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**Orvokki Ravanko:** Macroscopic green,  
brown, and red algae in the southwestern  
archipelago of Finland

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MACROSCOPIC GREEN, BROWN, AND RED  
ALGAE IN THE SOUTHWESTERN ARCHIPELAGO  
OF FINLAND\*

BY

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## I. Introduction

The first records of the macroscopic algae of Finland exist in a plant list, Herbarium Musei Fennici, published in 1859 by NYLANDER & SÆLAN. The Russian algologist GOBI (1874 and 1877) investigated the brown and red algae of the Gulf of Finland. Later research has been made there by HÄYRÉN (1900—1959), VÄLIKANGAS (1909 and 1927), SKOTTSBERG (1911), BOSTRÖM, later PURASJOKI (1937, 1946, and 1950), ULVINEN (1937), HERLIN (1945), and LUTHER (1954). The Tvärminne Archipelago is especially well known because most of the above mentioned authors made their research in that area. In addition, many algae have been observed there during Nordic Courses in Marine Biology.

The Gulf of Bothnia is algologically not as well known as the Gulf of Finland. Studies have been made there by KROK (1869), HÄYRÉN (see ref.), and EHNHOLM (1938). PEKKARI (1965) has been working in the northern part of the Gulf of Bothnia.

In the SW Archipelago of Finland, STRÖMFELT (1884) was the first to make investigations, but his records are nearly all from Fagerholm in Nauvo which was the westernmost research locality on his journey in 1882. The term SW Archipelago as used here (in a restricted sense<sup>1</sup>) refers to the area which, in the south, extends from the Gullkrona district, in Dragsfjärd and Hiittinen, to the Uusikaupunki Archipelago in the north. In the southwest it is bounded by the Åland Archipelago. In the northern part of this area, near Uusikaupunki, HÄYRÉN (1950b) carried out investigations (see map 3: A). HÄYRÉN (1958b) also mentions some algae from the vicinity of Turku. ANDERSSON (1953 and 1955) had two research areas, one in Nauvo and the other in Hiittinen (see map 3: D and E). HAVERINEN (1954) made investigations in Ruissalo, and KASKINEN (1964) had thirteen research localities at Airisto (see map 3: B and C).

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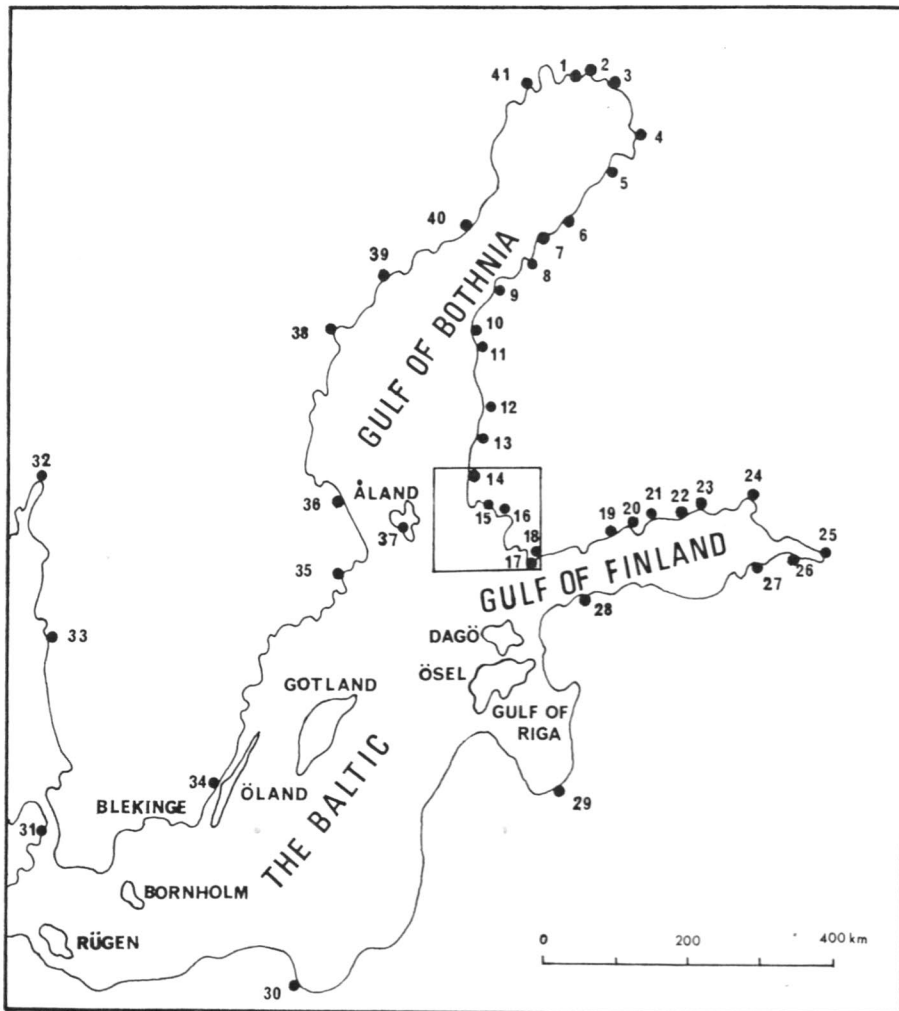
<sup>1</sup> The easternmost part (between the Gullkrona district and the Hanko peninsula) has here been omitted.

## II. Research area

### I. Research localities, times of investigation, and methods

At Lohm, Korppoo, which was my first research locality, investigations were made in 1961 by dredging material from different depths along straight lines around the island, at distances of 300 m from each other. Later (25.—26.8.62) skin divers helped in bringing material from different depths at Almastrand; Gyltö, S side; Lohm, N side; Lohm, S side; between Snäckholm and Ängsö; and Stor-Killingholm. A year later (1.—3.7.63), when studies were made in Dragsfjärd, at Helsingholm, Kälklobb, and Sandö, the skin divers also helped to recover material. In all my other research localities I have collected material either by dredging or by wading. When dredging I have mainly used a drag which was made of two rakes joined by welding. The depth has been measured with the rope fastened to the drag and marked with red yarn at 1 m intervals.

The research localities and times of investigation are seen from the following list and from maps 3—5. — *Kemiö* (Kimito): 1 Lill-Tjuvholm (23.7.64); 2 Flisholm (23.7.64). — *Dragsfjärd*: 1 Karaskär (22.7.64); 2 Helsingholm, Kälklobb, and Sandö (1.—3.7.63 and 22.7.64). — *Hiittinen* (Hitis): 1 Skogskär (30.6.63); 2 Tunhamn (30.6.63); 3 Lindörn (30.6.63); 4 Stubbö (1.7.63); 5 Vänö (3.7.63); 6 Harö and Söderö, E. side (4.7.63). — *Nauvo* (Nagu): 1 Rutiluoto (24.7.64); 2 Petäisholmar (24.7.64); 3 Högholm, S side (26.5.66), Pieni Riihiluoto (24.7.64), and Seili, many localities (24.7.64 and 23.9.65 and 25.—26.5.66); Orhisaari (26.5.66); 4 Pärnäs (August 1964); 5 Biskopsö (20.8.63); Ernholm (20.8.63), and Vikom (23.9.65); 6 Högsar (20.8.63); 7 Vansor and Petsor (20.8.63); 8 Fagerholm (25.8.62), Kalvholm, and Humleholm (20.8.63); Kasaholm (16.8.61, 13.8.63, and 24.8.64); Snäckö and Ängsö (25.8.62 and 10.—12.8.64); 9 Brändholm (23.7.64); 10 Stor-Klobbskär and Lill-Klobbskär (5.7.63); 11 Hamnskär (5.7.63); 12 Stenskar (5.7.63); 13 Hummelskär, (25. and 30.7.62); 14 Mossaskär (25.7.62); 15 Miraholm, Nötö, Skagsgadd, and Söderholm (19.7.64); 16 Borgskären (21.7.64); 17 Vikarharun (21.7.64); Låderskär (5.7.63); 18 Simonsharun (21.7.64); 19 Hjortronharun and Vitharun (21.7.64); 20 Rödharun (21.7.64); 21 Husskär and Sandskär (30.6.63); 22 Styrholmarne (30.6.63); 23 Fårö (30.7.62 and 20.7.64); 24 the skerries near Lökhalm (29.6.63); 25 Salskären (29.6.63); 26 Salskär (4.7.63); 27 Trunsö—Kalkskär (29.7.62). — *Korppoo* (Korpo): 1 Hevosluoto (10.—13.7.62); 2 Ahven-  
saari (29.8.61 and 20.8.64); 3 Kalvholm, NW of Nauvo (24.7.64); 4 Galtby (4.7.62); Galt-  
byviken (2.6.63), Julholm (22.—25.6.62, 28.7.63, 7.8.63; 18.5.64, 6.—8.6.64, 22.6.64, and  
16.8.64), Katilot (18.6.64), Kuggvik (11.6.64 and 1.7.62), Rågrunden (28.7.63); Sand-  
holm (as Julholm), Teijula (5.8.63 and 18.6.64, Turistbo (5.8.63 and 18.6.64), and Ver-  
kan (13.5.62, 10.6.62, 22.—25.6.62, 2.7.62, 31.8.62, 4.11.62, 28.7.63, 7.8.63, 18.5.64,  
6.—8.6.64, 22.6.64, 16.8.64, and 8.11.64); 5 Alskär (13.8.64); Hummelskär (13.8.64);  
Karlberg (13.8.64), the skerries near Korholm (29.8.63), and the sound between Lempersö  
and Älvsjö (13.8.64); 6 Almastrand (26.8.62); Granö, W of Lohm (18.7.64); Grisselborg  
(16.8.63), Hattskär (16.8.63), Kalvholm, S. side (13. and 16.8.63), Kulm and Verkhalm  
(18.7.64), Lohm (July—September 61, August 63 and 64, 13.6.65); Rumar (26.8.62),  
Råsklaks (5.7.64), Stora Gunnkobb (August 64); Stor-Killingholm (26.8.62); Vargskär  
(17.7.64, 19.7.64, and 14.8.64), and Vitharun and the skerries near it (17.7.64); 7 Retais



MAP 1. Situation of the research area in the Baltic. — 1 Haparanda (Haaparanta). 2. Tornio (Torneå). 3 Kemi. 4 Oulu (Uleåborg). 5 Raahe (Brahestad). 6 Kokkola (Gamlakarleby). 7 Pietarsaari (Jakobstad). 8 Uusikaarlepyy (Nykarleby). 9 Vaasa (Vasa). 10 Kaskinen (Kaskö). 11 Kristiinankaupunki (Kristinestad). 12 Pori (Björneborg). 13 Rauma (Raumo). 14 Uusikaupunki (Nystad). 15 Naantali (Nådendal). 16 Turku (Åbo). 17 Hanko (Hangö). 18 Tammisaari (Ekenäs). 19 Helsinki (Helsingfors). 20 Porvoo (Borgå). 21 Loviisa (Lovisa). 22 Kotka. 23 Hamina (Fredrikshamn). 24 Vyborg (Viipuri, Viborg). 25 Leningrad. 26 Lomonosov (Oranienbaum). 27 Krasnaja Gorka. 28 Tallinn (Reval). 29 Riga. 30 Gdansk (Danzig). 31 København (Copenhagen). 32 Oslo. 33 Göteborg (Gothenburg). 34 Kalmar. 35 Stockholm. 36 Öregrund. 37 Mariehamn (Maarianhamina). 38 Sundsvall. 39 Näske. 40 Ratan. 41 Luleå.

(August 64); 8 Långvik, (3.7.62); 9 Gyltö (26.8.62 and 13.8.64); 10 Lyddarholm (29.8.63); Kälö and Västerö, (15.8.63 and 14.8.64); 12 Brunskär (27.8.64); 13 Jurmo (1.8.61 and 26.7.62); and Huvudskär (26.7.62); 14 Estrevlan (27.7.62); 15 Sandvikharu (28.7.62); 16 Gaddarna (28.7.62); 17 Ullvinger (28.7.62); 18 Utö (28.7.62 and 20.6.65). — *Houtskari* (Houtskär): 1 Storö (22.8.63); 2 Bastö (22.8.63); 3 Topsalö (22.8.63); 4 Sandö (18.8.64); 5 Jungfruskär (28.8.63). — *Karuna*: 1 Sandö (23.8.64). — *Parainen* (Pargas): 1 Brattnässund, Bergholm and Finnholm, Ersby, Kassorfjärd, Kyrkfjärden, Sattmark, the mouth of Signnässund, and Tervsund (10.7.64, Ersby also 8.6.64, 18.6.64, 2.7.64 and Kyrkfjärden 8.6.64); 2 the sound between Attu and Långholm (23.7.64); 3 the sound between Bockholm and Granö (23.7.64); 4 Knapelö (6.7.63). — *Turku* (Åbo): 1 the Hirvensalo bridge and Pitkäsalmi, from the bridge to Uittamo (28.6.64). — *Rymättylä* (Rimito): 1 Kramppi (26.5.66). — *Kustavi* (Gustavs): 1 Lypertö, N side (19.7.63); 2 Lypertö, SE side (19.7.63); 3 Riihenmaa (14.6.64 and 5.—7.7.64); 4 Pirisholm (16.—19.7.63); and Iikholm and Sikaluoto (18.7.63). — *Lokalahti* (Lokalaks): 1 Iso Lehmämaa and the skerries on N side (16.—20.7.62).

## 2. The nature of the Baltic and of the research area

My research area is situated in the northern part of the Baltic, at the entrance of its two greatest and innermost gulfs, the Gulf of Bothnia and the Gulf of Finland. The Baltic is a unique brackish water area. The typical characters of this area are explained in detail by WÆRN (1952) and SEGERSTRÅLE (1957), among others.

The history of the Baltic, with its alternating salt and fresh water periods during the last part of the glacial epoch and the postglacial period, forms a background against which the composition of the flora and fauna can be understood.

The marine life in the Baltic is composed of only a few species, but the number of individuals is great. This is true especially in regard to littoral species, particularly the group *Chlorophyceae* among the algae (cf. WÆRN 1957, p. 52).

The Baltic is a large area, comprising about 400.000 km<sup>2</sup>, and the conditions in its different parts vary considerably. A feature common to the whole area is the small number and dwarfishness of most of the marine species, due to the low salinity. This »pauperism» increases towards the innermost part of the Baltic where lacustrine species dominate. Brackish water species are rare and endemics even rarer, especially among the plants (cf. WÆRN 1952, pp. 9—10, SEGERSTRÅLE 1957, pp. 780—782 and 785—786).

An often mentioned, characteristic feature of the Baltic is that many algae which in other regions are littoral species, here occur in the sublittoral. This downward displacement of certain marine algae has been discussed thoroughly by WÆRN (1950, p. 13 and 1965, p. 23).

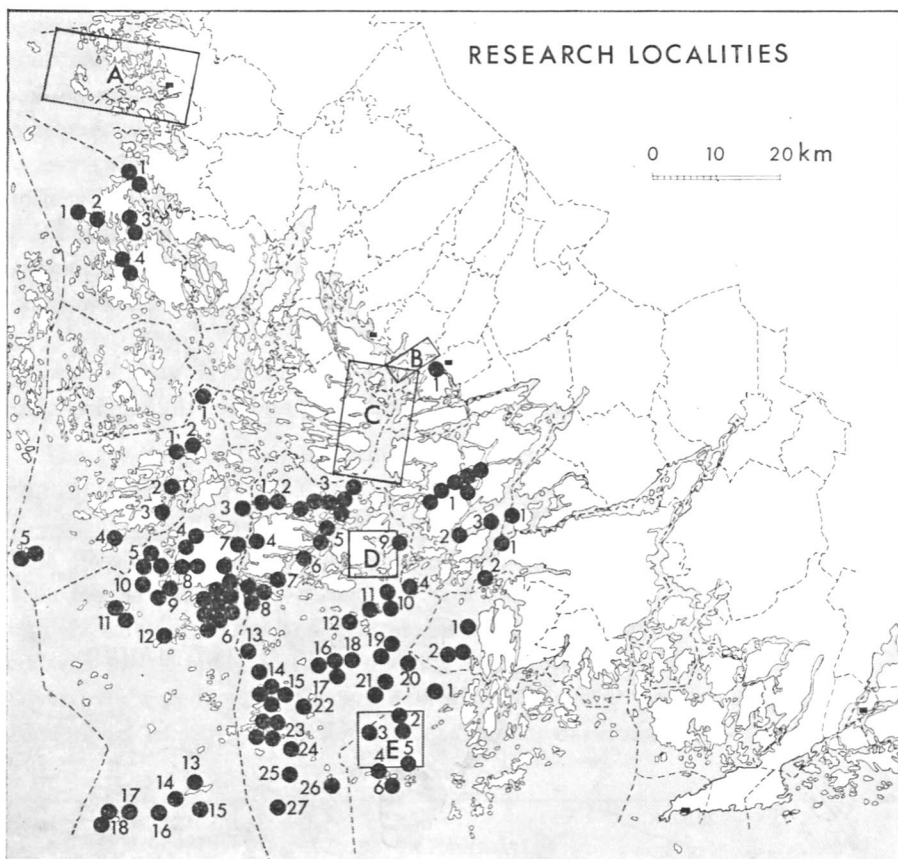


MAP 2. Towns and parishes of the research area: Uusikaupunki (Nystad); Lokalahahti (Lokalaks); Vehmaa (Vemo); Mietoinen; Taivassalo (Töfsala); Askainen (Villnäs); Naantali (Nädendal); Iniö; Velkua; Merimasku; Turku (Åbo); Paimio (Pemar); Piikkiö (Pikis); Houtskari (Houtskär); Rymättylä (Rimito); Kakkskerta; Parainen (Pargas); Sauvo (Sagu); Karuna; Kemiö (Kimito); Perniö (Björnå); Korppoo (Korpo); Nauvo (Nagu); Dragsfjärd; Särkisalo (Finby); Västansfjärd; Hiittinen (Hitis); Tenhola (Tenala); Bromarv; Tammisaari (Ekenäs); Hanko (Hangö). —

Research stations: Seili, the new Marine Biological Station of the University of Turku; Lohm, the former Marine Station of the University of Turku; Tvärminne, the Zoological Station of the University of Helsinki.

Tides in the Baltic are so unimportant that they have no real effect upon plants and animals. However, winds and changes in the atmospheric pressure bring about fluctuations in the sea level. Especially in spring, low water causes damage to the algal vegetation (cf. SEGERSTRÅLE 1957, p. 767).

The temperature of the water in the Baltic is variable. Shallow water may have a temperature in excess of 20°C in summer, while in winter it is frozen.



MAP 3. A. Uusikaupunki (Nystad) Archipelago, the research area of HÄYRÉN. B. Ruisalo (Runsala), the research area of HAVERINEN. C. Airisto (Erstan), the research area of KASKINEN. D. Nauvo (Nagu): Gytja, research area of ANDERSSON. E. Hiittinen (Hitis): Gullkrona district, research area of ANDERSSON. — The localities marked with numbers separately in each parish are research localities of the author (see pp. 5 and 7).

My research area belongs to the area in the Baltic which is covered with ice in winter (cf. WÆRN 1952, pp. 6—7, SEGERSTRÅLE 1957, pp. 764—765).

The Finnish SW Archipelago and the Åland islands are closely connected. The whole area is a peneplain which is essentially uniform, but is fractured into blocks by a complicated system of fault planes, especially in the eastern part of the archipelago. In the middle part of the archipelago the rock bed has been divided into isolated blocks separated by deep furrows along the fault planes. The blocks are again fractured by fault planes of secondary nature.

The height of the peneplain varies in different parts of the archipelago depending on the relative vertical movement of the fractured blocks along the fault planes. The Gullkrona open sea area is the most extensive sunken block with only small and low islands. Across the open Gullkrona in the direction SW—NW from Dragsfjärd to the island Jurmo in Korppoo a series of gravelly and sandy islands can be followed. They represent a continuation of the esker Salpausselkä III from the mainland of Finland. Airisto is another sunken block. It continues towards the SW between the islands Korppoo and Houtskari. The Kihti open sea area is a distinct, deep sunken block between the SW Archipelago and the Åland islands.

The archipelagos comprising the communes Rymättylä and Kustavi—Taivassalo represent, on the other hand, risen blocks and are thus higher than



MAP 4. Detailed map of the research locality number 6 in Korppoo.



