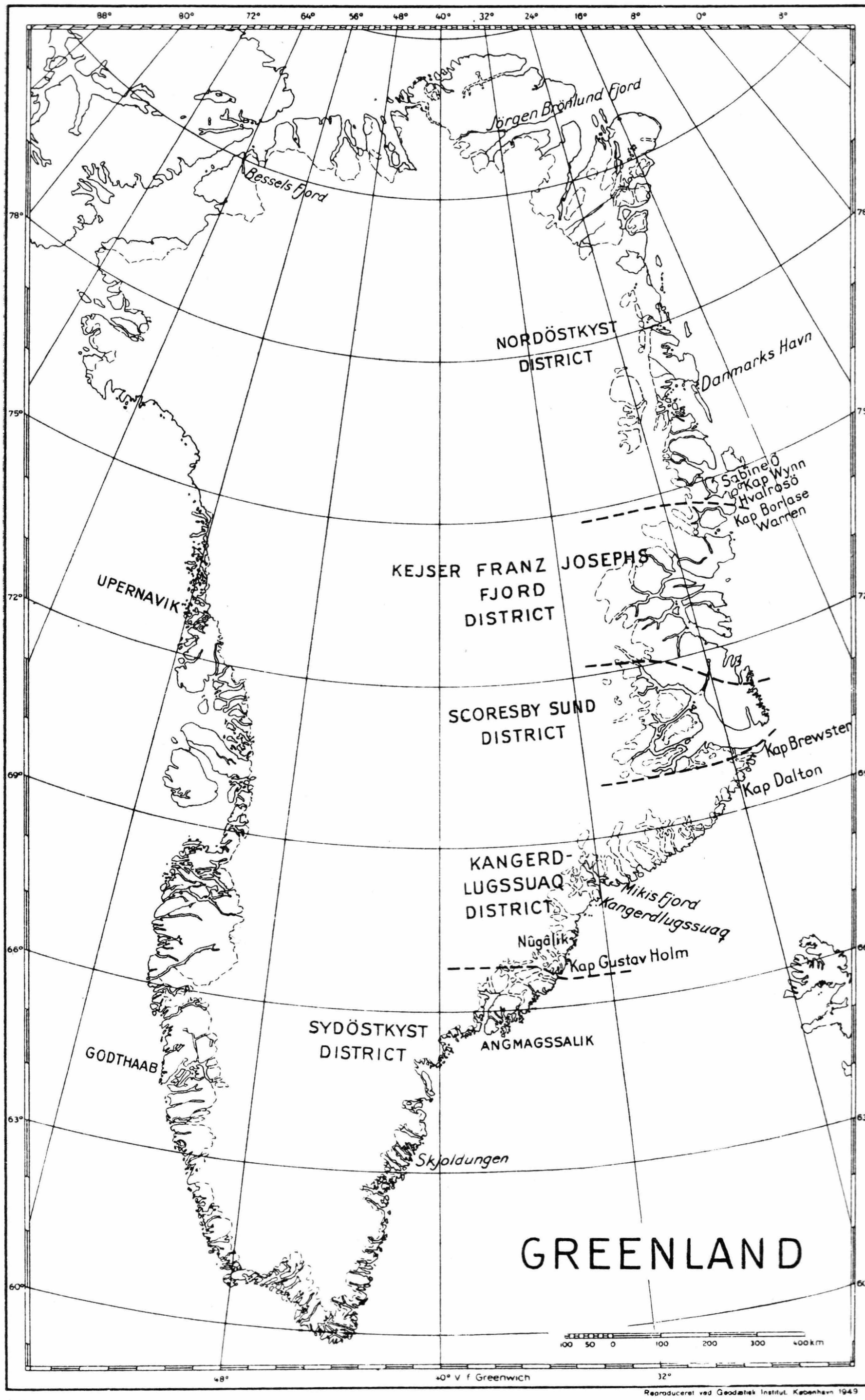


Fig. 1. Map of Greenland.

INTRODUCTION

In the summer of 1933, the author was a member of the Danish Three-Year Expedition to East Greenland under the leadership of Dr. Lauge Koch. The present work is based on the material collected on that occasion in the Scoresby Sund and Kejser Franz Josephs Fjord districts (between about lats. 70° and 74° N.). The collections were made from the s. s. "Godthaab" which that summer was placed at the disposal of the expedition for marine investigations. However, as marine zoology was the main object, algological stations were established at such places as had been chosen from zoological points of view. Thus, botanical interests were to some extent disregarded but, nevertheless, a large quantity of algae was collected in various places of algological interest with the purpose of contributing to the knowledge of the algal vegetation in the fiords. The localitities in which collections were made are quoted on pp. 13—14 and indicated in the maps, figs. 2 and 3.

The collections were made from a dinghy by means of a dredge or, in shallow water, by means of a hand-dredge with teeth (resembling a fruit-picker). When collecting I made a point of keeping as exact records as possible of the depth from which the algae were taken and as to whether they were attached or detached. In this connection it should be borne in mind that the depth may change considerably even when brief dredgings are concerned. Thus, the depth at the beginning of a dredging might measure 6 m and, at the end, 9 m; in other cases the depths measured 15 and 25 m, respectively, etc. During the zoological investigations it happened repeatedly that stones were taken up with the bottom sampler (the Petersen grab) and were given to me for the purpose of examining whether they were inhabited by algae which often appeared to be the case. The stones had sometimes been taken at greater depths than those at which the dredge could be used. As it was possible to state the exact depths, such stones might be of great interest. Thus, owing to the grab the presence of benthic algae down to a depth of 120 m was ascertained.

A large quantity of the collected material was preserved in alcohol for later examination with a binocular dissecting microscope. Thus, I have been able to make a detailed examination of the small-sized species and to get an impression of their frequency. Furthermore, it has been possible to discover unknown developmental stages of several species and to show the presence of a number of small species hitherto unknown from East Greenland — some of them new to science. This mode of treatment has, of course, required much time.

When working up the material I attached great importance to giving exact records of the substratum of the algae. Likewise, I have in the lists of localities given rather detailed depth records.

Besides my own material I have included a small collection made in 1924 and 1925 by ALWIN PEDERSEN in Rosenvinges Bugt. However, it comprised only 7 common species that were known beforehand from Scoresby Sund and which were present in my own material too.

I have especially concentrated on the *Phaeophyceae* and the *Rhodophyceae* of which the former group is by far the more important. The examination of the *Chlorophyceae*, on the whole, is less detailed, partly because this group is of minor importance within my area and partly because several of the *Chlorophyceae* occurring in East Greenland have previously been made the object of detailed examination (ROSENVINGE, 1893, 1898, 1910, and JÓNSSON, 1904). The *Cyanophyceae* (and *Xanthophyceae*) have not been taken into consideration.

In preparation of the manuscript I have, with the above exceptions, taken into consideration all species known from East Greenland so that the present work gives a complete survey of the marine algae in this area as it is known to-day. As a rule, however, only a brief reference is given to the species I myself have not found. For all species are stated the approximate latitudes of their previously known distribution in East and West Greenland. Respecting the distribution on the east coast it should be pointed out that the various localities in the Danmarks Havn area figure as one locality. The same procedure has been applied to the three localities Sabine Ø, Hvalrosø, and Kap Wynn which are situated near to one another. As regards the distribution on the west coast, literature prior to ROSENVINGE 1893 has not been taken into consideration as it was critically reviewed by that author.

In the list of localities stating the distribution of the species within my area I have treated the Scoresby Sund and Kejser Franz Josephs Fjord districts separately. I use the same demarcation of these districts as that applied in 'The Zoology of East Greenland' (Meddelelser om Grønland, Vols. 121—123) with the exception that I have indicated the southern limit of Scoresby Sund slightly farther north, namely at Kap Brewster at the southern part of the mouth of Scoresby Sund (cf. the maps, figs. 1—3). As regards the Scoresby Sund district the localities are quoted from the outer towards the inner parts of the fiord complex while records from the Kejser Franz Josephs Fjord district are quoted from south towards north. For the purpose of yielding as complete a survey as possible of the distribution I have included previously published findings, based principally on HARTZ' collections from Danmarks Ø and published by ROSENVINGE, 1898; contrary to what was done in that work, I do not distinguish between the various localities of this island but record only: Danmarks Ø. For such findings, the depth is quoted only when it is beyond the vertical range stated by me. In the case of records which are not due to my collections I have stated the collector's name or initials in brackets after the locality.

During the working up of my collections it has been of great value to consult the extensive material kept in the Arctic Herbarium of the Botanical Museum of the University of Copenhagen, particularly the collections from Greenland made by ROSENVINGE, HARTZ, KRUUSE, and LUNDAGER, from Iceland by JÓNSSON, and from the Faroes by BØRGESEN.

The preparation of my material was commenced in the 'thirties but was temporarily discontinued by other work, i. a. the working up of Danish *Phaeophyceae* left by the late Professor ROSENVINGE. Part of my collection has already been used for a paper on the *Lithoderma* problem (LUND, 1938) and at the Eight International Botanical Congress in Paris, 1954, I read a paper on the algal zones in East Greenland and their ecological factors (LUND, 1954).

I owe a debt of gratitude to my late teacher, Professor L. KOLDERUP ROSENVINGE, for many instructive discussions and for the great interest he took in my work. I am also indebted to Dr. TORE LEVRING, Gothenburg, for many valuable discussions.

I am greatly obliged to Dr. P. L. KRAMP for kindly having identified the hydroids and bryozoans mentioned in this work as serving as hosts to various algae; to Professor HANS JOHANSEN for the help afforded in translating sections of the Russian literature dealing with some of the species; and to Mr. TYGE CHRISTENSEN, cand. mag., for latinizing the diagnoses.

I am glad to have this opportunity of thanking the following gentlemen for their assistance in taking microphotographs: Mr. JUL. GRØNTVED, mag. scient. (fig. 12 A), Dr. TORE LEVRING (figs. 9 C, 15 A, 18, 21, 26 A, 40, and 41 E), Professor TH. SØRENSEN (figs. 20 A, 25 A), and Dr. J. TROELS-SMITH (figs. 9 A—B, 12 B, 26 B).

My especial thanks are due to the leader of the expedition, Dr. LAUGE KOCH, for having enabled me to join the expedition and for financial support for the preparation of my material.

I am greatly indebted to the Carlsberg Foundation for the grant bestowed on me and to the Danish State Research Foundation for having furnished me with technical facilities.

Finally, I am indebted to my wife, Mrs. A. M. LUND, who has translated the manuscript into English.

Abbreviations.

N. H.:	N. Hartz
J.:	H. Jónsson
K.:	P. Kuckuck
C. K.:	C. Kruuse
L.:	S. Lund
A. P.:	Alwin Pedersen
R.:	L. K. Rosenvinge
Z.:	G. Zeller
E. Gr.:	East Greenland
W. Gr.:	West Greenland

All the drawings of algae published in this work are made by the author.

REVIEW OF COLLECTIONS IN EAST GREENLAND AND THE PERTINENT LITERATURE

The first collector of marine algae in East Greenlandic waters seems to have been J. M. VAHL who lived in Greenland from 1828 to 1836. However, the great majority of his collections originate from the west coast and only some ten species came from the southernmost part of the east coast. With the exception of some few species mentioned by KJELLMAN, 1883, VAHL's East Greenlandic species were not recorded until 1893, when ROSENVINGE included them in his work together with the species collected by SYLOW, as mentioned below.

The next collections in East Greenland were made in some few localities in about lat. $74^1/_2$°N. by 'Die zweite deutsche Nordpolarfahrt in den Jahren 1869 und 1870'. The material was worked up by ZELLER, 1874, who recorded 16 species from this area, several of which must, however, be considered doubtful.

In the early 'eighties SYLOW visited two localities at the southernmost part of the east coast and the small collection he brought home seems to have contained 16 species.

In his great work on the algal vegetation of the Arctic Sea KJELLMAN, 1883, records only 12 species from East Greenland, 4 of which are doubtful. The records are based almost exclusively on ZELLER's list.

In ROSENVINGE's important work from 1893, which treats mainly of West Greenlandic algae, the number of species known from the east coast reaches 32 (9 *Rhodophyceae*, 17 *Phaeophyceae*, and 6 *Chlorophyceae*). These species were the result of VAHL's and SYLOW's collections and of a critical review of ZELLER's list, supplemented by 3 further species ROSENVINGE himself found in some material at the Botanical Museum of the University of Copenhagen, originating from the German expedition. From ZELLER's list ROSENVINGE records 10 species. Moreover, an eleventh species, viz. *Rhizoclonium riparium*, is mentioned though regarded as doubtful. But later, ROSENVINGE (1898, p. 51) is of the opinion that *Laminaria digitata* ought not to be omitted from ZELLER's list which he did in 1893. The number of algae known from East Greenland thus ought to be 33, 14 occurring in Northeast Greenland.

The first fundamental work on East Greenland's marine algae is, however, ROSENVINGE, 1898, which is based principally on N. HARTZ' very important collections in the inner Scoresby Sund in about lat. $70^1/_2°$ N. (almost exclusively at Danmarks Ø) and, moreover, on a small collection by E. BAY originating from Angmagssalik in about lat. $65^2/_3°$ N. Both collectors were members of 'Den østgrønlandske Ekspedition udført i Aarene 1891—92' under the leadership of C. RYDER (the 'Hekla' expedition). The number of species was thereby increased to 82. Besides treating of East Greenlandic algae the work deals with material from the west coast collected since ROSENVINGE's previous paper was published in 1893, thus giving a complete list of the species known at that time from the whole of Greenland.

In addition to his systematic work (1898), ROSENVINGE published in the same year an important work (1898 a) on the marine algal vegetation of Greenland. In that work the number of species from East Greenland was stated to total 83 (op. c., p. 180), the additional species being *Calothrix scopulorum.*

The next important work on the East Greenlandic marine algae was published by JÓNSSON in 1904. It treats of the collections provided by C. KRUUSE in the years from 1898 to 1902, partly as a member of 'Carlsbergfondets Ekspedition til Østgrønland udført i Aarene 1898—1900' under the leadership of G. AMDRUP, partly on his own expedition. The material originated chiefly from the region between lats. $65^1/_2°$ and slightly south of 70° N., i. e. from the area south of Scoresby Sund, while a minor part of the material was collected at two localities farther north, viz. in lats. $74^1/_4°$ and $74^1/_2°$ N., respectively. The latter locality was the Sabine Ø where the German expedition previously had made collections. A few species were, however, collected in a locality in about lat. $72^1/_2°$ N. JÓNSSON stated the total number of marine algae known from East Greenland to be 114. In a paper on his visits to East Greenland and his botanical investigations there, KRUUSE (1912) published a few brief descriptions of the algal vegetation at some of the places he visited.

As a member of 'Danmark-Ekspeditionen til Grønlands Nordøstkyst 1906—1908' under the leadership of L. MYLIUS-ERICHSEN, ANDR. LUNDAGER made some collections of marine algae. The material originated from the Danmarks Havn area between about lats. $76^1/_2°$ and $76^3/_4°$ N. and was worked up by ROSENVINGE (1910). It comprised 60 species, the most interesting of which was the hitherto unknown large *Punctaria glacialis.* The total number of marine algae known from East Greenland was thereby increased to 124.

The ensuing work on East Greenlandic marine algae was published by ROSENVINGE in 1933. The collections on which it was based were made by T. W. BÖCHER and M. DEGERBØL during 'The Scoresby Sound

Committee's 2nd East Greenland Expedition in 1932 to King Christian IX's Land' under the leadership of EJNAR MIKKELSEN. The material originated chiefly from the Kangerdlugssuaq area in about lat. 68—$68^1/_2$° N. This paper stated the total number of known species to be 126.

The next collections of some importance were those made in 1933 by the present author during the Three-Year Expedition and forming the basis of the present work. As a result of these investigations the total number of marine algae known from East Greenland has now been increased to 143. However, this number is not immediately comparable with those stated in the above-mentioned works as the latter were calculated on the basis of the taxonomy prevailing at the times at which the respective works were published. Furthermore, the three *Cyanophyceae* recorded from East Greenland are not included in the total I have indicated. The increase in the number of species amounts to 21.

The most recent collections of East Greenlandic marine algae were made by KJELD HOLMEN in 1950 in the Jørgen Brønlund Fjord in lat. 82°10′ N. on the 'Dansk Pearyland-Ekspedition 1947—50' under the leadership of EIGIL KNUTH. They were worked up by LUND (1951) and appeared to contain 21 species but did not entail an increase in the total number. Still, one species, viz. *Litosiphon groenlandicus*, had not yet been recorded in literature but, as it occurred in my own material from East Greenland, it had already been described in the manuscript of the present work. With the exception of that species, they were all known from the Danmarks Havn area, but HOLMEN's collections are of special interest in being made so far north. Apart from some few findings of detached algae, the Jørgen Brønlund Fjord is the northernmost locality in which collections of marine algae have been made.

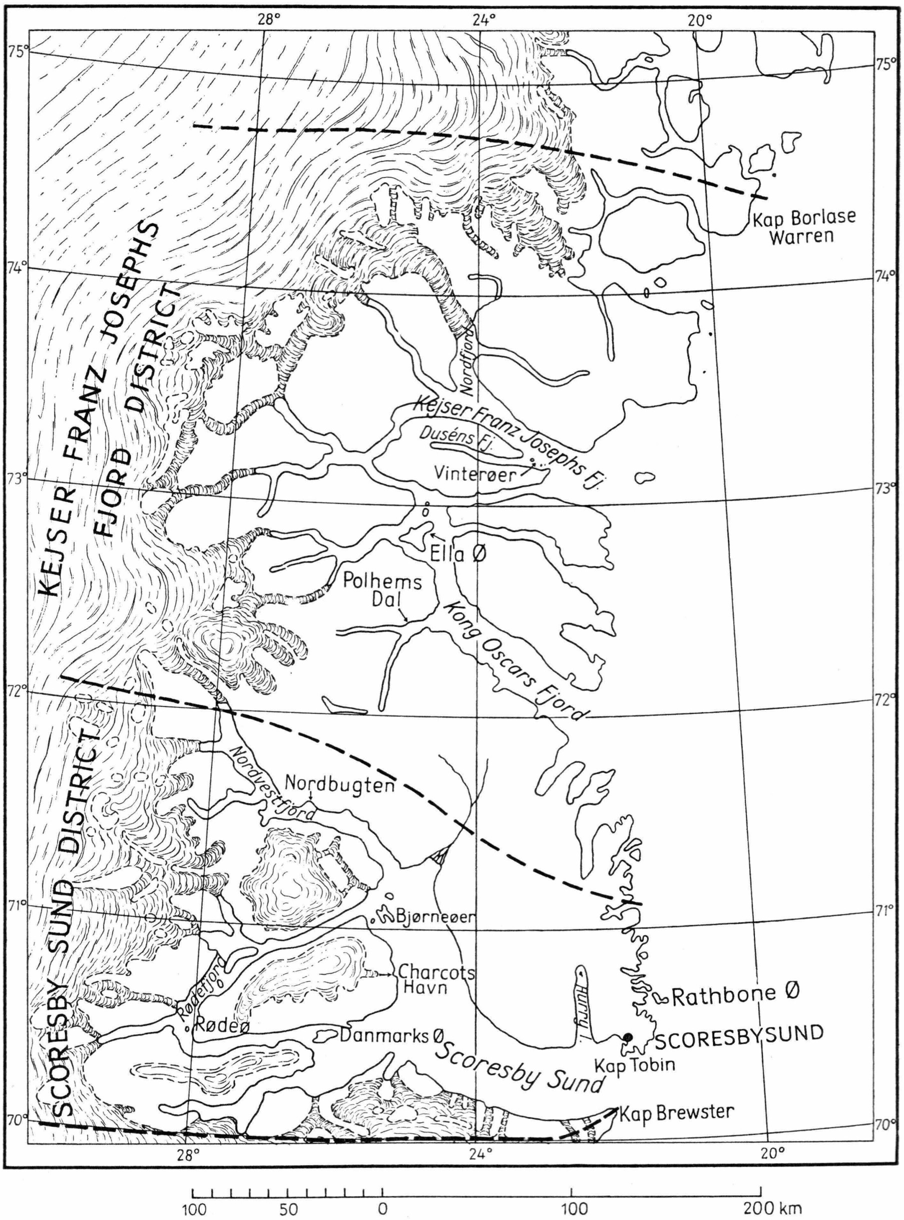


Fig. 2. Map of the Scoresby Sund and Kejser Franz Josephs Fjord districts.

SURVEY OF LOCALITIES IN THE SCORESBY SUND AND KEJSER FRANZ JOSEPHS FJORD DISTRICTS

Below is given a survey of all the localities in which marine algae have been collected within these two areas. For the sake of clearness, such localities in which collections were made by others are quoted in square brackets together with the collector's name; apart from ALWIN PEDERSEN's material (cf. p. 6) these collections have already been published. Among the localities concerned, Danmarks Ø is the only one of some importance.

As regards my own collections I have stated the dates on which they took place and the approximate latitudes. The localities in which I had but scarce opportunity of collecting are quoted in round brackets. As appears from this survey, my material originates chiefly from 7 localities in the Scoresby Sund and 3 in the Kejser Franz Josephs Fjord district.

It should be added that the names applied to the localities are in conformity with the standards set by Det Grønlandske Stednavneudvalg (The Board on Greenlandic Geographical Names).

Scoresby Sund District:

(Off Rathbone Ø, north of the mouth of Scoresby Sund, lat. 70°40′ N., August 13).

Kap Tobin, lat. 70°24′ N., July 11 and August 14.

Amdrups Havn, lat. 70°27′ N., July 28—29.

(Scoresbysund, lat. 70°28′ N., August 14, 22, and 28).

[Rosenvinges Bugt between Kap Tobin and Kap Hope, 1924 and 1925, ALWIN PEDERSEN].

Somewhat east of Kap Hope, lat. 70°26′ N., June 27—July 1, and July 10. Referred to as 'Kap Hope'.

The mouth of Hurry Inlet, the east side, lat. 70°27′ N., July 1, 4, 12, and 20—21.

The southernmost of the Fame Øer at the head of Hurry Inlet, lat. 70°50′ N., July 8, 14, and 17, and August 15. Referred to as 'Fame Øer'.

[Kap Stewart, lat. 70°28′ N., N. HARTZ].

(Charcots Havn, lat. 70°48′ N., August 26).

The south-eastern coast of the largest of the Bjørneøer, lat. 71°03′ N., July 25. Referred to as 'Bjørneøer'.

(Nordbugten at Nordvestfjord, lat. 71°35′ N., July 24).

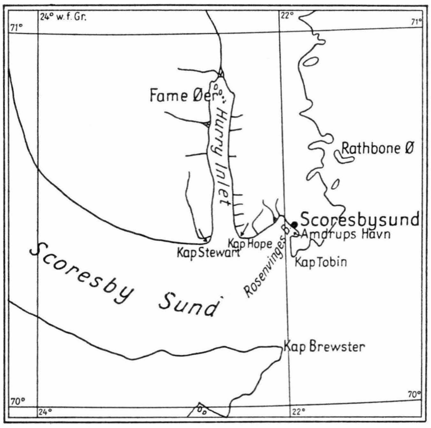


Fig. 3. Outer part of the Scoresby Sund district.

[Danmarks Ø, lat. 70°27′ N., N. HARTZ].
(Ibid., lat. 70°30′ N., August 21 and 23).
The bay west of Rødeø in Rødefjord, lat. 70°29′ N., August 22. Referred to as 'Rødeø'.

Kejser Franz Josephs Fjord District:

[Polhems Dal in Kong Oscars Fjord, about lat. 72°30′ N., C. KRUUSE].
Ella Ø, lat. 72°54′ N., August 3—5.
The west side of the westernmost of the Vinterøer at the mouth of Duséns Fjord, lat. 73°15′ N., August 8. Referred to as 'Vinterøer'.
The head of Duséns Fjord, lat. 73°20′ N., August 11.
(Nordfjord, off the valley in the north-western part, lat. 73°47′ N., August 7).
[Kap Borlase Warren, lat. 74°15′ N., C. KRUUSE].

LIST OF SPECIES

Chlorophyceae

Chlorococcales

Chlorococcaceae

Chlorochytrium Cohn, 1872.

1. **Chlorochytrium inclusum** Kjellm. 1883, p. 320 (392), pl. 31 figs. 8—17; Rosenv. 1893, p. 963; 1898, p. 119.

A very common and widely distributed endophyte especially inhabiting *Rhodophyceae* with thick, foliaceous thallus such as *Turnerella Pennyi* and *Phyllophora Brodiaei* f. *interrupta*. However, I also observed it in *Cruoria arctica*. Its vertical range is from about 4—6 m down to at least 40 m. I made no systematic search for it in my material, so the list of localities quoted below only states some places in which I happened to come across it.

Previous Records from Greenland:

E. Gr.: 6 localities between lats. $65^2/_3$ and well over 82° N. (R. 1898, l. c.; 1910, p. 131; 1933, p. 6; J. 1904, p. 69; L. 1951, p. 10).

W. Gr.: 6 localities between lats. $60^3/_4$ and $76^3/_4$° N. (R. 1893 & 1898, l. c.; L. 1933, p. 10).

Scoresby Sund District: Kap Tobin, 27—31 m, in *Euthora*; Amdrups Havn, 20 m, 33 m; Kap Hope, 30 m; Fame Øer, 4—6 m; Kap Stewart, in *Dilsea integra*, cast ashore (N. H.); Bjørneøer, 28—32 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, in *Turnerella* originating from a dredging at a depth of 40—80 m.

2. **Chlorochytrium Schmitzii** Rosenv., 1893, p. 964, fig. 56; 1898, p. 119, fig. 25 A—B; Jónsson, 1903, p. 338, fig. 1.

I found numerous individuals of this species in the thallus of *Petrocelis polygyna*. In old hosts it may attain a considerable size, its length and diameter exceeding 200 μ and 100 μ, respectively (measured on plants kept in glycerine as a permanent slide). Most of the individuals are clavate, a great number of them resembling the plant on the extreme left in Jónsson's (op. c.) fig. 1. In other individuals the lowermost, attenuated part may be appreciably longer. In some plants, the lowermost part may be rather abruptly narrowed and produce into a long, very narrow, irregularly tubular part. Such plants may be very similar to *Codiolum petrocelidis* KUCK., e. g. to KUCKUCK's (1894) fig. 27 F, but are easily distinguished from that species in which the stipe is solid. In many plants the chromatophore contains several pyrenoids, in some cases more than 10.

In many cases the uppermost part of the plant reaches the level of the surface of the host but, when inhabiting *Petrocelis* plants whose vertical threads are growing and terminate in low cells, it is completely immersed. Several plants collected in July seemed to be fructifying, some of them were empty.

Plants similar to those inhabiting *Petrocelis* were found in *Peyssonnelia Rosenvingii.*

The species was observed also in *Cruoria arctica.* When inhabiting this host the plant was less abundant, shorter, generally obovate, its lower part being more or less narrowed. Its reduced length may have some connection with the fact that the *Cruoria* crusts are considerably thinner than the *Petrocelis* crusts. Some plants inhabiting a specimen of *Cruoria* from a depth of 120 m were, however, well developed, measuring 68—84 × 48—64 μ.

The species is of frequent occurrence in the above-mentioned hosts and its vertical range is very considerable, viz. from 6—11 m down to 120 m. While in East Greenland it was observed only in these three host above plants, JÓNSSON's Icelandic plants, which were somewhat smaller than mine, inhabited *Ralfsia.*

In BRISTOL's opinion (1920, p. 14), later shared by PRINTZ (1927, p. 90), this species is but a form of *C. inclusum.* I for my part, however, judge it fully warranted to preserve it as an independent species which was also done by TAYLOR (1937, p. 43).

Previous Records from Greenland:

E. Gr.: 2 localities in lats. $70^1/_2$ and $76^1/_2$° N., respectively (R. 1898, l. c., and 1910, p. 131).

W. Gr.: A single locality in lat. $72^1/_3$° N. (R. 1893, l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m, 120 m; Kap Hope, 10—11 m; Bjørneøer, 6—11 m, 14—17 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Vinterøer, 25—35 m.

3. Chlorochytrium dermatocolax REINKE, Algenfl., p. 88; ROSENV., 1893, p. 964; SVEDELIUS, 1901, p. 72, fig. 1; SKUJA, 1924, figs. 1—2.

Chl. inclusum var. *dermatocolax* (REINKE) BRISTOL, 1920, p. 24.

This species is widely distributed in my districts where it was met with from the littoral zone down to almost 40 m. Most frequently it is encountered in hibernating shoots of *Sphacelaria arctica.* In mid-August I observed it in *Chaetopteris plumosa* where it occurred in the lowermost part of pinnae. The species is well developed and attains larger dimensions than those usually reported. Thus, its length and diameter may come close to 65 μ and 50 μ, respectively. Fructifying plants were observed in June, July, and August. In June, emptied sporangia were frequent. It applies to my findings as well as to previous Greenlandic ones that the species invariably inhabited *Sphacelariaceae* whereas, when occurring in other waters, it grows also in various *Rhodophyceae,* particularly *Rhodomelaceae.*

Previous Records from Greenland:
E. Gr.: 3 localities between lats. $65^1/_2$ and $66^1/_4$° N. (J. 1904, p. 69).
W. Gr.: 3 localities between lats. $61^1/_4$ and $69^1/_4$° N. (R., l. c.; J., l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m; Kap Hope, 5—10 m; the mouth of Hurry Inlet, 35—38 m; Fame Øer, 0 m, 5—10 m; Rødeø, 2 m.
Kejser Franz Josephs Fjord District: Vinterøer, 2—3 m.

4. **Chlorochytrium Cohnii** WRIGHT, 1877, p. 355; LAGERH., 1884, p. 91; PRINTZ, 1926, p. 218.
Chlorocystis Cohnii REINHARD, 1885, p. 4, pl. 1 figs. 1—12; ZIMMERMANN, 1925, p. 14, pl. 1 fig. 4.

In Greenland this species has only been met with in the mucilage-envelope of diatoms and in tests of infusorians, but records from other waters show that it also occurs endophytically in various algae.

Previous Records from Greenland:
E. Gr.: A single locality in about lat. 66° N. (J. 1904, p. 69).
W. Gr.: 5 localities between lats. $60^1/_2$ and $68^1/_2$° N. (R. 1893, p. 963; 1898, p. 119; J., l. c.).

Not observed by me.

Gomontia Bornet et Flahault, 1888.

1. **Gomontia polyrhiza** (LAGERH.) BORN. & FLAH., 1888, p. 163; 1889, p. 152, pls. 6—8; PRINTZ, 1926, p. 236, pl. 10 figs. 126—131; KYLIN, 1935, p. 3.
Codiolum polyrhizum LAGERH., 1885, p. 22.

As will be generally familiar, this species, which inhabits calcareous shells, was previously believed to consist of irregularly branched, vegetative threads giving rise to large, irregular cells that developed into sporangia. However, as shown by KYLIN (op. c.) the species is unicellular, the vegetative threads not pertaining to it. Each of the large cells, which on their outer sides are provided with rhizoid-like outgrowths, represents a distinct *Gomontia* specimen.

I have searched the species in some random samples of old, empty, perforated shells of bivalves with greenish specks, but succeeded only in one case in showing the presence of a couple of sterile specimens measuring 80 × 28 μ and 100 × 24 μ, respectively. The shell in question belonged to *Mya truncata* and was collected in the first half of July at a depth of 50 m.

Previous Records from Greenland:

E. Gr.: 2 localities in lats. 70½ and 76½° N., respectively (R. 1898, p. 101; 1910, p. 129).

W. Gr.: Four localities between lats. 64¼ and 72¾° N. (id. 1893, p. 907; 1898, l. c.; 1926, p. 11. — NB. It cannot be taken for granted that all specimens from W. Gr. are in conformity with KYLIN's construction).

Scoresby Sund District: Kap Tobin, 50 m; Danmarks Ø, 19—32 m (N. H.).

To *Chlorococcaceae* was previously referred *Characium marinum* KJELLM. (1883, p. 317 (388)) which was first described by KJELLMAN (1877 a, p. 57, pl. 4 fig. 10) as *Characium* spec. However, in his work on the marine algae of the Norwegian west coast LEVRING (1937, p. 16, the foot-note) is of the opinion that it does not represent a distinct species but merely germinating stages of *Cladophora*. At the beginning of July I observed similar plants growing epiphytically on *Sphacelaria arctica* at a depth of 5—10 m at Fame Øer and after having studied them I adopt LEVRING's interpretation. My plants may represent developmental stages of *Acrosiphonia*.

Ulotrichales

Ulotrichaceae

Ulothrix Kützing, 1833.

1. Ulothrix flacca (DILLW.) THURET in LE JOLIS 1863, p. 56; FOSLIE, 1890, p. 144, pl. 3 figs. 1—3; ROSENV., 1893, p. 935, fig. 44; 1910, p. 130; WILLE, 1901, p. 18, pl. 1 figs. 54—57, pl. 2 figs. 58—63; JÓNSSON, 1904, p. 54; FELDM., 1931, p. 196, pl. 7; 1937, p. 39, fig. 6 A.

Conferva flacca DILLWYN, 1809, pl. 49.

This species is especially characterized by its generally thick threads, consisting of low cells with thickened outer walls, and by the fact that each chromatophore often contains more than one pyrenoid. I found this species in August in two localities where it inhabited stones in the littoral zone. In one locality it grew together with *Urospora penicilliformis* and other *Ulothrix* species. My plants were fructifying and had a diameter of (16—) 24—28 μ. The length of the cells measured ¼ — almost 1 diameter, presumably most often ⅓—½ diameter. Each cell contained 1 to 3 pyrenoids. Some threads were bent and twisted as shown by KÜTZING (Tab. phycol., Bd. 3, pl. 64 fig. II b—e) in *Hormotrichum vermiculare*.

Previous Records from Greenland:

E. Gr.: 4 localities between lats. $65^3/_4$ and $67^1/_4$° N. (J., l. c.) and one in about lat. $76^1/_2$° N. (R. 1910, l. c.).

W. Gr.: Common between lats. $60^1/_4$ and 68° N. (R. 1893, l. c.; 1898, p. 115).

Scoresby Sund District: Kap Tobin, littoral.
Kejser Franz Josephs Fjord District: Nordfjord, littoral.

2. Ulothrix pseudoflacca Wille, 1901, p. 22, pl. 2 figs. 64—81; Jónsson, 1904, p. 55, fig. 7; Feldm., 1937, p. 40, fig. 6 C.
U. implexa Kütz., Rosenv., 1893, p. 936.

This species was recorded in August in three localities. It occurs on rocks of the littoral zone and seems to be the most abundant *Ulothrix* species. The diameter of the threads is 8—12 μ, the length of the cells $^1/_2$—1 diameter. Each cell contains only 1 pyrenoid. The threads are often somewhat bent (cf. Wille, op. c., pl. 2 fig. 64). The species is closely related to *U. flacca* (cf. Kylin, 1949, p. 13) and it might well be imagined that it is but a thin variety of that species. However, in addition to being thinner and harbouring only a single pyrenoid in each cell, it is also distinguished from that species by the absence of rhizoids.

Some detached, very characteristic threads were found at Ella Ø together with *Rhizoclonium.* They were bent and twisted and consisted of low, emptied cells (sporangia). In several cases they were bent like those depicted by Kützing in the figures quoted under the preceding species, so that it was possible to look into them. At first I was inclined to refer them to *U. flacca*, but as they measure only 8—12 μ in diameter I include them in the species under consideration.

Jónsson (op. c., p. 56) describes a f. *tenuior* from the southern part of E. Greenland whose threads are 7—14 μ in diameter while the cells measure $^1/_2$—2 diameters. The chromatophore does not occupy the whole length of the cell. This form is reported to resemble *U. subflaccida* but is distinguished from that species by the fact that the pyrenoid is laterally situated. I have not encountered this form.

Previous Records from Greenland:

E. Gr.: 3 localities between lats. 60 and 66° N. (J., op. c., p. 57).

W. Gr.: Numerous localities between lats. 60 and 70° N. (according to Jónsson's revision of material from West Greenland, op. c.).

Scoresby Sund District: Kap Tobin, littoral; Scoresbysund, littoral.
Kejser Franz Josephs Fjord District: Ella Ø, littoral.

3. Ulothrix scutata Jónsson, 1904, p. 57, figs. 8—9; Rosenv., 1910, p. 130.

Previous Records from Greenland:

E. Gr.: One locality in lat. $76^1/_2$° N. (R., l. c.).

W. Gr.: Some few localities in the southernmost part between lats. 60 and $60^1/_2$° N. (J., l. c.).

Not recorded by me.

4. **Ulothrix consociata** WILLE, 1901, p. 25, pl. 2 figs. 82—89; JÓNSSON, 1904, p. 60; ROSENV., 1910, p. 130; PRINTZ, 1926, p. 230.

Although with some doubt, I refer to the above a species growing in the littoral zone where it formed wisps on stones. When dissecting the wisps I noticed repeatedly that several threads might grow closely together and seem to be coalescent (cf. WILLE, op. c., pl. 2 fig. 84). In some cases a number of threads might be united so as to form a layer or a cord. The diameter of the threads measured 8—13 μ, the length of the cells $^1/_2$—$1^1/_2$ diameter. The chromatophore contained one pyrenoid and occupied only part of the cell. Rhizoids were sometimes observed up the threads. They grew, as a rule, obliquely downwards but might in some few cases issue rectangularly. In one instance a rhizoid was given out immediately above a series of emptied sporangia. However, I did not succeed in examining the basal parts of the threads so I do not know whether a short lateral rhizoid issues from one of the lowermost cells and whether the basal cell is oval or nearly ovate as recorded by WILLE.

Previous Records from Greenland:
E. Gr.: One locality in lat. $76^1/_2$° N. (R., l. c.).
W. Gr.: A couple of localities situated in lats. $60^1/_2$ and $64^1/_4$° N., respectively (J., l. c.).

Scoresby Sund District: Charcots Havn, littoral; Nordbugten at the Nordvestfjord, littoral.

5. **Ulothrix islandica** (JÓNSSON) PRINTZ, 1926, p. 230.

U. consociata var. *islandica* JÓNSSON, 1903, p. 354, figs. 5—9; 1904, p. 60, figs. 10—11.

Previous Records from Greenland:
E. Gr.: One locality in lat. 66° N. (J., l. c.).
W. Gr.: One locality in the southernmost part in lat. 61° N. (J., l. c.).

Not encountered by me.

6. **Ulothrix subflaccida** WILLE, 1901, p. 27, pl. 3 figs. 90—100; 1913, p. 20, pl. 1 figs. 5—13; JÓNSSON, 1904, p. 62; FELDM., 1937, p. 40, fig. 6B; WÆRN, 1952, p. 30.

Observed in a single locality at a depth of 15—17 m, growing on a bryozoan (*Bugula* sp.) which, in its turn, inhabited an ascidian. As this species generally is recorded from the littoral zone it is noteworthy to encounter it at such a comparatively great depth. The threads are typical, rather thin, 5—10 μ in diameter, and consist of long cells, only partially occupied by a chromatophore with a central pyrenoid. The material dates from late July and had emptied sporangia, measuring 12 μ in diameter.

Previous Records from Greenland:
E. Gr.: One locality in lat. 66° N. (J., l. c.).
W. Gr.: One locality in lat. $60^3/_4$° N. (J., l. c.).

Scoresby Sund District: Amdrups Havn, 15—17 m.

Ulvales

Monostromaceae

Monostroma Thuret, 1854.

1. **Monostroma leptodermum** Kjellm., 1877 b, p. 52, figs. 23—24; Rosenv., 1893, p. 944, fig. 49; Jónsson 1904, p. 63.

Previous Records from Greenland:
E. Gr.: One locality in lat. 66° N. (J., l. c.).
W. Gr.: Some 10 localities between lats. $60^3/_4$ and $67^1/_2$° N. (R. 1893, l. c.; 1898, p. 117).

Not recorded by me.

2. **Monostroma fuscum** (Post. & Rupr.) Wittrock, 1866, p. 53, emend. Rosenv., 1893, p. 940, figs. 47—48; Jónsson, 1904, p. 62. — Not *M. fuscum* in Hamel, 1931 a, p. 145.
Ulva fusca Postels & Ruprecht, 1840, p. 21.
Monostroma Blyttii (Aresch.) Wittrock, op. c., p. 49.
M. splendens (Rupr.) Wittrock, op. c., p. 50.

This is the only *Monostroma* species recorded by me. It occurred sparsely near Fame Øer at the head of Hurry Inlet, inhabiting stones and a shell of *Astarte borealis*, and was found cast ashore on the nearby eastern shore of this fiord which localities presumably constitute its northern limit in East Greenland. The specimens on hand are small, their length amounting to just under 3.5 cm and their width to about 2.5—3.5 cm. The cells of the specimens found in mid-August contained numerous starch-grains.

As will be known, it is characteristic of this species in distinction to most other species that each cell contains 2 chromatophores. However, in material from the American Atlantic coast, Collins (1909, p. 25) records that each cell contains but one chromatophore as depicted by Wittrock, 1866, pl. 3 fig. 11. In their work on the *Chlorophyceae* from the American Pacific coast, Setchell and Gardner (1920, p. 244) mention that in some plants two chromatophores were observed in each cell whereas this did not apply to other plants. In his diagnosis of the genus *Monostroma*, Taylor (1937, p. 69) says: "cells with a single plate-like chromatophore".

Previous Records from Greenland:

E. Gr.: Between the southern point and lat. $68^1/_2$° N. (R. 1893, p. 943; 1898, p. 116; 1933, p. 6; J., l. c.).

W. Gr.: Numerous localities between the southern point and lat. 70°, and one locality in lat. $78^1/_3$° N. (R. 1893 & 1898, l. c.; 1926, p. 11; L. 1933, p. 10).

Scoresby Sund District: Fame Øer 4—6 m, 8—12 m (fragments). Cast ashore near Fame Øer.

3. **Monostroma Grevillei** (THUR.) WITTROCK, 1866, p. 57, emend. ROSENV., 1893, p. 946, figs. 50—52; 1898, p. 117; JÓNSSON, 1904, p. 64.
Enteromorpha Grevillei THURET, 1854, p. 25.
Monostroma Vahlii J. AGARDH, 1883, p. 109.
M. arcticum WITTROCK, op. c., p. 44.

The following four forms of this species are recorded from both East and West Greenland: f. *typica*, f. *Vahlii*, f. *arctica*, and f. *intestiniformis*.

Previous Records from Greenland:

E. Gr.: One locality in lat. 60° N. (R. 1893, p. 954) and 5 localities between lats. $65^3/_4$ and $67^1/_4$° N. (J., l. c.).

W. Gr.: Between the southern point and 70° N. (R. 1893 & 1898, l. c.; 1926, p. 11; K. 1897c, p. 36).

Not met with by me.

Ulvaceae

Percursaria Bory, 1823.

1. **Percursaria percursa** (C. AG.) ROSENV., 1893, p. 963; JÓNSSON, 1903, p. 342, fig. 4; 1904, p. 67, fig. 13; KORNMANN, 1954b, p. 101; 1956, p. 259.
Conferva percursa C. AGARDH, 1817, p. 87.

Previous Records from Greenland:

E. Gr.: One locality in lat. 70° N. (J., l. c.).

W. Gr.: Four localities between lats. $60^3/_4$ and $68^1/_2$° N. (R. 1893, l. c.; J., l. c.).

Not observed by me.

Enteromorpha Link, 1820.

1. **Enteromorpha intestinalis** (L.) LINK, op. c, p. 5.
E. intestinalis α, *genuina* ROSENV., 1893, p. 957; JÓNSSON, 1904, p. 66.
Ulva intestinalis LINNÉ, 1753, p. 1163.

Previous Records from Greenland:

E. Gr.: One locality in lat. 66° N. (J., l. c.), fragments.

W. Gr.: Two localities in lats. 67 and 69° N., respectively (R. 1893, l. c.). Moreover, the latter author (1898, p. 118) records specimens from Godthaab in lat. 64° N., which are said to constitute an intermediate type between the species under consideration and the variety *micrococca* (= *Blidingia minima*), as well as other specimens originating from several localities south of lat. 61° N.

Not encountered by me.

2. Enteromorpha compressa (L.) GREVILLE, 1830, p. 180.
E. intestinalis γ, compressa (L.) ROSENV., 1893, p. 958.
Ulva compressa LINNÉ, 1753, p. 1163.

Previous Records from Greenland:

E. Gr.: According to ROSENVINGE (1898, p. 118), KJELLMAN (1883) has referred to this species some young specimens collected by VAHL in a locality in lat. $60^1/_2$°N.

W. Gr.: A dozen localities between lats. 60 and $69^1/_4$° N. (R. 1893; 1898, p. 118).

Not recorded by me.

3. Enteromorpha prolifera (MÜLL.) J. AG., ROSENV., 1893, p. 960; 1910, p. 131; JÓNSSON, 1904, p. 66; BLIDING, 1939, p. 134.
E. micrococca f. *subsalsa* BØRGESEN, 1901, p. 245, pl. 8 fig. 6.

I have referred to the above some plants collected at Ella Ø at the beginning of August which undoubtedly are identical with those described by JÓNSSON (l. c.). Some of the plants were attached, others unattached. However, the former were but slightly developed, well over 1 cm high, and occurred in scarce quantities together with *Calothrix scopulorum* and *Rhodochorton purpureum* f. *intermedium* in the upper part of the littoral zone. The unattached specimens, which were collected in a brackish pool, were interwoven so as to form a carpet.

The two kinds of plants resemble each other in being very flaccid and abundantly proliferating with divaricate, frequently bent branches and in having rather small cells with a single pyrenoid. In the unattached plants, the main threads may be e. g. 0.5 mm in diameter; the cells of the branches are arranged in longitudinal rows (although less distinct than in the below species), angular and often shorter than broad. As a rule the largest diameter of the cells does not exceed 8—10 (—12) μ.

In the attached plants, whose main threads are only about 75 μ in diameter, the largest diameter of the cells generally is no more than about 8 μ. The cells are more rounded and their arrangement in longitudinal rows is less distinct. Further, the cell-walls are thicker. I do not, however, presume that the two kinds of plants represent two distinct species but, as the attached specimens are too poorly developed to be used for an exact determination, I cannot enlarge on this question.

Previous Records from Greenland:

E. Gr.: Two localities in lats. 70° N. (J., l. c.) and $76^1/_2$° N. (R. 1910, l. c., the determination uncertain), respectively.

W. Gr.: A dozen localities from the southern point to lat. $78^1/_3$° N. (R. 1893, l. c.; 1926, p. 11).

Kejser Franz Josephs Fjord District: Ella Ø, littoral.

4. **Enteromorpha clathrata** (ROTH) J. AGARDH, 1883, p. 153; BLIDING, 1944, p. 331, figs. 1—3.
Conferva clathrata ROTH, 1806, p. 175.

I recorded this species in one locality only where it occurred in the littoral zone in mid-July together with *Fucus inflatus* with narrow frond, *Pylaiella*, *Rhodochorton purpureum* f. *intermedium*, and some few other species. It grew partly on *Fucus*, partly directly on the rocks. Together with *Pylaiella* it extended into some small crevices in the rocks in the upper part of the littoral zone where otherwise *Rhodochorton* was predominant.

The plants collected correspond with BLIDING's 'Typus I' but their length is only about 1 cm. They exhibit a main axis with a diameter of up to $^1/_4$ mm, truncated a little above its basal part and no doubt having hibernated; in several cases it bore epiphytic tufts of *Pylaiella*. The main axis gives rise to a great number of thinner laterals, unbranched or richly branched; in the latter case many of the branchlets still consist of but a single row of cells.

The cells were as a rule rectangular with slightly rounded angles and measured about 8—24 × 8—16 μ; they were arranged in distinct, longitudinal rows (less distinct as regards the main axes). The chromatophore occupied only part of the cell. The number of pyrenoids occurring in each cell was generally 2 or more. The branches of the first order and the more vigorous ones of the second order were to a wide extent fructifying, often with slightly protruding sporangia. Long rows of sporangia had already been evacuated.

Previous Records from Greenland:
None.

Scoresby Sund District: Fame Øer, littoral.

5. **Enteromorpha groenlandica** (J. AG) SETCHELL & GARDNER, 1920, p. 248.
Monostroma groenlandicum J. AGARDH, 1883, p. 107, pl. 3 figs. 80—83; ROSENV., 1893, p. 954, fig. 53; JÓNSSON, 1903, p. 350.

In West Greenland this species occurs in the littoral zone (often together with *Ulothrix flacca*). This is presumably also the case as regards East Greenland where it has likewise been recorded together with that species.

Previous Records from Greenland:
E. Gr.: One locality near the southern point and two localities in lats. $65^3/_4$ and $67^1/_4$° N., respectively (R., l. c.; J. 1904, p. 65).
W. Gr.: A number of localities between the southern point and lat. $68^3/_4$° N. (R. 1893, l. c.; 1898, p. 117).

Not recorded by me.

Chaetophorales

Chaetophoraceae

Acrochaete Pringsheim, 1862.

1. Acrochaete parasitica OLTMANNS, 1894, p. 208, pl. 7 figs. 1—10; ROSENV., 1898, p. 114.

Previous Records from Greenland:
E. Gr.: One locality in lat. $65^2/_3$° N. (R., l. c.).
W. Gr.: One locality in lat. $68^3/_4$° N. (OLTMANNS, op. c., p. 210).

Not observed by me. Nor did I succeed in finding *A. repens* PRINGSH., which inhabits *Chorda filum* but is unknown from Greenland.

Bolbocoleon Pringsheim, 1862.

1. Bolbocoleon piliferum PRINGSH., op. c., p. 2, pl. 1; HUBER, 1892, p. 308, pl. 13 figs. 8—12.

The species seems to be widely distributed and to occur abundantly, especially in *Chordaria* and old shoots of *Stictyosiphon*; it might even be impossible to find an old specimen of the latter species which is not inhabited by *Bolbocoleon*. As examples of other hosts may be mentioned *Dictyosiphon* and *Desmarestia aculeata*. The examination of the distribution of this species within my area is based only on random samples of the host plants; it was found in the below localities, at depths ranging from some few to 10 m. The chromatophores harbour several pyrenoids each. The hairs are long and vigorous and are not articulated. Sporangia occurred at the end of July.

Previous Records from Greenland:
E. Gr.: Danmarks Ø (R. 1898, p. 115) and in a locality in lat. $69^1/_2$° N. (the host was floating in an opening in the ice, J. 1904, p. 53).
W. Gr.: One locality in lat. $69^1/_4$° N. (R. 1893, p. 934).

Scoresby Sund District: Bjørneøer, 6—11 m; Danmarks Ø (N. H.).
Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 10 m; Vinterøer, 2—3 m.

Epicladia Reinke, 1889 (Atlas).

1. Epicladia flustrae REINKE, op. c., p. 31, pl. 24 figs. 5—9; KYLIN, 1938, p. 70, fig. 2.
Endoderma Flustrae BATTERS, 1902, p. 14.
Entocladia Flustrae TAYLOR, 1937, p. 54.

Observed in early July in *Membranipora* which it had rendered partially green. The species was well developed and to a great extent parenchymatous, disc-shaped. It possessed mature and emptied sporangia.

Previous Records from Greenland:

E. Gr.: One locality in lat. $76^1/_2$° N. (R. 1910, p. 129). The determination was somewhat doubtful.

W. Gr.: A couple of localities in lats. $64^1/_4$ and $65^1/_2$° N., respectively (id., 1898, p. 115).

Scoresby Sund District: The mouth of Hurry Inlet, 35—38 m.

Pseudendoclonium Wille, 1901.

1. **Pseudendoclonium submarinum** WILLE, op. c., p. 29, pl. 3 figs. 101—134; 1910, p. 282, pl. 1 figs. 1—9.
Ps. marinum (REINKE) ALEEM & SCHULZ, 1952, p. 72, fig. 5a—c.

I encountered this species at the end of August on stones in the littoral zone. It occurred together with *Ulothrix* and other green algae and is, no doubt, widely distributed in Greenland although it has until now been recorded only from one locality.

In recent years it has by ALEEM & SCHULZ been considered identical with *Protoderma marinum* REINKE (Algenfl., p. 81) and has by them been classified as quoted above, as is also done by FELDMANN (1954, p. 17). Personally I am of the opinion that REINKE's species is too insufficiently described to be recognisable, for which reason I preserve the name WILLE gave it. It may be added that this procedure is followed also by HOFFMANN (1953, p. 228).

Previous Records from Greenland:

E. Gr.: Danmarks Havn in lat. $76^1/_2$° N. (R. 1910, p. 129).

W. Gr.: None.

Scoresby Sund District: Scoresbysund, littoral.

Arthrochaete Rosenvinge, 1898.

1. **Arthrochaete penetrans** ROSENV., op. c., p. 111, fig. 24; 1910, p. 127.
A. phaeophila ROSENV., 1910, p. 127, fig. 9.

I have collected ample material of the genus *Arthrochaete* which seems to be of common occurrence, particularly in the outer Scoresby Sund. It was met with at depths from 5—10 m down to 50 m. ROSENVINGE described two species of this genus but as I consider it impossible to keep them distinct I prefer to amalgamate them. In my material I found, in *Turnerella* and *Symphyocarpus strangulans*, plants that agreed perfectly with the descriptions of *A. penetrans* and *A. phaeophila*, respectively, but in other hosts I observed various intermediate forms in which pseudo-parenchymatous parts were more or less prevailing. The species reaches its optimum development when inhabiting *Turnerella*, while in *Symphyocarpus* and similar species it occurs as a reduced form. Thus, the two "species" represent but extremes of one and the same species.

As examples of host plants besides the above-mentioned two species may be quoted *Euthora cristata*, *Polysiphonia arctica*, *Peyssonnelia Rosenvingii*, *Cruoria*, *Chaetopteris*, and *Desmarestia aculeata*. In some cases the species is entirely epiphytic, in others epi- and endophytic at the same time, according to the structure of the host. It is worth mentioning that it may be completely epilitic and that I also observed it growing on *Lithothamnion*. On a small stone I found a specimen that was pseudoparenchymatous and nearly orbicular, its diameter measuring slightly less than 350 μ.

The species is easily distinguished by its often numerous, long, articulated hairs, separated by a septum from the hair-bearing cells. In dried material, however, the hairs may be broken off. When it inhabits old *Turnerella* plants the hairs may be so numerous as to render the host slightly tomentose. Further characteristics are its large, plate-like chromatophore containing 1 (—2) pyrenoids, and its sporangia which are abundant and generally obovate, short pyriform, or nearly globular. Sporangia of different shapes may be found in one and the same specimen. In plants collected in July and August the sporangia usually were emptied and, if so, they were very often proliferated by a hair, while others dating from late June bore mature sporangia with differentiated, rather large spores. In the latter case the sporangia measured 22—25(—28) $\times$ (16—) 18—24 μ and had rather thick walls. It should be added that the plants in question had been kept in glycerine as a permanent slide for several years.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $70^1/_2$ and $76^1/_2$° N., respectively (R. 1898 & 1910, l. c.).

W. Gr.: None.

Scoresby Sund District: Kap Tobin, 6—11 m (on stones), 50 m; Amdrups Havn, 16—18 m, 22—25 m; Kap Hope, 12—13 m; Fame Øer, 5—10 m; Bjørneøer, 6—11 m, 9—20 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, in *Turnerella* in a dredging from a depth of 40—80 m.

Chaetobolus Rosenvinge, 1893.

1. Chaetobolus gibbus Rosenv., op. c., p. 928, fig. 41.

At the end of August I found a single individual of this species inhabiting *Fucus* in company with an old *Sorapion Kjellmanii* specimen with emptied sporangia and with branched vertical filaments. As the *Chaetobolus* plant is not quite intact I cannot give details as to the manner in which it grew in relation to *Sorapion* but it does not seem to have been inclosed. In surface view it appears rounded with a diameter of about 100 μ. At any rate part of it consists of at least two cell-layers.

The uppermost cells bear a single hair each and are slightly protruding, empty or with insignificant contents only. The other cells are often slightly rounded, measuring up to $14 \times 16\,\mu$; as a rule they contain a great number of starch grains.

ROSENVINGE (l. c.) compares the genus *Chaetobolus* with the genus *Ochlochaete* to which it is closely related. The main difference is reported to be that the typical thallus of the latter is monostromatic whereas that of *Chaetobolus* is composed of several layers. However, as the cells may overlap one another, old thalli of *O. ferox*, too, may in their central part exhibit more than one layer. WÆRN (1952, p. 59) is also of the opinion that the distinction between the two genera is insignificant; he applies the name of *Ochlochaete gibbus* to the species under consideration but does not consider it identical with *O. ferox.*

Another difference between *Ch. gibbus* and *O. ferox* lies in the shape of the thallus which in the former is described as hemispherical or subspherical while the latter is said to form more or less regular discs; the shape varies, however, according as the plants develop freely or are inclosed by surrounding algae.

Chaetobolus gibbus does not seem to have been recorded outside of Greenland. However, in April, 1933, I collected in Danish waters (Saltholm near Copenhagen) some specimens belonging to *Chaetophoraceae*, which bore a great number of hairs and grew isolated on a stone, and which presumably must be referred to this species. On the label of a slide containing these plants ROSENVINGE called them *Chaetobolus*. The specimens in question measure up to $160\,\mu$ in diameter and, as far as can be ascertained, they are all of them composed of more than one layer except at their margins. The hair-bearing superficial cells are elongated.

Previous Records from Greenland:

E. Gr.: Two localities in lats. 66 and $70^1/_2$° N., respectively (R. 1898, p. 110; J. 1904, p. 52).

W. Gr.: Two localities in lats. $68^2/_3$ and 71° N., respectively (R. 1893 & 1898, l. c.).

Scoresby Sund District: Danmarks Ø (N. H); Rødeø, 2 m.

Pringsheimiella v. Hoehnel, 1919, p. 97.

1. Pringsheimiella scutata (RKE) MARCHEWIANKA, 1924, p. 42; *P. scutata* (RKE) SCHMIDT & PETRAK in SCHMIDT, 1935, p. 29.

Pringsheimia scutata REINKE, Atlas, p. 33, pl. 25; Algenfl., p. 81; PRINTZ, 1926, p. 242, pl. 6 figs. 58—61.

This species occurred richly on *Rhodomela lycopodioides* collected in mid-August. The discs usually measured about $80\,\mu$ in diameter, but would vary from 60 to $100\,\mu$. They showed very much resemblance to

NEWTON's (1933) fig. 51 B. Many plants were fructifying and in several cases the central part of the disc consisted of evacuated sporangia exclusively. No hairs were observed.

As will be known, REINKE described and depicted both sexual and asexual plants but KYLIN (1949, p. 44) expresses his doubt as to whether the two kinds of plants do actually belong to the same species. When dealing with the occurrence of the species on the Swedish west coast he does, however, reproduce REINKE's drawings of both kinds of plants under the name of *Pringsheimiella scutata.*

Previous Records from Greenland:

E. Gr.: Two localities in lats. 66 and $66^{1}/_{4}$° N., respectively (J. 1904, p. 52).

W. Gr.: Two localities in lats. $61^{1}/_{4}$ (J., l. c.) and 67° N., respectively (R. 1893, p. 924).

Kejser Franz Josephs Fjord District: The head of Dusèns Fjord, 15—25 m.

Pseudopringsheimia Wille, 1909.

1. **Pseudopringsheimia confluens** (ROSENV.) WILLE, op. c., p. 89; LEVRING, 1937, p. 27.
Ulvella confluens ROSENV., 1893, p. 924, fig. 39; OLTMANNS, 1894, p. 212; JÓNSSON, 1904, p. 52.
Pseudopringsheimia penetrans KYLIN, 1910, p. 6.

When working up my *Laminaria* material I made, for the purpose of examining the occurrence of mucilage-canals, numerous transverse sections of stipes. At the same time I was conscious of the above species which I succeeded in finding on the stipe of a single plant collected in mid-August and with some doubt referred to *Laminaria groenlandica.* Contrary to what was stated by ROSENVINGE — but in accordance with OLTMANNS' and, as regards *Ps. penetrans*, KYLIN's observations — threads from the under surface of this plant penetrate into the host. The cushions were only about 50—60 μ high. One pyrenoid was observed in each chromatophore.

Previous Records from Greenland:
E. Gr.: Two localities in lats. 66 and $69^{3}/_{4}$° N., respectively (J., l. c.).
W. Gr.: Four localities between lats. 64 and 70° N. (R. 1893, l. c.; 1898, p. 109).

Scoresby Sund District: Kap Tobin, 6—11 m.

2. **Pseudopringsheimia fucicola** (ROSENV.) WILLE, 1909, p. 89.
Ulvella fucicola ROSENV., 1893, p. 926, fig. 40; OLTMANNS, 1894, p. 211, pl. 7 figs. 11—13.

Observed in company with young *Enteromorpha clathrata* specimens on *Fucus inflatus* collected in mid-July.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $65^1/_2$ and $65^2/_3$° N., respectively (J. 1904, p. 52; R. 1898, p. 110).

W. Gr.: Two localities in lats. $60^1/_2$ and $68^3/_4$° N., respectively (R. 1893 & 1898, l. c.).

Scoresby Sund District: Fame Øer, littoral.

Cladophorales

Cladophoraceae

Urospora Areschoug, 1866.

1. Urospora penicilliformis (ROTH) ARESCH., 1874, p. 4; WÆRN 1952, p. 64.
Conferva penicilliformis ROTH, 1806, p. 271.
Urospora mirabilis ARESCH., 1866, p. 16, pl. 3; ROSENV., 1893, p. 918; BØRGESEN, 1902, p. 500; JÓNSSON, 1903, p. 360; HAGEM, 1908, p. 294, pl. 1 figs. 1—4; PRINTZ, 1932, p. 273; JORDE, 1933, p. 1.
?*Codiolum gregarium* A. BRAUN, 1855, p. 20.
?*C. Nordenskiöldianum* KJELLM., 1877a, p. 56.

I found this species in two localities at the middle and the end of August, respectively. Together with *Ulothrix* species it inhabited rocks of the littoral zone and in both cases it was found to be less abundant than *Ulothrix*. Each cell harbours numerous pyrenoids. The diameter of the threads ranges from 24 to about 50 μ. The full-grown threads generally are about 36—40 μ in diameter and consist of barrel-shaped, thick-walled cells whose length is 1—2 diameters. In younger, thinner threads the length of the cells may be 1—4 diameters. In such threads, too, constrictions may occur at the transverse walls. When cell-division takes place it may temporarily give rise to segments, consisting of 2—4 or more cells without constrictions, between the constrictions of the parent-cell. From both localities, most of the material collected was fructifying.

Filaments exhibiting elongate cells suggest the var. *elongata*, described by ROSENVINGE (l. c.) from W. Greenland, whose characteristic feature lies in its long, cylindrical cells. This variety was later found in the Oslo Fjord by HAGEM, who considered it an independent species which he called *U. elongata*. HAGEM's species was subsequently investigated by PRINTZ who, however, was uncertain as to whether or not it ought to be kept distinct as it seems to be connected with *U. penicilliformis* by all intermediate forms. Personally I have not had sufficient material to be able to form an opinion on this problem.

In a paper issued in 1933, JORDE has published the result of some interesting examinations of the life-history of the species in question. According to that author *Codiolum gregarium* A. BR., which until then was considered a distinct alga, is but a developmental stage of this species. *Codiolum gregarium* has not been recorded from East Greenland whereas it has been met with in a couple of West Greenlandic localities in lats. $60^1/_2$ (Jónsson, 1904, p. 69) and $64^1/_4$° N. (Rosenvinge, 1898, p. 118, sub. nom. *C. Nordenskioeldianum*), respectively.

Previous Records from Greenland:
E. Gr.: Two localities in lats. 66 and $67^1/_4$° N., respectively (J. 1904, l. c.).
W. Gr.: Six localities between lats. 60 and $77^1/_3$° N. (R. 1893, l. c.; 1898, p. 106; L. 1933, p. 11).

Scoresby Sund District: Kap Tobin, littoral; Scoresbysund, littoral.

Chaetomorpha Kützing, 1845.

1. **Chaetomorpha melagonium** (Web. & Mohr) Kütz., op. c., p. 204; Rosenv., 1893, p. 917; 1898, p. 104; 1910, p. 126; Kuckuck, 1897 c, p. 35; Lund, 1951, p. 10.
Conferva melagonium Weber & Mohr, 1804, p. 194.
Chaetomorpha tortuosa (Dillw.) Kleen, Rosenv., 1893 & 1898, l. c.; Børgesen, 1902, p. 503; Jónsson, 1903, p. 364.

According to previous literature the genus *Chaetomorpha* is in Greenland represented by two species, viz. *Ch. melagonium* and *Ch. tortuosa*, of which the former is by far the more important. It occurs practically always as f. *typica* Kjellm. and is usually unattached. The species exhibits a wide range of variability as regards the diameter of the filaments. According to the pertinent literature the diameter in Greenlandic plants varies from 100 μ to 1 mm while the length of the cells is said to be 1—4 (usually 3—4) diameters.

When *Ch. melagonium* f. *typica* exhibits a diameter of 200—400 μ, which is the usual diameter of *Ch. linum*, it shows a striking resemblance to that species (cf. Kuckuck, Rosenvinge, 1898, l. c.). According to the latter author it is, however, distinguishable from *Ch. linum* by its darker colour, its firmer structure, and its more elongate cells, although he admits that the determination of an isolated thread may cause difficulty in case no information of its origin is available.

The other Greenlandic species is the so-called "northern form" of *Chaetomorpha tortuosa*, viz. *Ch. tortuosa* (Dillw.) Kleen. According to Rosenvinge (1893 & 1898, l. c.) the diameter of the threads of Greenlandic specimens varies from 40 to 70 μ (35—73 μ) while the length of the cells is said to be 2—4 (1.5—5) diameters. From the Faroes, Børgesen (1902, p. 504) reports that the diameter of the threads measures 30—60 μ and the length of the cells 2—5 diameters, and according to Jónsson the threads of the Icelandic plants are 32—87 μ in diameter.

When the threads of *Ch. melagonium* measure only 100 μ in diameter they approach the thick threads of *Ch. tortuosa*. Threads with this diameter were found by ROSENVINGE (1910, l. c.) in material from Danmarks Havn in Northeast Greenland. He referred them to *Ch. melagonium* which classification he considered justified by the fact that each cell harboured from one hundred to several hundred nuclei while in a previous paper (1893) he had stated that in *Ch. tortuosa* each cell contains only about 20 nuclei.

In my above-mentioned work it was proved that this characteristic is not valid, as in *Ch. tortuosa*, too, the cells may contain about one hundred nuclei, so I had no hesitation in referring to *Ch. tortuosa* some singly occurring, unattached, thin threads collected in the Jørgen Brønlund Fjord in eastern North Greenland. Their diameters measured 66—82 (—94) μ and their cells might contain well over one hundred nuclei.

Although the diameter of *Ch. melagonium* from Greenland varies considerably, no records are available of filaments thinner than the thickest filaments of *Ch. tortuosa.* However, within my East Greenlandic area I observed in several instances threads whose diameter measured no more than 60—75 μ, their cells measuring 3—4 (2—5) diameters. At first, I was inclined to refer such filaments, usually occurring in small quantities, to *Ch. tortuosa* but as they were always accompanied by thicker, unquestionable *melagonium* threads, and as they were connected with the latter by filaments of all intermediate diameters I decided to refer them to *Ch. melagonium.*

By way of example may be quoted the following diameters measured in a small collection taken at a depth of 10 m at Ella Ø: 60, 75, 85, 90, 105, 120, 165, 180, 200, 225, 270, 360, 375 and 425 μ.

Accordingly, I find no warrant for keeping *Ch. tortuosa* distinct from *Ch. melagonium* and consider it merely an extreme variation of the latter.

It should be added that in other localities, too, *Ch. melagonium* may occur as very thin filaments. Thus, among the filaments collected by WÆRN (1952, p. 67) in the Åland Sea (the Baltic) the thinnest did not measure more than 50 μ.

The species is widely distributed in the area investigated by me and occurs abundantly. Its vertical range extends from less than 2 m down to almost 40 m. However, at depths of more than 20—25 m only single threads or fragments are found and the species seems, on the whole, to be of most frequent occurrence at not too great depths. In the localities examined it was represented exclusively by f. *typica*, usually unattached but sometimes attached to stones. In protected places where the bottom is soft it may occur unattached in considerable quantities. In such cases it frequently occurs in company with looselying *Desmarestia aculeata*, *Stictyosiphon*, *Phyllophora Brodiaei* f. *interrupta*, and other species.

Previous Records from Greenland:

E. Gr.: Between lats. 65$^2/_3$ and well over 82° N. (Z. 1874, p. 83; R. 1898 & 1910, l. c.; 1933, p. 6; J. 1904, p. 51; L. 1951, l. c.).

W. Gr.: From the southern point to lat. 77$^1/_4$° N. (R. 1893 & 1898, l. c.; 1926, p. 11; K. 1897c, l. c.; L. 1933, p. 11).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 11—13 m to 30 m; Rosenvinges Bugt, 10—12 m (A. P.); Kap Hope, 5—7 m to 11 m; the mouth of Hurry Inlet, 12—13 m, 20 m, 35—38 m; Fame Øer, 1—2 m to 15—20 m; Kap Stewart, cast ashore (N. H.); Bjørneøer, 6—11 m, 9—20 m; Danmarks Ø (N. H.); ibid. 1—3 m, 18—22 m; Rødeø, 2 m, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m to 20—25 m; Vinterøer, 3—6 m; the head of Dusèns Fjord, abundant on soft bottom.

Rhizoclonium Kützing, 1843.

1. **Rhizoclonium riparium** (Roth) Harvey, Phycol. Brit. pl. 238; Rosenv., 1893, p. 913, figs. 32—34; Wille, 1901, pl. 3 figs. 136—137, pl. 4 figs. 138—142, 148—157; Jónsson, 1903, p. 365; Wærn, 1952, p. 71.

Conferva riparia Roth, 1806, p. 216.

f. *polyrhizum* Rosenv., l. c.

My East Greenlandic material of this species corresponds fairly well with f. *polyrhizum* which, however, according to Jónsson's (l. c.) examinations of Icelandic specimens is not clearly separated from f. *validum*. In some cases I observed threads that, a little above the basal portion, issued a long, lateral branch resembling the mother-shoot and forming an acute angle with same. In other cases similar branches arose at a greater distance from the basal part and, if so, they seemed to be given out rectangularly. In the latter instances it is undoubtedly the mother-shoot that continues its growth at a right angle while the branch grows in the original direction of the mother-shoot (cf. Rosenvinge's (op. c., p. 911) description of the branching in *Rh. pachydermum*).

Rhizoids occur abundantly. They are usually short, somewhat bent, lateral (less frequently terminal), either one- or few-celled or not cut off by a septum from the parent-cell. When the rhizoids are terminal the thread may continue its growth at a right (or nearly right) angle to its original direction.

The diameter of the filaments varies from 24 to 35 μ while the length of the cells measures 1—4 diameters, most frequently 1.5—2 diameters; the cell-wall is usually about 2 μ thick, in the lowermost part of attached individuals, however, about 4 μ. The plants dating from the beginning of August were fructifying but a great number of the sporangia had already been evacuated.

The species was observed in one locality only, growing on rocks of the littoral zone with *Rhodochorton purpureum* f. *intermedium*, *Calothrix* and a few filaments of *Pylaiella*. On the first of these species as well as on *Rhizoclonium* itself were observed several specimens of a *Characium*-like epiphyte which was obovate and abruptly narrowed to produce into a tap. Most of these specimens measured $24 \times 12\ \mu$ and contained one plate-shaped chromatophore harbouring one pyrenoid. I presume they represent germinating *Rhizoclonium* zoospores.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $65^2/_3$ and $65^3/_4$° N., respectively (J. 1904, p. 51). However, a doubtful record also exists from Kap Wynn in lat. $74^1/_2$° N. (Z. 1874, p. 83, sub nom. *Rh. litoreum* (cf. R., op. c., p. 916)); in my opinion this record is too doubtful to be relied upon.

W. Gr.: A number of localities between lats. 60 and $72^3/_4$° N. (R. 1893, l. c.; 1898, p. 104; 1926, p. 12).

Kejser Franz Josephs Fjord District: Ella Ø, littoral.

Cladophora Kützing, 1843.

1. **Cladophora gracilis** (GRIFF.) KÜTZ., 1845, p. 215; ROSENV., 1893, p. 910; JÓNSSON, 1904, p. 50.

Conferva gracilis GRIFFITHS in WYATT, Alg. Danm. No. 97.

Previous Records from Greenland:

E. Gr.: One locality in lat. $65^2/_3$° N. (J., l. c.).

W. Gr.: Two localities in lats. $68^1/_2$ and $68^3/_4$° N., respectively (R., l. c.).

Not recorded by me.

Acrosiphonia J. Agardh, 1846, sensu Wille 1909.

1. **Acrosiphonia incurva** KJELLM., 1893, p. 61; JÓNSSON, 1903, p. 368; 1904, p. 43, figs. 4—5; BØRGESEN, 1902, p. 510.

Cladophora (*Spongomorpha*) *arcta* α, *typica* and β, *pulvinata* ROSENV., 1893, p. 907.

The genus *Acrosiphonia* is of fairly wide distribution in my area, also as regards its vertical range. It was met with in most of the localities visited (apart from the inner Scoresby Sund) and extended from some few metres down to a depth of 35—38 m. In most cases it was represented only by some few sterile fragments, detached or attached to various algae or to grains of sand, a specific determination thus being impossible. In some instances, however, I succeeded in collecting intact fructifying plants.

