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## Lichens from Upernavik island, NW Greenland

### Abstract

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167 taxa of lichens are reported from the island of Upernavik. Their associations are briefly indicated and the new species *Rhizocarpon subareolatum* is described. For 25 taxa the records mean northern range extensions. The lichen flora of the island is comparatively rich in species with a distinct preference for moist habitats, while it is poor in species adapted to more xeric environments.

Key words: Arctis, lichenized fungi, *Rhizocarpon subareolatum*, lichen diversity, lichen ecology.

### Introduction

Upernavik Ø, centred at 72°48'N, 56°09'W, is situated in the archipelago between Svartenhuk Peninsula and Melville Bugt about 50 km north of the settlement Prøven (72°23'N, 55°32'W) in Baffin Bay (Fig. 1). The island covers an area of c. 4 km<sup>2</sup>. A 150 m high rocky hill occupies the central part of the island. Bedrock consists of siliceous rocks belonging to the Rinkian Mobile Belt; the gneissic rocks are locally rich in iron. Graphite has been mined in the vicinity of Upernavik (Escher & Stuart Watt 1976), the single settlement, which is located on a SW exposed slope at the southernmost point of the island and has c. 840 inhabitants. The area has a low arctic, oceanic climate. The mean temperature of the warmest month, July, is 5 °C at Upernavik, whereas the mean temperature of the coldest month, March, is -20 °C according to measurements made by Asiaq/Grønlands Forundersøgelse. The annual precipitation is > 370 mm (data for the year 2000).

The earliest lichen records from the island were made by J. Vahl, who visited the Upernavik District in 1834 (Branth & Grønlund 1888), but his lichen collections from this area are small compared with those from SW Greenland. However, it is of interest that he collected species such as *Catapyrenium daedaleum* and *Placidium lachneum* (Breuss & Hansen 1988). These species were not found during the present study. A more comprehensive investigation of the lichens of the archipelago at Prøven and Upernavik was carried out by P. Gelting, who made more than 500 collections of lichens in these districts in August 1951. Most of these collections have been determined and are kept the Herbarium of the Botanical Museum, University of Copenhagen (C), but

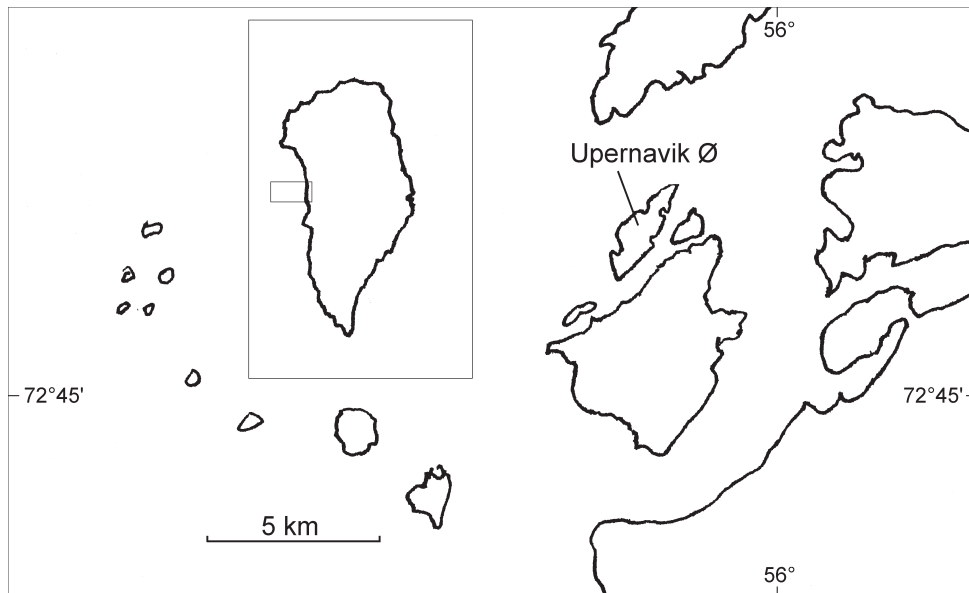


Fig. 1. Location of the island of Upernavik in NW Greenland. The inlay map of Greenland shows the position of the investigation area.

only a part of them have been published so far (Thomson 1984, 1997, Hansen & al. 1987b, Hansen 2003, 2005). Very interesting species such as, for example, *Gyalecta peziza*, *Rinodina parasitica*, *Rhexophiale rhexoblephara* and *Verrucaria halophiloides*, are included in this material.