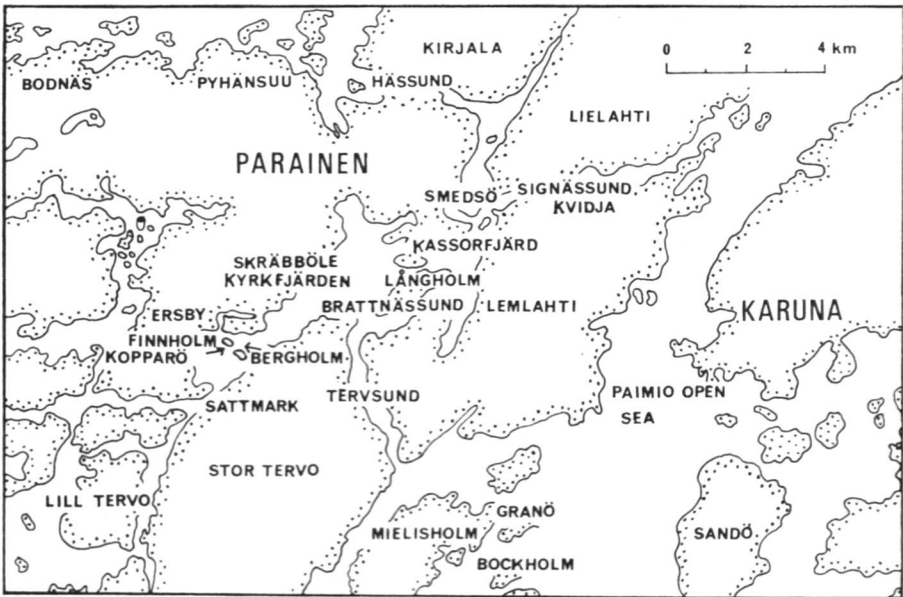
the neighbouring areas. The proportion of land surface here is therefore greater than in sunken areas where sea dominates the landscape.

The main part of the bedrock belongs to the younger granites, but closer to the coast gneisses also occur. In the communes Kustavi, Taivassalo, and Vehmaa the archaic bedrock is typical.

The bedrock and fault lines affect the relief of the sea bottom and thereby the distribution of gravel, sand, and different sediments, as well as the course of sea currents which, in turn, have influenced the distribution of dissolved nutrients (cf. HAUSEN 1948, pp. 30—73 and Atlas över Skärgårds-Finland, maps 1—3).

### 3. Vegetation

The zonation of the vegetation of the rocky shores in the Baltic has been studied especially by DU RIETZ (cf. 1950, pp. 6—10). WÆRN (1950, pp. 19—22, 25—30 and 1952, pp. 10 and 25) has adopted DU RIETZ's zonal classification. This classification also seems to be suitable for my research area and it has been followed in this work. DU RIETZ divided the vegetation into two parts, namely, the terrestrial and the marine vegetation. The terrestrial vegetation consists of the epilittoral belt and the geolittoral belt. The epilittoral belt is never submerged, while the geolittoral belt is submerged by high water and in exposed localities by waves. The geolittoral belt is further divided into



MAP 5. Detailed map of the research locality number 1 in Parainen.

three parts, the upper, the middle, and the lower part. The upper and middle parts are on rock substrate dominated by lichens. In the lower part the society of the blue-green alga *Calothrix scopulorum* is characteristic on sun facies whereas the lichen *Verrucaria maura* society dominates in shade.

The hydrolittoral belt forms the uppermost part of the marine vegetation and is exposed by the low-water of the spring after which it is submerged by the higher water level of the summer. The most important species in this belt, according to DU RIETZ, are *Ceramium tenuicorne*, *Cladophora glomerata*, *Dictyosiphon foeniculaceus*, and *D. chordaria*. Below the hydrolittoral belt is the sublittoral belt, which is permanently submerged. It is subdivided into two parts. The upper part is dominated by *Fucus vesiculosus*, and sometimes when *Fucus* is absent, societies of smaller algae, *Ceramium tenuicorne*, *Dictyosiphon foeniculaceus*, and *D. chordaria*, occur. The lower sublittoral is dominated by red algae.

In the outer part of my research area — Dragsfjärd, Hiittinen, Nauvo, Korppoo, Houtskari, Kustavi, and Lokalahti — the geolittoral belt resembles those described by WÆRN (1950, pp. 19—20 at Huvudskär in the Stockholm Archipelago and pp. 26—28 at Halsaren in the Öregrund Archipelago). In the inner archipelago of Parainen and Kustavi the geolittoral belt is nearly without algae.

The most important species in the hydrolittoral belt are the same in my research area as those listed by DU RIETZ (1950) and WÆRN (1950) in the Stockholm Archipelago. In addition, *Eudesme virescens* should be mentioned. In spring it forms narrow belts on rocks in some places in the outer archipelago. Similarly, the bluegreen alga *Rivularia atra* often forms a narrow zone in the upper part of the hydrolittoral belt. In the inner archipelago of my research area there are very few hydrolittoral species. Mostly only diatoms occur, but also single tufts of *Cladophora glomerata* can be found.

In the outer part of my research area the upper part of the sublittoral seems to be similar to the sublittoral in the Stockholm Archipelago and in the *Elachista*-district in the Öregrund Archipelago.

The lower part of the sublittoral, however, is different. In Dragsfjärd, Hiittinen, Nauvo, Korppoo, and Houtskari masses of usually vegetatively reproducing *Stictyosiphon tortilis* and *Fucus vesiculosus* are to be found at depths of 5—9 m. Red algae, such as *Furcellaria fastigiata* and *Phyllophora brodiaei*, mostly do not begin to occur until at depths of 9—10 m. Among them occur to a smaller extent *Ceramium tenuicorne*, *Polysiphonia violacea*, *Ahnfeltia plicata*, *Phyllophora membranifolia*, *Polyides rotundus*, and *Chaetomorpha* sp. Likewise, *Pilayella littoralis* and *Ectocarpus confervoides* may also be found. *Rhodomela confervoides* occurs mostly at depths of 12—15 m to a small extent. *Polysiphonia nigrescens* has been found only once in the southern

part of the archipelago. Of the genus *Sphacelaria* only *S. arctica* has been encountered, and even it is rare. The same applies to *Cladophora rupestris*, and as regards *Rhodochorton purpureum* only single tufts have been discovered in deep water. In the northern part of my research area, in Kustavi and in Lokalahti *Stictyosiphon tortilis* is quite rare. Red algae are common already at depths of 6—7 m. *Polysiphonia nigrescens* and *Sphacelaria arctica* are more common than in the southern part of my research area. *Sphacelaria radicans* and *Callithamnion roseum* have also been found.

The inner part of Parainen is different. At the mouth of Tervsund and at Sattmark *Fucus vesiculosus* still occurs, although it is scanty and begins to grow at depths of 2—3 m. Likewise, small specimens of *Pilayella littoralis*, *Elachista fucicola*, *Chorda filum*, *Ectocarpus confervoides*, and *Ceramium tenuicorne* are to be found. *Polysiphonia violacea* is quite common, and masses of *Sphacelaria radicans* have been found at Ersby. *Cladophora glomerata* and *Enteromorpha intestinalis* are not common, but I have encountered *C. glomerata* still at Kyrkfjärden attached to landings. The plants were about 0.5 m long. In the inner part of Parainen *Chaetomorpha* sp. is the most common alga in deep water at depths of 4—10 m.

The vegetation and its zonation described above can be seen only on rocky shores. Sandy and meadow shores have another vegetation type. On sandy shores phanerogams occur, such as *Potamogeton pectinatus*, *Ruppia maritima*, *R. spiralis*, *Zostera marina*, etc. On these phanerogams are many epiphytic algae; characteristic are *Eudesme virescens*, *Leathesia difformis*, *Desmotrichum undulatum*, and *Pilayella littoralis*. If *Phragmites* growths are not very dense, these epiphytes may also be found on them. On *Phragmites* also occur *Ceramium tenuicorne*, *Polysiphonia violacea*, and *Ectocarpus confervoides*.

The above mentioned species begin to occur mostly at depths of 0.2—0.5 m and they continue to grow to about 2 m depth. Some species of Charophyta, namely, *Chara aspera*, *C. canescens*, and *Tolypella nidifica* are also among the vegetation of sandy shores. In deeper water, in addition to phanerogams, there occur *Zostera marina*, *Potamogeton pectinatus*, and *Ruppia spiralis*. *Zostera marina* may be found even at depths of 5—6 m.

On muddy bottom, *Chara* meadows are typical, especially in shallow bays. At 0.2—0.5 m depth *C. aspera* dominates, and *C. canescens* can be found among it. *C. tomentosa* and *C. baltica* grow in deeper water, at 0.5—2.5 m depth. *Cladophora glomerata* occurs either loose or entangled with species of *Chara*. Many phanerogams, *Najas marina*, *Potamogeton pectinatus*, *P. filiformis*, and *Myriophyllum spicatum* are common. At 4—5 m depth these generally stop growing; and masses of loose-lying, vegetatively reproducing *Stictyosiphon tortilis* and *Fucus vesiculosus* can be found.

### III. Species of algae

#### 1. Chlorophyceae

*Ulothrix zonata* (Web. & Mohr) Kütz. — WÆRN 1952, pp. 28—29.

*U. zonata* is a lacustrine species in the flora of the Baltic. It is common at least in the northern and middle part of the Gulf of Bothnia. It has also been found many times in the Gulf of Finland (cf. WÆRN 1952, p. 28).

SW Archipelago. Literature: no records. Other collections: none. Own collections: *Korppoo*, Huvudskär, 13 (26.7.62, TUR); Julholm, E side, Sandholm, E side, 4 (18.6.64, TUR); Lohm, E side, 6 (6.9.64); Teijula, 4 (18.6.64, TUR, Verkan 4 (18.6.64). — *Parainen*, Knapelö, 4 (6.7.63).

*U. zonata* forms small slippery growths on rocks and stones near the water surface and it is often mixed with *Urospora penicilliformis*. I have seen well developed growths only in June. Later in summer *U. zonata* disappears or is seen only as very scanty remnants.

The breadth of the threads in my material has usually been less than 30  $\mu$ . The narrowest threads, only 14  $\mu$  broad, were collected from Huvudskär. I have observed zoosporangia and zoospores in material from Julholm, Sandholm, and Teijula. The zoospores were about 6  $\mu$  in diameter. In material from Teijula I also saw gametes.

*Ulothrix subflaccida* Wille — WÆRN 1952, p. 30.

The innermost records of the species in the Baltic are from Blekinge, Ösel, and the Gulf of Finland where it has been found in several localities (cf. WÆRN 1952, p. 30).

SW Archipelago. Literature: HÄYRÉN 1958b, p. 17: Turku, at the mouth of Aurajoki forming leatherlike coverings on piers above the water line. Other collections: none. Own collection: Turku, at Hirvensalo bridge (28.6.64).

At Hirvensalo the species occurred attached to poles just at sea level together with *Capsosiphon fulvescens* and *Enteromorpha* sp. The threads in living material were 8—9 broad and most of the cells were twice as long as broad, but shorter cells also occurred. I have also seen zoospores in my material.

*Percursaria percursa* (C. Agardh) Rosenv. — WÆRN 1952, p. 39; BLIDING 1963, pp. 20—23, figs. 5—6.

*P. percursa* has a wide distribution on the Finnish shores. In the Gulf of Bothnia it occurs as far north as Raahe (cf. HÄYRÉN 1952), and in the Gulf of Finland it has been found as far east as Loviisa (cf. WÆRN 1952, p. 39). During the Nordic Marine Botanical Course at Tvärminne in 1965 this species was seen in a rock pool at Spikarna where it formed large entwined masses, (LUTHER & NIEMI 1967, p. 2).

SW Archipelago. Literature: HÄYRÉN 1950b, p. 14; the Uusikaupunki Archipelago, Putsaari Ruonasuu. Other collections: none. Own records: *Korppoo*: Julholm, 4 (18.5.64), single threads among *Rhizoclonium riparium*, loose *Cladophora glomerata*, and *Fucus vesiculosus* in a small cove; Vitharun, 6 (17.7.64), scantily in a rock pool among *Cladophora glomerata* and *C. fracta*.

*Capsosiphon fulvescens* (C. Agardh) Setch. & Gardn. — WÆRN 1952, pp. 39—41; BLIDING 1963, pp. 15—19, figs. 2—4.

The innermost records of the species in the Baltic are from the Gulf of Finland where it has been observed several times (cf. WÆRN 1952, p. 40).

SW Archipelago. Literature: no records. Other collections: none. Own records: *Korppoo*, Julholm, N and E side, 4 (22.6.64, TUR); Teijula, 4 (22.6.64); Verkan, 4 (22.6.64). — *Turku*, near the Hirvensalo bridge (28.6.64, TUR).

In Korppoo, at Verkan *C. fulvescens* was growing on small stones near a landing in polluted water and formed a narrow zone just at the water line. In a similar way it occurred at Julholm and Teijula in sheltered localities among a mass of detached plants. At Hirvensalo the species was growing on poles just above the water line.

*Blidingia minima* (Näg. ex Kütz.) Kyl. — WÆRN 1952, p. 39; BLIDING 1963, pp. 23—30, figs. 7—9.

The innermost records of the species in the Baltic are from the Öregrund Archipelago in Sweden (WÆRN 1952, p. 39) and from Långskär, in the Tvärminne Archipelago in Finland, where WÆRN detected the species during the Nordic Marine Botanical Course in 1953. At Långskär the species has been collected by K. Linkola (4.7.11, TUR, as *Enteromorpha micrococca* Kütz.).

SW Archipelago. Literature: no records. Other collections: none. Own records: *Korppoo*, Brunskär, 12 (27.8.64) and Vargskär, 6 (14.8.64).

In both my localities the species was growing in very exposed rock fissures just above the water surface. The plants were tufted and only about 0.5 cm long. *Rhizoclonium riparium* occurred in the same places but higher up in the fissures.

*Enteromorpha intestinalis* (L.) Link — WÆRN 1952, pp. 32—35, figs. 14 and 15; BLIDING 1963, pp. 139—148, figs. 87—92.

*E. intestinalis* is one of the commonest algae in the Baltic.

SW Archipelago. Literature: HÄVRÉN 1950b, pp. 13—14: two places in the Uusikau-punki Archipelago. Other collections: some dried herbarium specimens in TUR and H determined as *E. intestinalis* but not critically examined by me. Own records: in the outer part of my research area the species is mainly a rock pool alga. Examples of this habitat are: *Dragsfjärd*, Karaskär, 1 (22.7.64); Kälklobb, 2 (1.—3.7.63). — *Hiittinen*, Tunhamn, 2 (3.6.63); Vänö, 4 (1.7.63). — *Nauvo*, Borgskären, 16 (21.7.64); Hjortronharun and Vit-harun, 19 (21.7.64); Hummelskär, 13 (25. and 30.7.62); Mossaskär, 14 (25.7.62); Nötö, Skagsgådd, and Söderholm, 15 (19.7.64); Rödharun, 20 (21.7.64); Simonsharun, 18 (21.7.64); Trunsö—Kalkskär, 27 (29.7.62). — *Korppoo*, Alskär, 5 (13.8.64); Brunskär, 12 (27.8.64); Galtby, 4 (4.7.62); Gyltö, 9 (26.8.62 and 13.8.64); Hummelskär, 5 (13.8.64); Huvudskär, 13 (26.7.62, TUR); Julholm, 4 (as on p. 3); Karlberg, 5 (13.8.64); Kälö and Västerö, 11 (15.8.63 and 14.8.64); Lohm, 6 (July—September 61, August 63 and 64, 13.6.65); Råggrunden, 4 (28.7.63); Sandholm, 4 (as on p. 3); Sandvikharun, 15 (28.7.62); Stora Gunnkobb, 6 (August 64); Ullvinger, 17 (28.7.62); Utö, 18 (28.7.62 and 20.6.65); Vargskär, 6 (17.7.64, 19.7.64, and 14.8.64); Vitharun and the skerries near it, 6 (17.7.64). — *Houtskari*, Jungfruskär, 5 (28.8.63); Sandö, 4 (18.8.64). — *Kustavi*, Lypertö, N side, 1 (19.7.63).

In rock pools *E. intestinalis* often occurs together with *Cladophora glomerata*. The plants are usually tufted and 5—10 cm long. In Korppoo (Sandvikharu) I saw the largest rock pool algae, which were about 20 cm long and 2 cm broad.

In the outer archipelago *E. intestinalis* also occurs on rocks and stones near the water surface forming sometimes narrow zones, but usually only single tufts are to be found here and there. I have seen the tufts attached to rocks, stones, shells of *Mytilus edulis*, and *Lymnaea* spp. *E. intestinalis* occurs on the shores of the same islands where it grows in rock pools, but it also is found on the shores of islands where there are no rock pools. In Korppoo (Julholm and Lohm), I have noticed *E. intestinalis* even at 2 m depth on rocks.

In small harbours near landings *E. intestinalis* is sometimes abundant. It is attached to rocks and stones but also to timber structures. The plants are often 20—30 cm long, 2—3 cm broad, and very dark green. Such small harbours are to be found, for example,

in Nauvo: Seili; Stenskär; Korppoo: Lohm; Stor-Killingholm; Verkan; Hiittinen: Vänä; and Kustavi: Lypertö, N side.

When dredging in the inner parts of the archipelago (in Parainen: near Bergholm and Finnholm; between Attu and Långholm; Sattmark; Tervsund; Kustavi: Lypertö, SE side; and Riihenmaa) I have found *E. intestinalis* at depths of 2—6 m but I have not been able to decide whether these algae were attached.

*Enteromorpha ahlneriana* Blid. — WÆRN 1952, pp. 36—37, fig. 16, a—c; BLIDING 1963, pp. 61—70, figs. 30—34, a—d.

*E. ahlneriana* has been confused with other species in the Baltic. BLIDING was the first to recognize this species and he considered it to be common in the Baltic. However, very little is known about its distribution in the inner parts of the Baltic. WÆRN (1952, pp. 36—37) mentioned it from the Öregrund Archipelago.

SW Archipelago. Literature: none. Other collections: dried *Enteromorpha*-material in H and TUR, of which some specimens probably belong to *E. ahlneriana*, not critically examined. Own records: Nauvo, Miraholm, 15 (19.7.64). — Korppoo, Ahvensaari, 2 (29.8.61); Julholm, 4 (22.6.64); Jurmo, 13 (1.8.61); Kulm, W side, 6 (18.7.64); Lyddarholm, 10 (29.8.63).

In all localities the species grew on stones in shallow water, at depths of 0.2—0.5 m. In Ahvensaari and Jurmo it occurred in somewhat polluted water near landings. At Miraholm *E. ahlneriana* occurred on a flat and sandy shore attached to small stones. All these plants had very fine threads. The algae at Julholm, Kulm, and Lyddarholm were broader.

In addition to *E. intestinalis* and *E. ahlneriana*, my material contains specimens which cannot be referred to either of these species, but I have not studied them enough to be sure about the species.

*Monostroma balticum* (Aresch.) Wittr. — WÆRN 1952, p. 31.

This plant is known only from the Baltic and only in a detached condition. In the Gulf of Bothnia it is known from the Uusikaupunki Archipelago (WÆRN 1952, p. 31). On Finnish shores it has been mentioned in the literature also from Åland (near Mariehamn) and from Tenhola (cf. HÄYRÉN 1955 and 1958b).

SW Archipelago. Literature: HÄYRÉN 1950, b, p. 14; eight localities in the Uusikaupunki Archipelago. Other collections: Parainen, Sydänperävik (K. Linkola, 1913, TUR). — Rymättylä, Isopoikko (A. Vuorisalo, 1953, TUR); Vepsä, Heinäinen (I. Haahtela, 24.6.65, TUR). — Uusikaupunki, Lyökki, Pirttikari (U. Laine, 17.8.64, TUR). — Own records: Nauvo, Kasaholm, N side, 8 (16.8.61 and 21.8.63, TUR); Rutiluoto, W side, 1 (24.7.64, TUR); Seili, S side (25.—26.5.66, TUR). — Korppoo, Julholm, 4 (18.5.65); between Kulm and Verkhholm, 6 (18.7.64, TUR); S side, 6 (19.7.62, TUR); Lohm, the long bay on the E side (13.9.61); Vitharun, 6 (17.7.64). — Kustavi, Riihenmaa, W side (14.6.64 and 6.7.64, TUR). — Lokalahti, Iso Lehmämaa, E side (16.—20.7.62, TUR).

Only at Kasaholm, in Nauvo, have I seen this species occur abundantly. The plants were longer than 10 cm. They grew in a hollow from which Littorina clay had been taken. In the same hollow occurred *Najas marina* and *Potamogeton pectinatus*.

In Korppoo (between Kulm and Verkhholm) and in Nauvo (Seili, S side), I have also seen a great number of plants but they were smaller, only 3—4 cm long. In both cases the bottom consisted of mixed sand and mud, and the plants occurred together with *Potamogeton pectinatus*.

In all the other localities *M. balticum* occurred only sparsely. In Korppoo: Julholm; Lohm; and Kustavi: Riihenmaa it grew at 2—4 m depth. In Nauvo: Rutiluoto; Korppoo: Vitharun; and Lokalahti: Iso Lehmämaa I have found the species by dredging from depths of 7—10 m. The plants were in good condition, but I cannot be sure whether they had been living there or were drifting algae.

*Prasiola furfuracea* (Mert.) Menegh. — WÆRN 1952, pp. 42—43.

The species has been reported from the Baltic, in the Öregrund Archipelago, by WÆRN (1952, pp. 42—43). He has identified this species for me from material which I collected at Tvärminne Vikarskär (20.8.65). The species was growing there in geolittoral rock fissures together with *P. stipitata v. cornucopiae*.

