ON FILAMENTOUS BLUE-GREEN ALGAE OF THE BROOKS OF LAPLAND

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I. INTRODUCTION

The blue-green algae of the brooks of Lapland have been studied to only a limited extent (ELFVING 1895, ENWALD 1904, CEDERCREUTZ 1929 and 1932, LIPPMAA 1929, LUTHER 1938 and ROUND 1959). Algal specimens collected by M. LAURILA in 1939 from Lapland are deposited in the Botanical Museum of the University of Turku.

CEDERCREUTZ (1929, 1932) determined algal specimens collected by HÄYRÉN and some of those collected by SÖYRINKI together with his own. These were all from the Petsamo tract. He concluded that the alpine region of Kalastajasaarento with its oligotrophic waters is very poor in blue-green algae. The material CEDERCREUTZ collected in 1929 was partly from Kalastajasaarento, but the greater part from the forest region that lies about 40 km south from the coast of the Arctic Ocean. The material provides a relatively reliable picture of the distribution of blue-green algae in the brooks of northern Petsamo.

Only a very few studies relate to the areas of Lapland south and west of Petsamo. LUTHER (1938) found four unicellular blue-green algal species and six filamentous blue-green algae in brooks of western Inari commune. ENWALD (1904) collected only *Chroococcales* (unicellular) species, mainly from Enontekiö commune. LIPPMAA (1929) found seven blue-green algal species on moist rock surfaces in the alpine region of the Kilpisjärvi area; these rock surfaces may dry up in summer, but are exposed to oxygenated water from melting snow and rain the rest of the year. ELFVING (1895) reviewed the findings of several investigators and presented information on filamentous blue-green algae that were found in areas of Enontekiö, Kemijärvi, Inari and Kuusamo in Lapland. Algal specimens in the Inari area have been collected by NYLANDER and on the algae of the Kemijärvi area by NORRLIN, HULT & ROSBERG and LINDÉN. ROUND (1959) visited the Tornio, Muonio and Könkämäeno areas where he found five unicellular and five filamentous blue-green algal species. The filamentous species were very random in distribution. *Tolypothrix* was encountered in many locations, but *Rivularia* and *Dichothrix* species only

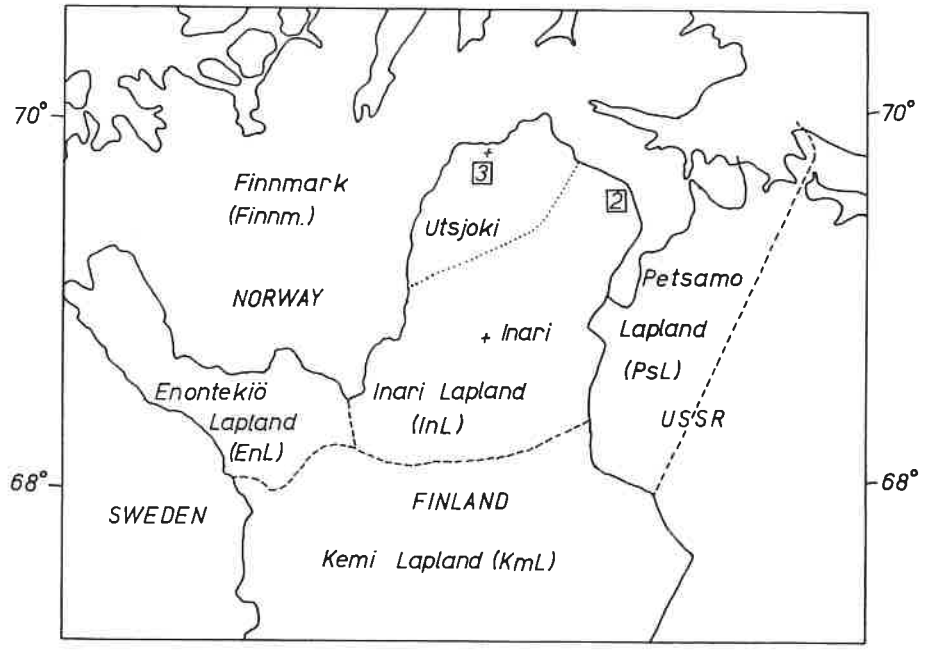

Fig. 1. Map of northernmost Fennoscandia. The numbers 2 and 3 refer to the areas investigated (see Figs. 2 and 3, resp.).

in the northernmost areas. LAURILA collected algal species mainly from Kuusamo and Salla communes. The list of species and information on their locations were at my disposal.