The author investigated the lichen flora of Upernavik on 30.7.-8.8.1989. All parts of the island were studied. Some collections have previously been published in connection with a revision of *Catapyrenium* (Breuss & Hansen 1988). Additional information about the lichen flora of NW Greenland has previously been given by the author in the following publications: Hansen 1980, 1983, 1989, 2002, Hansen & Obermayer 1999, Hansen & al. 1987a, Moberg & Hansen 1986.

### Material and methods

Lichens were collected at numerous sample plots on Upernavik Ø. The collected material, a total of c. 300 specimens of lichens, was studied with Zeiss light microscopes. *Rhizocarpon subareolatum* was photographed with a Wild Photomicroscope M 400. Selected specimens of *Stereocaulon* were identified by means of HPTLC. The material is deposited in the herbarium of the Botanical Museum, University of Copenhagen (C).

### Annotated list of lichens

The following list of lichens presents the results of the author's collection activities. The list cannot be considered representative as regards the genus *Aspicilia* and a number of lecideoid lichens. The lichenicolous fungi of Upernavik are also in need of further investigation. Associated specimens, which are part of closely intermingled specimens, are referred to with bracketed collection numbers of the numbered main specimen. Nomenclature follows Santesson & al. (2004) with some exceptions. Annotations are given as regards the substrate of the lichens. The symbol \* preceding the name indicates that the collection represents a northern range extension of the taxon in W Greenland. Following the collection number, the presence of apothecia or perithecia is indicated by "ap" and "pe", respectively; sterile specimens are indicated by "st".