SW Archipelago. Literature: no records. Other collections: none. Own records: Using the material identified by WÆRN for comparison I have been able to recognize *P. furfuracea* in my material from Korppoo (W of Granö) 6 (18.7.64, TUR). The tufts occurred in rock fissures above the geolittoral zone. They were dark green, about 2 mm broad and equally long.

In addition I have seen *Prasiola* in Korppoo, Huvudskär, 13 (26.7.62) and Vargskär, 6 (27.8.64) but because the material has been lost, I cannot be sure about the species.

*Pseudendoclonium marinum* (Reinke) Aleem et Schultz — WÆRN 1952, pp. 49—50 (as *P. submarinum* Wille); ALEEM & SCHULZ 1952, p. 72; LUND 1959, p. 26 (as *P. submarinum* Wille).

The innermost published records of this species in the Baltic are from the Öregrund Archipelago and from Ösel (cf. WÆRN 1952, p. 49). Furthermore, it is known in the Tvärminne Archipelago where WÆRN detected it first and where later it has been observed many times in the same locality.

SW Archipelago. Literature: no records. Other collections: none. Own records: Nauvo, Skagsgadd, 15 (21.7.64); Söderholm, 15 (21.7.64). — Korppoo, a high islet W of Granö, 6 (17.7.64, TUR); Julholm, 4 (7.6.64); Kalvholm, 3 (24.7.64, TUR); Lohm, S side, 6 (21.8.64); Sandholm, 4 (7.6.64); Vargskär, 6 (17.7.64, TUR); a skerry NE of Vitharun, 6 (17.7.64). — Parainen, Ersby, 1 (2.7.64).

The species was frequent only at Vargskär, where it occurred together with *Waer-niella lucifuga* and *Rhodochorton purpureum* in a geolittoral cave (cf. *Rhodochorton purpureum*, p. 49). In similar habitats I have seen the species in Nauvo, (Skagsgadd and Söderholm) and in Korppoo (a islet W of Granö, Kalvholm, and a skerry NE of Vitharun). In the rest of the localities *P. marinum* has been found on stones in the upper part of the hydrolittoral.

*Oedogonium* Link — HIRN 1900, pp. 185—186, plate 29, fig. 181.

The genus *Oedogonium* is mainly a lacustrine genus, but it has been found several times in the inner Baltic and near the coasts. The threads, however, have often been sterile and the species has not been determined (cf. WÆRN 1952, p. 62).

SW Archipelago. Literature: HIRN 1900, pp. 185—186: *O. oblongum* in Nauvo, near Rockelholm; HÄYRÉN 1950b, p. 14; sterile algae in three localities in the Uusikaupunki Archipelago. Other collections: none. Own records: *Kustavi*, Riihenmaa, 3 (5.—7.7.64, sterile threads among other algae). — Parainen, Brattnässund, near Bergholm and Finnholm, Ersby, Kassorfjärden, and Kyrkfjärden, 1 (10.7.64, sterile threads among other algae). — Turku, Pitkäsalmi, Vähä-Heikkilä, 1 (28.6.64, TUR, sterile threads attached to timber structures and *Myriophyllum spicatum*).

*Urospora penicilliformis* (Roth) Aresch. — WÆRN 1952, pp. 64—65.

On the Finnish shores the species has been mentioned in the literature in Hanko and Helsinki (cf. WÆRN 1952, p. 64). During the Nordic Marine Botanical Course in August 1965 the species could be seen in many localities in the Tvärminne Archipelago.

SW Archipelago. Literature: no records. Other collections: none. Own records: *Drags-fjärd*, Karaskär, 1 (22.7.64, TUR). — Korppoo, Huvudskär, 13 (26.7.62); Julholm, E side, 4 (18.6.64, TUR); Lohm, E side, 6 (6.9.64, TUR and 13.6.65); Sandholm, 4 (18.6.64, TUR); Vargskär, 6 (17.7.64, TUR).

In every locality where I have seen *U. penicilliformis* it grew just above the water level. In early summer (June) I have seen the species together with *Ulothrix zonata*, and

then it is well developed. Later, in July, I have seen only very small threads of *U. penicilliformis*, forming limited growths. In September the species was well developed at Lohm and formed pure growths.

*Chaetomorpha* Kütz. — WÆRN 1952, pp. 65—70, figs. 28—30; CHRISTENSEN 1957, pp. 311—316, figs. 1—2.

The limits between the species in this genus are still unclear. Therefore for the present I shall call my whole material *Chaetomorpha* sp.

On the Finnish shores *Chaetomorpha* has been found by HÄYRÉN several times in the Gulf of Bothnia and in the Gulf of Finland (cf. WÆRN 1952, p. 66 and 69).

SW Archipelago. Literature: HÄYRÉN 1950b, p. 14: *C. gracilis*, three localities and *C. tortuosa*, five localities in the Uusikaupunki Archipelago. Other collections: none. Own records: *Kemiö*: Flisholm, 2 (23.7.64, TUR). — *Nauvo*, between Kalvholm and Humleholm, 8 (20.8.63); Rutiluoto, 1 (24.7.64, TUR); Högholm, 3 (26.5.66, TUR). — *Korppoo*, Ahvensaari, 2 (20.7.64); Korppholm, W side, 5 (23.8.63, TUR); between Lempersjö and Älvsjö, 5 (13.8.64); Lyddarholm, 10 (29.8.64, TUR); Sandholm, 4 (21.6.64, TUR). — *Houtskari*, Bastö, 2 (22.8.63, TUR); Storö, 1 (22.8.63, TUR); Topsalö, 3 (22.8.63, TUR). — *Parainen*, near Bergholm and Finnholm, 1 (10.7.64, TUR); between Bockholm and Granö, 3 (23.7.64); Brattnässund, 1 (10.7.64, TUR); Kyrkfjärden, 1 (10.7.64). — *Kustavi*, near Likhholm and Sikaluoto, 4 (18.7.64, TUR); Lypertö, SE side, 2 (14.7.63); Pirisholm, 4 (17.7.63, TUR); Riihenmaa, W side, 3 (6.7.64, TUR). — *Lokalathi*, Iso Lehmämaa, 1 (19.7.62, TUR).

In most of the localities *Chaetomorpha* occurred at depths of 6—12 m together with *Furcellaria fastigiata*, *Phyllophora brodiaei*, and some rarer red algae. I have not observed attached plants among these finds. In the innermost archipelago of Parainen and in Kustavi (Riihenmaa), I have observed the plants occurring either alone in masses on mud, or together with *Vaucheria* sp. Some of these *Chaetomorpha* threads were intermingled with dead remnants of phanerogams.

*Rhizoclonium riparium* (Roth) Harv. — WÆRN 1952, pp. 71—74; BLIDING 1957, pp. 274—275, fig. 3.

*R. riparium* is a widely distributed species on shores (cf. WÆRN 1952, p. 71).

SW Archipelago. Literature: ÅBERG 1934, pp. 239—242: *Nauvo*: Storlandet, (Mövikén); HÄYRÉN 1950b, p. 14, seven localities in the Uusikaupunki Archipelago; 1958, p. 17, Turku, the bridge of Ruissalo and Pitkäsalmi. Other collections: none. Own records: *Kemiö*, Lill-Tjuvholm, 1 (24.7.64, TUR). — *Nauvo*, Petäisholmar, 2 (24.7.64, TUR); Röddharun, 20 (21.7.64); Simonsharun, 18 (21.7.64, TUR); Söderholm, 15 (19.7.64, TUR); Vikarharun, 17 (5.7.63, TUR). — *Korppoo*, Brunskär, 12 (27.8.64); Lohm, N side, 6 (25.8.61, TUR); Sandholm, 4 (18.6.64); Stora Gunkobb, 6 (August 64); Vargskär, 6 (17.7.64, TUR); Verkan, 4 (8.9.64); Vitharun, 6 (17.7.64, TUR); a high skerry, NE of Vitharun, 6 (17.7.64). — *Parainen*, near Bergholm and Finnholm, 1 (10.7.64, TUR); between Bockholm and Granö, 3 (23.7.64); Ersby, 1 (18.6.61, TUR and 2.7.64, TUR); Kyrkfjärden, 1 (8.6.64).

Especially in the southern part of the SW Archipelago *R. riparium* grows in the geolittoral rock fissures, crevices, and caves often together with *Pseudodoclonium marinum*, *Waerniella lucifuga*, and *Rhodochorton purpureum*. Such localities are *Kemiö*, Lill-Tjuvholm; *Nauvo*, Petäisholmar; Röddharun; Simonsharun; Söderholm; Vikarharun; *Korppoo*, Brunskär; a high skerry near Granö; Kalvholm; Stora Gunkobb; Vargskär; Vitharun; and a high skerry NE of Vitharun.

*R. riparium* occurs mostly near the water surface, but it may be found at a distance of several meters below the sea level in crevices together with the phanerogams *Puccinellia retroflexa*, *Sagina procumbens*, *Cochlearia danica*, *Sedum acre*, etc. *R. riparium* occurs in the mouth of crevices and caves (cf. *Rhodochorton purpureum*, p. 49). It is loosely attached to the rock or is completely detached.



On flat and marshy shores *R. riparium* occurs as green masses which are either freely floating, or entangled with phanerogams close to the water line. In such habitats the species has been found in *Korppoo*, Lohm, N side; Verkan; *Parainen*, near Bergholm and Finnholm; Ersby; and Kyrkfjärden. In these localities the threads of *R. riparium* are long and with only few rhizoids.

In addition, *R. riparium* may be found in the sublittoral belt at depths of 6—10 m, entangled with red algae. In such habitats I have found the species in *Korppoo*, at Sandholm and in *Parainen*, between Bockholm and Granö.

*Cladophora glomerata* (L.) Kütz. — WÆRN 1952, pp. 76—80, fig. 31; VAN DEN HOEK 1963, pp. 162—186, plates 38—45; SÖDERSTRÖM 1963, pp. 33—46, figs. 28—34.

*C. glomerata* is a common alga in the inner Baltic, and on the Finnish shores it is one of the most prevalent green algae.

SW Archipelago. Literature: HÄYRÉN 1950b, p. 14: a common alga in the Uusikaupunki Archipelago; 1958, p. 17: Turku, Pikku Pukki, 2.8.36, loose lying; ANDERSSON 1955, pp. 139 and 143: *Turku*, Ruissalo; KASKINEN 1964, pp. 84—85: a common alga at Airisto. Other collections: numerous specimens in H and TUR, the innermost from *Kaks-kerta*, Satava, Höytinen (H. Waris, 5.8.31, TUR); *Turku*, Ruissalo, Härkälä bay (L. Andersson, 5.8.55, TUR); Hiiriluo, S side (J. Haverinen, 26.7.52); *Parainen*, Kvidja (K. Linkola, 26.7.43, TUR); *Piikkiö*, Hiirsalmi (A. Vuorisalo, 20.8.47, TUR). Own records: *C. glomerata* is common in the outer part of my research area. My innermost records of it are from *Parainen* (Brattnässund and Kyrkfjärden), near the public baths. In the last mentioned locality the plants were attached to timber near the water line. At Brattnässund the plants were scanty and loose.

In the outer archipelago *C. glomerata* is a densely tufted alga. It usually grows in the upper part of the hydrolittoral belt, forming a green zone at 20—30 cm depths above *Dictyosiphon foeniculaceus*, *D. chordaria*, and other brown algae. The breadth of the zone depends upon the inclination of the shore. *C. glomerata* grows also in exposed geolittoral rock pools, often together with *Enteromorpha intestinalis*. Many consecutive generations of *C. glomerata* develop during summer.

In hydrolittoral rock crevices and caves *C. glomerata* is the highest alga in zonation. The red algae *Ceramium tenuicorne* and *Hildenbrandia prototypus* and sometimes the brown alga *Sphacelaria arctica* occur in slightly deeper water. In such shaded habitats *C. glomerata* is dark green and rigid. It is perennial and continues to grow in the upper part of the sublittoral, to a depth of about 2.5 m.

In the inner archipelago, in *Parainen* and in the inner part of *Kustavi*, *C. glomerata* is absent near the water line but occurs at 2—4 m depths. It is often loose or entangled with other plants. In the narrow sounds of *Kustavi*, at *Pirisholm*, near *Likholm* and *Sikaluo*, and at *Lypertö*, SE side I have found masses of loose, nearly unbranched *C. glomerata* at 6—10 m depths.

In sheltered localities in the inner archipelago, as also in shallow bays in the outer archipelago, *C. glomerata* forms loosely floating masses on the surface of the water but occurs also entangled to *Chara* spp. and *Potamogeton pectinatus* at 0.2—3.0 m depths. The long bay on the E side of *Lohm* is an excellent example of this kind of habitat.

Some specimens of *C. glomerata*, especially untypical, loose and nearly unbranched plants, collected in *Nauvo*, *Korppoo*, *Kustavi*, *Lokalahti*, and *Parainen* have been determined and confirmed by Dr. van den Hoek.

*Cladophora fracta* (Müll. ex Vahl) Kütz. — WÆRN 1952, pp. 75—76; VAN DEN HOEK 1963, pp. 199—208, plates 49—50 and 51, figs. 672—676; SÖDERSTRÖM 1963, pp. 21—32, figs. 12—21.

The species has been mentioned by HÄYRÉN many times from the Gulf of Bothnia and from the Gulf of Finland. In the Tvärminne Archipelago the species has also been known for a long time.

SW Archipelago. Literature: HÄYRÉN 1950b, p. 15, a common alga in the Uusikaupunki Archipelago; 1958, p. 17: Turku, Ruissalo bridge, 1.8.36; Turku, Pitkäsalmi, 1.9.37. Other collections: none. Own records: Nauvo, Skagsgadd, 15 (var. *intricata*, 19.7.64, TUR). — Korppoo, Brunskär, 12 (var. *intricata*, 27.8.64, TUR); Lohm, 6 (var. *fracta*, 2.6.61, TUR); Vargskär, 6 (var. *intricata*, 17.7.64); Vitharun, 6 (var. *intricata*, 17.7.64, TUR).

The material which I collected at Brunskär and at Lohm was determined by Dr. van den Hoek, the former as *C. fracta* var. *intricata* and the latter as *C. fracta* var. *fracta*. Using this material for comparison I was able to recognize *C. fracta* from other localities.

*C. fracta* var. *intricata* grew in geolittoral rock pools with faintly brackish water attached to the rock. *C. fracta* var. *fracta* at Lohm was a detached plant.

In the southern part of my research area *C. fracta* seems to be limited to geolittoral rock pools. More detailed studies in the inner parts of the SW Archipelago probably will show that it is more common in that area than present collections indicate.

*Cladophora aegagropila* (L.) Rabenh. — LUTHER 1951b, pp. 55—58; WÆRN 1952, pp. 82—84; VAN DEN HOEK 1963, pp. 51—58, map 3 and plates 11—12.

*C. aegagropila* is a widely distributed alga in the inner Baltic. It occurs mainly in the inner parts of the archipelago (cf. WÆRN 1952, p. 82).

SW Archipelago. Literature: ÅBERG 1934, pp. 239—242, Nauvo: Storlandet, (Mövikén); HÄYRÉN 1950b, p. 15, as *Aegagropila Martensii*, fragments near Pirkholma in the Uusikaupunki Archipelago. Other collections: Parainen, Toijoisvik (K. Linkola, 17.6.11 and 2.8.13, TUR). Own records: Korppoo, Sandholm, 4 (22.6.64, TUR); Långvik, 8 (3.7.62, TUR). — Parainen, Ersby, 1 (2.7.64, TUR). — Kustavi, Riihenmaa, W side (5.—7.7.64, TUR).

At Sandholm only a few 0.5 cm long tufts were found at 6—10 m depths on mud. In the inner part of Långvik, at Väsby and Bendby, I found several 0.5—1.0 cm long tufts. They occurred either loose on mud or loosely attached to submersed timber at a depth of 5 m. In Kustavi (Riihenmaa), I dredged the species from the same depth and similar bottom; the tufts here were also only 0.5—1.0 cm long. In Parainen (Ersby), I saw *C. aegagropila* at 0.5 m depth forming sea balls on sand together with *Sphacelaria radicans*.

My determinations of the species have been confirmed by Dr. C. VAN DEN HOEK.

*Cladophora rupestris* (L.) Kütz. — WÆRN 1952, pp. 80—82; VAN DEN HOEK 1963, pp. 64—75, plate 15, figs. 146—163; SÖDERSTRÖM 1963, pp. 107—110, figs. 95—96.

On the Finnish shores the species is distributed in the Gulf of Bothnia as far as the northern archipelago of Vaasa and in the Gulf of Finland as far as Narva (cf. WÆRN 1952, p. 80).

SW Archipelago. Literature: no records. Other collections: none. Own records: Korppoo, Gaddarna, 16 (28.7.62, TUR); Jurmo, 13 (26.6.62, TUR); Kälö, N side, 11 (15.8.63, TUR). — Kustavi, Lypertö, N side, 1 (19.7.63, TUR). — Lokalahti, Iso Lehmämaa, W side, 1 (16.—20.7.62, TUR).

In Korppoo the species grew on stony bottom at a depth of more than 10 m. At Kälö the depth was even 15—17 m. In Kustavi the species was attached to stones at depths of 5—6 m. In Lokalahti the depth was only 1—2 m, but the species was found on a precipitous shore as an epiphyte on *Fucus vesiculosus*.

The largest plants, about 12 cm long, I found in Korppoo (Gaddarna). All the other plants were smaller, ca. 2 cm long.

*C. rupestris* does not seem to be common in my research area, but because it not infrequently grows between large stones, it may have escaped observation when investigation was made by dredging.

*Spirogyra* Link — LAKOWITZ 1929, pp. 186—189; LEVRING 1940, p. 21.

Many species of *Spirogyra* have been found in the Baltic in sheltered localities near the coast (cf. LAKOWITZ 1929, pp. 186—189).

SW Archipelago. Literature: no records. Other collections: none. Own records: I have usually found only single sterile threads in sheltered localities among other algae. Only once, in Kemiö (Flisholm), 2 (23.7.64, TUR) did I find masses of *Spirogyra* in a shallow bay together with *Phragmites*. There it occurred on mixed sandy and muddy bottom at a depth of ca. 2 m.

## 2. Phaeophyceae

*Pilayella littoralis* (L.) Kjellm. — KYLIN 1937, pp. 5—6; WÆRN 1952, pp. 111—113; LUND 1959, pp. 38—39; RUSSELL 1961a, pp. 30—31; b, p. 101; CARDINAL 1964, pp. 11—13, fig. 1; DIXON & RUSSELL 1964, p. 280.

*P. rupincola* was separated by KYLIN (1937) from *P. littoralis* because according to his studies it lacked an alteration of generations. He also found morphological characters which appeared to distinguish it from *P. littoralis*. Subsequently this concept was supported by some authors (cf. RUSSELL 1963, p. 469), and only *P. rupincola* was supposed to occur in the Baltic (LEVRING 1940). WÆRN (1952) was the first to doubt the validity of *P. rupincola* as an independent species, but he still wrote about *P. rupincola*. Later *P. rupincola* was rejected as a separate species by LUND (1959), RUSSELL (1961b), and CARDINAL (1964).

*P. littoralis* is widely distributed in the inner Baltic. It occurs at least as far as near Vaasa in the Gulf of Bothnia and near Krasnaja Gorka in the Gulf of Finland (cf. WÆRN 1952, p. 111).

SW Archipelago. Literature: STRÖMFELT 1884, pp. 132—133, Nauvo (Fagerholmen); HÄYRÉN 1950b, p. 16, the Uusikaupunki Archipelago; ANDERSSON 1955, pp. 139—140, many records from Hiittinen, Nauvo and Turku: Ruissalo; KASKINEN 1964, pp. 85—86, many records from Airisto. Other collections: Nauvo, Fagerholm (Strömfelt, 1882, H). — *Korppoo* (Elfving, 1872, H). — *Parainen*, Levo (Linkola, 1910, TUR); Pyhänsuu (Linkola, 1910, TUR); Tennäs (Linkola 1910, TUR); Tennäs (Linkola, 1910, H). — *Karuna* (Elfving, 1872, H). Own records: *P. littoralis* is one of the most common algae in my research area. I have found it everywhere, except the inner part of Parainen and Pitkäsalmi, near Turku.

On rocky shores *P. littoralis* is typical in the lower part of the hydrolittoral zone and in the upper part of the sublittoral zone, occurring as an undergrowth of *Fucus vesiculosus*. In the outer archipelago of Nauvo and Korppoo *P. littoralis* may be up to 10 cm long in such growths. In the inner parts of the SW Archipelago and in harbours the tufts are often only 2—3 cm long and porous. They are densely covered with diatoms. Similar growths have been seen attached to landings and other similar structures in harbours, for example, in Korppoo: Galtby; Rumar; Verkan; and Nauvo: Fagerholm.