On the basis of these studies a general picture of the distribution of the blue-green algae in the brooks of Lapland can be drawn. The filamentous blue-green algae and their locations are summarized in the following:

Stigonemataceae

Stigonema hormoides — Enontekiö Lapland (EnL): Enontekiö commune (LIPPMAA 1929)
S. tomentosum — Inari Lapland (InL): Lemmenjoki River (LUTHER 1938)
S. ocellatum — Kuusamo (Ks): Oulankajoki River, Alakitka (LAURILA 1939), Kemi Lapland (KmL): Luirojärvi Lake (ELFVING 1895), Petsamo Lapland (PsL): Kervanto, Petsamontunturit (CEDERCREUTZ 1929)
S. minutum — EnL: Toskaljahta, Enontekiö, InL: Paatsjoki River (ELFVING 1895)
S. mamillosum — KmL: Sokustama, Pälkkimäoja Brook (ELFVING 1895), Kervanto (CEDERCREUTZ 1929) and Laukkujoki River (CEDERCREUTZ 1932)
S. informe — Enontekiö (LIPPMAA 1929)
S. spp. — EnL: Könkämäeno (ROUND 1959)
Hapalosiphon intricatus — Kervanto, Petsamontunturit (CEDERCREUTZ 1929)
H. hibernicus — PsL: Haukilampi Pool (CEDERCREUTZ 1932)

Rivulariaceae

Dichothrix orsiniana — Ks: Selkäjoki River and Kitkajoki River, KmL: Pälkinäoja Brook, Muonionjoki River, Pyssykorva (ELFVING 1895)

D. compacta — Ks: Honkaoja Brook (ELFVING 1895), InL: Ivalo (HÄYRÉN 1945), Kervanto (CEDERCREUTZ 1929)
D. spp. — Könkämäeno (ROUND 1959)
Calothrix parietina — EnL: Tschaimo et Toskaljahta (ELFVING 1895), Enontekiö (LIPPMAA 1929)
C. braunii — Ivalo (HÄYRÉN 1945)
Glocotrichia pisum — Pohjois-Pohjanmaa (PP): Tornionjoki River (ROUND 1929)
Rivularia biasolettiana — Ks: Salla, Oulankajoki (LAURILA 1939), KmL: Kitisjoki River (GRÖNBLAD 1942), Könkämäeno (ROUND 1959)

Scytonemataceae
Tolypothrix tenuis — Ks: Mäntyjoki River (LAURILA 1939), Luirojoki River (ELFVING 1895), InL: Viibustunturit Fjelds, Marastotunturit Fjelds (LUTHER 1938), PsL: Pummanki, Maattivuono, Petsamontunturit (CEDERCREUTZ 1929), Haukilampi (CEDERCREUTZ 1932)
T. distorta — Pummanki (CEDERCREUTZ 1929)
T. distorta var. *penicillata* — Tornionjoki,, Muonionjoki, Pahtajoki River, Könkämäeno (ROUND 1959)
T. limbata — PsL: Paatsjoki, Kervanto (CEDERCREURZ 1929)
Scytonema mirabile — Ks: Nivajärvi Lake, Oulankajoki (LAURILA 1939), Enontekiö (LIPPMAA 1929), PsL: Kiddjaur (CEDERCREUTZ 1932). An old synonym is *S. figuratum* by which name it is found in ELFVING's studies (1895) of Luirojärvi Lake and KmL: Anterijoki River.
S. crustaceum — Enontekiö (LIPPMAA 1929)

Nostocaccae
Nostoc commune — Oulankajoki (LAURILA 1939), Pummanki (CEDERCREUTZ 1929)
N. sphaericum — Muonionjoki (ROUND 1959), Maattivuono (CEDERCREUTZ 1929)
N. verrucosum — Mäntyjoki (ELFVING 1895), Vuorijärvi Lake (LAURILA 1939)
N. spp. — Tornionjoki, Palojoki River, Könkämäeno (ROUND 1959)
Anabaena cylindrica — Near the confluence of Muonionjoki and Tornionjoki, Könkämäeno (ROUND 1959)
A. augstumalis — Ivalo (HÄYRÉN 1945)
A. spp. — Tornionjoki, KmL: near the confluence of Muonionjoki and Tornionjoki, Palojoki, Muonionjoki, Pahtajoki, Könkämäeno (ROUND 1959), Lemmenjoki (LUTHER 1938).

Oscillatoriaceae
Oscillatoria tenuis. — Viibustunturit, Marastotunturit (LUTHER 1938), Pummanki (CEDERCREUTZ 1929)
O. amoena — Lemmenjoki, Marastotunturit (LUTHER 1938), Pummanki (CEDERCREUTZ 1929)
O. formosa — Kervanto (CEDERCREUTZ 1929), Kiddjaur (CEDERCREUTZ 1932)
O. spp. — Könkämäeno (ROUND 1959)
O. limnetica — Western Inari (LUTHER 1938).