The latter were collected in June, July, and August, all of them undoubtedly belonging to the species under consideration. They were encountered at depths from 5—6 m down to 15—25 m. The height of the tufts measured about 3—6 cm. Characteristic features are the numerous rhizoids, the tapering of the branches towards their apices, and the comparatively thin main filaments whose largest diameter as a rule varies from well over 100 to 135 (—150) μ. In mature plants (from mid-July and mid-August) the cells of the main filaments usually exhibit a length of 1—2 diameters, rarely up to 3 diameters. The tips of the shoots are often dead and proliferated. Hooked branches were observed only in some few fully developed plants; in one of them they occurred richly and the lowermost part of the tuft was entangled. Their not being observed in the other plants is no doubt due to the fact that the latter still displayed a luxuriant growth. Such plants were observed at the end of June as well as in mid-August. They are characterized i. a. by the facts that several cells are of a fairly appreciable length and that the chromatophores are well developed and intact. In old plants the cells generally are almost devoid of contents.

The sporangia occur as a rule singly. Their length is usually 1—3 diameters. When a branch-bearing cell is fertilized the sporangium often extends somewhat up the branch, the septum cutting off the latter generally being situated at some distance from the axis.

Previous Records from Greenland:

E. Gr.: 4 localities between lats. $65^3/_4$ and $67^1/_4$° N. (J. 1904, l. c.).

W. Gr.: A great number of localities between the southern point and lat. $70^2/_3$° N. (id., op. c.).

Scoresby Sund District: Kap Tobin, 6—11 m; Kap Hope, 6—12 m; Fame Øer, 5—6 m.

Kejser Franz Josephs Fjord District: The head of Dusêns Fjord, 15—25 m, partly on *Fucus*.

2. Acrosiphonia hystrix (Strömf.) Jónsson, 1903, p. 368, figs. 13—14; 1904, p. 46, fig. 6.

Spongomorpha hystrix Strömfelt, 1886b, p. 54.

Cladophora arcta γ, *hystrix* Rosenv., 1893, p. 907.

Acrosiphonia flaccida Kjellm., Børgesen, 1902, p. 512 (cf. Børgesen, 1904, p. 94, the foot-note).

Previous Records from Greenland:

E. Gr.: Several localities between lats. $65^3/_4$ and 68—$68^1/_2$° N. (J. 1904, p. 49; R. 1933, p. 6). Moreover, Rosenvinge (1910, p. 126) states that a fragment of an *Acrosiphonia* collected in lat. $76^1/_2$° N. seems to belong to this species.

W. Gr.: A great number of localities between the southern point and lat. $78^1/_3$° N. (J. 1904, p. 48; R. 1926, p. 11; L. 1933, p. 10).

Not encountered by me.

Spongomorpha Kützing, 1843, sensu Wille, 1909.

1. Spongomorpha vernalis (Kjellm.) Jónsson, 1903, p. 366; 1904, p. 49.

Acrosiphonia vernalis Kjellm., 1893, p. 82, pl. 5.

Cladophora arcta Rosenv., 1898, p. 102, p. p.

Cl. lanosa Rosenv., ibid., p. 103.

Sterile tufts of this species, measuring 1.2 cm in height, were found at the end of July in a single locality, growing on the rocks slightly below 0 m. They correspond perfectly with KJELLMAN's pl. 5 fig. 1. The diameter of the threads measures (16—) 20—25 μ (—28 μ). Hooked and incurved branches were observed. Each cell contains a single nucleus and several pyrenoids.

Previous Records from Greenland:
E. Gr.: None.
W. Gr.: A single locality in lat. $60^1/_2$° N. (J. 1904, l. c.).

Scoresby Sund District: Bjørneøer, slightly below 0 m.

Alga incertae sedis

Ostreobium Bornet et Flahault, 1889.

1. Ostreobium Queketti BORN. & FLAH., op. c., p. 161, pl. 9 figs. 5—8; ROSENV., 1910, p. 125; PRINTZ, 1926, p. 257; LAMI, 1938, p. 36.

As mentioned when dealing with *Gomontia* I have examined some random samples of old, empty, perforated shells of bivalves with greenish specks. After decalcifying, a great number of threads usually are seen. They are richly branched, irregular and of varying width, closely intertwined and often forming swellings which, in material originating from shells kept in the dry state, exhibit an intensely green colour. The resemblance to *Ostreobium Queketti* in BORNET & FLAHAULT's pl. 9 fig. 8, and NEWTON's, 1931, fig. 67 B, is often striking. However, at any rate most of the threads seem to have transverse walls so I dare not refer the individuals to that species. The material on hand presumably comprises representatives of various species, among them also *Ostreobium Queketti.* I choose, however, not to enlarge on this problem for the time being. It may be added that in old *Lithothamnion* specimens, collected at a depth of 18—28 m at Bjørneøer, I observed green, very irregular threads that seemed to be devoid of transverse walls. In these threads no swellings were observed.

Previous Records from Greenland:
E. Gr.: Two localities in lats. $70^1/_2$ and $76^1/_2$° N., respectively (R. 1898, p. 101; 1910, l. c.).
W. Gr.: Various localities between lats. $60^3/_4$ and $72^3/_4$° N. (id. 1893, p. 906; 1898, l. c.).

Scoresby Sund District: Danmarks Ø, 17—32 m (N. H.).

Phaeophyceae

ISOGENERATAE

Ectocarpales

Ectocarpaceae

Pylaiella Bory, 1823.

1. Pylaiella litoralis (L.) Kjellm., 1872, p. 99, emend. Kuckuck, 1891, p. 7 (sub nom. *Ectocarpus litoralis*).
Ectocarpus littoralis (L.) Lyngb., Rosenv., 1893, p. 881; 1898, p. 75; Jónsson, 1904, p. 35.
Pylaiella varia Kjellm., 1883, p. 282 (348).
P. rupincola (Aresch.) Kylin, 1937, p. 5.

As will be generally known, Kylin (1933, p. 5) distinguishes two forms of *Pylaiella litoralis* occurring on the Swedish west coast, namely the main form and f. *rupincola.* Later on, the same author interpreted the latter as a distinct species, *Pylaiella rupincola* (Aresch.) Kylin (1937, p. 5), which is adopted by Levring (1940, p. 32), and I myself also kept it distinct in a paper on Danish *Phaeophyceae* (Rosenv. & Lund, 1941, p. 11). Wærn too preserves its specific rank (1952, p. 111) referring to this species his entire material of *Pylaiella* from the Öregrund Archipelago in the Baltic. From a morphological point of view P. *rupincola* is especially characterized by the firm coiling of the lowermost parts of the threads around one another while in *P. litoralis* s. str. they are more loosely intertwined. On the Swedish west coast *P. rupincola* is prevalent in spring, *P. litoralis* in the other seasons.

Kylin is of the opinion that the life-cycles of the two species are quite different. In *P. litoralis* s. str. an alternation of generations occurs (cf. Knight, 1923). According to Kylin's investigations on the Swedish west coast the diploid generation bearing unilocular sporangia is found to inhabit the younger shoots of *Ascophyllum* and *Fucus vesiculosus* and *serratus*, while the haploid generation bearing plurilocular sporangia inhabits *Sertularia* (less frequently *Ceramium*) which in its turn grows on *Ascophyllum* and *Fucus.* According to Levring (1937, p. 44) the diploid generation on the Norwegian west coast is represented also by individuals bearing uni- and plurilocular sporangia as well as others with plurilocular sporangia only.

P. rupincola, however, does not exhibit an alternation of generations (Kylin, 1937, p. 6). Individuals with unilocular sporangia are met with as well as others with uni- and plurilocular sporangia. Contrary to *P. litoralis* the latter species, when occurring on the Swedish west coast, grows directly on rocks and stones or on the lower shoots of *Fucus vesi-*

culosus and *serratus*. In the Baltic, however, it was by LEVRING and WÆRN found also on other algae such as *Furcellaria*, *Phyllophora*, *Dictyosiphon*, and *Cladophora rupestris*.

Thus, the habitats of the two species are different. This constitutes an important feature to be taken into consideration when a determination is to be made of the two closely related species which may often, even in nature, be very difficult to distinguish from each other.

However, KYLIN stated later (1942, p. 64) that the sporophyte of *P. litoralis* s. str. may in winter grow directly on rocks on the Swedish west coast, below *Ascophyllum* and *Fucus vesiculosus*, even abundantly. WÆRN (l. c.) considers this a fact that may render the independence of *P. rupincola* doubtful and he advances the theory that this species might be but "a postponed succession of asexual (diploid) tufts of *P. litoralis*".

Personally I have for a long time felt scepticism about the specific rank of *P. rupincola* and I am of the opinion that WÆRN's interpretation most probably is correct; so much so that I prefer for the time being to speak about one species only, namely *P. litoralis*. Thus, I find no reason to discuss the problem of specific ranks in connection with my Greenlandic material.

In East Greenland *Pylaiella litoralis* s. lat. is widely distributed and occurs in great quantities. It is met with from the littoral zone down to a depth of more than 40 m, growing on rocks and stones and occurring epiphytically on a great number of hosts, especially on *Fucus* and *Desmarestia aculeata*. It has further been observed on bryozoans, hydroids, sponges, shells, and on the sipho of a bivalve, and occurs also detached. At Kap Hope and in other localities it was abundant in shallow water, growing directly on the rocks and on *Fucus*, bearing unilocular or, less frequently, both uni- and plurilocular sporangia.

Incidentally, most of the material collected bore unilocular sporangia though in several plants plurilocular sporangia were also present. Individuals bearing only plurilocular sporangia were of less frequency. Roughly estimated well over 10 per cent of the individuals bore only plurilocular sporangia, almost all of them inhabiting *Fucus*, but in one instance *Chætopteris* served as host plant. The plants bearing plurilocular sporangia only were in several cases in accordance with f. *varia* (KJELLM.) (cf. e. g. JÓNSSON, 1903, fig. 13). In some plants the individual plurilocular sporangia remained distinct, the original articulations of the filaments being conspicuous. Epizoic plants originating from hydroids (*Lafoëina maxima*, *Halecium muricatum* and *Lafoea gracillima* f. *elegantula*) bore unilocular sporangia.

In many individuals the unilocular sporangia formed long chains composed of up to 48 sporangia. Such plants show much resemblance to f. *macrocarpa* (= *P. macrocarpa* FOSLIE, 1887, p. 179). In a number of individuals one or more of the cells of a chain divide longitudinally to form two unilocular sporangia.

Previous Records from Greenland:

E. Gr.: Widely distributed from the southern point to well over lat. 82° N. (Z. 1874, p. 84 (sub nom. *Ect. ochraceus*); R. 1893 & 1898, l. c.; 1910, p. 122; 1933, p. 8; J. l. c.; L. 1951, p. 12).

W. Gr.: Widely distributed from the southern point to lat. $78^1/_3$° N. (R. 1893 & 1898, l. c.; 1926, p. 12; K. 1897c, p. 33; L. 1933, p. 11).

Scoresby Sund District: Kap Tobin, 0 m, 6—11 m, 27—31 m; Amdrups Havn, 0 m, 6—9 m, 14—16 m, 22—25 m; Scoresbysund, 11 m; Kap Hope, about 0—2 m, 6—12 m; the mouth of Hurry Inlet, about 4 m, 7—10 m, 35—38 m; Fame Øer, 0 m, 4—6 m, 9 m, 12—18 m; the head of Hurry Inlet, about 0 m; Bjørneøer, about 0 m, 6—11 m, 14—17 m; Danmarks Ø (N.H.); ibid., 1—3 m, 5 m, 15—16 m, 18—22 m; Rødeø, about 2 m, 13—15 m.

Kejser Franz Josephs Fjord District: Polhems Dal in Kong Oscars Fjord (C.K.); Ella Ø, 0 m, 2—5 m, 10 m, 20—25 m, 36 m, 40—80 m; Vinterøer, 2—3 m, 14—18 m, 25—35 m; the head of Dusén's Fjord, 15—25 m; Nordfjord, on free-floating *Desmarest. ac.*

Isthmoplea Kjellman, 1877b.

1. Isthmoplea sphaerophora (CARM.) KJELLM., op. c., p. 31; REINKE, Atlas, pl. 30; JÓNSSON, 1903, p. 162, figs. 18—19; A. ZINOVA, 1953, p. 131, fig. 108.
Pylaiella (?) *curta* FOSLIE, 1887, p. 181, pl. 3 figs. 4—5.
Fosliea curta REINKE, Atlas, p. 45.

In a collection from a single locality, made in the second half of July, were found on dark *Stictyosiphon*-shoots from the preceding year about ten tufts consisting of a filamentous Brown Alga which I have referred to the species under consideration. They were all of them of a small size, usually attaining a height of but $^3/_4$—2 mm. In some of the tufts a few threads might, however, attain a length of up to 4 mm. The great majority of the threads were simple, though the longest of them bore opposite or verticillate branches. Branches of orders higher than the first were not observed. The threads were slightly attenuated both at their upper and their lower parts and never terminated in a hair-like part. They were fertile over considerable areas, the majority of the cells being converted into plurilocular sporangia all of which were, however, evacuated. The diameter of the fertile parts of the threads varied from (16—) 20—26 μ (—28 μ). The vegetative cells were generally undivided or divided by a single longitudinal wall. In some instances the threads gave rise to numerous lateral thin shoots consisting of several cells and resembling those encountered in some cases on the assimilating filaments of *Elachista* (cf. p. 118).

Literature on this species usually describes it as bearing unilocular sporangia but plurilocular sporangia have also been mentioned, first by FOSLIE (l. c.) who, however, established a new species *Pylaiella* (?) *curta* for his plants. Two years later the plurilocular sporangia were briefly mentioned by BATTERS (1889, p. 58). REINKE (Atlas, p. 45) suggests that FOSLIE's species, which he calls *Fosliea curta*, may be identical with the species under consideration but he is aware of certain differences between them. However, in 1903 JÓNSSON advances strong evidence that the two species really are identical and gives a detailed description of the plurilocular sporangia. They are usually approved by later authors but in his paper on the *Phaeophyceae* of the Swedish west coast KYLIN (1947, p. 67) says that plurilocular sporangia are unknown in this species.

Personally I have had an opportunity of examining some of JÓNSSON's Southwest Icelandic *Isthmoplea sphaerophora* specimens, bearing plurilocular sporangia, and I do not feel the slightest doubt as to their identity with FOSLIE's species and with that under consideration.

As *Isthmoplea sphaerophora* thus comprises two kinds of isomorphic plants, bearing unilocular and plurilocular sporangia, respectively, it must be grouped in the *Isogeneratae*. In my opinion it must within that group be referred to the order *Ectocarpales* and is closely related to *Pylaiella litoralis*.

I do not hesitate, either, to refer my plants from East Greenland to this species although they are poorly developed which may be due to their having grown under unfavourable circumstances. Their plurilocular sporangia as well as the branching of their longer threads agree with the condition found in the Icelandic individuals.

Plurilocular sporangia have not previously been observed in Greenlandic plants.

Previous Records from Greenland:

E. Gr.: One locality in lat. $69^1/_2°$ N. "loose . . . in a hole in the ice on the lagoon, north of Kap Dalton" (J. 1904, p. 34).

W. Gr.: 7 localities between lats. $60^1/_2$ and 68° N. (R. 1893, p. 881; 1898, p. 75).

Scoresby Sund District: Amdrups Havn, 6—9 m.

Ectocarpus (Lyngbye) Hamel, 1939a.

1. Ectocarpus confervoides (ROTH) KJELLM., 1872, p. 67; ROSENV. & LUND, 1941, p. 14; WÆRN, 1952, p. 113.

The main form, ROSENV. & LUND, op. c., p. 19.

f. *pygmaeus* (ARESCH.) KJELLM., 1890, p. 77; BØRGESEN, 1902, p. 403, fig. 66; JÓNSSON, 1903, p. 155; *Ectocarpus pygmaeus* ARESCH., KJELLM., 1872, p. 85.

f. *siliculosus* (DILLW.) KJELLM., 1872, p. 73; *Ectocarpus siliculosus* (DILLW.) LYNGB., KJELLM., 1890, p. 78; KUCKUCK, 1891, p. 15; *Conferva siliculosa* DILLWYN, 1809, p. 69.

When working up the Danish material belonging to the *Ectocarpus confervoides* form group I arrived at the conclusion that only one species, represented by several forms, was involved (ROSENV. & LUND, l. c.). My interpretation corresponded on the whole with that advanced by KJELLMAN in 1872 (l. c.) which is at variance with his later interpretation (1890, p. 72 et seq.), shared by KUCKUCK (op. c., p. 14 et seq.) and giving specific rank to several of the forms in question. Later WÆRN (l. c.), too, used the designation *Ectocarpus confervoides* s. lat., whereas KYLIN (1947, p. 7) followed KJELLMAN 1890.

I based my construction particularly on the wide diversity in shape and size exhibited by the plurilocular sporangia. Also in my material from East Greenland, where this species is not too abundant, I have met with such a range of variation in the plurilocular sporangia that I have not always been able to refer a particular specimen to one of the species listed by KJELLMAN in 1890. Therefore, I am still convinced that it will be correct to adopt KJELLMAN's original taxonomic interpretation.

I have referred to the main form i. a. some plants collected in mid-August in the Dusén's Fjord where, together with *Pylaiella*, they formed a loose cover measuring about 17 cm on a *Laomedea*. The main filaments were 37—50 μ in diameter and consisted of rather long cells measuring up to 3 diameters; a cortex consisting of rhizoids was observed in some places. Some of the shoots were hyaline in their uppermost parts. Plurilocular sporangia were abundant, the majority being stalked, others sessile, their shape and size varying very much. Most of them corresponded with those found in f. *typicus* and measured 50—80 $\times$ 19—27 μ while others were ovate, measuring 33—45 $\times$ 17 μ. Others again were short conical (wide at their basal portion and abruptly narrowing towards their apices), often long-stalked and measuring 45 $\times$ 29 μ. Fairly elongated conical sporangia occurred as well, attaining a length of up to 120 μ and a diameter of 25—37 μ, and even some few long or short subulate ones, sometimes possessing a sterile, hair-like prolongation, thus resembling the f. *siliculosus* type.

I have referred to the same form some quite young plants occurring in scarce quantities on *Desmarestia aculeata* and *Chaetomorpha* and on a snail-shell; they were collected in August and bore plurilocular sporangia similar to those met with in f. *typicus* but the tips of their shoots consisted of long, hair-like cells. In view of the fact that, in its lowermost part, f. *siliculosus* often bears plurilocular sporangia of the type encountered in f. *typicus* or f. *arctus* it might be possible that the specimens under consideration would in due course develop into f. *siliculosus*.

Furthermore, I refer to this form some old, brownish, irregularly branched threads covered with rhizoids and partly detached, collected in July and August and bearing plurilocular sporangia of the f. *typicus* type.

Plants belonging to f. *pygmaeus* were encountered at the end of July on an old *Alaria*-stipe from a depth of 15—16 m. They grew in company with *Giffordia ovata* and young *Pylaiella* specimens and together with them formed a low, matted growth. The erect threads were as a rule simple, their diameter usually measuring 14—16 μ (12—20 μ). Most of the plurilocular sporangia belonged to the f. *typicus* type and occurred terminally as well as laterally on the erect threads. In the latter case they were either sessile or stalked. They measured 60—80 (43—107) $\times$ 17—21 μ (12—25 μ). F. *pygmaeus* has not previously been recorded from East Greenland.

Typical f. *siliculosus* individuals were found at depths from 1—3 m down to 15—25 m. They occurred partly epiphytically on *Fucus*, *Desmarestia aculeata*, *Chordaria flagelliformis*, and *Chaetomorpha melagonium*, partly detached in company with *Pylaiella.* All the attached specimens were rather small as the plant usually is detached when it reaches a certain size. Most of my individuals belonging to *Ect. confervoides* must be referred to this form.

The diameter of the main filaments in f. *siliculosus* varies between 35 and 60 μ, most frequently between 40 and 50 μ. In their lowermost part the threads are usually somewhat thinner and the colour is often brownish. Thus, one of the main filaments measured 33 μ below, whereas somewhat up the thread the diameter was 47 μ. In their lowermost portions the main filaments are often covered with rhizoids which may form a cortex, especially where branches are given out. The tips of the shoots terminate in a hair-like portion.

The cells are sometimes barrel-shaped. In some plants they contain well-developed, branched, ribbon-shaped chromatophores exhibiting several pyrenoids each, whereas in others the chromatophores are feebly developed. In some specimens, only plurilocular sporangia were observed, others bore both uni- and plurilocular sporangia. Plants bearing unilocular sporangia only were not observed.

Plurilocular sporangia occurred in July and August, most frequently being typical, sessile or stalked, with or without a hair-like prolongation. They are usually some 200 μ in length, varying from (125—) 160—225 μ (—284 μ), their diameter measuring about 20 μ (17—23 μ). Some plants bore also shorter plurilocular sporangia which came close to the f. *typicus* type; they measured 55—80 $\times$ 17—21 μ.

Unilocular sporangia were encountered only in August. They were as a rule sessile, less frequently borne on a unicellular stalk. In some individuals they were rather long, measuring 45—57 $\times$ 25—29 μ, in others their dimensions were 33—45 $\times$ 23—25 μ. Several of them harboured differentiated spores, others were evacuated or still unripe.

Previous Records from Greenland:
E. Gr.: f. *typicus:* One locality in lat. 66° N. (J. 1904, p. 37).
f. *siliculosus:* One locality in lat. $65^2/_3$° N. (J., 1904, p. 36).
W. Gr.: f. *typicus:* About a dozen localities between lats. $60^1/_2$ and $72^3/_4$° N. (R. 1893, p. 885; 1898, p. 77; 1926, p. 12; L. 1933, p. 11).
f. *pygmaeus:* One locality in lat. $68^3/_4$° N. (R. 1893).
f. *siliculosus:* Three localities between lats. $60^3/_4$ and 70° N. (R. 1893; L. 1933) and possibly at Bessels Fjord in lat. 81° N. (cf. R. 1893).
f. *penicillatus:* One locality in lat. $68^3/_4$° N. (R. 1893).

Scoresby Sund District: Amdrups Havn, 11—16 m, 15—16 m (f. *pygmaeus*); Fame Øer, 4—6 m (f. *silic.*); Bjørneøer, 6—11 m (main form and f. *silic.*); Danmarks Ø, 1—3 m (f. *silic.*), 5 m; Rødeø, 13—15 m (f. *silic.*).

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m (f. *silic.*), 10 m, 36 m; Vinterøer, 14—18 m; the head of Dusén's Fjord, 15—25 m (main form and f. *silic.*).

2. Ectocarpus pycnocarpus ROSENV., 1893, p. 886, fig. 23; JÓNSSON, 1904, p. 37.

This species was described by ROSENVINGE from West Greenland where it inhabited *Chordaria flagelliformis* and formed tufts attaining a height of 1—2 cm, bearing unilocular sporangia. He presumed it to be closely related to *Ectocarpus fasciculatus*. The resemblance between these two species is later mentioned by BØRGESEN (1902, p. 410) and JÓNSSON (1903, p. 157) when dealing with Faroese and Icelandic specimens, respectively, of *Ectocarpus fasciculatus*. In his work on East Greenlandic algae JÓNSSON (1904, l. c.) with some doubt refers to the species under consideration some plants collected by KRUUSE, attaining a length of up to 10 cm and kept as herbarium material, but he does not comment on its possible affinity with *Ectocarpus fasciculatus*. I myself have not encountered the species under consideration so I cannot discuss it further although I want to point out that macroscopically JÓNSSON's East Greenlandic specimens show no resemblance to *Ectocarpus fasciculatus*.

The two below localities are the only ones in which this species has been met with in Greenland and, as far as can be ascertained, the only records up to now.

Previous Records from Greenland:
E. Gr.: One locality in lat. $65^3/_4$° N. (J., l. c.). The determination doubtful.
W. Gr.: One locality in lat. 67° N. (R., l. c.).

Giffordia Batters, 1893.

1. Giffordia ovata (KJELLM.) KYLIN, 1947, p. 9; LUND, 1951, p. 12.
Ectocarpus ovatus KJELLM., 1877 a, p. 35; 1890, p. 74; ROSENV. & LUND, 1941, p. 46.
E. polycarpus KJELLM., 1872, p. 93, pl. 1 fig. 5 (non ZANARDINI).

Giffordia fuscata in KORNMANN, 1953, p. 17; 1954a, p. 41. — Non *Ect. fuscatus* ZANARDINI, 1865, p. 139, pl. 74A.

f. *tenuis* ROSENV., 1898, p. 80; JÓNSSON, 1904, p. 37; LUND, l. c., p. 13.
f. *elongata* ROSENV., 1893, p. 888.
f. *Holmii* ROSENV., 1898, p. 78; 1933, p. 7; JÓNSSON, l. c.; *Ectocarpus Holmii* ROSENV., 1893, p. 889, fig. 24; 1894, p. 114.

This characteristic little alga is widely distributed in my area although, as a rule, it seemed not to occur in great quantities. It attains only a small height, the largest individuals, collected at Rødeø in the innermost part of Scoresby Sund, measuring only some 0.7 cm. It was met with at depths from 3—6 m down to 40 m and occurred epiphytically on other algae such as *Desmarestia aculeata* and *viridis*, *Fucus*, *Chaetomorpha*, *Punctaria glacialis*, *Turnerella*, and on stipes of *Alaria* and *Laminaria*, as well as on hydroids, bryozoans and ascidians, stones and shells. When growing epiphytically it is nearly always occurring together with *Pylaiella*, *Leptonema*, *Sphacelaria*, *Elachista*, and other algae. On *Turnerella* collected at Ella Ø at a depth of at least 40 m it grew in company with *Audouinella efflorescens* and together with that species formed a dense, low felt on the host.

The great majority of the individuals show most resemblance to f. *tenuis* which, however, can hardly be kept distinct from the main form. The main filaments measure about 20—40 μ in diameter, usually about 30 μ, and are somewhat attenuated below. In an individual from Rødeø, closely resembling the main form, some of the main threads even exhibited a diameter of 37—50 μ.

Rhizoids occur in particular on the lowermost parts of the main threads, but descending rhizoids may be encountered also a little way up the threads, preferably where vigorous branches are given out.

The cells of the main filaments are often somewhat barrel-shaped. Their length and diameter may vary appreciably even in one and the same thread. In some cases the cells giving rise to branches or sporangia are thinner and shorter, their length approaching their diameter, while the other cells may reach a length of up to three diameters. Such threads may thus acquire a characterictic appearance. In some instances a cell bearing opposite sporangia could be longitudinally divided.

The main filaments as well as the branches are tapering towards their tips. When old, the tips of the shoots are hyaline but true hairs do not occur. A typical meristematic region below the hyaline part was never observed. The grading over to the hair-like cells is even and agrees with fig. 20A (the uppermost three branches) in ROSENVINGE & LUND (l. c.).

In some cases I observed branches terminating in a plurilocular sporangium (fig. 4 B) which may, however, differ from typical sporangia in being thin and uniseriate (fig. 4 C).

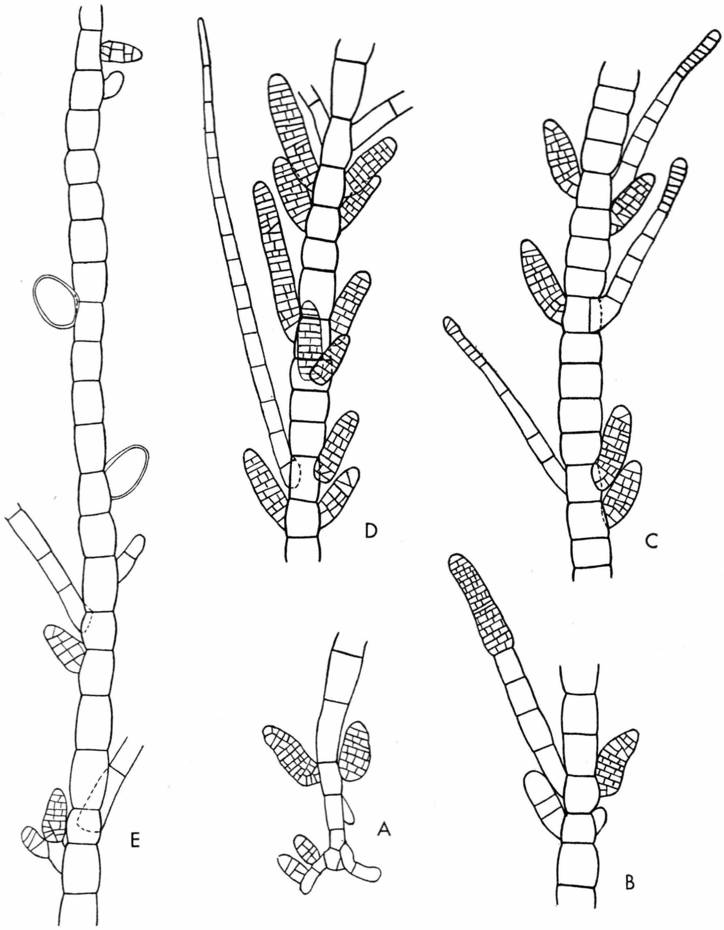


Fig. 4. *Giffordia ovata.* Threads with plurilocular sporangia; E with unilocular sporangia as well; in A, rhizoidal sporangia are seen, in B and C long-stalked sporangia. The plant depicted in D belongs to f. *elongata.* A—E: × 240.

Each cell contains many small, disc-shaped chromatophores. In some individuals exhibiting fairly thick threads, 29—37 μ (—45 μ) in diameter, and bearing rather small plurilocular sporangia, measuring 25—37 × 13—16 μ, the chromatophores of some cells, presumably the older ones, were rod-shaped, short or fairly long, and sometimes bent. In some instances they were even ribbon-shaped. Such ribbon-shaped chromatophores have been observed also in *Giffordia granulosa* (cf. PRINGSHEIM, 1873, pl. 11 figs. 7—8) which usually possesses disc-shaped chromatophores.

The plurilocular sporangia are met with in July and August. They are usually fairly long in proportion to their diameter, measuring 30—62

(—74) ×(13—) 17—20 μ, and are oblong ovate, oblong oval, or ovate, generally opposite or situated opposite a branch, sessile or more rarely stalked. On the thinner upper branches and on young branches they are frequently scattered and sessile. Stalked sporangia are found especially on the lower parts of the threads where they may issue rectangularly. Sporangia may even occur on the rhizoids (fig. 4 A). The emptied sporangia are rather often proliferated by a new one.

In several individuals the plurilocular sporangia formed groups, consecutive cells bearing opposite or verticillate sporangia (cf. KJELLMAN, 1877 a, p. 36). As such groups of sporangia may alternate with consecutive sterile cells the thread acquires a rather characteristic appearance.

Unilocular sporangia (fig. 4 E) were observed only in some few individuals from Ella Ø, dating from August, which in addition bore numerous plurilocular sporangia. The former occurred on the upper branches and measured 29—37 ×21 μ.

The individuals I have referred to f. *elongata* bear more elongated, often cylindrical, plurilocular sporangia (fig. 4 D) measuring 45—90 × 13—21 μ, but also sporangia of the *tenuis* type. This form has not previously been recorded from East Greenland.

I have referred to f. *Holmii* some plants consisting of thin, slightly branched filaments bearing scattered sessile plurilocular sporangia, measuring 27—45 ×16—18 μ (—21 μ). As f. *tenuis*, too, frequently bears scattered sporangia on its thin upper branches, it is scarcely possible to draw a line between the two forms (cf. ROSENVINGE, 1898, l. c.). In my material f. *tenuis* is nearly always accompanied by specimens resembling f. *Holmii*.

On the basis of material collected at Heligoland KORNMANN (1953 & 1954 a, l. c.) made cultivating experiments with the species under consideration. The swarmers originating from unilocular sporangia usually developed into a dwarf generation bearing plurilocular sporangia and, very rarely, unilocular sporangia. Contrary to what might be expected, the dwarf generation is not sexual and the above author presumes it to be diploid like that occurring in nature.

KORNMANN applies the name of *Giffordia fuscata* (ZAN.) KUCK., as KUCKUCK (KORNMANN, 1954 a, p. 41) holds that *G. ovata* is a synonym for *Ectocarpus fuscatus* ZANARDINI. Personally I do not, however, believe in the identity of the two species as i. a. their geographical distribution speaks against such a possibility. *G. ovata* is a subarctic species while the latter is Adriatic — or could it be a relict of *G. ovata*?

Previous Records from Greenland:

E. Gr.: Several localities between lats. $65^2/_3$ and 82° N. (R. 1898, l. c.; 1910, p. 122; 1933, l. c.; J., l. c.; L., l. c.).

W. Gr.: Four localities between lats. $60^3/_4$ and $65^1/_2$° N. (R. 1893 & 1898).

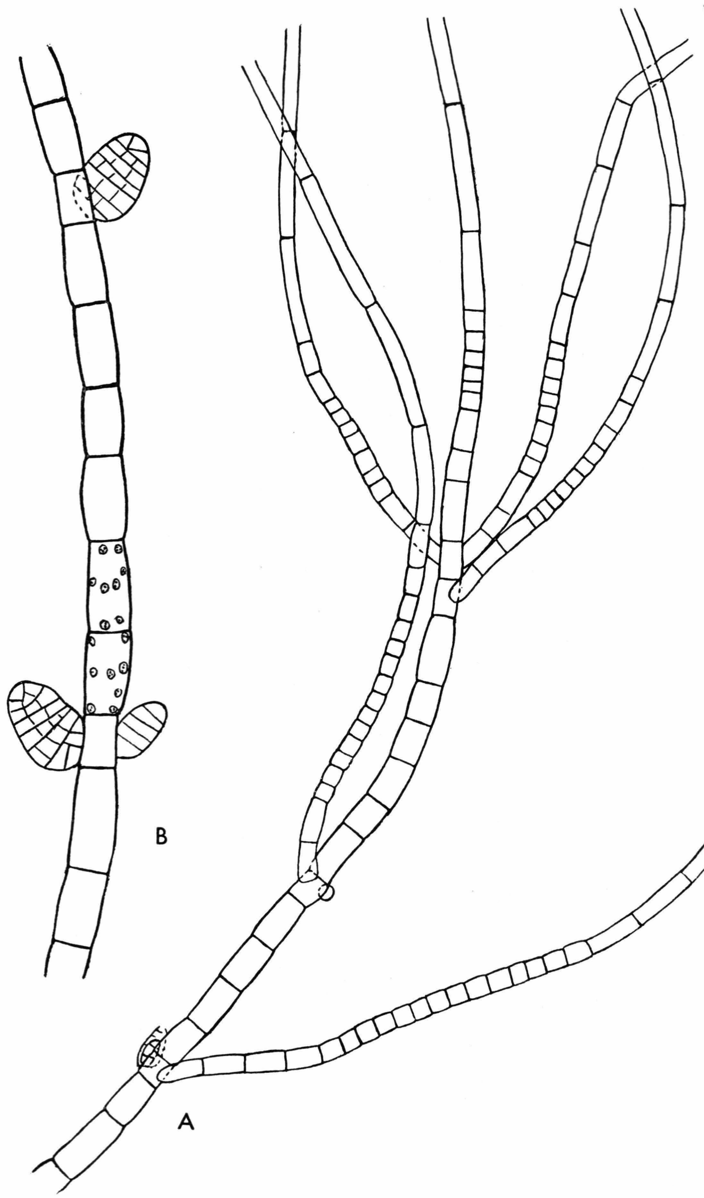


Fig. 5. *Giffordia intermedia*. A: upper portion of a plant exhibiting meristematic zones. In B, plurilocular sporangia and chromatophores are seen. A: × 210, B: × 425.

In the following, f. *tenuis* is involved if no other information is given.

Scoresby Sund District: Amdrups Havn, 11—20 m; Fame Øer, 5—6 m (also f. *Holmii*), 12—18 m; Kap Stewart (N. H.); Bjørneøer, 6—11 m (also f. *Holmii*), 10—21 m; Danmarks Ø (N. H.); ibid. 15—16 m (f. *Holmii*), 18—22 m (also f. *elongata*); Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 10 m, 20—25 m (also f. *elongata*), 36 m, in a dredging from 40—80 m on *Turnerella*; Vinterøer, 3—6 m, 14—18 m, 25—35 m; Nordfjord, on free-floating *Desmarestia aculeata*; Kap Borlase Warren (C. K.).

2. Giffordia intermedia (Rosenv.) S. Lund comb. nov.
Ectocarpus ovatus var. *intermedius* Rosenv. in Rosenv. & Lund, 1941, p. 49, figs. 21—22.

This species was encountered in scarce quantities at the beginning of August on *Fucus* where together with *Pylaiella* it formed minute tufts of small height (a few mm?). The branching is opposite, more rarely scattered, or a branch may issue opposite a plurilocular sporangium. Each cell harbours several small, disc-shaped chromatophores (fig. 5 B). In addition to attaching rhizoids, descending rhizoids may occur in the lower part of the plant. The main filaments measure 20—29 μ in diameter and are composed of cells attaining a length of two to three diameters. Near the apices of the threads is found a well-defined, often fairly long, meristematic region consisting of cells whose length is $^1/_2$—1 diameter (fig. 5 A). Above the meristem the thread tapers gradually into a long hair-like portion consisting of elongate hyaline cells measuring up to 10 diameters.

The plurilocular sporangia are ovate, opposite or less frequently scattered, usually sessile, and measure 25—33 $\times$ 17—22 μ. When opposite they are obviously not initiated simultaneously, one of them nearly always being more well developed than the other. In case one of them is mature, the other is as a rule still young (fig. 5 B) or already emptied. Only in one instance were observed equally developed opposite sporangia. When the sporangia are emptied they are often proliferated by a new one. Unilocular sporangia were not observed.

The plants on hand show much resemblance to Rosenvinge's above-mentioned variety from the Northern Kattegat and there is no doubt that they are identical with that variety from which, however, they differ in having thicker threads, generally opposite branches and sporangia, and in exhibiting smaller plurilocular sporangia.

Rosenvinge (l. c.) was not quite certain as to whether his plants ought to be considered a new species or only a variety of *Ectocarpus ovatus*. As no information was available as to whether they were attached when collected, and owing to their resemblance to that species, he was inclined to adopt the latter interpretation.

In my opinion the existence of well-defined meristematic regions near the tips of the shoots is so important a characteristic as to warrant the elevation to specific rank of the plants under consideration.

Previous Records from Greenland:
None.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m.

Feldmannia Hamel, 1939a.

1. Feldmannia desmarestiae (Gran) Kylin, 1947, p. 13; A. Zinova, 1953, p. 73.

Ectocarpus desmarestiae Gran, 1897, p. 44, pl. 2 figs. 22—30; Flerov & Karsakoff, 1932, p. 59.

In 1897 Gran described from the Oslo Fjord in southern Norway an endophytic *Ectocarpus* species inhabiting the thallus of *Desmarestia viridis*. Some years later, Kylin (1907, p. 52) encountered it in the same host in a couple of localities in the northern part of the Swedish west coast. Both Gran's and Kylin's plants bore unilocular sporangia only. In the early 'thirties the species was recorded by Flerov & Karsakoff from the subarctic coast of Novaya Zemlya at a depth of 23 m, bearing plurilocular sporangia only and inhabiting the same host. The plurilocular sporangia were carefully described (also in Latin), but not depicted. Since then, few references have been made in literature to this species which Kylin later referred to the genus *Feldmannia.*

In a couple of my localities I observed at the end of July and the beginning of August in the same host an endophyte which in all essentials agrees with the species under consideration but, like the Russian plants, my specimens bear plurilocular sporangia only (fig. 6). The species was not discernible until studied microscopically and was then distinguishable as small specks formed by more or less dense groups of plurilocular sporangia. The latter were terminal on very short, erect shoots and looked as if they were sessile or short-stalked on the surface of the host (fig. 6 A). In many instances, however, they occurred singly. The plurilocular sporangia correspond perfectly with those described by Flerov & Karsakoff and show a marked resemblance to the *Giffordia ovata* type. They are usually ovate, more rarely elongate ovate or cylindrical; they are somewhat constricted at the transverse walls, with fairly large loculi, and measure 10—14 $\times$ 14—28 μ, most commonly 12 $\times$ 20 μ.

In addition to creeping, endophytic filaments I have observed threads creeping over the surface of the host. The upright shoots were rather scarce. They were as a rule given out singly or some few close to one another (fig. 6 B—C), less frequently several of them together. They were always simple and, when old, terminated in elongate, hyaline cells. Their growth takes place by cell-divisions in their lower and middle portions. Their diameter measured 8—11 μ, their length rarely exceeding 0.2 mm, although some few threads attained a length of 0.5 mm. The majority of these shoots did not consist of more than 20 cells. They were, thus, by far less well developed than those in the plants depicted by Gran, which attained a length of up to 5 mm and a diameter of 5—17 μ, but may perhaps reach greater dimensions at a later time of the year. As far as I have been able to ascertain the cells harbour two to six irregular, plate-like chromatophores with one pyrenoid each. In several instances the upright shoots bore one or more lateral, sessile,

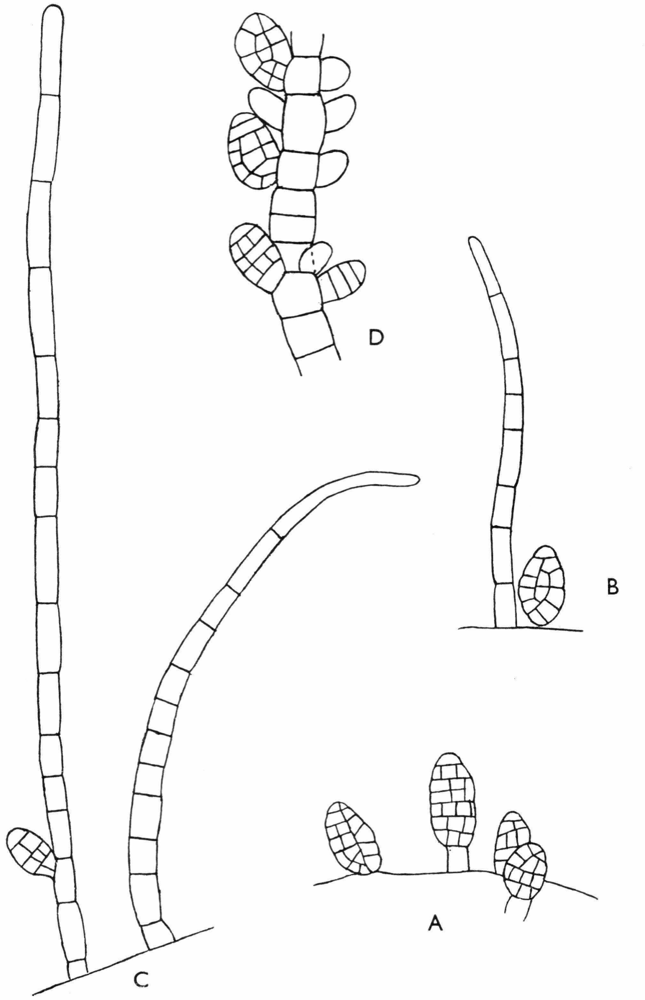


Fig. 6. *Feldmannia desmarestiae.* A—C: plurilocular sporangia and erect threads emerging from the surface of the host. D: part of an erect thread with sporangia and sporangial initials. A—D: × 400.

sometimes opposite, plurilocular sporangia, often with a broad base, or sporangial initials (fig. 6 D). One of the longest, upright shoots bore no less than seven plurilocular sporangia, some of them opposite, as well as several initials.

With a view to the fact that plants with plurilocular sporangia as well as others bearing unilocular sporangia are met with in nature it will be justified to presume that the species exhibits an alternation of generations which may, however, be more or less complicate.

The species seems to depend on *Desmarestia viridis* as a host. The paucity of records (the Skagerak, the Barents Sea, and East Greenland) is undoubtedly due to its small size. A. Zinova regarded the species as warm boreal (this ought presumably to have been cold boreal); after having been found in NE Greenland it must undoubtedly be considered subarctic.

Previous Records from Greenland:
None.

Scoresby Sund District: Amdrups Havn, 14—16 m, 22—25 m.
Kejser Franz Josephs Fjord District: Ella Ø, 20—25 m.

Laminariocolax Kylin, 1947.

1. Laminariocolax tomentosoides (Farl.) Kylin, op. c. p. 6.

Ectocarpus tomentosoides Farlow, 1889, p. 11; Rosenv., 1893, p. 890; Kuckuck, 1899, p. 370, figs. 5—7; Jónsson, 1903, p. 154; Knight & Parke, 1931, pl. 8 figs. 1—2; Kylin, 1937, p. 7; Rosenv. & Lund, 1941, p. 43.

Ectocarpus tomentosoides var. *norvegicus* Gran, 1893b, p. 7, figs. 1—8; Printz, 1926, p. 149, pl. 6 fig. 63.

Encountered in July and August in two localities at depths of 5—6 m and 15—25 m, respectively, inhabiting the lamina of *Laminaria saccharina* in company with other algae, especially *Entonema aecidioides* and *Litosiphon filiformis*. In one of the localities it occurred in considerable quantities although nearly all the specimens were quite small. Most of them resemble Kuckuck's "*Phycocelis*-stage" (op. c., fig. 5) as they consist chiefly of short-stalked, plurilocular sporangia and some single, short, vertical filaments, both of which issue from endophytic, creeping threads. Others were somewhat more well developed and in addition to endophytic threads exhibited creeping threads on the surface of the host as well as numerous vertical filaments. Even the latter specimens did rarely attain a height of more than some few mm, as many of the vertical threads were broken off. A single individual reached a height of 1 cm; it was unattached, presumably detached during the dredging.

The surface-layer of the host seems usually not to be much damaged, at any rate as compared with the damage inflicted e. g. by *Entonema aecidioides*. I have, however, met with a *Laminaria* host whose surface-layer was partially damaged or cast off, but this might be due to the old age of the lamina and to the fact that it was also infested with *Entonema aecidioides*.

The cells of the vertical filaments are usually 6—9 μ in diameter, but their length may vary considerably. Apart from the shorter cells, issuing either plurilocular sporangia or short branches later to be converted into sporangia, the length of the cells usually measures 2—4 diameters but may come close to 5—6 diameters.

Besides from the creeping threads the plurilocular sporangia issue in great numbers from the vertical threads (fig. 7 A—B). They are diva-

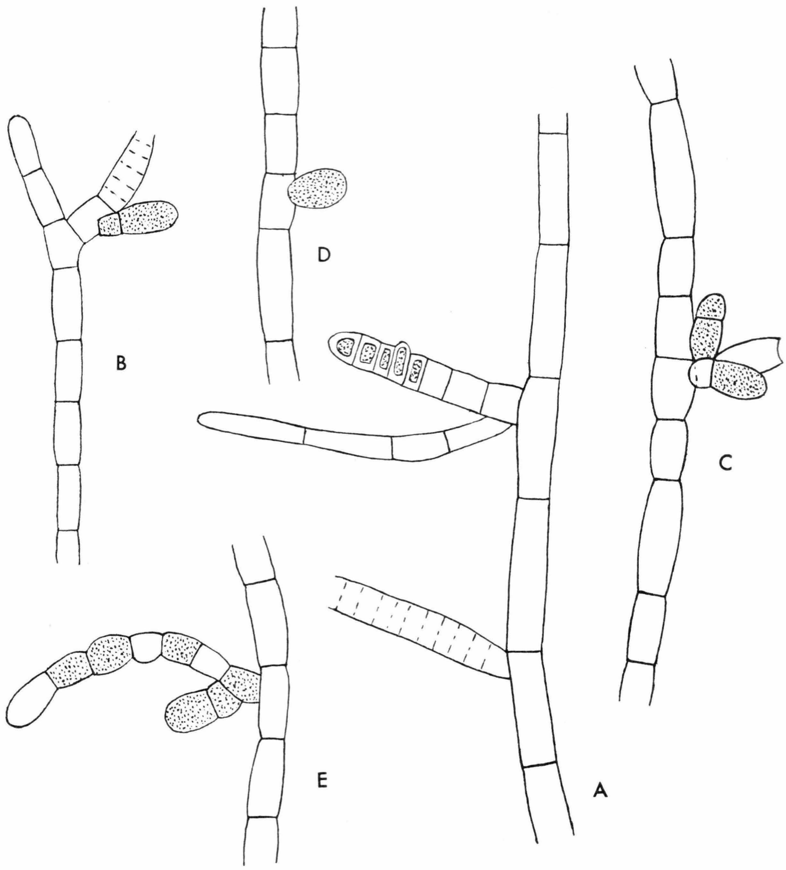


Fig. 7. *Laminariocolax tomentosoides.* Upright threads; A and B with plurilocular sporangia, B—E with fucosan-filled cells. A—E: × 700.

ricate, linear, uniseriate, usually sessile, sometimes opposite, and measure 13—63 μ in length and 6—7 μ in diameter. In some cases they are borne on a short stalk, consisting of one to few cells. In such instances the stalk may bear one or more sporangia or issue a sterile branch (fig. 7 A). Intercalary sporangia and others occurring terminally on the vertical threads have also been observed. The majority of the sporangia were emptied.

In some plants were observed, in addition to the plurilocular sporangia, cells that slightly resembled unilocular sporangia (fig. 7 B—D).

However, they measured only some 16 μ in length and about 7 μ in diameter, some of them harbouring refractive, homogeneous contents of fucosan, others being empty. They were borne on short stalks, which sometimes were given out from sporangia-stalks, or they might be sessile.

Such cells are presumably identical with those described by GRAN who interpreted them as unilocular sporangia. Similar cells have been described also from West Greenland and from Arctic North America by ROSENVINGE (1893, l. c.; 1926, p. 19), from the Faroes by BØRGESEN (1902, p. 415), and from Iceland by JÓNSSON (l. c.). While the last-mentioned two authors interpret them as GRAN does, ROSENVINGE is of the opinion that they more probably correspond to the ascocysts in the genus *Ascocyclus*. Judging from my East Greenlandic plants the identification with unilocular sporangia seems little warranted. — Incidentally, the occurrence of fucosan-filled cells is not uncommon in this species. Thus, in some instances I observed somewhat longer lateral shoots whose cells might likewise be filled with fucosan (fig. 7 E).

In his work dealing with the algal vegetation of the Trondhjemsfjord (Norway) PRINTZ (op. c., pl. 6 fig. 62) describes and depicts plants with unquestionable unilocular sporangia which seem to have no relation to those described by GRAN. However, the plants involved seem not to belong to *Laminariocolax tomentosoides* but more probably to *Ectocarpus confervoides* f. *siliculosus* (cf. ROSENV. & LUND, l. c.). It will, therefore, be justified to conclude that unilocular sporangia do not at all occur in the species under consideration.

KYLIN (1937) cultivated swarmers originating from the plurilocular sporangia of individuals from the Swedish west coast. Although the species is partially endophytic when occurring in nature, the swarmers germed on glass and developed into creeping branching filaments issuing erect branching threads, some of whose laterals were converted into plurilocular sporangia. It must be presumed that the species is diploid and reproduces itself vegetatively by diploid swarmers originating from the plurilocular sporangia.

Previous Records from Greenland:
E. Gr.: None.
W. Gr.: 4 localities between lats. 62 and 70° N. (R. 1893, l. c.).

Scoresby Sund District: Fame Øer, 5—6 m.
Kejser Franz Josephs Fjord District: The head of Dusén's Fjord, 15—25 m.

Kolderupia gen. nov.

Caespitulos expansos densos lanaceos parvae altitudinis in rupibus litoralibus vel supralitoralibus formans. Fila erecta dense congesta, ramos sparsos paucos vel plures gerentia, e parte repente emissa, apice crescentia, praeterea divisionibus intercalaribus nonnullis aucta. Cellulae filorum 5—15 μ crassae, diametro aequilongae vel duplo longiores, chromatophora parietalia singula (raro bina) continentes. Fila hyalina pilis similia terminalia lateraliave praesentia vel deficientia. Sporangia unilocularia claviformia, terminalia vel lateralia.

In recent years most authorities have adopted the procedure of removing to distinct genera certain groups of species that previously belonged to *Ectocarpus* sens. lat. So far no attention has been paid to the two closely related species *Ectocarpus lucifugus* KUCKUCK (Beiträge, 4, 1897 a, p. 359, pls. 11—12; Bemerkungen, II, 1897 b, p. 378, fig. 4) and *Ectocarpus maritimus* (KJELLM.) ROSENV. (1910, p. 122). As they differ in all essentials from the remaining species of *Ectocarpus* the logical consequence will be to remove also these two species and establish a new genus which I propose to name *Kolderupia* after L. KOLDERUP ROSENVINGE. Accordingly, the names of the two species will be *Kolderupia lucifuga* (KUCK.) and *Kolderupia maritima* (KJELLM.).

The systematic position of this genus is not quite certain as the predominantly terminal growth of the upright threads ought, in fact, to preclude classification of the genus within *Ectocarpaceae*. However, owing to the fact that its structure, on the whole, suggests an affinity with that family and to the occurrence of sparse, intercalary cell-divisions I judge it, nevertheless, warranted to preserve it in that family, though as a deviating type.

1. Kolderupia maritima (KJELLM.) S. LUND comb. nov.
Chaetophora maritima KJELLM., 1877 a, p. 51, pl. 5 figs. 15—16.
Pilinia maritima (KJELLM.) ROSENV., 1893, p. 932, fig. 43.
Ectocarpus maritimus (KJELLM.) ROSENV., 1910, p. 122; HAMEL, 1931 b, p. 64.

This species was formerly interpreted as a Green Alga. KJELLMAN described it as a species within the genus *Chaetophora* but it was later by ROSENVINGE referred to *Pilinia*. In 1910 the latter author, however, proved it to be a Brown Alga as its cells do not contain starch and its cell-walls are not composed of cellulose. Owing i. a. to its striking resemblance to *Ectocarpus lucifugus* KUCK., he referred it to the genus *Ectocarpus*. This taxonomical view is later quoted, though not commented on, by PRINTZ (1927, p. 195). In his work on the French Brown Algae HAMEL (Fasc. 1, 1931 b) employs ROSENVINGE's interpretation although listing the species as an *alga incertae sedis*. In Fasc. 5 (1939 b, p. XIX), where all the species are reviewed, he designates it *Ectocarpus* (?) *maritimus*.

The taxonomical view advanced in 1910 by ROSENVINGE seems, incidentally, to be little known and several authors still quote the species as *Pilinia maritima*. This applies e. g. to the authors of the two algological handbooks, OLTMANNS (Morphologie u. Biologie d. Algen, 2nd ed., Vol. 1, 1922, fig. 196, and p. 296) and FRITSCH (Structure & Reproduction of the Algae, Vol. 1, 1935, fig. 76 K, p. 256), and to TAYLOR (1945, p. 45) and PARKE (1953, p. 499). FLEROV & KARSAKOFF (1932, p. 47) even use the name that was originally given to this species by KJELLMAN.

Previous Records from Greenland:
E. Gr.: One locality in lat. $76^1/_2$° N. (R. 1910, l. c.).
W. Gr.: Four localities between lats. 62 and $72^3/_4$° N. (R. 1893, l. c.).

Not recorded by me although I searched my material of *Calothrix scopulorum* from various localities in the hope of finding it.

Sorocarpus Pringsheim, 1862.

1. Sorocarpus uvaeformis PRINGSH., op. c. p. 9, pl. 3 A; TAKAMATSU 1936, p. 90, pls. 4—5; TAYLOR, 1937, p. 120, pl. 9 fig. 6; ROSENV. & LUND, 1941, p. 58, fig. 30.

Ectocarpus siliculosus β, uvaeformis LYNGBYE, 1819, p. 132, pl. 43 D.

Encountered at the beginning of August in a single locality (Ella Ø) in three dredgings made at depths between 2—5 and 10 m, occurring epiphytically on *Fucus*, *Desmarestia aculeata*, *Stictyosiphon*, and on the lamina of *Laminaria saccharina* f. *glacialis*, though chiefly on the first-mentioned host on which it grew together with numerous other epiphytes. The species was, however, sparsely represented, frequently as single threads. In some instances it formed small tufts, of which only a single attained a height of 5 cm.

In young plants, the basal portion consists of a small monostromatic disc formed by horizontal, creeping threads (fig. 8E), free at the margin (fig. 8 M) and composed of more or less irregular, thick-walled cells. Later, many of the cells of the basal layer undergo a slight vertical elongation, frequently subsequent to a transverse division, eventually giving rise to upright threads. From the lowermost portion of the latter, numerous rhizoids are given out, expanding over the basal disc which in due course develops into a small, flat cushion.

The erect threads sometimes coil around one another. They are composed of cylindrical, thick-walled cells measuring (20—) 25—45 μ (—49 μ) in diameter and 1—3 (—6) diameters in length. In their lowermost portion the threads frequently are appreciably thinner and consist of very thick-walled cells.

Some small individuals inhabiting *Laminaria* exhibited threads with a diameter of about 50—57 μ. The cells were often conspicuously short and barrel-shaped, not infrequently of equal length and width, or somewhat shorter than broad. In their upper portions the plants might even possess cells whose length was only half their diameter, though no true meristem was involved. In these plants, rhizoids arose also at higher levels of the threads, e. g. where the more vigorous branches were given out.

The branching is usually scattered. Not infrequently two vigorous branches are given out from one and the same cell, one of them issuing just below the other (fig. 8 L). The two branches may be equally developed or one of them may be more vigorous than the other. Likewise, two sorus-bearing branches may issue from one and the same cell.

The cells contain a number of small disc-shaped, sometimes rod-shaped chromatophores though not by far so many as ascertained in the Danish plants depicted in fig. 30 in ROSENV. & LUND (l. c.). According to TAKAMATSU (op. c., p. 76) pyrenoids are to be found both in and outside the chromatophores.

The vegetative branches terminate in a hair, the growth being sympodial. In cases when two terminal hairs seem to be present, only one of them is terminal while the other is terminal on a new, very short shoot, consisting of a single low cell. In some instances the uppermost cell bears two sporangia-sori, only one of which is terminal and situated at the basis of the terminal hair.

In addition to terminal hairs the vegetative shoots exhibit also lateral ones. Both terminal and lateral hairs measure 13—18 μ in diameter. Moreover, thinner hairs occur in the sori (TAKAMATSU's "sekundäre Haare"). All the hairs have a well-defined basal meristem.

The sori are sessile or stalked and occur on all sides of the shoots or may be unilateral over shorter or longer distances. They are initiated in the tips of the shoots, generally at the base of the hair, or laterally. They are usually more elongate and less dense than those found in Danish plants originating from the northern Kattegat and the North Sea which resemble those depicted by PRINGSHEIM (op. c., pl. 3 fig. 3). However, I do not judge it necessary to remove from *S. uvaeformis* my plants which are, on the whole, less robust than the above Danish ones. I suppose that their habit, including the structure of the sori, may be ascribed to the fact that they grew in a sheltered locality. The sori are composed of a great number of small, ovate or curved ovate, plurilocular sporangia, measuring up to 20—24 μ in length and usually 12 μ in diameter.

Fig. 8. *Sorocarpus uvaeformis*. A—E: young upright threads, some of them with plurilocular sporangia. Cells belonging to the basal layer are seen below. F—K: uppermost part of young shoots with sporangia, some of which form sori. In F, the hair was given out from the seventh cell in the thread. L: Two branches issuing from one cell, one of them situated just below the other. M: margin of basal layer in surface view. A—B and L—M inhabiting *Laminaria*, C—K *Stictyosiphon*. A—K, M: × 355. L: × 173.

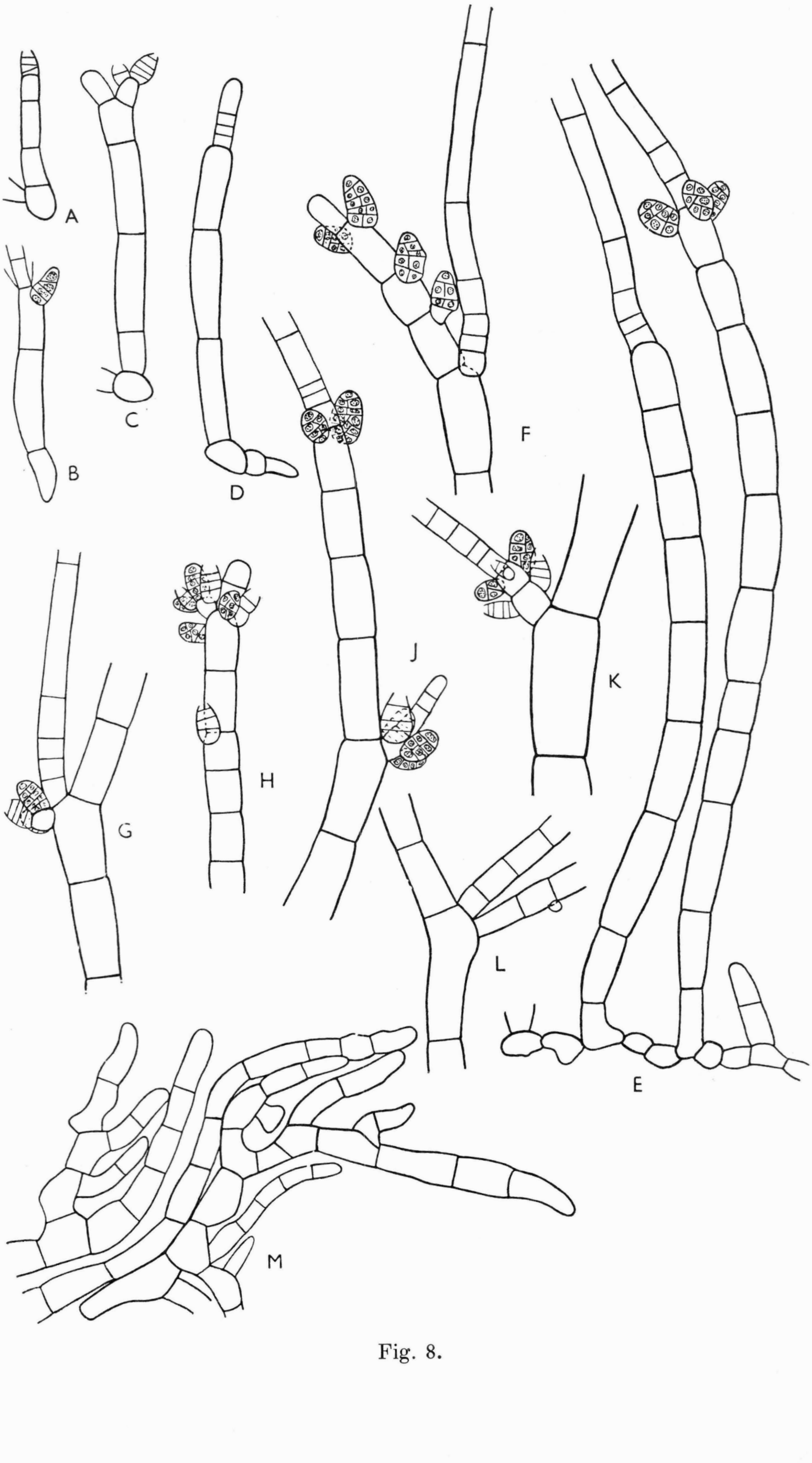


Fig. 8.

There is a marked difference between the sori occurring in younger and older individuals, respectively, the former being of a simpler structure and containing fewer sporangia. The condition is still simpler in quite young plants in which the sporangia may even occur singly.

The youngest upright threads, consisting of some few cells, are in some instances sterile, in others fructifying. They are generally simple, almost invariably bearing a terminal hair (fig. 8 B, D) which in many instances is surrounded by a sheath below (fig. 8 B). Besides the hair the uppermost cell may bear a sessile, lateral sporangium (fig. 8 B) or a unicellular stalk with two sporangia (fig. 8 C). I did, however, in exceptional cases encounter young threads devoid of hairs and exhibiting a terminal sporangium only (fig. 8 A). The diameter of all the threads in question measures 14—19 μ, that of the hairs 10—11 μ.

In slightly older and thicker threads the uppermost cell often exhibits two opposite, sometimes three verticillate, sporangia beneath the terminal hair (fig. 8 E). In fig. 8 F the uppermost portion of a young thread (the part above the hair) bears one stalked and three sessile sporangia, two of the latter being opposite, in addition to a terminal hair-initial. At this developmental stage the length of the sporangia measured up to 16—21 μ, the diameter (8—) 10—12 μ.

Besides solitary sporangia the somewhat older threads exhibit small clusters of sporangia, usually borne on a unicellular stalk (fig. 8 G). In several instances one and the same cell may, in addition to small stalked clusters of sporangia, bear sessile sporangia. In fig. 8 H the uppermost cell in a young thread bears, besides a terminal hair-initial, two unicellular stalks, one of them supporting two sporangia, the other four. A little way below, the same cell gives rise to a sessile sporangium.

In threads at a somewhat later developmental stage the sporangia-stalk frequently bears a terminal hair. Some unicellular stalks terminate in a hair-initial (fig. 8 J, below), but the hair is usually not formed until the unicellular stalk has divided into two to few cells (fig. 8 K; cf. Pringsheim, pl. 3 fig. 5) all of which may give rise to sporangia.

The sori in older plants are by far larger than these small clusters, although older plants may also exhibit small clusters of a simple structure. The sorus-branches are simple or branched and the sporangia sessile or stalked. In some instances a sporangium may be inserted rectangularly on another. In addition to terminal hairs the sori apparently bear lateral ones. In the latter case they are presumably often terminal on a very short, e. g. one-celled shoot issuing from the sorus-branch. The uppermost cells in the sorus-branch are often devoid of sporangia and hairs and conspicuous owing to brownish yellow, homogeneous contents of fucosan. The latter condition may also be found in the other cells in the sorus-branch.

The swarmers from the plurilocular sporangia in Japanese plants were cultivated by ABE (1935, p. 335). He records the occurrence of four different kinds of individuals: *A*, *a*, *B*, and *b*, and states that copulation takes place between the swarmers from *A* and *a*, respectively, and between those from *B* and *b*, respectively. The individuals classified as *A* or *a* are more vigorous than those classified as *B* or *b* and are supposed to be diploid, while the latter are supposed to be haploid. Meiosis is supposed to take place at the first nuclear division in the plurilocular sporangia in *A* and *a*.

I share KYLIN's (1937, p. 20) opinion that ABE's statements seem to be untrustworthy, particularly considering that in 1936 TAKAMATSU described unilocular sporangia occurring in distinct individuals in Japanese waters. Hence, it is reasonable to presume that the species under consideration, at any rate when occurring in Japanese waters, exhibits an alternation of generations following the *Dictyota*-type. Meiosis undoubtedly takes place in the unilocular sporangia, the swarmers giving rise to a gametophyte with plurilocular sporangia producing haploid swarmers which by copulation reproduce the diploid phase. The alternation of generations may, of course, be more or less complicate and is possibly suppressed in some of the areas in which the species occur. Unilocular sporangia have not yet been recorded outside of Japan.

Generally, this annual is prevalent in spring and early summer. In Danish waters it occurs mainly in April and May; such individuals as were met with in July and August occurred sparsely and were not well developed (ROSENV. & LUND, l. c.). In East Greenland it does undoubtedly not appear until later and persists longer. The material on hand, dating from August, did not furnish any evidence of its being on the decline. The species has not previously been found in the Arctic although it is fairly widely distributed, being recorded from both the European and the American part of the North Atlantic region as well as from Japan.

Previous Records from Greenland:
None.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 6—9 m, 10 m.

Hecatonema Sauvageau, 1897.

1. **Hecatonema maculans** (COLLINS) SAUV., op. c., p. 248, 2nd and 3rd forms, figs. 20—22; KYLIN, 1907, p. 43, fig. 11; KUCKUCK, 1953, p. 319, figs. 1—3.

Phycocelis maculans COLLINS, 1896, p. 459, pl. 278.

Ectocarpus terminalis KUCKUCK, 1897b, p. 376, fig. 3; BØRGESEN, 1926,

p. 52, figs. 27—28. — Non *Ectocarpus terminalis* KÜTZING, 1845, p. 236; Tab. phycol. 5, pl. 74.

Hecatonema terminalis (KÜTZ.) KYLIN, 1937, p. 8; LEVRING, 1937, p. 45; KUROGI, 1954b, p. 66.

This characteristic little alga occurred abundantly at Ella Ø at the beginning of August, especially on the lamina of *Laminaria saccharina* f. *glacialis* in company with *Symphyocarpus longisetus* and other epiphytes. The basal portion, disc-shaped and loosely attached to the host, was partially monostromatic, partially distromatic, up to 1.2 mm in diameter; in surface view its cells measured 10—15 μ in diameter. The individuals were of different ages. In some, the erect threads were short and simple and occurred sparsely; in others they were fairly long and numerous and frequently branched. The majority of the individuals seem to correspond with SAUVAGEAU's "deuxième forme".

The erect filaments were 12—16 μ in diameter; like the cells of the basal portion their cells contained a number of small disc-shaped chromatophores, usually 6 to 7. The hairs were terminal or lateral, their cells likewise measuring 12—16 μ in diameter, and possessed a distinct sheath at their base. The plurilocular sporangia were abundant, most of them with mature spores or emptied. They were usually terminal on a short or long, basal or lateral shoot but in some cases they were sessile on the erect shoots and, in a few instances, on the basal portion. They measured about 50—82 $\times$ 20—27 μ.

Besides on *Laminaria* this species was in the same locality recorded on *Fucus*, *Chaetomorpha*, *Chaetopteris*, and *Rhodomela*. When inhabiting *Fucus* the individuals seemed to be very similar to those growing on *Laminaria*, whereas the basal portion of such individuals as inhabited *Chaetopteris* and *Rhodomela* was somewhat diverging, consisting of creeping, partly free threads. It has previously been mentioned by LEVRING (op. c.) that the structure of the basal portion is influenced by the host.

In two other localities were found some small individuals which undoubtedly belong to this species. They were collected in August, bore plurilocular sporangia and grew sparsely on *Fucus*.

Unilocular sporangia were not observed and are unrecorded (cf. KYLIN, 1947, p. 15, and KUCKUCK, 1953, p. 321). LEVRING (op. c.) is of the opinion that KNIGHT & PARKE's (1931, pl. 10 fig. 14) *Ectocarpus terminalis* KÜTZ. bearing unilocular sporangia belongs to this species but, as pointed out by KORNMANN (in KUCKUCK, 1953, p. 325), KNIGHT & PARKE's species differs from that under consideration by harbouring only a single chromatophore in each cell for which reason they cannot be identical.

As emphasized by KYLIN (1934a, p. 15) *Hecatonema maculans* shows a striking resemblance to the supposed gametophytes of *Asperococcus* *echinatus* which have been developed in culture, and he is of the opinion that they are possibly identical. It should, however, be added that *Hecatonema maculans* is met with in localities in which *Asperococcus* is unknown, such as e. g. East Greenland. On the other hand, it cannot be denied that the former species might represent a diploid dwarf generation of the latter, reproducing itself vegetatively by means of diploid swarmers originating from the plurilocular sporangia.

Previous Records from Greenland:
None.

Scoresby Sund District: Rødeø, 1—2 m.
Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 6—9 m, 10 m; Vinterøer, 2—3 m.

Entonema Reinsch, 1875.

1. Entonema aecidioides (ROSENV.) KYLIN, 1947, p. 21.
Ectocarpus (*Streblonema*) *aecidioides* ROSENV., 1893, p. 894, fig. 27; 1898, p. 80; FOSLIE, 1894, p. 136; JÓNSSON, 1903, p. 151.
Phycocelis aecidioides (ROSENV.) KUCKUCK, 1894, p. 234, fig. 8.
Myrionema aecidioides (ROSENV.) SAUVAGEAU, 1897, p. 177; KYLIN, 1907, p. 36; LEVRING, 1937, p. 49, fig. 6.

This characteristic species was encountered in 4 localities, occurring endophytically in the lamina of *Laminaria.* In surface view the specimens are as a rule rounded but may, however, be of a more irregular shape, e. g. longish. In well-developed specimens the plurilocular sporangia and the hairs project over the edge of the "aecidium".

At Rødeø were encountered specimens at all developmental stages, including very young ones which had not yet penetrated the surface-layer of the host but only caused it to bulge, as well as old ones in which nearly all the plurilocular sporangia were emptied. The largest individuals from this locality measured 155 μ in diameter. The infested *Laminaria* lamina was, incidentally, characteristic in exhibiting a great number of small brownish cavities and holes indicating the points where specimens of the parasite had been situated.

In these plants the plurilocular sporangia most frequently issued directly from the creeping filaments or were borne on quite short stalks. In both cases each cell usually gave rise to more than one sporangium. The latter measured 30—52 $\times$ 8.5—10 μ and were typical.

The species was also met with in the Dusén's Fjord. In this locality the plants generally seem to attain greater dimensions, measuring up to well over 200 μ in diameter. They differed from the above specimens also in exhibiting longer plurilocular sporangia (measuring up to about 100 μ) which usually were borne on somewhat longer, though few-celled stalks. The sporangia were not only given out terminally but arose also from the other cells in the stalk, so that they occurred in great numbers. Owing to the sporangia-stalks and the long, partly lateral, plurilocular sporangia, these individuals deviate somewhat from those depicted by ROSENVINGE, KUCKUCK, and LEVRING.