In the upper part of the sublittoral zone *P. littoralis* also occurs as an epiphyte on *Fucus vesiculosus*; often together with *Elachista fucicola*. When these two epiphytes are thus associated, *P. littoralis* occurs below *E. fucicola*. Such growths are typical in my research localities in Hiittinen, the outer part of Nauvo, Korppoo, and Houtskari, where *Fucus vesiculosus* begins to occur at a depth of 0.5—1.0 m. The individual plants of *P. littoralis* may be more than 20 cm long. Single small tufts grow on *Fucus vesiculosus* in deeper water and also on *Furcellaria fastigiata*. In Lokalahti (Iso Lehmämaa) I have dredged *P. littoralis* about 1 cm long from 20 m depth, growing on *Furcellaria fastigiata*. In Korppoo, near the skerries Gaddarna, SW of Jurmo *P. littoralis* occurred as an epiphyte

on *Cladophora rupestris* and *Ceramium rubrum* at a depth of 12 m. Both species were densely covered with small tufts about 0.5 cm long. I have seen *P. littoralis* in Korppoo (Lohm, 13.6.65, and Utö, 20.6.65) growing epiphytically on *Ceramium tenuicorne* in the hydrolittoral.

*P. littoralis* occurs attached to *Mytilus edulis* at various depths. On flat and sandy shores in the outer archipelago *P. littoralis* occurs as an epiphyte on *Potamogeton pectinatus* and old leaves of *Zostera marina* at depths of 0.2—1.0 m. Such localities are Dragsfjärd: Sandö; Korppoo: Estrevlan; and Nauvo: Ängsö. In these places it is very small, 1—2 cm long but well developed, and numerous unilocular sporangia are to be found.

Unilocular sporangia are common on *P. littoralis* growing in the hydrolittoral and the upper part of the sublittoral. They have been found as early as the beginning of May and may still be present at the beginning of November. Plurilocular sporangia also occur throughout the summer, but they are less common than the unilocular sporangia. In deep water both sporangial types are infrequent, but they have been found even at a depth of 12 m.

For the present I am not sure about the occurrence of gametophytes in my research area (RAVANKO 1965a). According to RUSSELL (1961a, p. 30) the gametophytes are very small in size and bear plurilocular gametangia terminally. Gametophytes are said to be uncommon and have been found only in spring. Most *Pilayella* plants are sporophytes. Also according to CARDINAL (1964, fig. 1) the gametophytes are small and bear terminal, sometimes lateral plurilocular gametangia.

*Ectocarpus confervoides* (Roth) Le Jol. s. lat. — WÆRN 1952, pp. 113—118, figs. 50 and 51.

In the Baltic *E. confervoides* s. lat. has been found as far as Raahe in the Gulf of Bothnia and as far as Vyborg in the Gulf of Finland (cf. WÆRN 1952, p. 114).

SW Archipelago. Literature: STRÖMFELT 1884, p. 133, a common species; HÄYRÉN 1950b, p. 16, as *E. siliculosus*, the Uusikaupunki Archipelago; ANDERSSON 1955, p. 140, a common alga in Hiittinen, Nauvo, and Turku; RUISSALO; KASKINEN 1964, pp. 86—87, many records at Airsto. Other collections: Korppoo, Utö (Elfving, 1872, H). — Parainen, Kvidja (Linkola, 1913, H); Levo (Linkola, 1910, H); Pyhänsuu (Linkola, 1910, H); Tenäs (Linkola, 1910, H, TUR). — Kakskerta, Satava, Höyttinen (H. Wärén, 1931, TUR). — Askainen, Pukkila (Linkola, 1910, H). Own records: In my research area *E. confervoides* s. lat. penetrates farthest of all brown algae into the inner archipelago. I have seen it growing in Turku (near the Hirvensalo bridge and at Pitkäsalmi: Vähä-Heikkilä). It occurs between the water surface and a depth of at least 12 m, attached to rocks, stones, gravel, sand, timber, shells of mussels, various algae (*Fucus vesiculosus*, *Chorda filum*, *Dictyosiphon foeniculaceus*, and *Furcellaria fastigiata*), and aquatic phanerogams (*Phragmites communis*, *Potamogeton pectinatus*, *P. perfoliatus*, *Myriophyllum spicatum*, etc. Sometimes it is loose.

The species is variable in colour, size, and shape of the plurilocular sporangia, which are common. They are to be found already in May, and in September I have still observed them. I have found plurilocular sporangia also on specimens from the inner part of the archipelago, from Turku (Pitkäsalmi). These sporangia, however, were unusual. Some of them were branched, while others were broad at the base but narrow at the apex, and thus sharply delimited into two parts. Probably the sporangia had ceased growing for a certain time and later began to grow again.

Unilocular sporangia are rarer than plurilocular sporangia. They occur mostly on the same plants as plurilocular sporangia.

I have seen both sporangia types in material from the following localities. — Nauvo, Seili, 3 (23.9.65, on *Chorda filum*). — Korppoo, Julholm, 4 (23.6.62, on *Fucus*); Jurmo, 13 (1.8.61 and 27.7.62, on *Chorda filum* and *Dictyosiphon foeniculaceus*); Långvik, 8

(3.7.62, on *Fucus*); Råsklaks, 6 (3.7.62, on *Fucus*); Utö, 18 (20.6.65, on rocks in the sublittoral); Verkan, 4 (10.6.62 and 2.7.62, on a landing).

In Jurmo I have collected *E. confervoides* (1.8.61) with only unilocular sporangia.

In harbours and in shallow bays where *E. confervoides* occurs near the water surface either loose or attached to timber structures, *Phragmites*, and detached plants, its colour is olive green. Plurilocular sporangia are abundant, but mostly they are very slender, often not broader than the vegetative cells, and they terminate in long colourless hairlike structures. Such plants I have seen, for example, in Korppoo: Ahvensaari (on timber near the landing); at Lohm, N side (on *Phragmites*); and at Verkan (on timber).

Especially in early summer *E. confervoides* can be seen on rocks near the water surface together with *Cladophora glomerata*. Such plants are olive green as are those growing in harbours and shallow bays, but the sporangia are mostly without hairlike appendages.

In deeper water *E. confervoides* often occurs on *Fucus vesiculosus*. The plants are brownish, and the plurilocular sporangia are quite broad without hairlike structures. Similar plants occur more seldom on *Chorda filum* and *Dictyosiphon foeniculaceus*. In the lower part of the sublittoral *E. confervoides* grows on *Furcellaria fastigiata*.

In Korppoo (Hevosluoto) *E. confervoides* was attached to coarse sand at a depth of about 5 m forming a pure growth. The tufts were 10—20 cm long and very dark olive green. Hairless plurilocular sporangia occurred.

As a whole, *E. confervoides* is highly variable in my research area. This variability seems to be due to external conditions, especially light intensity.

*Waerniella lucifuga* (Kuck.) Kyl. — WÆRN 1936, pp. 329—342; 1952, pp. 118—120.

On the Finnish shores *W. lucifuga* has been found near Tvärminne and in many localities between Åland and Helsinki (cf. WÆRN 1952, p. 118).

SW Archipelago. Literature: WÆRN 1952, fig. 52; ANDERSSON 1955, p. 140, one record in Hiittinen (Tunhamn). Other collections: *Hiittinen*, (Tunhamn, leg. Holger Sältin, 1950, H). Own records: *Kemiö*, Lill-Tjuvholm, 2 (23.7.64). — *Nauvo*, Rödharun, 20 (21.7.64); *Simonsharun*, 18 (21.7.64); *Söderholm*, 15 (19.7.64). — *Korppoo*, the skerries near Kalvholm, NW of Nauvo, 3 (24.7.64); *Vargskär*, 6 (17.7.64, TUR); a high islet, NW of Vitharun, 6 (17.7.64). — *Lokalahti*, Iso Lehmämaa, NW side, 1 (16.—20.7.62).

ANDERSSON'S record as well as my own records are indicated on map 6.

In my research area I have found *Waerniella lucifuga* in gelittoral rock fissures, crevices, and caves. In fissures the species can be seen alone, but in crevices and caves it is associated with *Rhodochorton purpureum*, *Hildenbrandia prototypus*, *Rhizoclonium riparium*, and *Pseudoclonium marinum*. In caves, *W. lucifuga* is concentrated on the vertical surfaces and ceilings. It forms dense carpets, the threads of which are usually shorter than 1 mm. The best developed carpets that I have seen were at Vargskär in Korppoo. In most places, however, the carpets were very limited and in the material from Lokalahti I could find only a few threads.

I have not found sporangia in my material.

*Sphacelaria radicans* (Dillw.) C. Agardh — WÆRN 1945, pp. 400—401; 1952, pp. 96—98, figs. 38 and 39 a and b.

In the inner Baltic *S. radicans* has been mentioned from Björköby: Valsöarna, at Storösund, in the Gulf of Bothnia; and in the Gulf of Finland the species occurs at least near Helsinki, Degerö. In the archipelago west of Hanko Peninsula the species has been collected from Tenhola by HÄYRÉN (cf. WÆRN 1952, p. 96).

SW Archipelago. Literature: no records. Other collections: none. Own records: *Korppoo*, Julholm, 4 (22.6.64, TUR). — *Kustavi*, Riihenmaa, 3 (5.—7.7.64, TUR). — *Parainen*, near Bergholm and Finnholm, 1 (10.7.64, TUR); between Bockholm and Granö, 3 (23.7.64, TUR); *Ersby*, 1 (2.7.64, TUR).

In Korppoo (Julholm) some small tufts (ca. 0.5 cm long) of *S. radicans* were attached to rocks in the hydrolittoral rock crevices. On timber structures I have found plants 1.0—1.5 cm long in Parainen, near Bergholm and Finnholm, and in Kustavi, Riihenmaa at 4—5 m depth. At Ersby in Parainen I noticed plants lying loose in shallow water and forming abundant so-called sea balls, 2—3 cm long.

In material collected in Kustavi (Riihenmaa) I have observed sessile unilocular sporangia.

*Sphacelaria arctica* Harv. — WÆRN 1952, pp. 100—107, figs. 41, 43, and 44.

In the inner Baltic *S. arctica* is distributed as far as Ratan in the Gulf of Bothnia and as far as the innermost part of the Gulf of Finland (cf. WÆRN 1952, p. 104).

SW Archipelago. Literature: ANDERSSON 1955, p. 139, two plants in Ruissalo; KASKINEN 1964, p. 85, Airisto. Other collections: none. Own records: *Dragsfjärd*, Karaskär, 1 (cast ashore, 22.7.64). — *Korppoo*, Brunskär, 12 (lying loose in a rock pool, 2.7.64, TUR); Huvudskär, 13 (lying loose in shallow water, 26.7.62, TUR); Julholm, 4 (22.6.64, TUR); Kalvholm, 6 (13.8.63, TUR); Lyddarholm, 10 (29.8.62, TUR); Teijula, 4 (cast ashore, 18.6.64, TUR); Vargskär, 6 (17.7.64, TUR). — *Kustavi*, near Likhholm and Sikaluoto, 4 (19.7.63, TUR); Lypertö, SE side, 2 (19.7.63, TUR); Pirisholm, 4 (19.7.63, TUR); Riihenmaa, 3 (5.7.64, TUR). — *Lokalahti*, Iso Lehmämaa, N side, 1 (17.7.62). — *Parainen*, between Bockholm and Granö, 3 (23.7.64, TUR). — The distribution of the species is shown on map 7. Open dots indicate specimens, cast ashore.

In my research area only a few individual plants were observed in each locality. These were small, 1.0—2.5 cm long. I found unilocular sporangia in material from Korppoo (Kalvholm and Lyddarholm). The material from Brunskär contained plurilocular sporangia.

*S. arctica* has been observed attached to rocks and stones in Korppoo at Julholm, Kalvholm, Lyddarholm, and Vargskär. At Julholm and Vargskär it grew in a shaded rock crevice at a depth of 0.5 m. At Kalvholm and Lyddarholm it occurred at ca. 10 m depth among *Furcellaria fastigiata* and *Phyllophora brodiaei*. In the rest of the localities *S. arctica* occurred either loose or entangled with other algae at depths of 4—10 m.

*Lithoderma subextensum* Wærn — WÆRN 1949, pp. 659—662, fig. 4; 1952, p. 148.

This species was described by WÆRN (1949) from the Öregrund Archipelago. At present very little is known about its distribution on Finnish shores. In the Tvärminne Archipelago it was first observed by WÆRN and later many times by others. In the Gulf of Bothnia I have seen it at Norrskär in the Vaasa Archipelago, where it was growing on stones in shallow water (24.6.65, TUR). *L. subextensum* is probably very widely distributed, for on the Swedish coast it has been found in the northernmost part of the Bothnian Bay by PEKKARI (1965, p. 214).

SW Archipelago. Literature: ANDERSSON 1953, pp. 44—46, in Hiittinen (unpublished). KASKINEN (1964, p. 87) supposed that the common *Lithoderma* crusts at Airisto belong to *L. subextensum*. Own records: In my research area *L. subextensum* seems to be a very common alga although it is best developed in the southern part, namely in Hiittinen, Nauvo, Korppoo, and Houtskari. In the inner part of the Parainen Archipelago and in Turku (Pitkäsalmi) I was unable to find it despite careful searching.

*L. subextensum* is specially abundant in the geolittoral rock pools, in the hydrolittoral, and in the upper part of the sublittoral on stones and rocks. On small stones I have observed it even at a depth of 10 m.

*Lithoderma rosenvingii* Wærn — WÆRN 1949, pp. 655—658, fig. 3 and pl. II; 1952, pp. 146—147.

Like *L. subextensum*, *L. rosenvingii* also was described as a new species by WÆRN from the Öregrund Archipelago. In Finland the species has also been found by WÆRN in the Tvärminne Archipelago.

SW Archipelago. Literature: no records. Other collections: none. Own records: Found only twice in material from *Nauvo*, Salskären, 25 (29.6.63) and from *Lokalahti*, Iso Lehmämaa, 1 (16.—20.7.62).

This apparent rarity, however, is probably due to insufficient investigation in deep water. In both cases the crusts were dredged from a depth of about 10 m.

*Petroderma maculiforme* (Wollny) Kuck. — WÆRN 1949, pp. 663—667, pl. I; 1952, pp. 141—143.

Along the Finnish shores *P. maculiforme* was reported from Bergö, south of Mariehamn (Åland) by WÆRN (1952, p. 141), who also saw it a few times in the Öregrund Archipelago, Sweden. During the Nordic Marine Botanical Course at Tvärminne in 1965 Lic.phil. SVANTE PEKKARI showed *P. maculiforme* to the class in the vicinity of the landing of the zoological Station.

SW Archipelago. Literature: no records. Other collections: none. Own records: *Nauvo*, Orhisaari, 3 a (26.5.66, TUR); Vikom, 5 (23.9.65). — *Korppoo*, Julholm, N side, 4 (7.6.64); Kulm, S side, 6 (6.9.64, TUR); Lohm, S side, 6 (21.8.64, TUR).

The species grows in the uppermost part of the hydrolittoral and the lowermost part of the geolittoral. I have seen it mostly on sandstone. The crusts are either very dark brown or somewhat reddish. The size of the crust is small, 0.5—2.5 mm in diameter. I have seen unilocular sporangia in material collected at Lohm (S side). In these crusts I also saw hairs.†

*Elachista fucicola* (Vell.) Aresch. — WÆRN 1952, pp. 153—155.†

According to the literature *E. fucicola* occurs on the Finnish coast as far as Raahé in the Gulf of Bothnia and at least as far as Porvoo in the Gulf of Finland (cf. WÆRN 1952, p. 154).

SW Archipelago. Literature: STRÖMFELT 1884, p. 132; HÄYRÉN 1950b, p. 17, the Uusikaupunki Archipelago; ANDERSSON 1955, p. 141, Hiittinen, Nauvo, and Turku: Ruissalo; KASKINEN 1964, p. 87, many localities at Airisto. Other collections: *Nauvo*, Fagerholm (Strömfelt, 1882, H); *Korppoo*, Utö (Elfving, 1872, H); *Parainen*, Pyhänsuu (Linkola, 1910, H, TUR); Tennäs (Linkola, 1910, H). Own records: *E. fucicola* decreases towards the inner parts of the archipelago, but it does not disappear completely, and I have not been able to distinguish between ecological districts as WÆRN did in the Swedish Baltic (cf. 1950, pp. 23—24 and 1952, p. 21, fig. 11). He was able to divide the Öregrund Archipelago into two areas, the *Elachista* district and the *Fontinalis* district. These districts were distinguished by the presence of either *Elachista fucicola* or *Fontinalis dalecarlica*, which are absolute indicator species. The *Fontinalis* district in the west, near the coast, indicates the water flowing southwards from the Bothnian Bay, while the *Elachista* district in the east reflects the water of the Baltic flowing northwards.

In the inner part of my research area in Parainen I have seen *E. fucicola* only at the mouth of Tervsund. In Kustavi, excepting Lypertö (N side), it was also much rarer than in Hiittinen, Nauvo, Korppoo, and Houtskari. At Kustavi (Riihenmaa) only small specimens were found at a depth of 2 m. In Lokalahti (Iso Lehmämaa) it was well developed on the N side, but on the S side I saw only fragments. *Fontinalis dalecarlica* has not been found in my research area.

In the outer parts of my research area *E. fucicola* is typical in somewhat sheltered localities. It grows on the upper part of *Fucus vesiculosus*, at depths of 0.2—0.5 m. However, *E. fucicola* also occurs deeper and can be found at 3—4 m. — The distribution of the species is shown on map 8.

In my research area *E. fucicola* is a species of late summer. It is best developed in July and August, but small plants can be seen, already in May. At the end of September globular specimens without long assimilative filaments are to be seen.

I have seen plants with unilocular sporangia only in material from Nauvo (Ängsö), 8 (25.8.64).



*Leathesia difformis* (L.) Aresch. — LAKOWITZ 1929, pp. 267—268, fig. 370; DU RIETZ 1930a, pp. 363—364; LEVRING 1940, p. 48; ROSENINGE & LUND 1941, pp. 8—11, fig. 1; MATHIESEN 1965, pp. 71—75, figs. 2 and 3.

In Finland the species was found for the first time in the Tvärminne Archipelago (1953) by TOINI TIKKANEN and identified by WÆRN (cf. MATHIESEN 1965, p. 71). In the Åland Archipelago, at Vitfågelskär, the species was found later (1956) by LISBETH MATHIESEN (1965, p. 71).

SW Archipelago. Literature: no records. Other collections: Prof. ANTERO VAARAMA has brought me *Potamogeton pectinatus* from Nauvo, Seili (August 1965, TUR) bearing *L. difformis* with both unilocular and plurilocular sporangia on the same plants. Prof. HANS LUTHER has seen *L. difformis* on *Ruppia* from Hiittinen, Högsåra, collected by ULF LINDGREN. Own records: *Dragsfjärd*, Sandö, SW side, 2 (1.—3.7.63 and 22.7.64, unilocular sporangia, TUR). — *Nauvo*, Ångsö, 8 (12.8.64, unilocular sporangia). — *Korppoo*, Estrevlan, 14 (27.7.62, uni- and plurilocular sporangia, TUR); Julholm and the skerries near it, 4 (7.—22.6.64, TUR, 16.8.64). — See map 9 for the distribution of the species.

In *Dragsfjärd* (Sandö) *L. difformis* occurred on a flat and sandy shore in shallow water, 0.5—1.5 m deep on *Potamogeton pectinatus*, which was wholly covered with small epiphytes. Especially small specimens of *Eudesme virescens* and *Pilayella littoralis* occurred in abundance among *L. difformis*, which was small, the largest being ca. 0.5 cm in diameter. In *Korppoo* (Jurmo, Estrevlan) *L. difformis* grew also on *Potamogeton pectinatus*, but chiefly on old drifting leaves of *Zostera marina*. There I have seen the largest individual specimens hitherto known from Finland, some of them about 1.5 cm in diameter (Fig. 3). At Julholm they were smaller, usually less than 0.5 cm in diameter, but often the individual plants unite, forming irregular masses. At Julholm the species occurred epiphytically on *Potamogeton pectinatus* and *Phragmites*. In Nauvo, Ångsö I saw a few plants and they were very small, only 1.0—1.5 mm in diameter.

*Eudesme virescens* (Carm.) J. G. Agardh — SKOTTSBERG 1911, pp. 11—15, fig. 4; ROSENINGE & LUND 1941, pp. 28—30, fig. 10; KYLIN 1947, pp. 56—57, fig. 48 B; ANDERSSON 1955, pp. 141—142, fig. 2; LUND 1959, pp. 119—121, fig. 25.

*E. virescens* was first reported from Finland by VÄLIKANGAS (1909), who saw it near Tvärminne Zoological Station. Later it has been found in many localities near Tvärminne. I have seen it near Hanko in 1965. Its easternmost observed locality in the Gulf of Finland is near the island Suursaari in the U.S.S.R. (cf. HÄYRÉN 1940). STRÖMFELT did not see it at all on his excursion to the Finnish SW Archipelago in 1882, but to judge from the stage of development of the other annual brown algae reported by him, he probably made his excursion late in summer, when *E. virescens* might already have disappeared.