II. THE PRESENT MATERIAL

The area where I collected specimens comprises Utsjoki commune and Sevettijärvi in Inari. The centre of the Utsjoki area, The Kevo Subarctic Research Station (KALLIO 1964), has the coordinates 69° 45′ north latitude

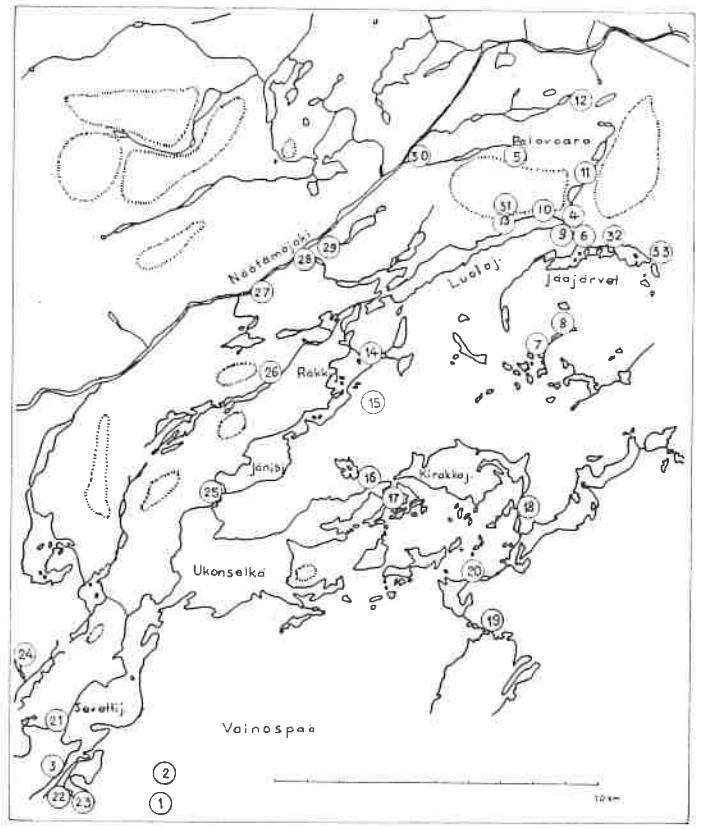

Fig. 2. Sevettijärvi area.

and 27° east longitude and Lake Sevettijärvi 69°N and 29°E. The areas belong to the granulite and gneiss regions of Inari Lapland. The granulite is gneiss-like, but is rich in granate and poor in mica. The alternating strata may be basic and contain pyroxene (LAITAKARI 1951). The climate is rugged. The mean annual temperature is —1°C, the mean temperature being —12° in February and +12° in July. The mean annual precipitation is 450 mm; most of the rain falls in July in the Inari region. The mean snow depth in winter is about 60 cm (KERÄNEN & KORHONEN 1951). Utsjoki River is a tributary of the Teno River that flows into the Arctic Ocean. Lake Sevettijärvi belongs to the Näätämö waterway, the lower reaches of which run through Norway to which the western bank of the Tenojoki River also belongs (RENQUIST 1951). Pine forests cover the land around Sevettijärvi, but Utsjoki River lies beyond the pine forest limit, although there is a pine forest enclave in the Utsjoki River valley where many plant species typical of pine forest zones have their northernmost habitats (KALLIO 1964).

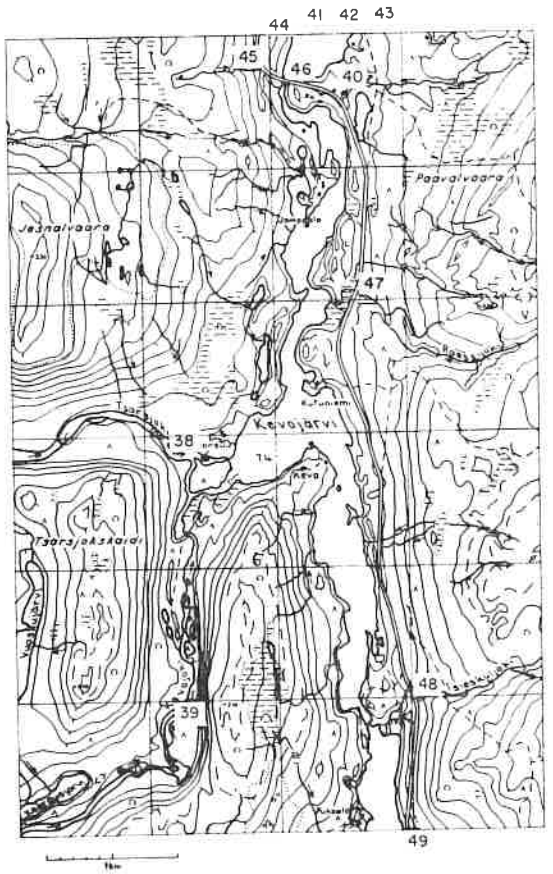

Fig. 3. Utsjoki area.

The dry specimens were collected in the summer of 1960, mostly from subalpine regions. Living material was collected from the Utsjoki area for measurement in 1962, during which also specimens of two species were collected that were preserved in 2 % formalin for comparison of cell sizes. No essential differences in cell dimensions or morphology resulted from the storage in 2 % formalin. *Hormogonales* have shown to be difficult taxonomically, and in order to make reliable identifications one — therefore — has to have both well preserved and abundant material. In this study for that reason only those species are discussed from which also abundant living material was available for microscopical studies. The species listed here represent the most typical and common filamentous blue-green algae which occur in the area investigated.