Hairs occur abundantly, especially in the plants from the Duséns Fjord in which they were given out particularly from the central portion. They possess a meristematic zone measuring 8.5—12 μ in diameter; the hair-cells proper are slightly thicker. Beneath the meristem is often found a fairly long, somewhat attenuated cell. The meristematic zone is surrounded by a sheath. In some instances remnants of several sheaths seem to occur but this condition must undoubtedly be ascribed to a splitting of the cell-wall.

Unilocular sporangia were not observed. Nor did I observe assimilatory shoots like those mentioned by FOSLIE (l. c.) and KYLIN (1907, l. c.).

From the North American Pacific coast, SETCHELL & GARDNER (1922, p. 395, pl. 44 fig. 8) described under the name of *Streblonema aecidioides* f. *pacificum* a form of the species under consideration, inhabiting the lamina of *Hedophyllum sessile*. In addition to plants bearing plurilocular sporangia, this form comprised others bearing sessile, narrow clavate cells which might possibly represent unilocular sporangia. In my material from Rødeø I encountered some individuals exhibiting similar, oblong clavate, ascocyst-like cells measuring 30—42 μ in length and in their upper part 10—11 μ in diameter. In my preparations such cells usually contained a yellowish brown homogeneous substance; some of them were empty and were in process of being proliferated. In some instances they were provided with a transverse wall. They were as a rule stalked, several issuing from one and the same cell. In my opinion they do not represent unilocular sporangia but must be interpreted as abortive plurilocular sporangia. The individuals bearing such cells did not exhibit plurilocular sporangia but were provided with hairs and grew among others bearing plurilocular sporangia.

The species was found at depths between 5—6 m and 15—25 m. At Rødeø it occurred especially in company with *Symphyocarpus strangulans* (and *Phaeostroma*), at Fame Øer and in the Duséns Fjord in company with *Litosiphon filiformis* and *Laminariocolax tomentosoides*. The individuals collected date from July and August.

Previous Records from Greenland:
E. Gr.: One locality: Danmarks Ø, mentioned below (R. 1898, l. c.).
W. Gr.: Six localities between lats. $60^3/_4$ and 67° N. (R. 1893, 1898, l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m; Fame Øer, 5—6 m; Danmarks Ø (N. H.); Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: The head of Duséns Fjord, 15—25 m.

Phaeostroma Kuckuck, 1895.

1. Phaeostroma pustulosum Kuck., op. c., p. 187; Rosenv. 1898, p. 68; 1910, p. 117; Jónsson, 1903, p. 165; Jaasund, 1951, p. 137.
Phaeocladia prostrata Gran, 1893a, p. 32.

This very variable little species is common in my area where it was found from just below 0 m down to at least 20 m, inhabiting various algae such as *Chordaria flagelliformis*, *Stictyosiphon*, *Litosiphon Mortensenii*, *Desmarestia viridis*, *Punctaria glacialis*, and *Laminaria* germlings. It is easily recognized because of its numerous, characteristic hairs exhibiting a considerably elongated basal cell. Near its lowermost part this cell is somewhat constricted and thick-walled.

As will be known, the nature of the substratum is decisive for the structure and behaviour of the plant (cf. Rosenvinge, Jónsson and other authors). When growing on *Laminaria* and other rather firm substrata, its thallus usually is disc-shaped and epiphytic. When inhabiting host plants of a loose texture, however, it consists chiefly of branching, monosiphonous threads, a smaller or greater number of which are endophytic, but pseudo-parenchymatous portions of varying extent may also be met with in such plants.

In cases when it was observed on quite young *Laminaria* germlings it did as a rule not form rounded discs as all the individuals were young, possibly owing to the early age of the host, but all of them bore plurilocular sporangia. In some instances the individuals consisted of irregularly creeping threads perfectly agreeing with Kuckuck's (op. c., p. 185) fig. 2 of *Ph. Bertholdi*, from which they differ only by their somewhat larger dimensions and by the long basal cell of the hairs. In slightly older plants the creeping threads had formed some isolated, small, irregular discs. A still older individual was disc-shaped but exhibited free threads at its margin. Only on well-developed *Laminaria* germlings did complete discs occur, corresponding with Kuckuck's pl. 7 fig. 2.

Nearly all the specimens collected in June, July, and August bore plurilocular sporangia, whereas no unilocular sporangia were observed.

In his work dealing with the algal vegetation of the South Swedish Baltic coast, Levring (1940, fig. 2) depicts the species with hairs in which no elongated basal cell is seen (cf. Jaasund's comment, l. c.). If such hairs, too, do really occur in this species, hairs with an elongated basal cell cannot be regarded as a decisive characteristic; in that case I would not hesitate to refer *Ph. Bertholdi* Kuck. to this species. It should be added that Gran's *Phaeocladia prostrata*, which generally is considered identical with the species under consideration, was devoid of hairs.

Previous Records from Greenland:
E. Gr.: One locality in lat. $76^{1}/_{2}$° N. (R. 1910, l. c.).
W. Gr.: Four localities between lats. $60^{1}/_{3}$ and 67° N. (R. 1898, l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m; Kap Hope, just below 0 m; the mouth of Hurry Inlet, 7—10 m; Fame Øer, 5—6 m; Bjørneøer, just below 0 m, 9—20 m.

Kejser Franz Josephs Fjord District: Ella Ø, 10 m, 20—25 m.

2. **Phaeostroma parasiticum** BØRGESEN, 1902, p. 441, fig. 83. — Fig. 9A.

This species occurs at depths from 6—11 m down to 30 m and was encountered particularly in the outer Scoresby Sund. In most instances it inhabited the lamina of *Laminaria* (and *Alaria*) germlings but I found it also in the lamina of fully developed specimens of *Laminaria saccharina* f. *glacialis*. The individuals occurring in *Laminaria* germlings have been kept in alcohol and most of the below observations were made on the basis of this material which comprises all stages, ranging from quite young plants to others measuring at least 2 mm in diameter.

In older *Laminaria* specimens many of the plants had fallen out and had left a cavity of an irregular shape in the lamina. Such cavities might measure about $200 \times 185\ \mu$. In many instances the plant had not fallen out entirely but long, dark brown, endophytic threads might still be observed. They were of a considerable length, at any rate up to 2.4 mm, and were rather sparsely branched.

My material corresponds on the whole with BØRGESEN's Faroese plants with the exception that in my individuals the horizontal, external thallus seems throughout its extent to grow close upon the substratum, whereas that depicted in BØRGESEN's fig. 83a is somewhat elevated above the surface of the host. Moreover, the Faroese plants obviously were more vigorously developed than mine.

Similar to the condition found in the Faroese plants, the horizontal thallus in my specimens does not form a disc. It is composed of richly and irregularly branched filaments. The main filaments almost invariably are distinguishable throughout their length from the central pseudo-parenchymatous part of the plant to their apices. Their appearance agrees perfectly with BØRGESEN's fig. 83b—c. Towards the central part the filaments grow over and in between one another so as to form a network, thus contributing to the height of the thallus exactly as described by BØRGESEN. Such branches may show much resemblance to rhizoids.

During its growth the horizontal thallus may sometimes reach the margin of the lamina of the host. Nevertheless, the thallus continues its growth, the shoots bending onto the other side of the lamina (fig. 9A, to the left) where they extend further. At the place of bending, some single short shoots may be observed projecting freely.

The main filaments generally consist of cells measuring 13—16 μ in diameter, more rarely up to 21 μ, their length being at least up to three times the diameter, but short cells are also frequent. As a rule the cells are more or less irregularly cylindrical. They harbour several small, disc-shaped chromatophores which seem to be connected by thin threads (coagulated plasma-threads). Several cells are hyaline and apparently empty. Thus, the dark brown colour characteristic of this species is possibly due to the cell-contents rather than to the cell-walls. It does not disappear when the plants are kept in alcohol and is especially pronounced in the endophytic threads and in older parts of the thallus whereas the young epiphytic threads are of a lighter colour.

Hairs were not observed and as I have examined a great number of specimens kept in alcohol it must be concluded that hairs are completely lacking in this species.

Most of the well-developed plants bear plurilocular sporangia, nearly always occurring in larger or smaller nodules, particularly on the central, pseudo-parenchymatous portion. The sporangia usually are coalescent and attain to considerable dimensions. By way of example it can be mentioned that in surface view one of the plurilocular sporangia measured about 75×53 μ, while an adjacent one, with which it was coalescent, measured 66×53 μ. I have not, however, observed with certainty unilocular sporangia and I doubt that Børgesen's fig. 83h—i do actually represent such sporangia.

As far as could be ascertained the plant commences its development as an endophyte. It seems likely that the shoots produced by the germination of the spores shortly afterwards penetrate the host. Not until the endophytic part has reached a certain development does the parasite rupture the surface-layer of the host to develop its horizontal epiphytic threads. In support of my supposition can be mentioned that I have in several instances observed systems of rather young, branched, exclusively endophytic threads. Moreover, I have observed a specimen whose pseudo-parenchymatous central portion had not yet ruptured the surface-layer of the host but had only pushed it upwards. Some few, quite short threads issuing from the central part of this plant were, however, in process of penetrating the surface-layer. Finally, in most of the young plants the endophytic portion was more vigorously developed than the epiphytic.

The species seems to be sparsely quoted in literature. It has been mentioned e. g. by Levring (1937, p. 36) who advances the theory that it might be identical with *Ph. pustulosum*, but in my opinion this possibility is quite out of the question. The species under consideration is a true parasite which, judging from collections made up to now, seems to depend on *Laminaria* and *Alaria* as hosts. Furthermore, it is much coarser than *Ph. pustulosum* which, admittedly, is endophytic when inhabiting algae of a loose texture but epiphytic when growing on *Laminaria*. *Ph. parasiticum* is further distinguished i. a. by the fact that its thallus is never disc-shaped, by its distinct main filaments, its lack of hairs, and its dark brown colour.

Levring is further of the opinion that the *Phaeostroma* species described (but not identified) from the Trondhjemsfjord on the Norwegian west coast by Printz (1926, p. 147, pl. 3 figs. 20—24), growing epiphytically on *Laminaria* and being devoid of hairs, might be identical with *Ph. pustulosum*. This is possibly true. Printz states that his species seems to combine the characteristics of *Ph. pustulosum* and *Ph. parasiticum*. However, it has no relation to the latter.

Previous Records from Greenland:
None.

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 11—13 m, 14—16 m; Kap Hope, 30 m.

Kejser Franz Josephs Fjord District: The head of Duséns Fjord, 15—25 m.

3. Phaeostroma endophyticum sp. nov.

Thallus flabelliformis, rarius irregulariter laciniato-lobatus vel rotundatus, initio monostromaticus, e seriebus cellularum cuique paucarum, magnarum connatis vel partim inter se liberis, simplicibus vel ramificatis compositus. Cellulae denique verticaliter elongatae, sporangia plurilocularia formantes. Thalli flabelliformes sporiferi 30—100 μ crassi, ad 250—350 μ lati, radiis medianis 130—200 μ longis; rotundati sporiferi 100—140 $\times$ 80—100 μ magni. In *Laminarias* juvenes paucos cm longas immersum, strato externo primum sublato postea rupto.

In some localities between 5—6 and 15—25 m I observed in July and August a characteristic endophyte inhabiting the lamina of *Laminaria* germlings and generally being rather abundant. In surface view it usually appears flabellate; more rarely it is irregularly lobed, laciniate, or of a more or less rounded shape.

The endophyte grows beneath the assimilatory surface-layer which eventually is lifted so that a distinct bladder is formed and in due course ruptured (fig. 10 D). In fig. 9 C a flabellate plant is photographed *in situ* and the bladder is seen as it appears when pressed down by the cover-glass. Fig. 9 B shows a plant separated from the host.

In surface view the thallus exhibits a small number of simple or branched horizontal shoots, coalescent or, more rarely, partially free, frequently clavate and usually divided by 1—3 indistinct transverse or oblique walls. The shoots are not always situated at exactly the same level. Some few fairly small cells are distinguishable in the basal portion of the fan (fig. 10 A). The branching may occur at indeterminate places. All shoots taken into account, the upper part of the plant exhibits

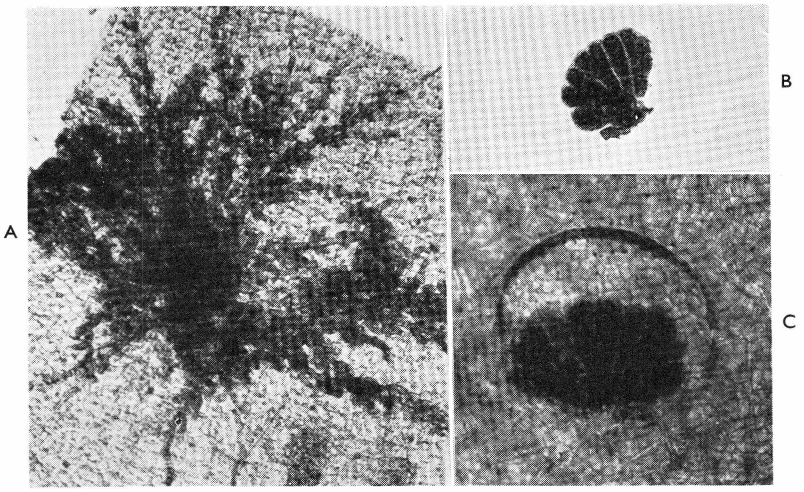


Fig. 9. A: *Phaeostroma parasiticum* inhabiting a *Laminaria* germling. At the margin of the host (to the left) the horizontal shoots bend onto its other side. B—C: *Ph. endophyticum* in surface view; in B separated from the host, in C inhabiting a *Laminaria* germling where it has caused a bladder. A—B: × 60; C × 120.

6—10 shoots (fig. 10 A), their width measuring between 20 and 60 μ. The rounded outer walls in the tips of the shoots are thick and hyaline. The same frequently applies to the walls between the shoots which then become very conspicuous (fig. 9 B); in other cases these walls are thin.

The angle between the two marginal shoots varies fairly much but is as a rule less than 180°. The width of well-developed flabellate individuals varied between 250 and 350 μ, the length of the middle portion between 130 and 200 μ. More rounded individuals measured 100—140 × 80—100 μ. In some plants a rather short, monosiphonous, rhizoid-like, endophytic thread was observed issuing from the base of the fan, in others from the tip of a shoot or from the outer side of one of the marginal shoots.

In the majority of the plants the clavate shoots were throughout their length converted into vaulted, plurilocular sporangia (in fig. 10 A indicated by a greyish colour) with rather thick septa and large loculi, each containing a large spore with a conspicuous blepharoplast. The small cells in the basal portion of the fan were mostly sterile though in older plants frequently fertile. When sterile they are, like the sterile rhizoid-like threads, situated at a level considerably below that of the fertile part of the clavate shoots.

In transverse section through the clavate shoots each of them usually seems to constitute a single, large, vertically elongated, plurilocular sporangium or sporangial aggregate; in some cases no cell-walls were seen in the sporangium (fig. 10 B—C) while in others several walls were

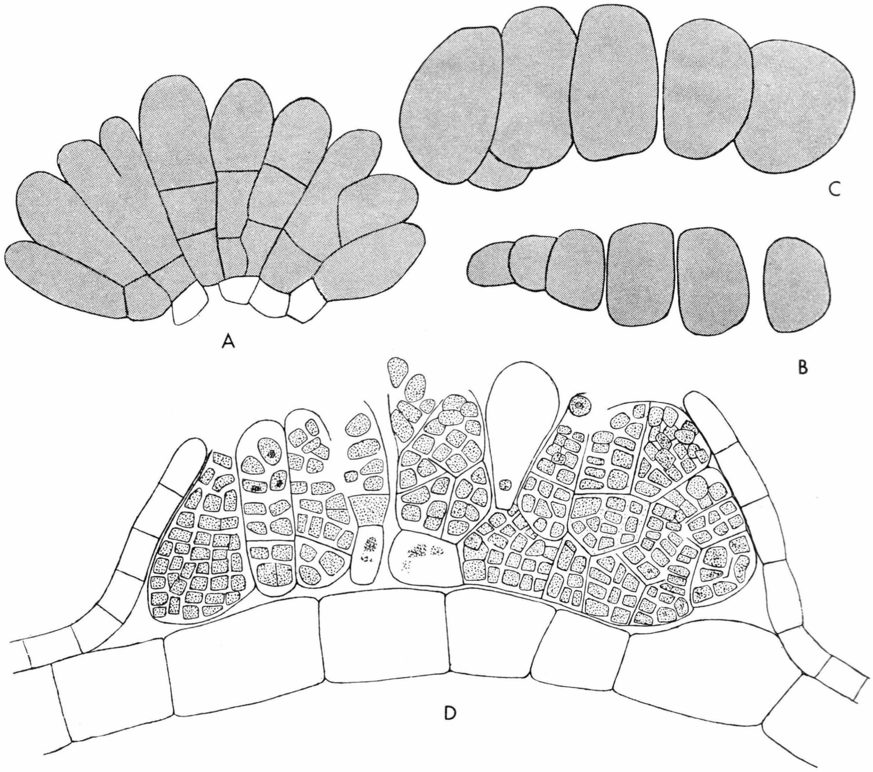


Fig. 10. *Phaeostroma endophyticum.* A: Flabellate plant in surface view. The lowermost four cells are still sterile; B—D: transverse sections through the clavate shoots. In A—C the fertile portions are indicated by a greyish colour. In B and C no walls are distinguishable in the sporangia. In D the blepharoblast is indicated in some of the spores. The drawings are somewhat diagrammatic, the walls not being depicted with their full thickness. A—C: $\times$ 225; D: $\times$ 375.

recognized (fig. 10 D). The height of the sporangia varies from 30 to 100 μ; in most of the plants it decreases towards the margin (fig. 10B).

The spores are liberated through a terminal aperture direct into the water. As I did not succeed in making transverse sections of plants whose sporangia were evacuating their spores I cannot give further details. In some nearly emptied sporangia in plants from Kap Tobin, dating from mid-August, which I studied in surface view, I observed some few remaining spores, measuring no less than about 8 μ in diameter.

Some sterile plants were found too. In surface view they appeared flabellate and grew parallel to the lamina of the host. They resembled fertile plants, with the exception that their cells were not vaulted, and like the small sterile cells in the basal portion of fructifying plants they were situated at a level below that of the fertile clavate shoots. In some young plants the branches were not coalescent.

In trasverse section the sterile plants appeared monostromatic, flattened towards the margin. They consisted of rounded, nearly isodiametric cells measuring e. g. 29—49 μ in diameter or, more rarely, of angular cells. At a somewhat later stage some of the cells were divided by a horizontal wall.

The cells in the sterile plants contain a somewhat granular plasma. Several disc-shaped chromatophores, issuing radiating plasma-threads, were as a rule distinguishable. The small basal cells in the fan exhibited only a single chromatophore each.

In spite of the fact that the appearance of this new species deviates from that of the members of the genus *Phaeostroma* I consider its plurilocular sporangia warrant for its inclusion in that genus, within which it is related to *Ph. parasiticum*. A further support for this view is furnished by the short, endophytic threads occurring in some plants. It should also be added that in a few plants I observed a very small number of few-celled, short, rhizoid-like, free threads, strongly resembling the epiphytic threads in *Ph. parasiticum*, project from the nearly completely fertilized thallus after the surface-layer of the host had burst.

It might be suggested that the new species constitutes a mere developmental stage of *Ph. parasiticum*, together with which it was sometimes found. This seems little probable as the species under consideration apparently dies away after the evacuation of the sporangia and as no intermediate stages between the two species were observed. The species might, however, be interpreted as a reduced type derived from *Ph. parasiticum* from which it differs by several distinctive features, e. g. by the nearly complete fertilization of its thallus.

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 11—13 m, 14—16 m; Fame Øer, 5—6 m.

Kejser Franz Josephs Fjord District: The head of Dusèns Fjord, 15—25 m.

Ectocarpus (?) **(Streblonema) helophorus** Rosenv., 1898, p. 82; Jónsson, 1904, p. 38.

Streblonema? helophorus Batters, 1902, p. 29.

I found this interesting endophyte in three localities, growing in the mucilage between the vertical threads of *Petrocelis polygyna*, but only in one locality (Bjørneøer) did it seem to be common and well developed. It occurs at depths between 6—9 and 19 m. The vertical threads attain their greatest length when the species inhabits thick crusts of *Petrocelis* infested at an early stage, as their terminal cells always are situated on a level with those of the vertical threads of the host.

The individuals agree very well with the description. In plants dating from the end of July I observed emptied sporangia, some of which were situated somewhat down the threads, thus indicating that the surface of the host was on a level with these sporangia when they matured. I did not, unfortunately, succeed in finding mature sporangia so I am unable to state whether or not the contents undergo a division before being liberated. In several instances were observed clavate tips of shoots which presumably represented young sporangia. Whether the tips of the shoots are swollen or vegetative, the terminal cell harbours a fairly large chromatophore.

With the present incomplete knowledge of the sporangia in this species it is impossible to decide its systematic position but, as an affinity with *Ectocarpaceae* cannot be excluded, I choose to list it as an uncertain member of that family and not to discuss the question of its proper generic name.

Outside of Greenland the species is known only from some few localities in Scotland reported by Batters (l. c.). His records are quoted in Newton's handbook (1931, p. 129); on this occasion the word "*helos*", occurring in the specific name, was interpreted as "a marsh". Rosenvinge, however, used it in the sense "a tack".

Previous Records from Greenland:
E. Gr.: Two localities in lats. 66 and $70^1/_2$° N., respectively (R., l.c.; J., l.c.).
W. Gr.: None.

Scoresby Sund District: Kap Hope, 10 m; Bjørneøer, 14—17 m; Danmarks Ø, 19 m (N. H.).
Kejser Franz Josephs Fjord District: Ella Ø, 6—9 m.

Ralfsiaceae

Symphyocarpus Rosenvinge, 1893.

1. **Symphyocarpus strangulans** Rosenv., op. c., p. 896, figs. 28—29; 1898, p. 67; Kuckuck, 1894, p. 236, fig. 9; Kylin, 1910, p. 17, fig. 4.

A common species, met with at depths from 1—3 m down to at least 40 m. It occurs mostly as an epiphyte on various algae such as *Desmarestia aculeata*, *Fucus*, *Laminaria* (stipe, haptera, and lamina), *Alaria* (stipe), *Punctaria glacialis*, *Chaetomorpha melagonium*, *Chordaria*, *Turnerella*, *Polysiphonia*, *Rhodomela*, and *Chaetopteris*, but was also encountered inhabiting *Ascidia* and the bryozoan *Eucratea loricata*. In most instances it was observed on the first-mentioned host (and *Fucus*) but owing to its colour it is, of course, not so conspicuous in such cases as when inhabiting e. g. *Chaetomorpha*.

As will be generally known, the basal portion primarily consists of free, branched, creeping filaments which later by luxuriant branching unite to form a parenchyma. In younger individuals whose basal portion has already become parenchymatous, but in which the vertical shoots are still few and quite short, it is easy to ascertain that development has actually taken place in this manner as, by pressure under a cover-glass, the cells pertaining to different threads recede from one another while such cells as pertain to one and the same thread remain united.

Each cell contains a disc-shaped chromatophore harbouring a pyrenoid (Kuckuck, l. c., fig. 9). In her fig. 74 A, Newton (1931) reproduces Rosenvinge's (1893) fig. 29 A and indicates the chromatophores, though erroneously more than one in each cell.

Ascocysts with yellowish brown, homogeneous contents consisting of fucosan occur commonly. They are usually terminal on the vertical threads, more rarely arising directly from the basal layer. In some plants, kept in formalin, the contents were granular so that on a superficial view the ascocysts might recall unilocular sporangia with differentiated spores.

Hairs have been depicted by Kylin (l. c., fig. 4 a) and Hamel (1939 b, fig. 62_{14}), and Rosenvinge left an unpublished drawing depicting a hair in a specimen from Danish waters. In Kylin's and Rosenvinge's drawings the hair issues immediately above the basal layer, while in Hamel's drawing it is borne terminally on a six-celled, vertical thread, its diameter being nearly equal to that of the thread. In Rosenvinge's (1893) fig. 29 C, too, a cell-thread is depicted and described as constituting a hair pertaining to the species under consideration, but in 1898 the author abandons this interpretation. Nevertheless, Newton (1931, fig. 74 B) reproduces Rosenvinge's drawing without mentioning that the latter author changed his opinion on this subject.

In my plants the frequency of the hairs varies rather much. In some individuals they seem to be completely lacking. In others they occur in fairly great numbers and were encountered even in rather young plants where, in surface view, they were easily recognized, especially near the margin. They occur singly and usually exhibit a diameter half that of the vertical threads, thus corresponding with Kylin's drawing and with that left by Rosenvinge. They possess a basal meristem and not rarely a small basal sheath. In the meristematic part the diameter measures about 7—10 μ while the hair-cells proper exhibit a slightly larger diameter.

Plurilocular sporangia, emptied or still harbouring their contents, were observed in June, July, and August. They occur very commonly and seem to be present already in fairly young plants. They are generally formed from the longitudinally divided apical cells and usually agree with the description by Rosenvinge.

In some copiously fructifying individuals, originating from Amdrups Havn where they inhabited a stipe of *Laminaria solidungula*, the majority of the plurilocular sporangia were, however, somewhat deviating, even in several respects (fig. 11 B). They were as a rule appreciably longer than is usually the case, their length measuring up to 65 μ, while the number of compartments might amount to 11. Their diameter measured 11—14 μ. Several compartments were divided by a longitudinal or oblique wall, more rarely by two longitudinal walls. They were usually cylindrical, slightly clavate or spindle-shaped, and fairly often branched. Their most characteristic feature, however, lay in their being mostly separate or

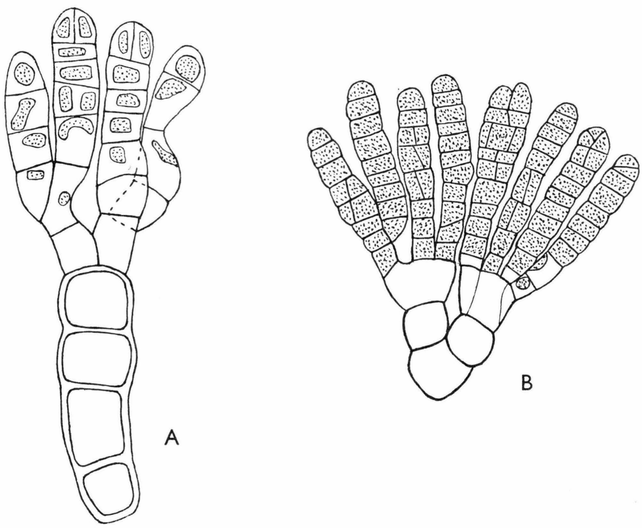


Fig. 11. *Symphyocarpus strangulans.* A: vertical thread with young free shoots in process of becoming fertile. × 525. B: branched vertical thread with bundles of free, extraordinarily long plurilocular sporangia. × 400.

coalescent only in their lowermost part. They are formed from free shoots which frequently are branched in their lower portion and arise from the apical cell of a vertical thread (fig. 11 A). This cell sometimes exhibited two indistinct, thin, longitudinal walls (fig. 11 B). The free shoots at first possess insignificant contents, are hyaline and exhibit few transverse walls. The formation of spores is basipetal. Owing to the branching of the free shoots the sporangia may occur several together. A vertical thread may thus bear a terminal bundle of no less than 8 sporangia.

The deviating appearance of the above sporangia might seem to constitute an objection to the inclusion in *S. strangulans* of the individuals involved. However, in addition to the deviating sporangia were observed other plurilocular ones, agreeing with those characteristic of this species, as well as intermediate forms. As, apart from this condition, the plants were typical, e. g. bearing ascocysts and hairs of the usual type, I interpret the above sporangia as a mere result of variability.

Unilocular sporangia were not observed and are unknown. Thus, it is a misprint when, in the key to *Phaeophyceae*, NEWTON (1931, p. 107) indicates "unilocular sporangia" instead of plurilocular ones.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $70^1/_2$ and $76^1/_2$° N., respectively (R. 1898, l. c.; 1910, p. 117).

W. Gr.: One locality in lat. $69^1/_4$° N. (R. 1893, l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 11—13 m, 14—16 m, 16—18 m; off Scoresbysund, 11 m; Kap Hope, 6—13 m, 26 m (on *Punct. glac.*), 27 m (on *Ascidia*); the mouth of Hurry Inlet, 7—10 m; Fame Øer, 5—6 m; Bjørneøer, 6—11 m, 14—17 m; Danmarks Ø (N.H.); ibid. 1—3 m, 15—16 m; Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 8 m, 10 m, 20—25 m, in a dredging from 40—80 m (on *Turnerella*); Vinterøer, 2—3 m, 3—6 m, 14—18 m, 21—22 m.

2. **Symphyocarpus longisetus** sp. nov.

Thallus pulvinatus, rotundatus, solidus, firmus, ad 0.75 mm diametro, ad 125 μ altus, e filis compositus paucicellularibus, erectis, dense congestis, inter se liberis, e strato monostromatico emissis. Cellulae filorum erectorum hyalinae, ad septa constrictae, saepe oblique insertae, infima elongata, insequens magna inflata, summae subovoïdes vel subsphaericae, interdum deorsum applanatae. Pilorum cellula basalis setacea, ad 200 μ longa, membrana crassa. Sporangia plurilocularia plerumque terminalia, lateribus connata, corpora simul formantia irregulariter ovoïda, 25—37 μ longa, 16—21 μ diametro.

Laminariae saccharinae f. *glaciali* affixus.

On a lamina of *Laminaria saccharina* f. *glacialis*, collected at a depth of 2—5 m at the beginning of August, were found numerous specimens of a small cushion-shaped, solid alga of a firm structure which seems to be a hitherto undescribed species. In surface view the thallus usually is more or less orbicular (fig. 12 A) but may be of a more irregular shape. Its diameter measures up to 0.75 mm, its height up to 125 μ. Towards the margin it becomes rather abruptly lower (fig. 12 B).

The plant consists of few-celled, erect, free, crowded, simple or branched threads, composed of hyaline cells that are constricted at the transverse walls and often obliquely inserted. The threads issue from a monostromatic layer. When seen from below, this layer, in young plants, consists of free, creeping, richly branched threads (fig. 13 A). Their cells are small, often rounded, isodiametric or exhibiting a length measuring up to two diameters. In older plants it is difficult to recognize the individual threads which usually are coalescent though here and there an open space may be observed between the threads. They are often composed of angular cells which in some cases may be divided by a horizontal wall.

In well-developed plants the erect threads usually consist of 3—4 cells (fig. 13 G). The lowermost cell is elongate, subcylindrical or slightly

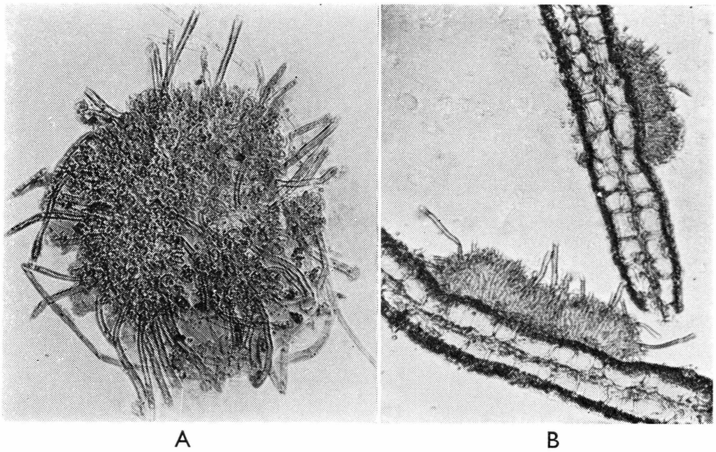


Fig. 12. *Symphyocarpus longisetus*. A: in surface view, $\times$ 104; B: in vertical section, $\times$ 57. In B, the lower cushion consists of two plants growing close to each other.

clavate. It supports a large inflated, thicker, often somewhat shorter, suboval or rather irregular cell, not infrequently oblique above. This cell in its turn bears terminally, sometimes also laterally (fig. 13 H), a subovate, subspherical, or suboval cell exhibiting the same diameter, from which one or a few similar, terminal cells may issue, frequently situated in an oblique position. The upper cells are sometimes flattened below.

The dimensions of the cells vary fairly much. In the most well-developed threads the lowermost, elongate cell may measure 29—53 $\times$ 8—10 μ (—14 μ), the large middle cell 37—41 $\times$ 16—25 μ, while the remaining cells may exhibit diameters of 16—25 μ. In other threads, particularly the marginal ones, the cells are, however, smaller and the threads may consist of only two cells. The pressure exerted by the other threads may cause the marginal threads to issue obliquely (fig. 13 C).

The cells of the threads are poor in chromatophores. Despite their much larger dimensions they seem, like the cells of the basal layer, to contain only one (or two) small disc-shaped or irregularly lobed chromatophore(s), apparently containing a pyrenoid.

In vertical section the small cell of the basal layer is often observed immediately below the lowermost elongate cell of the erect filaments (fig. 13 G, to the left). In one instance two upright threads issued from the same basal cell. The basal cell is not always distinguishable as it often undergoes an elongation and develops into the lowermost cell of the thread. At the margin of the cushion may be found some few cells of the basal layer which have not yet issued a thread.

Hairs are abundant. They are extremely characteristic in possessing a long bristle-like basal cell measuring up to 200 μ, above which the

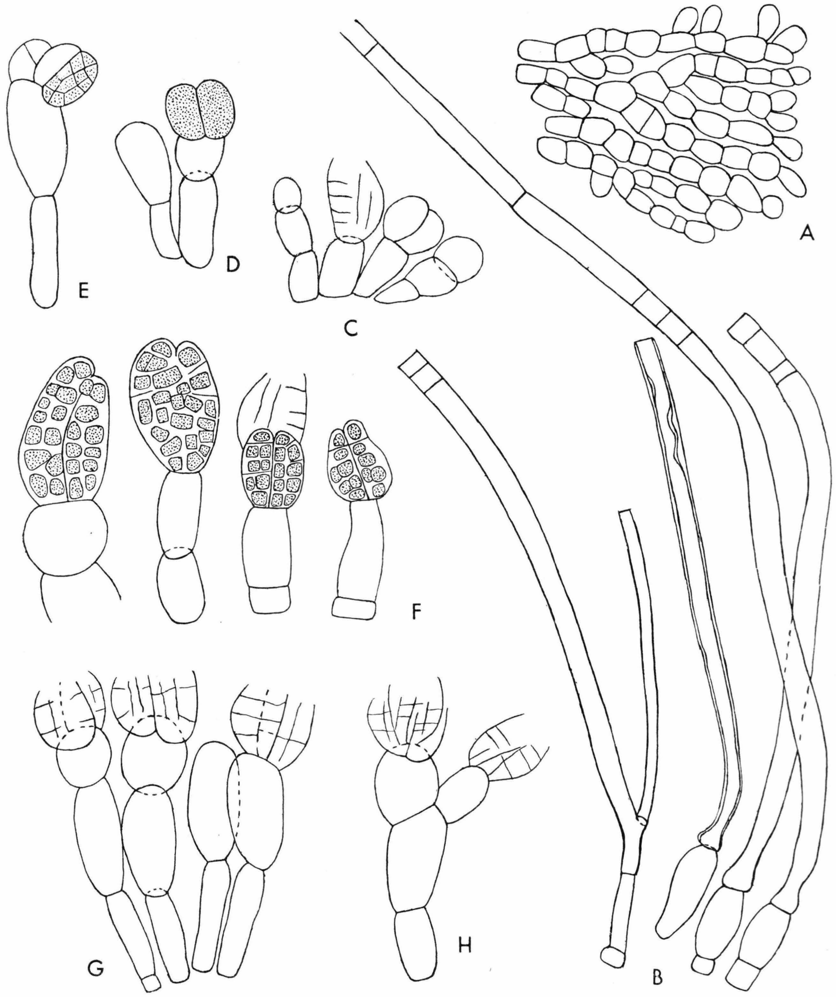


Fig. 13. *Symphyocarpus longisetus*. A: margin of the basal layer of a rather young plant, seen from below; B: hairs; only in one of the bristle-like basal cells is the outer wall depicted with its full thickness; C: vertical section of the margin of the cushion; in D: plurilocular sporangial initials; in E: young plurilocular sporangium; in F: mature sporangia; G—H: well-developed erect threads exhibiting emptied sporangia. A—C, E, G—H: × 320; D: × 455; F: × 565.

meristematic zone is situated (fig. 13 B). This cell exhibits a very thick outer wall whereas its transverse walls are thinner, especially the upper one. The outer wall is thickest a little way above the base where it is somewhat constricted. In the upper part of the cell a prominence of the thickened wall is frequently observed protruding into the cell (fig. 13 B, in the middle). This is due to a longitudinal splitting of the wall and causes a hollow space between the prominence and the remaining part of the wall. The diameter of the cell generally is smallest at the constriction at the lower end where it measures 5—6 μ, while it may be 10—12 μ or even up to 20 μ in the upper portion of the cell. In other cases the diameter may be largest at the middle of the cell or at another point, or it may be equal throughout the cell. In one instance I observed a hair possessing a basal cell which branched a little way above its base and gave rise to a similar, but thinner basal cell of another hair (fig. 13 B, to the left).

The meristematic region of hairs in growth consists of 5—6 thin-walled cells followed by the hair-cells proper, likewise thin-walled. In many cases it consisted of one or some few cells only, suggesting that the hairs had ceased their growth. This was also evident from the fact that in numerous instances only the long basal cell persisted while the upper part had worn away. The meristematic cells frequently are swollen owing to infestation by chytridiaceous fungi. In some cases the attack has caused the cells to produce into short lateral shoots. It may also happen that the upper part of the basal cell is infested, its upper transverse wall being thin, whereas an attack in the remaining part of this thick-walled cell was never observed.

The hairs issue terminally or laterally from the apical cells. As the latter sometimes undergo a longitudinal division after the formation of the hair-initial the hair may be borne on two cells. In other instances the hair-bearing cell becomes fertile, the hair thus being situated on a sporangium. In several cases the hair is given out from one of the lower cells, e. g. from the lowermost elongate one, but I have also met with hairs issuing from basal cells.

All the individuals bear a great number of plurilocular sporangia (fig. 13 F). They are terminal and are formed from the apical cells, practically all of which become fertile. Less frequently the sporangia may also issue laterally from the subapical cell which, after the ecavuation of the terminal sporangia, also may become fertile (fig. 13 F). Prior to the formation of the sporangia the parent-cell is divided by a longitudinal or oblique wall (fig. 13 D), the sporangia thus becoming laterally coalescent, wholly or in part. Sometimes one of the daughter-cells remains sterile (fig. 13 E), at any rate temporarily. In some cases even four sporangia seem to be coalescent owing to a longitudinal division of the two daughter-cells. As the sporangia-bearing cell often issues more than one cell it may bear more than one bunch of sporangia.

The great majority of sporangia were emptied (fig. 13 C, G—H). Judging from the fairly few ones that still retained their contents the sporangial aggregates are obliquely ovate, wide or elongate ovate, obovate or suboval. They measure 25—37 × 16—21 μ and generally consist of 4—7 compartments. The evacuation takes place terminally. The emptied sporangia were in several instances slightly longer than those still possessing their contents and might attain a length of upwards of 40 μ. Unilocular sporangia were not observed.

As appears from the description, the structure of the cushion shows much resemblance to that of the nucleus in the genus *Corynophlaea* (cf. KUCKUCK's (1929) fig. 43 of a young *C. umbellata*). However, the two species have no relation to each other and their structural similarity is due merely to the fact that both the nucleus of *Corynophlaea* and the thallus of the species under consideration are cushion-shaped.

On the other hand, the long basal cell of the hairs suggests a comparison with the genus *Phaeostroma*, within which *Ph. pustulosum* exhibits a similar, although much shorter cell. Apart from their dimensions the two cells are actually alike, as the species under consideration possesses exactly the same constriction and thickening of the cell-wall as were depicted by ROSENVINGE (1898) in *Ph. pustulosum* in his fig. 15.

It will, nevertheless, be unadvisable to ascribe too much taxonomical importance to the long basal cell of the hairs. Firstly, within the genus *Phaeostroma* it is met with only in *Ph. pustulosum*, in which it is not even a specific characteristic. At any rate, it is not mentioned by KUCKUCK (1895, p. 187) in the diagnosis of the species but only in the description (op. c., p. 183) and, as previously stated (the present paper, p. 63), LEVRING (1940, fig. 2) depicts individuals originating from the Baltic without an elongate basal cell. (It is, however, a fact that other authors, including myself, invariably observed the elongate basal cell in this species.) Secondly, basal cells of this type have recently been recorded in a third alga, *Halonema subsimplex* JAASUND (1951, p. 139, fig. 6a) belonging to *Chordariaceae*.

It is thus evident that such cells are recorded in three quite different species and, moreover, certain other species exhibit a resembling cell, though slightly pronounced; this is the case in *Entonema aequale* (OLTM.) KYLIN, 1947, p. 21 (= *Streblonema aequale* OLTMANNS, 1894, p. 214 = *Phaeostroma aequale* (OLTM.) KUCKUCK, 1897b, p. 385) where it is comparatively long. In my opinion such cells do not furnish proof of affinity and I think that too great importance is attached to this characteristic when JAASUND (op. c., p. 140) advocates the removal to *Chordariaceae* of the genus *Phaeostroma* on the basis of the long basal cell, in addition to a certain similarity in the structure of the plurilocular sporangia in *Phaeostroma* and *Halonema*, respectively.

As the species under consideration shows no other points of resemblance to *Phaeostroma* its relation to that genus is improbable. However, it recalls the genus *Symphyocarpus* with regard to the structure of the thallus as well as to the coalescent sporangia, so I choose to refer it to that genus. It differs from *S. strangulans* by the long basal cell of its hairs, by the shape of the cells in the erect threads and by their being hyaline, as well as by the absence of ascocyst-like cells.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m.

Ralfsia Berkeley in Engl. Bot., Suppl., Vol. 3, 1831, pl. 2866.

1. Ralfsia fungiformis (GUNN.) SETCHELL & GARDNER, 1924, p. 11; 1925, p. 499; TOKIDA, 1954, p. 81, pl. 8 figs. 10—12, pl. 13 figs. A—C (with description and drawings of unilocular and plurilocular sporangia).

Fucus fungularis OEDER in Fl. Danica, Fasc. 7, pl. 420, 1768.

Ralfsia deusta (AG.) J. AGARDH, 1848, p. 63; REINKE, Algenfl., p. 48; ROSENV., 1893, p. 898; 1898, p. 93.

Previous Records from Greenland:

E. Gr.: One locality in the southermost part in lat. $60^1/_2$° N. (R. 1893, l. c.).

W. Gr.: Five localities between lats. 60 and $67^2/_3$° N. (R. 1893 & 1898, l. c.).

Not recorded by me.

2. Ralfsia tenuis KYLIN, 1947, p. 45.

R. clavata REINKE, Algenfl., p. 48; Atlas, p. 9, pls. 5—6 figs. 14—20 (del. KUCKUCK); ROSENV., 1893, p. 899; KUCKUCK, 1894, p. 244.

R. clavata FARLOW, 1881, p. 88 (?).

In his "Algenflora d. westl. Ostsee" (1889) REINKE goes into the problem of synonyms within *Ralfsia clavata.* He maintains that there can be no doubt that the plant from Kiel is identical with *Linkia clavata* CARMICHAEL, referring to HARVEY's (Phycol. Brit., pl. 348) drawing of "*Myrionema clavatum*, CARM. (sp.)" and to English plants sent him by BATTERS. Moreover, REINKE maintains that FARLOW's (1881, l. c.) remarks on the North American specimen of *Ralfsia clavata* apply also to the plant from Kiel, with the exception of FARLOW's reference to CROUAN (1867, pl. 26 fig. 168). Simultaneously REINKE had the plant from Kiel depicted in his Atlas by KUCKUCK.

In literature appearing after REINKE's work the species generally has been designated *Ralfsia clavata* (CARM.) FARL., often with reference to REINKE's Atlas, as was done e. g. by ROSENVINGE in 1893 and by KUCKUCK in 1894. However, KYLIN (1947, p. 45) recently pointed out that it seems impossible to state the identity of *Myrionema clavatum* CARM. in HOOKER's British Flora, 2, 1833, p. 391 (= *Linkia cl.*) and added that HARVEY's drawing had at least no relation to REINKE's plant. KYLIN, therefore, suggested to apply another name to *Ralfsia clavata* REINKE s. str., namely *Ralfsia tenuis.* Personally I am inclined to follow KYLIN in this matter, so I have designated the species as proposed by him. I dare not advance an opinion as to whether FARLOW's American plants differ from this species as held by KYLIN. However, FARLOW's statement that they show a striking resemblance to No. 56 of CROUAN's "Algues marines du Finistère" supports KYLIN's point of view, the latter alga being identical with *R. verrucosa* ARESCH. as already pointed out by REINKE.

Previous Records from Greenland:
E. Gr.: One locality in lat. $65^2/_3$° N. (R. 1898, p. 94).
W. Gr.: Several localities between lats. 60 and $68^3/_4$° N. (R. 1893 & 1898, l. c.).

Not encountered by me.

Sorapion Kuckuck, 1894.

1. Sorapion Kjellmanii (WILLE) ROSENV., 1898, p. 95; 1910, p. 124; WÆRN, 1949, p. 662, fig. 2 a—d.

Lithoderma Kjellmani WILLE in WILLE & ROSENV., 1885, p. 89, pl. 13 figs. 9—14, pl. 14 figs. 15—21; ROSENV., 1893, p. 902.

Lithoderma fatiscens ARESCH., 1875, p. 23, p. p. (according to WÆRN, op. c.).

A very common alga in my area where it was recorded from the uppermost part of the sublittoral region down to a depth of at least 40 m, inhabiting other algae, bryozoans (*Scrupocellaria*), as well as shells and stones. The most frequent host is *Fucus*, followed by *Desmarestia aculeata* and *Chaetomorpha*. The species occurred also on *Laminaria* (stipe), *Punctaria glacialis*, and *Turnerella*.

The thallus forms crusts which usually are of no great horizontal extent, as a rule measuring less than 0.5 cm in diameter. In several instances, however, when the species inhabited shells, the crusts attained to greater dimensions, but in such cases they were obviously composed of several confluent individuals. When growing on *Fucus* the thallus is often more or less orbicular. In many individuals originating from that host and kept in alcohol the appearance was fairly characteristic, the marginal portion in which growth takes place being distinguishable as a light-coloured zone round the remaining darker part of the crust.

In young plants the vertical threads are coalescent, in older ones they are in many instances free in their uppermost part. The same observation was made by ROSENVINGE (1898, l. c.) in an old individual from Danmarks Ø. Also in old specimens the vertical threads are, however, situated very close to one another but recede easily by a gentle pressure on the cover-glass. A continuous cuticle is found above the apical cells.

The length of the vertical threads varies appreciably from one individual to another. In the most well-developed plants they attain a length of about 200 μ (—240 μ) and consist of 12—13 or even more cells, but as a rule they are shorter and consist of fewer cells. The diameter measures (11—) 14—17 μ (—21 μ).

WILLE states that the vertical threads rarely are branched. This applies also to most of my plants, but in a number of them branching was frequent. In some instances the branching was restricted to the uppermost part of the threads, in others it took place at indeterminate levels (fig. 14 B). Sometimes the threads may give rise to a number of short fastigiate branches (fig. 14 B—D), often of an extremely light colour revealing that they were recently formed. In other cases the branching was more sparse.

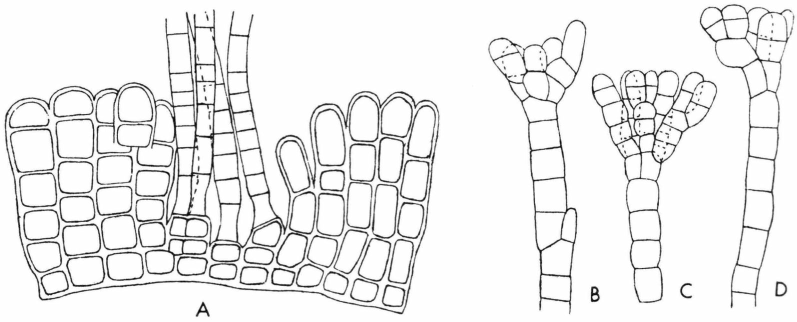


Fig. 14. *Sorapion Kjellmanii.* A: Vertical section of the crust exhibiting a hair-tuft; B—D: branched vertical threads (squeezed preparation). A: ×350; B—D: ×235.

The apical cell often produces into a short shoot composed of a few long cells with poor contents. Such threads have also been mentioned by WILLE (l. c.) and ROSENVINGE (1893, l. c.) and were by the former author regarded as abnormal. Judging from my slides they seem to occur (particularly?) after the fructification. In some cases, at least, they are formed through proliferation of the evacuated unilocular sporangia. They may attain to an appreciably greater length than depicted by WILLE.

The cells harbour a plate-like chromatophore with a pyrenoid. It may be difficult to distinguish the chromatophore which often is obscured by a yellowish brown, homogeneous substance of fucosan. This applies particularly to the apical cells which may thus acquire some resemblance to the ascocysts in *Symphyocarpus*. The pyrenoid is, however, as a rule visible.

Hairs have not previously been described in this species but they occur fairly commonly in my plants. They belong to the phaeosporean type possessing a basal meristem and are rather thin, their diameter at the meristematic zone measuring only 8—9 μ. They are usually terminal on the vertical threads and occur either singly or in tufts (fig. 14 A), in the latter case often borne on very short threads so as to be situated in a depression between the surrounding threads. In other instances they are given out laterally from one of the uppermost cells.

The unilocular sporangia are pyriform. They were encountered in June, July, and August, the great majority of them being emptied. They are terminal on the vertical threads and occur as a rule singly, more rarely two issuing from one and the same apical cell, and usually form sori. They are called "gametangia" in WILLE's description. According to WÆRN (1949, p. 646) the unilocular sporangia described by ARESCHOUG for *Lithoderma fatiscens* belong to the species under consideration (cf. p. 82 of the present work). Plurilocular sporangia were not observed and are unknown.

As pointed out by ROSENVINGE (1898, l. c.) *Sorapion Kjellmanii* is closely related to *S. simulans* KUCK. from which it differs by the facts that its chromatophore harbours a pyrenoid and that its sori are not so well defined. The occurrence of hairs should be added to these distinctive features. It shows resemblance also to *Petroderma maculiforme* KUCK., at any rate as regards such individuals whose vertical threads are coalescent only in their lower part. In both species each cell contains only one chromatophore (cf. KUCKUCK, 1897b, p. 384). The characteristic features of *Petroderma* lie i. a. in the occurrence of plurilocular sporangia, in the smaller dimensions of its vertical threads and its unilocular sporangia, and in the clavate—oblong oval shape of the latter.

Previous Records from Greenland:

E. Gr.: Three localities between lats. 66 and $76^1/_2$° N. (J. 1904, p. 39; R. 1898, l. c.; 1910, p. 124).

W. Gr.: 6 localities between lats. $63^2/_3$ and $70^2/_3$° N. (R. 1893, l. c.; 1926, p. 13).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 6—9 m, 11—13 m, 16—18 m; Scoresbysund, 11 m; Kap Hope, a little below 0 m, 5—7 m, 10—13 m; the mouth of Hurry Inlet, 9 m, 35—38 m, on shell of *Buccinum hydroph.*; Fame Øer, 5—6 m; Bjørneøer, 6—11 m, 9—20 m, 14—17 m; Danmarks Ø (N. H.); ibid. 1—3 m, 5 m; Rødeø, 2 m, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 8 m, 10 m, 20—25 m, dredging between 40 and 80 m (on *Turnerella*); Vinterøer, 2—3 m, 14—18 m.

Lithoderma Areschoug, 1875.

In most of the systematic works dealing with the algal vegetation in northern seas, records are given of *Lithoderma* crusts. In some instances they are designated *L. fatiscens* ARESCH., in others *L. fatiscens* ARESCH. emend. KUCK. or *L. fatiscens* KUCK. It is, however, common to most records that the authors only have had sterile plants at their disposal, so a specific determination has not been possible. It is quite probable that some of the records, after all, have no relation to *Lithoderma* but rather to some other crust-forming Brown Algae.

Lithoderma s. lat. occurs very commonly in my East Greenlandic area. It was encountered in all localities and its vertical range is considerable, from the upper part of the sublittoral region down to a depth of 120 m. Within this range it might be impossible to collect stones that are not inhabited by *Lithoderma* s. lat. — provided that the locality is fit for algal vegetation. It applies to my collections too that it is, on the whole, uncertain which species are represented, as practically all my material, dating from the period between the end of June and the end of August, is sterile. The majority of the previous Greenlandic collections of *Lithoderma* s. lat. have likewise been sterile, the result being that it is most unlikely that any of the specific determinations of material originating from West Greenland are reliable.

On the basis of an examination of numerous crusts occurring in my material I succeeded in the 'thirties in finding some few that were fructifying. It appeared that at least two species were represented in my material, viz. *L. fatiscens* Aresch. with lateral, plurilocular sporangia and *L. fatiscens* Kuck. (= *L. extensum* (Crouan) Hamel) with terminal, plurilocular sporangia corresponding with Kuckuck's (1894) fig. 11 A (Lund, 1938). In addition to plants of the latter type I found also plants with terminal, unilocular sporangia. As individuals with terminal, plurilocular sporangia exhibited terminal, unilocular sporangia too, even in one and the same sorus, I judged it established that plants having only terminal, unilocular sporangia belonged to Kuckuck's species. In spite of the disparity between the chromatophores in Areschoug's plant with plurilocular sporangia and those in *Ralfsia ovata* Rosenv., I was of the opinion that the two kinds of plants presumably represented one and the same species. This view was first advanced by Rosenvinge (1898, p. 95) and later approved by Jónsson (1903, p. 142).

After the publication of my paper the *Lithoderma* problem as such was taken under consideration, first by Svedelius (1939, pp. 241—50) in his paper in Swedish, later by Wærn (1949, pp. 633—70) who at the same time, as the result of recent investigations, gave an important contribution towards the elucidation of this subject.

When examining Areschoug's original slides of specimens from the Swedish west coast, Wærn made the interesting discovery that Areschoug's plant with terminal unilocular sporangia is, as a matter of fact, no *Lithoderma* but identical with *Sorapion Kjellmanii* (Wille) Rosenv. Moreover, he discovered that, besides *Sorapion* and the plant with lateral plurilocular sporangia, the slides contained also Kuckuck's species with terminal plurilocular sporangia. Thus, on the Swedish west coast "*Lithoderma fatiscens*" is represented by no less than three species.

In the same paper, Wærn gave a report on his investigations of "*Lithoderma*" crusts in the Öregrund area in the Baltic. Here, too, he was able to distinguish three species, though not the same as those occurring on the Swedish west coast; one of them was identical with

Petroderma maculiforme (WOLLNY) KUCK., whereas the other two represented new species of the genus *Lithoderma*, viz. *L. Rosenvingii* and *L. subextensum*.

I shall not dilate on WÆRN's publication, which later was summarized in his important work on the algal vegetation of the Öregrund area (WÆRN, 1952, p. 143), but shall confine myself to referring to that work.

After the publication in 1938 of my above paper I have made only some few further examinations of my East Greenlandic material of *Lithoderma*; they are mentioned below. With regard to the taxonomy within this genus I have, however, arrived at the conclusion that, by virtue of its lateral plurilocular sporangia, *Lithoderma fatiscens* ARESCH. emend. WÆRN differs so much from the species that are provided with terminal sporangia as to warrant a generic distinction (cf. SVEDELIUS, 1910, p. 176). I suggest, therefore, to re-establish the genus *Pseudolithoderma* SVEDELIUS (op. c., p. 175) for those of the species which exhibit terminal sporangia.

1. **Lithoderma fatiscens** ARESCH. emend. WÆRN, 1949, p. 652, fig. 2 e—g.
L. fatiscens ARESCH., p. p., KJELLM., 1883, pl. 26 fig. 7; HAUCK, 1885, fig. 177b; KUCKUCK, 1894, fig. 12.
L. fatiscens ARESCH. c. spor. plur. in LUND, 1938, p. 6, figs. 1—3.

In addition to the previously mentioned individuals I have at the end of July found this species in a third locality where it inhabited stones at a depth of 11—13 m, forming crusts of a rather great size. The material has been kept in alcohol. The sterile thallus is of a dark brown colour whereas the fertile areas are of a lighter colour, which corresponds with my previous observations. It is thus possible to distinguish with the naked eye the fructifying portions of the thallus. The plurilocular sporangia were quite young in the individuals involved, but typical.

I shall not enlarge on the hypothesis of *Ralfsia ovata* but confine myself to a brief statement of the fact that, in spite of the hindrance constituted by the chromatophores, I have not completely abandoned this theory. As previously maintained (LUND, op. c., p. 15) it might be imagined that the species is dimorphous as regards its chromatophores. ARESCHOUG's plant with plurilocular sporangia constitutes in itself an example of dimorphism, the number of chromatophores in the cells of its free threads and in the cells of the crust, respectively, being different. In case the two plants do not represent the same species they must at any rate be closely related.

Outside of East Greenland this species is known only from the Swedish west coast (ARESCHOUG, l. c.), Spitsbergen (KJELLMAN, 1877a, p. 43), and North East Siberia (WÆRN, 1949, p. 652).

Previous Records from Greenland:
E. Gr.: The below records from Fame Øer and Vinterøer (L. 1938, l. c.).
W. Gr.: None.

Scoresby Sund District: Amdrups Havn, 11—13 m; Fame Øer, 4—6 m.
Kejser Franz Josephs Fjord District: Vinterøer, 21—22 m.

Pseudolithoderma Svedelius, 1910.

1. Pseudolithoderma extensum (CROUAN) S. LUND comb. nov.
Ralfsia extensa CROUAN, 1867, p. 166.
Lithoderma extensum (CROUAN) HAMEL, 1935, p. 110, fig. 26 E; WÆRN, 1949, p. 658, fig. 2 i—j.
L. fatiscens (ARESCH.) emend. KUCKUCK, 1894, p. 238, fig. 11; 1912, p. 167, figs. 2—4, pl. 7 (18); ROSENV., 1898, p. 98, p. p.; 1910, p. 124.
L. fatiscens KUCK., KYLIN, 1907, fig. 12; LUND, 1938, p. 9, figs. 4—6 (p. p. ?).
Pseudolithoderma fatiscens (KUCK.) SVEDELIUS, 1910, p. 176.

As appears from HAMEL's examination of an authentic specimen of the brothers CROUAN's *Ralfsia extensa*, this species is identical with KUCKUCK's plant with terminal, plurilocular sporangia, so the specific name *extensa* should be applied. HAMEL's disclosure is not surprising as KUCKUCK (1894, l. c.) himself suggested that the two plants might be identical.

With regard to the unilocular sporangia mentioned in my paper from 1938 WÆRN (op. c., p. 659) states that he "is unaware of the extent to which the unilocular sporangia" belong to the species under consideration. Like this author I fully recognize their deviation from those depicted by KUCKUCK, and I do not exclude the possibility that some of them might belong to *Pseudolithoderma subextensum* (WÆRN) S. LUND comb. nov. or to another closely related species. Incidentally, in my above paper I drew attention to the wide range of variability exhibited by the unilocular sporangia in East Greenlandic individuals, as regards their shape as well as their dimensions.

Previous Records from Greenland:
E. Gr.: The below two localities and one locality in lat. $76^1/_2°$ N. (R. 1910, l. c.).
W. Gr.: None.

Scoresby Sund District: Danmarks Ø (N. H.).
Kejser Franz Josephs Fjord District: Vinterøer, 21—22 m.

2. Pseudolithoderma Rosenvingii (WÆRN) S. LUND comb. nov.
Lithoderma Rosenvingii WÆRN, 1949, p. 654, figs. 2h, 3, pl. 2; 1952, p. 146; A. ZINOVA, 1954b, p. 246, fig. 1.
L. fatiscens (ARESCH.) emend. KUCK., ROSENV., 1898, p. 97, p. p., fig. 22; JÓNSSON, 1904, p. 39 (p. p. ?).

The principal distinctive feature of this species lies in the fact that the (unilocular) sporangia occur by fours, borne terminally on the erect threads, but vegetative characteristics do also exist. According to Wærn the species was first collected by Areschoug in the Stockholm Archipelago sub. nom. *L. fatiscens*. It was later collected by Hartz at Danmarks Ø in Scoresby Sund and was described by Rosenvinge, who designated it *L. fatiscens* (Aresch.) emend. Kuck. Kuckuck himself (1912, p. 171) had much doubt about the latter's identity with his own species. It was obviously present also in Jónsson's (1904, p. 39) East Greenlandic material. Finally, it was encountered by Wærn in the Öregrund area, from where he described it and gave it specific rank, and by A. Zinova (l. c.) in the White Sea.

After the publication of my paper in 1938 I have in a squeezed preparation of *Petrocelis*, inhabiting a crust of "*Lithoderma*" collected at the end of June, observed some fragments that undoubtedly belong to the species under consideration. In one of these fragments all the apical cells in the threads of the crust were elongated and in process of forming sporangia; each of them seemed to be divided by a longitudinal wall. As I have not been able to study the fragment in surface view and as it was still rather young I cannot decide whether the final result would be the formation of four sporangia. The sporangia are unquestionably unilocular and the appearance corresponds perfectly with Wærn's (1949) fig. 3b and pl. 2 fig. b. I have, therefore, no doubt about its identity with Wærn's species.

In another fragment in the same slide the apical cells likewise were elongated and longitudinally divided, but in this instance one of the young sporangia was plurilocular, its loculi already being distinguishable. Unfortunately, as the fragment is too young and too small it does not furnish any evidence as to whether all the sporangia would in due course develop into plurilocular sporangia occurring in pairs as depicted in fig. 4 B in my paper from 1938, or by fours.—Apart from these fragments the "*Lithoderma*" crust from which they originated was sterile.

Previous Records from Greenland:

E. Gr.: The below record from Danmarks Ø (R. 1898, p. 97, p. p.). Four localities between lats. $69^1/_2$ and $74^1/_2°$ N. (J. 1904, p. 39); in some of these cases, however, the identity may be doubtful.

W. Gr.: None.

Scoresby Sund District: Kap Hope, 10—11 m; Danmarks Ø (N. H.).

Jonssonia gen. nov.

Planta crustacea, firmissime parenchymatica. Pars exterior e filis connatis composita paucicellularibus, ramificatis vel simplicibus, rectis vel leniter curvis, fila sustinentibus tenuiora, inter se libera, postea in sporangia plurilocularia vel unilocularia, solitaria vel pauca semiintercalarie seriata, utraque apice aperta transformata. Sporangia plurilocularia ectocarpoïda.

1. Jonssonia pulvinata sp. nov.

Planta pulvinata, ad 0.5 mm diametro vel paulo ultra. Fila exteriora connata 4—5-cellularia, (8—)12—16(—22) μ diametro, cellulis diametro subbrevioribus—sesquilongioribus. Sporangia plurilocularia plus minus articulata, uniseriata, subcylindrica vel elongate subconica, saepe curva. Sporangiorum plurilocularium series ut sporangia solitaria 40—50 μ longa, 6—8 μ diametro. Sporangia unilocularia subcylindrica vel subclavata. Eorum series ut sporangia solitaria 25—40 (—50) μ longa, 6—8 (—10) μ diametro.

Desmarestiae aculeatae affixa.

On a hairless specimen of *Desmarestia aculeata*, collected at the end of July at Amdrups Havn at a depth of 14—16 m, I observed a small epiphytic crust-forming Brown Alga that seems to belong to a new genus. I have named it after the Icelandic phycologist, Dr. HELGI JÓNSSON. It is characterized by the firm structure of its pulvinate, parenchymatous thallus, the peripheral part of which is composed of few-celled, branched or simple, erect or slightly curved threads bearing, usually terminally, free plurilocular or unilocular sporangia, solitary or arranged in short semi-intercalary rows (fig. 15). In both types of sporangia the evacuation takes place apically.

Despite a careful search I did not succeed in finding more than about 10 plants, the largest of them measuring 375—630 μ in diameter. The peripheral threads consist of 4—5 cells and usually attain a diameter of 12—16 μ although they may measure up to 22 μ in diameter immediately below a branching and in some cases no more than 8 μ just above it. The cells are as a rule slightly shorter than broad but their length may measure up to 1.5 diameter. Below the peripheral threads the cells are larger and somewhat irregular, so that it is difficult to distinguish the structure of this portion. I dare not advance any statement concerning the chromatophores on the basis of the material on hand.

The plurilocular sporangia occur so abundantly as to cover almost completely the surface of the thallus (fig. 15 A—B). They are almost invariably emptied and, consequently, hyaline, thus contrasting with the darker colour of the crust. Also the apical cells of the peripheral threads may, however, be of a conspicuously light colour.

The plurilocular sporangia belong to the *Ectocarpus* type. They are more or less markedly articulated, uniseriate (though sometimes a single compartment may be longitudinally divided), subcylindrical or elongate conical and frequently curved. They are formed from free, cylindrical or clavate, few-celled shoots. During the fertilization the (two) lowermost cell(s), instead of constituting the basal part of a single terminal sporangium, may often become elongated in their uppermost portion and

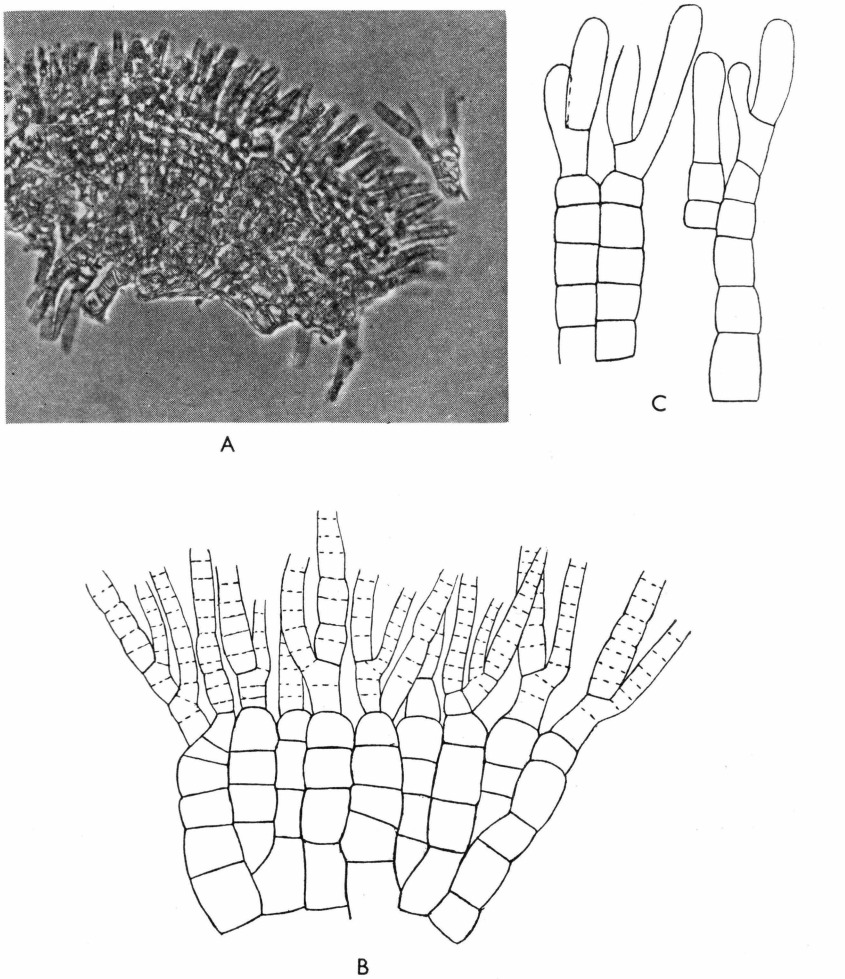


Fig. 15. *Jonssonia pulvinata.* Vertical sections of the crust. In A and B plurilocular sporangia, in C unilocular ones. A: × 225 (phase-contrast); B—C: × 475 (approx.).

grow obliquely upwards to assume the character of distinct sporangia, the terminal sporangium thus being formed from the remaining cells only (fig. 15 B, on the extreme left). Hence, the apparently branched plurilocular sporangium actually is composed of 2—3 seriate sporangia whose total length usually measures 40—50 μ while their diameter is 6—8 μ (measured on emptied sporangia). The solitary sporangia exhibit the same dimensions.

Unilocular sporangia were encountered in a single plant which seemed to bear such sporangia only (fig. 15 C). Like the plurilocular ones they occur in great numbers and are frequently arranged in short rows consisting of 2(—3) sporangia which, similarly to the solitary sporangia, measure 25—40(—50) μ in total length, 6—8(—10) μ in diameter. The unilocular sporangia are subcylindrical or slightly clavate and, apart from their frequently being seriate, they recall the corresponding organs depicted by Børgesen (1902, p. 417, fig. 75b) in the alga which he designates *Ectocarpus Stilophorae* var. *caespitosa.* The great majority of them were empty, yet some of them contained a faintly coloured homogeneous or granular substance which, however, has no relation to spores.

As the material on hand did not enable me to clarify the structure of the inner portion of the thallus or to elucidate the development of the species, its systematic position is uncertain and its classification under *Ralfsiaceae* is provisional.

Scoresby Sund District: Amdrups Havn, 14—16 m.

Tilopteridales

Tilopteridaceae

Haplospora Kjellman, 1872.

1. Haplospora globosa Kjellm., op. c., p. 5, pl. 1 fig. 1; Reinke, 1889, p. 108, pl. 2; Rosenv. & Lund, 1941, p. 67.

Capsicarpella speciosa Kjellm., 1872, p. 26, pl. 1 fig. 3.

Scaphospora speciosa Kjellm. 1877b, p. 30; Reinke, 1889, p. 125, pl. 3 figs. 1—20.

Scaphospora arctica Kjellm. 1877b, p. 31, figs. 1—15; Rosenv., 1898, p. 48.

This interesting alga is widely distributed in my area where it was recorded in nearly all the localities I examined, though mostly occurring in small quantities only, in several instances represented by loose-lying fragments. In no less than six localities both the sporophyte and the gametophyte were observed. This applies to a seventh locality as well, namely Danmarks Ø where Hartz collected very small quantities of both kinds of plants. In two localities, only the gametophyte was encountered (besides sterile individuals).

The species favours the open coast and the specimens collected at Kap Tobin in mid-August were well developed and abundantly fructifying, occurring in great quantities at a depth of 6—11 m. In this locality the sporophyte and the gametophyte grew together at the base of *Saccorhiza* and on stones, forming vigorous tufts. The sporophytic plants measured up to at least 13 cm in height, the gametophytic up to 12 cm. Contrary to this, the individuals (sporophytes and gametophytes growing together on *Fucus*) originating from the sheltered locality Ella Ø, far from the open sea, were small and rather feebly fructifying. It should be added that the species was not found at Rødeø, which locality is situated at a still greater distance (about 250 km) from the open sea.

Both kinds of plants were met with at depths between 2—5 and 14—18 m, sterile plants extending down to a depth of 20—25 m. Besides on the above-mentioned substrata the gametophyte was observed on *Desmarestia aculeata* and on the bryozoans *Alcyonidium disciforme* and *Scrupocellaria.* Sterile individuals were observed on the following substrata: stones, a shell of *Mya* and the sipho of another bivalve, the hydroid *Halecium muricatum*, *Fucus*, *Desmarestia aculeata*, haptera of *Laminaria*, and *Punctaria glacialis.*

Both the sporophyte and the gametophyte were observed in June, July, and August, sterile plants in the last-mentioned two months. However, only a single individual of each generation were recorded in June, bearing young reproductive organs and found entangled in a tuft of *Acrosiphonia.* Also in the material dating from July the reproductive organs were young in both the sporophyte and the gametophyte, whereas in that dating from August most of them were nearly mature; some were, however, mature, emptied, or young.

In previous literature the gametophyte is stated to occur more sparsely than the sporophyte when the two generations are found together (cf. SAUVAGEAU, 1928, p. 61, and other authors). I can only speak about the quantitative proportion of the two kinds of plants in so far as my material from Kap Tobin is concerned. In this locality they seem, however, to be present in equal quantities. A detailed description of the two kinds of plants is given below.

The sporophyte exhibits main threads that are closely united to form nearly a pseudo-axis throughout the tuft. In their thickest portion they measure 80—130 μ in diameter whereas in their lower, dark brown portion they are often considerably thinner, 60—70 μ. They are polysiphonous in their lower portion and rather far up, while their upper portion is monosiphonous. In the fully developed sections of the monosiphonous part the length of the cells is 2—3 diameters while the meristematic cells measure $^1/_3$—$^1/_2$ diameter in length. The lower part of the main threads gives rise to numerous, frequently rather long rhizoids that may be monosiphonous or partially polysiphonous. Rhizoids are also issued at higher levels, particularly where the long vigorous branches of the first order are given out. In such places various epiphytes, e. g. *Elachista*, are frequently encountered.

The branching of the main threads is usually scattered, in the upper part often opposite or nearly unilateral. A great part of the branches of the first order are distinct long-shoots, resembling the main threads and being polysiphonous in their lower portion, sometimes issuing rhizoids. Branches of no less than the fifth order were observed, but were feebly developed. All the shoots terminate in a hyaline hair-like portion beneath which a trichothallic meristem is situated (fig. 16 A).