SW Archipelago. Literature: ANDERSSON 1955, p. 141, only in the Gullkrona district. Other collections: *Hiittinen*, Tunhamn (Kallio, 1951, TUR). Own records: *Dragsfjärd*, Helsingholm, Kälklobb, and Sandö, 2 (1.—3.7.63 and 22.7.64, TUR). — *Hiittinen*, Lindörn, 3 (30.6.63); Skogskär, 1 (30.6.63); Stubbö, 4 (3.7.63); the Tunhamn mainland, 2 (30.6.62). — *Nauvo*, Färö, 23 (30.7.62 and 20.7.64); Hummelskär, 13 (25.7.62 and 30.7.62); Husskär, 21 (30.6.63, TUR); Låderskär, 17 (5.7.63); Miraholm, 15 (19.7.64); Mossaskär, 14 (25.8.62); Simonscharu, 18 (21.7.64); Skagsgadd, 15 (19.7.64); Söderholm, 15 (19.8.64); Trunsö—Kalkskär, 27 (29.7.62). — *Korppoo*, Estrevlan, 14 (27.7.62, TUR); Gaddarna, SW of Jurmo, 16 (28.7.62); Galtby, 4 (4.7.62); Galtbyviken, 4 (24.6.62, TUR); Granö, W of Lohm, 6 (18.7.64); between Kulm and Verkhholm, 6 (18.7.64, TUR); Hevosluoto, W side, 1 (11.7.62, TUR); Hummelskär, 5 (13.8.64, TUR); Huvudskär, 13 (26.7.62, TUR); Julholm, 4 (22.—25.6.62, TUR and 6.—8.6.64, TUR); Jurmo, 13 (26.7.62, TUR); Lohm, 6 (July 61, 13.6.65); Långvik, 8 (3.7.62); Råsklaks, 6 (5.7.64, TUR); Sandholm, 4 (22.6.64, TUR); Sandvikharu, 15 (28.7.62); Utö, 18 (28.7.62 and 20.6.65, TUR); Vargskär, 6 (17.—19.7.64); Verkan, 4 (13.5.62, 23.6.62, and 2.7.62); Vitharun and the skerries near it, 6 (17.7.64). — *Kustavi*, Lypertö, 1 (19.7.63). — The distribution of the species is shown on map 10.

Kustavi, Lypertö is now the northernmost known locality for *E. virescens* in Finland.



*E. virescens* is an annual species, and I have seen it fertile already in May. It is best developed at the end of June. Later it disappears though it can be seen at least until the end of July in the outer archipelago, where it is best developed and grows abundantly. The longest plants which I have seen were nearly 30 cm in length.

In most cases I have seen *E. virescens* growing on rocks and stones at depths of 20—50 cm forming relatively pure growths. In the same localities it can often be seen on *Fucus vesiculosus* in the uppermost part of the *Fucus*-belt. On flat and sandy shores the species occurs together with *Leathesia differmis* as an epiphyte on *Potamogeton pectinatus* and on old leaves of *Zostera marina*. Such localities are Korppoo (Julholm, Estrevlan) and Dragsfjärd (Sandö). In Korppoo (Galtby, Galtbyviken, Julholm, and Sandholm) I have seen *E. virescens* growing on *Phragmites communis*. The plants of *E. virescens* growing epiphytically on *Potamogeton pectinatus* and *Phragmites communis* are usually small, such as those depicted by SKOTTSBERG 1911, fig. 4, c.

*E. virescens* has always been found with unilocular sporangia in my research localities; I have never seen plurilocular organs.

*Desmotrichum undulatum* (J. G. Agardh) Reinke — SKOTTSBERG 1911, pp. 5—10, figs. 2 and 3; DU RIETZ 1930a, pp. 361—363; LEVRING 1940, pp. 50—51; KYLIN 1947, pp. 72—73, fig. 59 A and B; JAASUND 1957, pp. 216—218, fig. 6; 1965, pp. 87—89, fig. 26.

Recent studies JAASUND (1957 and 1965) have shown that *D. balticum* Kütz., *D. scopulorum* Reinke, and *Streblonema (Entonema) effusum* Kylin are only different stages in the development of *D. undulatum*.

There are only a few records of *D. undulatum* in the inner Baltic. On the Swedish coast of the Baltic it has been mentioned in the literature from Nynäshamn (DU RIETZ 1930a, as *D. balticum*) and from Blekinge (LEVRING 1940, as *D. balticum*).

In Finland the species was first mentioned by SKOTTSBERG (1911), who observed it at Land-Björkskär at Tvärminne. According to SKOTTSBERG the plants were intermediate between *D. balticum* Kütz., and *D. scopulorum* Reinke, but because his *Desmotrichum* had sporangia which were not imbedded in the thallus, he referred it to *D. scopulorum* (as f. *fennica*).

Already DU RIETZ (1930a, p. 361) was of the opinion that SKOTTSBERG's plants belong to the same species as DU RIETZ's *D. balticum* from Nynäshamn.

SW Archipelago. Literature: no records. Other collections: none. Own records: *Dragsfjärd*, Sandö, 2 (1.7.63, 22.7.64, TUR). — *Korppoo*, Julholm and the skerries near it, 4 (7.6.64, TUR); Utö, 18 (20.6.65, TUR). — The distribution of the species is shown on map 11.

In material collected in Dragsfjärd (Sandö) I observed the species for the first time in 1963. Only a few uniseriate filaments with plurilocular organs were seen when studying the material under a microscope. The filaments were attached to *Zostera marina*. In the following year I observed *D. undulatum* on *Potamogeton pectinatus* in material from the same locality. The specimens had well developed plurilocular organs as well as many old, empty organs. I saw also broader pluriseriate ribbons in this material. Most of these pluriseriate ribbons were without sporangia, but they had abundant hairs with a basal growing point. The chromatophores could easily be seen, and they were small disklike structures.

In Korppoo (Julholm) *D. undulatum* occurred as an epiphyte on *Potamogeton pectinatus* and *Phragmites communis* together with *Eudesme virescens* and *Leathesia difformis*. These were up to 2 cm long and bore both plurilocular and unilocular organs on the same plants. Reproductive organs occurred on both uni- and pluriseriate threads; some of them were imbedded in the thallus. Some of the pluriseriate plants had very short branches.

Among this material I also discovered partly endophytic plants (see fig. 1 C). Only long and broad plurilocular organs and hairs were seen on the surface of the host.

In Korppoo (Utö) *D. undulatum* occurred on and in *Ceramium tenuicorne*. The irregular endophytic filaments were growing between the cortical cells of *Ceramium*. In the innermost parts of the filaments were equally thick plurilocular organs, similar to those in *Streblonema oligosporum*. However, on these same filaments were also seen pluriseriate organs with a broader base. This sporangium type, which is similar to that depicted by JAASUND (1957, fig. 6, e and 1965, fig. 26, C), was dominant in the outer part of the endophyte from which there arose upright, unbranched filaments with several plurilocular organs, some unilocular sporangia, and hairs. The plurilocular organs were pluriseriate and broad at the base. They were lateral and most of them were not imbedded in the thallus. Most of the upright filaments were uniseriate, although pluriseriate ribbons also occurred.

Outside my special research area I have found *D. undulatum* also on *Ceramium tenuicorne* collected near the town of Hanko (19.6.65, TUR). These plants were less vigorous than those collected at Utö. Nearly all threads were uniseriate. Plurilocular organs occurred on both the upright epiphytic threads and on the endophytic *Streblonema*-like part

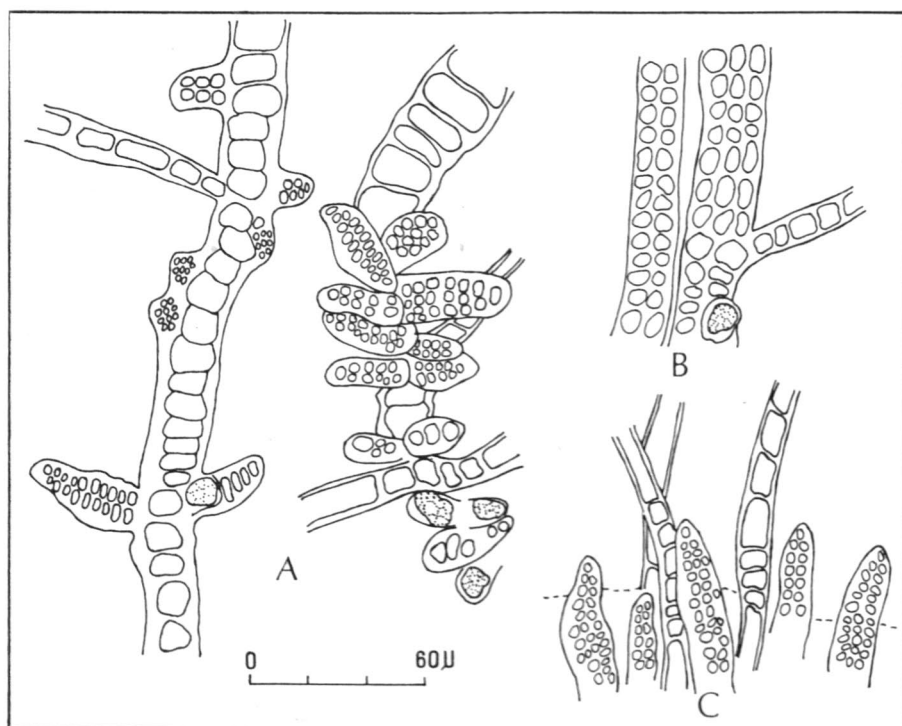


FIG. 1. *Desmotrichum undulatum*. — A. Monosiphonous threads with many sporangia. — B. Young polysiphonous threads. — C. Partly endophytic plants. — Drawn from formalin-preserved material, collected from *Potamogeton pectinatus* in Korppoo (Julholm) 7.6.64.

of the plants. I have also found similar plants on *C. tenuicorne* collected at K okar, near the naval guard and at M rket in the  land Sea (20.—21.6.65, TUR).

*Stictyosiphon tortilis* (Rupr.) Reinke — W ERN 1952, pp. 155—159, fig. 70.

*S. tortilis* is known from the Gulf of Bothnia as far as Raahe and from the Gulf of Finland to Krasnaja Gorka in the U.S.S.R. (cf. W ERN 1952, p. 156).

SW Archipelago. Literature: STR MFELT 1884, p. 128 (as *Phloeospora tortilis*), Nauvo, Stensk r and Fagerholmen; H YR N 1950b, p. 17, the Uusikaupunki Archipelago; ANDERSSON 1955, pp. 141—142, many localities in the Gullkrona district; KASKINEN 1964, p. 88, 1—2 cm long fragments in three localities at Airisto. Other collections: *Korppoo*, Ut  (Elfving, 1872, H). — *Nauvo*, Stensk r (Str mfelt, 1882, H). — *Parainen*, Bodn s (Linkola, 1910, H, TUR); Kvidja (Linkola, 1913, H, TUR); Pyh nsuu (Linkola, 1910, H). Own records: I have seen *S. tortilis* in most of the investigated localities. It becomes more scarce, however, towards the inner parts of the archipelago. In the inner part of the Parainen Archipelago and near Turku I did not find it. Similarly, near the bridge of Stattmark I have seen only poor specimens. In Kustavi, except Lypert , N side, it was rare. — The distribution of *Stictyosiphon tortilis* is shown on map 12.

In Hiittinen, Dragsfj rd, Korppoo, Nauvo, and Houtskari *S. tortilis* is common. It can be seen in the lower part of the hydrolittoral together with *Dictyosiphon foenicula-ceus* and *D. chordaria*. It often grows on the sides of stones and in rock crevices. Deeper, it also occurs as an undergrowth of *Fucus vesiculosus* and epiphytically on *Fucus*. On

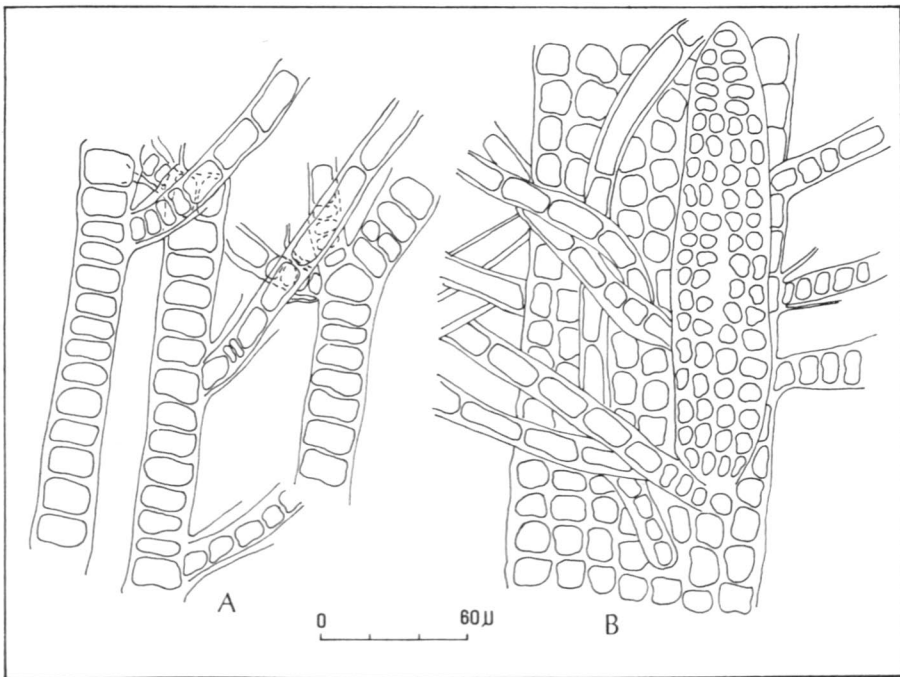


FIG. 2. *Desmotrichum undulatum*. — A. Monosiphonous threads. — B. A polysiphonous thread with abundant hairs and a short branch. — Drawn from formalin-preserved material: A, collected from *Zostera marina* and *Potamogeton pectinatus* in Dragsfj rd (Sand ) 1.7.63, and B, from *Phragmites communis* in Korppoo (Julholm) 18.6.64.

sand and mud it often forms large, detached, vegetatively reproducing masses. Especially in the outer parts of Nauvo and Korppoo such masses occur in abundance at depths of (2—) 3—7 (—8) m. Here the plants are rigid and very dark in colour. Such masses of *S. tortilis* may prevent many other algae from growing. The harmful effect of the species on phanerogams has been observed by LUTHER (1951b, p. 53).

I have not seen reproductive organs in my collections.

*Dictyosiphon foeniculaceus* (Huds.) Grev. — WÆRN 1952, pp. 162—163.

In the inner Baltic *D. foeniculaceus* is known from the Gulf of Bothnia as far as Raahe and in the Gulf of Finland as far as Vyborg (cf. WÆRN 1952, p. 162).

SW Archipelago. Literature: STRÖMFELT 1884, pp. 128—130 (as *D. hippuroides*), Nauvo (Stenskär and Fagerholmen); HÄYRÉN 1950b, p. 17, the Uusikaupunki Archipelago; ANDERSSON 1955, p. 142, many localities in Hiittinen, Nauvo, and Turku: Ruis-salo; KASKINEN 1964, p. 88, Airisto, common only at Viittakari. Other collections: *Hiittinen*, Högsåra (Strömfelt, 1882, H); Brändö (Linkola, 1927, H). — *Nauvo*, Fagerholm, (Strömfelt, 1882, H). — *Parainen*, Bodnäs (Linkola, 1910, H); Pyhänsuu (Linkola, 1910, H, TUR). — *Turku*, Ruissalo (Haverinen, 1952, TUR). Own records: *D. foeniculaceus* is common in my research area. Only in the innermost part of Parainen and in Turku, near the Hirvensalo bridge and in Pitkäsalmi did I not find it. In Kustavi (Riihenmaa, W side) the species was also poorly developed. — The distribution of the species is shown on map 13.

*D. foeniculaceus* occurs in the lower hydrolittoral on rocks and stones together with *Dictyosiphon chordaria* and *Stictyosiphon tortilis*. In the upper sublittoral it grows epiphytically on *Fucus vesiculosus*.

I have found unilocular sporangia in specimens collected in the following localities. — *Nauvo*, Kasaholm, 8 (20.8.63); Mossaskär, 14 (25.7.62); Snäckö, 8 (25.8.62); Trunsö—Kalkskär, 27 (29.7.62). — *Korppoo*, Gyltö, 9 (26.8.62); Hevosluoto, 1 (12.7.62); Lohm, 6 (28.8.62); Ullvinger, 17 (28.8.62).

*Dictyosiphon chordaria* Aresch. — WÆRN 1952, pp. 163—164.

In the inner Baltic *D. chordaria* occurs in the Gulf of Bothnia at least as far as Raahe and in the Gulf of Finland as far as Utria, in the Narva Bay (cf. WÆRN 1952, p. 164).

SW Archipelago. Literature: STRÖMFELT 1884, pp. 130—132 (as *Coilonema chordaria*), *Nauvo*, Fagerholmen and Stenskär; ANDERSSON 1955, p. 142, about ten records in *Nauvo*, Gytja and in the Gullkrona district; KASKINEN 1964, pp. 88—89, Airisto (only at Viittakari). Other collections: *Parainen*, Tennäs (Linkola, 1910, TUR). Own records: *Dragsfjärd*, Karaskär, 1 (22.7.64). — *Nauvo*, Fårö, 23 (30.7.62); Hummelskär, 13 (25.7.62 and 30.7.62, TUR); Kalvholm and Humleholm, 8 (20.8.63); Miraholm, 15 (19.7.64); Mossaskär, 14 (25.7.62, TUR); Petäisholmar, 2 (24.7.64); Pärnäs, 4 (August 1964); Seili, 3 (23.9.65); Skagsgådd, 15 (19.8.64); Söderholm, 15 (19.8.64, TUR); Trunsö—Kalkskär, 27 (29.7.62); Ångsö, NW side, 8 (25.8.62). — *Korppoo*, Ahvensaari, 2 (20.8.64); Alskär, 5 (13.8.64); Julholm, 4 (16.8.64, TUR); between Lempersjö and Älvsjö, 5 (13.8.64); Estrevlan, near Jurmo, 14 (27.7.62, unilocular sporangia, TUR); Gaddarna, SW of Jurmo, 16 (28.7.62); Galtby, 4 (4.7.62, TUR); Grisselborg, 6 (16.8.63); Gyltö, 9 (26.8.62); Hattskär, 6 (16.8.63); Hevosluoto, 1 (11.7.62, unilocular sporangia, TUR); Huvudskär, 13 (26.7.62, unilocular sporangia); Jurmo, 13 (26.7.62, unilocular sporangia); Jurmo, 13 (26.7.62, unilocular sporangia); Karlberg, 5 (13.8.64); Kuggvik, 4 (1.7.62); Kulm and Verkhholm, 6 (14.9.61, TUR and 18.7.64); Kälö, 11 (14.8.63, TUR); Lohm, 6 (25.7. — 15.8.61, unilocular sporangia, TUR, August 63, 64, and 13.6.65); Långvik, 8 (3.7.62); Lyddarholm, 10 (29.8.63); Retais, 7 (August 64); Råggrunden, 4 (28.7.63); Rumar, 6 (26.8.62); Sandholm, 4 (18.6.64); Sandvikharu, 15 (28.7.62); St. Gunkobb, 6 (August 64); Teijula, 4 (8.8.63); Turistbo, 4 (8.8.63, TUR); Vargskär, 6 (17.7.64, TUR); Verkan, 4 (22.—25.6.62); Vitharun, 6 (17.7.64). — *Houtskari*, Jungfruskär, 5 (28.8.63); Sandö, 4 (18.8.64, TUR). — *Kustavi*, Lypertö, N side, 1 (19.7.63, TUR). — *Lokalahti*, Iso Lehmämaa, NW side, 1 (19.7.62, TUR). — The distribution of *D. chordaria* is shown on map 14.

In my research area I have seen this species mostly growing on rocks and stones in the lower hydrolittoral. On rocks it may either form pure growths or it may occur together

with *Dictyosiphon foeniculaceus* and *Eudesme virescens*. In Korppoo (Galtby) I have seen it also attached to landings.

*D. chordaria* grows both in exposed and sheltered localities. In sheltered localities, it is often covered with long hairs. Such plants were observed in Korppoo (Hevosluoto) and in Nauvo (Trunsö—Kalkskär). The species was well developed in Nauvo, Korppoo, and Houtskari. The individual plants were often about 20 cm long. In Kustavi and in Lokalhti they were smaller, about 10 cm long.

In general, I have not been able to find *D. chordaria* in my research area before the end of July, since it belongs to the algae of late summer. Its occurrence seems also to vary from year to year, a phenomenon which has been pointed out by DU RIETZ and WÆRN (1952, p. 164) in the Swedish Baltic.

*Chorda filum* (L.) Stackh. — WÆRN 1952, pp. 164—166.

*C. filum* occurs along the Finnish shores in the Gulf of Bothnia at least as far as Raahe and in the Gulf of Finland as far as Suursaari (cf. WÆRN 1952, p. 165).