- \**Acarospora badiofusca* (Nyl.) Th. Fr. – on gneiss, 1003 ap.
- \**Acarospora molybdina* (Wahlenb.) Trevis. – on gneissic seashore rocks, (982) ap, 983 ap.  
Two additional specimens represent the northern distribution limit of the species in W Greenland: Moriussaq (76°47'N, 69°53'W), on granite, 15 m, 3.8.1992, V. Alstrup 925154 & 925426 (C).
- Acarospora sinopica* (Wahlenb.) Körb. – on siliceous stones with limonite coating, (876) ap, 878 ap, (1016) ap.
- Alectoria nigricans* (Ach.) Nyl. – on soil, 790 st, 896 st.
- Alectoria ochroleuca* (Hoffm.) A. Massal. – on soil, 882 st.
- \**Allantoparmelia alpicola* (Th. Fr.) Essl. – on gneiss, 831 st, 844 st, 845 st.
- \**Amygdalaria panaeola* (Ach.) Hertel & Brodo – on gneiss with limonite coating, (874) st.
- \**Arctocetraria andrejevii* (Oksner) Kärnefelt & A. Thell. – among mosses on soil, (912) st.  
Three additional specimens represent the northern distribution limits of the species in W Greenland: Moriussaq (76°47'N, 69°53'W), in *Salix herbacea* community, 10 m, 3.8.1992, V. Alstrup 9203044 (C); Qaanaaq (77°28'N, 69°13'W), on moss in dwarf shrub heath, 50 m, 1.8.1992, V. Alstrup 910908 (C); in blockfield, 50 m, 5.8.1991, V. Alstrup 910915 (C). A fairly typical specimen of *A. simmonsii* has been collected at Savigssivik (Meteorite Island), Melville Bay (76°01'N, 65°05'W), on soil, 20.8.1943, M. Porsild (C).
- Arctocetraria nigricascens* (Nyl.) Kärnefelt & A. Thell. – among mosses on soil, 912 st, 938 st, (968) st.
- Arctoparmelia incurva* (Pers.) Hale – on gneiss together with *Allantoparmelia alpicola*, *Orphniospora moriopsis*, *Rhizocarpon inarense* and *R. jemtlandicum*, 918 st, (965) st.
- Arthrorhaphis alpina* (Schaer.) R. Sant. – on soil, (977) ap.
- Arthrorhaphis citrinella* (Ach.) Poelt – on soil, 929 st.
- \**Aspicilia caesiocinerea* (Nyl. ex Malbr.) Arnold – on gneiss, 997 ap.
- \**Aspicilia mastoidea* (Lynge) Thomson – on gneiss, 867 ap.
- Aspicilia mastrucata* (Wahlenb.) Th. Fr. – on gneiss, 1009 ap.
- Baeomyces placophyllus* Ach. – on clayey soil, (898) ap, (922) ap, (969) ap.
- Baeomyces rufus* (Huds.) Rehb. – on soil, (771) ap, (898) ap.
- \**Bellemeria subsorediza* (Lynge) R. Sant. – on siliceous stones with limonite coating, (1016) st.
- \**Biatora vernalis* (L.) Fr. – on mosses and litter, 821 ap, 903 ap, 914 ap, 932 ap.
- Bryocaulon divergens* (Ach.) Kärnefelt – on soil, 889 st, 939 st, (940) st.
- Bryonora castanea* (Hepp) Poelt – on soil, mosses and litter, 771 ap, (904) ap, 910 ap, 949 ap.
- Bryoria chalybeiformis* (L.) Brodo & D. Hawksw. – on soil, 778 st.
- Bryoria nitidula* (Th. Fr.) Brodo & D. Hawksw. – on soil, 888 st.
- Buellia papillata* (Sommerf.) Tuck. – on mosses and litter, 837 ap, (862) ap, 951 ap, (952) ap, 953 ap.
- Caloplaca alcarum* Poelt – on *Lecanora contractula* on gneissic seashore rocks, (982) ap, 996 ap, (1006) ap.
- Caloplaca ammiospila* (Wahlenb.) H. Olivier – on soil and litter, (942) ap, 948 ap, (1025) ap.
- Caloplaca castellana* (Räsänen) Poelt – on *Placynthium asperellum* on gneiss, (1013) ap.
- Caloplaca cerina* (Ehrh. ex Hedw.) Th. Fr. – on litter and old bone, 915 ap, 954 ap.
- Caloplaca fraudans* (Th. Fr.) H. Olivier – on gneiss, (962) ap, (1004) ap.
- \**Caloplaca nivalis* (Körb.) Th. Fr. – on *Andreaea*, 824 ap.
- Caloplaca psoricida* E. S. Hansen & al. – on *Psora rubiformis* soil, 946 ap. A rare Greenland lichen known so far from Qeqertarsuaq, Upernavik and Qaanaaq in W Greenland and Ittoq-qortoormiit and Fligely in E Greenland (Hansen & al. 1987a).
- Caloplaca tetrastora* (Nyl.) H. Olivier – on litter, (862) ap, (904) ap, (947) ap.
- Caloplaca tirolensis* Zahlbr. – on litter and old bone (915) ap, 942 ap.
- Candelariella dispersa* (Räsänen) Hakul. – on *Placynthium asperellum* on gneiss, 936 ap.
- Candelariella placodizans* (Nyl.) H. Magn. – on soil, 913 st, 930 st, 973 ap