The following reference works were employed in the identification of the species: GEITLER, 1932: Cyanophyceae in Rabenhorst's Kryptogamenflora von Deutschland; DESIKACHARY, 1959: Cyanophyta.

The numbers after each species refer to the sites listed in the following list.

Sites (Maps 2 and 3)

1. Lake Sevettijärvi, 3 km north of Järvenpää. Width of brook 2 meters. Moderate current. 8. 7. 1960.
2. A slow-flowing brook south of Vainospää Fjelds. Width ½—1 m. Rocky bottom. 9. 7. 1960.
3. A brook about 300 m N from Sevettijärvi church village. Strong current. 9. 7. 1960.
4. A rock-bottomed, rapidly-flowing brook emptying into the northeast end of Luolajärvi Lake. Width 3 m. Temperature 18°C. 10. 7. 1960.
5. Kotaoja Brook, 3—6 m wide. 22°C. 11. 7. 1960.
6. Rocks on the shore of Lake Jääjärvi. 11. 7. 1960.

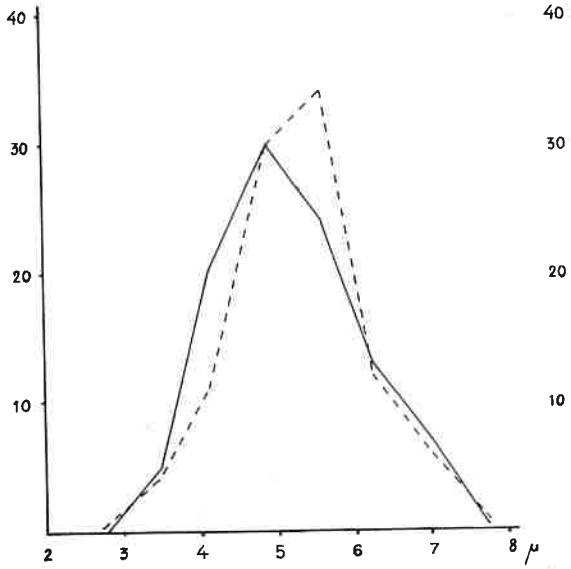

Fig. 4. Dichothrix gypsophila. Lengths of 100 living cells (———) and in 2 % formalin (— — —).

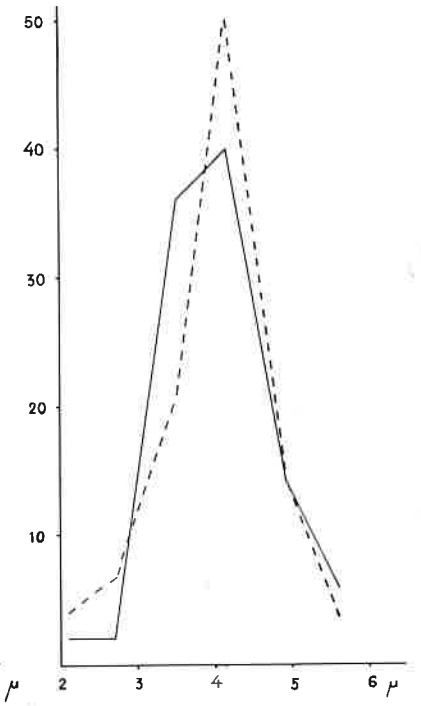

Fig. 5. Nostoc sphaericum. Lengths of 100 living cells (———) and in 2 % formalin (— — —).

7. A small brook starting from a spring and flowing southwest in a valley beside Jäävaara Fjeld. Weak current. Width 1 m. 13°C. 11. 7.
8. Jäävaara, about 300 m northeast of the preceding. Width under 1 m. 16°C. Current minimal. 11. 7.
9. A swift-flowing brook joining Jääjärvi Lake and Luolajärvi Lake 11. 7.
10. A voluminous brook flowing from Palovaara Fjeld to the north end of Luolajärvi, about ½ km north from the frontier guard post. 23°C. Width 1 m. 12. 7. 1960.
11. A brook about 1½ km northeast of Luolajärvi. Width 1—2 m. 12. 7.
12. A brook flowing between the two easternmost ridges of Palovaara into Näätämö River. 17°C. 12. 7.
13. A pool on Palovaara 1½ km west from the frontier guard post. 17°C. 12. 7.
14. A swift brook with rocky bottom 1½ km NE from Räkkijärvi Lake (Uutela). 16°C. Width 1½ m. 13. 7. 1960.
15. A brook southeast of Räkkijärvi about 1 km from postal route. Width 1 m. 14°C. 13. 7.
16. Slowly flowing brook about ½ km NW from the eastern end of Ukonselkä Lake. 14°C. 13. 7.
17. Rapidly flowing brook flowing into the eastern end of Ukonselkä. Width 5 m. 16°C. 14. 7. 1960.
18. Brook flowing southeast into a lake ½ km wide about 2½ km south of Kirakkajärvi Lake. Very slow current. Width ½—1 m. 15°C. 14. 7.