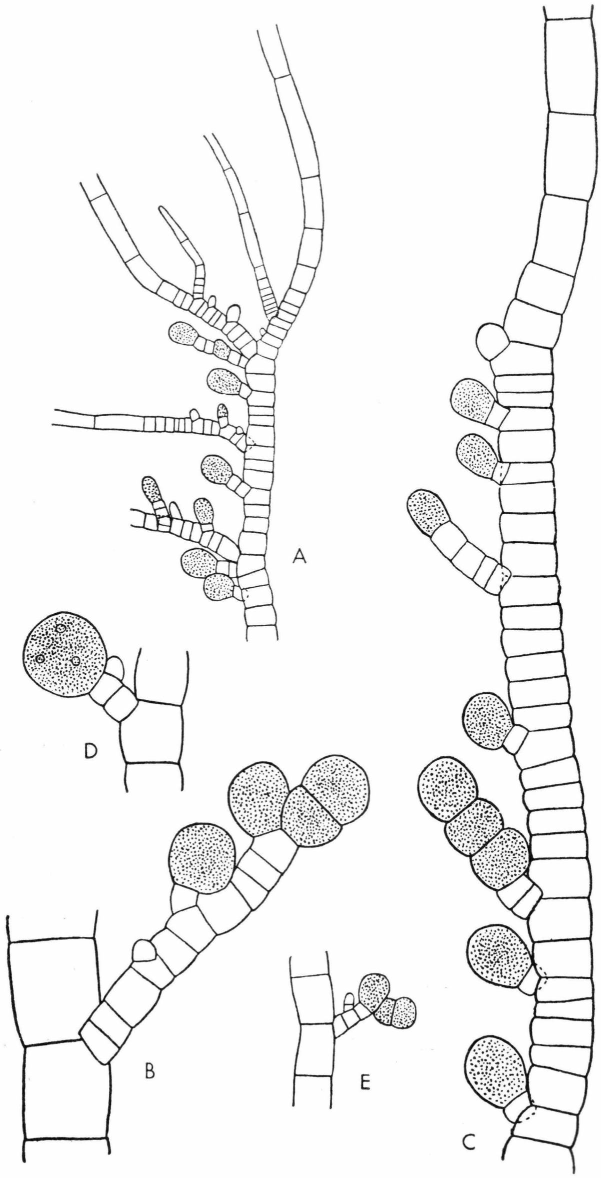


Fig. 16. *Haplospora globosa.* The sporophyte. A: uppermost portion of a shoot of the second order exhibiting trichothallic meristems and monosporangia; B—E: threads with monosporangia; in D, three nuclei are distinguishable within the monosporangium. A, E: × 60 (approx.), B—D: × 140.

Quadrinucleate monosporangia (fig. 16 D) occur abundantly, especially in the upper part of the main threads and the long-shoots. Most of them were not yet quite mature and measured 90 μ in diameter. Some were, however, mature and spherical, measuring 105(—110) μ in diameter. They are as a rule terminal on stalks that are composed of one to few, more rarely many cells and given out from branches of the first, the second, or the third order, less frequently directly from the main threads or from branches of the fourth order. The sporangia may, however, also be sessile.

When long, the sporangia-stalk frequently bears lateral sporangia in addition to the terminal one. Such sporangia may be sessile, stalked, or intercalary, the last-mentioned being similar to those depicted in Reinke (l. c.) in pl. 2 fig. 10a (β) and b (ε). In some cases the stalk bears no less than two or three terminal, seriate sporangia (fig. 16 B—C) or, besides two such sporangia, a lateral, sessile one given out from the uppermost cell (fig. 16 B). In a single instance two seriate sporangia arose laterally from the terminal sporangium (fig. 16 E).

Sessile sporangia are rather frequent. Like the less frequent intercalary ones they occur principally in the younger shoots of the plant.

The gametophyte corresponds, on the whole, fairly well with the sporophyte as regards its vegetative structure. The main threads measure about 100—140 μ in diameter in their thickest portions. The length of the full-grown monosiphonous cells generally is nearly equal to their diameter. The meristematic cells sometimes measure only $^1/_4$—$^1/_3$ diameter. The cells of the hyaline tips of the shoots measure up to 3—5 diameters. Branches of orders higher than the third are rare, though in some few instances feeble branches of the fourth order were observed.

The shorter branches are very often recurvate and issue branches from their upper side only. In the sporophytic plant, too, such branches in many instances are recurvate, but the condition is much more marked in the gametophyte which, therefore, acquires a very characteristic appearance. In other cases the branches may be incurvate.

Antheridia and uninucleate monosporangia occur among each other in great numbers, particularly in the upper part of the plant. It may be added that, in comparison with the individuals on hand, even the most vigorous gametophytic plant collected in Danish waters (Rosenv. & Lund, l. c., fig. 36 B, from the eastern Kattegat) must be characterized as feebly fructifying.

The antheridia are tubular, measuring (40—)125—200 μ(—230 μ) in length and (37—)40—55 μ(—60 μ) in diameter. They are intercalary (fig. 17 D, above) in branches of the second and third orders, more rarely in branches of the first and fourth orders. In several instances the antheridial branch is short, being fertile throughout its length or sterile at its base (fig. 17 D, below). The antheridium may exhibit small sterile portions, much as the condition in Reinke's pl. 3 fig. 12. In such instances, as well as when the branch exhibits one continuous antheridium, the sterile portion(s) of the branch may give rise to new antheridial branches. Not infrequently antheridia and monosporangia are found in one and the same branch, often adjoining one another (cf. KJELLMAN, 1877b, fig. 14). In a single instance one of the daughter-cells of a longitudinally divided cell had developed into an antheridium while the other, after a preceding longitudinal division, had given rise to two sporangia. Many antheridia were mature, some of them completely or partially emptied, while several of them were young.

When mature, the monosporangia are spherical, measuring (65—) 80 — 100 μ in diameter. Most of them were well developed and almost

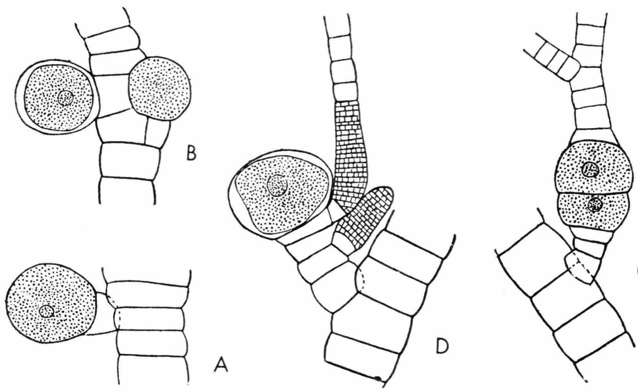


Fig. 17. *Haplospora globosa.* The gametophyte. Antheridia and monosporangia, in the latter the nucleus is visible. A—B, D: exhibiting external sporangia; C: two intercalary sporangia formed without a prior longitudinal division of the mother-cells. A—D: $\times$ 140.

mature, others were emptied. In the youngest branches, however, several quite young ones were observed. The sporangia nearly always are intercalary (fig. 17 B, the sporangium to the right) and occur in branches of the first, second, and third orders, but may also be situated directly in the upper part of the main threads. They are generally formed from a branch-cell that undergoes longitudinal division after which one or both of the daughter-cells give rise to a sporangium. According to KJELLMAN (1877b, p. 34) the latter condition is rarely observed, and also REINKE (op. c., p. 127) considers it rather uncommon. In my plants, however, it is very common, and roughly estimated half of the sporangia observed in the upper part of the main threads and the long-shoots occur in pairs.

In some instances the sporangium arises directly from the branch-cell without a prior longitudinal division of the latter. Such sporangia seem to occur chiefly in the youngest branches. Two successive cells in a branch may become fertile without a preceding longitudinal division (fig. 17 C), the appearance thus resembling the condition found in the monosporangia-bearing branchlets in *Tilopteris Mertensii*. In other instances the branch-cell is divided by two or three longitudinal walls. At any rate three of the four daughter-cells may become fertile.

In addition to intercalary sporangia, occasional external sporangia may be observed, sessile (fig. 17 B) or borne on a short, frequently unicellular stalk (fig. 17 A). In a single instance a sporangium was borne terminally on a four-celled branch which, moreover, issued two antheridial branches (fig. 17 D).

The number of sporangia (or sporangia-pairs) varies, of course, from one branch to another but is, on the whole, fairly great. At any rate, it exceeds the number stated by Kjellman (1877b, p. 33) in *Sc. arctica*, namely one to three. I have frequently found up to 8—11 in one and the same branch, but as a rule the number was somewhat smaller. It is but natural that the branchlets contain a small number, one or two only. When several sporangia occur in one branch they may be scattered over a long distance. Some of the interjacent sterile cells may give rise to new branches. Most frequently, however, several sporangia (or sporangia-pairs) succeed one another immediately.

The sporophytic and gametophytic plants originating from the other localities resemble those described above although being considerably less developed as regards their vegetative structure and possessing more feebly developed reproductive organs occurring in much smaller quantities. The gametophytic plants show some points of resemblance to *Scaphospora arctica* while in other respects they correspond with *Sc. speciosa*, for which reason I agree with Reinke (op. c., p. 128) in regarding the former as a mere form of the latter.

No proof has so far been furnished of Reinke's (op. c., p. 139) assumption that *Haplospora* and *Scaphospora* represent the sporophyte and the gametophyte, respectively, of one and the same species but several authors, most recently Kylin (1947, p. 34), are in favour of Reinke's theory. I for my part adopt Reinke's interpretation, especially as *Haplospora* and *Scaphospora* occurred together in seven of the ten localities in which the species has been found in my area. In my opinion it is most likely that the species exhibits an alternation of generations when occurring at Kap Tobin and other localities in East Greenland but, on the other hand, it is very probable that the alternation is more or less irregular near the southern limit of the area in which the species occurs as, in such localities, *Scaphospora* is as a rule much sparser than *Haplospora*. At Heligoland, where Nienburg (1923, p. 215) and Dammann (1930, p. 19) without success attempted to elucidate the life-cycle of *Haplospora* by cultivating its monospores, the alternation of generations has apparently been completely suppressed as *Scaphospora* has not at all been recorded from that locality.—Although it has not yet been possible to prove that *Haplospora* and *Scaphospora* belong to one and the same species, it should be emphasized that no evidence has been furnished to the contrary.

It is generally familiar that the life-cycle of a species may vary from one locality to another. In this connection reference may be made to the condition found in *Cutleria multifida*. When occurring at Naples this species displays a regular alternation of generations whereas near its northern limit, including Danish waters, an alternation is apparently rare, the species in these areas being represented almost exclusively by the asexual form, *Aglaozonia* (cf. LUND, 1950, pp. 60, 73).

As regards *Tilopteris Mertensii*, DAMMANN (1930, p. 15) has recorded and depicted a special kind of monosporangia occurring in the lowermost, more rarely in the middle part of the antheridia and supposed to represent oogonia. Similar cells had previously been observed by BORNET and KUCKUCK (cf. DAMMANN, p. 17). In her discussion on the pattern of development followed by *Haplospora* that author (p. 25) advances the hypothesis that a systematic search carried out in various localities most likely would result in the finding of such monosporangia in *Scaphospora* too. Despite a very careful examination of the abundantly fructifying plants I collected at Kap Tobin I did not, however, succeed in finding any similar cells, so I regard the uninucleate monosporangia in *Scaphospora* as oogonia.

According to KYLIN (l. c.) the species is fertile in April—June when occurring on the Swedish west coast. In Danish waters the sporophyte is fertile in April—June and exhibits emptied sporangia in May—June while the gametophyte is fertile in April—May and bears emptied sporangia in May (ROSENV. & LUND, l. c.). Like the condition found in many other species the development of *Haplospora globosa* is, thus, retarded in East Greenland as compared with the Swedish west coast and Danish waters.

Previous Records from Greenland:
E. Gr.: One locality, Danmarks Ø, in lat. $70^1/_2$° N., mentioned below (R., l. c.).
W. Gr.: None.

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 11—13 m; Kap Hope, 6—12 m; the mouth of Hurry Inlet, 7—10 m; Fame Øer, 4—6 m; Bjørneøer, 6—11 m, 9—20 m, 10—21 m, 14—17 m; Danmarks Ø (N. H.); ibid., 5 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 6—9 m, 12—20 m, 20—25 m; Vinterøer, 3—6 m, 14—18 m; the head of Duséns Fjord, 15—25 m.

Sphacelariales

Sphacelariaceae

Sphacelaria Lyngbye, 1819.

1. Sphacelaria radicans (Dillw.) C. Agardh, 1824, p. 165; Sauvageau, Remarques, p. 56 (1901, p. 27); Jónsson, 1904, p. 40; Rosenv., 1933, p. 8; Lund, 1950, p. 17, and Wærn, 1952, p. 96, both with references to literature.
Sph. olivacea Rosenv., 1893, p. 904, pro parte.

Previous Records from Greenland:
E. Gr.: One locality in lat. 68—68$^1/_2$° N. The identification uncertain (R. 1933, l. c.).
W. Gr.: Two localities in lats. 68$^3/_4$ and 61$^1/_4$° N., respectively. Moreover, threads mingled with *Sph. britannica*, collected by Giesecke without indication of locality (J., l. c., p. 41).

Not encountered by me.

2. Sphacelaria britannica Sauvageau, Remarques, p. 66 (1901, p. 50); Jónsson, 1904, p. 41; Lund, 1950, p. 22, and Wærn, 1952, p. 95, both with references to literature.
Sph. olivacea Rosenv., 1893, p. 904, pro parte.

Previous Records from Greenland:
E. Gr.: One locality in lat. 69$^1/_2$° N. (J., l. c.).
W. Gr.: One locality in lat. 65$^1/_2$° N. Furthermore, specimens collected by Giesecke without indication of locality (J., l. c.).

Not recorded by me.

3. Sphacelaria arctica Harvey, 1858, p. 124; Kjellm., 1877a, p. 34, pl. 2 figs. 4—6; Wærn, 1945, p. 409, fig. 2; 1952, p. 100, figs. 39b, 41, 43—44, 47b.
Sphacelaria racemosa Grev. var. *arctica* (Harv.) Reinke, Algenfl., p. 40; Atlas, p. 66, pls. 44, 45 figs. 1—10; Rosenv., 1898, p. 100; Jónsson, 1904, p. 40; Lund, 1950, p. 46, fig. 10; 1951, p. 13.

In Algenflora (1889), in his paper on the *Sphacelariaceae* (1891, p. 11), and in Atlas (1892) Reinke advanced the opinion that Greville's *Sph. racemosa* and Harvey's *Sph. arctica* were identical and he amalgamated them under the name of *Sph. racemosa* Grev. within which, however, the former *Sph. arctica* was regarded as a variety. Later authors usually have adopted this interpretation. When dealing with the Danish *Sphacelariaceae* (Lund, 1950, l. c.) I had no opportunity to decide on this specific problem but, as I found Reinke's interpretation natural, I chose to follow that author and speak about one species only.

However, by describing and depicting Scotch specimens of *Sph. racemosa* and Baltic specimens of the *arctica* type Wærn (1945 & 1952, l. c.) has furnished clear evidence that two distinctly separate species are involved. For this reason the *arctica* type must be designated *Sph. arctica.*

Owing to its abundant occurrence this species, which is widely distributed in the Arctic and in the Baltic, plays an important role in the East Greenlandic localities investigated by me. It inhabits in particular rocks and stones but is also found on various algae, especially on *Fucus* and *Laminaria* (between the haptera). As examples of other hosts may be mentioned *Desmarestia aculeata*, *Chaetopteris*, *Alaria* (stipe), and *Chaetomorpha melagonium.* On the last-mentioned host it frequently occurs as young sterile shoots, but I observed also a tuft which reached a height of 1.1 cm issuing from a basal disc and bearing plurilocular sporangia. Furthermore, it was found on bryozoans, ascidians, on the sipho of a bivalve, and on shells; finally, it occurs also unattached in company with other unattached algae. On the sand-bottom off Kap Hope it formed loose-lying balls together with other unattached algae.

The vertical distribution of the species under consideration ranges from the uppermost part of the sublittoral zone down to a depth of almost 40 m. In a few places it even extended into the littoral zone but was in such cases, however, poorly developed. Off Kap Tobin were found some young shoots with distichous, partly opposite branches, presumably belonging to this species, if not to *Chaetopteris plumosa.* They grew on a bryozoan attached to a stone collected at a depth of 50 m. The species occurs in greatest quantities in shallow water and is frequently a component of the *Fucus inflatus* community found in such places. At Fame Øer nearly all the stones at small depths were inhabited by the species under consideration together with *Lithoderma.* It also reaches its optimum development when occurring in shallow water, in such cases forming dense and vigorous tufts. The largest specimens collected originate from Rødeø from a depth of 2 m; they attained a height of nearly 10 cm.

Much of the material collected was fructifying and both kinds of sporangia were present in June, July, and August. The plurilocular sporangia, which do not seem to have been recorded from Greenland before, are less frequent than the unilocular ones. Individuals with plurilocular and unilocular sporangia, respectively, occur in the ratio of about 2 to 3. The two kinds of sporangia almost invariably occur on distinct plants, but in one instance a fragment bore some few plurilocular sporangia in addition to the predominant unilocular sporangia. In another case a fragment bore some few unilocular sporangia besides the predominant plurilocular ones.

It is generally reported that the sporangia form small racemes (some of them, however, occurring singly) and they have been depicted like that e. g. in Reinke's Atlas (pl. 45, figs. 8—10) and by Wærn (1952, figs.

43—44). However, in arctic specimens the unilocular sporangia are reported usually to occur singly (cf. KJELLMAN, l. c.; ROSENVINGE, l. c.; SAUVAGEAU, Remarques, fig. 23 E). In my plants, the unilocular as well as the plurilocular sporangia very often occurred singly, but in several instances the stalk bore two sporangia, and racemes were not rare, either. As a rule both the solitary sporangia and the racemes issue laterally from the polysiphonous long-shoots over considerable distances. They may also be terminal on polysiphonous laterals, or they may be given out from the rhizoids, wherever the latter are situated.

When the uni- or plurilocular sporangia occur in pairs or several together, one or more of them frequently are sessile or borne on a very short stalk. If in the latter case the axis of the raceme is short, the result may be a very dense cluster. In a specimen collected at a depth of nearly 40 m some few solitary unilocular sporangia were sessile directly on the polysiphonous shoots, while a great number of them were borne on stalks consisting of one very short cell so that they, too, looked sessile. When such a short unicellular pedicel bears two unilocular sporangia the resemblance to the twin sporangia in *Sph. radicans* may be striking. In the specimen under review unilocular sporangia borne on longer stalks were also observed as well as others forming racemes.

Besides on attached plants, both the unilocular and the plurilocular sporangia may occur on fragments that doubtless in several cases have given rise to the sporangia after having been detached. The fragments are always provided with numerous long, irregular rhizoids, many of which issue from the point of truncation while others issue at a higher level and grow downwards, extending far below the truncation.

In addition to the unilocular sporangia on the erect frond I observed others that were sessile on the basal disc. The specimens in question inhabited *Chaetomorpha melagonium* and exhibited a well-developed basal disc, whereas the erect threads were scanty, sterile, poorly developed, usually unbranched, but not all of them young; some of the threads were truncated. These individuals were collected at the beginning of July. Most of the unilocular sporangia were emptied. The plants involved correspond to the *Sphaceloderma*-stage of *Sphacelaria caespitula* (cf. SAUVAGEAU, Remarques, p. 71; 1901, p. 55, fig. 17 D—E (sub. nom. *Sph. olivacea* PRINGSH.)).

Hairs occurred singly or in pairs. In the former case they might be opposite on the shoot.

Previous Records from Greenland:

E. Gr.: A dozen localities between lats. $65^1/_2$ and well over 82° N. (R. 1893, p. 904; 1898, l. c.; 1910, p. 125; 1933, p. 8; J. 1904, l. c.; L. 1951, l. c.).

W. Gr.: Almost 10 localities between the southern point and lat. $72^3/_4$° N. (R. 1893, p. 904; 1898, l. c.; 1926, p. 12; K. 1897c, p. 33; L. 1933, p. 12).

Scoresby Sund District: Kap Tobin, 6—11 m, 50 m(?); Amdrups Havn, 0 m, 6—9 m, 15—16 m, 25—26 m; Rosenvinges Bugt (A.P.); Kap Hope, 0—2 m, 5—7 m, 10—13 m, 27 m; the mouth of Hurry Inlet, 4 m, 7—10 m, 12—13 m, 35—38 m; Fame Øer, 0 m, 2 m, 4—6 m, 9 m; Bjørneøer, about 0 m, 6—11 m, 14—17 m; Nordbugten, 2—3 m; Danmarks Ø (N.H.); ibid. 1—3 m, 5 m, 15—16 m, 18—22 m; Rødeø, 2 m, 32—35 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 6—9 m, 10 m, 20—25 m; Vinterøer, 2—3 m, 3—6 m; the head of Dusén's Fjord, 15—25 m.

Chaetopteris Kützing, 1843.

1. Chaetopteris plumosa (Lyngb.) Kütz., op. c., p. 293; Rosenv., 1893, p. 903; 1898, p. 99; Jónsson, 1904, p. 40; Lund, 1950, p. 55 (with references to literature); 1951, p. 14.

Sphacelaria plumosa Lyngbye, 1819, p. 103.

A very common species, encountered in all localities where dredgings were made with the exception of Rødeø and the head of the Dusén's Fjord. It was recorded from the uppermost part of the sublittoral zone down to a depth of about 40 m, most abundantly between some few and about 10 m, occurring on rocks and stones, between the haptera of *Laminaria* and *Alaria*, and on *Fucus*. Off Kap Hope it was also observed unattached in company with other unattached algae, together with which it formed loose-lying balls.

The species is well developed and forms tufts of a height of up to at least 12 cm. The majority of the specimens are sterile but I did, however, observe unilocular sporangia in June, July, and August. Plurilocular sporangia were found only on a fragment collected at the end of June. They were ripe and copious, only some few of them being emptied. Hairs occur in pairs or four together at or near the tips of the pinnulae and the younger pinnae in vigorously growing plants.

Previous Records from Greenland:

E. Gr.: A dozen localities between lats. $65^1/_2$ and well over 82° N. (R. 1898, l. c.; 1910, p. 125; 1933, p. 8; J. 1904, l. c.; L. 1951, l. c.).

W. Gr.: Common from the southern point to lat. $78^1/_3$° N. (R. 1893 & 1898, l. c.; 1926, p. 12; K. 1897c, p. 35; L. 1933, p. 12).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 11—13 m; Rosenvinges Bugt, 10—12 m (A.P.); Kap Hope, 1—2 m, 5—7 m, 10—13 m, 27 m, 30 m; the mouth of Hurry Inlet, 4 m, 7—10 m, 35—38 m; Fame Øer 4—6 m, 9 m, 12—18 m; Kap Stewart, between the haptera of *Laminaria* cast ashore (N.H.); Bjørneøer, 6—11 m, 10—21 m; Danmarks Ø (N.H.); ibid., 1—3 m, 5 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 10 m; Vinterøer, 2—3 m, 3—6 m; Kap Borlase Warren (C. K.).

Delamareales nov. ord.

Thallus parenchymaticus, filiformis, divisionibus intercalaribus auctus. Cellulae chromatophora discoida complura continentes. Plantae haploides sporangia plurilocularia proferentes diploidibus similes sporangia proferentibus unilocularia (vel unilocularia et plurilocularia), ut in *Dictyota* isomorphae. Inter *Isogeneratas Polystichineas* referendae.

Besides the polystichous genera removed by FELDMANN (1949) from *Heterogeneratae* to *Isogeneratae*, within which class they constitute a distinct order *Scytosiphonales*, there are some other polystichous *Heterogeneratae* genera which it will be even more warranted to subject to a similar removal. The genera concerned are characteristic in that their species comprise two kinds of isomorphic plants, some bearing plurilocular sporangia and others with unilocular (or unilocular + plurilocular) sporangia. Although it has not yet been proved it must, with our present knowledge of the *Phaeophyceae*, be taken for granted that such species exhibit an alternation of generations in accordance with the *Dictyota* type.

A genus of this kind is *Delamarea* which so far is represented only by one species, *D. attenuata*. The possibility of an alternation of generations within this species has previously been suggested (ROSENVINGE & LUND, 1947, pp. 3 and 26). The species is represented in my East Greenlandic material and I have for several years been aware of the necessity of removing it to *Isogeneratae*. It cannot, however, be included in *Scytosiphonales*, from which order it deviates i. a. by its unilocular sporangia and by the fact that each cell harbours several disc-shaped chromatophores, or in other polystichous orders within the *Isogeneratae*. It will therefore be necessary to establish a distinct order for it, *Delamareales*, the diagnosis of which is given above. *Delamareaceae* A. ZINOVA (1953, p. 128) would be the appropriate family name. As this family is, however, based only on the structure of the thallus the diagnosis must be amended so as to include the statement: "alternation of generations in accordance with the *Dictyota* type".

A. ZINOVA (1954 a, p. 237 ff.) includes four genera in *Delamareaceae*. Among these, *Cladothele* HOOK. & HARV. displays a life-cycle that undoubtedly agrees with that of *Delamarea*. In both *Cl. Decaisnei* HOOK. et HARV. and *Cl. striarioides* (SKOTTSB.) A. ZIN. (= *Cl. Decaisnei* var. *striarioides* SKOTTSB.) SKOTTSBERG (1921, p. 38) in material from the southernmost part of S. America recognized plants with unilocular sporangia as well as others with "gametangia". It is true that in some instances both kinds of sporangia were found in one and the same plant but in such cases the swarmers from the plurilocular sporangia are, of course, diploid.

It is, so far, impossible to decide whether or not the remaining two, insufficiently known genera, *Coelocladia* ROSENV. and *Stschapovia* A. ZIN., can be retained in the family as interpreted by me. In the former, represented by a single species, *C. arctica*, only plurilocular sporangia are known while the latter, likewise represented by a single species, *S. flagellaris*, has been encountered only in the sterile condition.

Delamareaceae A. Zin. 1953, p. 128, emend.

Delamarea Hariot, 1889.

1. Delamarea attenuata (KJELLM.) ROSENV., 1893, p. 865; 1898, p. 63; id. in ROSENV. & LUND, 1947, p. 24, figs. 7—8; KUCKUCK, 1894, p. 246, fig. 16.
Scytosiphon attenuatus KJELLM. 1883, p. 259 (321), pl. 26 figs. 1—5.
Physematoplea attenuata KJELLM. 1890, p. 60.
Dictyosiphon (*Coilonema*) *Chordaria* f. *simpliciuscula* KJELLM. 1877 a, p. 40.
Delamarea paradoxa HARIOT, op. c., p. 156.

Encountered only in two localities in Scoresby Sund, viz. at Kap Tobin and Bjørneøer, occurring at a depth of 6—11 m and collected in August and July, respectively. In the latter locality was found only a single, not intact individual, measuring well over 0.5 mm in diameter and bearing rather young, plurilocular sporangia. It seems to have been growing in company with *Scytosiphon*. At Kap Tobin, however, several individuals were met with, occurring in bundles. With the exception of the youngest individuals, which were sterile, all of them bore plurilocular sporangia. In this locality the species grew on the bryozoan *Scrupocellaria* in company with several other algae, particularly *Elachista*, *Pylaiella*, *Haplospora*, and *Chordaria flagelliformis*.

The largest individual from Kap Tobin measured upwards of 7 cm in length and about 0.5 mm in diameter in its upper part. The other plants were somewhat shorter but exhibited the same diameter. From the basal portion of the shoots, vigorous simple or branched rhizoids are given out in great numbers. They are almost invariably monosiphonous, although some of the cells may be divided by a longitudinal wall. The rhizoids grow in between one another to form a cushion-like attaching portion, though several of them are free and may issue upright shoots (fig. 19 A—B) as has already been mentioned by HARIOT. ROSENVINGE (1898, l. c.) did not succeed in confirming this observation. In my material the upright shoots, issuing from the rhizoids, invariably were young and monosiphonous and of a light colour, generally bearing a terminal sheathed hair.

In several individuals, rhizoids were observed also at higher levels in the sterile part of the shoot. In some instances they were confined to a single zone, while in others such zones occurred at different levels in one and the same shoot. They are formed by outgrowth of all (or nearly all) superficial cells within a certain area into long, vigorous, simple or branched threads similar to those occurring in the basal portion of the shoot. In these rhizoids, too, some of the cells may be divided by a longitudinal wall. While some of the rhizoids are descending and recall cortical filaments, most of them grow obliquely downwards at an acute angle to the shoot. Several of the rhizoids issue erect monosiphonous shoots (fig. 19 C—D), much as the condition found in the basal

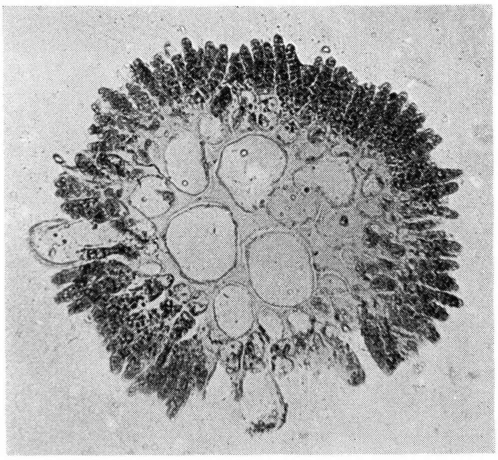


Fig. 18. *Delamarea attenuata.* Transverse section showing plurilocular sporangia and paraphyses. Phase-contrast. × 140.

rhizoids. The basal rhizoids as well as those occurring at higher levels frequently are of a dark colour (in fig. 19 indicated by dots), while in other instances they are much lighter.

In their sterile parts the shoots exhibit only a small number of hairs, whereas in the fertile parts hairs occur so abundantly as to render the shoots quite tomentose. The hairs possess a basal meristem and measure 10—14 μ (—17 μ) in diameter, slightly less in the meristem than in the hair-cells proper. They are usually provided with a long thin sheath at their basal portion.

The plurilocular sporangia are cylindrical or conical (fig. 18) and are not infrequently branched. They measure 28—70 × 11—21 μ (—28 μ). At the commencing of fructification the plurilocular sporangia often form small isolated spots which may also be the case with the paraphyses. Later the plurilocular sporangia and the paraphyses form a continuous layer.

The quantitative ratio of the plurilocular sporangia to the paraphyses varies from one individual to another and from one portion to

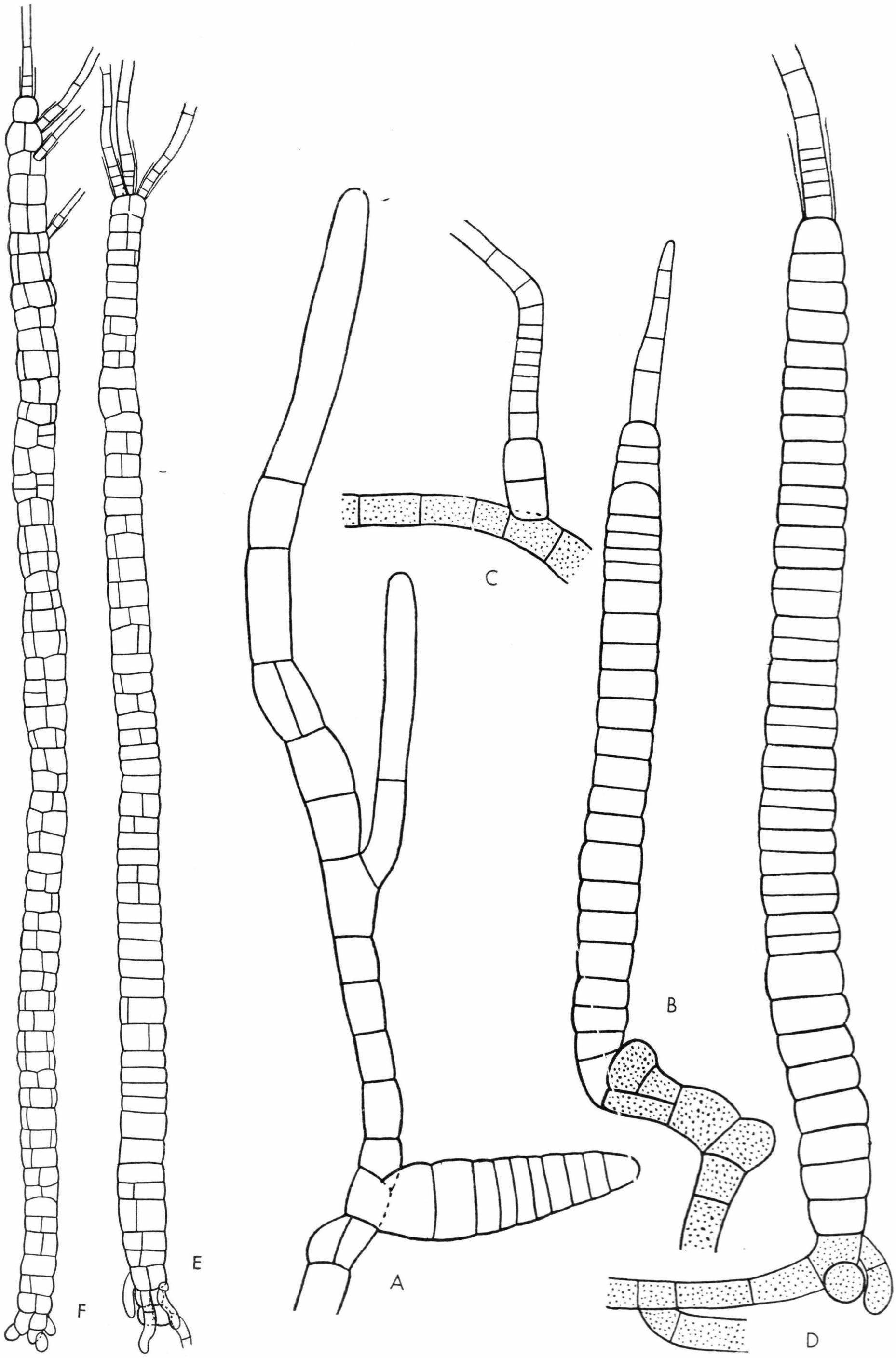


Fig. 19. *Delamarea attenuata.* A—D: young erect monosiphonous shoots, in A—B issuing from basal rhizoids, in C—D from rhizoids given out at higher levels; in A, the rhizoid (which is depicted vertically) was of a light colour, in B—D the rhizoids were darker (indicated by dots); E—F: young plants at a somewhat older stage. A—D: × 285; E—F: × 140.

another in one and the same thallus (cf. Kjellman, 1883, l. c.). As pointed out by Rosenvinge (1898, l. c.) the plurilocular sporangia may often in certain sections of a shoot be so crowded that few paraphyses are present (fig. 18). On the other hand, other sections of the thallus exhibit almost exclusively paraphyses.

Judging from young individuals, given out by basal rhizoids or by rhizoids occurring at higher levels, as well as from Hariot's statements, the species at an early developmental stage is represented by a monosiphonous thread whose cells soon undergo transverse divisions (fig. 19 A—B, D). Later, longitudinal walls occur in the newly formed cells (fig. 19 E—F), and further cell-divisions eventually render the shoot parenchymatous. In all plants, each cell harbours several disc-shaped chromatophores. While the young shoots as a rule bear one terminal hair, the somewhat older usually terminate in several hairs and exhibit, moreover, several lateral hairs which seem to be arranged mainly in whorls, at any rate at a certain stage of the development.

Individuals with unilocular sporangia were not observed.

Previous Records from Greenland:
E. Gr.: One locality in the southernmost part in lat. 60° N. (R. 1893, l. c.).
W. Gr.: A dozen localities between lats. 60 and $76^3/_4$° N. (R. 1893 & 1898, l. c.; L. 1933, p. 12).

Scoresby Sund District: Kap Tobin, 6—11 m; Bjørneøer, 6—11 m.

Scytosiphonales Feldmann, 1949, p. 112.

Scytosiphonaceae

Scytosiphon C. Agardh, 1811.

1. Scytosiphon lomentaria (Lyngb.) J. Ag., 1848, p. 126; Kuckuck, 1929, figs. 138—140; Rosenv. & Lund, 1947, p. 27 (with references to literature); Feldmann, op. c., p. 107, fig. 1 A—B; Jaasund, 1951, p. 128.

Chorda Lomentaria Lyngb., 1819, p. 74; Harvey, Phycol. Brit., III, 1851, pl. 285.

Scytosiphon pygmaeus Reinke, Atlas, p. 17, pl. 14; Algenfl., p. 60.

Encountered in July and August in five localities, from the uppermost part of the sublittoral region down to a depth of 14—18 m, growing on stones and rocks, on *Desmarestia aculeata*, *Punctaria glacialis*, and on the bryozoan *Scrupocellaria*. The species was as a rule present in sparse quantities only, occurring gregariously or more frequently singly, in most instances represented by small, feebly developed individuals. A single, not intact thread measured, however, 11 cm in length. The plants did not exhibit constrictions or the latter were not well defined, so the specimens must be referred to f. *fistulosa* RKE (f. *cylindricus* SETCHELL & GARDNER). Hairs occur singly or in tufts.

At Bjørneøer the species was, however, fairly common on rocks slightly below 0 m, growing together with *Pylaiella*, *Stictyosiphon*, *Punctaria plantaginea*, and *Spongomorpha* in a community dominated by *Fucus* with narrow frond. The individuals in question were rather characteristic, with respect to their habit recalling f. *castanea* (CARM.) KYLIN. They were fairly small, about 5—6(?) cm in length, but robust, measuring up to 1 mm in diameter. Several of them bore hairs to such an extent as to be almost tomentose. The majority of them were abundantly fructifying, most of the surface being covered with very crowded plurilocular sporangia interspersed with numerous paraphyses, while others exhibited areas that were sterile or bore only small isolated groups of plurilocular sporangia and paraphyses.

The plurilocular sporangia in the plants involved were very characteristic in mostly being stalked, in many instances branched. Not infrequently several sporangia were borne on the same stalk. Some of them were cylindrical or subcylindrical, uniseriate, measuring 5—8 μ in diameter, often laterally coalescent two by two, obviously the result of longitudinal division of a sporangial initial. Others were claviform, spindle-shaped, or attenuated above, one or several compartments being divided by one or, less frequently, two longitudinal walls or by an oblique wall. Still others exhibited a more irregular shape and were pluriseriate, especially the sporangia in the basal portion of the plant which measured no less than up to 20 μ in diameter.

In some instances were observed cushions formed by plurilocular sporangia borne on longer stalks than the adjacent ones (fig. 20 B). In transverse section of the plant they expanded like a fan above the latter (fig. 20 A).

The plurilocular sporangia vary fairly much in length, not infrequently measuring 50—70 μ. The number of compartments amounts to up to 13—17, though in the lower portion of the plant I observed much shorter uniseriate sporangia measuring e. g. no more than 20 μ in length, containing four compartments. Such short sporangia, too, may be stalked. During the fertilisation the sporangia-stalks may also be fertilized, the sporangia thus becoming sessile.

The paraphyses were cylindrical or clavate, measuring about 14 μ in diameter. Many of them possessed brown, homogeneous contents of fucosan. They project very often beyond the plurilocular sporangia though when occurring amid the long-stalked sporangia they are shorter than the latter.

The plurilocular sporangia in the plants under consideration differ appreciably from most drawings available in literature, depicting *Sc.*

lomentaria with 5—8 compartments, and I do not feel completely convinced that it would not be warranted to refer the individuals involved to a distinct species. I have, incidentally, previously (in ROSENV. & LUND, l. c.) mentioned plants with similar stalked, sometimes branched, long plurilocular sporangia with many compartments, several of which were

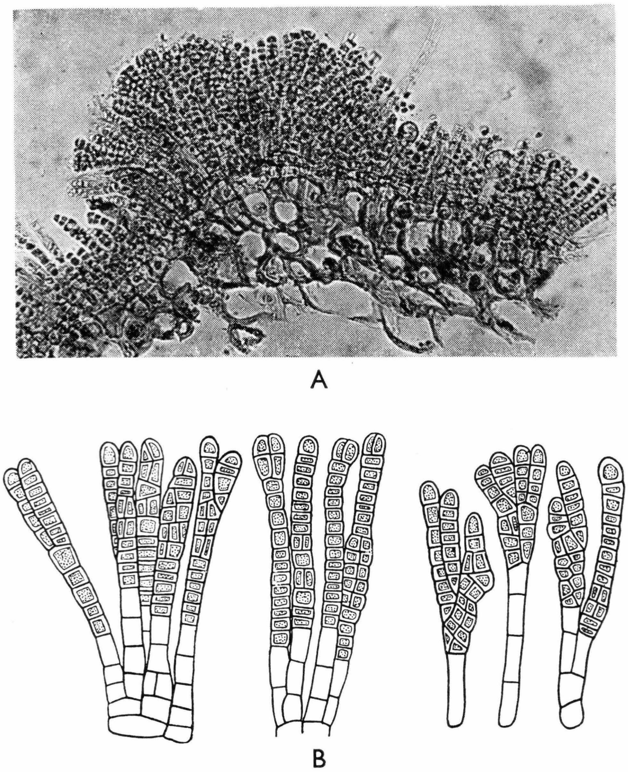


Fig. 20. *Scytosiphon lomentaria.* A: Transverse section; in the middle, long-stalked plurilocular sporangia expand like a fan. ×200. B: Stalked plurilocular sporangia, some of them branched. × 420.

longitudinally divided. Moreover, individuals with exceptionally long plurilocular sporangia have been recorded and depicted in literature prior to that time. Thus, a few of LYNGBYE's (pl. 18 E 2) rows of "semina" exhibit 9 compartments, one of them even 10, while the "radiating, close-packed, moniliform filaments" in HARVEY (Phycol. Brit., pl. 285) consist of 11—13(—14) cells. SETCHELL & GARDNER (1925, p. 532) state that the "gametangia" may have "up to twenty-five or more longitudinal uniseriate loculi" and depict in f. *typicus* (pl. 39 fig. 45) sporangia with 14—16 compartments. In recent years JAASUND (l. c.) has recorded sporangia with up to 14 compartments in plants from North Norway.

For the present I do not, however, separate my plants from *Sc. lomentaria* but choose to interpret the above-mentioned sporangia as a result of variability within this species.

The remaining plants in my material either were sterile or had just commenced fructification. The plurilocular sporangia formed partly small isolated spots, partly continuous, often elongate portions. Several individuals resembled *Sc. pygmaeus* RKE. This applied for instance to a small plant originating from Fame Øer and possessing differentiated spores.

KYLIN (1933, p. 48) supposes that the species is diploid, reproducing itself vegetatively by diploid swarmers from the plurilocular sporangia. It is true that at Naples and Heligoland BERTHOLD (1881, p. 407) and KUCKUCK (1898, p. 35, and 1912, p. 162), respectively, in some few cases observed a copulation between swarmers from the plurilocular sporangia but it was not established in culture by DAMMANN (1930, p. 12), SAUVAGEAU (1929, p. 331), and KYLIN (1933, p. 47). In DAMMANN's cultures at Heligoland the swarmers produced fructifying germlings which reproduced themselves repeatedly so as to give rise to four successive generations, all of them with plurilocular sporangia.

In his paper from 1935 ABE (p. 333), however, maintains that in his cultures a copulation did take place between swarmers originating in certain plurilocular sporangia. Almost simultaneously, two other Japanese phycologists, KUNIEDA & SUTO (1938, p. 545), arrived at a similar result concerning the closely related species *Colpomenia sinuosa*.

KYLIN (1937, p. 20) objects sharply to ABE's statement whereas in a recent work FELDMANN (1949, p. 107), on the contrary, interprets ABE's as well as KUNIEDA & SUTO's results as a confirmation of the older statements by BERTHOLD and KUCKUCK on the sexual behaviour of the zoids from certain plurilocular sporangia in *Scytosiphonaceae* and, consequently, regards these species as gametophytes. At the same time, when studying their cytological structure, FELDMANN finds that *Scytosiphon*, *Colpomenia*, and other closely allied genera exhibit a striking similarity, constituting a deviation from the *Punctariales* (*Dictyosiphonales*). He therefore removes these genera and classifies them as a distinct order, *Scytosiphonales*, which in its turn is included in *Isogeneratae*. The life-cycle of the species within this order is, however, still unknown as it has not yet been established where meiosis takes place. FELDMANN advances the hypothesis that meiosis might occur at the germination of the zygote. It should be added that PAPENFUSS (1955, pp. 171, 173) rejects the order *Scytosiphonales* FELDM. — and also (1951 b and 1955) the three classes into which KYLIN divides the *Phaeophyceae*.

In addition to f. *typica*, f. *complanata* is recorded from East Greenland, from lat. 66° N.; this form is characteristic in exhibiting a flattened thallus, without constrictions and devoid of paraphyses, and was originally described from West Greenland (ROSENVINGE, 1893, p. 863).

Previous Records from Greenland:

E. Gr.: Known with certainty from five localities between lats. 60 and $70^1/_2$° N. (R. 1893, l. c.; 1898, p. 63; J. 1904, p. 34). A doubtful specimen recorded from lat. $76^1/_2$° N. (R. 1910, p. 117).

W. Gr.: Numerous localities between lats. 60 and $72^3/_4$° N. (R. 1893 & 1898, l. c.; 1926, p. 12).

Scoresby Sund District: Kap Tobin, 6—11 m; Fame Øer, 5—6 m; Bjørneøer, slightly below 0 m; 6—11 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, slightly below 0 m, 10 m; Vinterøer, 14—18 m.

Petalonia Derbès et Solier, 1850.

1. **Petalonia fascia** (O. F. MÜLL.) KUNTZE, 1898, p. 419.
Phyllitis Fascia (O. F. MÜLL.) KÜTZ., 1843, p. 342; ROSENV., 1893, p. 862; JÓNSSON, 1904, p. 33.

Previous Records from Greenland:

E. Gr.: One locality in lat. $65^2/_3$° N. (J., l. c.). Large, well-developed though sterile specimens collected at a depth of at least 9 m (9—36 m).

W. Gr.: With certainty known from five localities only, between lats. $60^3/_4$ and 70° N. (R. 1893, l. c.; L. 1933, p. 12).

Not observed by me.

HETEROGENERATAE

Chordariales

Myrionemataceae

Dermatocelis Rosenvinge, 1898.

1. **Dermatocelis laminariæ** ROSENV., op. c., p. 89, fig. 21.
Myrionema laminariæ (ROSENV.) JÓNSSON, 1903, p. 148.

I found numerous specimens of this nice little species inhabiting a couple of young individuals of *Laminaria saccharina*, which measured about 26—40 cm in length and were collected in mid-August. It was observed on the upper part of the lamina and on the remainder of the preceding year's lamina, growing in the outer membrane of the host. All developmental stages were represented, from very young ones up to such as exhibited a diameter of 240 μ. The disc usually is monostromatic and nearly orbicular (fig. 21). The radiating threads are often still free, not only in their peripheral part but a long way towards the middle portion.

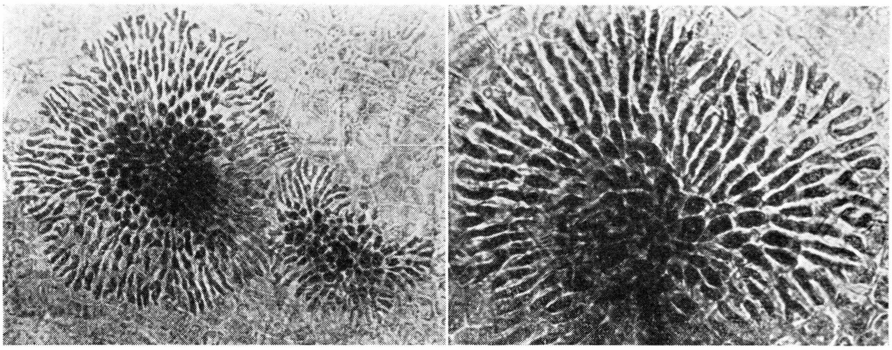


Fig. 21. *Dermatocelis laminariae* in surface view. The dark portion in the middle of the plants signifies unilocular sporangia and hairs. In A, the hair-tuft of the larger plant is discernible in the portion adjoining the smaller plant. A: × 180. B: × 375.

I have, unfortunately, not been in a position to study the chromatophores, as the material has been kept in the dry state.

All the young plants were sterile whereas the somewhat older specimens bore sessile, very crowded, immature unilocular sporangia in their middle portion. In the oldest specimens the sporangia were abundant, but still immature.

In most (all?) fertile plants as well as in some young sterile ones, numerous long hairs were also given out densely from the middle part of the disc (fig. 21 A). Hairs have not previously been described in this species. They possess a basal meristem, consisting of about 4—7 cells. The lowermost cell is somewhat narrowed below and is slightly longer than the meristematic cells. The diameter of the meristem measures 6—7 μ. Although I succeeded in isolating some of the individuals from their substratum I did not observe a sheath surrounding the basal part of the hairs. This may, however, be due to the dry state of the material.

Neither vegetative vertical threads nor plurilocular sporangia were observed. The former are unknown in this species, the latter have at any rate not been recorded with certainty although Jónsson (op. c., fig. 9) mentions the supposed occurrence of young plurilocular sporangia in specimens from South West Iceland.

Apart from the hairs my plants correspond perfectly with the description by Rosenvinge, though being of appreciably smaller dimensions. The plants described by that author measured about 0.5 mm in diameter.

The genus *Dermatocelis* is undoubtedly very closely related to *Myrionema* (cf. Rosenvinge, op. c., p. 93) in which it was included by Jónsson. Owing to the present incomplete knowledge of the species under consideration I choose, however, not for the present to abandon this genus.

Previous Records from Greenland:
E. Gr.: None.
W. Gr.: One locality in lat. 60° N. (R., l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m.

Ascocyclus Magnus, 1874.

1. Ascocyclus foecundus (Strömf.) Cotton, 1912, p. 122.
Phycocelis foecunda Strömf., 1888, p. 383, pl. 3 fig. 5.
Myrionema foecundum (Strömf.) Sauv., Rosenv., 1910, p. 124(?).
Ascocyclus islandicus Jónsson, 1903, p. 149, figs. 10—12.
Asc. Saccharinae Cotton, 1912, p. 122, pl. 10, figs. 4—9.

On the lamina of a *Laminaria saccharina* f. *glacialis*, collected at the beginning of August, were found some specimens of an *Ascocyclus* species, forming small, orbicular, monostromatic (in part distromatic) discs that measured up to 600 μ in diameter. The ascocysts are, at any rate as a rule, sessile and very numerous, particularly in the middle portion of the disc. They are generally more or less markedly clavate, their narrowest portion often being found a little way above their base. In some instances, their middle portion exhibited the largest diameter.

Hairs are abundant. They reach a length of at least 1.5 mm, while their diameter measures 6—8 μ. The basal cell of the hair is often slightly elongate and somewhat attenuated below. In some cases it shows resemblance to the similar cell in *Phaeostroma pustulosum* in being narrowest a little way above its base and having a thickened cell-wall in that place. In several hairs was observed a well-defined sheath surrounding the basal part. In other (older) individuals, however, no sheath was observed.

Plurilocular sporangia, several of them proliferated, occur abundantly. They are generally uniseriate or possess an oblique longitudinal wall in some of the middle compartments and measure 21—49 × (5—) 8—9 μ(—10 μ). They are sessile or borne on stalks consisting of one to three cells. The sessile sporangia are met with in the marginal portion of the disc and are usually given out singly, more rarely two issuing from one and the same basal cell. When the sporangia are borne on a stalk, the latter is often branched. Thus, it is not uncommon that the uppermost cell of the sporangia-stalk issues a lateral shoot which becomes fertile throughout its length (fig. 22 B—C). This lateral sporangium is as a rule shorter than the terminal one. The sporangium proper is rarely branched.

Vertical, simple or branched, vegetative threads do also occur but as they do not project above the stalked, plurilocular sporangia it must be assumed that they eventually become fertile in their upper part.

Apart from the branched sporangia-stalks my plants show much resemblance to *Asc. islandicus* JÓNSSON and *Asc. Saccharinae* COTTON. When dealing with the genus *Ascocyclus*, COTTON examined the type specimen of the alga described by STRÖMFELT under the name of *Phycocelis foecunda*. The examination showed that this species actually is an *Ascocyclus*; COTTON, therefore, changed its name to *Asc. foecundus* in which he includes *Asc. sphaerophorus* SAUV. and *Asc. islandicus* JÓNSSON. Later, NEWTON (1931, p. 159) and LEVRING (1937, p. 51, and 1940, p. 43) refer *Asc. Saccharinae* COTTON to this species.

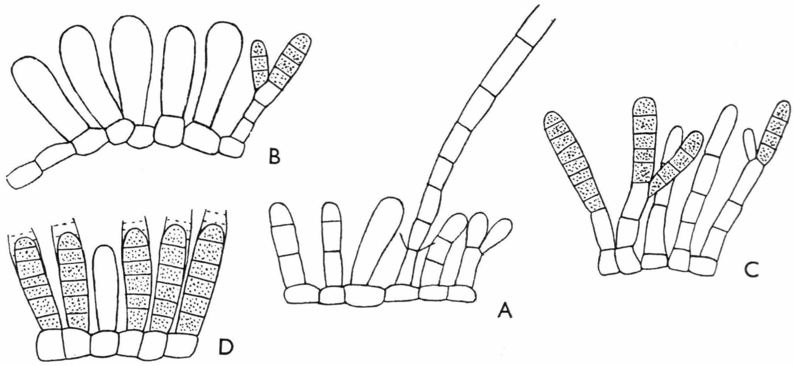


Fig. 22. *Ascocyclus foecundus*. Vertical sections of young plants. A—D: × 400.

I am of the opinion that the above deviation of my plants does not preclude their identification with *Asc. foecundus*. It may, at the most, justify their being separated as a f. *ramosus* (not to be confused with *Asc. ramosus* nom. provis., WÆRN, 1952, p. 151).

Myrionema foecundum (STRÖMF.) SAUV. recorded by ROSENVINGE (l. c.) from NE Greenland is presumably also to be referred to this species; I am, however, unable to advance any definite pronouncement on this question as the description is very brief and I have had no access to the material involved. Ascocysts are not mentioned, so that author has apparently not observed any. This does not, however, constitute an objection to its being referred to the species under consideration as, according to COTTON, the number of ascocysts varies considerably from one individual to another.

In addition to the ascocysts occurring in my above plants I have observed ascocysts in supposed *Ascocyclus* specimens collected in other localities where they inhabited *Fucus* and other hosts. Some of these ascocysts were considerably longer than those described above but the plants in question occurred too sparsely to furnish sufficient material for a thorough examination.

Previous Records from Greenland:
E. Gr.: One locality at Danmarks Havn in lat. $76^{1}/_{2}$° N. (R., l. c.) (somewhat doubtful).
W. Gr.: None.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m.

Microspongium Reinke, 1888.

1. Microspongium globosum Rke., op. c., p. 16.
Ascocyclus globosus Reinke, Atlas, pl. 17; Algenfl., p. 46.
Myrionema globosum (Rke) Foslie, 1894, p. 130; Børgesen, 1902, p. 419; Jónsson, 1903, p. 146.
Phycocelis globosus (Rke) Rosenv., 1898, p. 86.

In 1888 Reinke established a new genus, *Microspongium*, represented by two species, viz. *M. gelatinosum* and *M. globosum*. However, shortly afterwards the author included the latter in the genus *Ascocyclus*, established by Magnus (1874, p. 73). Five years later Foslie referred this species to the genus *Myrionema*, in which it usually has been retained by later authors although Rosenvinge (l. c.) included it in the genus *Phycocelis* established by Strömfelt (1888, p. 383). However, Kylin has recently (1947, p. 41) again removed the species in question to the genus *Microspongium*, thus following Reinke's original procedure which I also adopt.

I have referred to this species some specimens collected at the beginning of August at a depth of 2—5 m. They occurred epiphytically in rather small quantities on the lamina of *Laminaria saccharina* f. *glacialis* in company with a great number of other epiphytes, especially *Hecatonema maculans* and *Symphyocarpus longisetus*. The basal layer is monostromatic. In a single instance a short unicellular rhizoid was observed issuing from one of the basal cells (fig. 23 B; cf. Jónsson, l. c.). The upright threads, attaining a height of up to about 150 μ (—185 μ), seem in most cases to correspond with Rosenvinge's fig. 19 A—B. They are branched or simple and bear a great number of plurilocular sporangia. The erect threads, whose cells usually seem to contain one chromatophore each, exhibit a diameter of 7—9 μ.

Hairs are given out from both the basal layer and the erect threads. They possess a basal meristem and are provided with a basal sheath. Their diameter measures 8—11 μ (—14 μ) and they are somewhat attenuated below.

The plurilocular sporangia are terminal or lateral, in the latter case they are sessile or borne on a stalk. They are cylindrical and uniseriate. Their length may measure up to at least 65 μ, though as a rule they are shorter, and their diameter measures 6—7 μ. Most of the sporangia were emptied.

Besides the above individuals I have referred to this species some plants collected at the end of July and occurring on an old, hairless specimen of *Desmarestia aculeata*, where they formed small, hemispherical cushions of a height of up to at least 225 μ. They differ from the above plants in that their basal portion is partially endophytic. In several instances the endophytic part had caused a small depression in the outer-

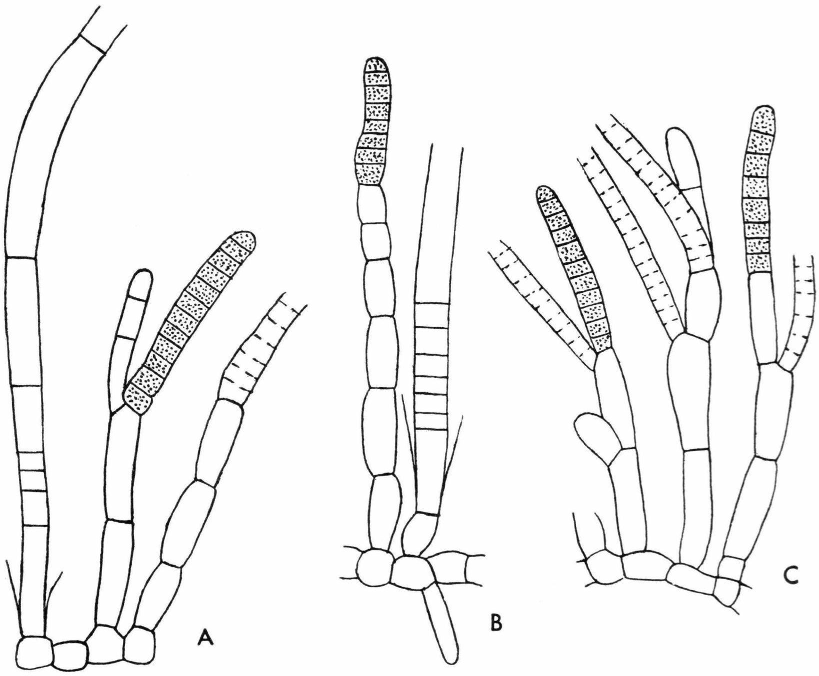


Fig. 23. *Microspongium globosum* which inhabited a *Laminaria saccharina.* In B, a rhizoid is seen. A—C: $\times$ 630.

most part of the host in which it had developed a small-celled pseudoparenchymatous portion. In vertical section the latter was attenuated below and penetrated as a small tap a little way farther into the host, sometimes obliquely. Endophytic, creeping threads were, however, also encountered. In none of my plants did the endophytic portion penetrate farther than 50—60 μ into the host; the plants were loosely rooted and easily removed.

Another deviation is constituted by the fact that the cells of the upright threads mostly contain 2—3(1—4) small disc-shaped chromatophores. Apart from these characteristics, the plants correspond perfectly with *Microspongium globosum.*

I am of the opinion that the partially endophytic basal portion does not preclude the identification of the above plants with the species under consideration. It has often been emphasized in literature that the nature of the substratum may be of decisive importance to the structure of the basal portion of an alga which may be caused to penetrate the host or to develop on its surface, to form a disc or to develop into separate threads, etc. Nor do I attach too great significance to the number of chromatophores which by some authors is stated to be one to two, while others report only a single one.

In my view, *Ectocarpus pulvinatus* GRAN (1897, p. 45, pl. 2 fig. 31), described from the Oslo Fjord, must also be referred to the species under consideration. Like the individuals found by me on *Desmarestia aculeata*, this species exhibits an endophytic basal portion.

In none of the East Greenlandic plants did I observe unilocular sporangia which so far are unknown.

Previous Records from Greenland:
E. Gr.: One locality, mentioned below (R., l. c.).
W. Gr.: One locality in lat. $60^1/_2°$ N. (id., l. c.).

Scoresby Sund District: Bjørneøer, 6—9 m; Danmarks Ø (N. H.).
Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m.

Elachistaceae

Leptonema Reinke, 1888.

1. Leptonema fasciculatum REINKE, op. c., p. 16; Atlas, p. 13; Algenfl., p. 50 (excl. var. *flagellare*); KUCKUCK, 1929, p. 34; ROSENV., 1935, p. 38.
Elachista fasciculata (RKE) GRAN, 1893a, p. 29; ROSENV., 1898, p. 75.

f. *uncinata* RKE, Atlas, pl. 9, and Algenfl. p. 50; PRINTZ, 1926, p. 159, pl. 3 fig. 28.
f. *majus* RKE, Atlas, pl. 10 figs. 1—9; Algenfl., p. 51; KNIGHT & PARKE, 1931, pl. 13 figs. 35—36, 39; KYLIN, 1947, fig. 40.
f. *subcylindrica* ROSENV., 1893, p. 879; 1935, p. 39, fig. 38; NEWTON, 1931, fig. 78; LUND, 1951, p. 15.

A very common and widely distributed species, met with at depths between 1—3 and 20—25 m. It occurs both in exposed and in more sheltered localities and was encountered in largest quantities at Ella Ø. It forms small, sparse tufts on several other algae, especially on *Desmarestia aculeata* and *Fucus* which it may render slightly tomentose. Other hosts are *Chaetomorpha*, *Punctaria glacialis*, *Laminaria* (lamina and haptera, also on germlings), *Dictyosiphon*, *Sphacelaria*, *Chaetopteris*, *Haplospora* (on the lower part of the shoots), *Halosaccion*, *Euthora*, *Rhodomela*, and *Lithoderma*. It was, moreover, observed on byssi of bivalves, hydroids and bryozoans, snail-shells, and on the sipho of *Saxicava arctica*.

The great majority of the individuals belong to f. *subcylindrica*, though many filaments show resemblance to f. *majus* (cf. JÓNSSON, 1904,

p. 35) and it may frequently be a matter of opinion whether a particular plant ought rightly to be referred to one or the other form (cf. KNIGHT & PARKE's fig. 36). However, unquestionable representatives of f. *majus* were also met with, such as that depicted in fig. 24 A, which inhabited a snail-shell at Kap Tobin. The sterile threads in this plant measured up to 14—16 μ in diameter, the fertile ones up to 17—18 μ. This form has not previously been recorded from Greenland. F. *uncinata* was mentioned by ROSENVINGE from Danmarks Ø and Danmarks Havn.

The diameter of the assimilatory filaments usually varies between 7—8 and 16—17 μ, though some threads exhibited diameters smaller than 7 μ. In fertile threads the diameters vary between 7—8 and 21 μ. The thin threads are frequently intact and taper towards their upper part where they consist of very long, thin cells that may become fertile too (fig. 24 B); the apex proper of these threads may measure no more than 3 μ in diameter. The thicker threads, on the contrary, are as a rule not intact but usually appear truncated after the evacuation of the spores.

The fertile sections of a thread may be exceedingly long and, apart from their lowermost portions, the threads may be converted into plurilocular sporangia throughout their length. In other instances the chains of sporangia are fairly short but numerous, separated by (still) sterile intervals.

Much as the condition met with in several other Brown Algae the fructification sets in already when the plant is young. Plants in which the majority of the assimilatory filaments display luxuriant growth, still being sterile or at the most just having commenced the formation of sporangia, may frequently also exhibit short threads in which all or nearly all the cells have developed into plurilocular sporangia which have already been emptied (fig. 24 C (*a*)).

This was the case with some individuals collected on August 22 at Rødeø which, moreover, exhibited quite short, fertilized shoots (fig. 24 C (*b*), D—E) in which the lowermost sporangia might be papillate elongated (fig. 24 D—E). In some cases such very short, fertile shoots did not constitute actual sporangia-chains as each of them represented a single sporangium with an apical aperture (fig. 24 C (*x*), F—G), recalling the sporangia in *Ectocarpus confervoides*; they seem to issue not only laterally from the lowermost portion of the assimilatory filaments but also from the horizontal, creeping threads. Such sporangia occurred abundantly in tufts together with the other quite short, fertile shoots.

Plurilocular sporangia were met with in July and August. Unilocular sporangia were also observed, though only in a single individual which also bore plurilocular ones. This plant, however, exhibited only three immature unilocular sporangia, the largest measuring 45×21 μ (depicted

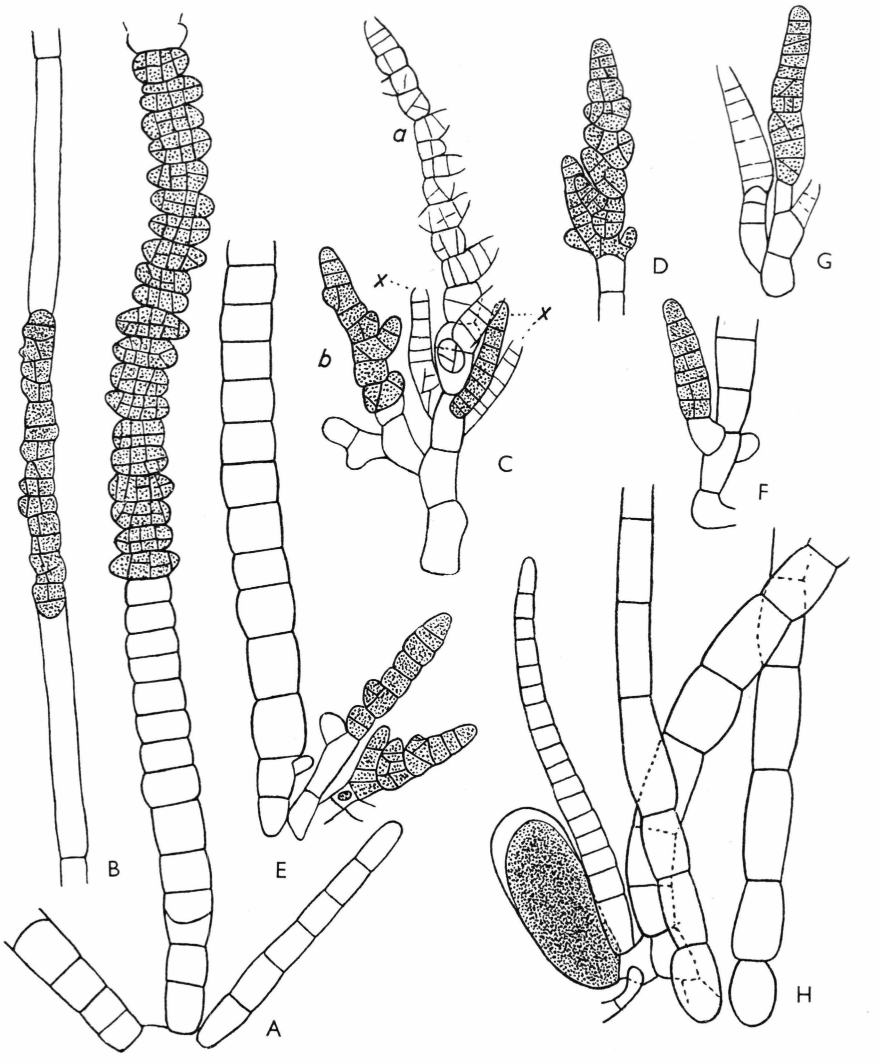


Fig. 24. *Leptonema fasciculatum.* A: f. *majus;* B: f. *subcylindrica,* upper part of a thin thread; C—G: young fertile shoots, some of which consist of sporangia-chains while others represent a single plurilocular sporangium each (comp. the text); H: plant with a unilocular sporangium. A—H: × 525.

in fig. 24 H). Like the last-mentioned individuals it was collected on August 22 at Rødeø.

As a great number of individuals were examined, and as unilocular sporangia have not previously been recorded from Greenland, there is no doubt that they are rare in these areas. Also when occurring in other waters the species exhibits by far fewer unilocular sporangia than plurilocular, so a regular alternation of generations would seem impossible.

No doubt, the species is as a rule diploid, reproducing itself chiefly by means of diploid swarmers from the plurilocular sporangia. On the other hand, it cannot be doubted that a meiosis takes place in the unilocular sporangia, giving rise to haploid swarmers which must be supposed to develop into a haploid sexual generation bearing plurilocular sporangia. The swarmers originating from such individuals would by copulation reproduce the diploid phase.

Previous Records from Greenland:

E. Gr.: Five localities between lats. $65^2/_3$ and 82° N. (R. 1898, l. c.; 1910, p. 122; J. 1904, l. c.; L. 1951, l. c.). F. *subcylindrica* and f. *uncinata*.

W. Gr.: Six localities between lats. $60^3/_4$ and $72^1/_3$° N. (R. 1893, l. c.). F. *subcylindrica*.

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 16—18 m; Fame Øer, 4—6 m; Bjørneøer, 6—11 m, 10—21 m; Danmarks Ø, 8—28 m (N. H.); ibid. 1—3 m, 15—16 m; Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 20—25 m; Vinterøer, 2—3 m, 21—22 m.

Elachista Duby, 1830.

1. Elachista fucicola (VELL.) ARESCH. emend. ROSENV., 1893, p. 878; 1898, p. 74; PRINTZ, 1926, p. 159.

f. *typica* ROSENV., l. c.; *El. fucicola* (VELL.) ARESCH., 1842, p. 235; KUCKUCK, 1929, p. 22; ROSENV., 1935, p. 19; KYLIN, 1937, p. 12; 1947, p. 51.

f. *lubrica* (RUPR.) ROSENV., l. c.; KUCKUCK, 1897c, p. 32; *El. lubrica* RUPR., 1856, p. 388; ARESCH., 1875, p. 18; KUCKUCK, 1929, p. 21.

After having studied a comprehensive material originating from nearly all the localities examined, I have arrived at the conclusion that ROSENVINGE's inclusion of *El. lubrica* in *El. fucicola* is fully warranted. It applies to my material, too, that besides typical representatives of both types a great number of intermediate forms are found, showing affinity with both "species" as regards the length of the lower cells in the assimilatory filaments as well as the manner in which the latter are attenuated below. Thus, it is frequently a matter of opinion whether a particular plant ought rightly to be referred to one "species" or the other. Moreover, in one and the same plant some threads may correspond with those characteristic of *El. lubrica* while others correspond with those found in *El. fucicola*.

The identification is most difficult when young or old plants are involved. In young specimens of f. *typica*, in which the assimilatory filaments display luxuriant growth, the cells of the meristematic zone are very often conspicuously short as compared with the diameter, the condition thus recalling that found in f. *lubrica*. In old individuals of f. *lubrica*, approaching the "*globosa*-stage", the lower cells of the assimilatory filaments are frequently fairly long as compared with the diameter, their length often being equal to the diameter. It seems thus to be the case that with increasing age f. *lubrica* approaches f. *typica*. In both forms the assimilatory filaments measure up to 1.5 cm in length, the diameter of the most vigorous ones measuring about 50—60 μ. The meristem of the assimilatory filaments is generally long and well-defined.

Most of the individuals belong to the *lubrica* form group, although far from all of them agree with the typical f. *lubrica*. Typical representatives of f. *typica*, such as those occurring in Danish waters, are not very common.

In the upper part of the assimilatory filaments are often found short meristem-like sections in which one or some few of the cells may be divided by a longitudinal wall. Such sections may give rise to adventitious plants. This condition corresponds with observations made by me in Danish individuals, published in Rosenvinge, 1935, p. 23, fig. 23.

In some specimens from the Nordfjord, most closely related to f. *typica* and inhabiting a free-floating *Dictyosiphon* individual, adventitious plants at all developmental stages occurred in great numbers on the assimilatory filaments. The youngest adventitious plants were but little developed, usually consisting of a single short assimilatory thread, while others were fully developed and bore unilocular sporangia.

Paraphyses are more or less abundant. Their shape is by Setchell & Gardner (1925, p. 503) indicated as a distinctive feature between *El. fucicola* and *El. lubrica*. In the former the paraphyses are stated to be "decidedly curved", in the latter to be "straight or slightly curved" (cf. also Taylor, 1937, p. 146). Judging from my material this characteristic seems not to be too reliable, although it might be maintained that the paraphyses usually are more curved in f. *typica*. In some representatives of f. *typica* the paraphyses in their upper part consisted of more or less spherical or one-sidedly swollen cells.

Hairs do not occur although they are mentioned in the generic diagnosis as rendered by Setchell & Gardner (l. c.), Newton (1931, p. 133) and other authors. As mentioned by Rosenvinge (1935, l. c.) it should be pointed out that this genus does not exhibit hairs. Indications to the contrary presumably date from previous years when e. g. the hair-bearing genus *Myriactula* Kuntze was also included in *Elachista*.

Unilocular sporangia are exceedingly common. They occurred in both forms in June, July, and August. They vary considerably in size and may not uncommonly measure about 140—205 μ in length and about 40—75 μ in diameter; others are, however, of considerably smaller dimensions. They occur presumably throughout the year; this is, at any rate, the case with f. *lubrica* at Spitsbergen (Kjellman, 1883, p. 254 (315)). Thus, Rosenvinge (1898, l. c.) encountered them in material from February, March, and July to November. On the contrary, the species is stated to be sterile in summer in the Trondhjemsfjord on the Norwegian west coast (Printz, l. c.).