- Candelariella vitellina* (Hoffm.) Müll. Arg. – on gneiss, (926) st, 987 st, (992) ap.  
*Candelariella xanthostigma* (Ach.) Lettau – on dead mosses, 993 ap.  
*Catapyrenium cinereum* (Pers.) Körb. – on soil, (1025) pe.  
*Cetraria islandica* (L.) Ach. – on soil, 780 st, 811 st, 940 st, 1021 st.  
*Cetraria muricata* (Ach.) Eckfeldt – on soil, 890 st.  
*Cetraria nigricans* Nyl. – on soil, 883 st, (968) st.  
*Cetrariella delisei* (Bory ex Schaer.) Kärnefelt & A. Thell. – on soil, 826 st.  
 \**Cladonia acuminata* (Ach.) Norrl. – on soil, 1033 st.  
*Cladonia alaskana* A. Evans – on soil, 818 st.  
*Cladonia amaurocraea* (Flörke) Schaer. – on soil and litter, 779 st, 793 st, 884 st.  
*Cladonia bellidiflora* (Ach.) Schaer. – on soil and litter, 768 ap, 781 ap, 891 st.  
*Cladonia borealis* S. Stenroos – on soil and litter, 771 st, 802 st, (899) st.  
*Cladonia cenotea* (Ach.) Schaer. – on soil, 1024 st.  
*Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng. – on soil and litter, 771 st, 862 st.  
*Cladonia cyanipes* (Sommerf.) Nyl. – on litter, 792 st, 814 st.  
*Cladonia fimbriata* (L.) Fr. – on soil and litter, 797 st, (970) st.  
*Cladonia gracilis* (L.) Willd. – on soil and litter, 800 st, 819 st, 897 st.  
*Cladonia macrophylla* (Schaer.) Stenh. – on soil and mosses, 901 st.  
 \**Cladonia macrophyllodes* Nyl. – on soil, 827 st.  
*Cladonia mitis* Sandst. – on soil and mosses, 785 st, 895 st.  
*Cladonia phyllophora* Hoffm. – among mosses on soil, (774) st.  
*Cladonia pleurota* (Flörke) Schaer. – among mosses on soil, 770 ap.  
*Cladonia pyxidata* (L.) Hoffm. – on litter, (861) st.  
*Cladonia squamosa* Hoffm. – on soil, 779 st, (816) st, 905 st.  
 \**Cladonia stygia* (Fr.) Ruoss – among mosses on soil, 764 st.  
 \**Cladonia trassii* Ahti – on soil and litter, 798 st, (970) st.  
*Collema undulatum* var. *granulosum* Degel. – among mosses on soil, 1029 st.  
  
*Dactylina ramulosa* (Hook. f.) Tuck. – among mosses on soil and on litter, 845 st, (928) st.  
*Dimelaena oreina* (Ach.) Norman – on gneiss, 1000 ap, 1004 st  
  
 \**Epilichen scabrosus* (Ach.) Clem. – on *Baeomyces placophyllus* and *B. rufus* on soil, (771) ap, (898) ap, (922) ap, (969) ap.  
  
*Flavocetraria cucullata* (Bellardi) Kärnefelt & A. Thell. – on soil, 791 st, 808 st.  
*Flavocetraria nivalis* (L.) Kärnefelt & A. Thell. – on soil, 782 st, (787) st, (881) st.  
 \**Fruitedella caesioatra* (Schaer.) Kalb. – on soil and mosses, (838) ap, 955 ap.  
  
*Lecanora atosulphurea* (Wahlenb.) Ach. – on gneiss, (857) ap, (999) ap, (1030) ap.  
 \**Lecanora cenisia* Ach. – on siliceous rocks, 843 ap, 866 ap.  
*Lecanora chloroleprosa* (Vain.) H. Magn. – on gneiss, (850) st, 859 st.  
*Lecanora contractula* Nyl. – on gneiss, (982) ap, (996) ap, (1006) ap.  
*Lecanora geophila* (Th. Fr.) Poelt – on soil and mosses, 958 st.  
*Lecanora intricata* (Ach.) Ach. – on gneiss, 848 ap, (934) ap, (999) ap.  
*Lecanora marginata* (Schaer.) Hertel & Rambold – on gneiss, 980 ap.  
*Lecanora polytropa* (Ehrh. ex Hoffm.) Rabenh. – on gneiss, (839) ap, (857) ap, (915) ap, (1010) ap.  
 \**Lecanora swartzii* (Ach.) Ach. subsp. *swartzii* – on siliceous rocks with limonite coating, 876 ap.  
*Lecidea atrobrunnea* (Ramond ex Lam. & DC.) Schaer. – on gneiss, 1002 ap, 1011 ap.  
*Lecidea auriculata* Th. Fr. – on gneiss, 856 ap, 1032 ap.  
*Lecidea lapicida* var. *pantherina* Ach. – on gneiss, 978 ap.  
*Lecidea silacea* Ach. – on siliceous rock with limonite coating, 1014 ap.  
*Lecidea tessellata* Flörke – on gneiss, 850 ap, 862 ap.  
*Lecidella wulfenii* (Hepp) Körb. – on mosses and litter, (885) ap, (977) ap, 1033 ap.  
 \**Lecidoma demissum* (Rutstr.) Goth. Schneid. & Hertel – on soil and mosses, 825 ap, 828 ap, (861) ap. Two additional specimens represent the northern distribution limit of the species