19. Slowly flowing brook running southeast into Vainosjärvi Lake. Width ½ m. 16°C. 14. 7.
20. Brook flowing from a small pool to a lake northwest of Vainosjärvi. Rocky bottom. Width 2—10 m. 16°C. Moderate current. 14. 7.
21. Ailioja Brook containing many green algae and flowing into Sevettijärvi. Strong current. Width 3—5 m. 18°C. 16. 7. 1960.
22. Solmujoki River. Strong current. Width 6—8 m. Bottom covered by pebbles. 17°C. 17. 7. 1960.
23. Upper reaches of Solmujoki. Strong current. 18°C. Width 5—10 m. 17. 7.
24. Brook flowing into a pond about 200 m west of Gerasimoff farmstead. Dry bed. 16°C. 18. 7. 1960.
25. Rapidly flowing brook, about 200 m from its mouth on the western slope of a ridge between Jänisjärvi Lake and Ukonselkä. The brook divides into many smaller channels lower down. 12°C. 18. 7.
26. Nälkäoja Brook. An almost dry rocky bed about 25 m wide. 16°C. 19. 7.
27. A rapidly flowing brook emptying into Näätämö River about 100 m north of the State Forest Bureau station. 12°C. 19. 7.
28. Kuosnijoki River, width 5—30 m, strong current. 15°C. 19. 7.
29. A brook 1—2 m wide about 1½ km north of the mouth of Kuosnijoki. 13°C. 19. 7.
30. Mouth of Kotaoja Brook, 1 m wide and moderate current. 11°C. 19. 7.
31. About 1½ km west of the northern end of Luolajärvi. Width 1 m. Fairly strong current. 8°C. 19. 7.
32. Two kilometers east of the northern end of Luolajärvi. Width 1 m. 8°C. 21. 7. 1960.
33. Three and a half kilometers east of the northern end of Luolajärvi 10°C. 21. 7.
34. Nuottijoki River, half a kilometer from frontier guard post. A very shallow gravel-bottomed river about 20 m wide. 9°C. 21. 7.
35. Nuottijoki, near bridge 150 m from frontier guard post. Width 30 m, strong current. 5°C. 21. 7.
36. Small brook flowing into Näätämö on the Norwegian bank near Vejnes village. 15°C. 21. 7.
37. Näätämö, 1 km from Vejnes village. Width about 50 m. 12°C. 21. 7.
38. Tsharsjoki River, about ½ km from the Kevo Station. Rocky bottom with rapids, width about 50 m. 23. 7. 1960.
39. Kevojoki River, about 100 m southwest of Kotkapahta Cliff. Bottom covered by coarse gravel and rocks. Strong current. 23. 7. 1960.
40. Kitisjoki River. Many-branched, strong current. Width about 10 m. 23. 7. 1960.
41. Nammajoki River. Bottom gravel and rocks, strong current. Width 5 m. Abundant green algae. 10°C. 23. 7.
42. Mielgijoki River. Strong current. Bottom covered by rocks and sand. 9°C. 23. 7. 1960.
43. Brook flowing east from a marsh to Kidsajärvi Lake. Bottom covered by sand and mud with rocks here and there. Width 1 m. 23. 7.
44. Brook flowing east into Kuoddusvuobbejärvi Lake. Width 1 m. Moderate current. 23. 7.
45. A brook 1—3 m wide south of the preceding. Rocky bottom covered by mud in the lower reaches. 23. 7.
46. Below the bridge at Jomppala. Width 10 m. Strong current. 23. 7.
47. Raessijoki River. Width 10 m. Strong current. Rock-covered bottom. 23. 7.
48. Tshieskuljoki River. Width 3 m. Strong current. Water mosses in abundance. 10°C. 23. 7.
49. Keneskoski River. About 20 m wide. Strong current. 24. 7. 1960.

Description of Species

Stigonema ocellatum (Dillw.) Thuret ex Born. et Flah.
7, 13, 43

The specimens are usually small in size, the thallus being 3—4 mm high. They represent aquatic forms in that the sheaths are yellow-brown in colour and the filaments are less branched. Cells are in a single row, generally wider (15—18 μ) than long.

The species was found in the alpine regions on Jäävaara near Sevettijärvi and Palovaara and in a brook flowing east into Kidsajärvi in Utsjoki commune. The brooks are fairly small and the current is weak. The species has previously been found in Luirojärvi in KemL (ELFVING 1895), in PsL Kervanto and on the fjelds of Petsamo (CEDERCREUTZ 1929), in the mouth of Pihtioja Brook in Outakoski and on the wall of Kistuskaidi Cliff in Utsjoki commune (CEDERCREUTZ 1955), in western Inari (LUTHER 1938), in Alakitka and in several places in Central Finland (LAURILA 1939, ELFVING 1895, SILFVENIUS 1903, HÄYRÉN 1940 d, CEDERCREUTZ 1934 and 1940).