SW Archipelago. Literature: STRÖMFELT 1884, p. 127, a common alga; HÄYRÉN 1950b, p. 17, the Uusikaupunki Archipelago; ANDERSSON 1955, p. 142, many records in Hiittinen and Nauvo, but only few in Ruissalo; KASKINEN 1964, p. 89, five records at Airisto. Other collections: Some herbarium specimens exist. The innermost are from *Parainen*, Pyhänsuu (Linkola, 1910, H TUR); Tennäs (Linkola, 1910, H). — *Piikkiö*, Harvaluoto, Alastalo (Mäkinen, 1955, TUR). — *Turku*, Hirvensalo: Kommo (Aschan, 1906, TUR); Ruissalo (Haverinen, 1954, TUR). — *Naantali*, near the ferry (Laine, 1926, TUR). Own records: I have seen *C. filum* in all the investigated localities, except the innermost part of Parainen. The species still occurs at the inner mouth of Tervsund, and I could see also it near the bridge of Sattmark.

*C. filum* is best developed in the sheltered localities of the outer archipelago, especially in narrow channels with shallow water. There it grows in the uppermost part of the sublittoral and may be ca. 1 m long and densely covered with colourless hairs. I have seen such growths, for example, in the narrow channel between Lohm and Kaitholm in Korppoo and in a sheltered cove in the outermost archipelago of Nauvo, at Trunsö—Kalkskär. *C. filum* is mostly attached to gravel, coarse sand, stones, as well as shells of *Mytilus edulis* and *Cardium lamarcki*.

*C. filum* occurs also deeper in the sublittoral and it is then often attached to *Fucus vesiculosus*. When dredging I have often gotten it from a depth of 7—8 m. Besides, *C. filum* may be attached to landings and to phanerogams, especially *Phragmites communis*, *Potamogeton pectinatus*, and *Myriophyllum spicatum*. I have seen such plants which are usually short, thin, and lacking both hairs and paraphyses, in Korppoo (Verkan) and in Kustavi (Riihenmaa).

I have investigated only a limited amount of *C. filum* microscopically, and in a few specimens collected in Korppoo (Lohm) I have seen unilocular sporangia.

*Chorda tomentosa* Lyngb. — WÆRN 1952, p. 164.

The species has been observed at Kobbaklinter in the Åland Archipelago, SE Åland Sea by WÆRN (1952, p. 164) and in the Tvärminne Archipelago in the strait between the rocky islands of Segelskär and Lill-Segelskär, ca. 10 km SE of Tvärminne Zoological Station (SOUTH 1965, p. 5).

SW Archipelago. Literature: no records. Other collections: none. Own records: none.

*Fucus vesiculosus* L. — HÄYRÉN 1950b, pp. 7—12; LUTHER 1951b, pp. 48—53; WÆRN 1952, pp. 166—173, fig. 75.

The northernmost attached *F. vesiculosus* plants in Finland have been observed in the Vaasa Archipelago (cf. HÄYRÉN 1957, 1958a, and 1959). In the Gulf of Finland the species occurs as an attached plant as far as the Gulf of Vyborg (cf. WÆRN 1952, p. 168).

SW Archipelago. Literature: STRÖMFELT 1884, p. 127, a common species; HÄYRÉN 1950b, pp. 7—12, the Uusikaupunki Archipelago; HAVERINEN 1954, p. 256, Turku, Ruissalo; ANDERSSON 1955, pp. 142—143, Hiittinen, Nauvo, and Ruissalo; KASKINEN 1964, pp. 89—90, a common alga at Airsto. Other collections: *Pavainen*, Kvidja, Levo, Pyhänsuu, Sattmarkerna, and Tennäs (Linkola, 1910, H); Källvik and Lemlax (Linkola, 1913, H). — *Turku*, Hirvensalo: Kommo (Aschan, 1906, H); Ruissalo: Kuuva (Linkola, 1909, H). — *Naantali* (Collander, 1914, H and Laine, 1925, TUR). — *Askainen*, Pukkila (Linkola, 1912, H). — According to Prof. ANTERO VAARAMA (oral communication), attached plants occur north of Parainen, in Piikkiö (Hiirsalmi, W of Toivonlinna).<sup>1</sup> Own records: In the outer part of my research area, Dragsjärd, Hiittinen, Nauvo, Korppoo, and Houtskari.

*F. vesiculosus* is the most conspicuous plant in the vegetation. It is mainly a plant of the upper sublittoral, beginning to occur at a depth of 0.5—1.0 m. When the water level is low the upper part of the thallus, however, can be seen floating on the surface by means of vesicles which occur abundantly in somewhat sheltered habitats. *F. vesiculosus* is attached to rocks and stones, and it may be about 1 m long. It is well developed even at 5—6 m depth. By dredging in deeper water I have gotten small specimens. At depths of 7—9 m I have still observed detached and vegetatively reproducing plants. On soft bottoms *F. vesiculosus* forms large detached masses already at depths of 1—3 m, often together with *Stictyosiphon tortilis*. Such masses have been studied in detail by LUTHER (1951) in the Tvärminne Archipelago. The *Fucus* masses may even more than *Stictyosiphon tortilis* suppress the development of other algae.

I have seen attached plants of *F. vesiculosus* in all my research localities, except in Turku (Pitkäsalmi) and in the innermost part of Parainen. In Parainen I observed the innermost attached plants at Ersby and in the inner mouth of Tervsund. In Kustavi, at Riihenmaa (W side) and at Lypertö (SE side), *F. vesiculosus* was also weak and without vesicles, beginning to occur at 1.0—1.5 m depth. In Kustavi (Lypertö, N side) and in Lokalahti (Iso Lehmämaa) it was better developed, but plants with vesicles and receptacles were rarer than in the southern part of my research area.

### 3. Rhodophyceae

*Bangia fuscopurpurea* (Dillw.) Lyngb. — WÆRN 1952, pp. 180—181.

In the inner Baltic *B. fuscopurpurea* has been observed as far as the Haparanda Archipelago (N end of the Gulf of Bothnia), in the Gulf of Vyborg, at Suursaari, and in Narva Bay (WÆRN 1952, p. 181). The species has been known for a long time in the Tvärminne Archipelago, at the islands Skarvkyrkan and at Långskär. HÄYRÉN (1958, p. 18) mentioned *B. fuscopurpurea* from Gennarbyviken W of the Hanko Peninsula, in Tenhola (Skogby, 3.12.33).

SW Archipelago. Literature: no records. Other collections: none. Own records: I have seen the species only once in Korppoo (Jurmo, Huvudskär, 26.7.62, TUR). It was growing in a small rock crevice on a steep exposed shore in the lower part of the gelittoral zone. The small growth consisted only of this species. Individual plants were 1—3 cm long and pink in colour.

It is probable that *B. fuscopurpurea* is more common during late autumn, winter, and spring, i.e. between October and April (cf. WÆRN 1952, p. 182), but during this time I have made only few investigations and only near the coasts of larger islands.

<sup>1</sup> Mr. UNTO LAINE has provided me with collections from the Uusikaupunki Archipelago (17.8.64). In this material I noticed dichotomously branching *Fucus* plants about 1 cm long. They closely resembled *Furcellaria fastigiata*, but their colour was yellowish brown. The plants had been growing loosely on a stony bottom in a muddy bay. An abundant literature exists about such detached small *Fucus* modifications, see i.a. Häyrén 1950b.

*Audouinella efflorescens* (J. G. Agardh) Papenf. — WÆRN 1952, pp. 182—183.

The innermost Baltic records of *A. efflorescens* are from the Öregrund Archipelago in Sweden (WÆRN op.c.). I have found the species only once in my research localities. It occurred on *Sphacelaria arctica* at a depth of 3—4 m near Kopparö in Parainen (10.7.64). In material collected at Tvärminne (Långskär) during the Nordic Marine Botanical Course in August 1965 the species was observed a few times. The tufts which were attached to *Sphacelaria arctica*, too, were very small (ca. 0.5 cm long), but they could be noticed without a microscope. The plants in Parainen could be seen only with a microscope.

*Pseudochantrasia leibleinii* (Kütz.) Israelss. — ISRAELSSON 1942, pp. 51—57, pl. I, fig. a.

*P. leibleinii* is mainly a lacustrine species. In my research area I have seen it in Parainen near Bergholm and Finnholm, S of Ersby at a depth of 3—4 m on timber (10.7.64). The tufts were 2—4 mm long, and their colour was violet, but turned greyish green when preserved in formalin. The cells were 12—14  $\mu$  broad and ca. 60  $\mu$  long; their walls were very thick, nearly 2  $\mu$ . Monosporangia occurred.

*Rhodochorton purpureum* (Lightf.) Rosenv. — WÆRN 1952, p. 1952, p. 183 [as *R. rothii* (Turt. emend. Dillw.) Näg.].

In the innermost part of the Gulf of Finland *R. purpureum* has been found between Lomonosov and Krasnaja Gorka in the U.S.S.R., as well as near Helsinki, and outside Tvärminne (WÆRN 1952, p. 183). In the Gulf of Bothnia I have found the species at Ritgrund, Ensten in the Vaasa Archipelago, where it was growing as an epiphyte on *Cladophora glomerata* (RAVANKO 1965b).

SW Archipelago. Literature: ANDERSSON 1953, p. 80, one record in *Hiittinen*, Tunhamn. Other collections: *Hiittinen*, Tunhamn (Holger Sältin, 23.6.50). Own records: *Dragsfjärd*, Karaskär, 1 (22.7.64). — *Nauvo*, Rödharun, 20 (2.7.64, TUR); Simonsharun, 18 (21.7.64); Söderholm, 15 (19.7.64). — *Korppoo*, the skerries near Kalvholm, NW of Nauvo, 3 (24.7.64, TUR); Julholm, 4 (18.6.64, 22.6.64, 16.8.64); Sandholm, 4 (18.6.64); Vargskär, 6 (17. and 19.7.64, and 14.8.64, TUR, two different finds); a high skerry NE of Vitharun, 6 (17.7.64, TUR). — *Parainen*, Tervsund, 1 (10.7.64). — *Kustavi*, Riihenmaa, 3 (16.7.64).

The distribution of *Rhodochorton purpureum* is shown on map 15. The open dots indicate places where the species was observed only as single threads.

In Korppoo (Vargskär, N side) I have seen *R. purpureum* forming red carpets on the bottom of a geolittoral cave. This cave is situated in the zone formed by the lichen *Verrucaria maura*. Although the carpets were very dense, the threads were only about 1 mm long. Among *R. purpureum* occurred *Hildenbrandia prototypus*, *Waerniella lucifuga*, *Rhizoclonium riparium*, *Pseudoclonium marinum* and filamentous blue-green algae. *R. riparium* and *P. marinum* were concentrated in the outer part of the cave, while *R. purpureum* was principally in the inner part. *Waerniella lucifuga* was dominant on vertical surfaces and on the ceiling of the cave, however.

In Korppoo (Julholm, E side, 18.6.64) I found some threads of *R. purpureum* entangled with *Urospora penicilliformis*, *Ulothrix zonata*, and *Rhizoclonium riparium* on rocks in the lower part of geolittoral zone. I have also seen the species in similar habitats in Dragsfjärd (Karaskär), Korppoo (Sandholm, E side), and Parainen (Tervsund).

In Korppoo (on the small skerries N of Julholm) *R. purpureum* occurred (22.6.64) as an epiphytic tuft on *Sphacelaria arctica*. *S. arctica* was growing in small rock crevices at ca. 50 cm depth. In the same locality I found some threads of *R. purpureum* growing epiphytically on *Potamogeton pectinatus* at the same depth. In Korppoo (Vargskär, S side,

17.6.64) the species was also growing on *Sphacelaria arctica* in a rock crevice at 50 cm depth.

In material from Kustavi (Riihenmaa) I observed *R. purpureum* epiphytic on *Poly-siphonia nigrescens* which had been growing at 4—6 m depth.

My deepest records of the species are from Korppoo (Sandholm, E side). When dredging I got some very small specimens of *Cladophora aegagropila* (only 0.5 cm long) from a muddy bottom at 10 m depth. On these specimens *R. purpureum* was partly epiphytic and partly endophytic.

In my material I have not seen tetrasporangia, which is possibly due to the time of investigation, or to the fact that the caves in my research area were almost dry. At Märket in the Åland Sea I have seen a well developed growth of *R. purpureum* in a wet geolittoral cave (21.6.65, TUR). The threads were ca. 5 mm long and bore tetrasporangia.

*Polyides rotundus* (Huds.) Grev. — LEVRING 1940, pp. 82—83, fig. 24; KYLIN 1944, p. 34; WÆRN 1952, pp. 186—188; DREW 1958, pp. 744—752; MATHIESEN 1959, pp. 78—84, figs. 2b, 5, and 6.

The oldest reports of *P. rotundus* from the inner Baltic are from Blekinge and Gotland (WÆRN 1952, p. 188). In Finland the species has been observed earlier only once in material collected around Tunhamn in Hiittinen in August 1951 (MATHIESEN 1959). In her material collected between Stengrunnen and Bergskär five plants ca. 1.5 cm long were noticed; in material from Gräsgrunden, S of Tunhamn mainland only one plant occurred.

SW Archipelago. Literature: except the above mentioned records, no finds from the SW Archipelago. Other collections: none. Own records: *Kemiö*: near Flissholm, 2 (4—5 specimens, depth 10 m, 23.6.64, TUR). — *Hiittinen*, SE of Harö and Söderö, 6 (about ten specimens, depth 10 m, 3.6.63, TUR); Lindörn, SE side, 3 (two specimens, depth 7 m, 29.7.63, TUR). — *Nauvo*, Brändholm, 9 (three specimens, depth ca. 10 m, 23.7.64, TUR); Borgskären, 16 (a few specimens, depth 12—15 m, 21.7.64); Kalvholm, SE side, 8 (a few specimens, depth 10 m, 20.8.63); between Hjortronharun and Vitharun, 19 (a few specimens, depth 10—15 m, 21.7.64); Rutiluoto, 1 (a few specimens, depth ca. 10 m, 24.7.64, TUR); Rödhärun, 20 (about ten specimens, depth 10—15 m, 21.7.64, TUR), Trunsö—Kalkskär, 27 (one specimen, depth ca. 10 m, 29.7.62). — *Korppoo*, Ahvensaari, near the islet on NE side, 2 (one specimen, depth ca. 10 m, 20.8.64, TUR); Hevosluoto, W side, 1 (hundreds of specimens, depth 6—10 m, 10.—13.7.62, TUR); Jurmo, in the sound between Jurmo and Huvudskär, 13 (a few specimens, depth ca. 10 m, 26.7.62); Kalvholm, SE side, 6 (four specimens, depth ca. 15 m, 16.8.63, TUR); Korppholmen, the skerries on SW side, 5 (one specimen, depth 11—12 m, 29.8.63, TUR); Kälö, NW side, 11 (two specimens, depth 15—17 m, 15.8.63, TUR); between Lempersjö and Älvsjö, 5 (a few specimens, depth 13 m, 26.8.64, TUR). — *Houtskari*, Storö, E side, 1 (one specimen, depth 10 m, 22.8.63, TUR); Topsalö, W side, 3 (one specimen, depth 12—13 m, 22.8.63). — *Kustavi* near Likhholm and Sikaluoto 4 (one specimen, depth 9—10 m, 18.7.63, TUR). — *Lokalahti*, Iso Lehmämaa, N side and W side, 1 (dozens of specimens, depth 9—12 m, 18.—19.7.62, TUR). — The distribution of *Polyides rotundus* is shown on map 16.

The number of specimens in the above mentioned localities has mostly varied between one and ten. Only in two localities were there considerably more, namely, in Lokalahti, at Iso Lehmämaa where I saw dozens of plants and in Korppoo, at Hevosluoto where there were hundreds. The length of the plants was 0.5—2.0 cm, and they were growing at depths of 6—17 m, mostly at 9—12 m. They occurred sparingly among *Furcellaria fastigiata*, *Phyllophora brodiaei*, and some rarer algae, for example *Ahnfeltia plicata*.

*P. rotundus* has in my research area nearly always been observed in the mouth of a sound between two islands, or in other places where currents occur and the bottom is composed of small stones.

When I first observed *P. rotundus* at the island Hevosluoto, in the Korppoo Archipel-



ago, where I collected specimens cast ashore together with *Furcellaria fastigiata*, I noticed that the rotting plants of *P. rotundus* were small, fragile, and either pale green or pink in colour. *Furcellaria*, on the contrary, was dirty brown and tough. When preserved in formalin, the colour of *Polyides* changed from dark red to bright red and pink, finally to green. The colour of *Furcellaria*, on the other hand, turned dirty brown and finally grey.

The best developed *P. rotundus* was found in Korppoo, W side of Hevosluoto, where a small area with gravel and coarse sand on the bottom occurred at a depth of 7—10 m. In this area *P. rotundus* was a dominant species. This is a very exposed place in the northernmost corner in Korppoo. The other locality where I obtained dozens of specimens, Lokalahti (Iso Lehmämaa) is a similar habitat, being exposed to the Gulf of Bothnia. On the bottom small stones were abundant. (Fig. 4).

In material from Hevosluoto I found some algae with a basal, disklike structure which may indicate that these plants had been attached to a substrate. This circumstance, however, requires further study. From the same sound in Korppoo (between Lempersjö and Älvsjö) where I collected *P. rotundus* (26.8.64), Mr. HELMO HIIRSAJMI collected the species a year later (25.8.65). In his material I also discovered a plant with a disklike base.

*Hildenbrandia prototypus* Nardo — WÆRN 1952, pp. 184—185.

In the inner Baltic this species has been found as far as the Vaasa Archipelago in the Gulf of Bothnia and as far as the Bay of Vyborg in the innermost part of the Gulf of Finland (WÆRN 1952, p. 184).

SW Archipelago. Literature: HÄYRÉN 1950b, p. 19, two records in the Uusikaupunki Archipelago (as *H. rosea*); ANDERSSON 1955, p. 143, the Gullkrona district, Nauvo, and Ruissalo; KASKINEN 1964, p. 90, a common species at Airisto. Other collections: Piikkiö, Yltöinen (Jalas, 1950, H). Own records: *H. prototypus* is a common alga in Dragsfjärd, Hiittinen, Houtskari, Korppoo, Nauvo, and the outer part of Parainen. It occurs on rocks and stones in the geolittoral, hydrolittoral, and sublittoral zones. In the geolittoral it is typical also in rock pools, fissures, and caves. Toward the inner part of Parainen the species becomes rarer. I found *H. prototypus* at Tervsund and near Kopparö but not at Kyrkfjärden, Brattnässund, and Kassorfjärd. In Lokalahti (Iso Lehmämaa, N and W side) the species was common and similarly also in Kustavi, except at Riihenmaa (W side), where it was very rare.

*Furcellaria fastigiata* (L.) Lamour. — WÆRN 1952, pp. 185—190.

The innermost records of *Furcellaria fastigiata* in the Baltic are from the northern part of the Vaasa Archipelago in the Gulf of Bothnia and from the neighbourhood of Kotka in the Gulf of Finland (cf. WÆRN 1952, p. 188).

SW Archipelago. Literature: STRÖMPFELT 1884, p. 126, Fagerholmen; HÄYRÉN 1950b, p. 18, the Uusikaupunki Archipelago, Putsaari (cast ashore); ANDERSSON 1955, p. 143, Hiittinen, Nauvo, and Turku, Ruissalo; KASKINEN 1964, p. 90. Other collections: Iniö, between Jumo and Norrby (Kari, 1932, TUR). — Korppoo, Utö (Nylander & Elfving, 1872, H). — Parainen, Pyhänsuu (Linkola, 1910, cast ashore, H). — Own records: together with *Phyllophora brodiaei*, *F. fastigiata* is one of the most common red algae in my research area. When dredging in the outer archipelago (Hiittinen, Houtskari, Korppoo, and Nauvo) I nearly always have seen this alga, providing only there is a hard bottom at a depth of 9—12 m. I have observed it attached to rocks, stones, often also to shells of *Mytilus edulis*, and to limonite. On muddy bottoms I have seen only a few loose plants of *F. fastigiata*, if any. From some places in Korppoo and Lokalahti I have collected plants, mostly loose, even from 20 m depth. In Lokalahti plants were attached to shells of *Mytilus edulis*. Here I also obtained *F. fastigiata* already at 2—3 m depth on a steep rock. In Kustavi the species was common at a depth of 6 m. Further, I have observed it in Dragsfjärd, Karuna, and Parainen. However, in the inner part of Parainen, (near Finnholm and Bergholm, at Kyrkfjärden, Tervsund, Brattnässund, and Kassorfjärd), I did not find the species.

All my own finds as well as the others mentioned above are marked on map 17.

*F. fastigiata* belongs to the reduced marine algae in the Baltic. The specimens in my material are mostly 2—4 cm long and always sterile.

*Ahnfeltia plicata* (Huds.) Fr. — SKUJA 1924, p. 351; LEVRING 1940, p. 92, fig. 27f; MATHIESEN 1959, pp. 80—83, figs 1, 3, and 4.

In the inner Baltic *A. plicata* has been mentioned before from the Gulf of Riga (SKUJA 1924) and from the coast of Blekinge, in southern Sweden (LEVRING 1940).

In Finland the species was first observed in 1953 by WÆRN at Tvärminne on an excursion to Byviken during the Nordic Course of Brackish Water Botany (cf. MATHIESEN 1959). The northernmost record of *A. plicata* in the Baltic, probably a drifted specimen, is from the neighbourhood of the Vaasa Archipelago (RAVANKO 1965b).