- in W Greenland: Qaanaaq (77°28'N, 69°13'W), on soil, 200 m, 1.8.1991, V. Alstrup 910463 & 2.8.1991, V. Alstrup 910540 (C).
- Lepraria frigida* J. R. Laundon – on mosses and litter, (823) st, 825 st, (834) st.
- Leprocaulon subalbicans* (I. M. Lamb) I. M. Lamb & A. M. Ward – on mosses, 804 st, 834 st, (902) st.
- Leptogium lichenoides* (L.) Zahlbr. – on mosses and soil, (960) st.
- Lichenomphalia alpina* (Britzelm.) Redhead & al. – on mosses on soil, 1027.
- Lobothallia melanaspis* (Ach.) Hafellner – on gneiss, (923) ap, 966 ap.
- Lopadium coralloideum* (Nyl.) Lyngé – on mosses and soil, 810 ap, (821) ap.
- Lopadium pezizoideum* (Ach.) Körb. – on litter, 908 ap.
- Megaspora verrucosa* (Ach.) Hafellner & V. Wirth – on litter, 976 ap.
- Melanelia hepatizon* (Ach.) A. Thell. – on siliceous rocks, (769) st, 838 st, 853 st, 974 st.
- Melanelia infumata* (Nyl.) Essl. – on gneiss, (956) st.
- \**Miriquidica atrofulva* (Sommerf.) A. J. Schwab & Rambold – on siliceous rocks with limonite coating, 858 st, 871 st, (875) st, (1016) st, (1017) st.
- Miriquidica nigroleprosa* (Vain.) Hertel & Rambold – on siliceous rocks with limonite coating, 868 ap, (875) ap.
- Myxobilimbia lobulata* (Sommerf.) Hafellner – on soil, 1022 ap.
- Ochrolechia frigida* (Sw.) Lyngé – on soil, litter and mosses, 775 st, 885 ap, 816 ap, 907 ap, 926 ap.
- Ochrolechia grimmiae* Lyngé – on *Racomitrium lanuginosum*, 941 ap.
- Ochrolechia lapuensis* (Räsänen) Räsänen – on litter, (827) st, (928) st.
- Ophioparma ventosa* (L.) Norman – on gneiss, 842 ap, 920 st, 1026 ap.
- Orphniospora moriopsis* (A. Massal.) D. Hawksw. – on gneiss, 839 ap, (852) ap, 855 ap, (965) ap.
- Parmelia omphalodes* (L.) Ach. – on gneiss, (769) st, (937) st.
- Parmelia saxatilis* (L.) Ach. – on gneiss, 832 st, 991 st, 1007 st.
- Peltigera aphthosa* (L.) Willd. – among mosses on soil, 795 st.
- Peltigera didactyla* (With.) J. R. Laundon – on mosses and litter, 836 st.
- Peltigera leucophlebia* (Nyl.) Gyeln. – among mosses on soil, 894 st, (975) st.
- Peltigera malacea* (Ach.) Funck – on mosses and litter, 766 st, 787 ap, 812 st.
- Peltigera rufescens* (Weiss) Humb. – on mosses on soil, 765 st.
- Peltigera scabrosa* Th. Fr. – on mosses and litter, 784 st, 893 st, (975) st.
- Peltigera venosa* (L.) Baumg. – on soil and mosses, 960 ap.
- \**Pertusaria bryontha* (Ach.) Nyl. – on mosses, 803 ap, 909 ap.
- Pertusaria coriacea* (Th. Fr.) Th. Fr. – on mosses and litter, 833 ap, 931 ap.
- Pertusaria dactylina* (Ach.) Nyl. – on litter, 923 st.
- Pertusaria geminipara* (Th. Fr.) C. Knight ex Brodo – on mosses and litter, 906 st.
- Pertusaria oculata* (Dicks.) Th. Fr. – on soil, 813 st.
- Phaeophyscia sciastra* (Ach.) Moberg – on gneiss, (934) st, 1023 st.
- Physcia caesia* (Hoffm.) Fürnr. – on gneiss, (964) st, (990) st.
- Physcia dubia* (Hoffm.) Lettau – on gneiss, (963) st, 964 st.
- \**Physcia tenella* var. *marina* (E. Nyl.) Lyngé – on gneiss, (982) st. An additional specimen represents the northern distribution limit of the species in W Greenland: Qaanaaq (77°28'N, 69°13'W), on soil on sea-cliff, 10 m, 18.7.1992, V. Alstrup 920212 (C).
- Physconia muscigena* (Ach.) Poelt – on mosses and litter, (937) st, 952 st, 985 st.
- Placynthium asperellum* (Ach.) Trevis. – on gneiss, (915) st, 934 ap, 936 st, (1013) st.
- Pleopsidium chlorophanum* (Wahlenb.) Zopf – on gneiss, 959 st.
- Porpidia flavocoerulescens* (Hornem.) Hertel & A. J. Schwab – on siliceous rocks with limonite coating, 873 ap, 1015 ap.
- Porpidia melinodes* (Körb.) Gowan & Ahti – on gneiss, 879 st, 880 st, 919 st.
- Protoparmelia badia* (Hoffm.) Hafellner – on gneiss, 840 ap, (875) ap.
- Pseudophebe minuscula* (Nyl. ex Arnold) Brodo & D. Hawksw. – on gneiss, 830 st.