The species evidently occurs throughout the country. The typical sites are on bed rock, but the alga also fares well on soil and in brooks.

Stigonema mamillosum (Lyngb.) Ag. ex Born. et Flah.
8, 13, 17, 20, 21, 29, 30, 35, 36, 37, 41, 44

The specimens are dark brown in colour and relatively small in size, about 3—5 mm high. The filaments are interwoven and 45—75 μ broad. Short mamilliform hormogoniferous branches 20—24 μ broad are present in abundance. The sheath is yellowish. The cells are barrel-shaped and the heterocysts lateral (Fig. 6).

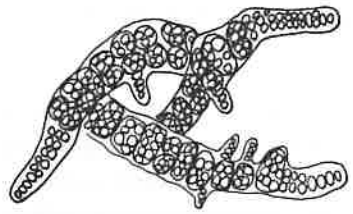

Fig. 6. Stigonema mamillosum (ca. 100 ×).

The species occurs in the alpine region of Sevettijärvi, on Jäävaara (8) and Palovaara (13), and at lower levels at the east end of Ukonselkä, in Ailioja, in a small brook near Kuosnijoki, in Kotaoja, Nuottijoki, Näätämö and Nammajoki and on the west shore of Kuoddusvuobbejärvi. The species has been reported to occur in Pälkkimäoja (ELFVING 1895), in Kervanto (CEDERCREUTZ 1929) and in Laukkujoki (CEDERCREUTZ 1932). In southern Finland the species occurs in several locations (ELFVING 1895, CEDERCREURZ 1934 and 1940 and HÄYRÉN 1940 b, c, d). It has been found in water flowing over bed rock in Tvärminne. There *Stigonema* species form separate stands, or sometimes two species together form a stand. The stands occur on shady irregular slopes of

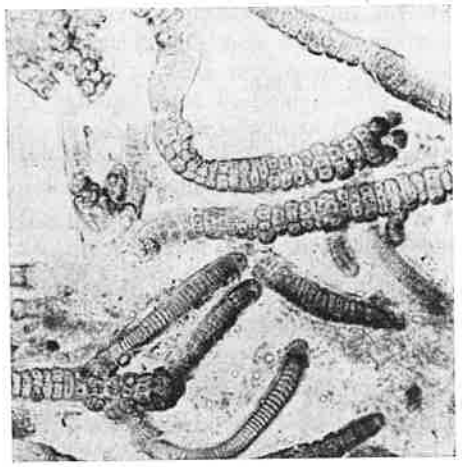

Fig. 7. Stigonema informe (ca 100 ×).

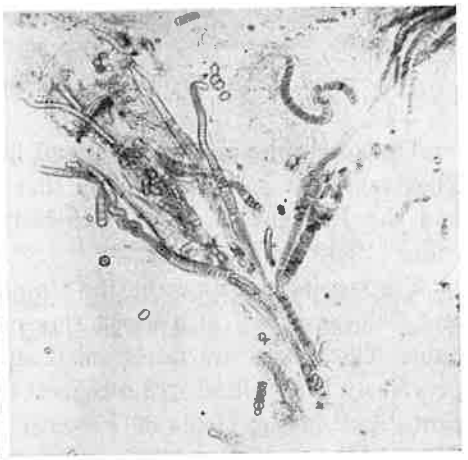

Fig. 8. Dichothrix orsiniana (ca. 100 ×).

granite or lime-containing gneiss. They develop best on shady granite walls. Different species may have different requirements. *Stigonema* stands are generally widespread (HÄYRÉN 1940 a).

Generally the incidence of species of *Stigonema* genera seems to be highest in July and August because in October, 1962, I found only residues of the species in places where they had grown in abundance in the summer.

Stigonema informe Kütz. ex Born. Flah.
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 19, 22, 23, 24, 26, 27, 28, 31, 32, 34, 39, 42, 44, 47

The specimens are brown in colour. The filaments are 1—2 mm long, 39—66 μ broad and irregularly branched; often the branches are less than 40 μ broad. Secondary branches mostly rise from the upper surface. The trichomes have 3—6 rows of cells and are 16—17 μ broad. The heterocysts are lateral (Fig. 7).

The species is found very often in brooks. Previously it has been found in alpine regions on moist rock surfaces together with other algae on black streaks below melting snow (LIPPMAA 1929). It occurs also on a cliff wall near the mouth of Pihtioja; it has been found in Utsjoki, Outakoski in two places (CEDERCREUTZ 1955). In southern Finland it occurs in many locations (CEDERCREUTZ 1934 and 1940, LAURILA 1939).

The species is found especially on moist rock surfaces, but standing waters are typical habitats, too.