SW Archipelago. Literature: MATHIESEN (1959, pp. 80—83) collected the species from two localities in the archipelago of Hiittinen. One collection was S of Tunhamn, between Alskär and Långskär: the other was N of Tunhamn, between Bergskär and Stengrunden. The specimens were 0.5—0.7 cm long. Other collections: *Iniö*, between Jumo and Norrby (I found three specimens in material collected by Lauri E. Kari, 1932, and identified as *Furcellaria fastigiata*, etc., TUR). — Furthermore, Mr. HEIMO HIIRSALMI has shown me material of *A. plicata*, which he had collected in Korppoo, between Vattkast and the Korppoo mainland (a few specimens, 19.8.65, TUR) and in Nauvo, S of Redamo (a few specimens, 26.8.65, TUR). Own records: *Kemiö*, Flisholm, 2 (one specimen, 23.7.64); Lill-Tjuvholm, 1 (one specimen, 23.7.64, TUR). — *Hiittinen*, between Harö and Söderö, 6 (four specimens, 4.7.63, TUR). — *Nauvo*, near Borgskären, 16 (about fifteen specimens, 21.7.64, TUR); Rutiluoto, 1 (a few specimens, 24.7.64, TUR); S side of Högholm, NE of Seili, 3 (26.5.66, TUR); between Seili and Svartö, E of the cable, 3 (26.5.66, TUR); between Seili and Vetjan, 3 (26.5.66, TUR). — *Korppoo* Ahvensaari near the small islet on the NE side, 2 (four specimens, 20.8.64, TUR); Hevosluoto, W side, 1 (dozens of specimens, 15.8.64, TUR); Kalvholm, 6 (one specimen, 16.8.63, TUR); Korholm, the skerries on SW side, 5 (a few specimens, 29.8.63); between Lempersjö and Älvsjö, 5 (seven specimens, 15.8.64, TUR); Sandholm, 4 (three specimens, 21.6.64, TUR). — *Houtskari*, Storö, E side, 1 (two specimens, 22.8.63, TUR); Topsalö, W side, 3 (a few specimens, 22.8.63, TUR). — *Parainen*, between Bockholm and Granö, 3 (4—5 specimens, 24.7.64, TUR). — *Lokalahti*, Iso Lehmämaa, N and W side, 1 (dozens of specimens, 18.—19.7.62, TUR).

All these records of *A. plicata* from the southwestern archipelago of Finland are marked on map 18.

The range of *A. plicata* in my research area resembles that of *Polyides rotundus*. These two species have mostly been found to a small extent together with *Furcellaria fastigiata* and *Phyllophora brodiaei* at depths of (6—) 9—12 (—15) m. Like *Polyides rotundus*, *A. plicata* is a depauperized alga which in this region forms only twiglike, irregular, and sterile masses. The length of the plants has mostly been 0.5—2.0 cm. In Lokalahti (Iso Lehmämaa) and in Korppoo (Hevosluoto) I have also seen many specimens 3 cm long. The best developed ones, however, ca. 4 cm long, I collected in Korppoo, near Ahvensaari. (Fig. 5).

*Phyllophora brodiaei* (Turn.) J. G. Agardh — WÆRN 1952, pp. 190—192.

In the inner part of the Baltic *P. brodiaei* has been observed as far as the Vaasa Archipelago in the Gulf Bothnia and as far as near Helsinki in the Gulf of Finland (WÆRN 1952, p. 190).

SW Archipelago. Literature: STRÖMFELT 1884, p. 126, Fagerholmen; ANDERSSON 1955, p. 143, Hiittinen, Nauvo, and in drift at Turku, Ruissalo; KASKINEN 1964, pp. 90—91, Airsto. Other collections: *Hiittinen*, Tunhamn (Kallio, 1950, TUR). — *Korppoo*, Utö (Elfving, 1872, H). — *Parainen*, Pyhänsuu (Linkola, 1910, H, cast ashore). — *Iniö*, between Norrby and Jumo (Kari, 1932, TUR, det. E. Häyryén). Own records: I have seen *P. brodiaei* always together with *Furcellaria fastigiata*, and according to our present knowledge, it seems to have a distribution similar to that of *Furcellaria fastigiata*. Some-

times, however, large masses of loose *P. brodiaei* can be found on soft bottoms, and in this case *Furcellaria fastigiata* occurs only scantily. Such is the situation for instance in the sound between Nauvo and Högsar.

My own observations, as well as those mentioned above, are marked on map 19.

*P. brodiaei* occurs mostly either loose or entangled with *Furcellaria fastigiata*. In Lokalahti, Iso Lehmämaa I have seen plants with a basal structure which indicates that they have probably been attached to a substrate.

*Phyllophora membranifolia* (Good. & Woodw.) J. G. Agardh — WÆRN 1952, pp. 192—193.

This species has not been found in the Gulf of Bothnia. The northernmost records from the Baltic, mentioned in the literature, are from the Öregrund Archipelago, in Sweden. The species probably also occurred in GOBI's material from the Gulf of Finland (cf. WÆRN 1952, p. 192). WÆRN (1952, p. 193) mentions *P. membranifolia* also from the Åland Archipelago (Spättrarhållet between Degerby and Gripö), where it was better developed than in the Öregrund Archipelago. The species has been known for a long time in the Tvärminne Archipelago.

SW Archipelago. Literature: ANDERSSON (1955, p. 144) mentions observing it in about ten localities in the Turku Archipelago. Other collections: *Iniö*, between Jumo and Norrby (Lauri E. Kari, 1932, TUR. det. E. Häyrén, odd looking specimen). Own records: *Kemiö*, Flisholm, 2 (22.7.64). *Hiittinen*, E of Harö and Söderö, 6 (4.7.63). — *Nauvo*, Brändholm, 9 (23.7.64); between Humleholm and Kalvholm, 8 (20.8.63); between Petsor and Vansor, 7 (20.8.63); Rödharun, 20 (21.7.64, TUR); Salskären, 25 (29.6.63, TUR); Trunsö—Kalkskär, 27 (29.7.62). — *Korppoo*, Ahvensaari, 2 (20.8.64, TUR); Hevosluoto, W side, 1 (15.7.64, TUR); Kalvholm, 6 (16.8.63); Korppholm, the skerries on SW side, 5 (29.8.63); Kälö, NW side, 11 (15.8.64); Sandholm, E side, 4 (21.6.64). — *Houtskavi*, Jungfruskär, NE side, 5 (28.8.63); Storö, E side, 1 (22.8.63); Topsalö, W side, 3 (22.8.63). — *Parainen*, between Bockholm and Granö, 3 (24.7.64, TUR). — *Kustavi*, near Likholm and Sikaluoto, 4 (18.7.63, TUR); Lypertö, SE side, 2 (18.7.63); Pirisholm, 4 (18.7.63). — *Lokalahti*, Iso Lehmämaa, 1 (19.7.62, TUR). — See map 20 for the distribution of the species.

In my research area *P. membranifolia* like *Polyides rotundus* and *Ahnfeltia plicata* occurs sparingly among *Phyllophora brodiaei* and *Furcellaria fastigiata*. It seems to have a similar distribution as these species.

*Callithamnion roseum* (Roth) Lyngb. — BOSTRÖM 1937, pp. 398—405, figs. A—D; WÆRN 1952, pp. 193—196, figs. 79—80.

*C. roseum* has not been observed in the Gulf of Bothnia. The innermost Baltic records are from the Öregrund Archipelago in Sweden and from the Tvärminne Archipelago in the Gulf of Finland (cf. WÆRN 1952, p. 193).

SW Archipelago. Literature: KASKINEN 1964, p. 91, three localities at Airisto. Other collections: none. Own records: *Kustavi*, Pirisholm, W side, 4 (17.7.63, TUR); near Sikaluoto, 4 (17.7.63, TUR). — *Lokalahti*, Iso Lehmämaa, N side, 1 (19.7.62, TUR). — *Uusi-kaupunki*, Lyökki, Tevaluoto (a microscopic fragment, probably detached, among *Furcellaria fastigiata*, leg. Unto Laine).

In the archipelago of *Kustavi*, *C. roseum* occurred on *Rhodomela confervoides* at a depth of 6—10 m. Among *R. confervoides* grew *Furcellaria fastigiata*, *Phyllophora brodiaei*, *Polysiphonia nigrescens*, *P. violacea*, *Sphacelaria arctica*, and *Chaetomorpha* sp. I saw about ten specimens of *C. roseum*, and they were very small, 0.5—1.0 cm long.

Near Iso Lehmämaa, in Lokalahti I observed only one plant ca. 1 cm long entangled with *Ahnfeltia plicata* at a depth of 10—12 m. — The distribution of the species is shown on map 11.

I have not found tetrasporangia in my plants, but they have been mentioned as occurring in the Tvärminne Archipelago (BOSTRÖM 1937).

*Ceramium tenuicorne* (Kütz.) Wærn — WÆRN 1952, pp. 205—218, figs. 85—89, 90 K, 91—92.

*C. tenuicorne* is a widely distributed species in the inner Baltic (cf. WÆRN 1952, p. 207) and the most common red alga in the SW Archipelago of Finland.

In my research area the species occurs at various depths, from the upper part of the hydrolittoral to the lower part of the sublittoral. It forms growths on rocks, stones, and timber. Often it is attached to shells of *Mytilus edulis*, and it is also very common as an epiphyte on *Phragmites communis*, *Potamogeton pectinatus*, *Fucus vesiculosus*, and *Furcellaria fastigiata*.

I have seen *C. tenuicorne* in all my research localities, except in the innermost parts of Parainen and in Pitkäsalmi, near Turku. In Parainen it occurred as far as the inner mouth of Tervsund and poorly developed in the southernmost part of Kyrkfjärden, at Skrabböle. However, when dredging northwards in Kyrkfjärden, Brattnässund, and Kassorfjärd, I did not find the species. Likewise, I did not discover it when searching near Turku, in Pitkäsalmi, between the Hirvensalo bridge and Uittamo. Neither has the species been found in the eastern part of Ruissalo outside Turku. It occurs only on the shores facing Airisto (cf. ANDERSSON 1955, p. 144).

The asexual and sexual plants of *C. tenuicorne* differ in size. The asexual plants are largest, and the sexual male plants are smallest. The periodicity of this alga and the possible seasonal alternation of generations has been mentioned in several publications, but these phenomena have not yet been wholly explained (cf. WÆRN 1952, pp. 216—217).

In my research area I have found fertile female plants in the following localities. — *Hiittinen*, Lindörn, 3 (30.6.63, upper sublitt.); Skogsskär, 1 (30.6.63, upper sublitt.). — *Nauvo*, Hummelskär, 13 (30.7.62, upper sublitt.); Husskär, 21 (30.6.63, upper sublitt.); near Salskären, 25 (28.6.63, upper sublitt.); Seili, W side, 3 (August 65, upper sublitt.); Trunsö—Kalkskär, 27 (29.7.62, upper sublitt.). — *Korppoo*, Alskär, 5 (13.8.64, upper hydrolitt.); Hevosluoto, 1 (13.7.62, upper sublitt.); Huvudskär, 13 (27.7.62, upper sublitt.); Julholm, NW side, 4 (4.8.64, upper hydrolitt.); Karlberg, 5 (26.8.64, upper hydrolitt.); Kälö, 11 (15.8.64, upper hydrolitt.); the mouth of Långvik, 8 (3.7.62, upper sublitt.); near Teijula, 4 (5.5.62, very old plants and 5.8.63, upper sublitt.); Turisto, 4 (5.8.63, upper sublitt.); Verkan, 4 (2.7.62, upper sublitt.). — *Houiskari*, Sandö, 4 (26.8.64, upper sublitt.).

I have observed fertile male plants only in Korppoo (Utö, 26.6.65) where they occurred on stones in the hydrolittoral. ANDERSSON found them in the SW Archipelago of Finland in the Gullkrona district (cf. 1955, p. 144). Male plants are probably more common than these collections would indicate, but they might have been overlooked because of their small size.

Asexual plants with tetrasporangia seem to be quite frequent in my research area during June and July. I have observed parasporic plants in material from *Korppoo*, Hevosluoto, 1 (11.7.62); Huvudskär, 13 (26.7.62); Jurmo, 13 (26.7.62); and Sandvikharu, 15 (28.7.62).

*Ceramium rubrum* (Huds.) J. G. Agardh s. lat. — WÆRN 1952, pp. 196—197, fig. 81.

The innermost finds of the collective *C. rubrum* have been described by WÆRN (1952, p. 197). Along the coasts of Finland *C. rubrum* has been found only by WÆRN at Kökar, in the Åland Archipelago and near Utö, in Korppoo.

SW Archipelago. Literature: no records except the above mentioned by WÆRN. Other collections: none. Own records: In Korppoo, near the skerries Gaddarna, SW of Jurmo, the species (28.7.62, TUR) occurred at 12 m depth among stones together with *Cladophora rupestris*, *Phyllophora brodiaei*, *Chaetomorpha* sp., and *Mytilus edulis*. These plants were about 5 cm long and partly covered with epiphytic *Pilayella littoralis*.

The species could be recognized because it was completely covered with small cortical cells, resembling the specimen depicted by WÆRN (1952, p. 197). A rather typical feature

recognizable in my material, is that the branch tips are generally straight, only a few being slightly curved inwards.

*Polysiphonia violacea* (Roth) Spreng. — WÆRN 1952, pp. 219—221.

According to WÆRN (1952, p. 219) the innermost Baltic records of *P. violacea* are from the Vaasa Archipelago in the Gulf of Bothnia and from Stor-Pernåviken in the Gulf of Finland.

SW Archipelago. Literature: HÄYRÉN 1950b, p. 18, many localities in the Uusikaupunki Archipelago; ANDERSSON 1955, pp. 144—145, a common species in the neighbourhood of Gyttja, in Nauvo and also found in Möviken, but in Hiittinen found only once, between Stor-Enharu and Halsskär and in Turku (Ruissalo) only at Rautakari; KASKINEN 1964, pp. 92—93, four localities at Airisto (about ten specimens). Other collections: Mr. ILPO HAAHTELA supplied me with material which was collected at Airisto, near Vepsä (21.8.64) and which contained *P. violacea*. — Hiittinen, Brändö (Linkola, 1910, H). — Nauvo, Fagerholm, (Strömfelt, 1882, H); Stenskär (Strömfelt, 1882, H). — Parainen, Bodnäs (Linkola, 1910, TUR); Kvidja (Linkola, 1910, H); Pyhänsuu (Linkola, 1910, TUR). — Iniö, between Jumo and Norrby (August 1932, leg. Lauri E. Kari, det. E. Häyrén). — Askainen, Pukkila (Linkola, 1910, H). Own records: Kemiö, Lill-Tjuvholm, 1 (22.7.64); Flisholm, 2 (23.7.64). — Nauvo, Seili, 3 (23.9.65, TUR); Vikom, 4 (23.9.65). — Korppoo, Ahvensaari, 2 (29.8.61, TUR); Brunskär, 12 (27.8.64, TUR); Lohm, 6 (several localities in August and September 61, TUR); Verkan, 4 (August 62—64). — Houtskari, Jungfruskär, NE side, 5 (28.8.63, TUR). — Parainen, S of Ersby, 1 (2.7.64, TUR); between Bockholm and Granö, 3 (24.7.64, TUR); Sattmark, 1 (10.7.64); Tervsund, 1 (10.7.64). — Kustavi, near Likhholm and Sikaluoto, 4 (18.7.63, TUR); Lypertö, SE side, 2 (18.7.63); Pirisholm, 4 (18.7.63, TUR); Riihenmaa, W side, 3 (14.6.64, TUR). — Lokalahti, Iso Lehmämaa, 1 (several localities, 23.9.65, TUR). — See map 21 for the distribution of the species.

I have seen *P. violacea* in deep water together with *Furcellaria fastigiata* and *Phyllophora brodiaei* in Houtskari (Jungfruskär), Kustavi (Likhholm, Sikaluoto, Pirisholm), Korppoo (Brunskär), Lokalahti (Iso Lehmämaa), and Parainen (between Bockholm and Granö).

In Korppoo (Ahvensaari, Lohm, Verkan) and Nauvo (Fagerholm) the species was noted growing attached to landings.

Masses of *P. violacea* can often be seen on *Phragmites*, for example, in Korppoo (Lohm, Verkan), Kustavi (Riihenmaa), and Nauvo (Seili, Vikom). At Lohm *P. violacea* grows also on *Ranunculus baudotii*. In Parainen, S of Ersby the species occurred on *Fucus vesiculosus*.

I have seen fertile plants in material from the following localities. — Korppoo, Lohm (cystocarps, spermatangia). — Kustavi, Riihenmaa (carpogonia). — Lokalahti, Iso Lehmämaa (carpogonia). — Nauvo, Seili (carpogonia). — Parainen, S of Ersby (carpogonia). Plants with tetrasporangia were observed in material collected in Korppoo (Lohm) and Parainen (Sattmark, Tervsund).

*Polysiphonia nigrescens* (Huds.) Grev. — WÆRN 1952, pp. 221—223.

According to the literature this marine species has been observed in the Gulf of Bothnia as far north as the Vaasa Archipelago and in the Gulf of Finland as far east as Porvoo (cf. WÆRN 1952, p. 223).

SW Archipelago. Literature: HÄYRÉN 1950b, p. 18, the Uusikaupunki Archipelago, two localities at Putsaari; KASKINEN 1964, p. 93, six localities at Airisto. Other collections: Iniö, between Jumo and Norrby (Lauri E. Kari, 1932, TUR, fragments in material identified as *Furcellaria fastigiata*, etc.). Similarly, I have seen the species in material collected by Mr. UNTO LAINE at Uusikaupunki (Tevaluoto). Own records: Nauvo, Trunsö—Kalkskär, 27 (one about 2 cm long plant, 29.7.62, TUR). — Kustavi, near Likhholm and Sikaluoto, 4 (mass occurrences, 18.7.63, TUR); Lypertö, SE side, 2 (mass occurrences, 17.7.63, TUR); Riihenmaa, W side, 3 (two localities, 4—5 specimens, 5.7.64). — Lokalahti, Iso Lehmämaa, NW, N, and NE side, 1 (many specimens, up to 18 cm long, 19.7.62, TUR).

In Kustavi (near Likhholm, near Sikaluoto, at Lypertö, and at Pirisholm), where mass occurrences were seen, the species occurred at depths of 6—10 m entangled with *Rhodomela confervoides*, *Furcellaria fastigiata*, and *Phyllophora brodiaei*. At Riihenmaa *P. nigrescens* grew epiphytically on *Fucus vesiculosus*. In Lokalahti (Iso Lehmämaa) the species was best developed, especially on the NE shore of the narrow sound, where it was attached to stones and to *Furcellaria fastigiata* at a depth of ca. 9 m (Fig. 6). The only specimen which I found in the southern part of the SW Archipelago was only about 2 cm long. The upper part of the plant remained red when dried, but the lower corticated part turned black. The small specimen looks as if it had been attached to a substrate. It was difficult to identify this single fragment, but because I saw twelve pericentral cells in cross section, I classified it as *P. nigrescens*.

According to the distribution of *P. nigrescens* (map 22), the species seems to be lacking almost completely in the southern part of the SW Archipelago of Finland. This circumstance has been discussed by previous workers. For example, WÆRN (1952) did not find the species at Jurmo, Utö, Kökar, Ledsjär, Jarramas, Nyhamn, and Kobbarklintar (islands in the outer parts of the Turku and Åland Archipelagos). Only at Spättarhälet (Degerby) in the Åland Archipelago did he find a fragment. WÆRN mentioned that the probable reason for the absence of *P. nigrescens* is the mass production of *Mytilus edulis*. This may also be the reason in some localities of my research area, but *Stictyosiphon tortilis*, too, may have an influence on the absence of *P. nigrescens*. *S. tortilis* often forms large vegetatively producing masses at depths of 6—8 m. The harmful effect of *S. tortilis* upon aquatic phanerogams has been observed by LUTHER (1951b, p. 53). In the northern part of the SW Archipelago, in Kustavi, where masses of *P. nigrescens* are to be found, *S. tortilis* is rare.

*Rhodomela confervoides* (Huds.) Silva — WÆRN 1952, pp. 225—228, figs. 94—95 (as *R. subfusca* (Woodw.) C. Agardh); SILVA 1952, p. 269.

*R. confervoides* is not known to occur in the Gulf of Bothnia. In the Gulf of Finland it is distributed as far as Helsinki, and near Hanko masses of it have been seen many times. The species has also been found in the Tvärminne Archipelago. (cf. WÆRN 1952, pp. 226—227).