Plurilocular sporangia were not observed. They are unknown in f. *typica*. It is true that E. Sinova (1940, p. 155, fig. 38) describes plurilocular sporangia in individuals originating from the Japanese Sea off Vladivostok, inhabiting *Rhodomela larix*, but in my opinion these plants do not belong to *El. fucicola*. They measured only 1—2 mm in height and their assimilatory threads, short and abruptly attenuated below, measured no more than 16.1—18.4 μ in diameter at their middle portion while the paraphyses exhibited a diameter of 18.4—23 μ. The plurilocular sporangia were uniseriate and filiform and were situated at the base of the assimilatory threads, where they surrounded the unilocular sporangia. They recall those later depicted by Kylin (1947, p. 52, fig. 44 C) in *El. chondri* Aresch.

Although they seem to be rare, plurilocular sporangia have been encountered in f. *lubrica* by Rosenvinge (1893, l. c., in a plant from West Greenland), Jónsson (1904, p. 35, East Greenland) and Kuckuck (1929, p. 21, figs. 9—11, northern Norway). Setchell & Gardner (l. c.) state for both species "gametangia unknown" and seem thus to have overlooked the records by Rosenvinge and Jónsson.

The fact that plurilocular sporangia are present in f. *lubrica* but lacking in f. *typica* constitutes, of course, a difference between the two forms as pointed out by Kuckuck when stating "Bis die plurilokulären Sporangien bei der letzteren [*El. fucicola*] bekannt sind, mag aber *E. lubrica* nun getrennt stehen" (1929, p. 21).

However, the possibility cannot be excluded that some of my f. *typica* individuals possess abortive plurilocular sporangia. In the specimens involved, collected in August at Kap Tobin and bearing unilocular sporangia, some of the assimilatory filaments exhibited segments in which the cells were divided into small cells, frequently projecting like papillae, which sometimes developed into thin, irregular, richly branched shoots. Similar structures were observed in an individual showing most affinity with f. *lubrica*, collected at the end of June at Kap Hope. The majority of its assimilatory filaments were truncated, but some of the cells in the remaining portions of the shoots had given rise to a great number of papillae and thin branches. It applies, however, to both cases that no spores were observed.

Elachista fucicola sens. lat. is a very common alga in the examined localities. Its vertical range extends from some few metres down to a depth of 36 m. The plants collected at a depth of 36 m belong to f. *lubrica* which seems, on the whole, to extend farther down than f. *typica*. The latter was, however, found down to at least 15 m. The species grew epiphytically on no less than 21 different algae, most commonly on *Desma-*

restia aculeata (which it may, together with *Leptonema*, render slightly tomentose), *Chaetomorpha*, *Punctaria glacialis*, and *Polysiphonia*. As the species almost invariably is stated to be epiphytic, it may be of special interest that it was found also on stones (if not on a crust-forming alga which in its turn inhabited the stone), byssi of bivalves, hydroids (*Halecium muricatum*), and bryozoans (*Eucratea loricata* and *Scrupocellaria*). It should be added in this connection that COLLINS (1891, p. 339) encountered it on woodwork and that I observed it on tubes of a polychaete contained in material originating from the Jørgen Brønlund Fjord (LUND, 1951, p. 15).

The individuals collected by me were, with respect to their substratum, distributed as follows: on *Desmarestia aculeata*, 13 instances; *Chaetomorpha* 11; *Punctaria glacialis* 10, *Polysiphonia* 10, *Stictyosiphon* 5, *Fucus* 4, *Laminaria* (stipe and haptera), *Chaetopteris*, and *Halosaccion* 3, *Dictyosiphon*, *Sphacelaria*, and *Lithoderma* 2, *Ahnfeltia*, *Phyllophora*, *Euthora*, *Rhodomela*, *Chordaria* (basal portion), *Chorda tomentosa* (basal portion), *Punctaria plantaginea*, *Pylaiella*, and *Haplospora* 1, hydroids 1, bryozoans 2, byssi of bivalves 1, stones 2 instances.

Previous Records from Greenland:

E. Gr.: Nine localities between lats. $65^2/_3$ and 82° N. (R. 1893 & 1898, l. c.; 1910, p. 121; 1933, p. 8; J. 1904, p. 35; L. 1951, p. 15).

W. Gr.: Numerous localities from the southern point to lat. $76^3/_4$° N. (R. 1893 & 1898, l. c.; 1926, p. 12; K., l. c.; L. 1933, p. 11).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 6—9 m, 14—16 m, 16—18 m, 22—25 m; Kap Hope, common between 5 and 13 m; the mouth of Hurry Inlet, 3—4 m, 7—10 m, 12—13 m, 25—35 m; Fame Øer, 4—6 m, 12—18 m; Bjørneøer, 6—11 m, 9—20 m; Danmarks Ø (N. H.); ibid. 1—3 m, 15—16 m, 18—22 m; Rødeø, 2 m, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 8 m, 12—20 m, 36 m; Vinterøer, 3—6 m, 14—18 m, 21—22 m; the head of Dusén's Fjord, 15—25 m; Nordfjord, on free-floating algae.

Chordariaceae

Eudesme J. Agardh, 1880.

1. **Eudesme virescens** (CARM.) J. AGARDH, op. c., p. 31; KUCKUCK, 1929, p. 47, fig. 55; PARKE, 1933, pp. 15 and 37; KYLIN, 1933, p. 56; 1940, p. 31; ROSENV. & LUND, 1943, p. 28.

Mesogloia virescens CARM. in HOOKER, British Flora, Vol. 2, 1833, p. 387; HARVEY, Phycol. Brit., pl. 82; THURET, 1850, p. 237, pl. 27.

Castagnea virescens (CARM.) THURET in LE JOLIS, 1863, p. 85; SAUVAGEAU, 1929, p. 281; HAMEL, 1935, p. 158.

Aegira virescens (CARM.) SETCHELL & GARDNER, 1925, p. 547.

In material originating from a dredging made at Kap Tobin in mid-August were found some unquestionable, although minute individuals belonging to this species. They inhabited the bryozoan *Scrupocellaria*, collected at a depth of 6—11 m. The largest plant attained a height of well over 1.5 cm only. The individuals were unbranched, although in one of them branching had commenced. They bore plurilocular sporangia.

Each plant consists of an axis, composed of many central filaments. In one of the individuals, the axis throughout most of its length is covered with peripheral assimilatory threads, often occurring in bundles;

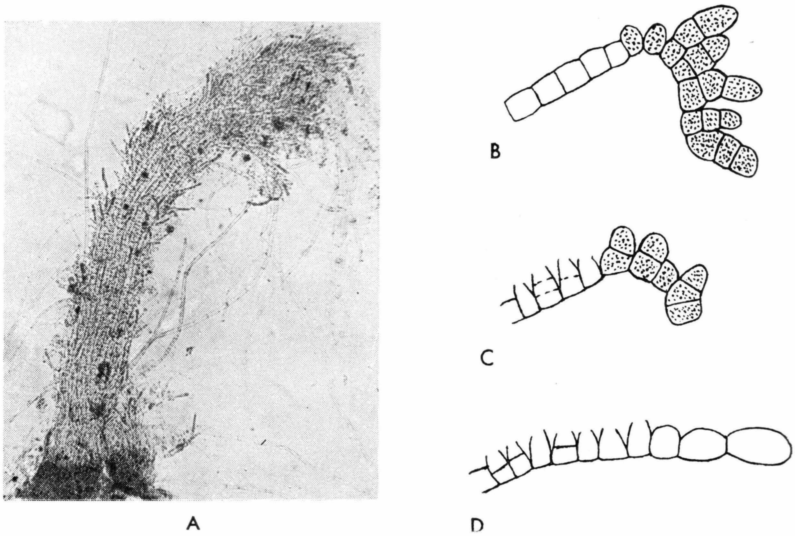


Fig. 25. *Eudesme virescens*. A: young plant exhibiting assimilatory threads almost exclusively in its uppermost portion; B, assimilatory thread; C—D, uppermost portion of assimilatory threads, all of them exhibiting plurilocular sporangia.
A: × 50 (approx.); B—D: × 625.

in the other plants the axis is mostly naked, actual assimilatory threads occurring almost exclusively in the upper part of the central filaments (fig. 25 A).

The assimilatory threads are usually curved, at any rate when they have attained a certain length. They are frequently thickest in their upper part where the cells often are slightly swollen. In some cases the upper cells contain a yellowish, homogeneous substance. Hairs with a basal meristem occur abundantly, exhibiting a diameter of about 8.5—14 μ.

Plurilocular sporangia were described and depicted by THURET (1850, pl. 27 fig. 4) and PARKE (op. c., pl. 6 fig. 30) and are mentioned by JÓNSSON (1903, p. 171) and LEVRING (1937, p. 59). They occur in the upper part of the assimilatory threads. According to KYLIN (1940, l. c., & 1947, p. 57) it is, however, uncertain whether the species does actually possess plurilocular sporangia. This author advances the opinion that the plurilocular sporangia depicted by THURET pertain to another species, viz. *Sauvageaugloia chordariaeformis* (= *Castagnea ch.*).

After the above collections were made I have found plurilocular sporangia in a specimen from the Baltic (see ROSENV. & LUND, l. c., fig. 10 C) and do not feel the slightest doubt about the presence of plurilocular sporangia in this species. Also in the East Greenlandic plants they were seriate and occurred in the uppermost part of the assimilatory threads (fig. 25 B—C) and seem to correspond fairly well with THURET's drawing, although they do not project so far as depicted by that author. In most cases they are unilateral, more rarely issuing in various directions. Several plurilocular sporangia are, however, considerably reduced and do not project at all; they seem to have arisen from the cells without any prior division of the latter. In some instances the uppermost cells of the fertile assimilatory threads are still sterile (fig. 25 D).

In a squeezed preparation were observed some spores that had germinated. The germlings were quite similar to those depicted in THURET's fig. 3, consisting of two or three cells and derived from "oosporanges". In my preparation they were situated immediately outside some emptied plurilocular sporangia. Two of the germinating spores seemed, however, to be situated within the sporangia so that I am inclined to conclude that the spores actually have germinated while still enclosed in the sporangia but that most of them were squeezed out as a result of the pressure on the cover-glass. Unilocular sporangia were not observed, but would possibly have developed later on.

Previous Records from Greenland:
E. Gr.: None.
W. Gr.: Three localities between lats. $65^1/_2$ and $72^3/_4$° N. (R. 1898, p. 58; L. 1933, p. 13).

Scoresby Sund District: Kap Tobin, 6—11 m.

Chordaria C. Agardh, 1817.

1. Chordaria flagelliformis (MÜLL.) C. AG., op. c., p. 12; KJELLM., 1877 a, p. 28; 1883, p. 249 (310); REINKE, Algenfl., p. 74; Atlas, H. 2, pl. 39 figs. 1—7; ROSENV., 1893, p. 854; 1898, p. 58; JÓNSSON, 1904, p. 31; SAUVAGEAU, 1929, p. 266, fig. 2; ROSENV. & LUND, 1943, p. 34; CARAM, 1955, p. 18.
Fucus flagelliformis O. F. MÜLLER in Fl. Danica, Fasc. 11, pl. 650, 1775.

The species is widely distributed in my area where it was encountered from the upper part of the sublittoral region down to a depth of 35—38 m. It is most frequent at rather small depths, between 6 and 9 m. Farther south, near Angmagssalik in lat. $65^2/_3$° N., it is reported to occur in the littoral region (ROSENVINGE, 1898, l. c.). I found it growing on stones, shells, *Fucus*, *Desmarestia aculeata*, *Punctaria glacialis*, haptera of *Laminaria*, *Dictyosiphon*, and *Rhodomela* as well as on the bryozoan *Scrupocellaria*. Despite its wide distribution it occurs only sparsely and plays no important role in the composition of the vegetation. Besides, most of the specimens collected were young and their being recognized was in many cases due to the fact that they have been kept in alcohol so that they could be examined in the soaked state, by means of the binocular dissecting microscope.

As at Spitsbergen (KJELLMAN, 1877a, l. c.) the species is more slender in E. Greenland than when occurring in Skagerak and Kattegat, but it may attain an appreciable length. This applies to some specimens originating from the Duséns Fjord, one of which even measured 45 cm, though not being intact. These plants were characteristic particularly in exhibiting elongate, flaccid main axes and reminded perhaps most of f. *ramusculifera* KJELLMAN (1877a, pl. 1 fig. 10) with the exception that the laterals of my plants are three to four times as long as those depicted by that author. The main axes were thicker than the branches. The branches of the first order were sparingly branched, and no branches of orders higher than the second were observed. The plants correspond to a certain degree to the elongate, flaccid *typicus* → *flaccidus* type of *Dictyosiphon foeniculaceus*.

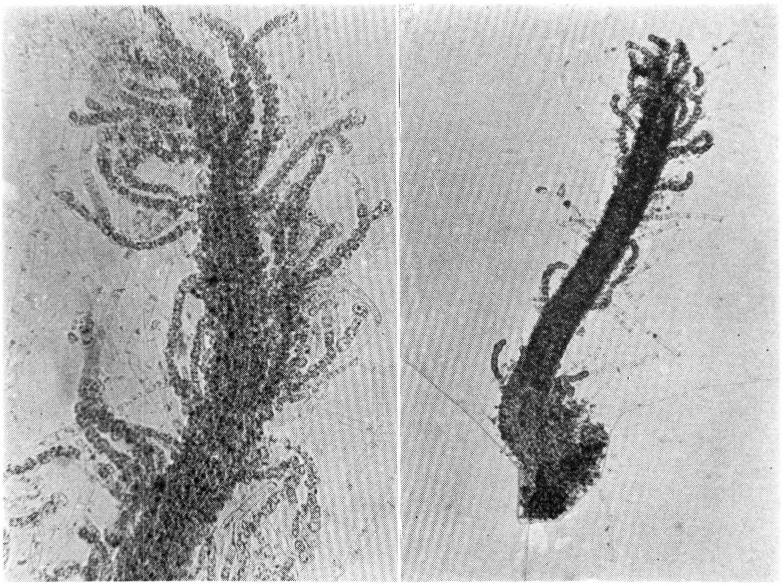
At Kap Tobin I encountered plants attaining a length of up to 19 cm quite similar to f. *subsimplex* KJELLMAN (1877a, pl. 1 fig. 16), and at Bjørneøer I found individuals of the same type measuring up to 15 cm in length.

The plants from the above-mentioned three localities were collected in July and August; they date presumably from the end of the winter or spring of 1933. They were not fully developed but bore numerous unilocular sporangia, many of which were mature or emptied. The diameter of the unilocular sporangia was often conspicuously small. In the plants from Kap Tobin the sporangia in some cases occurred in pairs, one sporangium being inserted into the basal part of the other which was curved below.

In several localities I observed old plants that were truncated some few centimetres above their base, no doubt having hibernated. They grew gregariously and arose from a disc-shaped or cushion-like basal portion, similar to the condition mentioned by KJELLMAN (1877a, l. c.) for f. *chordaeformis*. The shoots in question were usually simple and dark-coloured, sometimes nearly black. In some instances their surface was covered with paraphyses, which might be branched, interspersed with numerous mature or emptied unilocular sporangia. The terminal cell of the paraphyses differed only slightly from their other cells. Other shoots were, however, devoid of paraphyses and sporangia.

Some of the older shoots were of a more brownish colour. They are presumably somewhat younger than the dark ones but have no doubt hibernated like the latter.

In the plants concerned, several young shoots issued from the basal cushion as well as from the dark shoots. They were of a light colour, short, simple or branched, and had been given out in the year in which



A B

Fig. 26. *Chordaria flagelliformis.* A: upper half of a young plant with free threads; B: somewhat older plant found on *Rhodomela* and still exhibiting free threads. A: × 115 (phase-contrast); B: × 65.

they were collected. They had a peculiar appearance, quite different from that of the other shoots, as the filaments of their central axis had continued their growth so as to exceed the axis proper and form a bundle of free, mono- or partially disiphonous (or polysiphonous) cell-threads, bearing a great number of hairs. Similar threads might be given out laterally at lower levels, too. Paraphyses had not yet been formed on these shoots, but the surface was more or less covered with slightly inflated cells. When issuing from old shoots, the young ones might be lateral or given out from the place of truncation. The fact that the lateral shoots are given out from the very central axis proves that they constitute true laterals and not independent plants growing epiphytically on the old ones. In some shoots the outer cell-walls of the free filaments were conspicuously convex and, apart from their hairs, such threads showed a striking resemblance to the creeping threads which SAUVAGEAU (op. c., fig. 2 A—E) succeeded in obtaining when cultivating swarmers from the unilocular sporangia; however, the distal cells of the threads depicted by SAUVAGEAU differ from those exhibited by my plants. In other shoots the cells of the free filaments were oval.

The young shoots in question are quite similar to young plants I have met with in many of the examined localities, where they occurred singly or some few together growing directly on the substratum (presum-

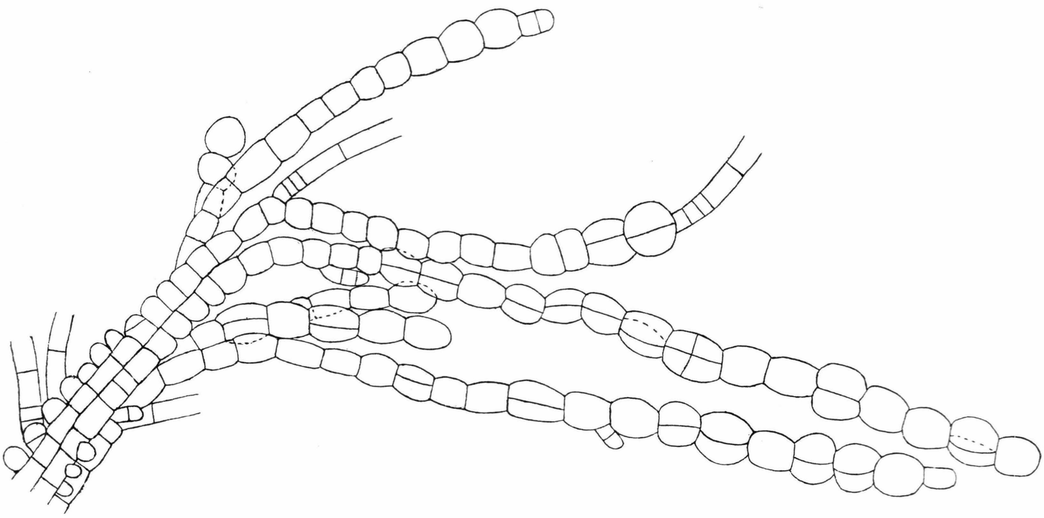


Fig. 27. *Chordaria flagelliformis*. Tip of young plant with free threads. × 350.

ably always an alga) without being accompanied by older shoots. In some cases several of the shoots in such bundles had shed the free threads and assumed the normal *Chordaria* appearance, although the surface might as yet be covered only with slightly inflated, somewhat pyriform cells or with two-celled paraphyses. The growth is probably very rapid and already in August such young light-coloured shoots might be fertile.

In fig. 26 I have depicted some young plants of the above-mentioned appearance, and in fig. 27 the tip of a shoot. As will be seen, my plants correspond with the young sporophytes recently obtained by CARAM (op. c., figs. 7c—d, 9) in cultures of the species under consideration.

A thorough examination of the young plants in my material has proved that at a very early stage the basal disc issues numerous short, erect, free, monosiphonous, somewhat curved threads. Their upper cells are longer than the lower ones, thicker and somewhat constricted at the transverse walls. In due course the upper cells become barrel-shaped, the uppermost ones even nearly spherical. In their uppermost part the terminal cells sometimes bear a hair which is, however, deflected to one side when growth continues, the growth thus becoming sympodial.

After a short time one or more of the upper, oval or spherical cells are divided by a transverse wall, and shortly afterwards such walls appear in several of the other upper cells too. The cells thus formed undergo further divisions (transverse and longitudinal), followed by a slight bulging-out of the outer walls, the result being stages corresponding to the free threads at the tips of the young shoots.

At a slightly later stage of the development the young plant appears pseudo-parenchymatous, with a central axis formed by uniting of the free cell-threads in their lower part, but still without paraphyses and covered only with fairly few, scattered, inflated cells. These cells gradually increase in number so as to form a continuous layer. The innermost part of each cell is cut off, the outermost part constituting the initial of a future paraphyse. Shortly afterwards paraphyses occur abundantly, forming a continuous cover, but the primary paraphyses remain distinguishable on account of their larger diameter. The terminal cell, in particular, is conspicuously large.

The time at which the free threads are shed varies from one plant to another. In some individuals the shedding takes place at a rather late time and I have met with plants of up to 2.3 cm in length in which the free threads still persisted.

While it is annual in other areas (cf. e. g. REINKE, Algenfl., l. c.; PRINTZ, 1926, p. 178; KYLIN, 1947, p. 60) the species may thus grow older in East Greenland. The basal cushion may presumably reach an older age than the upright shoots.

As shown by CARAM (op. c.) in cultures of plants from Danish waters the species exhibits an alternation of two heteromorphous generations. The *Chordaria* plant observed in nature represents the sporophyte in whose unilocular sporangia meiosis is presumed to take place. The gametophyte is microscopic and consists of branched threads bearing plurilocular sporangia in which supposed anisogametes are formed.

Previous Records from Greenland:

E. Gr.: Five localities between lats. 60 and $70^1/_2$° N. (R. 1893 & 1898, l. c.; J., l. c.).

W. Gr.: Commonly distributed from the southern point to lat. $78^1/_3$° N. (R. 1893 & 1898, l. c.; 1926, p. 12; L. 1933, p. 13).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 6—9 m, 11—13 m; Kap Hope, slightly below 0 m; the mouth of Hurry Inlet, 9 m, 35—38 m; Fame Øer, 4—6 m, 8—12 m; Bjørneøer, 6—11 m; Danmarks Ø, (N. H.); Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 10 m; Vinterøer, 2—3 m, 14—18 m, 21—22 m; the head of Duséns Fjord, 15—25 m; Nordfjord, on free-floating *Dictyosiphon.*

Desmarestiales

Desmarestiaceae

Desmarestia Lamouroux, 1813.

1. **Desmarestia aculeata** (L.) Lamour., op. c., p. 25; Rosenv., 1893, p. 857; 1898, p. 59; id. in Rosenv. & Lund, 1943, p. 51 (with references to literature); Jónsson, 1904, p. 32; Printz, 1926, p. 175.

f. *typica.*

f. *media* (Ag.) J. Ag., 1848, p. 168; Rosenv., 1893, p. 858; Børgesen, 1902, p. 445; Jónsson, 1904, l. c.; Printz, 1926, p. 176.

A widely distributed and in many localities important species. It usually inhabits stones and rocks, more rarely the haptera of *Laminaria.* In one instance some young plants were observed on the sipho of a bivalve. The largest specimens on hand (kept in the dry state) measured when soaked 97 and 110 cm, respectively, and were collected at the mouth of Hurry Inlet at a depth of 35—38 m and at Kap Tobin at a depth of 6—11 m, respectively.

The species is characteristic of the sublittoral region from about 4 m to approximately 40 m, presumably most abundant from about 10 to upwards of 20 m, in several localities forming communities. I encountered such communities in Amdrups Havn (14—16 m and 22—25 m) and at Kap Tobin (17—21 m) where the dredge might often be stuffed almost exclusively with this species.

It occurs also unattached on soft bottom and may then be abundant (cf. Rosenvinge's (1898, l. c.) records from Danmarks Ø). I myself found it in the same locality, occurring unattached on soft bottom at depths of 5 m and 15—16 m, respectively. I observed it occurring in the same manner at the head of the Dusén's Fjord at a depth of 15—25 m, almost unmixed at that, accompanied only by unattached *Chaetomorpha.*

On clay bottom at Ella Ø this species plays an important role and forms a distinct community. In this locality, however, a great number of the plants were attached to shells and small stones.

In a zoological work Thorson (1933, p. 54 et seq.) has already mentioned this community from Ella Ø and other localities in the Kejser Franz Josephs Fjord complex, although without indicating the specific name *aculeata.* In some places the community was nearly unmixed, in others also *Fucus*, *Laminaria* and Red Algae occurred. At Ella Ø it extended to a depth of 40 m.

In East Greenland the shedding of the 'hairs' obviously commences in June, but hairs may still persist in specimens collected as late as in August. In Jónsson's (l. c.) material, most of which originates from the districts south of Scoresby Sund between lats. $65^1/_2$ and almost 70° N., hairs were abundant in the specimens dating from May whereas among those collected in June only some few bore a small number of hairs. With regard to material from Kangerdlugssuaq (between lats. 68 and $68^{1}/_{2}°$ N.). ROSENVINGE (1933, p. 11) states that even a single specimen dating from August still exhibited some hairs. The same author (1898) reports that near Danmarks Ø in Scoresby Sund (in lat. $70^{1}/_{2}°$ N.) the hairs are shed in August. At Danmarks Havn (in lat. $76^{1}/_{2}°$ N.) hairs still persisted in plants dating from July, whereas those collected in August and September were devoid of hairs with the exception of a single plant from August (id., 1910, p. 117). In all plants from the Jørgen Brønlund Fjord (in lat. 82° N.), dating from the beginning of August, the hairs had been shed (LUND, 1951, p. 15).

As regards such of my own plants as were collected at the end of June (at Kap Hope) part of them were already devoid of hairs, whereas others still exhibited hairs which, however, usually occurred only on some of the youngest shoots. Most of my plants from July and August were devoid of hairs. An exception was constituted by the individuals collected at the end of July at a depth of 6—11 m at Bjørneøer, nearly all of which were richly hair-bearing. It is true that also in mid-August I observed individuals (at Kap Tobin at a depth of 6—11 m) in which the younger shoots still exhibited hairs, and even as late as on August 22 (at Rødeø at a depth of 13—15 m) did I collect an individual with numerous hairs, but this plant seems to belong to f. *media*, a characteristic feature of which is the late persistence of its hairs.

The time at which the plants reach the hairless stage has relation to the light-intensity. Thus, with regard to the Trondhjemsfjord PRINTZ (p. 19) draws attention to the fact that individuals growing in deeper water preserve their hairs later in the summer than those from smaller depths. This also applies to Danish waters, from where ROSENVINGE (in ROSENV. & LUND, 1943, l. c.) records plants with numerous hairs collected at depths of 24—31 m in the North Sea as late as the end of July or the beginning of August.

In several localities were encountered plants with local hypertrophies. I cannot explain the reason for these excrescences which were, incidentally, similar to others met with in a specimen of *D. viridis*.

In addition to the main form, or f. *typica*, I have, as mentioned above, found a single plant which shows much resemblance to f. *media* and which I have, although with some doubt, referred to that form. This specimen was intact and vigorous, richly branched, well over 40 cm in length and very sparsely provided with spinules, and bore numerous long hairs when collected at the end of August. In its lower part it exhibited two pairs of opposite branches. BØRGESEN (l. c.) and PRINTZ (l. c.) are inclined to consider f. *media* a distinct species, which view is held also by PEASE (1917, p. 386), SETCHELL & GARDNER (1925, p. 561), and the Japanese authors NAGAI (1940, p. 52) and TOKIDA (1954, p. 98).

I have had an opportunity of examining ROSENVINGE's (1893, l. c.) and JÓNSSON's (1904, l. c.) Greenlandic and BØRGESEN's (l. c.) Faroese specimens of this form and agree with the last-mentioned author that typical f. *typica* plants and typical f. *media* plants differ considerably from each other. However, my East Greenlandic plant suggests that f. *media* is merely a form of *D. aculeata*. While, on one hand, it shows much accordance with the above-mentioned specimens of f. *media* (apart from the spinules and the more vigorously developed thallus), its resemblance to *D. aculeata*, on the other hand, is unquestionable.

Opposite branching may also occur in the lower part of the thallus of f. *typica*, as observed e. g. by ROSENVINGE in an individual from North East Greenland (1910, l. c.) and in plants originating from the northern Kattegat (in ROSENV. & LUND, 1943, p. 52). I have had an opportunity of examining the plants in question which exhibited numerous spinules and corresponded perfectly with f. *typica*. In my East Greenlandic material I have also encountered a specimen with opposite branching in its lowermost part, belonging to f. *typica*.

D. aculeata is an important host for various small epiphytes forming crusts or delicate tufts. Among those most constantly occurring, *Elachista fucicola* and *Leptonema fasciculatum* seem to be the two most abundant. In spite of their inconsiderable size they may sometimes render otherwise hairless hosts slightly tomentose.

Previous Records from Greenland:

E. Gr.: Numerous localities between lats. $65^1/_2$ and well over 82° N. (Z. 1874, p. 84; R. 1898, l. c.; 1910, p. 116; 1933, p. 11; J. 1904, l c.; THORSON, 1933, p. 54 et seq.; L. 1951, p. 15).

f. *media:* One locality in lat. $74^1/_4$° N. (J., l. c.).

W. Gr.: Numerous localities between the southern point and lat. 81° N. (R. 1893 & 1898, l. c.; 1926, p. 12; K. 1897c, p. 32; L. 1933, p. 12).

f. *media:* Two localities in lat. 70° N. (R. 1893, l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m, 17—21 m, 27—31 m; west of Kap Tobin, 30—40 m; Amdrups Havn, 14—16 m, 22—25 m; Rosenvinges Bugt, 8—10 m, 10—12 m (A. P.); Kap Hope, 6—13 m; the mouth of Hurry Inlet, 4 m, 12—13 m, 35—38 m; Fame Øer, 4—6 m, 12—18 (?) m; Kap Stewart, cast ashore (N. H.); Bjørneøer, 6—11 m; Danmarks Ø (N. H.); ibid. 1—3 m, 5 m and 15—16 m (unattached), 18—22 m; Rødeø, 13—15 m (f. *media*).

Kejser Franz Josephs Fjord District: Ella Ø (Thorson); ibid. 8 m, 20—25 m, 36 m; Vinterøer, 3—6 m, 14—18 m, 21—22 m; the head of Duséns Fjord (unattached); Nordfjord (free-floating); Kap Borlase Warren (f. *media*, C. K.).

2. **Desmarestia viridis** (O. F. MÜLL.) LAMOUR., 1813, p. 25; ROSENV., 1893, p. 859; 1898, p. 60; id. in ROSENV. & LUND, 1943, p. 54; JÓNSSON, 1904, p. 32; PRINTZ, 1926, p. 174.

Dichloria viridis (MÜLL.) GREV., KJELLM., 1883, p. 263 (325).

The vertical range of this species within my districts is from about 15 m down to 35—38 m. It generally grows on stones but was also found occurring epiphytically on the stipe of *Laminaria saccharina* as well as epizoically on the sponge-like hydroid *Lafoëina maxima.* It occurred most commonly near Kap Tobin, Vinterøer and Ella Ø, but in none of the localities was the occurrence of any importance. In most instances it was encountered in the deep-water community of Florideae in which *Laminaria solidungula* and *saccharina*, *Desmarestia aculeata*, *Alaria* and other species also occur. Near Vinterøer it was a component of the community dominated by *Punctaria glacialis.* At the mouth of Hurry Inlet, several individuals were found at a depth of 35—38 m but they seem to have occurred loose-lying on the bottom. The largest of the specimens collected measures about 38 cm in length and is intact. It was found at Kap Hope on June 30 at a depth of nearly 30 m. In this specimen the shoots bore a rather great number of hairs in their upper parts.

With regard to the time at which the hairs are shed it can be stated that I found plants without, or nearly without, hairs in both July and August. In the same months I encountered, however, also individuals still possessing the majority of their hairs. The above-mentioned large specimen was the only one dating from June.

No information is available on the fructification of this species when occurring in East Greenland. As might be expected the unilocular sporangia occur in summer in these areas too and were observed in June—August. They are scattered over the surface as depicted by Bornet in Hariot (1888, pl. 6 fig. 2) and do not form sori as indicated by Abe (1938, figs. 1—2). From West Greenland unilocular sporangia are recorded only in some plants collected in mid-August (Lund, 1933, p. 12) but they are, of course, common also in West Greenland.

The species is undoubtedly sensitive to the little saline water forming a surface-layer during the period of snow-melting in spring and early summer. As pointed out by Printz (1926 l. c.) this must be the reason why the species is not found in the uppermost part of the sublittoral zone in the Trondhjemsfjord, and the same applies to East Greenland. In Danish waters the salinity of the surface-water is not appreciably reduced in spring and the species is, consequently, encountered already at a depth of 1—2 m (Rosenvinge in Rosenv. & Lund, 1943, p. 55).

Previous Records from Greenland:

E. Gr.: Eight localities between lats. 68 and well over 82° N. (Z. 1874, p. 86, sub nom. *Dictyosiphon foeniculaceus*; R. 1898, l. c.; 1910, p. 117; 1933, p. 11; J., l. c.; L. 1951, p. 15).

W. Gr.: From the southern point to lat. $78^{1}/_{3}$° N. (R. 1893 & 1898, l. c.; 1926, p. 12; L. 1933, p. 12).

Scoresby Sund District: Kap Tobin, 17—21 m; Amdrups Havn, 14—16 m, 22—26 m; off Kap Hope, 20—28 m; the mouth of Hurry Inlet, 25—35 m and 35—38 m (unattached); Fame Øer, 15—20 m; Danmarks Ø, 8—19 m (N. H.); Rødeø, 32—35 m.

Kejser Franz Josephs Fjord District: Ella Ø, 12—20 m, 20—25 m; Vinterøer, 14—18 m; Kap Borlase Warren (C. K.).

Dictyosiphonales emend. Papenfuss 1947, p. 401.

Striariaceae

Stictyosiphon Kützing, 1843.

1. Stictyosiphon tortilis (RUPR.) REINKE, Algenfl., p. 55, and Atlas, p. 47, pls. 31—32; ROSENV. 1898, p. 70; 1935, p. 3; WÆRN, 1952, p. 155.

Scytosiphon tortilis RUPR., 1856, p. 373.

Dictyosiphon tortilis GOBI, 1874, p. 15, pl. 2 figs. 12—16.

Phloeospora tortilis (RUPR.) ARESCH., 1876, p. 34; KJELLM., 1877 a, p. 40, pl. 1 fig. 21; 1883, p. 264 (327).

One of the commonest species in my districts, found in all the examined localities, in most cases even abundantly. It was encountered from the uppermost part of the sublittoral region down to a depth of 35—38 m, though it seems to be most frequent at depths from some few metres down to 15—16 m. The great majority of the individuals were unattached. Some plants, chiefly young ones, were, however, attached to stones or to other algae, most frequently *Fucus* and *Desmarestia aculeata*, more rarely *Chaetopteris*, *Chaetomorpha*, or *Laminaria* (haptera). Attached plants were, moreover, observed on *Mya* shells.

At Kap Hope unattached individuals occurred in company with other unattached algae in loose-lying balls. Besides *Stictyosiphon*, these balls contained mainly *Chaetopteris* and *Sphacelaria* and, moreover, small quantities of *Desmarestia aculeata*, *Pylaiella*, *Polysiphonia*, and *Rhodomela*.

The species exhibits a fairly wide range of variability. Thus, some individuals are rather robust while others are thin. A characteristic attached form was found in several localities in Scoresby Sund, growing in quite shallow water and forming small tufts measuring 2—9 cm in height. It was characteristic in being rather delicate and flaccid, issuing an exceedingly great number of short, thin, crowded branches. It constitutes a reduced form which is also known from Danish waters. I have met with quite similar plants, in January at Saltholm off Copenhagen, growing near the watermark.

While in certain other areas the species is annual (cf. e. g. REINKE, Algenfl., l. c., and KYLIN 1947, p. 68) it is perennial when occurring in East Greenland (ROSENVINGE, 1898, l. c.). According to the last-mentioned author the growth of the plant, when occurring at Danmarks Ø, is arrested during winter but resumed in April. In most of my plants, particularly in those dating from June and the first part of July, it was easy to ascertain the increase as the new shoots are of a very light colour and devoid of epiphytes, whereas the old shoots are dark and often exhibit numerous epi- and endophytes which may render these shoots slightly tomentose. The rate of growth varies considerably from one locality to another. As an instance of vigorous growth may be mentioned that an old fragment, 4.5 cm long, collected on June 27 at Kap Hope at a depth of 6—12 m, issued new shoots measuring up to 16 cm in length. Another specimen, fructifying and measuring about 2.5 cm in length, collected August 5 at a depth of 2—5 m at Ella Ø where it grew on *Fucus*, showed an increase of 0.5 mm only.

In all the individuals the shoots are distinctly articulated throughout most of their length. The articulation is very often conspicuous also in the old, dark brown shoots, in which the segments may be markedly barrel-shaped.

Plurilocular sporangia were met with in July and August in attached specimens. The number of fructifying individuals is, however, insignificant in proportion to the material on hand. Sporangia were observed at Kap Tobin, at Fame Øer, in Nordbugten, at Danmarks Ø, Rødeø, and Ella Ø. In several instances they occurred in plants originating from shallow water.

The plurilocular sporangia are somewhat protruding. They are found particularly (or exclusively?) in shoots dating from the preceding year and occur not only in well-developed individuals but also in feebler ones. They were abundant in the above-mentioned small, though at least one year old, individual collected at Ella Ø, which was almost simple as, in addition to four branch-initials, it bore one small branch only.

The plurilocular sporangia occur singly or, more often, several together. In some individuals collected at Kap Tobin the fructification was copious as the majority of the surface-cells of the fertile threads were converted into plurilocular sporangia.

Unilocular sporangia were not observed and are unknown. It is true that prior to Reinke's careful investigations (Atlas, pl. 32) the plurilocular sporangia generally were regarded as unilocular ones, their thin septa disappearing before the spores are liberated. Even after that author's elucidation of the nature of the sporangia they have by some authors been described as unilocular, e. g. by Jónsson (1904, p. 34) who records them in individuals from East Greenland.

St. subarticulatus is a closely related species. By Areschoug (1873, p. 164, and 1875, p. 25, pl. 3 figs. 2–5) it was described as *Phloeospora* *subarticulata* but was later by Hauck (1885, p. 375) referred to the genus *Stictyosiphon*. Reinke (Atlas, p. 48) included it, however, in *St. tortilis* which procedure was followed e. g. by Rosenvinge (1935, l. c.). In recent years Levring (1937, p. 71) has re-established its specific rank and extended it to comprise *Kjellmania striarioides* Gran (1897, p. 38) and *Stictyosiphon Corbierei* Sauvageau (1929, p. 298) as well as *Stictyosiphon soriferus* Rosenvinge (1935, p. 9), all of which are interpreted as small specimens of *St. subarticulatus*. Kylin (1947, p. 68) and Feldmann (1954, p. 49) follow Levring although, considering Reinke's experiences, Kylin still feels some doubt as to whether *Stictyosiphon subarticulatus* and *St. tortilis* do really constitute two distinct species.

I share Kylin's doubt, but feel convinced that *St. soriferus* Rosenv. deserves specific rank. It is characterized e. g. by the fact that its large central cells are nearly isodiametric and by the occurrence of plurilocular sporangia in both the parenchymatous portion of the thallus and the monosiphonous parts of the shoots. *St. tortilis* is characteristic in exhibiting central cells, appreciably longer than broad, and in bearing plurilocular sporangia only in the parenchymatous portion of the thallus (in plants collected in nature). Finally, in his *St. soriferus* Rosenvinge observed unilocular sporangia in addition to the plurilocular ones (1935, p. 14, fig. 14) while, as mentioned above, only plurilocular sporangia are known in *St. tortilis*.

Previous Records from Greenland:

E. Gr.: A dozen localities between lats. $65^1/_2$ and 82° N. (R. 1898, l. c.; 1910, p. 118; J. 1904, p. 34; L. 1953, p. 16).

W. Gr.: Almost 20 localities between lats. $60^1/_2$ and $78^1/_3$° N. (R. 1893, p. 869; 1898, l. c.; 1926, p. 12; K. 1897c, p. 32; L. 1933, p. 12).

Scoresby Sund District: Kap Tobin, 6—11 m, 27—31 m; Amdrups Havn, slightly below 0 m, 6—9 m, 25—26 m; Kap Hope, a little below 0 m, 6—13 m, 30 m; the mouth of Hurry Inlet, 7—13 m, 35—38 m; Fame Øer, 2 m, 4—14 m; Bjørneøer, slightly below 0 m, 6—11 m; Nordbugten, 2—3 m; Danmarks Ø (N.H.); ibid. 1—3 m, 5 m, 15—16 m; Rødeø, 2 m, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 10 m, 20—25 m, Vinterøer, 2—6 m; the head of Dusén's Fjord, 15—25 m; Nordfjord, free-floating; Kap Borlase Warren (C. K.).

Acrocytis Rosenvinge, 1933.

1. **Acrocytis groenlandica** Rosenv., op. c., p. 8, fig. 3.

This species is incompletely known, being described on the basis of unattached sterile individuals collected in the below locality. As it may be supposed to represent a modified, hairless form of *Stictyosiphon* I have, though of course provisionally, classified it close to the latter. Its systematic position cannot be finally decided so long as its reproductive organs are unknown. PAPENFUSS (1951, p. 126) with some doubt refers it to *Sphacelariaceae*. Not encountered by me.

Previous Records from Greenland.
E. Gr.: One locality (Kangerdlugssuaq) in lat. 68—68½° N. (R., l. c.).
W. Gr.: None.

Punctariaceae

Punctaria Greville, 1830.

1. Punctaria plantaginea (ROTH) GREV., op. c., p. 53, pl. 9; HARVEY, Phycol. Brit., pl. 128; KJELLM., 1883, p. 260 (323); ROSENV., 1898, p. 71; JÓNSSON, 1903, p. 161; HAMEL, 1937, p. 213; ROSENV. & LUND, 1947, p. 11 (with references to literature).

Ulva plantaginea ROTH, 1800, p. 243; ENGL. BOT., tab. 2136.

The species is widely distributed but occurs as a rule only in rather small quantities. It was met with from slightly below 0 m down to at least 21 m, but seems to be most frequent at depths between some few metres and approximately 15 m. In some cases it was encountered growing on stones. It is, however, mostly met with epiphytically, particularly on *Fucus*, but also fairly frequently on *Desmarestia aculeata*, *Chaetopteris*, and *Punctaria glacialis*. It was, moreover, observed on *Chaetomorpha*, *Laminaria* (lamina, stipe, and haptera), *Chordaria*, and *Polysiphonia* as well as on the bryozoan *Eucratea loricata*.

The individuals usually occur in tufts, more rarely singly. They are generally rather small and narrow. The largest plants measured 10—14 cm or slightly more in length and about 0.7 cm in width, a single individual, however, upwards of 1 cm in width. The width measures frequently no more than some few millimetres, even in fairly long plants. Thus, an individual originating from Ella Ø attained a length of 7 cm while its width measured no more than 0.2 cm. In the most well-developed individuals the thickness is from 70 to 140 μ; it may vary considerably even at short intervals in one and the same thallus. Older vigorous plants are of a fairly dark colour.

In addition to the surface-layer on both sides, the thallus exhibits two, more rarely one or three, cell-layers which are almost hyaline whereas the surface-layer is of a darker colour. The cells of the inner layers are usually larger than those of the outer ones (contrary to HAMEL l. c., fig. 44_3). In transverse section they are generally rounded, isodiametric, and of fairly varying dimensions. In longitudinal section they appear as a rule to be somewhat elongate, their length measuring up to two diameters. In some instances the intercellular substance is vigorously developed. The cells of the superficial layer are frequently divided by walls perpendicular, more rarely parallel, to the surface.

Hairs occur abundantly in all well-developed plants and may often render the thallus slightly tomentose. They arise in tufts, are long and vigorous and possess a basal meristem, surrounded by a sheath. In younger plants they are observed only at the margin of the thallus, occurring solitarily but in great numbers.

Unilocular sporangia are common and are abundant in the most vigorous plants. They occur singly or form small sori; in some instances

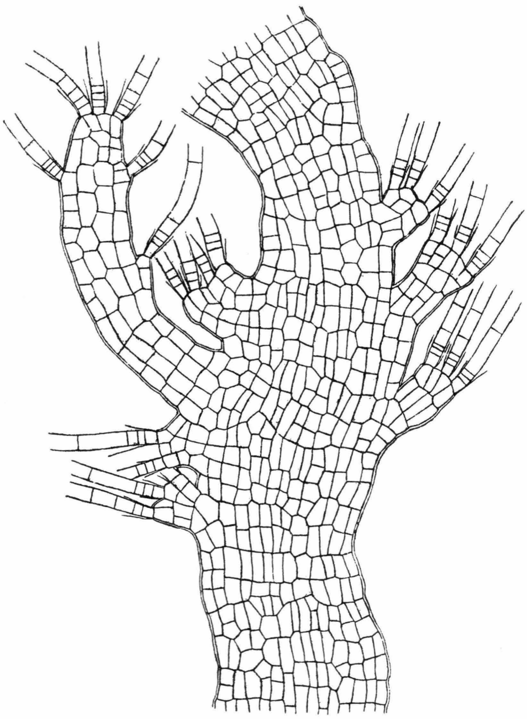


Fig. 28. *Punctaria plantaginea.* Part of a branched plant. × 115.

they were almost immersed and projected only slightly, in others, however, they protruded rather much. They extend apparently rarely far beyond the inner limit of the outer cell-layer, although in some cases they may stretch into the middle cell-layers (cf. HAMEL, fig. cit.). If sori are formed, the walls between adjacent sporangia usually are plane. Sporangia were found in June, July, and August, in all three months represented by young ones, mature ones with differentiated spores, as well as emptied ones. Plurilocular sporangia were not encountered.

In its typical form the species is simple, but in some rather young individuals, collected at Rødeø on August 22 at a depth of 2 m, short branches occurred. When most primitive these branches were formed by elongation of a hear-bearing marginal cell. At more advanced stages of development the branches consisted of a monosiphonous cell-thread. In several instances the branches were flattened, resembling the main shoot (fig. 28). In this connection it should be added that branches may also occur in the allied species *Desmotrichum undulatum* (cf. Reinke, Algenfl., p. 58; Kylin, 1907, p. 70; Rosenv. & Lund, op. c., p. 8, fig. 1 A).

In the material from Rødeø were, moreover, encountered branched plants and fragments that were only poorly developed, their growth being arrested at a juvenile stage as, in surface view, the thallus exhibited only two to few cell-rows. The individuals involved were old and consisted of yellow cells with plentiful fucosan. Some of the branches had recently produced into monosiphonous or flat shoots of a light colour which at their basal portion might give rise to hyaline rhizoids. In other cases the old branched plants might even be monosiphonous, consisting of cells filled with fucosan.—The occurrence of such feebly developed old plants is undoubtedly due to unfavourable growing conditions.

Previous Records from Greenland:

E. Gr.: One locality, Danmarks Ø, mentioned below (R. 1898, l. c.).

W. Gr.: Eight localities between lats. $60^1/_2$ and $72^3/_4°$ N. (R. 1893, p. 872; 1898, l. c.; 1926, p. 12).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 11—13 m; Kap Hope, 2 m, 5—7 m; the mouth of Hurry Inlet, 7—10 m; Fame Øer, 4—6 m, 5—10 m; Bjørneøer, slightly below 0 m, 6—11 m, 10—21 m, 14—17 m; Danmarks Ø (N. H.); ibid. 1—3 m, 5 m; Rødeø, 2 m, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 10 m, 20—25 m; Vinterøer, 2—3 m, 14—18 m, 21—22 m; the head of Dusėns Fjord, 15—25 m.

2. Punctaria glacialis Rosenv., 1910, p. 118, figs. 6—7.

Seems to occur commonly in my districts where it was encountered most abundantly in the outer, but comparatively sheltered areas (such as the mouth of Hurry Inlet and Vinterøer). It was, however, also recorded in the innermost part of Scoresby Sund (at Rødeø). It occurred at depths from 4—6 m down to 35—38 m, though most commonly at a depth of at least 10 m. It grows on stones and may often be abundant. At Vinterøer it formed a community at a depth of 14—18 m.

I collected quite a number of individuals in June, July, and August; they are kept partly as herbarium specimens, partly in alcohol. When dried they are usually of a brownish olive green colour, some, however, light olive green, others fairly dark. Most of the individuals are oblong and exhibit a nearly constant width, measuring about 2.5—6 cm only, whereas the length frequently is at least 35—50 cm. It is, however, as a rule impossible to state the exact length as, owing to their fragile thallus, the plants seldom are intact. One not intact individual measured about 1 cm in width and 26.5 cm in length; in another likewise incomplete specimen the width measured about 2.5 cm and the length about 50 cm.

In other individuals the width is greater, measuring about 10 cm, and some of them may be of a shape very similar to that depicted in ROSENVINGE's fig. 6. The largest plant was collected at Rødeø at a depth of 13—15 m. It was not intact but measured, nevertheless, no less than about 60 cm in length; at this distance from the base the width, increasing gradually from the lowermost part, measured about 23.5 cm.

The stipe is poorly developed. Its length measured from less than 1 cm to 1.5 cm. In transverse section its diameter measured well over 0.5 mm (measured on a single individual only). At its bottom the stipe passes over into a small cushion-like attaching disc, at its uppermost part it expands into the lamina. In individuals with a narrow frond the transition into the lamina is gradual, in those with a broad frond it is more abrupt. The central portion of the stipe is of a loose texture, perhaps in due course becoming partially hollow.

The thickness of the lamina varies from 115 to nearly 200 μ (measured on individuals kept in alcohol), most commonly about 160 μ. The lamina usually consists of 4 to 6 cell-layers. In longitudinal and transverse sections its appearance is characteristic as the cells of the surface-layer on each side may be palisade-like arranged. As these cells are often provided with walls perpendicular to the lamina their width frequently is rather small as compared with their length. The latter may, incidentally, vary appreciably as the cells are often further divided by oblique walls or walls parallel to the surface. The walls between adjacent cells are thin, the outer ones very thick and of a brownish colour.

The cells of the middle layers generally are larger than the superficial cells and rather thick-walled. In longitudinal section their length often appears to be rather great as compared with their diameter.

Hairs were not observed. Unilocular sporangia were encountered in some few instances only, in plants dating from July, and seem to correspond perfectly with those mentioned by ROSENVINGE. In some cases they do not extend to the surface. Plurilocular sporangia were not observed and are unknown.

As far as I know this high-arctic species has not been recorded from localitities outside of NE Greenland. It is noteworthy that KJELLMAN did not find it at Spitsbergen.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $76^1/_2$ and 82° N., respectively, (R. 1910, l. c.; L. 1951, p. 16).

W. Gr.: None.

Scoresby Sund District: Kap Hope, 6—7 m, 7.5—10 m, 10—11 m, 12—13 m; the mouth of Hurry Inlet, 9 m, 35—38 m; Fame Øer, 4—6 m, 9 m; Bjørneøer, 9—20 m; Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 20—25 m; Vinterøer, 14—18 m.

Omphalophyllum Rosenvinge, 1893.

1. Omphalophyllum ulvaceum Rosenv., op. c., p. 872, fig. 19, and pl. 2 figs. 1—2; 1898, p. 73; E. Sinova, 1914, p. 238.

An arctic deep-water species which in my districts was encountered at such considerable depths as between 27 and 50 m, in a single locality, however, at a depth of 15—16 m. It inhabits chiefly *Euthora cristata*, *Turnerella*, and the ascidian *Ascidia callosa*. Moreover, it was observed on *Phyllophora Brodiaei*, *Phycodrys*, *Alaria* (stipe), and on *Lithothamnion*. The species occurs generally in sparse quantities. Only at Ella Ø, where it inhabited *Turnerella* at a depth of at least 40 m, was it fairly well represented, though mainly by quite young plants. On the whole, nearly all the plants were small, only a single specimen, which was not intact, measuring about 9 sq. cm. The species, when dried, is of an olive colour similar to that of the previously collected Greenlandic specimens, kept in the herbarium of the Botanical Museum of the University of Copenhagen.

The individuals correspond perfectly with Rosenvinge's description. The rhizoids attaching the plant consist of long, very thin cells. In all the individuals the stipe is short and solid, as a rule passing into the frond near its margin though in the largest specimens at some distance within the margin. The cells harbour several disc-shaped or, in some cases, rod-shaped chromatophores. In the largest individual a vertical section was made of the frond about 2 cm above the insertion of the stipe, where the thallus appeared monostromatic and measured 29—33 μ in thickness. Unilocular sporangia were observed only in one plant, collected at the beginning of July, nearly all of them being emptied.

As my material contained several quite young and slightly older stages, I have been able to trace the development of the species. It appears that, at a very early stage, the species consists of a short, upright, monosiphonous filament (fig. 29 A). Such threads were encountered in various localities where they always occurred in company with somewhat older *Omphalophyllum* germlings. For this reason, and because the cells of the threads are exactly similar to those of the monosiphonous part of the tap in somewhat older plants (cf. fig. 29 C), I have no doubt about their identity.

During the growth of the young thread several cells very soon undergo transverse and longitudinal divisions. This activity continues and in due course the thread acquires the appearance depicted in fig. 29 B. At this stage or somewhat later the thallus commences to become hollow except in its upper and lower parts, the latter eventually developing into a stipe.

Subsequently the young plant commences to curve, its hollow part undergoing repeated cell-divisions causing it to bulge out one-sidedly like a bladder or a sack. Shortly afterwards it tears open longitudinally in its concave part. The rupture is evidently due to the fact that in this part the cells have undergone very few divisions, if any. At any rate, the margin-cells of the ruptured thallus are larger than its other cells. Immediately after the rupture the thallus is markedly curved, but shortly afterwards the part in which the rupture occurred spreads out like a membrane, at the summit of which the original tip of the thread persists as a tap while the lowermost part, which has undergone no rupture, persists as a solid stipe attached a little way within the margin.

Fig. 29 C shows a plant shortly after the rupture has taken place. In this plant the margin-cells of the ruptured thallus were clearly situated at a higher level than its other cells. The rupture was also easily recognized where the torn thallus passes into the stipe and the tap, respectively. In the figure I have stressed the cell-walls at these points and also the walls of the marginal cells of the membranous portion so as to indicate that the cells in question were situated at a higher level than the others.

The formation of the membranous thallus by a rupture of a hollow frond is thus in conformity with the supposition advanced by ROSENVINGE (1893, l. c.). This mode of development is, accordingly, known within all three algal groups. Within the Green Algae, *Monostroma* behaves similarly; within the Red Algae, *Porphyropsis coccinea*.

Previous Records from Greenland:

E. Gr.: Three localities between lats. $70^{1}/_{2}$ and $76^{1}/_{2}°$ N. (R. 1898, l. c.; 1910, p. 121; J. 1904, p. 34).

W. Gr.: Two localities in lats. $60^{3}/_{4}$ and 64° N., respectively, (R. 1893 & 1898).

Scoresby Sund District: Kap Tobin, 30—40 m, 50 m; Amdrups Havn, 15—16 m, 30 m; Kap Hope, 27 m; the mouth of Hurry Inlet, 35—38 m; Danmarks Ø (N. H.); Rødeø, 34 m.

Kejser Franz Josephs Fjord District: Ella Ø, in a dredging from a depth of 40—80 m; Kap Borlase Warren (C. K.).

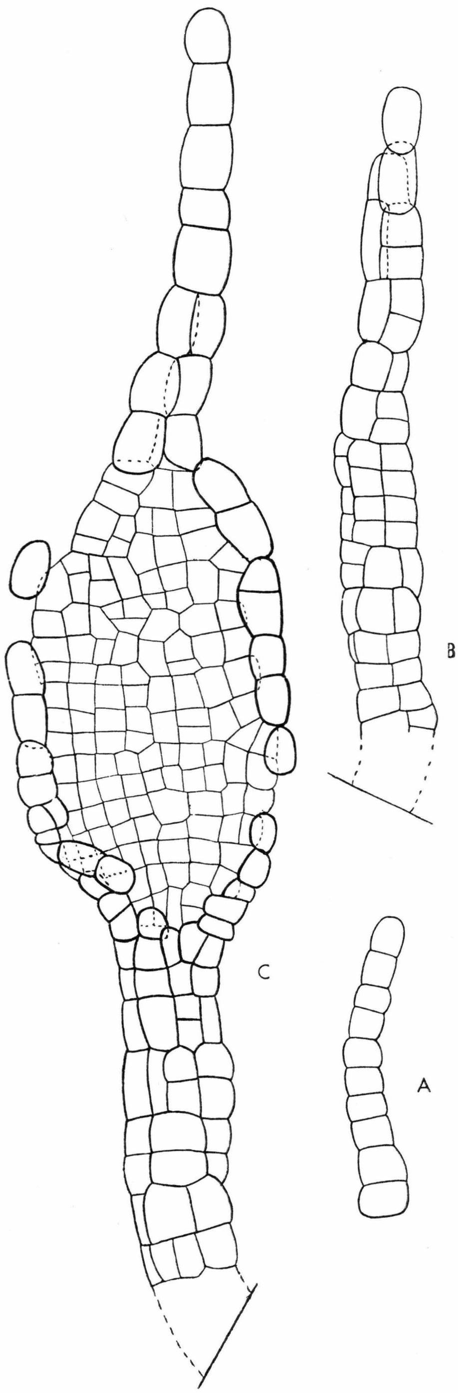


Fig. 29. *Omphalophyllum ulvaceum.* A: young monosiphonous thread; B: polysiphonous thread; C: young plant shortly after the rupture of the hollow part of its thallus. In B and C, the basal portions could not be clearly distinguished and are indicated by dotted lines. The substrata are indicated by full-drawn lines. A—C: × 350.

Litosiphon Harvey, 1849.

1. Litosiphon Mortensenii sp. nov.; *Litosiphon* sp. in ROSENV. & LUND, 1947, p. 23, fig. 6.

Plantae filiformes, ad 2 cm longae vel ultra, 125 μ crassae, fasciculatae. Cellulae externae 24—32 μ longae, 20—28 μ latae. Pili 14—20 μ crassi. Sporangia plurilocularia pro ratione magna, prominentia, irregulariter subconica, 28—52 μ longa, singula vel in soros aggregata, in loculos multos 7—10 $\times$ 7—8.5 μ magnos divisa. In filis juvenibus sporangia intercalaria. Sporangia unilocularia ignota. Algis majoribus affixus.

Typum ad oram insulae Ella Ø (Groenlandiae orientalis) legit auctor die 3. Aug. 1933.

In some dredgings at depths between 6 and 10 m at Ella Ø were found small quantities of a simple filiform Brown Alga, forming tufts and undoubtedly representing a new species of the genus *Litosiphon.* The individuals inhabited *Desmarestia aculeata* and *Fucus*, partly in company with *Litosiphon groenlandicus.* They bore plurilocular sporangia and plenty of hairs. The longest threads, though not intact, measured 2 cm in length, their diameter measuring up to about 125 μ.

The threads are of a parenchymatous structure. The outer walls of the surface-cells appear thick and rather markedly convex. The surface-cells measure 24—32 $\times$ 20—28 μ and harbour several small disc-shaped chromatophores (fig. 30 B). The threads do not exhibit any differentiation into large central cells and smaller peripheral ones which is, however, presumably due to their young age. In fig. 30 C—F I have depicted some transverse sections of threads at different ages.

The diameter may vary perceptibly from one section to another in one and the same thread. Thus, a young polysiphonous, fructifying thread exhibited a monosiphonous sterile section, about 100 μ in length, in which the diameter measured only about 35 μ, while above and below this section it measured about 70—85 μ. All the threads are attenuated in their lower part.

Rhizoids occur commonly in the basal part of the threads but may also be encountered at higher levels. In a single instance I observed rhizoids issuing from a parenchymatous fructifying portion. One of these rhizoids gave rise to a young upright shoot much as in *Delamarea.*

Plurilocular sporangia occur all over the threads except in the lowermost part of the latter. They are formed from superficial cells and protrude fairly much (fig. 30 B, E—F); they are as a rule rather large, short and irregular conical, irregular ovate or of another more or less irregular shape, their dimensions being 28—52 $\times$ 24—40 μ. In younger parenchymatous threads they occur as a rule singly or some few together while in more well-developed threads they form small sori. In the former

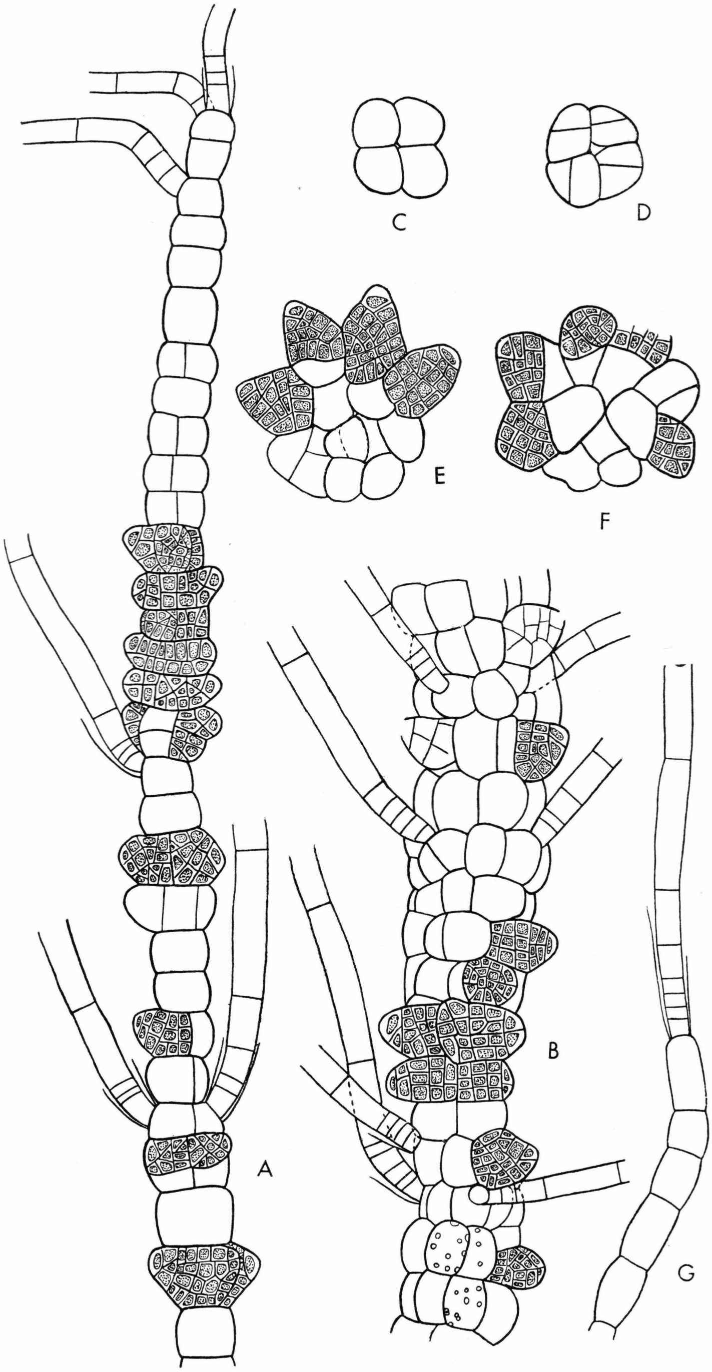


Fig. 30. *Litosiphon Mortensenii.* A: uppermost fourth of a young thread with intercalary plurilocular sporangia; B: part of the upper portion of a somewhat older plant in which the lower portion was partially monosiphonous; C—F: transverse sections of threads of different thickness; G: young monosiphonous thread. A—G: × 270.

case they remind very much of the sporangia occurring in the *Litosiphon* sp. depicted by me in fig. 6 in Rosenv. & Lund, 1947.

When forming sori the sporangia usually are coalescent, in their lower part only (fig. 30 E) or throughout most of their length, only the uppermost part being free.

The plurilocular sporangia are characteristic not only in being protruding but also in exhibiting large loculi and large spores. The loculi measure 7—10 × 7—8.5 μ. The liberation of the spores takes place through an apical aperture.

The hairs are chiefly opposite or verticillate, though occasionally being scattered. They are typical phaeosporean hairs possessing a basal, sheathed meristem, are often narrowed near their base, and measure 14—20 μ in diameter.

As the tufts contain threads of different ages it is possible to describe some developmental stages. The young plants consist of a monosiphonous cell-thread, terminating in a sheathed hair (fig. 30 G). The somewhat older plants exhibit, moreover, lateral scattered or opposite hairs. When the thread has attained a certain length the hairs seem to be chiefly opposite or verticillate and the apical cell often bears 2—3 hairs. Such articulations as give rise to two opposite hairs are very often conspicuously short and almost invariably longitudinally divided.

Fructification commences already when the threads are still monosiphonous or nearly so. In such threads the plurilocular sporangia are intercalary and project like papillae (fig. 30 A). As, prior to the formation of sporangia, the articulations involved usually become longitudinally divided each articulation will as a rule give rise to more than one sporangium. In most instances the entire articulation becomes fertile, in others only part of it.

The intercalary sporangia generally are seriate. The threads show a certain resemblance to Reinke's (Atlas) pl. 12 fig. 2 depicting *Desmotrichum balticum* and to Rosenvinge's (1935) drawings of *Stictyosiphon tortilis* (fig. 8 C—E) and *St. soriferus* (figs. 11 A and 18), as well as to fructifying tips of shoots in certain other Brown Algae, depicted by other authors.

When the threads develop further, longitudinal walls become of common occurrence and transverse walls also appear in the new cells. The cells of the threads divide further to render the latter parenchymatous and plurilocular sporangia are now formed from the surface-cells. In some instances the uppermost part of the thread may for some time remain thin and give rise to intercalary sporangia like those observed in the young threads. Thus, such individuals simultaneously bear intercalary sporangia near the tips of the shoots and superficial sporangia in the parenchymatous portion of the thallus, a condition found also in

Litosiphon filiformis (cf. KUCKUCK, 1899, p. 362), *Stictyosiphon soriferus* ROSENV., and other species. Plurilocular sporangia were met with in August, several of them being emptied, whereas unilocular sporangia were not observed.

I feel convinced that the above-mentioned Danish *Litosiphon* sp. in ROSENV. & LUND (1947, l. c.) is identical with the species under consideration, from which it differs only by the condition that the central cells are larger than the peripheral ones. However, as mentioned above, it is most probable that the individuals collected by me would at an older age exhibit a similar differentiation. As none of my plants seem to be mature, and as the Danish individuals were not intact, the possibility cannot be completely excluded that the fully developed individuals are branched, which would suggest an affinity with the genus *Stictyosiphon*.

Personally I am, however, of the opinion that this is only a remote possibility so I choose to refer my plants to a new species within the genus *Litosiphon* and to name it after the zoologist Dr. TH. MORTENSEN who collected the Danish individuals as early as in 1895. As I had already prepared the manuscript dealing with this species when I worked up the Danish *Phaeophyceae* the diagnosis is based on the Greenlandic material from Ella Ø.

Kejser Franz Josephs Fjord District: Ella Ø, 6—9 m, 8 m, 10 m.

2. Litosiphon groenlandicus sp. nov.; LUND, 1951, p. 17.

Plantae filiformes, ad 4 cm longae, 50—200 μ crassae, in fasciculos paucifiles aggregatae. Cellulae externae thalli 14—40 μ longae, 12—32 μ latae, internae multo majores. Pili 8—16 μ crassi. Sporangia plurilocularia plerumque prominentia, obtuse irregulariter conica, 16—32 μ longa, multa contigua, in loculos multos 5—7 $\times$ 4—5 μ magnos divisa. In filis juvenibus sporangia plurilocularia intercalaria. Sporangia unilocularia ovoida vel paene subsphaerica, 33 μ longa, 29—33 μ diametro, plurilocularibus pauca immixta. Variis algis affixus.

This new species was encountered in no less than seven localities, occurring at depths from some few metres down to about 22 m, inhabiting *Desmarestia aculeata*, *Fucus* (including germlings), *Punctaria glacialis*, *Chaetomorpha*, *Chaetopteris*, and presumably also growing on stones (or perhaps on a crust-forming alga which in its turn grew on a stone). In most instances it inhabited the first-mentioned host. The species seems to be widely distributed, though usually occurring in small quantities.

The thallus is filamentous, measuring up to 4 cm in length and 50—200 μ in diameter. In several cases the diameter varies fairly much in one and the same thread. The individuals occur in tufts which, however, frequently consist of few threads only. The threads are of a parenchymatous structure and, in surface view, the outer cells appear polygonal (or rounded). These outer cells measure 14—40 × 12—32 μ and contain several disc-shaped chromatophores each. In the thickest threads the central cells are appreciably larger than the peripheral ones (fig. 31 C), while no differentiation exists in the thinner threads. In the lower part of the filaments rhizoids are abundant, but they do also occur at higher levels, even in several places, in which instances they may be very numerous.

Phaeosporean hairs possessing a basal, sheathed meristem are common. They are chiefly verticillate or opposite, measuring 8—16 μ in diameter, frequently attenuated below. In the more vigorous threads many of the hairs had broken off.

Except in the lower part of the filaments plurilocular sporangia occur in great numbers. In the thinner threads the sporangia form sori, in the more vigorous ones they form an almost continuous layer although larger or smaller sterile sections may be observed here and there. The sporangia arise from the superficial cells and their diameter is equal to that of the latter. They are generally somewhat protruding and irregular conical, frequently with an obtuse apex, which gives these threads a characteristic appearance (fig. 31 B—C). In most instances the sporangia are more or less coalescent. In transverse section of the thread they generally measure 16—32 μ in length. They contain a fairly great number of small loculi and spores, the loculi measuring 5—7 × 4—5 μ. The sporangia in the thicker threads sometimes appear transversely divided so that the fructifying portions are partially distromatic. In such cases the innermost sporangium may be divided by a longitudinal or oblique wall. Plurilocular sporangia were observed in July and August.

In the most vigorous threads in the material dating from July unilocular sporangia were observed in addition to the plurilocular ones, though occurring sparsely and being rather young. They were oval or subspherical, measuring 33 (—41) × 29—33 μ, and occurred singly or some few together amid the plurilocular sporangia.

At Ella Ø I encountered young individuals which furnished evidence that an early developmental stage is constituted by a monosiphonous cell-thread with a terminal, sheathed hair (fig. 31 D). Shortly afterwards lateral hairs appear, being chiefly opposite or verticillate, and intercalary plurilocular sporangia may also occur (fig. 31 A). As a rule the articulation appears completely fertile, more rarely only part of it (× in fig. 31 A). The hair-bearing articulations usually are conspicuously short and longitudinally divided. During the further development longitudinal walls are formed in several of the articulations, primarily in the immediately adjacent ones, the thread hereby increasing in thickness at such points.

Shortly afterwards small sori appear in the same places, composed of projecting plurilocular sporangia with a free apex, lending a characteristic appearance to the thread in which long, sterile sections alternate with short, thicker, fertile ones. During the further growth of the thread, which eventually becomes polysiphonous, the sori enlarge and

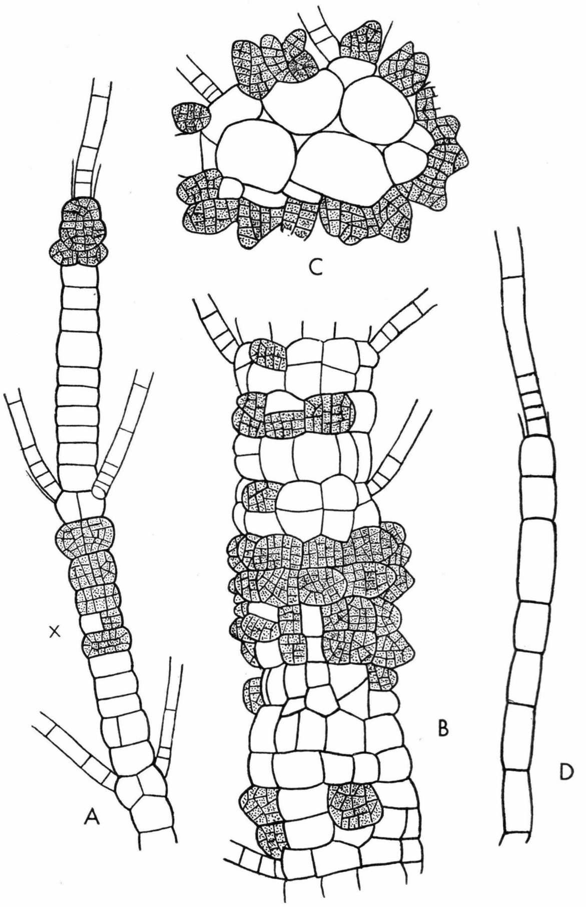


Fig. 31. *Litosiphon groenlandicus.* A: uppermost portion of a rather long, chiefly monosiphonous thread with intercalary plurilocular sporangia; the articulation marked with an x is only partially fertile; B: portion of a parenchymatous plant; C: transverse section of an older plant; D: a young monosiphonous thread. A—D: × 270.

other small sori or solitary sporangia appear in the intervals, the thread thus in due course assuming the appearance described above.

The presence of both kinds of sporangia in the same threads suggests that the plants are diploid. The swarmers produced in the plurilocular sporangia are undoubtedly diploid and reproduce the species vegetatively while those originating in the unilocular ones are haploid, arising after a prior meiosis. The life-cycle of this species presumably agrees with that of *L. pusillus*. According to Kylin (1933, p. 26) the latter, when occurring on the Swedish west coast, exhibits only plurilocular sporangia at the beginning of the summer, later in the summer both kinds of sporangia occur in one and the same individual, and in late autumn only unilocular ones are found. The plants involved are sporophytes whose plurilocular sporangia produce diploid swarmers while in the unilocular sporangia a meiosis is supposed to take place, their swarmers thus being haploid. The gametophyte is microscopic and occurs during winter. A similar condition seems to exist in the French form of *L. pusillus* inhabiting *Saccorhiza bulbosa*, which was cultivated by Sauvageau (1929, p. 350).