*Psora rubiformis* (Ach.) Hook. – on soil, 925 ap, (946) ap.

*Psoroma tenue* Henssen – on mosses and litter, 823 ap, (951) ap.

*Rhizocarpon bolanderi* (Tuck.) Herre – on siliceous rocks, 846 st, 981 st.

*Rhizocarpon eupetraeoides* (Nyl.) Blomb. & Forssell – on gneiss, 864 ap.

*Rhizocarpon geminatum* Körb. – on siliceous rock, (917) ap, 847 ap, (851) ap.

*Rhizocarpon geographicum* (L.) DC. – on gneiss, 935 st, 1001 st.

*Rhizocarpon grande* (Flörke) Arnold – on gneiss, 841 ap, 852 ap, 921 ap.

*Rhizocarpon hochstetteri* (Körb.) Vain. – on gneiss, (919) ap.

*Rhizocarpon inarense* (Vain.) Vain. – on gneiss, 849 ap, 863 ap.

\**Rhizocarpon jemtlandicum* (Malme) Malme – on gneiss, 844 ap, 870 ap, 916 ap, 979 ap.

***Rhizocarpon subareolatum*** E. S. Hansen, **sp. nov.** – Holotype: Greenland, Upernavik, 72°48'N, 56°09'W, on *Rhizocarpon grande* on siliceous rock, 31.7.1989, Hansen 852 (C) – Fig. 2.

Thallus crustaceus, parvus, areolatus, in *Rhizocarpon grande* parasitatur. Areolae 0.5-1.5 mm in diametro, rotundatae vel lunares, plus minusve convexae, flavae, leves, hebetes; 1-2-3 areolae in apothecio affixae. Medulla K+, I+ violacea. Apothecia usque ad 1 mm lata, convexa, superficiem minute papillatam et marginem tenuem et persistentem habentia. Epihymenium, excipulum et hypothecium brunnea, hymenium hyalinum vel virellum c. 130 µm altum. Asci clavati c. 120 × 22 µm, octospori. Ascospores late ellipsoideae, muriformes, multiseptatae, fuscae, 22-32 × 12-16 µm.