Dichothrix orsiniana (Kütz.) Born. et Flah.
4, 5, 8, 10, 11, 12, 14, 15, 21, 22, 29, 32, 37, 41, 49

The specimens show the general features of the species (Fig. 8).

The species occurred on different levels in the northeast part of Sevettijärvi and in Näätämö, Nammajoki and Keneskoski. Previously it has been reported to occur in Selkäjoki, Kitkajoki, Pälkinäoja and Muonionjoki (ELFVING 1895). It has been found also in the alpine region of Kilpisjärvi and Siilas-Malla. Its distribution seems to be concentrated in Lapland; it has not been found in southern Finland. It occurs more often in brooks than on cliff walls, though one can not draw any distinct boundary between rheophilic and aerophilic cliff stands (CEDERCREUTZ 1955).

The species is typical of rapidly flowing waters and is sessile in form. It is not often found in standing waters or on moist rock surfaces. It is very cosmopolitan.

Dichothrix gypsophila (Kütz.) Born. et Flah.
4, 7, 12, 14, 16, 24, 26, 32, 42

I did not find calcium incrustations in the specimens, but they show other general features of the species (Fig. 4).

The species has been found in Sevettijärvi at the north end of Luolajärvi, in the alpine regions on Jäävaara (7) and Palovaara (12), in Räkkijärvi, on the west side of Sevettijärvi in two brooks and in Mielgijoki in Utsjoki commune. These waters differ greatly in size and current. The species has been reported to occur in a little alpine lake in Enontekiö (CEDERCREUTZ 1955). In southern Finland it is found in several locations (HÄYRÉN 1931 b, 1938, 1940 c, EHNHOLM 1936, CEDERCREUTZ 1934 and 1940). Living trichomes have been found under the ice near Tammisaari (HÄYRÉN 1929). In Tvärminne, Ahvenanmaa and on the Swedish coast in Uppland the species forms stands in open places in the geolithoral zone. It fares best on the lee side of rocks (HÄYRÉN 1956). The distribution seems to be mainly on sea coasts and in Lapland. Generally it is very cosmopolitan.

Calothrix braunii (A. Br.) Bornet et Flahault
6, 8, 9, 10, 14, 15, 18, 21, 22, 23, 25, 27, 29, 30, 31, 32, 36, 39

The specimens show the general features of the species (Fig. 9).

The species was found in many brooks in different zones in Sevettijärvi and in Kevojoki in Utsjoki. The brooks differed in size. Previously the species has been found in Ivalo ½ km from the old Tourist Inn on the road to Petsamo (HÄYRÉN 1945). In southern Finland it has been found in five locations (CEDERCREUTZ 1934 and 1940, HÄYRÉN 1956). It is cosmopolitan.

Rivularia biasolettiana Menegh.
2, 6, 9, 11, 15, 16, 17, 18, 22, 23, 27, 29, 30, 31, 32, 33, 34, 37, 42, 45, 49

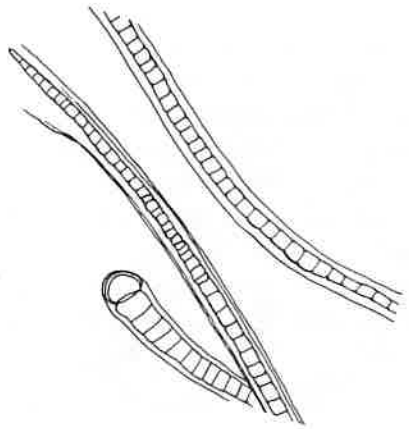

Fig. 9. Calothrix braunii (ca. 600 ×).

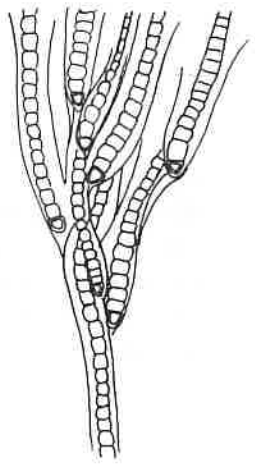

Fig. 10. Rivularia biasolettiana (ca. 600 ×).

The specimens had no calcium incrustations. The colonies are rather small, 2—3 mm in diameter. They show the other features of the species (Fig. 10).

The species was very common in both areas. It seems not to grow in alpine regions. Previously it has been found in Oulankajoki (LAURILA 1939), Kitinen (GRÖNBLAD 1942) and Könkämäeno (ROUND 1959). In southern Finland it has been found in several locations (HÄYRÉN 1928 a and b, 1929, 1931 a and b, 1938, 1946, 1956, CEDERCREUTZ 1934, EHNHOLM 1936). The species seems to live on the coasts and in northern Finland. It can be found in standing, flowing and salt waters, on rocks and water plants, seldom on moist soil.

Tolypothrix tenuis (Kütz.) Johs. Schmidt em.