It appears from the above as well as from figs. 30 and 31, both of them magnified 270 times, that *Litosiphon groenlandicus* shows some resemblance to *L. Mortensenii*, particularly on account of its protruding plurilocular sporangia which are narrowed above. It might even prove to be the case that some of the distinctive characteristics will not remain valid when mature specimens of *L. Mortensenii* are found. This applies e. g. to the facts that unilocular sporangia were not observed in this species and that its threads are thinner. The two species do, however, differ from each other although the distinctive features mainly are of a quantitative character. Thus, *L. Mortensenii* exhibits larger and more protruding plurilocular sporangia with larger loculi and spores, and the diameter of its hairs is larger. In addition to these quantitative differences it should also be pointed out that in *L. Mortensenii* the surface-cells generally appear rounded, in *L. groenlandicus* usually polygonal.

The species under consideration shows a marked resemblance also to *L. pusillus*. From the latter species as encountered in Danish waters and on the Swedish west coast, mostly inhabiting *Chorda filum*, it deviates, however, by the shape of its plurilocular sporangia, by the greater number of spores in the sporangia, and by the smaller dimensions of its spores (cf. Kylin, 1933, fig. 5A). The last-mentioned two characteristics in *L. groenlandicus* recall Hamel's (1937) fig. 43 vi which is designated *L. pusillus* although hardly being identical with that species. However, as the shape of the sporangia in Hamel's plant differs from that found in *L. groenlandicus* these two species cannot be identical.

Previous Records from Greenland:

E. Gr.: One locality, Jørgen Brønlund Fjord, in lat. 82° N. (L., l. c.).
W. Gr.: None.

Scoresby Sund District: Kap Tobin, 6—11 m; Fame Øer, 5—6 m; Bjørneøer, 6—11 m; Danmarks Ø, 5 m; Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 10 m; Vinterøer, 2—3 m, 3—6 m, 14—18 m, 21—22 m.

3. Litosiphon subcontinuus (Rosenv.) S. Lund comb. nov.; id. in Rosenv. & Lund, 1947, p. 19.

Kjellmania subcontinua Rosenv., 1898, p. 64, fig. 14.

Recorded in three localities, in two of which, however, only in small quantities. In the third locality (Ella Ø) several individuals were collected. The species grew epiphytically on *Fucus* (including germlings), *Desmarestia aculeata*, *Chaetopteris*, and *Laminaria saccharina* (lamina) at depths between 1—3 and 10 m. Moreover, some few, young, unattached plants were found at a depth of 15—25 m in Dusėns Fjord occurring in a loose-lying tuft consisting of *Pylaiella* and *Ectocarpus confervoides* f. *siliculosus*.

The individuals collected formed tufts and were on the whole rather young, though most of them were fructifying. The longest plant measured almost 4 cm in length while, in the most vigorous filaments, the diameter of the fructifying portions measured about 150 μ. All the individuals were simple for which reason I refer the species to the genus *Litosiphon*. The fertile plants agree perfectly with Rosenvinge's description, with regard to their vegetative structure as well as to their plurilocular sporangia.

The youngest stage represented consists of a few-celled monosiphonous thread bearing a terminal hair (fig. 32 F). The somewhat older threads bear, moreover, one or several lateral hairs. In such plants, the cells are of nearly equal length and diameter. At a slightly later stage a meristematic zone becomes differentiated in the middle portion of the thread which at this point exhibits very low, almost disc-shaped cells. The cells below and above the meristem eventually become capable of division too, the entire thread thus consisting of low cells (fig. 32 B). Moreover, a longitudinal wall appears in some of the cells, particularly in the middle and lower portions of the thread (fig. 32 C). The thread has, however, usually attained a considerable length before longitudinal division of any importance sets in.

During its development the thread gives rise to many hairs. In addition to scattered, lateral hairs, one to three terminal ones occur (fig. 32 A—B). As a rule only one lateral hair issues from a hair-bearing cell though in some instances two hairs may occur, situated beside each other or one of them beneath the other (fig. 32 B—C).

Through further cell-divisions the thread acquires a parenchymatous structure, the diameter at the same time increasing. Hairs become abundant and sori formed from small projecting plurilocular sporangia become frequent, too. In transverse section the thallus at this stage exhibits large inflated central cells while the peripheral ones usually are considerably smaller (fig. 32 H). The longitudinal growth persists longest in the upper part of the thread, which frequently is monosiphonous and composed of low cells while the remaining part of the thread already has become parenchymatous.

The basal portion of the thread may likewise for a long time remain monosiphonous and thin. In one individual the cells of the monosiphonous basal portion measured only 20 μ in diameter while the polysiphonous part measured 58 μ. The lower cells are, however, fairly elongate and the longitudinal growth of the basal portion seems to cease rather early. Subsequently these cells become divided by longitudinal walls but the basal portion of the thread remains thinner than its other parts. This condition, however, is counterbalanced by a vigorous outgrowth of rhizoids from the lowermost cells.

The cells of the threads contain many disc-shaped chromatophores (fig. 32 D) which are of insignificant size in young, monosiphonous shoots while in older plants they are somewhat larger.

The hairs are long and vigorous and possess a basal meristem, composed of 3—5 cells of a brownish colour. Their diameter measures 17—27 μ and seems generally to be somewhat smaller in young plants than in adult ones.

Rhizoids were observed with certainty only in the basal part of the plant (fig. 32 E). They are simple or branched, in older individuals forming a cortex. Young upright shoots are in some cases given out from the rhizoids (fig. 32 F—G), either from the cortex-covered basal portion or from prostrate rhizoids.

In some young plants from Danmarks Ø, inhabiting *Desmarestia aculeata*, the prostrate rhizoids were composed of creeping, branched threads consisting of irregular cells and extending over the surface of the host (fig. 32 A).

The stage at which fructification commences seems to vary from one individual to another. Some plants exhibit sori of plurilocular sporangia when the thread is still monosiphonous or possessing longitudinal walls in few cells only. Thus, a single sorus measuring $40 \times 40\,\mu$ was found on a 0.2 mm long monosiphonous thread. When occurring on completely or chiefly monosiphonous threads the sori are separated by smaller or larger sterile intervals. In such instances the sori may cover, completely or in part, the cell(s) on which they are situated. It is noteworthy that also these plurilocular sporangia are external, the inner parts of the cells remaining sterile. This constitutes an essential difference from the alga depicted in REINKE's Atlas (pl. 3) and designated *Kjellmania sorifera.*

Fig. 32. *Litosiphon subcontinuus.* A: upright and prostrate threads; B—C: portions of young threads; D: cells of a young thread exhibiting chromatophores; E: lowermost, monosiphonous portion of a rather young thread, issuing rhizoids; F—G: young threads issuing from rhizoids; H: transverse section of an older thread with plurilocular sporangia and a hair. A, E: $\times$ 240; B—C: $\times$ 115; D, F—H: $\times$ 350.

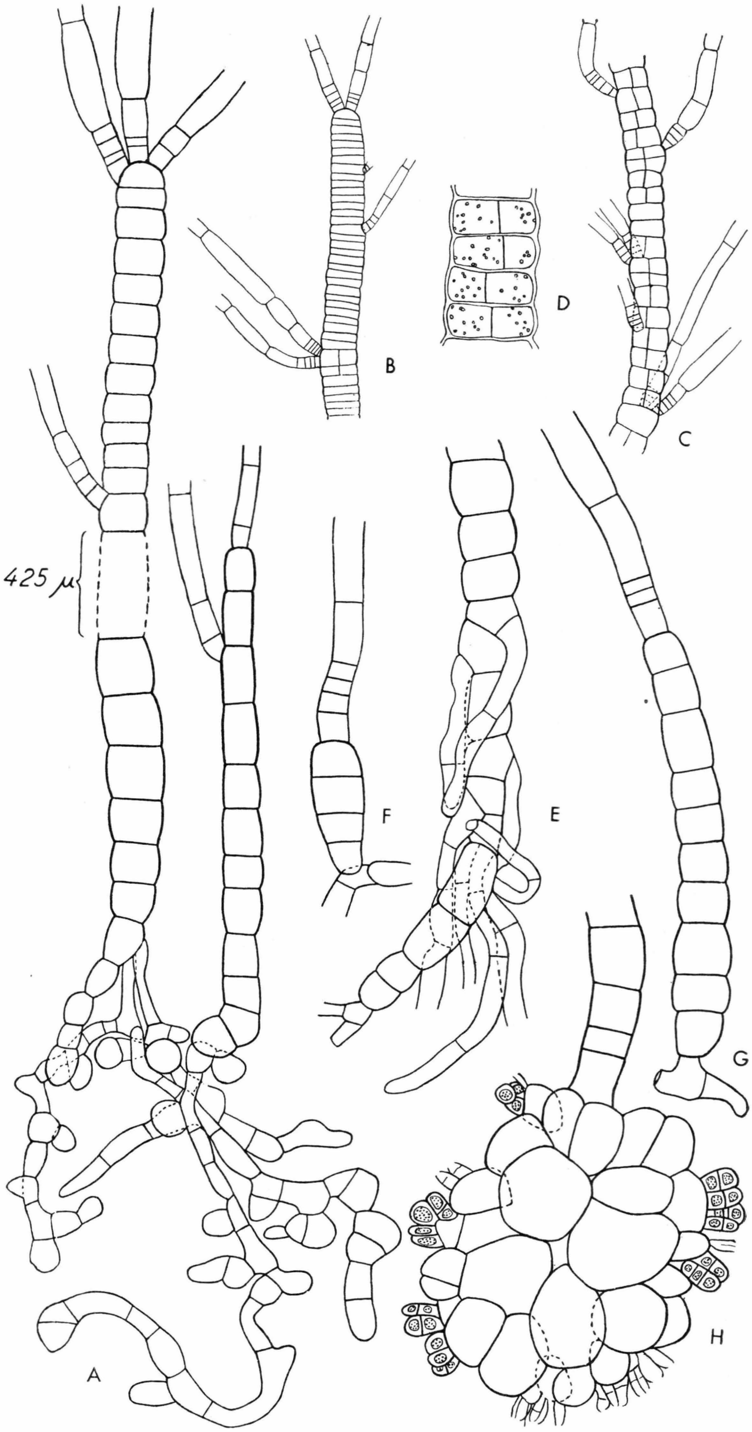


Fig. 32.

In the majority of the individuals the fructification seems, however, to commence only when the filament is polysiphonous and becoming parenchymatous. Sori were rather small and scattered in most plants of this structure. On the most vigorous threads they might be more or less confluent, though only over small areas.

The plurilocular sporangia (fig. 32 H), which agree with ROSENVINGE's records as regards both their shape and their dimensions, seem, however, only rarely to contain more than two compartments. They were observed in August. Unilocular sporangia were not observed and are unknown.

Outside of Greenland the species has been met with only in Danish waters where it occurred in a dredging made by ROSENVINGE in the Kattegat in May, 1893. ROSENVINGE was not, however, aware of its occurrence and it was not observed until my working up of a Danish *Ectocarpus* material. On this occasion I found it in a tuft consisting chiefly of *Ectocarpus confervoides* f. *siliculosus*. The Danish plants of this species were described by me in ROSENV. & LUND, 1947, l. c. They were more vigorous than the Greenlandic ones and measured well over 7 cm in length and up to 0.25 mm in diameter.

Previous Records from Greenland:
E. Gr.: None.
W. Gr.: One locality in lat. $60^1/_2°$ N. (R. 1898, l. c.).

Scoresby Sund District: Danmarks Ø, 1—3 m, 5 m.
Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 8 m, 10 m; the head of Dusėns Fjord, 15—25 m.

4. **Litosiphon filiformis** (RKE) BATTERS, 1902, p. 25; JÓNSSON, 1903, p. 162; PRINTZ, 1926, p. 167, pl. 3 figs. 18—19; KYLIN, 1937, p. 9, fig. 3; 1947, fig. 60 B—D; ROSENV. & LUND, 1947, p. 20, fig. 4.

Pogotrichum filiforme REINKE, Atlas, H. 2, p. 62, pl. 41 figs. 13—25; ROSENV., 1893, p. 869 (excl. *β*, *setiforme*); KUCKUCK, 1899, p. 360, fig. 1, pl. 13; 1917, p. 557, figs. 1—3.

Encountered only at Fame Øer at a depth of 5—6 m and in the Dusėns Fjord at a depth of 15—25 m. In both localities it formed dense growths on the lamina of *Laminaria*, in the Dusėns Fjord growing on both sides of the lamina of *Laminaria saccharina*. The individuals originating from the latter locality measured 2—3 cm in length, the filaments frequently coiling round one another, while those originating from Fame Øer measured upwards of 1 cm only.

The filaments, which issue from a basal disc, are simple and hairless. Their diameter varies fairly much even in one and the same thread, the majority of the threads being partially monosiphonous, partially polysiphonous. Some of them are, however, chiefly monosiphonous, disiphonous segments being few and scattered, while others are chiefly polysiphonous, being monosiphonous only in their upper and lower portions. The diameter usually varies between 25 and 45 μ; in the vigorous polysiphonous threads it may amount to 60—65 μ, exceptionally to 80 μ. Even in the most vigorous threads the lowermost portion remains monosiphonous and thin (about 20 μ) or may exhibit some few longitudinally divided cells.

In monosiphonous threads the cells are as a rule somewhat barrel-shaped; in young threads they may be cylindrical. In polysiphonous threads or segments, the outer walls are convex and the cells rather small. Each cell contains several disc-shaped chromatophores. Rhizoids occur in the lowermost parts of the threads (cf. Kuckuck (1899, fig. 1)

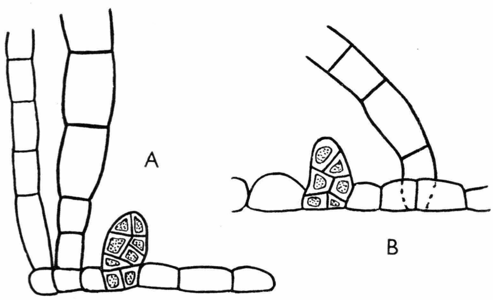


Fig. 33. *Litosiphon filiformis.* Plurilocular sporangia situated in the basal disc. A—B: × 525.

and other authors), but in some instances a few rhizoids may be observed at higher levels.

Plurilocular sporangia were met with in July and August and were of common occurrence, though not abundant. They are generally single, but in chiefly monosiphonous threads several consecutive cells may frequently be fertile. In monosiphonous threads the articulations usually become completely fertile, more rarely only in part as, immediately prior to the formation of the sporangia, small cells that remain sterile may be cut off by one or more, longitudinal or oblique walls.

It will be generally known that the species exhibits plurilocular sporangia in or on the basal disc in addition to those occurring in the upright filaments. Such basal sporangia were carefully described and depicted by Kuckuck (1899 and 1917). In my material from the Duséns Fjord, dating from the first half of August, I observed similar sporangia. They occurred as a rule in the disc (fig. 33) like those depicted in Kuckuck's (1899) pl. 13 fig. 16, usually singly, more rarely forming a sorus. Other sporangia were sessile or stalked on the basal disc, or intercalary and seriate in a sporangia-stalk or a short vegetative branch issuing from the disc. In addition to the basal sporangia, several of which were emptied, the basal discs bore numerous upright filaments.

In his work from 1893 (l. c.) ROSENVINGE established a variety of the species under consideration, *setiforme*, which has, however, later been given specific rank under the name of *Litosiphon setiformis* (ROSENV. & LUND, 1947, p. 21).

Previous Records from Greenland:
E. Gr.: None.
W. Gr.: Four localities between lats. 62 and 70° N. (R. 1893, l. c.; 1898, p. 71).

Scoresby Sund District: Fame Øer, 5—6 m.
Kejser Franz Josephs Fjord District: The head of Dusèns Fjord, 15—25 m.

Dictyosiphonaceae

Coilodesme Strömfelt, 1886 a.

1. **Coilodesme bulligera** STRÖMF., op. c., p. 173, and 1886b, p. 48, pl. 2 figs. 9—12; ROSENV., 1893, p. 862; 1898, p. 61, fig. 13; KUCKUCK, 1929, p. 89, figs. 142—44.

Previous Records from Greenland:
E. Gr.: One locality in the southernmost part in lat. 60° N. (R. 1893, l. c.).
W. Gr.: About ten localities between lats. 60 and 65$^1/_2$° N., most of them situated between lats. 60 and 60$^1/_2$° N. (R. 1893 & 1898, l. c.).

Not recorded by me.

Dictyosiphon Greville, 1830.

1. **Dictyosiphon foeniculaceus** (HUDS.) GREV., op. c., p. 56, emend. LEVRING, 1940, p. 55; ROSENV. & LUND, 1947, p. 63 (with references to literature).

f. *typicus* KJELLM., 1883, p. 269 (333); *D. foeniculaceus* (HUDS.) GREV. [s. str.], ROSENV., 1893, p. 859; 1898, p. 60; JÓNSSON, 1904, p. 33.
f. *flaccidus* ARESCH., 1873, p. 169; ROSENV., 1893, l. c.
f. *hispidus* KJELLM., 1877a, p. 39, pl. 2 fig. 1; *D. hispidus* KJELLM., 1883, p. 270 (334); ROSENV., 1893, p. 860.
f. *hippuroides* LEVRING, 1940, p. 55; *D. hippuroides* (LYNGB.) KÜTZING, Tab. phycol., VI, 1856, pl. 52 II; ROSENV., 1893, p. 860.

As shown by LEVRING (1940, p. 55) and other authors, a distinction between the two closely related "species" *D. foeniculaceus* and *D. hippuroides* cannot be kept, as numerous intermediate forms link them together. As a matter of fact they must be considered mere forms of one and the same species, their different habits being caused by external conditions. According to LEVRING even the age of the plant may influence its appearance. When growing in protected habitats or still being young the plant corresponds with f. *typicus* (= the former *D. foeniculaceus*), while in exposed localities it will develop into f. *hippuroides*

(= the former *D. hippuroides*). After having worked up the Danish material I arrived at the same conclusion (ROSENVINGE & LUND, l. c.).

When growing in very protected localities the species may be represented by a special form, f. *flaccidus*, which often occurs unattached and, if so, attains to a considerable length. This form, which is closely related to f. *typicus*, exhibits a very fragile and flaccid, somewhat inflated thallus which sometimes gives rise to numerous, short shoots.

D. hispidus is another "species" that is closely related to *D. foeniculaceus* s. str., or maybe rather to f. *flaccidus*. As appears clearly from KJELLMAN's (1877a) drawing it is especially characterized by the fact that the branches of the highest order but one are copiously provided with short, thin shoots. Its resemblance to f. *flaccidus* was already mentioned by GOBI (1878, p. 66) and ROSENVINGE (1893, l. c.). Incidentally, KJELLMAN (1877a) originally described it as a subspecies of *D. foeniculaceus* [s. str.] but later he gave it specific rank (1883, l. c.). COLLINS (mscr.) regarded it as a variety of *D. foeniculaceus* (TAYLOR, 1937a, p. 226) which point of view is held also by TAYLOR himself (l. c. and 1937, p. 184). The same interpretation is adopted in NEWTON's (1931, p. 169) Handbook and presumably by other authors. On the basis of my experiences in East Greenland I, too, find it unwarranted to give *D. hispidus* specific rank.

It is most probable that also *D. corymbosus* KJELLMAN (1883, p. 267 (330), pl. 26 figs. 12—15) is so closely related to the species under consideration in its present interpretation, that it ought to be included in the latter as a f. *corymbosus* (KJELLM.). It shows most resemblance to f. *hippuroides*, also as regards its structure (KJELLMAN, l. c.). Its chief distinctive feature lies in its elongated, usually simple, subcorymbose branches of the first order. Other characteristics are reported to be that branches of orders higher than the second are rare and that the sporangia often form small groups.

It will appear from the above that I regard *D. foeniculaceus* as a very variable species within which several forms may be distinguished, provided that the individuals concerned are typically developed. It must, however, be considered the rule that the specimens involved represent intermediate forms.

In East Greenland I encountered the four forms listed above, but also in my area most of the specimens represent intermediate forms. It is very common that the specimens belonging to f. *typicus-flaccidus* resemble f. *hispidus* more or less closely. They exhibit an elongated, flaccid thallus whose main axes, at any rate when older, are tubular and of a very loose structure. A greater or smaller number of long shoots bear numerous delicate, short shoots which often, however, are somewhat adpressed.

F. *flaccidus* occurred mostly in protected habitats, so it was surprising to encounter plants showing most resemblance to this form in the rather exposed locality Kap Tobin where they occurred in a *Laminaria* community at a depth of 6—11 m. These specimens were collected in mid-August; they were fructifying and so abundantly provided with hairs as to render the herbarium specimens quite glistening. Typically developed specimens of f. *flaccidus* were found in Nordbugten where they occurred loose-lying on soft bottom. These plants attained to a considerable length.

The most typical representatives of f. *hispidus* were met with in the Nordfjord but were, however, free-floating. They are in accordance with some of KJELLMAN's plants from Spitsbergen, kept in the Botanical Museum of the University of Copenhagen.

No more than two plants have been referred to f. *hippuroides*, which has not previously been recorded from East Greenland, one of them presumably having inhabited *Chordaria flagelliformis*. This individual, which was not intact, measures about 23 cm in length, is thin and flaccid but possesses numerous elongated, almost simple branches of the first order and of nearly equal length. The other individual resembles *D. foeniculaceus* in TAYLOR (1937, pl. 12 fig. 4) but, as far as could be ascertained, my plant possesses few branches of orders higher than the second.

The vertical distribution of this species ranges from the uppermost part of the sublittoral region down to a depth of 20—25 m. It grows on stones and on various algae such as *Desmarestia aculeata*, *Chordaria flagelliformis*, *Fucus*, and *Halosaccion*; in a single instance it was found on a hydroid. Besides in *Laminaria* communities it occurs in communities dominated by *Fucus* or other algae, as well as unattached in communities formed by loose-lying algae. In several cases it occurred only in sparse quantities, partly as fragments; together with *Stictyosiphon* it sometimes formed wads round the haptera of *Laminaria*. Unilocular sporangia were observed in June, July, and August; even material dating from the end of June contained many mature or evacuated sporangia. Practically all the plants were fructifying. In HARTZ' material from Danmarks Ø, ROSENVINGE (1898, l. c.) observed sporangia only in the plants dating from August while those from July were sterile. The sporangia are sometimes conspicuously elongate.

Previous Records from Greenland:

E. Gr.: Several localities between lats. 60 and $74^1/_2°$ N. (Z. 1874, p. 84, f. *hispidus* (sub nom. *Enteromorpha ramulosa*); R. 1893 & 1898, l. c.; J., l. c.).

W. Gr.: From the southern point to lat. $78^1/_3°$ N. (R. 1893 & 1898, l. c.; 1926, p. 12; K. 1897c, p. 32; L. 1933, p. 12).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 6—9 m, 11—13 m; Kap Hope, 2 m and a little above, 5—7 m, 12—13 m; the mouth of Hurry Inlet, 9 m; Fame Øer, 4—6 m; Kap Stewart, cast ashore (N.H.); Bjørneøer, 6—11 m; Nordbugten, 1—3 m and somewhat below (unattached); Danmarks Ø (N.H.); ibid., 1—3 m; Rødeø, 2 m, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 10 m, 20—25 m; the head of Dusén's Fjord, 15—25 m; Nordfjord, free-floating.

Laminariales

Chordaceae

Chorda Stackhouse, 1797.

1. Chorda filum (L.) STACKH., LYNGB., 1819, p. 72; KJELLM., 1890, p. 27; REINKE, Atlas, p. 37, pls. 26—28; KYLIN, 1918, p. 21; 1933, p. 69.
Fucus Filum LINNÉ, 1753, p. 1162.

Attached, unquestionable specimens were recorded only in two localities, namely at Fame Øer where they were collected on July 17 at a depth of 5—6 m, and at Bjørneøer, collected on July 25 at a depth of 6—11 m. All of them were small and filiform. Those originating from the former locality measured up to almost 4 cm in length, those from the latter only well over 0.5 cm.

To this species may, however, possibly be referred also a couple of individuals, sterile and not intact, about 20 cm in length and collected in mid-August in the Dusén's Fjord at a depth of 15—25 m. They exhibited hyaline hairs and grew on a small stone in intimate company with a *Ch. tomentosa* specimen. However, as the hairs in the latter possessed only some few and rather small chromatophores it might be possible that the hairs of the first-mentioned two plants previously had contained chromatophores which had degenerated at the time when gathering took place.

In the Nordfjord some sterile fragments were found at the beginning of August. They measured up to 25 cm in length and were free-floating but fresh.

The small filiform individuals inhabited stones, partly forming tufts. They were gradually tapering towards their apices. The youngest plants exhibited elongate surface-cells containing many small disc-shaped chromatophores. They bore numerous vigorous, verticillate, phaeosporean hairs and were frequently slightly constricted at the points where such hairs were situated; in the lower whorls the hairs might be less developed than in those occurring at higher levels. These plants correspond perfectly with REINKE's description and drawings (Atlas, p. 37, pl. 28 figs. 6, 9) and with KYLIN's (1933) fig. 35 H.

Whorls of hairs were found also in the upper portion of slightly older plants which, however, in their lower, thicker portion possessed shorter surface-cells and fewer hairs, the latter usually being scattered or fasciculate. At a distance of about $^3/_4$—1 cm above their base these plants exhibited a characteristic narrowing which gave them some resemblance to *Scytosiphon lomentaria*. They were, nevertheless, easily distinguished from that species owing to their structure and their more vigorous hairs and to the fact that each cell harboured several chromatophores. Around the narrowing they were of a fairly dark colour and exhibited small cells and a rather great number of hairs.

It is noteworthy that at such a relatively late time of the year as the last part of July the species was not more well developed. Like the condition met with in several other species common to East Greenlandic and Danish waters its development is somewhat retarded in East Greenland. In Danish waters it is encountered already in spring (Rosenvinge & Lund, 1947, p. 71).

Previous Records from Greenland:

E. Gr.: One locality in lat. $65^2/_3$° N. (J. 1904, p. 31) and possibly at Danmarks Ø in lat. $70^1/_2$° N., mentioned below (R. 1898, p. 58).

W. Gr.: A dozen localities between the southern point and lat. $72^3/_4$° N. (R. 1893, p. 854; 1926, p. 13; L. 1933, p. 13).

Scoresby Sund District: Fame Øer, 5—6 m; Bjørneøer, 6—11 m; Danmarks Ø (N.H.) (?).

Kejser Franz Josephs Fjord District: The head of Duséns Fjord, 15—25 m (?); Nordfjord, free-floating.

2. Chorda tomentosa Lyngb., 1819, p. 74, pl. 19; Kjellm., 1890, p. 28; Reinke, Atlas, p. 41, pl. 29; Lund, 1951, p. 18.

I found only a single attached specimen (mentioned under the preceding species), inhabiting a stone in the Duséns Fjord at a depth of 15—25 m and collected in mid-August. It attained a length of about 16 cm but was not intact. Another individual, likewise not intact, collected in the same locality, measured 56 cm and had most probably been detached by the dredge from its substratum. In both individuals the chromatophores in the hairs were rather small and occurred in small numbers. Both plants were sterile.

In the Nordfjord free-floating sterile plants were collected at the beginning of August. Some of them formed tufts on free-floating *Dictyosiphon*. They were, on the whole, small, several of them measuring no more than 8—12 cm in length. The hairs possessed numerous well-developed chromatophores.

In East Greenland the species persists longer and the hairs are kept longer than in Danish waters where they usually are shed at the end of June and the first part of July, after which the plant dies away (Rosenv. & Lund, 1947, p. 74).

Previous Records from Greenland:
E. Gr.: Three localities between about lats. 68 and 82° N. (R. 1910, p. 116; 1933, p. 11; L., l. c.).
W. Gr.: Three localities between lats. 61 and $69^3/_4$° N. (R. 1893, p. 854).

Kejser Franz Josephs Fjord District: The head of Dusėns Fjord, 15—25 m; Nordfjord, free-floating.

Laminariaceae

Saccorhiza De la Pylaie, 1824.

1. Saccorhiza dermatodea (De la Pyl.) J. Agardh, 1868, p. 31; Kjellm., 1877a, p. 14; Setchell, 1891, p. 177; Rosenv., 1893, p. 850; Jónsson, 1903, p. 172; 1904, p. 31.
Laminaria dermatodea De la Pyl., op. c., p. 180, pl. 9 fig. g; 1829, p. 48.
Phyllaria dermatodea (De la Pyl.) Le Jol., Kjellm., 1883, p. 223 (278), pl. 25 figs. 1—4; Foslie, 1890, p. 74.
Ph. lorea (Bory) Kjellm., ibid., p. 226 (282), pls. 24, 25 figs. 5—6.

I encountered this alga at Kap Tobin where two sterile individuals were collected in mid-August at a depth of 6—11 m, occurring in a *Laminaria* community. The two plants seem to correspond perfectly with Kjellman's (1883) pl. 24, figs. 1—2 of *Phyllaria lorea* which, according to Areschoug (1875, p. 11), Setchell (l. c.), and Rosenvinge (1893, l. c.), must be considered but a juvenile stage of the species under consideration. One of the plants is young, the other somewhat older. In both plants the lamina is provided with numerous cryptostomata, many of which still possess their hair-tufts. The transition between stipe and lamina is gradual. In both plants the lamina is undivided; in the uppermost part a remnant of a supposed older lamina occurs, its colour being somewhat darker, but a boundary between two generations cannot be exactly indicated. In the larger specimen, the basal disc is lobed and a couple of outgrowths issue immediately above. When dried the plants measured as follows, stated in cm:

Total length	Stipe		Entire lamina		Remnant of supposed older lamina	
	Length	Diameter	Length	Width	Length	Width
26.7	3.7	0.12	about 23	1.4	about 2	about 0.1
93	21	0.4	» 72	4.2	» 8	» 0.5

Furthermore, a germling was encountered in a dredging from Amdrups Havn. Its stipe was missing and its lamina was not intact. When soaked the lamina attained a length of 5 cm and a width of 1.1 cm. The lamina exhibited numerous hair-tufts.

The below localities are, so far, the northernmost records from East Greenland and are presumably near the northern limit of the species on this coast.

Previous Records from Greenland:

E. Gr.: Three localities between lats. $65^1/_2$ and 66° N. (J., 1904, l. c.).

W. Gr.: Some 16 localities between lats. 60 and 70° N. (R. 1893, l. c.; 1898, p. 57).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 16—18 m.

Laminaria Lamouroux, 1813.

1. Laminaria solidungula J. Agardh, 1868, p. 3, pl. 1; Kjellm., 1877 a, p. 15; 1883, p. 227 (284); Rosenv., 1893, p. 850; 1898, p. 57; 1910, p. 115; 1926, p. 21; Jónsson, 1904, p. 28, fig. 2.

This species favours habitats near the open sea and in my districts I observed it chiefly in the outer part of Scoresby Sund where it was well developed. Near Fame Øer at the head of Hurry Inlet it was represented only by rather small specimens; this condition corresponds with Rosenvinge's (1898, l. c.) records from Danmarks Ø in the inner Scoresby Sund. Two fragments were collected at Rødeø, undoubtedly belonging to this species; each of them consisted of two lamina-generations. The larger fragment measured some 40 × well over 15 cm. The species occurs together with *Laminaria saccharina* in *Laminaria* communities but seems especially to be prevailing in deep water. By way of example it may be mentioned that a *Laminaria* community at a depth of 27—31 m at Kap Tobin consisted mainly of this species. Its vertical distribution in my localities was from a little less than 10 m down to almost 40 m. The species inhabits rocks and stones as well as shells of barnacles but was also met with on stipes of *Alaria* and *Laminaria*. Germlings and young plants were observed on *Desmarestia aculeata* and *Turnerella*.

My plants were collected in July and August. Almost all of them exhibited two lamina-generations, the older lamina, however, often being more or less ragged, possibly damaged during the gathering. Some specimens exhibited one generation only, a few three (or four?). Among the plants possessing only the new lamina some were in process of forming a sorus which extended from the base a long way upwards, occupying the middle part of the blade. In plants with two lamina-generations the new blade was in some instances sterile while the sorus of the older lamina still persisted (although the great majority of the sporangia were emptied), or a perforation in the lamina might indicate where the sorus had been situated; in other cases the new lamina exhibited a young sorus which might occupy the lower four fifths of the middle portion of the lamina. In one of the fragments from Rødeø the remnant of the old lamina bore a sorus while in the other it exhibited a perforation where the sorus had been located.

In a plant possessing three lamina-generations the youngest was sterile, that of the preceding year bore a basal sorus, while the two years old remnant exhibited a perforation where the lowermost part of its sorus had been situated. In a similar plant all the three lamina-generations were sterile; the uppermost part of the two years old lamina possibly bore a remnant of a three years old lamina with a perforation indicating where the sorus had been situated.

When dried the new lamina usually is olive green, the older ones more yellowish brown.

The species attains to considerable dimensions in the outer Scoresby Sund and may probably become larger than the plants collected by me which were measured when soaked. The below figures indicate the dimensions in cm:

	Total length	Length of stipe	New lamina		Preceding year's lamina	
			Length	Width	Length	Width
Kap Hope						
7—9 m	144	33	49	30	62	23
,, ...	159	35	70	33	54	24
Amdrups Havn						
11—13 m	162	38	64	43	60	38
Kap Tobin						
27—31 m	..	53	80 (not intact)	40	..	..

Previous Records from Greenland:

E. Gr.: A series of localities between lats. $65^2/_3$ and $76^1/_2$° N. (R. 1898 & 1910, l. c.; 1933, p. 11; J., l. c.).

W. Gr.: Between lats. $60^3/_4$ and $78^1/_3$° N. (R. 1893 & 1898, l. c.; 1926, p. 13; L. 1933, p. 13).

Scoresby Sund District: Kap Tobin, 6—11 m, 17—21 m, 27—31 m; Amdrups Havn, 14—16 m, 22—26 m, 33 m; Kap Hope, 7—9 m; the mouth of Hurry Inlet, 7—10 m, 20 m, 35—38 m; Fame Øer, 15—25 m; Kap Stewart, cast ashore (N. H.); Danmarks Ø (N. H.); Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Kap Borlase Warren (C. K.).

2. Laminaria saccharina (L.) Lamour., 1813, p. 22.

f. *glacialis* Rosenv., 1898, p. 53, fig. 12.

f. *grandis* Kjellm., 1890, p. 25; Jónsson, 1904, p. 27; Rosenv., 1910, p. 114.

I have collected a considerable number of *Laminarias* with undivided lamina and branched haptera, originating from almost all the localities visited. With a single exception all of them seem to belong to *Laminaria saccharina* which, apart from *L. solidungula*, is the only important representative of this genus in my area. The specimens collected have the condition in common that the solid stipe invariably is devoid of mucilage-ducts, an identification with *L. groenlandica*, *L. cuneifolia*, or *L. longicruris* thus being out of the question. Another common feature is the presence of mucilage-canals in the lamina; this entails the exclusion of *L. Agardhii*, which resembles *L. saccharina* in not exhibiting mucilage-canals in the stipe.

The great majority of the material on hand corresponds with the high-arctic f. *glacialis*, described from Scoresby Sund and recorded only from N. East Greenland. The length of the stipe varies very much, from about 2.5 cm in some rather small specimens (yet possessing two lamina-generations) up to at least 80 cm. There is, however, no fixed proportion between the length of the stipe and the dimensions of the lamina. ROSENVINGE's (1898, p. 57) f. *longipes*, f. *brevipes* as well as intermediate forms are represented in the material.

In plants originating from protected habitats the holdfast frequently consists of numerous long, branched, thin haptera which may be attached to a great number of very small stones, gravel-particles or shells. A clod of clay is often retained between the haptera. In some protected habitats, affording adverse conditions for growth, were encountered some plants in which the haptera were very scarce. In exposed places the haptera were, on the contrary, vigorous and well developed.

The dimensions of the lamina exhibit a wide range of variation, not only as regards its length and width, but also with respect to its thickness as in some specimens it is thin and membraneous while in others it may be coriaceous (in its middle portion). In the latter case the thickness of its middle portion may be up to 0.5 mm. The margins are usually deeply undulate down to the basal portion, the undulations sometimes extending to the very middle portion of the lamina. The basal portion is cuneate, presumably as a rule narrow cuneate. In the largest specimen, originating from Danmarks Ø from a depth of 1—3 m, the lamina measured 180 cm in length when soaked, its largest width being nearly 40 cm. At its summit it bore a remnant of the preceding year's lamina, measuring about 19 cm. The stipe measured 36 cm in length, the total length of the plant, including the haptera, being 240 cm.

Fig. 34. *Laminaria saccharina.* Photo of two soaked herbarium specimens exhibiting three lamina-generations. In order to emphasize the preserved sorus in the plant to the right, its dark colour was slightly intensified on the photo.
$^1/_{10}$ nat. size (approx).

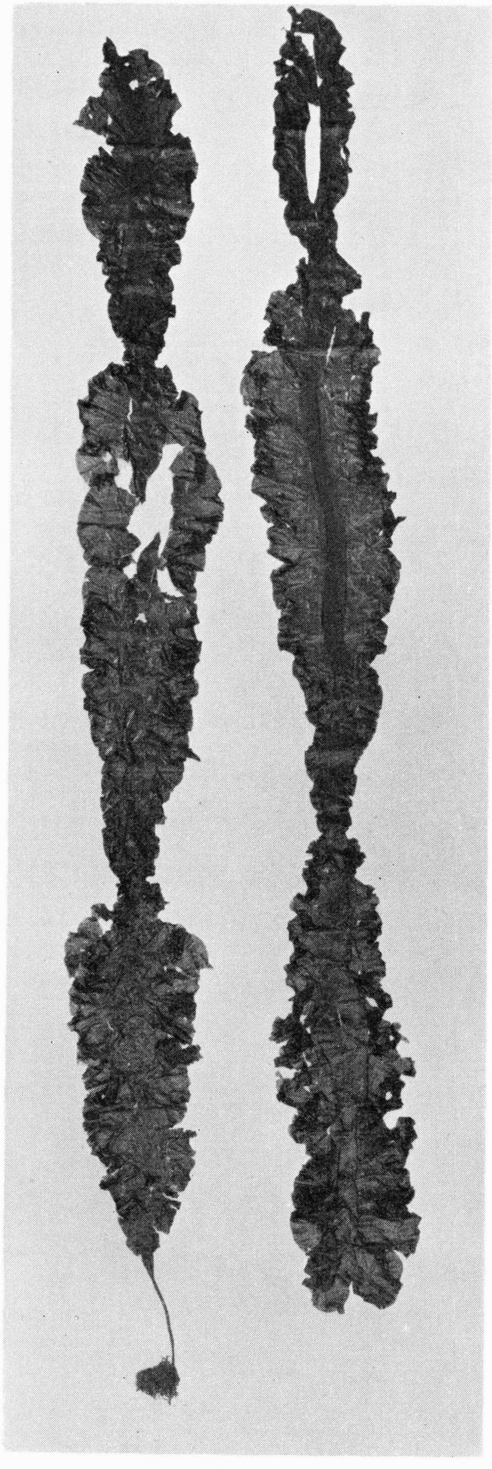


Fig. 34.

All the plants on hand date from the end of June and from July and August and in almost all of them two lamina-generations were present, the older being somewhat darker and in its median portion usually exhibiting a linear sorus or a perforation indicating the contours of the discharged sorus. However, in some few instances also the older lamina was sterile, possibly because it had been fertile only in its uppermost part which had fallen off before the plant was collected.

In some of the plants from the end of July and from mid-August three lamina-generations were distinguishable, the oldest of them, however, usually represented only by a remnant in which the contours of the basal part of the discharged sorus could be recognized; in a few instances the preceding year's lamina (like the new one) was sterile. In a couple of plants with delicate thallus, which had grown under very quiet conditions, the three years old laminae were rather well preserved, their length amounting to one fifth and one fourth, respectively, of that of the total lamina (fig. 34). One of them (to the right in the photo) exhibited a sorus in the preceding year's lamina while in the oldest lamina the contours of a discharged sorus were recognizable. The possibilities of persistence of the three years old lamina are, of course, the greater, the smaller sorus is, as in such cases only a small perforation will arise when sorus falls out.

From Danish waters I have also recorded specimens of *Laminaria saccharina* with three lamina-generations (ROSENVINGE & LUND, 1947, p. 83, fig. 27). The plants in question were collected at depths of 20—30 m in the Baltic off Bornholm.

Only some few specimens have been referred to f. *grandis*. When soaked, the largest three measured as follows:

	Stipe	New lamina		Old lamina	
		Length	Width	Length	Width
Amdrups Havn, 22—25 m	82	56 + x	33	..	..
Bjørneøer, 6—11 m	..	30	40	50	30
Rødeø, 13—15 m	48	105	58	60	35

The basal portion of the lamina was broad cuneate or somewhat cordate. The specimen from Amdrups Havn exhibited a remarkably thin lamina. Contrary to this plant the two others had laminae whose middle portion was somewhat thicker than their deeply undulate margin. The lamina of the very large specimen from Rødeø, whose total length measured 213 cm, was widest a little way above its middle. This specimen can possibly be referred to f. *latifolia* KJELLM. In the two plants from

Bjørneøer and Rødeø, respectively, the preceding year's lamina exhibited a sorus.

Some rather young plants whose laminae had a broad cuneate or cordate basal part ought possibly also to be referred to f. *grandis*; they were, however, too young to be further identified.

Laminaria saccharina is widely distributed in my area, its vertical range being from some few metres down to almost 40 m. In most localities it forms communities, more or less mixed with other species. In the outer Scoresby Sund it occurs, as mentioned before, together with *L. solidungula* which species may become characteristic of the community at greater depths. The species under consideration inhabits rocks and stones as well as *Lithothamnion*. Germlings, presumably belonging to the same species, were observed on shells and stones, on ascidians and hydroids as well as on various algae.

Previous Records from Greenland:

E. Gr.: Between lats. 68 and 82° N. (R. 1898 & 1910, l. c.; 1933, p. 11; J., l. c.; L. 1951, p. 19). Some *Laminaria* stipes lying detached on the ice in lat. $83^{1}/_{4}$° N. and presumably belonging to the species under consideration are reported by ROSENVINGE (1910, p. 95).

W. Gr.: None.

Scoresby Sund District: Kap Tobin, 6—11 m, 27—31 m; Amdrups Havn, 6—9 m, 11—13 m, 22—25 m; Kap Hope, 5—7 m, 7—9 m, 27 m; the mouth of Hurry Inlet, 7—10 m, 14—15 m, 35—38 m; Fame Øer, 4—6 m, 10 m, 15—25 m; Kap Stewart, cast ashore (N. H.); Bjørneøer, 6—11 m; Danmarks Ø (N. H.); ibid., 1—3 m; Rødeø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 6—9 m; the head of Dusén's Fjord, 15—25 m; Kap Borlase Warren, f. *grandis* (C. K.). — Without stating the specific name THORSON (1933) mentions *Laminaria* from several localities in this district. The plants involved presumably belong to f. *glacialis* of the species under consideration.

3. Laminaria groenlandica ROSENV., 1893, p. 847; 1894, p. 91; 1926, p. 22, fig. 1; JÓNSSON, 1904, p. 26.

Among the great number of *Laminarias* with undivided lamina, of which I have made transverse sections of the stipe, only a single may be suspected of containing mucilage-ducts in its stipe. When dried the plant in question measured 80 cm in length (the stipe 20 cm, the new lamina 45 × about 20 cm, the remnant of the preceding year's lamina 15 cm). The presumable muciferous canals in the stipe were seen in several sections made about 7 cm above the haptera, whereas they could not be recognized in sections made some few centimetres below that level. They were radially elongated and appeared only in one side of the stipe where their number amounted to five, arranged in a circle. I cannot, however, completely exclude the possibility that they may be fissures resulting from the cells' receding from one another when the sections were made, so it is with some doubt that I refer the plant to this species.

The lamina is of equal width throughout most of its length, although slightly broader above its middle; it has a broad cuneate basal portion and is provided with rugae. Its margin is undulate down to the base. The lamina contains distinct mucilage-ducts and a well-defined medullary layer. The middle portion attains a thickness of 345 μ.

Previous Records from Greenland:

E. Gr.: One locality in lat. 60° N. (R. 1893, l. c.) and four localities between lats. $65^2/_3$ and $66^1/_4$° N. where it is reported to be common in sheltered habitats (J., l. c.).

W. Gr.: A dozen localities between approx. lats. 60 and 62° N. (R. 1893, l. c.; 1898, p. 53).

Scoresby Sund District: Kap Tobin, 6—11 m.

4. Laminaria longicruris DE LA PYL., 1824, p. 177, pl. 9 figs. A-B; ROSENV., 1893, p. 845; 1898, p. 52; JÓNSSON, 1904, p. 25.

Previous Records from Greenland:

E. Gr.: One locality in lat. $65^2/_3$° N. (R. 1898, l. c.). A small young specimen later collected in an adjacent locality was with some doubt referred to this species by JÓNSSON (l. c.).

W. Gr.: Between lats. $62^1/_2$ and about 81° N. (R. 1893 & 1898, l. c.; 1926, p. 13; L. 1933, p. 13).

Not observed by me.

5. Laminaria nigripes J. AG., 1868, p. 29, emend. ROSENV., 1893, p. 842.

f. *atrofulva* (J. AG.) ROSENV., l. c.; JÓNSSON, 1903, p. 177; 1904, p. 25; *Laminaria atro-fulva* J. AG., 1872, p. 16; KJELLM., 1883, p. 235 (294).

Previous Records from Greenland:

E. Gr.: f. *atrofulva:* Two localities in lat. 60° N. (R. 1893, p. 845) and two others in lats. $65^3/_4$ and $67^1/_4$° N., respectively (J. 1904, l. c.). A damaged, not exactly identified specimen of *L. nigripes* is reported from the Kangerdlugssuaq district in about lat. 68° N. (R. 1933, p. 11).

W. Gr.: Between the southern point and lat. $78^1/_3$° N. (R. 1893, l. c.; 1898, p. 52; 1926, p. 13; L. 1933, p. 13). The species is in West Greenland represented by f. *longipes*, f. *atrofulva*, and f. *fissilis*.

Not recorded by me. The northern limit in East Greenland is presumably situated south of Scoresby Sund.

6. Laminaria digitata (L.) LAMOUR., KJELLM., 1883, p. 240 (299); ROSENV., 1893, p. 841; 1898, p. 51.

In the first half of July I found several plants of this species in some dredgings made near Fame Øer. The individuals belong to two distinct types, in one of which the lamina is divided into several segments. In some of these plants the lamina was split almost down to its lowermost part, in others the lower part was undivided. Some few individuals were fairly well developed and measured, when soaked, 78 cm (stipe 18 cm, lamina 60 cm) and 73 cm (stipe 3 cm, lamina 70 cm), respectively, in total length. The other individuals of this type attained a total length of 36 to upwards of 50 cm (stipes 3—5 cm, laminae 31—48 cm). In some of the plants the upper part of the segments may represent the remnant of the old lamina, but only in a few segments could the boundary between two generations be distinguished. The largest specimen bore sori in the upper part of one of the segments. This portion obviously belonged to the old lamina. In all the plants the lamina, when dried, was dull and of a characteristic yellowish olive green colour, while the stipe usually was dark brown (though dark olive green when soaked). The stipe was flattened, at any rate in its upper part, sometimes throughout most of its length as was the case in the longest plant.

The other type, f. *cucullata* Le Jol., which has not previously been recorded from Greenland, is represented by three specimens only, two of which exhibited laminae whose upper part was repeatedly split into some few broad segments, while the third one had an undivided lamina. The total length of the individuals, when soaked, measured only 21—33 cm (stipes 2—3 cm, laminae 19—31 cm) but the stipe of the longest plant was not intact. In two of the plants the lamina seemed to represent two generations. When dried, the laminae were of the same colour as that mentioned above while the stipes were red brown. The longest specimen shows a marked resemblance to a plant collected by C. Kruuse at Nûgâlik in lat. $67^1/_4$° N. which by Jónsson (1904, p. 25) was referred to *L. nigripes β, atrofulva* and is kept in the Botanical Museum of the University of Copenhagen. Contrary to my specimen, however, its lamina is dark in its lowermost part, which is a common feature in that species. Nor did the other plants in my collection exhibit laminae whose lowermost portion was darker than the remaining part.

Decisive for my specific determination was, in addition to the colour, the structure of the lamina, as no distinct boundary was seen between the medullary and the intermediate layer. In my opinion no great importance can be attached to the fact that mucilage-ducts were lacking in the stipe as this condition can be found also in *L. nigripes*, especially in young plants (cf. e. g. Jónsson, 1903, p. 178).

Previous Records from Greenland:

E. Gr.: Two localities in lats. $74^1/_2$ (Z. 1874, p. 85) and $70^1/_2$° N. (R. 1898, l. c.), respectively. In 1893 (l. c.) Rosenvinge advances the opinion that Zeller's record is due to a confusion with *L. nigripes* which supposition, however, he abandoned when the species was encountered in Scoresby Sund and considering that the species occurs at Jan Mayen too (R. 1897, p. 27).

W. Gr.: One specimen collected near the southern point (R. 1893, l. c.), perhaps transferred to that locality from the east coast (id., 1898, l. c.).

Scoresby Sund District: Kap Stewart, cast ashore (N. H.); Fame Øer, 4 m, 4—6 m, 8—12 m.

Agarum (Bory) Post. & Rupr., 1840.

1. Agarum cribrosum Bory, 1826, p. 193.

A. Turneri Post. & Rupr., op. c., p. 12; J. Ag., 1872, p. 18; Rosenv., 1893, p. 841; 1898, p. 50; 1933, p. 11; Jónsson, 1904, p. 24.

Previous Records from Greenland:

E. Gr.: Between lats. $65^1/_2$ and 68° N. (J., l. c.; R. 1898 & 1933, l. c.). Furthermore, a large and well-preserved fragment was found in the stomach of a shark near Danmarks Ø in Scoresby Sund (R. 1898, l. c.).

W. Gr.: Between the southern point and lat. $78^1/_3$° N. (R. 1893 & 1898, l. c.; 1926, p. 13; K. 1897c, p. 32; L. 1933, p. 13).

Not found by me. The northern limit of the species in East Greenland is presumably situated south of Scoresby Sund.

Alariaceae

Alaria Greville, 1830.

1. Alaria Pylaii (Bory) J. Ag., emend. Jónsson, 1904, p. 21.

A. Pylaii (Bory) J. Ag., 1872, p. 24; Kjellm., 1883, p. 213; Rosenv. emend. 1893, p. 838; 1898, p. 48; Yendo, 1919, p. 97; Printz, 1926, p. 198.

Agarum Pylaii Bory, 1826, p. 194.

f. *membranacea* (J. Ag.) Rosenv., 1893, p. 839; Jónsson, l. c.; *A. membranacea* J. Ag., op. c., p. 26; Kjellm., 1883, p. 215 (269).

f. *grandifolia* (J. Ag.) Jónsson, l. c.; Rosenv., 1910, p. 112, fig. 5; *A. grandifolia* J. Ag., op. c., p. 26; Kjellm., 1877a, p. 10; 1883, p. 217 (270); Yendo, op. c., p. 120, pl. 14.

I encountered *Alarias* only in three of the outermost localities of Scoresby Sund where they occurred at depths from 6—11 m down to 27—31 m in *Laminaria* communities. They seem to be most abundant at Kap Tobin at not too great depths. Germlings and young plants were encountered on snail-shells, on the stipe of an old *Alaria*, and on *Desmarestia aculeata*.

The material collected consists chiefly of lamina-fragments of various dimensions. Only some few plants are nearly intact. I do not, however, hesitate to refer the entire material to *Alaria Pylaii* within which species most of it can be referred to f. *membranacea*. Only one plant and perhaps some few fragments belong to f. *grandifolia*. Incidentally, these two forms differ from each other only by their dimensions (cf. Jónsson, l. c.). In all the plants collected the lamina is thin, the costa in transverse section two-edged, either biconvex or complanate. In Rosenvinge's (1910, l. c.) f. *grandifolia* the costa was biconvex; nevertheless, when discussing the renewal of blades in *A. esculenta*, Printz (op. c., p. 195) includes Rosenvinge's plants in that species.

With regard to the blade-renewal in East Greenlandic plants, Rosenvinge (1898, l. c.) states that an older specimen found at Danmarks Ø in Scoresby Sund, dating from March, exhibited only the lower part of the lamina from the preceding year while the new blade had commenced its development. According to the same author (1910, p. 114) f. *grandifolia* at Danmarks Havn (in lat. $76^1/_2$ ° N.), too, sheds the lamina during winter, like the condition found at Spitsbergen (Kjellman, 1877 a, l. c.), but he states that the lower part of the old lamina persisted as late as in summer. In the Trondhjemsfjord, according to Printz (l. c.), the species commences to develop the new blade in December; it may be well developed already in March, although growth may continue until some time in summer. In the course of late summer and autumn the blade wears away.

In most of my lamina-fragments, almost all of which were collected in mid-August at Kap Tobin, two generations were present. Although somewhat ragged they could easily be distinguished from each other because of their colour when dried, the older lamina invariably being darker, usually dark brown, while the younger was lighter brown: golden brown, greenish brown, brownish olive green, or yellowish brown. Furthermore, when foraminiferas occurred they were considerably more numerous on the old lamina. As the lamina-generations were not intact it was impossible to determine the proportion of the old lamina to the new when collected.

In the largest of my specimens, collected at the end of June at Kap Hope and doubtless belonging to f. *grandifolia*, the costa measured 125 cm; only one lamina-generation seemed to be present. The lamina of this specimen was, incidentally, very ragged and decaying, its colour being brown like that of the old lamina in the above-mentioned fragments. Throughout most of its length the stipe, which was not intact, bore scars caused by shed sporophylls. The stipe measured 66 cm in length, the fertile rachis 12 cm, the sporophylls up to 38 cm in length and up to 5 cm in width (the plant was measured when soaked). I think it most probable that this specimen, which was fructifying, had not yet commenced the formation of its new lamina.

Another plant from Kap Hope, collected at the same time and belonging to f. *membranacea*, also exhibited one lamina only, yet of a beautiful yellowish brown colour when dried, and developed in the year when it was collected. The total length of the plant when dried measured about 50 cm (stipe 16 cm, rachis 3.5 cm, lamina 30×15 cm). The sporophylls attained dimensions of up to 20×2.5 cm and were sterile.

According to PRINTZ the age of the individuals can be determined on the basis of the number of successive rings in the stipe which, in his opinion, represent annual rings. I have not examined transverse sections of the stipes of my plants, but the above f. *grandifolia* specimen must be supposed to be at least four years old, as the scars caused by the shed sporophylls and occurring below the remaining ones seem to represent at least two generations.

Previous Records from Greenland:

E. Gr.: About 10 localities between lats. 60 and 76½° N. (R. 1893 & 1898, 1910, l.c.; 1933, p. 11; J. l. c.).

W. Gr.: Between the southern point and 76¾° N. (R. 1893, l. c.; L. 1933, p. 13).

Scoresby Sund District: Kap Tobin, 6—11 m, 17—21 m, 27—31 m; Amdrups Havn, 14—16 m, 22—25 m; Kap Hope, 7—10 m, 11 m (f. *grandifolia*), 35—40 m (fragment of lamina); Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Kap Borlase Warren (f. *membranacea*, C. K.).

2. Alaria esculenta (L.) GREVILLE, 1830, p. 25.

f. *pinnata* (GUNN.) KJELLM., 1890, p. 20; JÓNSSON, 1903, p. 183; 1904, p. 24; *A. flagellaris* ROSENV., 1898, p. 49.

Previous Records from Greenland:

E. Gr.: Some few specimens from Angmagssalik in lat. 65⅔° N. have by ROSENVINGE (l. c.) been referred to *A. flagellaris* STRÖMFELT (1886 b, p. 41), described from Iceland on the basis of young plants without sporophylls. According to JÓNSSON (1903, p. 183) STRÖMFELT's species represents but young stages of *A. esculenta* and ROSENVINGE's plants are interpreted as fully developed specimens of f. *pinnata*. In the latter of his above works JÓNSSON with some doubt refers to f. *pinnata* a couple of East Greenlandic plants from an adjacent locality.

W. Gr.: None.

Not encountered by me.

CYCLOSPOREAE

Fucales

Fucaceae

Fucus (L.) Decaisne et Thuret, 1845.

1. Fucus vesiculosus LINNÉ, 1753, p. 1158; ROSENVINGE, 1893, p. 833; JÓNSSON, 1904, p. 18.

Previous Records from Greenland:

E. Gr.: From the southern point to Kangerdlugssuaq in lat. 68—68½° N. (R. 1893, l. c.; 1933, p. 12; J. 1904, l. c.).

W. Gr.: Between the southern point and lat. $72^3/_4°$ N. (R. 1893, l. c.; K. 1897c, p. 31; L. 1933, p. 14); it is reported to be of common occurrence south of lat. 69° N.

Not observed in my districts. Like *Ascophyllum*, the species does presumably not extend so far north as Scoresby Sund, or its northern limit may be situated near that area.

2. **Fucus inflatus** L., Rosenv., 1893, p. 834 emend.; 1898, p. 45 (f. *membranacea*); Børgesen, 1902, p. 465; Jónsson, 1903, p. 184; 1904, p. 19.

f. *edentatus* (De la Pyl.) Rosenv., 1893, l. c.; *Fucus edentatus* De la Pylaie, 1829, p. 84.
f. *evanescens* (C. Ag.) Rosenv., 1893, l. c.; 1910, p. 112; 1926, pp. 13 and 27; *Fucus evanescens* C. Ag., 1821, p. 92.
f. *linearis* (Oeder) Rosenv., 1893, l. c.; *Fucus linearis* Oeder in Fl. Danica, Fasc. 6, pl. 351, 1767.

This species is the only representative of the genus *Fucus* observed by me. It is widely distributed and plays an important role in most of the examined localities where it grows on rocks and stones. In sheltered or fairly sheltered habitats in shallow water it forms a well-developed community, sometimes almost unmixed. Other abundant species in this community are *Pylaiella* and *Sphacelaria.* The community occurs not only in the upper part of the sublittoral region, down to 3 m or a little below, but was also observed in the littoral region. When the species occurs at greater depths the growths are generally more scattered, the communities in such cases being more mixed. In several localities the species under consideration was, however, still predominant at depths of 6—9 m. Its vertical range is considerable, extending down to 35—38 m. The specimens originating from this great depth were small, the largest of the shoots measuring about 13 × well over 1 cm. They were not intact but seem to have been attached, as all of them were fructifying. In several sheltered habitats the species is abundant but is unattached or fixed to small stones. Under such conditions it often remains quiescent or is partially decaying. Similar conditions are recorded by Thorson (1933, p. 57) from a couple of localities near Ella Ø, at depths of 10—15 m and 25—30 m, respectively.

The species varies considerably as regards the width of its frond. The principal rule seems to be that plants occurring in shallow water are narrow and usually rather short, while those occurring at greater depths are broad and attain to greater lengths. There are, however, many exceptions as the type with a broad frond may be encountered in shallow water and that exhibiting a narrow frond may be found at greater depths. Furthermore, the narrow type may attain to rather great lengths. Thus, one of the narrow specimens measured, when dried, 23 × 0.3 cm. The uppermost plants in the littoral region are particularly narrow and short.

Air-filled bladders were observed only in a couple of plants (cast ashore?) from Ella Ø. In both of them the midrib was lacking in the upper thin shoots which were greenish when dried. One of the specimens measured 17 × 0.4—0.5 cm, its receptacles up to 1.3 × 0.4 cm; the other, which was not intact, measured 17 × almost 1 cm, its receptacles up to well over 2 × 0.6—0.8 cm. These specimens show most resemblance to f. *edentatus*.

Apart from the above individuals, the plants seem to be grouped around two distinct main types, f. *linearis* and f. *evanescens*, which forms constitute the two extremities with regard to the width of the thallus, but many plants must be considered intermediate forms. F. *evanescens* seems to be by far the commoner. In this type the length may be up to about 27 cm and the width up to 1 cm or slightly more. The midrib is usually distinct to the very apex of the shoot. The receptacles show much variability from one individual to another, being either short and broad or longer and narrow, short and narrow or long and fairly broad. The longest of them measure almost 3 × 0.6 cm, the broadest well over 1 cm in width.

In f. *linearis* the width of the frond is only about 0.1 to 0.3 cm. Here, too, the midrib is visible until the apex, or it may be scarcely visible in the upper part of the shoots. The receptacles measure from less than 0.5 to upwards of 1 cm in length, their width being about 0.2 cm. Plants of this type were encountered only in the littoral region and the uppermost part of the sublittoral region.

In a great number of plants the thallus is conspicuously thin, almost membraneous; they correspond with f. *membranacea* ROSENV. (1898, l. c.). This form was established on the basis of plants originating from Danmarks Ø in inner Scoresby Sund and is characterized only by its thin thallus, possibly due to the water's deficiency of nutrition, and not by a definite width of the thallus which is stated to vary from less than 0.5 mm up to 1.5 cm. I am, however, of the opinion that it is unadvisable to maintain this form which, as a matter of fact, includes both f. *linearis* and f. *evanescens* as well as all intermediate forms. It would be equally justified to establish e. g. a f. *coriaceus* exhibiting thick thallus and the same range of variability with respect to the width of the thallus. I judge it more warranted to maintain the morphologically defined forms (f. *linearis*, f. *evanescens*, f. *edentatus*) and, if so desired, to indicate by affixing subforma *membranaceus* or *coriaceus* whether plants with thin or thick thallus are involved.

Almost all the plants collected, dating from June—August, bore receptacles. Unattached plants from Danmarks Ø were, however, sterile. Germlings are commonly occurring on various hosts, but most freqently on older individuals of the species under consideration.

Previous Records from Greenland:

E. Gr.: Occurring between the southern point and lat. $76^1/_2$° N. (Z. 1874, p. 85, sub nom. *F. vesic.*; R. 1893, 1898 & 1910, l. c.; 1933, p. 12; J., l. c.).

W. Gr.: Between the southern point and lat. $78^1/_3$° N. (R. 1893, l. c.; 1926, p. 13; L. 1933, p. 13).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 6—9 m; Rosenvinges Bugt, 8—10 m, 10—12 m (A. P.); Kap Hope, 1 m, 6 m; the mouth of Hurry Inlet, 4 m, 12—13 m, 35—38 m; Fame Øer, littoral, 2 m, 4—6 m; Kap Stewart (cast ashore, N. H.); Bjørneøer, 0 m and below, 6—11 m, 14—17 m, 28—32 m; Nordbugten, 2—3 m; Danmarks Ø (N. H.); ibid. 1—3 m; Rødeø (fragment, N. H.); ibid. 2—3 m.

Kejser Franz Josephs Fjord District: Polhems Dal (C. K.); Ella Ø, littoral, 6—9 m, 12—17 m, 20—25 m; Vinterøer, 2—6 m; the head of Dusêns Fjord, 15—25 m. — Mentioned (without specific name) by Thorson (op. c., p. 56) from Ella Ø at depths down to 30—35 m and from other localities in the district.

Ascophyllum Stackhouse, 1809.

1. Ascophyllum nodosum (L.) Le Jol., 1863, p. 96; Rosenv., 1893, p. 832; 1898, p. 45; Jónsson, 1904, p. 18.

Fucus nodosus Linné, 1753, p. 1159.

Ozothallia nodosa (L.) Dcne & Thur., Kjellm., 1883, p. 194 (243).

Previous Records from Greenland:

E. Gr.: Recorded from the coast between lats. $65^1/_2$ and immediately south of 66° N. (J., l. c.).

W. Gr.: Between the southern point and lat. $70^2/_3$° N. (R. 1893 & 1898, l. c.; L. 1933, p. 14). Commonly occurring south of lat. 67° N.

In both East and West Greenland it grows in sheltered localities.

Not encountered by me.

Rhodophyceae

BANGIOIDEAE

Bangiales

Bangiaceae

Porphyra Agardh, 1824.

1. Porphyra miniata (Ag.) Ag., emend. Rosenv., 1893, p. 826; Børgesen, 1902, p. 347; Jónsson, 1904, p. 16.

Diploderma amplissimum Kjellm., 1883, p. 188 (236), pl. 17 figs. 1—3, pl. 18 figs. 1—8.

Porphyra abyssicola Kjellm. op. c., p. 191 (240), pl. 17 fig. 4, pl. 18 figs. 10—11.

Previous Records from Greenland:

E. Gr.: Two localities between lats. 60 and 61° N. (R. 1893, p. 830) and one in lat. $65^3/_4$° N. (J., l. c.).

W. Gr.: Numerous localities between lats. 60 and $76^3/_4$° N. (R. 1893, l. c.; 1898, p. 44; K. 1897c, p. 31; L. 1933, p. 14).

Not recorded by me.

Conchocelis Batters, 1892.

1. Conchocelis rosea BATTERS, op. c., p. 25, pl. 8.

This widely distributed alga was described from Scotland by BATTERS after which many authors recorded it from quite a number of other waters. It has usually been referred to *Bangiaceae* but, after having carried out a very careful examination of material from Danish waters, ROSENVINGE (1931, p. 618, figs. 617—19) ascertained the presence of a central pit in the transverse walls and included it in *Florideae.* However, he considered its generic position within this sub-class very doubtful and classified it as a *genus incertae sedis.* Later authors usually take the consequence of the above discovery, among them LEVRING (1937, p. 132) who adopts ROSENVINGE's procedure, TAYLOR (1937, p. 238) and KYLIN (1944, p. 29) both of whom refer it to *Chantransiaceae*, whereas FRITSCH (1945, p. 440) regards it as a doubtful member of *Bangiales.*

In some recent publications DREW (1949, p. 748; 1953, p. 835; 1954a, p. 183), however, on the basis of cultures has furnished evidence that *Conchocelis rosea* does not represent an autonomous species but a mere phase in the life-cycle of *Porphyra.* When spores of *Porphyra umbilicalis* germinated on sterile calcareous shells the germ-tubes penetrated the shells and afterwards formed growths quite similar to those of *Conchocelis rosea.*

Corresponding results have later been obtained by KUROGI (1953a, p. 67; 1953b, p. 104) in cultures of carpospores originating from no less than four Japanese *Porphyra* species. This author succeeded, moreover, in distinguishing monospores liberated from monosporangia of the *Conchocelis*-phase. They appeared abundantly in the culture solution. The monospores are reported to germinate into a bud of the leafy *Porphyra*-thallus.

Also GRAVES (1955, p. 393) succeeded in establishing the *Conchocelis*-phase in shells when cultivating carpospores of a South-African *Porphyra* species. The monospores of *Conchocelis* germinated within the sporangia or after liberation and produced young leafy plants.

A *Conchocelis*-phase besides that observed in *Porphyra*, though somewhat deviating, has been established in *Bangia* (DREW & RICHARDS, 1953, p. 87; KUROGI, 1953a, p. 74; 1954a, p. 74).

Further investigations of the life-cycles of *Porphyra* and *Bangia* will be awaited with much interest. Special importance must be attached to cytologic studies and investigations of the influence of the substratum on the development of the monospores of the *Conchocelis*-phase. In this connection it should be added that while KUROGI (1953a, p. 73) maintains that the monospores do not again penetrate the shells and GRAVES depicts young plants of the leafy phase growing on shells, DREW (1954b, p. 1243) found that the *Conchocelis*-phase was capable of reproducing itself. It will also be of interest to verify ROSENVINGE's statement that pit-connections are present in the transverse walls in *Conchocelis*, as such presence would seem to be inconsistent with the species' representing a phase of members of the order *Bangiales* within which such connections have never been observed.

The *Conchocelis*-phase — for practical reasons I classify it provisionally as *Conchocelis rosea* BATT. — is presumably widely distributed in East Greenland. I have not undertaken a systematic search for it in my material of shells and *Lithothamnia* but have confined myself to ascertaining its occurrence in some reddish shells of barnacles collected in a single locality.

It is, of course, impossible to state which species *Conchocelis* represents when occurring in East Greenland. *Porphyra miniata* is the only *Bangiaceae* recorded from the East coast, whereas on the West coast *Porphyra umbilicalis* and *Bangia fuscopurpurea* are recorded in addition to that species. It might, however, well be imagined that the *Conchocelis* occurring in the Scoresby Sund District represents a *Porphyra* or *Bangia* species hitherto unknown from Greenland and that the species concerned always or usually is represented by the *Conchocelis*-phase in these waters.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $70^1/_2$ and $76^1/_2$° N., respectively (R. 1898, p. 45; 1910, p. 111).

W. Gr.: Three localities between lats. $60^3/_4$ and 67° N. (R. 1898, l. c.).

Scoresby Sund District: The mouth of Hurry Inlet, 35—38 m; Danmarks Ø, down to at least 32 m (N. H.).

FLORIDEAE

Acrochaetiales Feldmann, 1953, p. 12.

Acrochaetiaceae

Acrochaetium Nägeli, 1861.

1. Acrochaetium parvulum (KYLIN) HOYT, 1920, p. 470.

Chantransia parvula KYLIN, 1906, p. 124. — Not *Ch. parvula* LEVRING, 1935, p. 33; 1937, p. 84.

Ch. hallandica γ, *parvula* ROSENV., 1909, p. 97.

Kylinia parvula (KYLIN) KYLIN, 1944, p. 13.
Chromastrum parvulum (KYLIN) PAPENFUSS, 1945, p. 322.
Chantransia microscopica (NÄG.) FOSLIE, 1890, p. 54; ROSENV., 1893, p. 825; JÓNSSON, 1904, p. 15.
Ch. rhipidandra ROSENV., 1909, p. 91; KYLIN, 1928, p. 5.

In several localities within the examined area I recorded a small *Acrochaetium* species, which undoubtedly must be referred to the above. It was encountered at depths from some few metres down to 14—18 m and grew epiphytically on various algae, most commonly on *Chaetopteris*, *Sphacelaria arctica*, *Polysiphonia*, and *Rhodomela*, where it occurred abundantly, in particular on the older shoots. Moreover, it was observed on the sporophyte of *Haplospora*, on whose lower parts it was copious, on *Desmarestia aculeata*, *Elachista*, *Punctaria glacialis*, as well as on byssi of bivalves and on bryozoans (*Eucratea loricata*).

The height of the individuals varies from about 50 to almost 200 μ, but is most often about 100 μ. The basal cell is very thick-walled and as a rule somewhat flattened where it adjoins the substratum (fig. 35 C, G). It usually measures 10—11 μ (—13 μ) in diameter and gives rise to some few erect shoots (fig. 35 E—G), mostly three. In many plants the branching takes place in one plane only; in others the branches and the sporangia issue in several directions. In some cases the branching is chiefly unilateral over a shorter or longer distance.

The diameter of the shoots measures 5—9 μ, most often 7—8.5 μ. The lower cells of the main threads generally are short and very thick-walled (their length nearly equal to the diameter). In many plants also the upper cells are short (their length measuring 1—$1^1/_2$ diameters), and as practically each cell may issue a lateral, often branched, or a sporangium, such plants acquire a very compact appearance. In other plants the upper cells may, however, measure up to 2—3 diameters and as such plants at the same time are more sparsely branched they become less dense so as to deviate somewhat from the typical *A. parvulum*.

The growth of the shoots is sympodial as mentioned by KYLIN (1906, l. c.). Each cell terminates in a hair which is displaced when the succeeding cell continues the growth. In young plants the hairs may persist on several consecutive cells, but they are mostly shed shortly after having become lateral — if not earlier. Sometimes two terminal hairs seem to occur, but in such instances one of them pertains to a daughter-cell in process of being formed (in fig. 35 C the latter was not yet distinguishable). The hairs appear early; the spore may issue a hair immediately after having germinated or may even commence its germination by the formation of a hair (fig. 35 D) as has been stated e. g. in *Acrochaetium* (= *Chantransia*) *gynandrum* by ROSENVINGE (1909, p. 89) and in *A.* (= *Chantransia*) *collopodum* by LUND (1942, p. 55).