Thallus crustose, small, areolate, parasitic on *Rhizocarpon grande*. Areoles 0.5-1.5 mm in diameter, roundish to crescent-shaped, ± convex, whitish yellow, smooth, dull; one to three areoles attached to each apothecium. Medulla K-, I+ violet. Apothecia to 1 mm broad, convex with a minutely papillate surface; margin thin, persistent. Epihymenium, exciple and hypothecium dark

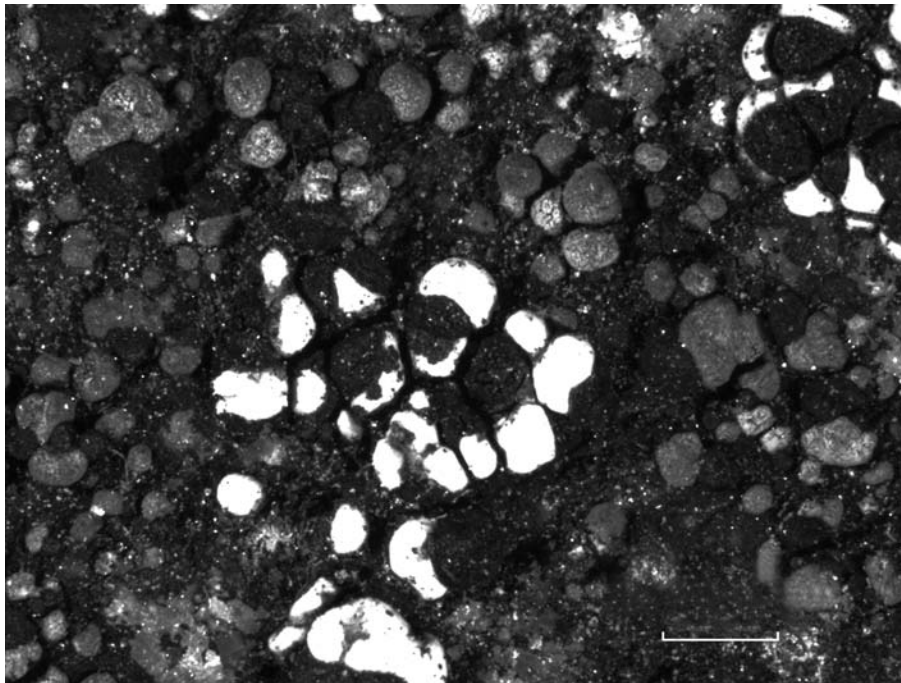


Fig. 2. *Rhizocarpon subareolatum* – holotype; thallus areoles and apothecia on the host thallus. – Scale bar = 1 mm.

brown, *hymenium* hyaline to greenish, c. 130 µm high. *Asci* clavate, c. 120 × 22 µm, 8-spored. *Ascospores* broadly ellipsoid, muriform with many septa, dark brown, 22–32 × 12–16 µm.

*Rhizocarpon subareolatum* is closely related to *R. ferax* and *R. lecanorinum*, but differs from these species by its parasitic habit. In addition it lacks a hypothallus. *R. ferax* and *R. lecanorinum* grows on alkaline rocks and siliceous rocks influenced by mineral dust. The medulla of the somewhat similar, parasitic species, *R. viridiatrum*, reacts I-, and this species lacks the characteristic crescent-shaped areolae. – *Additional specimen*: NE Greenland, Scoresby Sund, Danmarks Ø, c. 70°30'N, 26°10'W, on *Rhizocarpon grande*, 6.1892, N. Hartz (C).

\**Rhizocarpon viridiatrum* (Wulfen) Körb. – on gneiss, (921) ap, (1017) ap. The species grows parasitically on the thallus of *Tremolecia atrata* (Runemark 1956). *R. viridiatrum* is rare in Greenland (Thomson 1997).

*Rinodina mniaraea* (Ach.) Körb. var. *mniaraea* – on soil, 771 ap.