3, 6, 7, 13, 35, 39

The specimens show the general features of the species (Fig. 11). *T. lanata* and *T. tenuis* can be differentiated essentially on the basis of the breadth of the filaments. Schmidt found a clear demarcation of the two species difficult and has amended the older of the two names, *T. tenuis,* to include *T. lanata* and a few other related species (DESIKACHARY 1959).

The species was found close to Sevettijärvi church, in the alpine regions of Jäävaara and Palovaara, on the shore of Jääjärvi, and in Nuottijoki and Kevojoki in Utsjoki commune. Previously it has been reported to occur in Mäntyjoki (LAURILA 1939), Luirojoki (ELFVING 1895), Viibustunturit and Marastotunturit (LUTHER 1938) and Pummanki, Maattivuono, Petsamontunturit (CEDERCREUTZ 1929) and Haukilampi (CEDERCREUTZ 1932). In southern Finland it has been found in several places (ELFVING 1895, HÄYRÉN 1928 a and b, 1931, 1938, 1940 c and d, 1956, CEDERCREUTZ 1934, EHNHOLM 1936, LAURILA 1939). The species is distributed throughout the whole country. It has been found living under the ice on the shore of Kokholm Island (HÄYRÉN 1929).

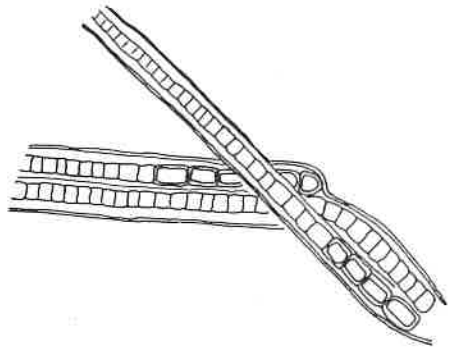

Fig. 11. Tolypothrix tenuis (ca. 600 ×).

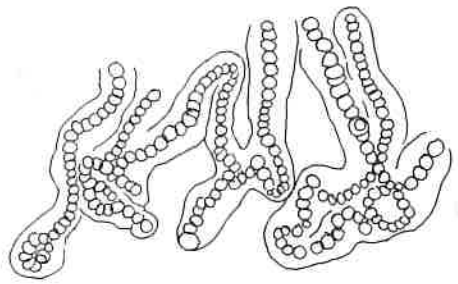

Fig. 12. Nostoc sphaericum (ca. 400 ×).

Scytonema mirabile (Dillw.) Born.

28, 34, 38

The specimens show the general features of the species.

The species was found in Sevettijärvi, Kuosnijoki, Nuottijoki and Tsharsjoki in Utsjoki. These rivers have strong currents and their water is rather cold. Previously it has been reported to occur in Nivajärvi and Oulankajoki (LAURILA 1939), Luirojärvi, Anterijoki (ELFVING 1895), Inari (LUTHER 1938), and in alpine region of Enontekiö (LIPPMAA 1929). It was found on rock surfaces in Utsjoki Outakoski, Kistuskaidi and Kilpisjärvi Jehkats (CEDERCREUTZ 1955), and in Kiddjaur (CEDERCREUTZ 1932). In southern Finland it occurs in several locations (CEDERCREUTZ 1934, 1940, HÄYRÉN 1944, 1956). It is cosmopolitan.

Nostoc sphaericum Vaucher ex Born. et Flah.

16, 28, 29, 37, 47, 48, 49

The specimens are relatively small in size, up to 1 cm long. They show other general features of the species (Figs. 5 and 12).

The species was found at the east end of Ukonselkä, in Kuosnijoki, in Näätämö in Sevettijärvi and in Raessijoki, Tshieskuljoki and Keneskoski in Utsjoki. Most of the rivers have strong currents. Previously it has been reported to occur in Muonionjoki (ROUND 1959) and Maattivuono (CEDERCREUTZ 1929). In southern Finland it has also been found on lime rocks (CEDERCREUTZ 1940). It is common on the southern coast and in Lapland (HÄYRÉN 1931 a, 1956). Typical habitats are moist soil and stagnant waters.

III. SUMMARY

The following ten species have all been earlier recorded from Lapland. Because the specimens were picked from rocks in the brooks, the number of species is not high.

No essential differences in cell dimensions or morphology resulted from storage of the specimens in 2 % formalin.

The brooks form a special habitat for the algae because of the current. The algae must be sessile and must not resist the current. Hemispherical forms, uneven mucilaginous thalluses (*Nostoc* and *Rivularia*) or caespitose thalluses (*Tolypothrix*) have been adapted to these habitats.

The temperature variations in the brooks were 5°—23°C. Usually the water is cold, clear and oxygenated. There is light enough in the Lapp brooks because of the parcity of water plants. The bottoms are often covered by rocks, which are good bases for sessile algae.

A regional difference between the brooks of Sevettijärvi in Inari and of those in Utsjoki was that the specimens of Utsjoki were mostly from larger brooks. The incidence of the species was equal in both areas. Great differences did not exist between the two studied areas, as was to be expected, because the species are cosmopolitan.

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