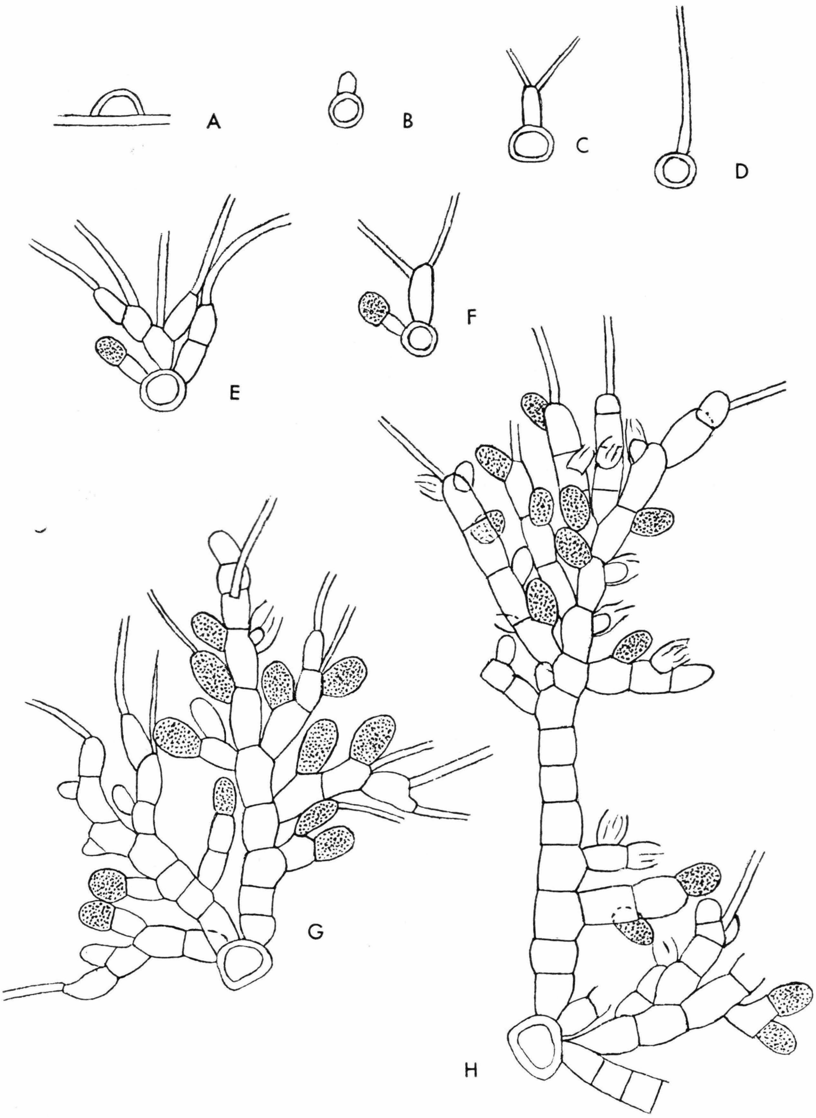


Fig. 35. *Acrochaetium parvulum.* A: spore germinating on the apical cell of *Sphacelaria;* B—F: young plants, E and F already bearing a sporangium; G—H: mature plants with sporangia. A—G: Bjørneøer; H: Upernavik, W. Greenland, July 18, 1886. A—H: × 700.

The monosporangia generally measure 8.5—11 (—15) × 5.5—8.5 μ (—10 μ). They are usually sessile, scattered, sometimes unilateral, in some cases opposite, or opposite a branch; in some plants many of them may, however, occur singly or in pairs on a one-celled stalk. In young individuals they may occur singly on a one-celled stalk issuing directly from the basal cell (fig. 35 E—F). After their evacuation the monosporangia sometimes are proliferated by new ones. In some few cases the emptied monosporangia were proliferated by a hair. They were met with in June, July and August. Sexual organs were not observed.

The species under consideration was first described as *Chantransia parvula* by KYLIN (1906, l. c.). ROSENVINGE (1909, l. c.) maintains that it is but a form of *Ch. hallandica* (= *Acrochaetium hallandicum*), a view that is shared i. a. by PRINTZ (1926, p. 55). The independence of the species is preserved by LEVRING (1935 & 1937, l. c.; 1940, p. 75), but according to KYLIN (1944, p. 14) *Ch. parvula* in LEVRING 1935 & 1937 represents, however, *Kylinia rosulata* ROSENV., a closely related species characterized particularly by its prostrate branches. KYLIN (1944, p. 13) still considers that the species under consideration deserves specific rank, but now he refers it to the genus *Kylinia.* Also PAPENFUSS classifies it as a distinct species designated *Chromastrum parvulum.* Personally I am not quite convinced that this species ought to be kept distinct from *A. hallandicum*, but as the great majority of my *Acrochaetium* material is grouped around the *parvulum* type I cannot enlarge on the question.

Under the name of *Chantransia microscopica*, older literature dealing with algae in northern seas contains several incorrect records of *Acrochaetium microscopicum* (NÄG.), in which only a single shoot is given out from the basal cell. In all instances *A. parvulum* (or perhaps *A. hallandicum*) seems to have been involved, but at that time these species had not yet been described. Thus, *Chantransia microscopica* is recorded by FOSLIE (1890, l. c.) from the Finmark in North Norway. According to KYLIN (1906, p. 126) FOSLIE's plants are not identical with NÄGELI's species, but probably belong to the species under consideration. This applies also to GRAN's (1897, p. 20) *Ch. microscopica* from Oslo Fjord; it is true that LEVRING (1937, l. c.) refers GRAN's plant to *Ch. rhipidandra* but according to KYLIN (1944, p. 14) the latter is identical with *Kylinia parvula.* In BØRGESEN & JÓNSSON (1905, p. XII, note 3) *Ch. microscopica* is listed from NW Iceland. I have examined one of JÓNSSON's permanent slides of these plants, which inhabited *Cladophora gracilis*, and have ascertained that they belong to *A. parvulum.* Moreover, *Ch. microscopica* is reported from the White Sea (E. SINOVA, 1929, p. 25) and from the Murman Coast (E. SINOVA, 1926, p. 35), in which cases, too, it is presumably identical with *A. parvulum* (or *hallandicum*).

Ch. microscopica is furthermore recorded from West Greenland by ROSENVINGE (1893, l. c.) from two localities in lats. $68^3/_4$ and $72^3/_4°$ N., respectively. I have had an opportunity of examining one of ROSENVINGE's permanent slides from the latter locality (Upernavik), where the species inhabited *Antithamnion*, and have in fig. 35 H depicted one of his plants. As will be seen, this plant, too, differs from NÄGELI's species

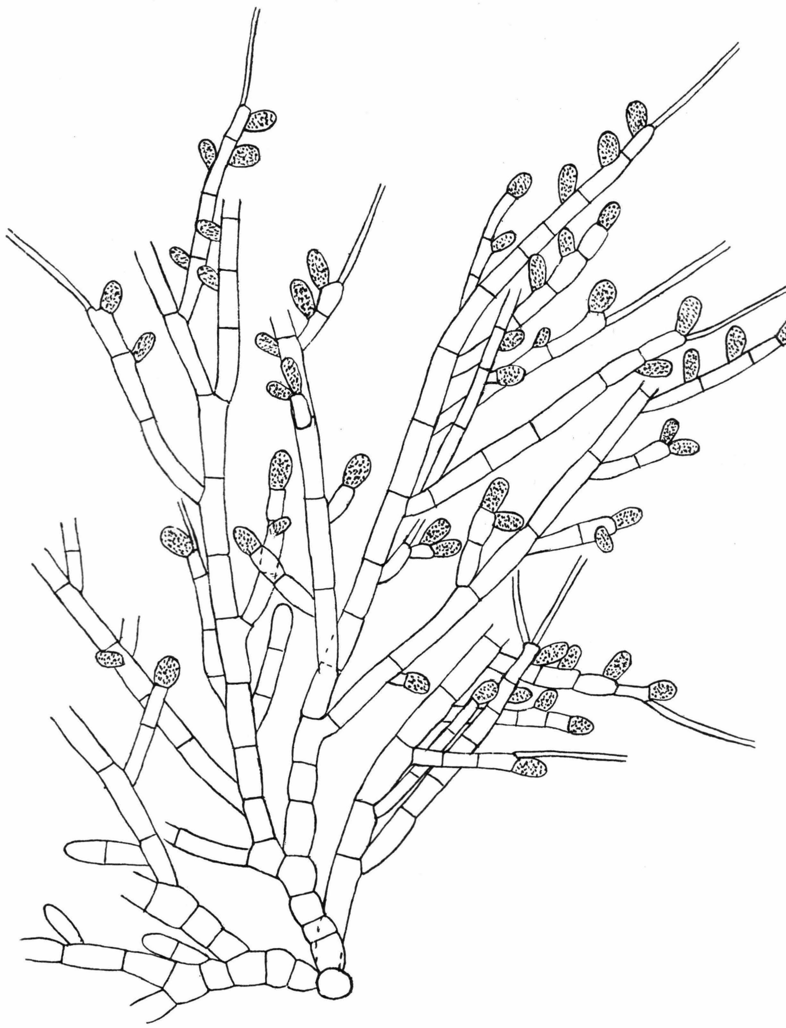


Fig. 36. *Acrochaetium hallandicum.* × 475.

as its basal cell gives rise to more than one shoot, whereas it corresponds with my East Greenlandic plants.

Finally, *Ch. microscopica* is reported from East Greenland by ROSENVINGE and by JÓNSSON (see below). JÓNSSON states that his plants "ramify abundantly from their very base" so it is beyond doubt that they belong to *A. parvulum* (or *hall.*); nor can it be doubted that also ROSENVINGE's plants must be referred to this species. Thus, the result is that *Acrochaetium microscopicum* (NÄG.) (= *Chantransia microscopica* (NÄG.) FOSL. 1890, p. 54; *Rhodochorton m.* DREW, 1928, p. 163; *Kylinia m.* KYLIN, 1944, p. 13; *Chromastrum m.* PAPENFUSS, 1945, p. 322) must be deleted from Greenland's flora.

Previous Records from Greenland:
E. Gr.: Two localities in lats. $65^{2}/_{3}$ and $70^{1}/_{2}$° N., respectively (R. 1898, p. 40; J. 1904, l. c.).
W. Gr.: Two localities in lats. $68^{3}/_{4}$ and $72^{3}/_{4}$° N., respectively (R. 1893, p. 825).

Scoresby Sund District: Kap Tobin, 6—11 m; Kap Hope, 2 m, 6—12 m; the mouth of Hurry Inlet, 7—10 m; Fame Øer, 1—3 m, 5—10 m; south of Kap Stewart (N. H.); Bjørneøer, 6—11 m; Rødeø, 2 m.
Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m; Vinterøer, 2—3 m, 14—18 m.

2. Acrochaetium hallandicum (KYLIN) HAMEL, 1927, p. 20 (excl. f. *parvula*).
Chantransia hallandica KYLIN, 1906, p. 123; LEVRING, 1940, p. 76.
Ch. hallandica α, *typica* and β, *brevior* ROSENV., 1909, p. 93, figs. 21—23.
Kylinia hallandica (KYLIN) KYLIN, 1944, p. 15.
Chromastrum hallandicum (KYLIN) PAPENFUSS, 1945, p. 321.

In my fairly extensive *Acrochaetium* material I found only a few specimens that cannot be referred to *A. parvulum*, but rather to the species under consideration. The most typical plant (fig. 36) was collected in mid-July, attained a height of 450 μ and inhabited *Desmarestia aculeata* at a depth of 4—6 m. The diameter of the basal cell measured about 10 μ; it issued three branches. The cells in the lower part of the plant measured 8.5 μ in diameter, their length often being the same; in the upper parts the cells were about 5.5—8 μ in diameter, their length being up to 4—5 diameters. The branches issued in all directions. The monosporangia measured 10—11 × 5.5—7 μ; they were usually sessile, often unilateral, more rarely occurring in pairs on short, one- or two-celled stalks. This plant corresponds with *A. hallandicum* as regards its dimensions, the length of its cells, and its manner of branching. — The species has previously been recorded so far north as lat. $78^{3}/_{4}$° N. in northeastern North America (ROSENVINGE 1926, p. 28).

Previous Records from Greenland:
None.

Scoresby Sund District: Fame Øer, 4—6 m.

Audouinella Bory, 1823, p. 340.

1. Audouinella efflorescens (J. AG.) PAPENFUSS, 1945, p. 326; LUND, 1951, p. 19.
Callithamnion efflorescens J. AGARDH, 1851, p. 15.
Chantransia efflorescens (J. AG.) KJELLM., 1883, p. 129 (166) (f. *tenuis*); LEHMANN, 1902, p. 1, pl. 1 (f. *petrophila*); KYLIN, 1906, p. 113; ROSENV., 1909, p. 134; LEVRING, 1940, p. 80.
Grania efflorescens (J. AG.) KYLIN, 1944, p. 26.
Rhodochorton chantransioides REINKE, Atlas, pl. 21.

This species seems to be widely distributed in the area examined by me although as a rule it does not occur abundantly. It was encountered at depths from 5—9 m down to at least 40 m, the latter record originating from Ella Ø. It is generally inhabiting other algae such as *Alaria* (stipe), *Laminaria saccharina* (stipe and haptera), *L. solidungula* (lamina of a germling), *Turnerella*, *Chaetopteris*, *Chaetomorpha melagonium*, *Desmarestia aculeata* and *viridis*, *Fucus*, and *Euthora*. Moreover, it was met with on hydroids (e. g. *Halecium muricatum*), snail-shells, shells of barnacles, and stones.

The material on hand comprises sexual plants as well as sporangia-bearing plants. Both kinds of plants, in particular the latter, attain only small dimensions; thus, the largest of the sporangia-bearing plants reached a height of no more than well over 1 mm, while the sexual plants measured upwards of 2 mm in height. The diameter of the main filaments measures 5—6 μ (—7 μ). The branching is usually scattered, though not rarely opposite. In the sexual plants two opposite laterals may sometimes both bear sexual organs.

In the lower part of the main filament rhizoids were observed here and there both in the sexual plants and in the sporangia-bearing ones. In addition, rhizoids may occur at higher levels too. Fragments of threads are obviously also capable of issuing rhizoids from their lowermost parts (fig. 37A).

Antheridia and carpogonia as well as cystocarps were encountered in July and August. In both months some of the cystocarps were partially emptied. Most of the sexual plants were, however, comparatively young, many of them bearing antheridia and carpogonia only. This applies e. g. to the individuals mentioned above, collected at Ella Ø (at the beginning of August) at a depth of at least 40 m where, together with *Giffordia ovata*, they grew so abundantly on *Turnerella* as to form a felt-like coating. Antheridia and carpogonia were also observed in the upper portion of cystocarp-bearing individuals, even in such plants as had evacuated part of their spores. Mature cystocarps have previously been encountered in specimens from Danmarks Ø in October, emptied ones in March (Rosenvinge, 1898, p. 40).

Sporangia-bearing plants were likewise recorded in July and August. At the time when my collections were made, such individuals had not been recorded from Greenland, but they have later been encountered in the Jørgen Brønlund Fjord in eastern North Greenland (Lund, 1951). In both months, the great majority of the sporangia were emptied, but in some plants there were observed a few sporangia still retaining their contents which were divided (tetraspores). The sporangia-bearing plants thus represent the sporophyte. It has not been ascertained whether plants bearing monosporangia (cf. Lehmann, l. c., and other authors) do also occur. The tetrasporangia measured 14.5—20.5 × 10 μ. In some plants bearing emptied sporangia only, such sporangia as had not collapsed measured 12.5—20 × 8 μ.

The sporangia usually occur in pairs or by threes, more rarely by fours or even by fives (fig. 37 E), as a rule borne on one- to three-celled laterals whose uppermost cell is slightly broader above. In some instances the stalk bears a single sporangium only (fig. 37 C). In several cases the sporangia issue directly from the main threads and may then be either lateral and sessile (fig. 37 D; cf. REINKE, l. c., fig. 9; KYLIN, 1906, fig. 4a) or situated in the tip of the thread (fig. 37 D, F). In the latter case one of the sporangia is apical while the others occupy a more or less oblique position around it. Terminal sporangia on the main thread seem, however, to occur only when the latter is comparatively short. Further, the sporangia may be borne on one- to few-celled stalks issuing directly from the basal portion (fig. 37 G—H).

Whether the emptied sporangia were terminal on stalks or on main threads they were frequently accompanied by a shoot situated in a slightly lateral position on the sporangia-bearing cell and developing into a long branch (fig. 37 D, F). In a single case the previously sporangia-bearing cell had given rise to two lateral shoots which had developed into long branches forming an angle of less than 180°. Not uncommonly the sporangia-bearing cell issued a terminal shoot proliferating an emptied terminal sporangium (fig. 37 F, on the left, 37 G).

The basal portion seems to vary according as the individual in question is a sporangia-bearing or a sexual plant. In the former instance the basal portion is crust-forming and consists of parenchymatous, fairly large thick-walled cells (fig. 37 G—H; cf. LEHMANN, l. c., pl. 1 fig. 10); in the latter, at any rate when the individuals involved are young, it may consist of creeping cell-threads (fig. 37 B; cf. ROSENVINGE, 1909, p. 135). Nevertheless, I have no hesitation in referring the sporangia-bearing plants to the species under consideration, partly because of the perfect agreement of their chromatophores with those of the sexual plants. It should be added that in the material from the Jørgen Brønlund Fjord in eastern North Greenland both kinds of plants exhibited a disc-shaped basal portion.

As will be generally known a seasonal alternation of generations is supposed to exist in this species (ROSENVINGE, 1909, p. 137; LEVRING, l. c., p. 81, and other authors). The sporophyte is supposed to occur in spring and early summer, the gametophyte chiefly in summer. Conditions in East Greenland seem to harmonize with this theory although the times at which the two generations occur obviously are somewhat retarded. The sporophyte is met with until August, presumably not much later. The facts that the sporangia-bearing plants were not very abundant in

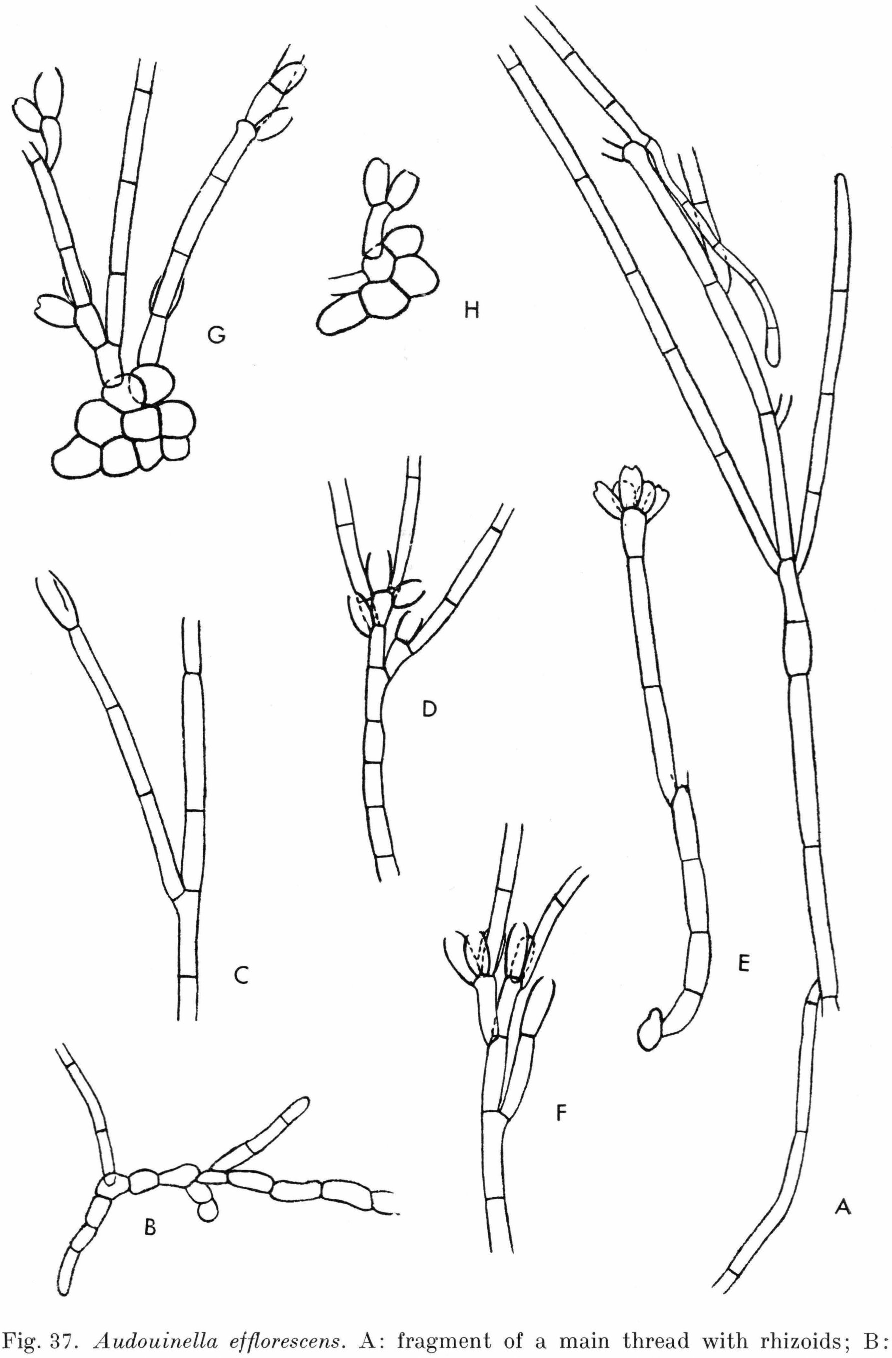


Fig. 37. *Audouinella efflorescens.* A: fragment of a main thread with rhizoids; B: creeping basal thread of young sexual plant, issuing two upright shoots; C—F: main threads with sessile and stalked sporangia (comp. the text); G—H: crust-forming basal portions with sporangia and upright threads. A—H: × 425.

my material and that the great majority of their sporangia were emptied lend support to this view. It must be presumed that the gametophyte does not occur until the actual summer months but persists until autumn or even later.

Previous Records from Greenland:

E. Gr.: Four localities between lats. $65^2/_3$ and 82° N. (R. 1898, p. 40; 1910, p. 111; L. 1951, l. c.).

W. Gr.: One locality in lat. $78^1/_3$° N. (R. 1926, p. 14).

Scoresby Sund District: Kap Tobin, 30—40 m; Amdrups Havn, 14—16 m, 20 m, 25—26 m; the mouth of Hurry Inlet, 35—38 m; Fame Øer, 5—10 m, 15—20 m; Bjørneøer, 6—11 m; Danmarks Ø (N. H.); Røde Ø, 13—15 m.

Kejser Franz Josephs Fjord District: Ella Ø, 6—9 m, 12—20 m, 36 m, in a dredging at 40—80 m; Vinterøer, 14—18 m.

2. **Audouinella membranacea** (MAGNUS) PAPENFUSS, 1945, p. 326.

Callithamnion (Rhodochorton) membranaceum MAGNUS, 1874, p. 67, pl. 2 figs. 7—15.

Rhodochorton membranaceum MAGNUS, ROSENV., 1893, p. 794; id. 1923—24, p. 393; KUCKUCK, 1897a, p. 337, figs. 1—4, 7.

As appears from ROSENVINGE's (ll. cc.) and especially from KUCKUCK's careful examinations, the development of the free threads in this species shows a wide range of variation. In some cases the threads consist of one or some few cells, in others of up to 30—40 cells. The variations may be encountered within one and the same individual as plants exhibiting free threads with many cells invariably possess also few-celled threads. When not too long, the threads usually bear a terminal tetrasporangium in addition to lateral, stalked or sessile, ones.

The degree of development of the free threads does apparently not depend exclusively on ecological factors, but has obviously some relation to the nature of the host. Thus, ROSENVINGE (1923—24) states that the free fertile threads of individuals inhabiting *Sertularia pumila* in Danish waters always are short. When the free threads are branched, the primary thread always terminates in a sporangium. On the other hand, the free threads of plants inhabiting *Abietaria abietina* were in several instances appreciably more well developed, terminating in a long sterile cell, while the sporangia were lateral.

At Heligoland KUCKUCK had already made a similar observation. Though sometimes rather well developed, the free threads in plants inhabiting *Sertularia pumila* (KUCKUCK, op. c., fig. 2 E) were simple or sparsely branched, and the apical cell was invariably fertilized. In plants inhabiting *Abietaria abietina* they were more vigorous and richly branched, while their tips were sterile.

In East Greenland I encountered this species in five localities at depths between 15 and at least 35 m, growing in various hydroids, and here, too, the development of the free threads varied according to the host. At Bjørneøer, where it occurred in *Laomedea longissima*, the free threads were extremely short, consisting of some few cells only. The tetrasporangia formed small groups and at first sight appeared almost sessile. These specimens reminded very much of ROSENVINGE's (1923—24) fig. 332 which, incidentally, also represents specimens inhabiting *Laomedea.*

In Amdrups Havn the species inhabited *Halecium muricatum.* In this case the free threads were far more well developed and reached a length of up to almost 0.5 mm. They were as a rule simple with a terminal tetrasporangium. Moreover, they exhibited lateral sporangia borne on short or long stalks. Other unbranched threads, however, bore only lateral sporangia and terminated in a long sterile cell. Finally, very short fertile shoots occurred as well as all intermediate stages.

At Vinterøer, where the species was observed in *Halecium muricatum* and *Lafoea gracillima* f. *elegantula*, the free threads were particularly well developed in individuals inhabiting the latter host and measured up to 0.75 mm in length. Some of them consisted of up to 35 cells and issued three to four long branches from their lowermost part, while others were still simple. In both instances the threads usually terminated in a sterile cell which is also the case in the long branches. The tetrasporangia were lateral, generally borne on one- or two-celled stalks. When occurring on branched threads they were situated both on the primary thread and on the long branches. They usually occurred singly and were sometimes seriate over a shorter or longer distance, in some cases they were opposite or might be opposite a short sterile branch. Quite close to the terminal sporangium the stalk usually exhibited an initial of a branch or of a sporangium. Like the plants originating from other localities, these individuals possessed also shorter and quite short free threads with a terminal sporangium and their long, branched threads measured 6—8 μ in diameter. I am, therefore, of the opinion that they belong to the species under consideration.

The tetrasporangia were observed in July and August. They have not previously been recorded from East Greenland.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $65^2/_3$ and $65^3/_4°$ N., respectively (J. 1904, p. 9).

W. Gr.: About ten localities between lats. 60 and $65^1/_2°$ N. (R. 1893, l. c.; 1898, p. 23).

Scoresby Sund District: Kap Tobin, 30—40 m; Amdrups Havn, 15—16 m; the mouth of Hurry Inlet, 35—38 m; Bjørneøer, 10—21 m.

Kejser Franz Josephs Fjord District: Vinterøer, 14—18 m; 25—35 m.

Rhodochorton Nägeli, 1861.

1. **Rhodochorton purpureum** (LIGHTF.) ROSENV., 1900, p. 75; HAMEL, 1927, p. 57; FELDMANN, 1954, p. 69.
Byssus purpurea LIGHTFOOT, 1777, p. 1000.

f. *Rothii* (TURT.); *Rhodochorton Rothii* (TURT.) NÄG., ROSENV., 1893, p. 791; 1923—24, p. 390; JÓNSSON, 1901, p. 146; BØRGESEN, 1902, p. 390 (excl. the plants resembling *Rh. intermedium*).

f. *intermedium* (KJELLM.); *Thamnidium intermedium* KJELLM., 1875, p. 28, pl. 1 fig. 10; *Rhodochorton intermedium* KJELLM., 1883, p. 184 (231), pl. 15 fig. 8; E.SINOVA, 1912, p. 245; 1929, p. 5; FLEROV & KARSAKOFF, 1932, p. 57; *Rh. Rothii* BØRGESEN p. p., op. c., fig. 61.

The plants referred to f. *Rothii* all originate from the sublittoral region where they inhabited *Chaetopteris*, *Stictyosiphon*, *Ahnfeltia*, *Lithothamnion*, stones and shells at depths between about 2 and 30 m. They generally form small, isolated, low tufts and usually occur in small quantities only. In some few instances, however, well-developed plants attaining a height of up to 0.6 cm were observed forming a continuous growth on some small stones. These plants were collected at Fame Øer at depths of 2 and 5 m, respectively.

All the plants on hand, collected at the end of June and in July and August, are sterile. The diameter of the upright filaments measures from 12 to 16 μ or more, not infrequently up to 20 μ. The basal portion consists of creeping branched threads, often very much entangled and in such instances difficult to separate. The cells of the creeping filaments are often short, irregular and somewhat inflated.

Contrary to f. *Rothii*, f. *intermedium* was met with only in littoral and supralittoral habitats, the lowermost of them perhaps occurring in the uppermost part of the sublittoral region. I encountered this interesting form in two localities, viz. at Fame Øer and at Ella Ø, where it was collected in mid-July and the beginning of August, respectively, chiefly in crevices. The individuals collected form well-developed tufts (fig. 38) corresponding exactly with those depicted by KJELLMAN (1883). The tufts originating from the former locality were 2—2.5 cm in height, those from the latter upwards of 3 cm. In both places they formed dense continuous growths which at Ella Ø had a vertical extension of at least 1 m. In this locality the species was growing in company with small quantities of *Pylaiella*, *Rhizoclonium riparium*, and *Ulothrix*, at Fame Øer it grew together with *Pylaiella* and *Enteromorpha clathrata*. In both localities it was furthermore accompanied by *Calothrix scopulorum* and *Pleurocapsa amethystea*, both occurring abundantly and revealing their presence in the material kept in alcohol by the well-known smell of

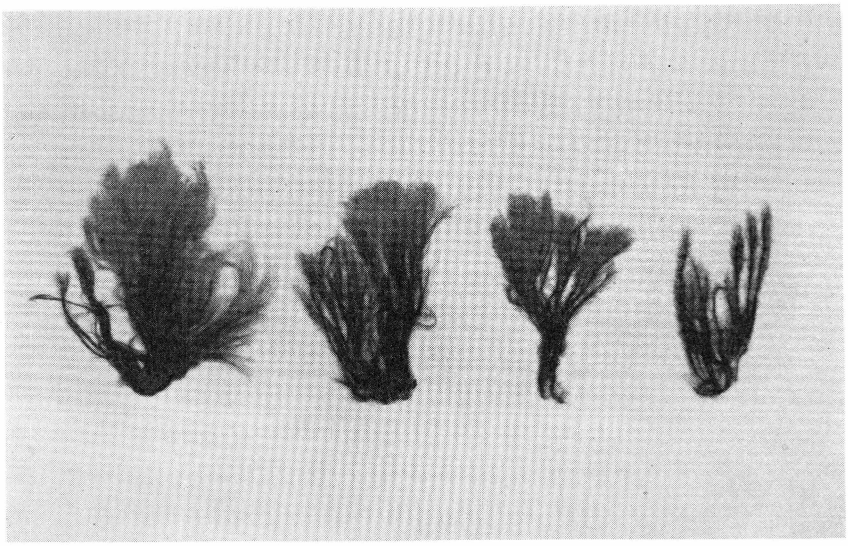


Fig. 38. *Rhodochorton purpureum* f. *intermedium* from Ella Ø, nat. size. The plants are densely inhabited by diatoms.

Cyanophyceae. When dried the plants are of a dirty reddish colour with a lilac tinge. Some of the individuals apparently are bleached which is, however, caused by a dense epiphytic growth of diatoms. Near the basal portion the colour is often somewhat greenish blue owing to the presence of *Pleurocapsa*.

The basal part consists of creeping branched filaments composed of shorter or longer cells of varying shape. In some instances these cells do not differ very much from those in the upright threads, whereas in others they are more irregular and resemble the corresponding cells in Børgesen's (op. c.) fig. 63 and in Rosenvinge's (1923—24) fig. 328.

The erect filaments, which in their lowermost part often give rise to long, thin, rhizoid-like threads, usually measure 12—16 μ in diameter. They consist of fairly long cells whose length may be up to 6 diameters. The branching is irregular and generally takes place in the upper half of the filaments. The branches are often given out close to one another as several consecutive cells may give rise to as many branches. In such instances the branches may be unilateral or alternate. In one case I observed five consecutive cells issuing as many unilateral branches. Not infrequently a cell may give out two branches in opposite directions, though not necessarily at the same level. Most of the branches arising from the main axes at some distance from the apex and farther down are pronounced long shoots (fig. 39) similar to the main axis (a) and may often be repeatedly branched.

Most of the individuals were fructifying. With regard to the arrangement of the sporangia they are, however, only to a certain degree in accordance with KJELLMAN's (1875, p. 28) description reading "Ramuli tetrasporangiferi ... dense corymboso-aggregati". It is true that the tetrasporangia-bearing branches often form larger or smaller, dense clusters but in many cases they occur scattered (fig. 39; cf. also ROSENVINGE (1893, l. c.) and BØRGESEN (op. c., fig. 61)).

Most of the sporangia were undeveloped, but in several cases their contents had undergone a transverse division. More rarely also a longitudinal wall was observed in the lower half or in both halves. A number of sporangia were emptied, some of them proliferated by a new sporangium. In many instances remaining stalk-cells were observed. In some cases the fruiting branches, after the evacution of the sporangia, had given rise to long branches as mentioned i. a. by BØRGESEN (op. c., fig. 62) and ROSENVINGE (1923—24, p. 392).

In some of the transversally divided sporangia the contents of the two halves had become rounded. Such sporangia recall the bisporangia depicted by BAARDSETH (1941, fig. 20 B) in *Rhodochorton bisporiferum* from Tristan da Cunha, but in my plants they seem to represent degenerate sporangia. Similar degenerate sporangia, though sometimes also longitudinally divided in either half, were depicted by ROSENVINGE (1900, fig. 4) in the terrestrial *Rhodochorton islandicum*.

Vegetative reproduction by means of detached branches seems to be common. In several instances were observed branched main threads, bearing fruiting branchlets, which after having been detached had issued a rhizoid-like thread below.

I have felt some uncertainty as to whether f. *intermedium* ought to be kept as a distinct species. Owing to their dimensions, their rich branching, their longer cells, and the arrangement of their sporangia the individuals under consideration differ essentially from the f. *Rothii* occurring e. g. in Danish waters. On the other hand, the two forms are connected by intermediate forms and, as a matter of fact, it is impossible to indicate definite distinguishing features. Like JÓNSSON (l. c.) and BØRGESEN (op. c., p. 394) I am, therefore, of the opinion that it will be correct not to give it specific rank. This view was, incidentally, held also by ROSENVINGE (1923—24, p. 392, and 1926, p. 34). Consequently, I choose to maintain it as f. *intermedium*.

Rhodochorton purpureum seems, thus, to be a rather polymorphous species. Its outward appearance is essentially influenced by the habitat according as the latter is sublittoral, littoral-supralittoral or terrestrial. The possibility cannot be excluded that also *Rh. islandicum* ROSENV. ought to be referred to this species (cf. BØRGESEN, op. c., p. 391).

F. *intermedium* has not previously been recorded from Greenland.

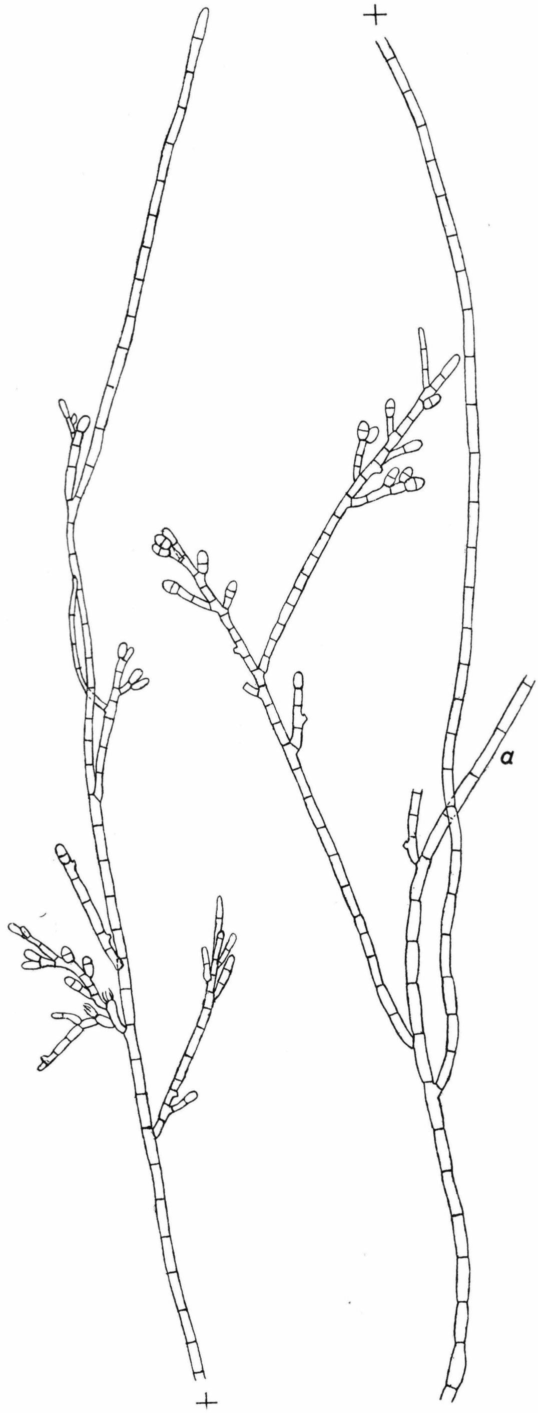


Fig. 39. *Rhodochorton purpureum* f. *intermedium*. Upper portion of a plant with sporangia. The long shoot, cut off at +, is a lateral issuing from the main axis (a). × 115.

Previous Records from Greenland:

E. Gr.: Several localities between lats. $65^2/_3$ and $76^1/_2$° N. (R. 1893, p. 792; 1898, p. 23; 1910, p. 106; 1933, p. 12; J. 1904, p. 9).

W. Gr.: Several localities between lats. 60 and about 69° N. (R. 1893, l. c.; 1926, p. 14).

Scoresby Sund District: Amdrups Havn, 30 m; Scoresbysund, 11 m, 21—25 m; Kap Hope, 6—12 m; Fame Øer, about 0 m and slightly above (f. *intermed.*), 1—2 m; 4—6 m; 12—18 m; Bjørneøer, 14—17 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, 0 m and somewhat above (f. *intermed.*) 6—9 m, 10 m.

2. Rhodochorton penicilliforme (Kjellm.) Rosenv., 1894, p. 66; 1923—24, p. 388; Børgesen, 1902, p. 389; Jónsson, 1904, p. 9; Miranda, 1932, p. 279; Lami, 1940, p. 56, pl. 2 and text-fig. 2; A. Zinova, 1955, p. 62, fig. 56.

Thamnidium mesocarpum f. *penicilliformis* Kjellm., 1875, p. 30.

Rhodochorton mesocarpum f. *penicilliformis* Kjellm., 1883, p. 187 (235), pl. 16 figs. 6—7; Rosenv., 1893, p. 792.

Rh. (?) *sparsum* (Carm.) Kjellm., 1883, p. 186 (234) (cf. Rosenv. 1926, p. 4).

I encountered this species in two instances, growing on *Euthora* at the end of July at Amdrups Havn and on *Halosaccion* in mid-August at Kap Tobin. In both cases the species occurred sparsely, forming low tufts of a height of up to well over 2 mm and 3.5 mm, respectively. The plants were characteristic and exhibited a well-developed, marginally growing disc. The upright threads measured 10—14 μ (—16 μ) in diameter and terminated in a long sterile cell; in a single case an immature sporangium occurred terminally on an unbranched thread consisting of about 25 cells. Some upright threads were branched, others (younger) were as yet simple.

In material from both localities mature tetrasporangia occurred in small quantities besides emptied and immature ones. In the material from Amdrups Havn they were situated on one- or two-celled shoots, issuing laterally from the main threads and from the branches of the first order. In that from the other locality they were borne on lateral, sometimes branched shoots composed of two to five cells. Emptied sporangia were encountered particularly in the former locality; most of them were in process of being proliferated by sterile shoots. Basal tetrasporangia were not observed. Nor did I find antheridia, recorded by Rosenvinge (1923—24, l. c., fig. 327) in tetrasporic Danish plants, or female sexual organs which are, so far, unknown in this species.

Previous Records from Greenland:

E. Gr.: 5 localities between lats. $65^2/_3$ and $76^1/_2$° N. (J. 1904, l. c.; R. 1910, p. 106, and 1933, l. c.).

W. Gr.: About ten localities between lats. 60 and $76^3/_4$° N. (R. 1893, l. c., and 1898, p. 23; L. 1933, p. 15).

Scoresby Sund District: Kap Tobin, 6—11 m; Amdrups Havn, 22—25 m.

Cryptonemiales

Dumontiaceae

Dilsea Stackhouse, 1809.

1. Dilsea integra (KJELLM.) ROSENV., 1898, p. 19, fig. 3; A. ZINOVA, 1955, p. 66, figs. 58—59.
Kallymenia? integra KJELLM., 1875, p. 19, pl. 1 figs. 8—9.
Sarcophyllis arctica KJELLM., 1877b, p. 17; 1883, p. 152 (194), pl. 14 figs. 1—3.

This species seems to be common in outer Scoresby Sund, where I collected it in three localities at depths from 4 m down to 35—38 m. It extends, however, also to the inner Scoresby Sund where it was collected by HARTZ (ROSENVINGE, l. c.). The individuals collected by me correspond perfectly with the latter plants although some of them are larger, the largest ones measuring 24.5 × 7.5 cm and 31 × 11.5 cm. On the other hand, I encountered also some very small plants, attaining a height of some few centimetres only.

The plants grow singly or gregariously, as several individuals may issue from one disc-shaped basal portion. As a rule the stalk passes gradually into the lamina which in the great majority of the plants is integrate. The lamina of the largest individual was, however, lobed and exhibited irregular fissures and holes. About 1.5 cm above its base, another plant issued a lobe measuring some 3 cm in length which must rather be characterized as a distinct individual. Some few plants were not intact, part of the lamina having worn away. In one instance this was due to a disorganization of the thallus after the fructification, in others to external causes such as animals' browsing.

The shape of the lamina varies and is generally oblong ovate, obovate, or lanceolate. The young plants resemble KJELLMAN's (1875) fig. 8. In older plants the marginal portion is slightly undulate. In some cases the width of the lamina decreased abruptly some few centimetres above the stalk. When dried, the plants are membraneous and of varying thickness, their colour usually being reddish brown, sometimes with bleached areas, dull or more rarely glossy. In one individual, dating from the end of June, numerous small groups of mature cystocarps were observed in the marginal portion of the lamina, particularly in its upper part.

The species is often infested with *Chlorochytrium inclusum* which presumably accounts for the small, round holes that often occur in great numbers in the lamina (cf. KJELLMAN, 1877b, l. c.).

Dilsea integra grows in various communities. In shallow water it grows together with such species as *Stictyosiphon*, *Desmarestia aculeata*, *Fucus*, *Punctaria glacialis* and *plantaginea*, *Chaetopteris*, and *Sphacelaria*, at greater depths especially together with other Red Algae. In the sublittoral communities of Florideae it is found together with *Phycodrys* as well as with *Phyllophora*, *Turnerella*, *Euthora*, *Polysiphonia*, *Rhodomela*, *Lithothamnion*, *Desmarestia aculeata*, *Laminaria solidungula* and *saccharina*.

Previous Records from Greenland:

E. Gr.: A couple of localities in Scoresby Sund (R. 1898, l. c.) and at Sabine Ø in lat. 74½° N. (J. 1904, p. 7).

W. Gr.: One locality in lat. 76½° N. (L. 1933, p. 16).

Scoresby Sund District: Kap Hope, 6—12 m; the mouth of Hurry Inlet, 4 m, 15—25 m, 35—38 m; Fame Øer, 4 m, 5—12 m, and cast ashore; Kap Stewart, cast ashore (N. H.); Danmarks Ø (N. H.).

Squamariaceae

Peyssonnelia Decaisne, 1841.

1. Peyssonnelia Rosenvingii SCHMITZ in ROSENV., 1893, p. 782, fig. 8; 1894, p. 61; ROSENV., 1898, p. 14; JÓNSSON, 1901, p. 151.

Together with other algae, preserved in alcohol, I have in material from three localities encountered small quantities of a minute *Peyssonnelia* species, no doubt belonging to the species under consideration. The plants involved inhabited stones, a snail-shell, and the haptera of *Laminaria saccharina* and were collected at depths between 6—11 m and 14—18 m. They were mostly old and dark and not very conspicuous and their bearing antheridial threads was the only fact that drew my attention to their existence. One individual was examined from below and exhibited some few short rhizoids issuing from the under side. Besides old plants, some young sterile individuals of a much lighter colour were observed on one of the stones.

The antheridial threads occur in nemathecia covering most of the surface of the thallus. They show a striking resemblance to those depicted in *P. squamaria* by RIOCREUX in THURET (1855, pl. 4). They arise from the terminal cells of the crust and, in longitudinal section, exhibit two (to three) cell-rows, measuring up to well over 80 μ in length and consisting of up to 13—14 cells. So far as I have been able to ascertain they have not previously been recorded in this species. They were met with from the end of July until mid-August.

According to TAYLOR (1937, p. 257) *P. Dubyi* in FARLOW (1881, p. 115) is identical with *P. Rosenvingii.* TAYLOR also indicates *P. Dubyi* SCHIFFNER (1916, p. 148) as a synonym; this is, however, hardly correct as that species more probably is a *Cruoriopsis* as held by FELDMANN (1942, p. 252).

Previous Records from Greenland:
E. Gr.: Danmarks Ø in Scoresby Sund (R. 1898, p. 15); some small sterile plants.
W. Gr.: Five localities between lats. 64 and 73° N. (R. 1893 & 1898, l. c.).

Scoresby Sund District: Kap Tobin, 6—11 m; Bjørneøer, 6—11 m; Danmarks Ø, 19—32 m (N. H.).
Kejser Franz Josephs Fjord District: Vinterøer, 14—18 m.

Rhododermis Crouan in J. Agardh, 1852.

1. **Rhododermis elegans** CROUAN, 1867, p. 148, pl. 19 fig. 130; ROSENV., 1898, p. 18; 1910, p. 104, fig. 3; 1917, p. 197, fig. 118; LEVRING, 1935, p. 42, fig. 9.

Recorded in three localities at depths between 14—17 m and 34 m, growing on stones and forming small crusts which are lilac-rose when dried, more rarely dark purple. It seems to be common in two of the localities, Bjørneøer and Vinterøer, where it was collected on July 25 and August 8, respectively. In plants originating from these two localities the vertical filaments consist of up to 6—7 cells which might exhibit a diameter of up to 10—12 μ, though usually somewhat less. The length of the cells varied from less than one to two diameters, most commonly being equal to or smaller than the diameter. Fusions between cells in the basal layer were observed in several instances.

In the individuals collected in the two above localities, numerous paraphyses as well as sporangia issued from the surface of the crust, whereas no hyaline hairs were observed. The absence of hairs may be due to the fact that they have not been preserved in the material examined, which has been kept in the dry state. The paraphyses almost invariably consisted of 5 cells, more rarely of 4 or 6. They were usually fairly much curved and somewhat attenuated towards their apices, less frequently straight. The apical cell in a vertical thread usually issues only a single paraphyse, in exceptional cases two, and in some instances both a paraphyse and a sporangium. The paraphyses almost invariably are simple, though I observed a single one issuing a branch from its basal cell.

In some of the plants described above the great majority of the sporangia were emptied; in others most of them were still young though emptied sporangia occurred too, some of them being proliferated by the supporting cell which was in process of forming a new sporangium.

The emptied sporangia were frequently sheathed below or might even be completely enveloped by a membrane, which seems to suggest their originating from proliferations. In some few instances were observed sporangia with bipartite or even tetrapartite contents; a couple of the latter measured $29 \times 16\ \mu$ and $25 \times 16\ \mu$, respectively. Not infrequently were observed sporangia harbouring homogeneous, refractive contents which occupied part of the sporangium only.

Some few very thin crusts were collected at Rødeø, only one of them measuring up to 0.5 cm in diameter; this crust did not exceed 20—25 μ in thickness and the vertical threads consisted of no more than four very low cells. These individuals too, collected on August 22 at a depth of as much as 34 m, exhibited paraphyses and sporangia. Nearly all of the latter were young, and only in some few of them were the contents divided by a transverse wall. The paraphyses were composed of three (or four) cells.

None of my plants possessed antheridia or carpogonia. Antheridia were described by ROSENVINGE (1910, l. c.) in a plant collected at Danmarks Havn, whereas carpogonia are unknown.

The question as to whether it is warranted to refer *Rh. parasitica* to the species under consideration has often been subject to debate in literature (e. g. by LEVRING, 1935, l. c., 1937, p. 131; KYLIN, 1944, p. 36). The former species was described and depicted by BATTERS (1889, p. 92, pl. 11 fig. 2A & B) and was later very carefully studied and depicted by KUCKUCK (1897a, p. 329, pls. 7, 8). Having had no opportunity to study the original material or plants inhabiting *Laminaria*, I am not in a position to advance an opinion about this problem. Judging from the descriptions and drawings I am, however, most inclined to include it in the species under consideration.

Previous Records from Greenland:

E. Gr.: Two localities, Danmarks Ø in lat. $70^1/_2$° N. (mentioned below) and Danmarks Havn in lat. $76^1/_2$° N. (R. 1898 and 1910, l. c.), respectively.

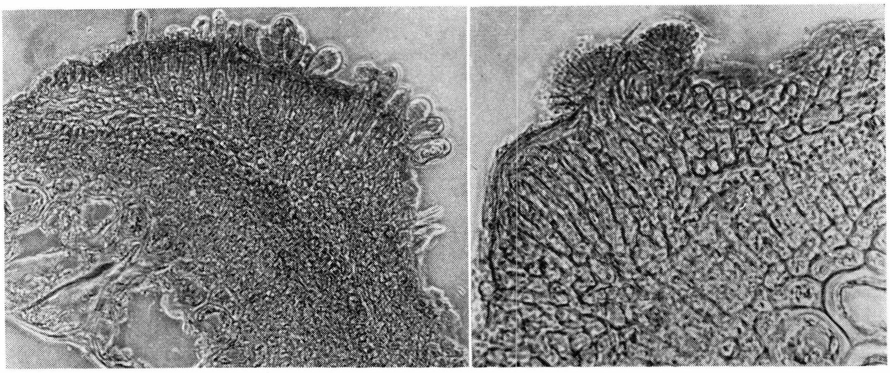
W. Gr.: One locality between lats. 64 and 67° N. (R. 1898, l. c.).

Scoresby Sund District: Bjørneøer, 14—17 m; Danmarks Ø (N. H.); Rødeø, 34 m.

Kejser Franz Josephs Fjord District: Vinterøer, 25—35 m.

Halosacciocolax gen. nov.

Planta in *Halosaccio* parasitica, pulvinari-verruciformis vel circum hospitem cingulum imperfectum formans, e filis erectis vel adscendentibus composita. Pars basalis partim extramatricalis, ad marginem versus e filis radiantibus formata, partim intramatricalis. Tetrasporangia cruciata, breviter pedunculata vel in superficie thalli sessilia. Antheridia in soros aggregata cellulas suffultorias magnas claviformes pari loco sitas induentes.



A B

Fig. 40. *Halosacciocolax Kjellmanii.* Vertical sections showing tetrasporangia and antheridial sori. To the right in B, the cortical cell-rows of the host are seen below the parasite. (Phase-contrast). A: × 155; B: × 250.

1. Halosacciocolax Kjellmanii sp. nov.; *Halosaccion ramentaceum* Kjellm., 1875, p.p., p. 18, pl. 1 figs. 6—7.

Thallus plerumque 0.5—1 mm latus, ad 180 μ crassus. Tetrasporangia 32—48 μ longa, 24—28 μ diametro. Sori cum cellulis suffultoriis 40—48 (—60) μ prominentes, 52—64 μ diametro. In *Halosaccio ramentaceo* parasitica.

In his work on the Red Algae from Spitsbergen, Kjellman (1875) records some wart-like outgrowths on *Halosaccion ramentaceum*, on their outer side bearing tetrasporangia-like cells with cruciate divided contents. As one of the plants also exhibited the tetrasporangia characteristic of the species, the above author advances the hypothesis that the cells concerned may represent "sporocarps" which so far are unknown in this species. Similar protuberances are by Farlow (1881, p. 143) stated to occur on specimens from New England.

In 1883 (p. 156 (199)) Kjellman reverts to the wart-like outgrowths but declares that he is not yet in a position to explain their nature. As far as I know they have not later been mentioned.

In my material of *Halosaccion* collected in the outer Scoresby Sund I observed similar outgrowths in plants originating from three localities in depths between 3—4 and 6—11 m. They appear to represent a parasitic member of the Florideae, to which I have given the above name. In the herbarium material they were bleached and exhibited the same brownish yellow colour as the host.

The species forms low, small, rounded or irregular cushions or warts (fig. 41 A—B), measuring up to 160—180 μ in height and in most cases approximately 0.5—1 mm in width. Not infrequently the plant grows round the host so as to form an incomplete belt, measuring up to 800 μ in width. In several instances were observed confluent individuals which

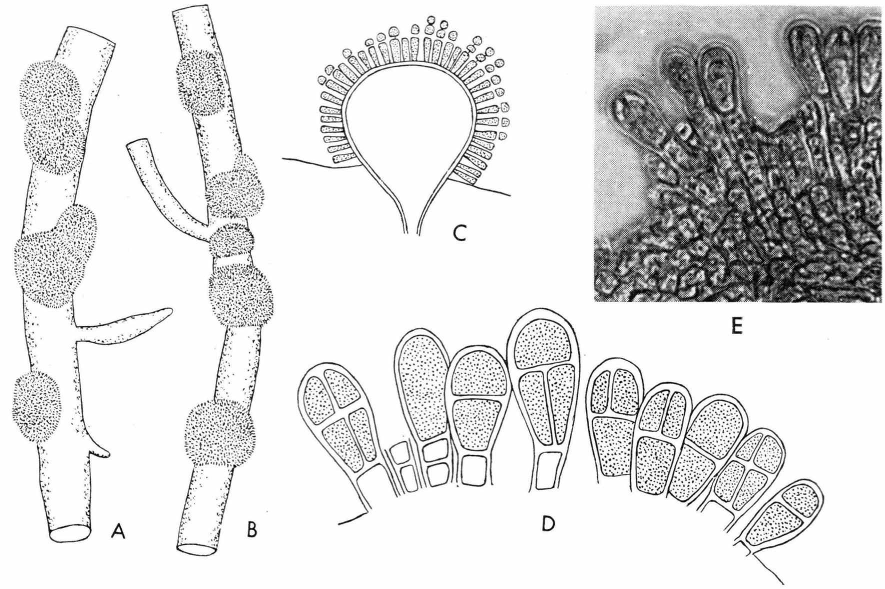


Fig. 41. *Halosacciocolax Kjellmanii.* A—B: habit of plants growing on *Halosaccion;* C—E: vertical sections showing an antheridial sorus and tetrasporangia, respectively; in E, the tetrasporangia are seen issuing terminally from the upright threads. A—B: × 12; C: × 555; D: × 450; E: photo (phase-contrast), × 300.

might likewise form incomplete belts, up to well over 2 mm in width. As appears from fig. 41 A—B the species may be rather abundant. It is frequently situated at the base of the branches of the host.

In vertical section the species is seen to consist of upright, straight or slightly curved, branched threads consisting of rather loosely connected cells and issuing from a basal layer. The latter is partially external, near the margin exhibiting elongated cells arranged in radiating rows, partially endophytic. Thus, the parasite may appear completely epiphytic in some vertical sections (fig. 40 A) or it may send some few threads into the cortical layer of the host. To the right in fig. 40 B the parasite is likewise epiphytic while to the left it penetrates the host. In other sections a comparatively large part of its basal portion was situated within the host.

As a rule the parasite does not penetrate beyond the cortical layer of the host. In specimens of the host collected at Kap Tobin, this layer was usually vigorously developed, in radial direction consisting of up to at least 8 cells arranged in distinct rows. In some instances, however, some few threads of the parasite were observed extending beyond this layer.

The boundary between the parasite and the host is as a rule easily distinguished even where the former is endophytic. This is due principally to the distinct rows of cortical cells in the host, but also to the fact that the cells of the parasite frequently are larger and have more plentiful contents than those of the host.

In sterile plants the surface is covered with a thick mucilage-envelope which is of a brownish yellow colour in material kept in alcohol. During the fructification this envelope is burst and lifted upwards by the reproductive organs on whose upper side remnants often may be recognized.

Nearly all the examined plants bear on their upper side an exceedingly great number of very crowded cruciate tetrasporangia. Thus, the whole plant is in the nature of one sporangial nemathecium. The tetrasporangia arise from the apical cells of the upright threads (fig. 41 E) and are sessile on the cushion or borne on a short, one- to two-celled stalk (fig. 41 D). When mature, they measure 32—48 × 24—28 μ. The emptied tetrasporangia were not infrequently proliferated and might be interspersed with comparatively long, few-celled, sterile, free threads projecting somewhat above the former and presumably in due course producing terminal tetrasporangia.

Several plants exhibited antheridial sori (fig. 40 B) on their upper side, borne on large clavate cells (fig. 41 C) which, like the tetrasporangia, arise from the terminal cells of the upright threads. The sori, including the supporting cells, measured 40—48(—60) × 52—64 μ. The plants in question bore also tetrasporangia. The antheridia are spherical and cut off from the peripheral part of the elongate mother-cells, each of which presumably produces two to few antheridia successively.

Tetrasporangia were met with in July and August, antheridia in August. Female sexual organs and cystocarps were not observed, so the classification of the species is uncertain. I choose to classify it provisionally close to *Rhododermis.*

Scoresby Sund District: Kap Tobin, 6—11 m; the mouth of Hurry Inlet, 3—4 m; Fame Øer, 4 m, 5—6 m.

Hildenbrandiaceae

Hildenbrandia Nardo, 1834.

1. Hildenbrandia prototypus Nardo, op. c., p. 675; Rosenv., 1917, p. 202, figs. 121—25; Printz, 1926, p. 127.

Hildenbrandtia rosea Kützing, 1843, p. 384; Rosenv., 1893, p. 826; 1898, p. 43.

Contrary to previous records of *Hildenbrandia* in Greenland, according to which this alga is restricted to the littoral region, I found it only in the sublittoral region. I collected it in July in three localities at depths of 2 m, 11—13 m, and 25—35 m, respectively, but only in the last-mentioned locality did it occur fairly commonly, inhabiting small stones which it covered almost completely. When dry, these crusts were of a rose or lilac colour; they measured at any rate 125 μ in thickness. When examined through a hand lens the crusts appeared punctated because of the numerous immersed conceptacles.

The sporangia in the plants concerned, collected at the beginning of July, were chiefly old and emptied; in the latter case they exhibited somewhat elongated walls, thus showing some resemblance to paraphyses. A great number of sporangia were still young, their contents being either undivided or bipartite. Mature sporangia were, however, also present and were usually obovate. Two of them were measured, their dimensions being $25 \times 16\ \mu$. The mature sporangia were irregularly cruciate, not zonate as in *H. Crouani*. In some sporangia with undivided contents the latter occupied only part of the sporangium; in such cases abortive sporangia are presumably involved.

According to PRINTZ' (1926, l. c.) investigations in the Trondhjemsfjord on the Norwegian west coast this perennial exhibits periodicity not only as regards its growth, including the formation of conceptacles, but also as regards the formation of sporangia. It is reported that tetrasporangia, both older and young undivided ones, are particularly numerous in spring (from January to April and in May) whereas they are stated to be far scarcer later in the summer and in the autumn.

In East Greenland the species has as yet been collected only in June and July so it cannot be ascertained whether the fertility is subject to a similar periodicity in this area. However, my plants seem to correspond to those collected by PRINTZ in spring.

In the Trondhjemsfjord, PRINTZ encountered fructifying specimens of *H. prototypus* in the littoral region. The majority of the individuals originating from the sublittoral region were sterile, and fertile plants from this region appeared to belong to *H. Crouani*. As the two species are distinguishable from each other only when fertile, the above author did not succeed in stating the occurrence of *H. prototypus* in the sublittoral region. The fact that the individuals met with in East Greenland do actually belong to *H. prototypus* is proved by the manner in which the sporangia are divided. The species under consideration is, incidentally, also recorded from the sublittoral region in other areas.

Previous Records from Greenland:
E. Gr.: Two localities in lats. 66 and $69^1/_2$° N., respectively (J. 1904, p. 6).
W. Gr.: 12 localities between lats. 60 and 72° N. (R. 1893 & 1898, l. c.).

Scoresby Sund District: Amdrups Havn, 11—13 m; the mouth of Hurry Inlet, 25—35 m; Fame Øer, 2 m.

Corallinaceae

Lithothamnion Philippi, 1837.

Apart from some few records from the west coast (KJELLMAN, 1883) the first contribution towards the knowledge of the Greenlandic flora of *Lithothamnion* was given by ROSENVINGE (1893, pp. 772—81). His material originates exclusively from West Greenland and contains six species. It was later revised by FOSLIE to whom additional Greenlandic collections, particularly from East Greenland, were also given over for investigation. The result of his investigations was that no less than twelve species of this genus were stated to be represented in Greenland (ROSENVINGE 1898, pp. 9—14). Five species were stated to occur both in West and East Greenland, five to occur in West Greenland only and two in East Greenland only. According to JÓNSSON (1904, p. 6) only a single species, likewise identified by FOSLIE, was represented in KRUUSE'S collections from East Greenland while FOSLIE (1905, p. 95) records an additional species; as they were already known from both the west and the east coast they did not influence the existing figures.

However, as appears from his publications, FOSLIE repeatedly changed his taxonomical point of view, and in his work from 1905 only seven species were recorded from Greenland. In that publication several of the species mentioned in ROSENVINGE 1898 were reduced to mere forms. For one species only, namely *L. glaciale* KJELLM., did FOSLIE use the same specific name as had been applied by ROSENVINGE in 1893. The remaining specific names used in the latter work were modified so as to become synonyms or names of forms. As FOSLIE'S work from 1905 was his last publication of greater importance on northern species, the taxonomical view advanced in that work must, on the whole, be considered his final interpretation which was also done in FOSLIE'S great monograph published posthumously in 1929 by PRINTZ.

With regard to the Greenlandic flora of *Lithothamnion* later contributions were given first and foremost in 1910 by ROSENVINGE who worked up the material originating from Danmarks Havn in lat. $76^1/_2$° N. on the east coast. The same author furnished a single record from the east coast in lat. 68° N. (1933, p. 12) and some few records from the west coast (1926, p. 14). Finally, a single record from the west coast is given by the present author (1933, p. 16).

The material of *Lithothamnion* collected in East Greenland by me is very extensive and its working up will probably take up much time. Therefore, in order to avoid a delay of the publication of the present work, I have judged it most advisable to postpone the working up proper and to confine myself to indicating my specific determinations without detailed descriptions of the specimens. With a view to taxonomy I follow

FOSLIE 1905, with the exception that I have not used the generic name of *Phymatolithon*. For the purpose of throwing light on the problem of species in Greenland it has been necessary to bring the specific names occurring in ROSENVINGE 1893 and 1898 into agreement with the taxonomy applied by me. As I have, moreover, referred to other important names, some of the species will be provided with fairly many references.

A perusal of the literature up to now gives the result that the total number of species occurring in East Greenland amounts to six, one of which, viz. *L. investiens*, is, however, doubtful (ROSENVINGE, 1898, p. 13; FOSLIE, 1905, p. 87). The remaining five species have also been reported from West Greenland together with a single species which is unknown from East Greenland, viz. *L. breviaxe* FOSL. (= *L. fruticulosum* (KÜTZ.) FOSL.). The material collected by me does not contain species that are new from East Greenland, but all the five unquestionable species recorded from this coast are represented.

1. **Lithothamnion laeve** (STRÖMF.) FOSL. in ROSENV., 1898, p. 14; FOSL., 1905, pp. 16 and 131; 1908, p. 6; 1929, p. 43, pl. 3 figs. 4—9; ROSENV., 1910, p. 100, fig. 1; 1917, p. 215, figs. 129—32.
Lithophyllum laeve STRÖMF., 1886b, p. 21, pl. 1 figs. 11—12.
Lithothamnion tenue ROSENV., 1893, p. 778, figs. 6—7, p. p.

Commonly occurring within my area where it was met with at depths from about 10 m down to 120 m. Almost invariably inhabiting stones, but also encountered on a shell of a bivalve. The species is readily distinguished owing to its large sporangial conceptacles measuring up to 1 mm in diameter. In the material from Danmarks Havn in lat. $76^1/_2$° N. this species was the commonest (ROSENVINGE 1910, l. c.).

Previous Records from Greenland:
E. Gr.: Three localities between lats. 66 and $76^1/_2$° N. (R. 1898 & 1910; J. 1904, p. 6).
W. Gr.: About ten localities between lats. $60^3/_4$ and $72^3/_4$° N. (R. 1893 & 1898; 1926, p. 14).

Scoresby Sund District: Kap Tobin, 50 m, 120 m; Kap Hope, 27 m; the mouth of Hurry Inlet, 25—35 m; Bjørneøer, 11—13 m, 14—17 m, 18—28 m; Danmarks Ø (N. H.).
Kejser Franz Josephs Fjord District: Ella Ø, 12—20 m, in a dredging between 40 and 80 m; Vinterøer, 21—22 m.

2. **Lithothamnion foecundum** KJELLM., 1883, p. 99 (131), pl. 5 figs. 11—19; FOSL., 1905, p. 21; 1929, p. 40, pl. 2 figs. 12—14 (fig. 14 from Danmarks Ø); ROSENV., 1898, p. 12; 1910, p. 100.
L. tenue ROSENV., 1893, p. 778, p. p.

An extremely common species, particularly in Scoresby Sund, and presumably the most abundant. It is distributed from about 10 m down to 120 m, mostly inhabiting stones, but it was also encountered on the shell of a *Buccinum hydrophanum* which was almost quite overgrown. The most characteristic feature of this species is furnished by its very numerous, immersed or subimmersed, sporangial conceptacles, provided with an elevated, ring-shaped border.

Previous Records from Greenland:

E. Gr.: Three localities between lats. 68 and $76^1/_2$° N. (R. 1898 & 1910; 1933, p. 12).

W. Gr.: Two localities in lats. $72^1/_2$ and $72^3/_4$° N., respectively (id. 1898).

Scoresby Sund District: Off Rathbone Ø, 70 m (the identity questionable); Kap Tobin, 50 m, 120 m; Kap Hope, 27 m, 35—40 m; the mouth of Hurry Inlet, 25—35 m; Fame Øer, 8—12 m; Bjørneøer, 9—20 m, 14—17 m, 18—28 m; Danmarks Ø (N. H.); ibid., 18—22 m.

Kejser Franz Josephs Fjord District: Ella Ø, in dredgings between 40 and 60 m and between 40 and 80 m; Vinterøer, 25—35 m.

3. Lithothamnion glaciale Kjellm., 1883, p. 93 (123), pls. 2—3; Rosenv., 1893, p. 773; 1898, p. 9; Fosl., 1905, p. 26.

f. *typicum* Fosl., 1905, p. 26; 1929, p. 41, pl. 23 figs. 1—2, 6—7, 9—11, pl. 24 figs. 1—3; Rosenv., 1910, p. 99.

f. *botrytoides* Fosl., 1905 p. 26; 1929, p. 41, pl. 23 figs. 12—13; Rosenv., 1910, p. 100; *Lithothamnion botrytoides* Fosl. in Rosenv., 1898, p. 10; *L. intermedium* Rosenv., 1893, p. 774; *L. delapsum* f. *conglutinata* Fosl., 1895, p. 78, pl. 14 fig. 4.

f. *subsimplex* Fosl., 1905, p. 27; 1929, p. 41, pl. 23 figs. 3, 5; Rosenv., 1910, p. 100; *Lithothamnion colliculosum* Fosl. in Rosenv., 1898, p. 11; *L. varians* Fosl. in Rosenv., 1898, p. 11.

Encountered at depths between 11—13 m and 50 m. A great number of specimens were collected at Bjørneøer. Usually attached, generally to stones, more rarely to shells of barnacles. The crusts are often of a considerable extension. Plants from a depth of 28—32 m were especially well developed. Most of the specimens belong to f. *subsimplex*. The branches were short, simple or slightly branched.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $70^1/_2$ (R. 1898) and $76^1/_2$° N. (f. *typicum*, f. *botrytoides*, and f. *subsimplex*, id. 1910), respectively.

W. Gr.: Nine localities between lats. 61 and $72^1/_3$° N. (id. 1893 & 1898).

Scoresby Sund District: Kap Tobin, 50 m; off Scoresbysund, 17—20 m; Bjørneøer, 11—13 m, 14—17 m, 18—28 m, 28—32 m; Danmarks Ø (N. H.).

4. Lithothamnion tophiforme Unger, 1858, p. 21, pl. 5 fig. 14; Rosenv., 1898, p. 13; Fosl., 1905, p. 51; 1929, p. 46, pl. 20.

L. soriferum Kjellm., Rosenv., 1893, p. 772, p. p.

L. flabellatum Rosenv., 1898, p. 10.

f. *flabellata* (Rosenv.) Fosl., 1905, l. c.; 1908, p. 14; 1929, p. 46, pl. 20 fig. 18; *Lithothamnion flabellatum* Rosenv., 1893, p. 772, figs. 1—2.

Found in a single locality, where a specimen attaining a height of about 3 cm was collected at a depth of 11—13 m. It was not fan-shaped so it does not belong to f. *flabellata*.

Previous Records from Greenland:
E. Gr.: Danmarks Ø (R. 1898 (f. *flabellata*, FOSL., 1905, p. 58)) and Danmarks Havn in lat. $76^1/_2$° N. (R. 1910, p. 99).
W. Gr.: Five localities between lats. $60^3/_4$ and $72^1/_3$° N. (R. 1898; L. 1933, p. 16).

Scoresby Sund District: Bjørneøer, 11—13 m; Danmarks Ø, 17—21 m (N. H.).

5. Lithothamnion investiens FOSL., 1895, p. 157, pl. 22 figs. 2—5; id. in ROSENV., 1898, p. 13; A. ZINOVA, 1955, p. 83 (f. *torosum*).
Phymatolithon investiens FOSL., 1905, p. 81; 1929, p. 47, pl. 40.

Only a single, questionable specimen of this species has been recorded from Greenland (see below).

Previous Records from Greenland:
E. Gr.: One locality (R. 1898, l. c.; FOSL., 1905, p. 87, the foot-note).
W. Gr.: None.

Scoresby Sund District: Danmarks Ø, 19 m (N. H.).

6. Lithothamnion compactum KJELLM., 1883, p. 101 (132), pl. 6 figs. 8—12.
Phymatolithon compactum (KJELLM.) FOSL., 1905, p. 88.

f. *typicum* FOSL., 1905, l. c.; *Clathromorphum compactum* (KJELLM.) FOSL., 1898, p. 4; 1908, p. 11; MASON, 1953, p. 331; *Cl. compactum* f. *typicum* FOSL., 1929, p. 29, pl. 41 figs. 1—4; *Lithothamnion circumscriptum β, validum* ROSENV., 1893, p. 775, fig. 3.
f. *circumscriptum* (STRÖMF.) FOSL., 1905, l. c.; *Lithothamnion circumscriptum* STRÖMF., 1886b, p. 20, pl. 1 figs. 4—8; ROSENV., 1898, p. 13; *L. circumscriptum α, areolatum* ROSENV., 1893, p. 774; *Clathromorphum circumscriptum* (STRÖMF.) FOSL., 1898, p. 5; MASON, 1953, p. 332; *Cl. compactum* f. *circumscriptum* FOSL., 1929, p. 28, pl. 41 figs. 5—10.

The species was collected only at Bjørneøer but was found on stones in several dredgings between 6—11 m and 18—28 m. As compared with the other two crust-forming species it was, however, of insignificant importance.

Previous Records from Greenland:
E. Gr.: Two localities in lats. $65^2/_3$ and $70^1/_2$° N., respectively (FOSL., 1905, p. 95; R. 1898). Both f. *typ.* and f. *circumscr.* are involved.
W. Gr.: Numerous localities between lats. 60 and $72^3/_4$° N. (R. 1893 & 1898; 1926, p. 14). Both f. *typ.* and f. *circumscr.* are involved.

Scoresby Sund District: Bjørneøer, 6—11 m, 9—20 m, 11—13 m, 14—17 m, 18—28 m; Danmarks Ø, 13—32 m (N. H.).

Kallymeniaceae

Euthora J. Agardh, 1847.

1. Euthora cristata (L.) J. Ag., op. c., p. 11; Kjellm., 1883, p. 145 (186); Jónsson, 1904, p. 13; Printz, 1926, p. 69.
Fucus cristatus L., Turner, 1808, p. 48, pl. 23.

f. *typica* Kjellm., l. c.; Areschoug, Alg. scand. exsicc. No. 308.
f. *angustata* Lyngb., 1819, p. 13; *Sphaerococcus cristatus β angustatus* Lyngb., l. c.

Only a single, not intact specimen has been referred to f. *typica*. Most of the other individuals are fairly narrow and must presumably be referred to f. *angustata* although some of them seem to represent intermediate forms. The distinctive features of the two forms lie not only in the width and size of the frond but also in the density of the branches. The individual referred to f. *typica* measured about 3 cm in height, while its width did not exceed some 3 mm. The other plants attained a height of between 2 and 8 cm, their width measuring about 1 mm; in their upper parts they were more richly branched than the former. According to literature f. *typica* occurs in exposed habitats, f. *angustata* in more sheltered localities (e. g. Børgesen, 1902, p. 361, and Jónsson, 1904, l. c.). The individual I have referred to f. *typica* grew together with f. *angustata* specimens reaching a height of up to 8 cm in the rather exposed locality Kap Tobin, but at a great depth (27—31 m).

In the f. *typica* individual the cystocarps, situated on the margin of the thallus, occurred abundantly though not by far in so great numbers as in Areschoug's above-mentioned exsiccata number. Also in f. *angustata* they were common but were almost invariably situated near the tips of the young shoots, in the upper part of the plant as well as at lower levels; in several instances they were apparently terminal or nearly so. They measured up to 0.5 mm in diameter. Tetrasporangia occur on distinct individuals but the two kinds of individuals frequently grow together. Cystocarps were observed in July and August, tetrasporangia in June and July.