SW Archipelago. Literature (all as *R. subfusca*): ANDERSSON 1955, p. 145, one record in the Nauvo Archipelago, at Sandö: Örfjärd (some small plants, 3—5 cm long, at a depth of 30 m); KASKINEN 1964, p. 93, Airisto: Iso Tervi (only one 1.5 cm long plant with tetrasporangia) and Norra Linsör (one plant, less than 1 cm in length). Other collections: *Korppoo*, Utö (Elfving, 1872, H). — *Iniö*, between Jumo and Norrby (Lauri E. Kari, 1932, TUR). Mr. HIRSALMI has shown me *Rhodomela* material which he collected in *Nauvo*, S of Redamo (25.8.65). Own records: *Hiittinen*, near Harö and Söderö, 6 (one specimen ca. 3 cm long with tetrasporangia, 3.7.63, TUR). — *Nauvo*, Brändholm, 9 (ten to fifteen specimens ca. 5 cm long, 23.7.64, TUR); Fårö, W side, 23 (about fifty specimens, 5—7 cm long, 30.7.62, TUR); between Kalvholm and Humleholm, 8 (five to six specimens, 20.8.63); S side of Högholm, NE of Seili, 3 (26.5.66, TUR); between Seili and Svartö, E of the cable, 3 (26.5.66, TUR). — *Korppoo*, Gyltö, 9 (one specimen ca. 5 cm long, 18.8.64, TUR); Huvudskär, 13 (one specimen ca. 4 cm long, 26.7.62); Kalvholm, SW side, 6 (two specimens ca. 13 cm long, tetrasporangia, 15.8.63); Korholm, near the skerries on SW side, 5 (about ten specimens 5—13 cm long, tetrasporangia, 29.8.63, TUR); between Lempersjö and Älvsjö, 5 (two specimens 4—5 cm long, 3.6.62, TUR). — *Houtskari*, Topsalö, W side, 3 (a few specimens ca. 5—6 cm long, 22.8.63). — *Parainen*, between Bockholm and Granö, 3 (mass occurrences, tetrasporangia, 19.7.63, TUR). — *Kustavi*, Lypertö, SE side, 2 (mass occurrences, 19.7.63); Pirisholm, W side, 4 (mass occurrences, tetrasporangia, 18.7.63); Likhholm and Sikaluoto, 4 (mass occurrences, 18.7.63). — See map 23 for the distribution of the species.

In my research area *R. confervoides* has been found at depths of 6—15 m and it seems to prefer narrow channels with currents and a hard bottom. Usually it occurs among

*Furcellaria fastigiata* and *Phyllophora brodiaei*. Only once have I seen it in a dense growth of *Stictyosiphon tortilis* at Nauvo (Fårö).

In most cases, only a few plants have been seen, except for the mass occurrences in three localities in Kustavi and in Parainen (Fig. 7). *R. confervoides* grows mostly entangled with other algae, but at least the specimens which I got by dredging in Korppoo, near Kalvholm and near Korpholm, were attached to stones. Sexual plants have not been observed, but sometimes I have seen specimens with tetrasporangia (listed above).

### Summary

Only a few studies have been made on algae in the SW Archipelago of Finland. In the present paper, the earlier investigations have been combined with my own studies in order to make an up-to-date review of the present knowledge of the green, brown, and red algae in the archipelago of SW Finland. Small algae have been taken into consideration provided that they sometimes, like *Rhodochorton purpureum* and *Waerniella lucifuga*, occur in large masses perceptible to the naked eye.

The distributions of most brown and red algae, excepting very common and rare species, have been discussed in detail and depicted on maps.

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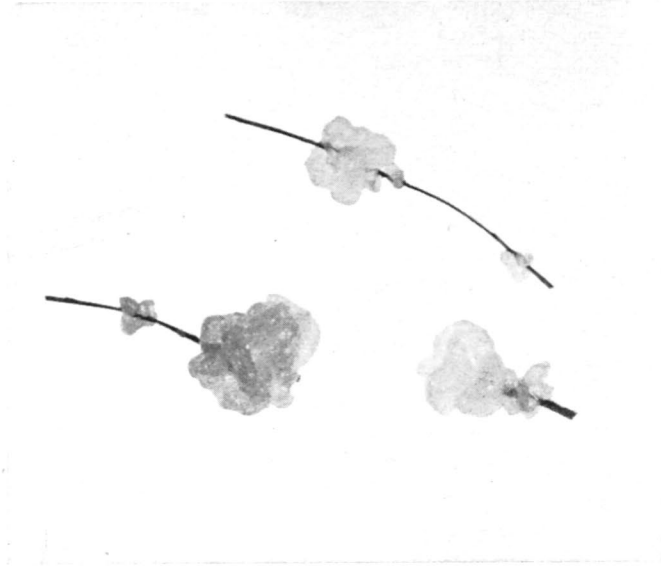


FIG. 3. *Leathesia difformis* on *Potamogeton pectinatus* from Korppoo (Estrevlan, SW of Jurmo). — Photographed from formalin-preserved material.  $1.5\times$ .

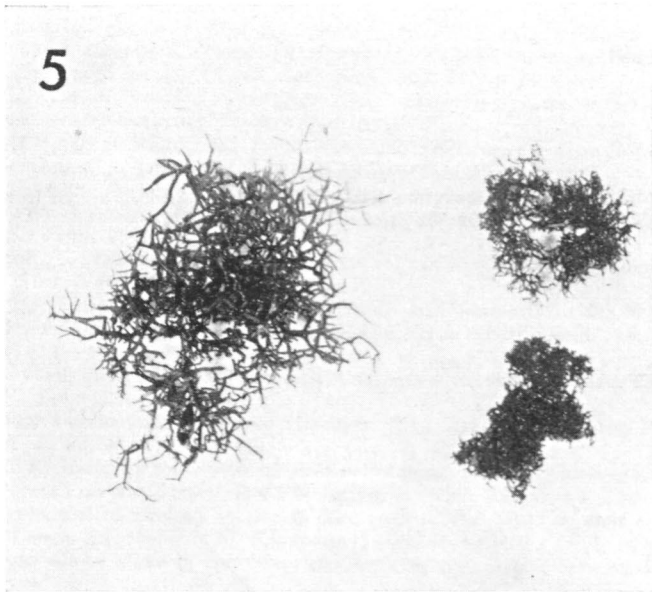
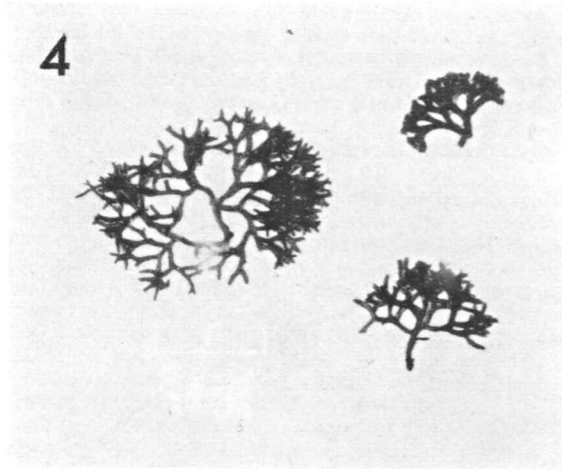


FIG 4. *Polyides rotundus*. — FIG. 5. *Ahnfeltia plicata*. — Individual plants from different localities in the SW Archipelago of Finland, photographed from moistened herbarium material.

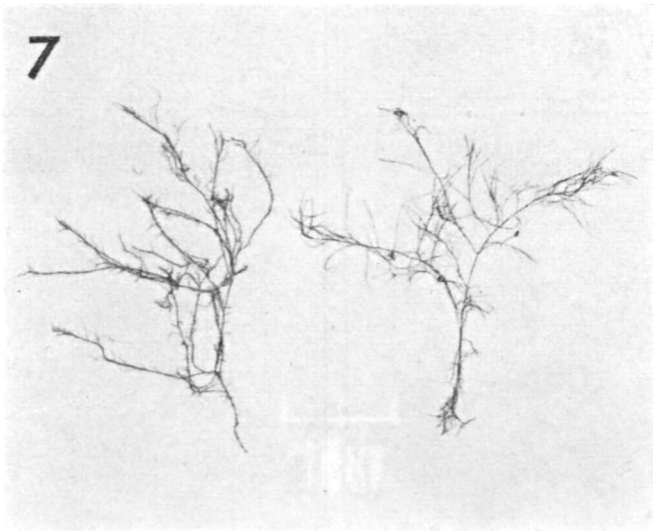
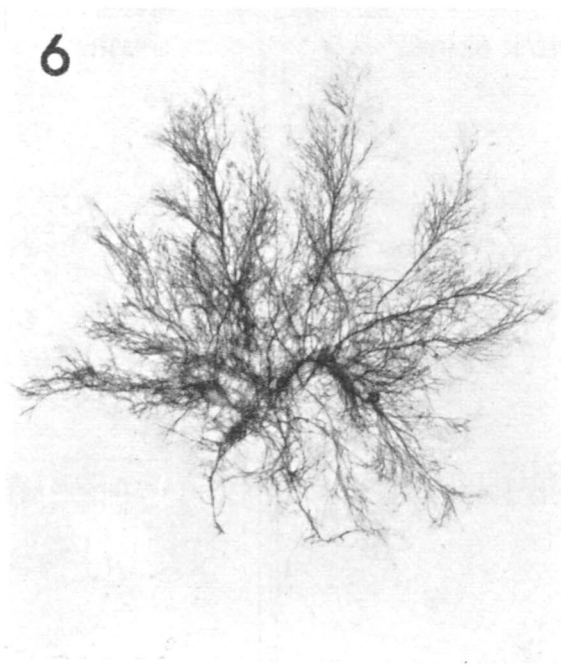
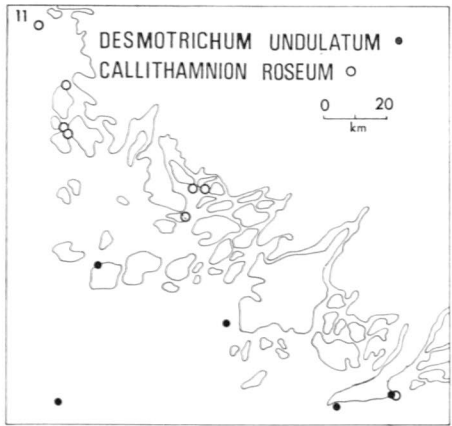
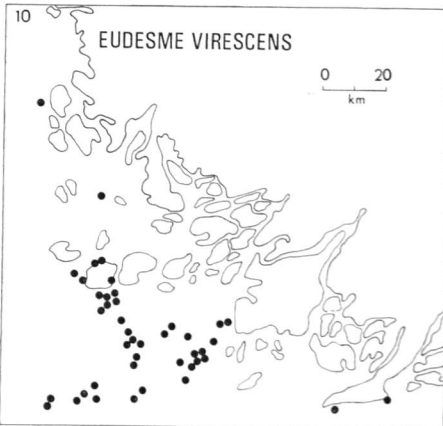
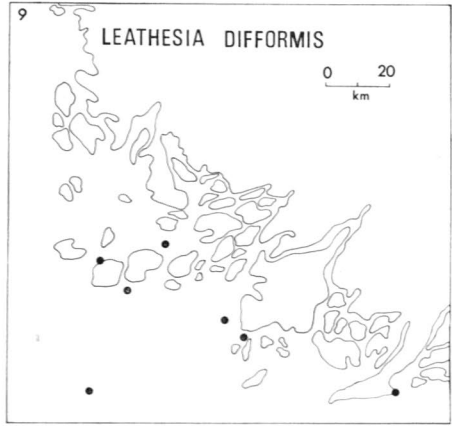
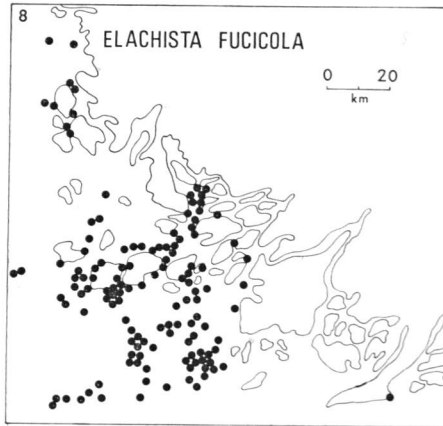
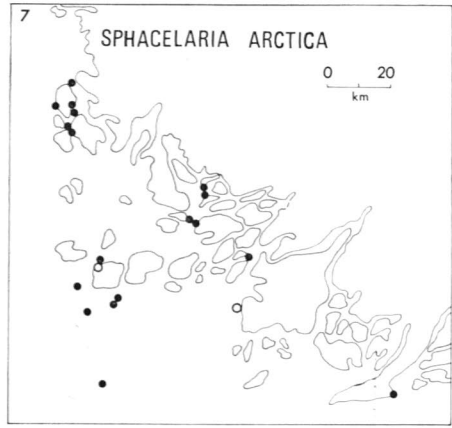
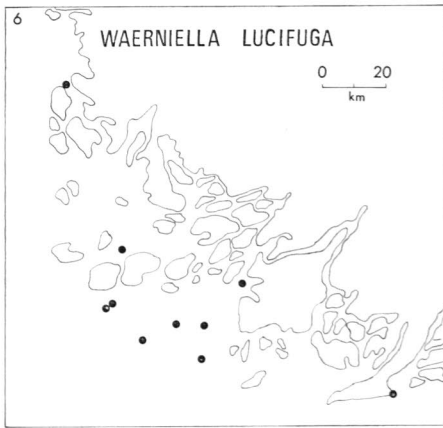
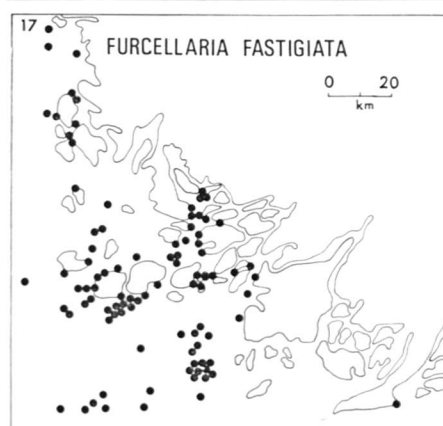
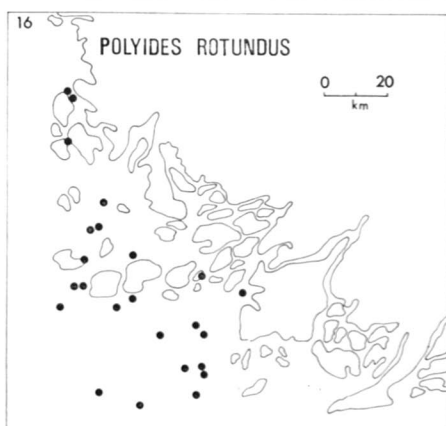
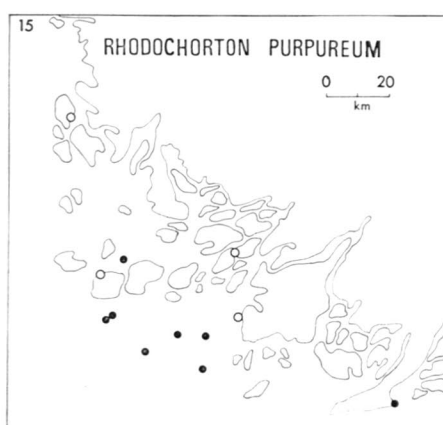
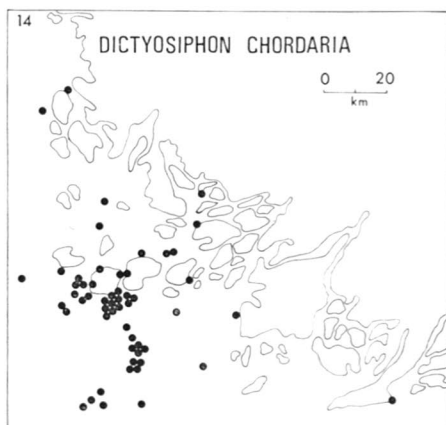
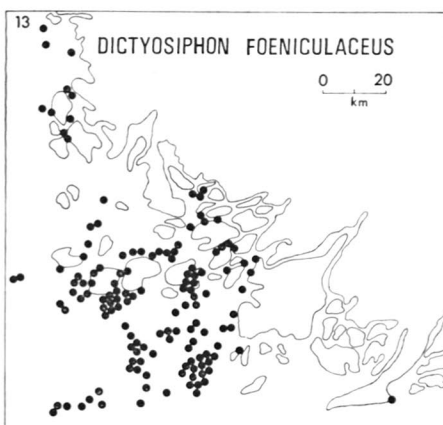
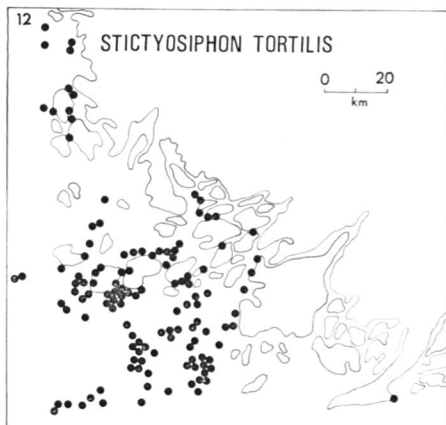
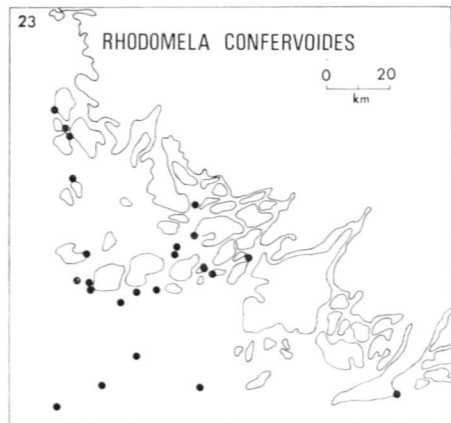
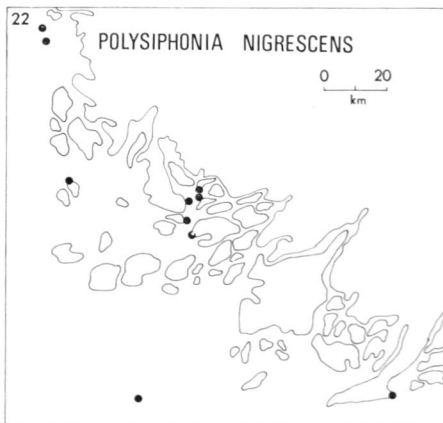
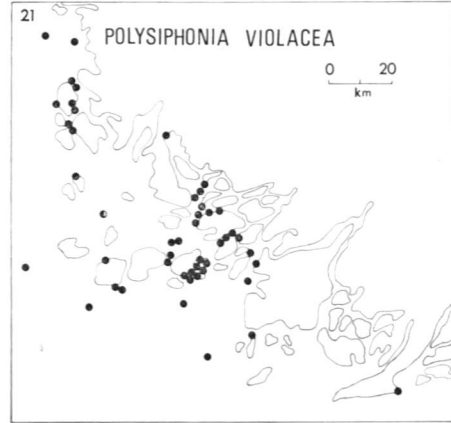
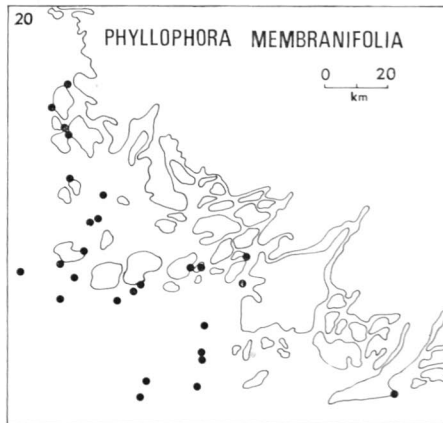
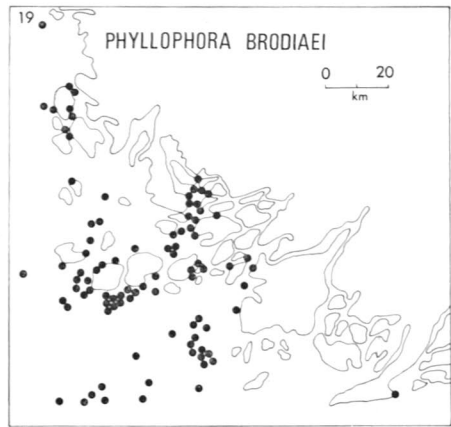
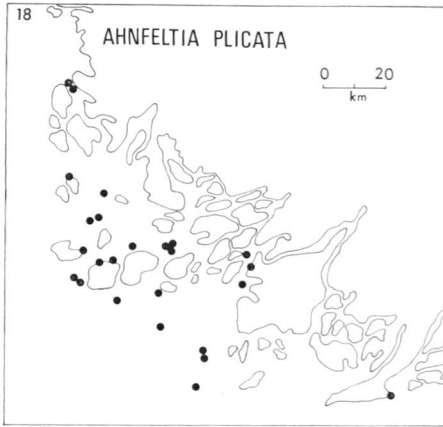


FIG. 6. *Polysiphonia nigrescens* from Lokalahti (Iso Lehmämaa).  
FIG. 7. *Rhodomela confervoides* from Parainen (between Granö and Bockholm). — Photographed from dried herbarium material.



MAPS 6—23. Distribution of some brown and red algae in the SW Archipelago of Finland. Most of these algae have been seen in the Tvärminne Archipelago but the exact localities of them have not been given in this work. A black dot at the place where the Zoological Station is situated indicates that the species has been reported from the Tvärminne archipelago.







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