Printz (l. c., p. 70) records from the Trondhjemsfjord that the majority of the plants are annual while a small number of them hibernate though in such cases being pale and disorganized. In some single instances, shoots dating from three successive years were observed on one and the same individual. At Spitsbergen the species is reported to develop all through the year and even to bear cystocarps in winter (Kjellman, l. c.); no information, however, is given as to how old it may grow in that area. I am not in a position to state the maximum age of the species when occurring in East Greenland but it would not seem unlikely that some of the individuals I collected were more than one year old.

The species is characteristic at greater depths in the sublittoral region in the outer part of Scoresby Sund, most often at depths from 16—18 m down to almost 40 m; a single sterile individual was found at a depth of 11 m, and another likewise sterile specimen at a depth of 5—6 m. The species inhabits shells of barnacles (frequently), *Lithothamnion*, *Phycodrys*, *Phyllophora Brod.* f. *interrupta*, and hydroids as well as *Ascidia callosa*. Several individuals were not attached to their substratum; most of them have presumably been growing on stones from which they were detached when collected.

Previous Records from Greenland:

E. Gr.: Ten localities between lats. $65^1/_2$ and $76^1/_2$° N. (R. 1898, p. 28; 1910, p. 108; 1933, p. 13; J., l. c.).

W. Gr.: Numerous localities between the southern point and lat. $76^3/_4$° N. (R. 1893, p. 813; 1898, p. 28; 1926, p. 14; K. 1897c, p. 29; L. 1933, p. 15).

Scoresby Sund District: Kap Tobin, 27—31 m, 30—40 m; Amdrups Havn, 16—18 m, 22—25 m, 25—26 m, 30 m; Scoresbysund, 11 m; Kap Hope, 27 m; the mouth of Hurry Inlet, 25—35 m, 35—38 m; Fame Øer, 5—6 m; Danmarks Ø (N. H.).

Choreocolacaceae

Harveyella Schmitz & Reinke in Reinke, 1889 (Algenfl.).

1. Harveyella mirabilis (Reinsch) Schmitz & Reinke, op. c.; Sturch, 1899, p. 83; 1924, p. 27; Kylin, 1907, p. 128; 1944, p. 49; Rosenv., 1931, p. 494.

Choreocolax mirabilis Reinsch, 1875, p. 63.

Choreocolax albus Kuckuck, 1894 a, p. 983.

As will be generally known, this species is in nature represented by three kinds of plants, namely by male, female, and tetrasporic ones, and most probably a seasonal alternation of generations takes place. As appears from literature cystocarpic and tetrasporic plants occur, on the whole, at different times of the year on North European coasts. While the former occur in winter, the latter are met with chiefly in spring and in early summer. In material originating from Scoresby Sund, however, Rosenvinge (1898, p. 40) found cystocarpic individuals in April and July, whereas tetrasporic ones were not observed and he concluded therefore (1931, p. 498) that, in the Arctic, this species displays a diverging biological behaviour. It should be added that in West Greenland, too, this author (1893, p. 823) found cystocarpic plants in July whereas tetrasporic individuals are not recorded from this area either.

Judging from my observations in East Greenland the species under consideration does not, however, seem to behave very differently from what is the case in North Europe; for in my material, collected at the end of June as well as in July and August, I did actually encounter tetrasporic plants all through the period involved; they even seem to be predominant. Cystocarpic individuals, some of them still retaining trichogynes pertaining to unfertilized carpogonia, were found in July and August and, finally, three antheridia-bearing plants were collected, likewise in July and August. Combined with ROSENVINGE's records, my observations indicate that conditions in East Greenland agree fairly well with those found by KYLIN (1944, p. 50) on the Swedish west coast, where the cystocarpic and tetrasporic plants occur simultaneously from January to March; at the beginning of that period the cystocarpic plants are predominant, later on the tetrasporic, which agrees with the fact that the former are quite preponderant in December, the latter in April. In East Greenland the times at which the two kinds of individuals occur are but somewhat retarded. As on the Swedish west coast (KYLIN, 1907, l. c.) the individuals inhabiting the youngest generation of branches in *Rhodomela* are tetrasporic. They were generally smaller than the cystocarpic ones which attained a size of up to well over 1 mm in diameter.

The species is widely distributed in the localities in which *Rhodomela* is present and was even relatively numerous at Bjørneøer and at Ella Ø. It was met with at depths from about 2 m down to 25—35 m and was observed on f. *tenuissima* and f. *flagellaris* of the above host. The material kept in alcohol is not always of a whitish colour, but more frequently brownish red or even nearly black. The dark colour may be ascribed mainly to the mucilage-envelope.

Previous Records from Greenland:
E. Gr.: One locality in lat. $70^1/_2$° N. (R. 1898, l. c.).
W. Gr.: Two localities in lats. $68^3/_4$ and $72^3/_4$° N., respectively (R. 1893, l. c.).

Scoresby Sund District: Kap Hope, 6—12 m; the mouth of Hurry Inlet, 10 m?, 25—35 m; Fame Øer, 4—6 m, 8—12 m, 12—18 m; Bjørneøer, 6—11 m, 10—21 m; Danmarks Ø (N. H.); ibid., 1—3 m.
Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m; the head of Duséns Fjord, 15—25 m.

Gigartinales

Cruoriaceae

Cruoria Fries, 1835.

1. **Cruoria arctica** SCHMITZ in ROSENV., 1893, p. 784; 1894, p. 63; ROSENV., 1898, p. 15, fig. 1; 1910, p. 102.
Cruoria firma KJELLM., 1906, p. 14, pl. 1 figs. 1—7.

In my material this species is by far the commonest of the crust-forming uncalcified Red Algae. It is a pronounced deep-water species, encountered from about 25—30 m down to 120 m, in a single instance, however, at a depth of only 10 m. It is of greatest importance in the Scoresby Sund district. Nearly all the individuals inhabited crusts of *Lithothamnion*; more rarely it was met with on shells of barnacles. When dried it is easily recognized because of its reddish brown colour. The crusts vary in size. In a single instance a crust of *Cruoria* covered a *Lithothamnion* completely over an area of at least 25 sq. cm; this crust was, however, presumably composed of several individuals. Gland cells were observed in all plants.

Although I have examined a great number of individuals I found only two zonate but immature tetrasporangia, one of which measured $82 \times 16\ \mu$. They agreed perfectly with ROSENVINGE's drawing. The plant in question was collected at Bjørneøer at the end of July at a depth of 28—32 m. Since they occurred in a squeezed preparation the sporangia were detached, so it was impossible to state how they had been situated on the threads. However, in an individual from a depth of 120 m, collected in mid-July and exhibiting vertical threads of a length of $120\ \mu$, were observed several large emptied cells, undoubtedly representing tetrasporangia. They issued laterally from the vertical threads, e. g. from the lowermost cell but two. They measured about $60\ \mu$ in length and reached the level of the surface of the crust.

According to the description the basal portion is monostromatic. TAYLOR (1937, p. 281), too, states that the basal portion is monostromatic but adds that it may sometimes be somewhat distromatic.

In the description of the closely related species *Cruoria firma* KJELLM., which ROSENVINGE (1910, l. c.) regarded as identical with the species under consideration, the basal portion is stated to consist of at least two cell-layers.

In my plants the basal portion often consists of a single cell-layer but, as far as I have been able to ascertain, it is in some instances (older crusts?) composed of more than one layer. In such cases the vertical threads may be somewhat arched which, according to KJELLMAN, is the case in his *Cr. firma*. As a matter of fact my material contains both the latter and *Cr. arctica*. Despite the difference between their basal portions I judge it warranted to amalgamate the two species which are similar to each other as far as the gland cells, the tetrasporangia and other features are concerned.

Previous Records from Greenland:

E. Gr.: Danmarks Ø in Scoresby Sund in lat. $70^1/_2$° N. and Danmarks Havn in lat. $76^1/_2$° N. (R. 1898 & 1910, l. c.). Furthermore, one doubtful record from Kangerdlugssuaq in lat. 68—$68^1/_2$° N. (R. 1933, p. 12).

W. Gr.: Four localities between lats. $60^1/_2$ and $72^1/_3$° N. (id. 1893 & 1898, l. c.).

Scoresby Sund District: Off the Rathbone Ø, 70 m; Kap Tobin, 27—31 m, 50 m, 120 m; Kap Hope, 10 m, 27 m, 35—40 m; the mouth of Hurry Inlet, 25—35 m; Bjørneøer, 28—32 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, 36 m, 40—80 m; Vinterøer, 25—35 m.

Petrocelis J. Agardh, 1852.

1. **Petrocelis polygyna** (Kjellm.) Schmitz, 1889, p. 454; Rosenv., 1898, p. 16; Jónsson, 1904, p. 7. — Not *P. polygyna* in Printz, 1926, p. 120, pl. 1 figs. 1—4.

Haemescharia polygyna Kjellm., 1883, p. 142 (182), pl. 11.
Petrocelis sp. Rosenv., 1926, p. 34.

I encountered numerous specimens of this species at Bjørneøer at the end of July, inhabiting stones together with other crust-forming algae, particularly *Lithoderma*, which it had often partially overgrown. As a rule the crusts are separate and rather small, their diameter usually measuring less than 1 cm, often only some few mm. In some few instances, however, it attained a diameter of at least 3 cm, but in such cases confluent plants may be involved. When dried, the plants usually are of a reddish brown or brownish violet colour. In old individuals, kept in the dry state and exhibiting a blackish colour, the crusts cracked and might get partially loose from the stone. The crusts contain mucilage which swells considerably when soaked and the vertical threads, particularly their upper halves, are easily separated from one another by exerting a gentle pressure under a cover-glass.

The basal layer is monostromatic and consists of horizontally elongated cells, whose length may measure several diameters (cf. Kjellman, figs. 4, 7). Older plants, in particular, may exhibit fairly elongate cells, which may often be rather irregular.

The vertical threads, issuing rectangularly from the basal layer, exhibit an almost equal diameter throughout their length or may be slightly tapering towards apex. When full-grown, they consist of cylindrical cells, generally 6—9 μ in diameter and attaining a length of about 1.5 diameters. The cells are, however, often somewhat longer and the lower ones may be somewhat thicker than stated above. In many individuals the vertical threads were not yet full-grown, as they exhibited very short cells in their distal portion. Apart from the uppermost ones, the cells generally possess plentiful contents of starch grains.

The vertical threads attain to a considerable length; they may measure up to 4—500 μ in length and consist of up to 30 (35) cells. Thus, they may be appreciably longer than those described by Kjellman which measured up to about 250 μ and were composed of 15—20 cells. They are usually simple, more rarely they exhibit a single dichotomous branching which may occur anywhere between the lowermost cell and apex, or they may be repeatedly dichotomously branched. Some threads bore a poorly developed lateral branch. In some cases I observed older vertical threads which a short way behind the apex had undergone repeated dichotomous branchings at short intervals, the result being a bundle of short, low-celled, slightly divaricate, fastigiate shoots near the tip. This might sometimes be the case e. g. in threads growing close to the emptied cystocarps.

In several plants, lateral carpogonia with intact trichogynes were inserted on the vertical threads. In some instances the fertile threads bore a single carpogonium or some few ones each, in others they bore several; generally no more than one carpogonium is given out from an individual cell but I did, however, observe some cells bearing two opposite carpogonia each. The condition is completely similar to KJELLMAN's fig. 8. Unlike that author I have, however, also seen two- and three-celled carpogonial branches.

In several plants were observed mature or almost mature cystocarps, which might be fairly abundant. Also in these individuals carpogonia could be found, but in such cases the trichogynes had partly withered away. The cystocarps are nearly spindle-shaped and show some resemblance to those in *Petrocelis Hennedyi.* One of the intact cystocarps measured $104 \times 34\ \mu$. They are invariably immersed in the crust between the vertical threads, not infrequently in the lower part, and presumably arise as the result of a fertilization of a carpogonium. I have not, however, had an opportunity of studying their development; nor have I observed cells that might be supposed to represent antheridia, although in some cases I found both lateral and apical cells, diverging from the others in containing a refractive, homogeneous substance. However, the contents possibly represent an artificial product.

Thus, the cystocarps do not correspond with KJELLMAN's descriptions and drawings, according to which they consist of cell-rows. As a matter of fact that author did not observe the cystocarps; it is most likely that the vertical threads in his figs. 4—6 represent but vegetative threads. It may, however, be possible that some of the cells depicted by KJELLMAN in fig. 6 (and 9) represent tetrasporic mother-cells (cf. PRINTZ, 1926, p. 120).

On the other hand, ROSENVINGE (1898, l. c.) mentioned supposed immature cystocarps consisting of groups of large cells in his plants from Scoresby Sund but did not describe their shape. He did, however, later describe spindle-like cystocarps in a plant originating from North Devon in Arctic NE America (1926, p. 34, fig. 7) but classified the species involved as a *Petrocelis* sp., with the designation "an *P. polygyna* Kjellm.?" affixed in brackets. His hesitation to refer his plant to the species under consideration is no doubt due especially to the disagreement of the cystocarps with the description by KJELLMAN. After having studied the cystocarps in the *P. polygyna* in my material I feel, however, no doubt that ROSENVINGE's plant does actually belong to this species. The identification of this specimen entails an addition to the algal flora of NE North America as TAYLOR (1937) does not record *Petrocelis polygyna* from this area.

One plant, in which neither carpogonia nor cystocarps were observed, probably possessed solitary, intercalary tetrasporangia. One of the upper cells (the uppermost but two?) in a vertical thread was of conspicuously larger diameter and length than the other cells and within its wall four distinct cells were seen. I found only this sole supposed tetrasporangium with tetraspores(?) so I dare not assert that it actually is a tetrasporangium; but as I observed, in the same slide, some few other threads that also exhibited a wider, elongate, but empty, cell near their apices I find my observation worth mentioning. The supposed tetrasporangia resemble those in *P. Middendorffii* (RUPR.) KJELLM. which, however, usually occur in the middle of the threads.

All the individuals collected were inhabited by numerous specimens of *Chlorochytrium Schmitzii*, some of them also by *Ectocarpus* (?) (*Streblonema*) *helophorus*.

Besides at Bjørneøer I met with this species in several other localities and it seems to be common. Its vertical range extends from a depth of 6—9 m down to 25—35 m. The majority of the plants from localities other than Bjørneøer, collected from the end of June to the end of August, were sterile. The most well-developed ones originated from Danmarks Ø; their vertical threads measured up to 386 μ and consisted of more than 20 cells. The species thus seems to reach its optimum development in the inner Scoresby Sund. In some individuals from Ella Ø dating from the beginning of August a great number of the vertical threads, not yet full-grown, bore a single lateral, somewhat refractive cell, possibly representing a young carpogonium which had not yet produced a trichogyne. It must be considered out of the question that these cells represent anomalies as they occurred fairly regularly and abundantly. In some few instances the cell involved had become elongated and was divided by a transverse wall.

In his work on the algal flora of the Trondhjemsfjord (Norway), PRINTZ (1926, l. c.) describes a *Squamariaceae* which he refers to *Petrocelis polygyna* to which it shows certain points of resemblance. I do not, however, feel convinced of its identity. The vertical threads in the Norwegian plant consist only of 6 cells (5—7), are simple and terminate in a tapering cell. Furthermore, the cells in its basal layer are much shorter. It might be imagined that the plants involved were still young and that their vertical threads would later increase in length. This seems not, however, to be the case as the number of cells in the threads was constant and some of the plants bore seriate, intercalary tetrasporangia. Even assuming that *Petrocelis polygyna* may display a fairly wide range of variability I do not judge it possible to include in it the Norwegian plant, particularly if future investigations establish the existence of solitary, intercalary tetrasporangia. It should be added that A. ZINOVA (1955, p. 114) shares the opinion advanced by PRINTZ.

Outside of East Greenland *Petrocelis polygyna* is recorded from one locality in the Siberian Arctic (KJELLMAN, l. c.) and from North Devon in Arctic NE America (ROSENVINGE, 1926, l. c.).

Previous Records from Greenland:

E. Gr.: Five localities between lats. 66 and $76^1/_2$° N. (R. 1898, l. c.; 1910, p. 102; J. 1904, p. 7).

W. Gr.: No records.

Scoresby Sund District: Kap Tobin, 6—11 m; Kap Hope, 10—11 m; the mouth of Hurry Inlet, 25—35 m; Bjørneøer, 6—11 m, 14—17 m; Danmarks Ø, 8—23 m (N. H.); ibid. 18—22 m.

Kejser Franz Josephs Fjord District: Ella Ø, 6—9 m; Vinterøer, 14—18 m; Kap Borlase Warren (C. K.).

Cruoriopsis Dufour, 1864.

1. Cruoriopsis hyperborea ROSENV., 1910, p. 102, fig. 2; 1926, p. 35.

I have had an opportunity to examine the original material of this species from Danmarks Havn in lat. $76^1/_2$° N. in NE Greenland as well as material originating from arctic NE Canada. The material agrees perfectly with ROSENVINGE's (l. c.) descriptions. The species is rather conspicuous on account of its deep blood-red colour. In my own collections I have made a thorough examination of a great number of stones, kept in the dry state, by means of a hand lens, but in no instance did I succeed in finding it. All reddish crusts of *Squamariaceae* appeared to consist of *Petrocelis polygyna.* In case this species really is present in my area, it is presumably rare. Outside of Greenland it is, so far, known only from three localities between approximately lats. $76^1/_2$ and $78^3/_4$° N. in NE Canada.

Previous Records from Greenland:

E. Gr.: One locality (see above) in lat. $76^1/_2$° N. (R., l. c.).

W. Gr.: No records.

Solieriaceae

Turnerella Schmitz, 1889.

1. Turnerella Pennyi (HARV.) SCHMITZ emend. in ROSENV., 1893, p. 815, pl. 2 fig. 3; ROSENV., 1898, p. 29; 1910, p. 109; 1926, p. 30; JÓNSSON, 1901, p. 136; 1904, p. 13; HOWE, 1927, p. 23.

Kallymenia Pennyi Harvey, 1853, p. 172.

Turnerella septemtrionalis (Kjellm.) Schmitz in Rosenv., 1893, p. 817; Foslie, 1896, p. 3; Printz, 1926, p. 66; Kylin, 1934b, p. 4.

Kallymenia septemtrionalis Kjellm., 1883, p. 161 (204), pl. 14 figs. 4—6.

K. rosacea J. Ag., Kjellm., 1883, p. 160 (204).

During the working up of the West Greenlandic material of his new genus *Turnerella*, Schmitz (1893) was of the opinion that the two species *T. Pennyi* and *T. septemtrionalis*, which had previously been classified

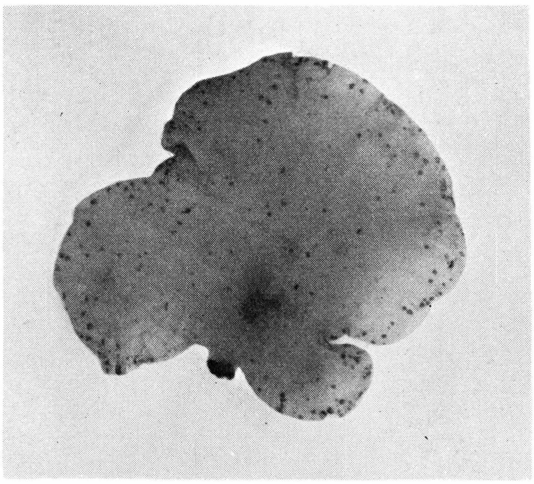


Fig. 42. *Turnerella Pennyi* collected off Rathbone Ø on August 13 at a depth of 70 m, growing on a stone which was taken by means of the Petersen grab. Photographed in water after having been kept in alcohol. Slightly magnified.

as species within the genus *Kallymenia*, ought to be kept distinct. The distinctive features of *T. Pennyi* were stated to lie in its thicker, darker, considerably larger and always detached, sterile thallus.

After having encountered attached individuals of *T. septemtrionalis* in the Trondhjemsfjord in Norway, which were appreciably larger and thicker than is usually the case, and having observed that the colour is influenced by the age, Foslie (l. c.) arrived at the conclusion that the two species are identical. On the basis of material from Jan Mayen and from Scoresby Sund Rosenvinge (1898, l. c.) adopted the same view and amalgamated the two species under the designation of *T. Pennyi*, which name must be given priority. In his later works (cf. above) the latter author maintained this point of view which is shared by Jónsson (l. c.).

Printz (l. c.) does not seem to be convinced of the identity of the two species as he applies the name of *T. septemtrionalis* to his plants from the Trondhjemsfjord. In his work this author gives an important contribution to the knowledge of the biology of this species but does not discuss its specific relation to *T. Pennyi*. Subsequent to Printz, e. g. Levring (1937, p. 107) has applied the same specific name to his plants from the Bergen area on the Norwegian west coast, and it must be admitted that it would seem surprising if the individuals found so far south should represent the markedly arctic species *T. Pennyi*.

In East Greenland the species, sensu lato, is common, particularly in the outer Scoresby Sund where it plays an important role in the sublittoral community of Florideae. It occurs especially together with *Phycodrys*, *Phyllophora*, *Euthora*, and other Red Algae as well as with *Laminaria solidungula* and *L. saccharina*. It was particularly abundant in Amdrups Havn, and a dredging at a depth of 33 m contained almost exclusively this species. Its vertical range in the districts examined by me was from 20 down to 70 m. There is no doubt that few species extend further down.

Fig. 42 shows an individual collected at a depth of 70 m. It attained a length of 4 cm and a width of about 4.2 cm and was inhabited by a great number of foraminiferas. It was collected in mid-August but dated most likely from the preceding year. If so, its insignificant size indicates that growth is very slow at this great depth.

The species occurs attached or loose-lying on the bottom. In the former case it usually inhabits shells of barnacles and stones (or *Lithothamnia* growing on stones?) but I observed several plants growing on *Ascidia callosa*.

When attached, the specimens attain to considerable dimensions, up to 28 cm in width and 18 cm in length, but I encountered plants of all sizes, even quite small. Most of the attached individuals were of a light colour and were rather thin and sterile. This applies e. g. to my largest plants. When dried, the specimens were of a reddish brown, dull colour or, more rarely, slightly glittering, the consistency being rather membraneous. Others, however, were considerably thicker and darker (brownish violet), although sometimes yellowish brown on account of bleaching; several of these individuals, which undoubtedly had hibernated, bore numerous cystocarps in July and August. The behaviour of the species in this area seems thus to agree with that described by Printz (l. c.) from the Trondhjemsfjord where the species is biennial and usually not fructifying until its second year.

That individuals dating from two successive years are involved is proved also by the fact that the plants dating from the year in which collection took place very rarely serve as hosts to other algae or animals. As a rule their thallus exhibits few foraminiferas. The plants from the preceding year, on the other hand, often bear a rich epiflora, consisting

e. g. of *Giffordia ovata*, *Audouinella efflorescens*, *Pylaiella*, *Omphalophyllum*, *Sorapion*, and *Symphyocarpus strangulans*, as well as hydroids.

Apart from their being fertile and attached, the hibernating individuals do not seem to differ essentially from Greenlandic specimens of *T. Pennyi* sensu SCHMITZ, 1893. If the two years old, fructifying plants collected by PRINTZ and myself, respectively, were detached and sterile they would simply represent that species. Thus, I see no reason why *T. Pennyi* and *T. septemtrionalis* should be kept distinct.

I am not in a position to state how old detached individuals may grow but I agree with ROSENVINGE (1898, l. c.) that they seem to be able to survive for several years.

The detached old plants in my material often bear numerous young shoots at their margins, sometimes issuing from a fracture. These adventitious shoots, whose light colour and thin thallus reveal that they date from the year in which collection took place, very often are in the nature of young distinct plants, the transitional zone being narrow and stalk-like. In other instances, however, the transitional zone is broader. The new shoots soon increase in width, but their lower part remains narrow and will thus, together with the difference as regards colour and thickness, indicate the boundary between the two generations.

Adventitious shoots were in one instance observed on an attached plant which was of a light colour and exhibited a maximum diameter of no more than 3.5 cm. They were given out as marginal shoots close to the basal portion, undoubtedly dating from the same year as the plant in question.

Finally, a couple of young shoots were observed issuing from the surface of an old thallus. They were, however, presumably formed from germinating carpospores (or tetraspores which, according to FOSLIE, l. c., are known too), thus representing distinct plants.

Previous Records from Greenland:

E. Gr.: 7 localities between lats. $65^2/_3$ and $76^1/_2°$ N. (R. 1898, 1910, l. c.; 1933, p. 13; J. 1904, l. c.).

W. Gr.: About a dozen localities between lats. 60 and $76^3/_4°$ N. (R. 1893, 1898, l. c.; 1926, p. 14; L. 1933, p. 14).

Scoresby Sund District: Off Rathbone Ø, 70 m; Kap Tobin, 27—31 m; west of Kap Tobin, 30—40 m; Amdrups Havn, 20 m, 22—26 m, 33 m; Kap Hope, 27 m, 30 m, 35—40 m; the mouth of Hurry Inlet, 25—35 m, 35—38 m; Danmarks Ø, 17—38 m (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, dredging between 40 and 80 m.

Rhodophyllidaceae

Rhodophyllis Kützing, 1847.

1. **Rhodophyllis dichotoma** (LEPECH.) GOBI, KJELLM., 1883, p. 144 (185), pl. 12 fig. 3; ROSENV., 1893, p. 812; JÓNSSON, 1904, p. 12; TAYLOR, 1937, pl. 60 fig. 1.

Previous Records from Greenland:

E. Gr.: Two localities in lats. $65^2/_3$ and 68° N., respectively (J., l. c.; R. 1933, p. 13).

W. Gr.: Numerous localities between lats. 60 and $76^3/_4$° N. (R. 1893, l. c.; 1898, p. 28; L. 1933, p. 15).

Not observed by me.

Phyllophoraceae

Phyllophora Greville, 1830.

1. **Phyllophora Brodiaei** (TURN.) J. AG., ROSENV., 1931, p. 521.

f. *interrupta* (GREV.) ROSENV., 1893, p. 821; 1898, p. 32; PRINTZ, 1926, p. 60 fig. 3; KYLIN, 1944, pl. 13 fig. 44; LUND, 1951, p. 21.

Sphaerococcus interruptus GREVILLE, 1829, p. 423; KÜTZING, Tab. phycol., Vol. 19, pl. 20.

Phyllophora interrupta (GREV.) J. AG.; KJELLM. in ARESCHOUG, Alg. scand. exsicc. No. 405 (from Spitsbergen); id. 1875, p. 20; 1883, p. 164 (208).

I found this species in several localities in the Scoresby Sund district, particularly in the outer areas, and at Ella Ø. It was encountered at depths from 4—6 m down to 35—38 m, usually attached to stones, in a single case to a bivalve. In some instances it was found loose-lying on soft bottom and might then be abundant, which was the case e. g. at Fame Øer. It reaches its optimum development at greater depths where it is represented by vigorous individuals, attaining a height of up to 21 cm, sometimes issuing several long shoots from their lowermost stalk-like portion.

All the individuals on hand belong to f. *interrupta*, characteristic in possessing broad shoots exhibiting narrowings at regular intervals. In plants from greater depths (30—38 m) these narrowings are fairly broad while in plants from smaller depths (less than 18 m) they are more pronounced and, moreover, fairly long. The latter plants may thus acquire some resemblance to fig. 498b in ROSENVINGE (1931) while other individuals from smaller depths show most resemblance to fig. 3 in PRINTZ (1926).

According to KJELLMAN (1883, l. c.) f. *interrupta* displays vegetative growth all through the year when occurring at Spitsbergen as proliferations were found throughout the winter. On the basis of HARTZ' material from Danmarks Ø, ROSENVINGE (1898) states that in this locality growth is arrested in autumn and winter and resumed at the end of February. In his fig. 6 the latter author has shown the dimensions of the new shoots at various times of the year.

Also in my individuals from smaller depths, kept as herbarium specimens, it was usually easy to ascertain the dimensions of the new shoots which are of a pale pink colour, membraneous and fairly well adhering to the paper. The older portions of the frond are darker and not too well adhering. By way of example it may be mentioned that in some individuals dating from the end of June the new shoots measured up to 1.5—2 cm in length, while in a plant from mid-July their length was up to 2.5 cm.

In plants from greater depths no or only inconsiderable growth could be ascertained in June—July, although a single individual exhibited new shoots measuring almost 2 cm in length. In a vigorous specimen, reaching a length of 21 cm, were observed some few new apical shoots, 0.6 cm in length; near its base some few adventitious shoots were given out, measuring about 2 cm.

During one period of growth no more than one segment or generation of segments is formed; it attains its greatest width at the middle of the period of growth (cf. ROSENVINGE). Hence, it is possible to estimate the age of the plants and their average growth per year. An unattached, not intact individual from a depth of 12—18 m exhibited four generations of shoots, measuring almost 4 cm on an average. In this plant, the narrow portions of the shoots were fairly long. In another, not intact plant from a depth of 10 m five generations were distinguishable, measuring about 2 cm on an average. In the above vigorous plant, 21 cm long, which was collected at a depth of 30 m, no less than about ten generations were distinguishable. The segments dating from the last years were shorter than the older ones. The individual involved was partially inhabited by other algae such as *Polysiphonia arctica*, *Phycodrys*, and *Euthora*, and served, moreover, as substratum to bryozoans and hydroids.

In several plants dating from June and July nemathecia occurred abundantly, particularly in the older individuals. They were situated both on the upper margin of the frond and on special, short leaflets and were frequently quite confluent. All the nemathecia examined were immature, the largest of them measuring about 1 mm in diameter. It is difficult to estimate the time it takes them to develop; they were of fairly varying dimensions and were observed on up to three generations of shoots simultaneously. Only in one individual, dating from the end of June, did I observe nemathecia on the new shoots.

As will be generally known, the nemathecia were formerly interpreted as a distinct, parasitic Red Alga, *Actinococcus subcutaneus* (LYNGB.) ROSENV. However, in 1929 ROSENVINGE proved that they represent the sporophyte of the species under review; this generation does not occur independently but develops on the *Phyllophora* plant from special auxiliary cells. A preceding fertilization has presumably taken place (cf. CLAUSSEN, 1929, p. 544, and KYLIN, 1930, p. 27), but no gonimoblasts are produced. As *Phyllophora Brodiaei* thus comprises sexual plants only, it may be designated a haploid haplobiont (SVEDELIUS, 1938, fig. 6). The period between the fertilization and the formation of the tetraspores constitutes the diploid phase.

Almost all specimens of this species hitherto collected in Greenland represent f. *interrupta*. The main form is recorded from a locality in lat. $72^3/_4°$ N. on the west coast (ROSENVINGE, 1893, l. c.).

Previous Records from Greenland:

E. Gr.: A dozen localities between lats. $65^1/_2$ and 82° N. (Z. 1874, p. 85, presumably f. *interr.* (cf. R. 1893, p. 821); R. 1898, p. 34; 1910, p. 109; 1933, p. 13; J. 1904, p. 14; L. 1951, p. 21).

W. Gr.: A dozen localities between lats. $60^3/_4$ and $76^3/_4°$ N. (R. 1893, 1898, l. c.; 1926, p. 14; K. 1897c, p. 29; L. 1933, p. 14).

Scoresby Sund District: Amdrups Havn, 14—16 m, 30 m; Scoresbysund, 17—20 m; Kap Hope, 5—7 m, 6—12 m, 30 m; the mouth of Hurry Inlet, 9 m, 20 m, 35—38 m; Fame Øer, 4—6 m, 5—10 m, 12—18 m, 15—25 m (loose-lying); Kap Stewart, cast ashore (N. H.); Danmarks Ø (N. H.); ibid. 18—22 m.

Kejser Franz Josephs Fjord District: Ella Ø, 6—9 m.

Ahnfeltia Fries, 1835.

1. Ahnfeltia plicata (HUDS.) FRIES, op. c., p. 310; PRINTZ, 1926, p. 63; ROSENV., 1931, p. 554.

Several well-developed specimens of this species were found at Fame Øer at depths between 4—6 and 12—18 m. Although most of them seem to have occurred attached, only a single individual from a depth of 4—6 m was attached to a small stone when collected. The plants originating from a depth of 12—18 m seem, however, to have been loose-lying on the bottom together with *Chaetomorpha* and other unattached algae.

Some of the individuals, all of which date from July, were presumably fructifying. As will be generally known, the nemathecia were formerly interpreted as a distinct parasitic alga, *Sterrocolax decipiens* SCHMITZ. They produce monosporangia which are the only reproductive organs known in this species. The monospores are haploid, the species therefore being a haploid asexual haplobiont (SVEDELIUS, 1938, p. 70, fig. 7). In addition, vegetative reproduction seems to take place by means of fragments arising from unattached individuals, growing at the tips of their shoots and dying away below.

Previous Records from Greenland:
None.

Scoresby Sund District: Fame Øer, 4—6 m, 5—6 m, 5—10 m, 12—18 m.

Ceratocolax Rosenvinge, 1898.

1. Ceratocolax Hartzii Rosenv., op. c., p. 34; 1931, p. 545; Levring, 1937, p. 110.

This small parasitic Red Alga was described by Rosenvinge on the basis of material collected by Hartz at Danmarks Ø. However, as later pointed out by Rosenvinge (1931, l. c.), it was already observed by Lyngbye (1819, p. 11) and was examined by Schmitz (1893, p. 380) and Darbishire (1894, p. 369), but without being established as a species.

In East Greenland I recorded the species in several localities in the Scoresby Sund district at depths between 4—6 and 35—38 m. It inhabits *Phyllophora Brodiaei* f. *interrupta* on which it occurs on the older portions of the thallus, also at the margin, whereas it does not occur on the youngest shoots. In some instances the host exhibits only a single or some few specimens of the parasite, in others numerous. It inhabits attached as well as loose-lying *Phyllophora* individuals. In dried material there is often a marked difference in colour between the parasite and the host, the former being pale pink, the latter frequently reddish brown or dark brown.

Ceratocolax occurred abundantly on *Phyllophora* individuals collected at a depth of 35—38 m at the mouth of Hurry Inlet at the beginning of July. Almost all ages were represented, from quite young, unbranched or feebly branched plants to older, richly branched individuals. In the latter, nemathecia were common but differentiated tetraspores were not observed. Other individuals with nemathecia, likewise immature, were encountered in mid-July at a depth of 4—6 m at Fame Øer. When soaked the nemathecia measured about $^3/_4$—1 mm in diameter. In some instances two nemathecia had fused (cf. Rosenvinge, 1931, p. 550).

Besides tetraspores, procarps are known, being recorded already by Darbishire (l. c.). They were described in detail from Danish waters by Rosenvinge (1931, p. 551) who mentions supposed antheridia too, usually occurring in procarp-bearing specimens. In some instances this author found procarps in nemathecia-bearing individuals. The sexual organs are, however, abortive, and cystocarps are unknown so that reproduction takes place exclusively by means of tetraspores. In Greenlandic plants no sexual organs have been observed. With regard to their habit the sexual individuals differ from those bearing sporangia in being more richly branched and by the fact that the tips of their shoots are not swollen.

Previous Records from Greenland:

E. Gr.: Four localities between lats. $65^2/_3$ and 82° N. (R. 1898, p. 39; 1910, p. 110; L. 1951, p. 21).

W. Gr.: One locality in lat. $60^3/_4$° N. (R. 1898, l. c.).

Scoresby Sund District: Amdrups Havn, 14—16 m, 30 m; Scoresbysund, 17—20 m; Kap Hope, 5—7 m, 10 m, 30 m; the mouth of Hurry Inlet, 20 m, 35—38 m; Fame Øer, 4—6 m, 12—18 m; Danmarks Ø (N. H.); ibid., 18—22 m.

Rhodymeniales

Rhodymeniaceae

Halosaccion Kützing, 1843.

1. **Halosaccion ramentaceum** (L.) J. AG., 1852, p. 358; KJELLM., 1875, p. 17, pl. 1 figs. 5—6; 1883, p. 153 (196), pls. 12—13; ROSENV., 1893, p. 825; KUCKUCK, 1897c, p. 30, fig. 1; JÓNSSON, 1901, p. 138, fig. 2; 1904, p. 12.

Fucus ramentaceus LINNÉ, System. Nat. 2, 1767, p. 718.

Encountered in some localities in the outer Scoresby Sund at depths from about 4 to 13 m. A single specimen from Kap Hope originated, however, from a depth of 30 m. Extends into the inner Scoresby Sund where it was collected at Danmarks Ø by HARTZ (ROSENVINGE, 1898, p. 43).

The most well-developed plants were collected at Kap Tobin in mid-August and inhabited stones. They attained a height of well over 20 cm and exhibited branched main axes with numerous proliferations, bearing a great number of tetrasporangia, chiefly mature. When dried the individuals were of a brownish yellow colour. In vertical sections the cortical layer exhibited radial cell-rows consisting of up to 8—10 cells.

In one of the plants from this locality were observed antheridia which so far have been ascertained only in one individual from West Greenland (KUCKUCK, l. c.) and in several Icelandic plants (JÓNSSON, 1903, l. c.). However, while in the latter author's fig. 2a they occur singly on the elongated mother-cell, this cell supports two antheridia in my plant. They were somewhat elongate but no doubt become rounded when maturing. In some instances, emptied, somewhat elongate antheridia were observed but the evacuation of their contents must presumably be ascribed to the mechanical pressure exerted by me on the cover-glass and not to their being mature.

The other plants were more reduced, usually consisting only of an unbranched or sparingly branched main axis which exhibited a larger or smaller number of lateral proliferations. When dried the axes were as a rule reddish brown, more rarely dark reddish brown or even blackish brown, while the proliferations were reddish purple, more rarely reddish brown. The type of these plants may be derived from the individuals from Kap Tobin as they are quite similar to the long branches in the latter. They were collected in June and July and presumably all of them were sterile. Several individuals bore numerous hyaline hairs.

At Fame Øer the species seems to occur unattached. In this locality I have at a depth of 8—12 m encountered some old, thick, cartilaginous fragments which, despite their having been kept in alcohol, preserve their brown colour. These fragments were doubtless two years old. They issued long shoots formed during the second year, bearing a few sterile proliferations and remains of others, all of which dated from the same year as the long shoots. It is uncertain whether the proliferations actually have fructified before being shed. As a rule, unattached Red Algae do not fructify.

Previous Records from Greenland:

E. Gr.: 12 localities from the southern point to lat. $76^1/_2°$ N. (R. 1893, l. c.; 1898, p. 43; 1910, p. 108; 1933, p. 13; J. 1904, l. c.).

W. Gr.: Numerous localities between lats. 60 and $76^3/_4°$ N. and one uncertain record between lats. 78 and 82° N. (R. 1893 & 1898, l. c.; K., l. c.; L. 1933, p. 15).

Scoresby Sund District: Kap Tobin, 6—11 m; Kap Hope, 7—10 m, 12—13 m, 30 m; the mouth of Hurry Inlet, 3—4 m; Fame Øer, 4—6 m, 8—12 m (unattached); Danmarks Ø (N. H.).

Rhodymenia Greville, 1830.

1. Rhodymenia palmata (L.) Grev.; Kjellm., 1883, p. 147 (188); Rosenv., 1893, p. 809; 1931, p. 569.

Previous Records from Greenland:

E. Gr.: Five localities between lats. $65^2/_3$ and $66^1/_4°$ N. (J. 1904, p. 12).

W. Gr.: Numerous localities between lats. 60 and $78^1/_3°$ N. (R. 1893, l. c.; 1898, p. 28; 1926, p. 14).

Much to my surprise I did not find the species in my area, although it is recorded e. g. from both Jan Mayen and Spitsbergen. In the latter locality it is even reported to be one of the commonest Red Algae, occurring in great quantities in several places (Kjellman, 1875, p. 15). I suppose that future investigations will result in its being recognized also in Scoresby Sund and farther north.

Ceramiales

Ceramiaceae

Antithamnion Nägeli, 1847.

1. Antithamnion boreale (GOBI) KJELLM., 1883, p. 180 (226); ROSENV., 1923—24, p. 368; PRINTZ, 1926, p. 105.

A. Plumula var. *boreale* GOBI, 1878, p. 47; ROSENV., 1893, p. 787; 1898, p. 21.

f. *typica* KJELLM., l. c., pl. 16 figs. 2—3.
f. *corallina* (RUPR.) KJELLM., l. c., pl. 16 figs. 4—5.

I found this species in nearly all the localities examined where it occurs at depths from 2—5 m down to 50 m, most commonly at great depths. All individuals on hand are of insignificant size, measuring at the most 2 cm in length, the majority of them being sterile. The species was observed partly on other algae such as *Euthora*, *Phycodrys*, *Chaetopteris*, *Alaria* (stipe), *Laminaria* (haptera), *Chaetomorpha*, and *Lithothamnion*, partly on ascidians, hydroids (*Lafoea gracillima* f. *elegantula*, and *Lafoëina maxima*), and bryozoans (*Scrupocellaria*).

The great majority of the individuals seem to belong to f. *typica*. They possess opposite pinnae, bearing frequently branched pinnulae both on their upper and their under side, more rarely on the upper side only. Articulations bearing a whorl of three pinnae do, however, not infrequently occur. At Bjørneøer I collected some plants, measuring well over 1.5 cm, which undoubtedly must be referred to f. *corallina*. Special characteristics were the occurrence of numerous young branches in very dense fascicles at the tips of the main axes and of the long shoots, the partly verticillate arrangement of their pinnae in whorls of three, and especially the fact that their pinnulae of the first and partly of the second order were long-celled, long, flaccid, and pointed. The appearance is completely like that depicted by KJELLMAN, whereas the resemblance to BØRGESEN'S (1902) fig. 59 is less marked. The two forms are, incidentally, connected by intermediate stages.

Glandular cells, invariably supported by a single cell, occur more or less frequently. They are extremely common in many individuals, particularly older ones, whereas they are lacking or scarce in others. They were not observed in the above-mentioned representatives of f. *corallina* which displayed a luxuriant growth. They seem, on the whole, to be rare in newly-formed portions of the thallus, which suggests their being formed at a later stage. The increasing age of the plant does not, however, always entail the formation of gland cells. A form completely devoid of gland cells (f. *baltica* REINKE, Atlas, pl. 22) is recorded from the western part of the Baltic (REINKE, Algenfl. p. 23), the Swedish west coast (KYLIN, 1907, p. 173; 1944, p. 63), the southern Danish waters, including the Baltic (ROSENVINGE, 1923—24, l. c.), and possibly also from other areas. ROSENVINGE (1898, l. c.) states that in some plants originating from Danmarks Ø he observed long, rhizoid-like threads issuing particularly from the basal cell of the pinnae. Similar threads were also common in some of my individuals from Amdrups Havn.

Young tetrasporangia were observed in mid-July and (in f. *corallina*) at the end of July, mature ones at the end of July and the beginning of August. The individuals bearing mature tetrasporangia were abundantly fructifying and bore, moreover, a great number of immature sporangia. The sporangia are invariably sessile and occur in particular on the upper side of the pinnulae, whether the latter issue from the upper or the under side of the pinnae. They may, however, issue also from the upper side, more rarely from the under side, of branchlets given out from the pinnulae, or may even issue directly from the upper side of the pinnae (near the tip of the long shoot).

In addition to tetrasporangia, antheridia were observed at the end of July and in the first half of August. They occurred on distinct individuals which, however, often grew amid the tetrasporic plants. The antheridia are arranged in small clusters and are borne on one- to few-celled, frequently branched stalks, situated opposite or in whorls on the pinnulae, whether the latter are given out from the upper or the under side of the pinnae, and do often occur throughout the length of the pinnulae. I have, moreover, observed some antheridia on branchlets issuing from the pinnulae or directly on the pinnae, when the latter are short. The antheridia were profuse and occurred all over the upper part of the individuals, to the very apex of the long shoots. They have not previously been recorded from Greenland but are mentioned by ROSENVINGE (1923—24, l. c.) from Danish waters where they were observed on plants which might also bear tetraspores. However, the description given by ROSENVINGE does not agree with my observations as, according to him, the antheridia are few and situated at the upper end of short, three- to six-celled pinnulae or at the tip of a branchlet given out from a pinnula. Female sexual organs and cystocarps were not observed by me; ROSENVINGE (1923—24) states that they are unknown, but since then TAYLOR (1937, p. 315) has recorded cystocarps.

In the Trondhjemsfjord (PRINTZ, l. c.) and the Oslo Fjord (GRAN, 1897, p. 27), on the Swedish west coast (KYLIN, 1907, p. 174), in Danish waters (ROSENVINGE, 1923—24), and in other areas this species occurs in early summer. In East Greenland the development is retarded and the fructification does not set in until later (but persists longer). In plants from Danmarks Ø ROSENVINGE (1898, l. c.) records mature tetrasporangia as late as in October. Also with a view to duration of life the behaviour of the species in East Greenland differs from that displayed in certain other areas. Thus PRINTZ states the species to be annual in the Trondhjemsfjord whereas several of the individuals collected by me undoubtedly had hibernated. In some instances I encountered plants that had hibernated, in which the main shoot was truncated a little way above its base. Near the point of truncation a new long shoot issued laterally in place of a pinna, thus serving in regeneration. In other cases the hibernating portions were more reduced, composed of creeping, branched threads which consisted of barrel-shaped cells and gave rise to new shoots. Finally, I encountered old, detached threads which had issued new shoots.

Previous Records from Greenland:

E. Gr.: A dozen localities between lats. $65^1/_2$ and $76^1/_2$° N. (R. 1898, l. c.; 1910, p. 106; 1933, p. 12; J. 1904, p. 8).

W. Gr.: Almost a dozen localities between lats. $65^1/_2$ and $78^1/_3$° N. (R. 1893, l. c.; 1926, p. 14; K. 1897c, p. 29; L. 1933, p. 16).

Scoresby Sund District: Kap Tobin, 50 m; Amdrups Havn, 15—16 m, 30 m; Scoresbysund, 11 m; Kap Hope, 27 m; Fame Øer, 5—10 m, 15—20 m; Bjørneøer, 6—11 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m, 20—25 m, 20—40 m; Vinterøer, 14—18 m, 25—35 m.

Ptilota C. Agardh, 1817.

1. **Ptilota pectinata** (GUNN.) KJELLM., 1883, p. 174 (219); ROSENV., 1893, p. 790.

Plumaria pectinata (GUNN.) RUPR., TAYLOR, 1937, p. 329.

Ptilota serrata KÜTZ., KJELLM. in ARESCH., Alg. scand. exsicc. No. 406 (from Spitsbergen).

Previous Records from Greenland:

E. Gr.: Ten localities between lats. $65^1/_2$ and $74^1/_2$° N. (Z. 1874, p. 85; R. 1898, p. 23; 1933, p. 12; J. 1904, p. 8).

W. Gr.: Numerous localities between lats. 60 and $77^1/_2$° N. (R. 1893, l. c.; 1898, p. 22; 1926, p. 14; L. 1933, p. 15).

Not recorded by me although undoubtedly occurring in my area.

Delesseriaceae

Pantoneura Kylin in Kylin and Skottsberg, 1919.

1. **Pantoneura Baerii** (POST. & RUPR.) KYLIN, 1924, p. 18; TAYLOR, 1937, pl. 44 fig. 6.

Delesseria Baerii (POST. & RUPR.) RUPR., emend. ROSENV., 1893, p. 806.

D. corymbosa J. AG., KJELLM., 1883, p. 133 (172), pl. 10 fig. 3.

Pantoneura corymbosa (J. AG.) KYLIN, 1924, p. 18.

Previous Records from Greenland:

E. Gr.: A dozen localities between lats. $60^1/_2$ and $74^1/_2$° N. (Kjellm., 1883, p. 132 (170), sub nom. *Deless. rostrata*; R. 1898, p. 26; 1933, p. 13; J. 1904, p. 11).

W. Gr.: Unquestionable records only from four localities between lats. $60^3/_4$ and $76^3/_4$° N. (R. 1893, p. 808; L. 1933, p. 15).

Not recorded by me although undoubtedly occurring in my area.

Phycodrys Kützing, 1843.

1. Phycodrys rubens (Huds.) Batters, Rosenv., 1923—24, p. 467.

Delesseria sinuosa (G. & W.) Lamour., Kjellm., 1883, p. 136 (175); Rosenv., 1898, p. 27; Jónsson, 1904, p. 11.

Phycodrys sinuosa (Huds.) Kütz., op. c.; Kylin, 1923, p. 64; Printz, 1926, p. 78.

f. *typica* Kjellm.
f. *lingulata* Ag.

A widely distributed species, encountered at depths between 2—5 m and at least 40 m. It reached its optimum development at greater depths in the outer part of Scoresby Sund where it was a predominant species in the sublittoral community of Florideae. In this area it attains to considerable dimensions, up to about 40 cm in height, being represented by f. *typica* (→ f. *quercifolia*). Most of the individuals with a broad frond had undoubtedly been growing on rocks and stones but were detached from their substratum, presumably by the dredge. A single plant, about 18 cm in height, was still attached to a large stone, while others grew on barnacles and ascidians. In well-developed, large, intact individuals the basal portion consisted of several vigorous, cylindrical haptera, recalling Rosenvinge's (1923—24) fig. 441 of *Delesseria sanguinea*; moreover, several fairly long, narrow shoots, provided with haptera serving in attachment, issued from the base. Young plants originating from deep water, which would presumably have developed into the type with a broad frond, were observed inhabiting *Phyllophora Brodiaei* f. *interrupta*. At Fame Øer plants with a broad frond were encountered loose-lying in great quantities together with the latter species at a depth of 15—25 m.

Plants from more shallow water generally are narrower; as a rule they correspond perfectly with f. *lingulata*. They are sterile and frequently, by means of narrow lateral haptera, attached to other algae such as *Laminaria* (haptera), *Fucus*, and *Chaetopteris*.

Apart from the loose-lying ones, the majority of the well-developed individuals collected in June and July at great depths bore tetrasporangia, occurring in small marginal leaflets. I did not observe cystocarps, which previously have been recorded in plants from Danmarks Ø (Rosenvinge, 1898, l. c.). According to literature cystocarpic individuals are less frequent than tetrasporic ones. This applies not only to East Greenland (Rosenvinge, 1898, l. c., and 1933, p. 13; Jónsson, 1904, l. c.) but also to other areas such as Iceland (Jónsson, 1901, p. 141), the Faroes (Børgesen, 1902, p. 370), the Trondhjemsfjord in Norway (Printz, op. c., p. 80), and Danish waters (Rosenvinge, 1923—24, p. 473). In some of the above papers they are not even mentioned.

Printz (op. c.) carried out a thorough study of the growth of this species in the Trondhjemsfjord. In this locality growth takes place chiefly from January to early summer and, like the condition found elsewhere, it is effected partly by means of adventitious shoots issuing from the margin of the hibernating portions of the thallus, partly apically. In the latter case, too, it is possible to ascertain the increase during the year of collection as shoots from the preceding year bear short, fertile, marginal shoots; moreover, the frond usually is somewhat narrower between the successive generations; finally, the old shoots serve as substratum to an epifauna. In some plants collected at the optimum depth (5—6 to 16—17 m), the year-shoots measured up to 10—12 cm in length and no less than 8—9 cm in width; above and below this depth the dimensions were considerably smaller.

According to Rosenvinge (1898, l. c.) the growth of the species, when occurring in Scoresby Sund, is arrested from summer until after mid-winter. In an individual dating from the beginning of March the new shoots, conspicuous by their light colour, measured 1 cm in length, while in plants collected in mid-March the shoots reached a length of 1—2 cm. The depth from which the individuals originate is not stated. There is no doubt that the depth is of great importance to the times at which growth is resumed and finished, as well as to the growth-rate and, consequently, to the length of the year-shoots (cf. Printz, op. c., pp. 80, 82).

The majority of the individuals with a broad frond collected by me occurred at depths between 27 m and 35—38 m and have been kept as herbarium specimens. In these plants, the new shoots seemed to measure some few centimetres at the end of June and the beginning of July, the shoots dating from the preceding year in some instances attaining a length of about 6—8 cm. It is possible that these individuals have resumed growth later than the above from Danmarks Ø and that their growth would continue longer. Although the new shoots were already partially provided with short marginal shoots, later to bear tetrasporangia, the latter shoots were still sterile.

It is beyond doubt that the species plays a more important role in East Greenland than in West Greenland. With respect to the latter area Rosenvinge (1893, p. 808) states that the species is distributed along the west coast, though not commonly occurring and only rarely met with in greater quantities.

Previous Records from Greenland:

E. Gr.: A dozen localities between $65^1/_2$ and $76^1/_2$° N. (Z. 1874, p. 86; R. 1898, l. c.; 1910, p. 108; 1933, p. 13; J. 1904, l. c.).

W. Gr.: Numerous localities between the southern point and lat. $76^3/_4$° N. (R. 1893 & 1898, l. c.; L. 1933, p. 15).

Scoresby Sund District: Kap Tobin, 17—21 m, 27—31 m, 35—40 m; Amdrups Havn, 16—18 m, 25—26 m (fragments), 30 m; Scoresbysund, 17—20 m; Rosenvinges Bugt (A. P.); Kap Hope, 5—7 m, 27 m, 30 m; the mouth of Hurry Inlet, 7—10 m, 12—13 m, 20 m, 35—38 m; Fame Øer, 4—6 m, 8—12 m, 12—18 m, 15—25 m (loose-lying); Bjørneøer, 6—11 m, 10—21 m; Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m and in a dredging at 40—80 m; Kap Borlase Warren (C. K.).

Rhodomelaceae

Polysiphonia Greville, 1824.

1. **Polysiphonia urceolata** (Dillw.) Grev., op. c., p. 309; Kjellm., 1883, p. 118 (153); Batten, 1923, p. 288; Rosenv., 1923—24, p. 406; Printz 1926, p. 86.

Previous Records from Greenland:

E. Gr.: One locality in lat. 68—$68^1/_2$° N. (R. 1933, p. 13).

W. Gr.: Eight localities between lats. $60^3/_4$ and $72^3/_4$° N. (R. 1893, p. 797; 1926, p. 14; K. 1897 c, p. 29).

As this species was not encountered in the area examined by me and is recorded neither from Spitsbergen nor from Jan Mayen it will be reasonable to suppose that its northern limit in East Greenland is situated south of Scoresby Sund.

2. **Polysiphonia arctica** J. Ag., 1863, p. 1034; Kjellm., 1883, p. 123 (160); Rosenv., 1893, p. 800; 1898, p. 25; 1910, p. 107.

Although I examined an ample material I did not succeed in finding individuals exhibiting a primary attaching portion; the lowermost part of the plants was never intact. However, a secondary attachment almost invariably was effected by short or by rather long rhizoids. The rhizoids originally terminate in an obtuse apex and this condition remains unchanged in a great number of them, but in case the apex comes into contact with a substratum it may develop into a small attaching disc. The rhizoids are abundant, particularly in the lower part of the plant, issuing from the surface of the fracture or the immediate neighbourhood.

The number of pericentral cells in Greenlandic plants is stated to vary between 4 and 7 (Rosenvinge, 1893, 1898, 1910, l. c.; Jónsson, 1904, p. 10). This applies to my specimens too. In young shoots 4 is the usual number which may, however, be ascertained also in older shoots. The pericentral cells often form a spiral. Trichoblasts were not observed and are as yet unrecorded.

The species is perennial. According to KJELLMAN (1883, p. 124(161)) it develops throughout the year at Spitsbergen although growth is slow during winter. ROSENVINGE (1898, l. c.) is of the opinion that at Danmarks Ø its growth is arrested during winter but resumed already in February, and in his specimens the length of the new shoots was readily ascertained.

It applies to my material, too, that the older shoots are distinguishable partly by their darker colour (in the species under consideration they may even be blackish), partly by serving as host to a true microflora, composed e. g. chiefly of filamentous *Cyanophyceae* and diatoms. In individuals from Kap Tobin, dating from mid-August, *Acrochaetium parvulum* was a very common epiphyte on the older shoots. The table indicates the length of the new shoots, based on the colour.

Locality	Date	Total length	Length of new shoots
Kap Hope, 6–12 m	27th June	9 cm	about 5 cm
– – 10 m.........	29th June	17 cm	– 4 (–5) cm
– – 30 m.........	29th June	22–25 cm	– 3–4 cm
– – 12–13 m......	30th June	16 cm	– 4 (–5) cm
The mouth of Hurry Inlet, 10 m ?	12th July	20 cm	– 3–4 cm
Kap Tobin, 6–11 m	14th August	26 cm	– 10 cm
Dusêns Fjord, 15–25 m...	11th August	20 cm	– 7–9 cm

The plants collected at Kap Hope show that the increase was relatively smaller in the individual from a depth of 30 m than in those from smaller depths. This may be due not only to the greater depth and the ensuing reduced light intensity, but also to the fact that the individual involved obviously was old and presumably full-grown so that growth practically had ceased.

It is of course difficult to estimate the maximum age of the plants but I would judge it to be two years. When the plants disorganize, fragments of the shoots will give rise to new individuals, which undoubtedly is the pattern of reproduction followed by this species.

Tetrasporangia are the only reproductive organs observed. They were encountered in several plants collected at Kap Tobin in mid-August. They were seriate and occurred to the number of (4—) 6—8 in the young shoots. In most cases the tetrasporic mother-cell was undivided, and its nucleus conspicuous, even without staining. Some mother-cells were, however, divided or in process of dividing. The most well-developed mother-cells, some of them dividing, were somewhat elongate, measuring 45—62 × 33—45 μ. I doubt, however, that they would give rise to spores capable of germination as they seem to be degenerate.

Tetrasporangia are not common in this species. They were mentioned by J. AGARDH and by KJELLMAN (1875, p. 9) from Spitsbergen, and by KJELLMAN (1906, p. 14) from Jan Mayen; ROSENVINGE (1893, l. c.) reports plants with emptied tetrasporangia from West Greenland, and abortive tetrasporangia from Scoresby Sund (1898, l. c.). They are, furthermore, recorded by JÓNSSON (1901, p. 143) from Iceland.

KJELLMAN (1875, p. 9) states that in plants from Spitsbergen the tetrasporangia were very large, measuring 250—260 μ in diameter, i. e. much larger than those described above. In this connection it should be added that several of my tetrasporic plants exhibited empty seriate cells, presumably tetrasporangia, near the apices of the shoots from the preceding year, and that these cells attained a considerable diameter. The articulations involved were inflated and barrel-shaped, measuring 200—250 μ in diameter, while immediately below, the diameter did not exceed 100—120 μ. I do not, however, feel convinced that normal spores have been formed in these supposed tetrasporangia; but, if so, the spores have possibly been mature in winter and the emptied sporangia have persisted since then. In some sporangia an abortive spore (or mother-cell?) was observed.

Incompletely developed cystocarps were observed by ROSENVINGE (1893, l. c.) in one plant from West Greenland, and KJELLMAN (1883) records from Spitsbergen a specimen with young "sporocarps" and another with supposed antheridial initials.

Polysiphonia arctica was encountered mainly in the outer Scoresby Sund where it occurred abundantly. It favours the exposed coast and in such habitats it displays luxuriant growth, forming tufts of up to 26 cm in height. It was found at depths from 6—7 m (exceptionally at 2 m and at 4—6 m) down to 35—38 m. It occurs fixed to other species such as *Laminaria* (haptera), *Fucus*, *Punctaria glacialis*, *Chaetopteris*, *Phyllophora Brod.* f. *interrupta*, *Euthora*, and *Rhodomela lycop.* f. *flagellaris*, as well as to animals such as *Ascidia callosa* and the bryozoan *Alcyonidium disciforme*, and to stones. At Kap Hope it occurred i. a. together with *Chaetopteris*, *Sphacelaria*, and *Stictyosiphon* in loose-lying balls.

Previous Records from Greenland:

E. Gr.: Numerous localities between lats. $60^1/_2$ and 82° N. (Z. 1874, p. 85; R. 1893, 1898, 1910, l. c.; 1933, p. 13; J. 1904, p. 10; L. 1951, p. 22).

W. Gr.: Numerous localities between lats. 60 and $76^3/_4$° N. (R. 1893 & 1898, l. c.; K. 1897c, p. 29; L. 1933, p. 15).

Scoresby Sund District: Kap Tobin, 6—11 m, 17—21 m, 27—31 m; Amdrups Havn, 30 m; Kap Hope, 2 m, 6—13 m, 27 m, 30 m; the mouth of Hurry Inlet, 7—10 m, 25—35 m, 35—38 m; Fame Øer, 4—6 m and 9 m (sparsely), 12—18 m (fragments); Kap Stewart, cast ashore (N. H.); Danmarks Ø (N. H.).

Kejser Franz Josephs Fjord District: The head of Dusén's Fjord, 15—25 m; Kap Borlase Warren (C. K.).

Rhodomela C. Agardh, 1822.

1. Rhodomela lycopodioides (L.) AG., op. c., p. 377; KJELLM., 1883, p. 107 (139).

f. *typica* KJELLM., l. c.
 subf. *laxa* KJELLM., l. c., pl. 9 fig. 1.
 subf. *tenera* KJELLM., l. c., pl. 9 fig. 2.

f. *tenuissima* (RUPR.) KJELLM., l. c., pp. 109, 116 (141, 150); ROSENV., 1898, p. 24; JÓNSSON, 1904, p. 10; *Fuscaria tenuissima* RUPR., 1856, p. 221; *Rhodomela tenuissima* (RUPR.) KJELLM., 1875, p. 6, pl. 1 figs. 1—2; id. in ARESCH., Alg. scand. exsicc. No. 402 (from Spitsbergen).

f. *flagellaris* KJELLM., 1883, p. 108 (141), pl. 10 figs. 1—2; 1875, p. 33 sine nom.; FOSLIE, 1890, p. 14; E. SINOVA, 1912, p. 290; LUND, 1951, p. 23, fig. 2.

Seems to be widely distributed though usually not occurring in great quantities. It was recorded at depths from about 2 m down to at least 30 m, most commonly inhabiting *Fucus* and *Chaetopteris*, more rarely the haptera of *Laminaria*, or growing directly on rocks or stones. In several instances it occurs unattached on the bottom. At Kap Hope it was encountered unattached in loose-lying balls consisting chiefly of *Stictyosiphon*, *Sphacelaria*, and *Chaetopteris*. The material on hand was collected at the end of June, in July and August. Trichoblasts occur in nearly all the plants and are particularly well developed in the individuals dating from August. Tetrasporangia, antheridia and cystocarps were observed in July and August. When comparing the vegetative and reproductive development of the plants occurring in East Greenland with that of *Rh. subfusca* (including *Rh. lycop.*) in Danish waters, it is found that in East Greenland the development is somewhat retarded (cf. also ROSENVINGE, 1898, l. c.). In Danish waters the trichoblasts usually are shed in June, while the spores mature and are liberated in spring (ROSENVINGE, 1923—24, p. 458).

The material on hand comprises the above forms. Only one tuft of subf. *laxa* is present, collected in mid-August in Dusén's Fjord, measuring 15 cm and bearing tetrasporangia. It is the most vigorous individual within my material; not only are its shoots thicker than those of the other plants, but also the trichoblasts, being vigorously developed and long, are thicker. This individual is, furthermore, characterized by the penicillate arrangement of its fertile, short branches which the trichoblasts had rendered quite tomentose in their upper part. The tetrasporangia were, on the whole, mature, in part already emptied.

The plants referred to subf. *tenera* were collected at the beginning of August at Ella Ø, growing on *Fucus* and attaining a length of up to 13 cm. They deviate from KJELLMAN's drawing by the fact that fewer branchlets are given out from the main axis, but the elongated and flaccid long-shoots issuing from the main axis follow the same pattern of branching and are similar to those depicted by that author. As regards the diameter of the shoots, these plants constitute an intermediate stage between the above plant of subf. *laxa* and the most slender specimens of f. *tenuissima*. They bear numerous trichoblasts but are, however, still sterile. Close to these plants grew others, bearing tetraspores, cystocarps, or antheridia, which, however, do not seem to belong to the form under consideration but rather to f. *tenuissima*.

F. *tenuissima* is the commonest form and the only one found in the inner Scoresby Sund. A rather large collection was made at Bjørneøer at the end of July, consisting of conspicuously slender individuals. A great number of them were fructifying, bearing tetrasporangia, antheridia, or cystocarps, although some of the antheridia and cystocarps encountered were still young. All three kinds of plants grew together. It should be added that all the specimens collected by HARTZ in Scoresby Sund in February—April, July, and August were sterile (ROSENVINGE 1898, l. c.). The tufts of the form under consideration collected at Ella Ø and part of those originating from Fame Øer were more vigorously developed and attained a length of up to 17 cm.

F. *flagellaris* is a very characteristic form which, so far as I know, has hitherto been encountered only at Spitsbergen (KJELLMAN, 1883, l. c.), at Finmarken (FOSLIE, l. c.), at the Murman Coast (E. SINOVA, op. c., p. 291), and in Eastern North Greenland (LUND, l. c.). I found it in three localities in the outer Scoresby Sund where it occurred in a dozen dredgings at depths between 4—6 m and 30 m. It is, thus, not uncommon in this area. All the individuals on hand, dating from the end of June and the first half of July, were devoid of trichoblasts and were sterile. Most of them seem to have been unattached and exhibit no basal portion. In a single case I observed, however, an intact plant measuring about 22 cm in length and, in its basal part, provided with a small disc. The longest plants measured well over 30 cm. The specimens on hand agree perfectly with that depicted by KJELLMAN and are especially characteristic in that their branches of the highest order are long and retain their red colour when dried. On the more vigorous long-shoots of the individuals kept in alcohol I observed numerous quite short and slender, simple, pointed, adventitious shoots whose uppermost part usually was somewhat incurved. These are the adventitious branchlets which, according to KJELLMAN (l. c., p. 113—114 (148)), are a distinctive feature in *Rh. lycopodioides*. As was stated by ROSENVINGE (1923—24, p. 452) such branchlets do, however, also exist in *Rh. subfusca* and *Rh. virgata*.

KJELLMAN is of the opinion that f. *flagellaris* is closely related to f. *setacea* KJELLM. (1883, p. 108 (140)) and I agree with him. An indirect proof of f. *flagellaris*' being a *Rhodomela* at all is furnished by the fact that the plants occurring in my material were in several instances infested with *Harveyella*.

Previous Records from Greenland:

E. Gr.: Nearly a dozen localities between lats. 60 and 82° N. (R. 1893, p. 797; 1898, l. c.; 1910, p. 106; J. 1904, p. 10; L. 1951, l. c.).

W. Gr.: Numerous localities between lats. 60 and $76^1/_2$° N. (R. 1893, l. c.; 1926, p. 14; L. 1933, p. 15).

Scoresby Sund District: Rosenvinges Bugt, 10—12 m (A. P.); Kap Hope, 2 m, 5—7 m, 10 m, 12—13 m, 30 m; the mouth of Hurry Inlet, 7—10 m, 25—35 m; Kap Stewart, cast ashore (N. H.); Fame Øer, 4—6 m, 8—12 m, 12—18 m; Bjørneøer, 6—11 m, 10—21 m; Danmarks Ø (N. H.); ibid., 1—3 m.

Kejser Franz Josephs Fjord District: Ella Ø, 2—5 m; Vinterøer, 2—3 m, 3—6 m; the head of Duséns Fjord, 15—25 m.

SUMMARIZING REMARKS

The present work deals with the marine algae encountered in the area examined by the author, the Scoresby Sund and Kejser Franz Josephs Fjord districts, amounting to a total of 109, namely 25 *Chlorophyceae*, 53 *Phaeophyceae*, and 31 *Rhodophyceae*. A brief reference is given also to the algae known from East Greenland outside of this area, the work thus furnishing a complete list of the 143 marine algae now known to occur in East Greenland, comprising 37 *Chlorophyceae*, 68 *Phaeophyceae*, and 38 *Rhodophyceae*.

On the basis of the material collected by the author are described 6 new species, namely 5 Phaeophyceae: *Phaeostroma endophyticum*, *Symphyocarpus longisetus*, *Jonssonia pulvinata*, *Litosiphon Mortensenii*, and *L. groenlandicus*, and 1 member of the Rhodophyceae: *Halosacciocolax Kjellmanii*, of which the last mentioned and *Jonssonia pulvinata* represent new genera. Further is established the new genus *Kolderupia* which, however, in East Greenland is known from one locality only, in lat. $76^{1}/_{2}°$ N.

In the material were found, in addition to the above-mentioned new ones, the following 15 species which were hitherto unknown from East Greenland: 2 Chlorophyceae: *Enteromorpha clathrata* and *Spongomorpha vernalis*; 11 Phaeophyceae: *Giffordia intermedia*, *Feldmannia desmarestiae*, *Laminariocolax tomentosoides*, *Sorocarpus uvaeformis*, *Hecatonema maculans*, *Phaeostroma parasiticum*, *Lithoderma fatiscens* ARESCH., *Dermatocelis laminariae*, *Eudesme virescens*, *Litosiphon subcontinuus*, and *L. filiformis*; and 2 Rhodophyceae: *Acrochaetium hallandicum* and *Ahnfeltia plicata*.

To these should be added several forms which previously had specific rank, e. g. *Ectocarpus confervoides* f. *pygmaeus*, *Dictyosiphon foeniculaceus* f. *hippuroides*, *Laminaria digitata* f. *cucullata*, and *Rhodochorton purpureum* f. *intermedium*. New is also *Rhodomela lycopodioides* f. *flagellaris*.

Among the above 15 species which are new to E Greenland, 9 are unknown from W Greenland; this applies also to 3 of the quoted forms. As regards 29 of the species, which were already known from East

Greenland, the new records denote a new northern limit whereas a single species, the high-arctic *Punctaria glacialis*, appears to extend farther south than hitherto known.

Below are mentioned some of the results obtained through the working up of the material.

Chlorophyceae. — Within this class it was considered warranted to amalgamate *Chaetomorpha tortuosa* (DILLW.) KLEEN and *Ch. melagonium*; likewise, *Arthrochaete phaeophila* appeared not to be specifically distinct from *A. penetrans.*

Phaeophyceae. – With regard to taxonomy it should be pointed out that *Isthmoplea sphaerophora* is classified under *Isogeneratae* and is considered closely related to *Pylaiella litoralis.* Further, the family *Delamareaceae* is removed to a new order, *Delamareales*, which is classified under *Isogeneratae.* The generic name *Pseudolithoderma* SVED. is applied to such species within the genus *Lithoderma* as exhibit terminal sporangia.

Within several *Phaeophyceae*, successful endeavours have been made to establish juvenile and developmental stages. This applies to *Sorocarpus uvaeformis*, *Delamarea attenuata*, *Leptonema fasciculatum*, *Chordaria flagelliformis*, *Omphalophyllum ulvaceum*, *Litosiphon subcontinuus*, and to the two new species *Litosiphon Mortensenii* and *L. groenlandicus.*

In other species it has been possible to recognize interesting features, some of them described by previous authors, others hitherto unknown. Thus, hairs are described for the first time in *Sorapion Kjellmanii* and *Dermatocelis laminariae*, and plurilocular sporangia depicted for the first time in *Feldmannia desmarestiae.* In *Symphyocarpus strangulans* and *Scytosiphon lomentaria* aberrant plurilocular sporangia were distinguished. Plurilocular sporangia were found in *Eudesme virescens. Sphacelaria arctica* appeared to possess unilocular sporangia sessile on the basal disc, the latter in such cases corresponding to the "*Sphaceloderma*" stage in *Sph. caespitula.* In *Elachista fucicola* were recognized adventitious plants occurring on the assimilatory filaments. *Punctaria plantaginea* proved to comprise branched individuals, and *Laminaria saccharina* plants exhibiting three lamina-generations were encountered.

In *Haplospora globosa* an alternation of generations is supposed to take place. In most of the investigated localities both generations were met with.

Rhodophyceae. – Within the genus *Acrochaetium* the bulk of the material belongs to *A. parvulum.* This applies also to plants collected in West Greenland and NW Iceland by ROSENVINGE and JÓNSSON, respectively, classified as *Chantransia microscopica* and preserved as permanent slides. It must be supposed that all records of *Ch. microscopica* from the Arctic are erroneous and that the material involved most probably represents *A. parvulum* or *A. hallandicum*, as the case may be.

Rhodochorton Rothii is classified as *Rh. purpureum* in which species *Rh. intermedium* is included as a form. The possibility cannot be excluded that also *Rh. islandicum* ought rightly to be referred to *Rh. purpureum.*

In *Petrocelis polygyna* were recognized cystocarps, and in *Halosaccion ramentaceum* and *Antithamnion boreale* antheridia. Likewise, the hitherto unknown antheridia were found in *Peyssonnelia Rosenvingii.*

In *Audouinella efflorescens* and *Harveyella mirabilis* an alternation of generations seems to take place also in Greenland as the material proved to comprise tetrasporic plants in addition to cystocarpic ones.

It is characteristic of many species in the area examined that they extend to appreciable depths. Thus, no less than two fifths of the total number of species were encountered down to at least 30 m. Off Scoresby Sund an attached individual of *Turnerella Pennyi* was collected at a depth of 70 m and at the mouth of Scoresby Sund the following crust-forming algae grew on stones at such a considerable depth as 120 m: *Lithothamnion laeve*, *L. foecundum*, and *Cruoria arctica*, the latter inhabited by *Chlorochytrium Schmitzii.*

Another typical feature is that in quite a number of species the development is retarded as compared with conditions prevailing in Danish waters. Some species which in Danish waters are annuals, persist longer when occurring in East Greenland.

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INDEX OF SPECIES RECORDED FROM EAST GREENLAND

The species occurring in the Scoresby Sund and/or Kejser Franz Josephs Fjord districts are marked with an asterisk. — Synonyms are printed in *italics*.

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