*Rinodina turfacea* (Wahlenb.) Körb. – on litter, 822 ap, (862) ap, (942) ap.

*Solorina crocea* (L.) Ach. – on soil, 767 ap, 783 ap, 927 ap, 972 ap, 1018 ap. No. 927 and 972 are infested by *Rhagadostoma lichenicola* (De Not.) Keissl.

*Sphaerophorus fragilis* (L.) Pers. – on soil, 969 st, 809 st. The usual substrate of the species is rocks and boulders.

*Sphaerophorus globosus* (Huds.) Vain. – on soil and mosses, (906) st, (911) st.

*Sporastatia polyspora* (Nyl.) Grunmann – on gneiss, (856) ap, 879 ap.

*Sporastatia testudinea* (Ach.) A. Massal. – on gneiss, (849) ap, 967 ap, 998 ap.

*Stereocaulon alpinum* Laurer – on soil and litter, 774 st, 776 st, 786, 796 ap, 1020 st. Thallus contains atranorin (HPTLC).

*Stereocaulon arenarium* (L. I. Savicz) I. M. Lamb – on soil, 804 st, 900 st. Thallus contains atranorin (HPTLC).

*Stereocaulon botryosum* Ach. – on gneiss, 773 st, 789 st, 815 st, 937 st.

*Stereocaulon glareosum* (L. I. Savicz) H. Magn. – on gravel and soil, 794 st, (861) st, 899 st, 911 st. Thallus contains atranorin (HPTLC).

*Stereocaulon vesuvianum* Pers. – on soil among stones, 772 st. Thallus contains atranorin and stictic acid (HPTLC). An additional specimen represents the northern distribution limit of the species in W Greenland: Qaanaaq (77°28'N, 69°13'W), at inland ice, 7.8.1992, V. Alstrup 920442 (C). Subfossil material of *S. vesuvianum* is available from Qaanaaq.

*Thamnia vermicularis* var. *subuliformis* (Ehr.) Schaer. – on soil and mosses, (881) st, 1028 st.

\**Trapeliopsis granulosa* (Hoffm.) Lumbsch – on soil and litter, 827 st, (861) st. An additional specimen represents the northern distribution limit of the species in W Greenland: Qaanaaq (77°28'N, 69°13'W), on moss on moraine slope, 25 m, 5.8.1991, V. Alstrup 920690 (C).

*Tremolecia atrata* (Ach.) Hertel – on siliceous rocks with limonite coating, (871) ap, (874) ap, 986 ap, (1014) ap, (1017) ap.

*Umbilicaria arctica* (Ach.) Nyl. – on gneiss, 944 st, 988 ap, 1019 ap.

*Umbilicaria decussata* (Vill.) Zahlbr. – on gneiss, 971 st, 994 st.

*Umbilicaria hyperborea* (Ach.) Hoffm. – on gneiss, 806 ap, (957) st.

*Umbilicaria lyngei* Schol. – on gneiss, 886 ap, 961 ap.

*Umbilicaria proboscidea* (L.) Schrad. – on gneiss, 820 ap.

*Umbilicaria torrefacta* (Lightf.) Schrad. – on siliceous rocks with limonite coating, 838 ap, 851 ap, (1016) st.

*Umbilicaria virginis* Schaer. – on gneiss, 777 ap, 807 ap, 887 ap.

*Verrucaria ceuthocarpa* Wahlenb. – on gneissic seashore rocks, 1005 pe.

*Vestergrenopsis isidiata* (Degel.) Å. E. Dahl – on gneiss, 945 st.

*Xanthoria candelaria* (L.) Th. Fr. – on gneiss, (956) st, 963 st, (990) st.

*Xanthoria elegans* (Link) Th. Fr. – on gneiss, 963 st, 982 ap.

*Xanthoria sorediata* (Vain.) Poelt – on gneiss, 917 st, 943 st.

### Discussion

Of the 167 lichens reported in the present study 65 taxa are terricolous, 65 saxicolous and the remaining either muscicolous or lichenicolous. A few occur on other substrates such as old bones. Many lichens have comparative low substrate specificity and accordingly grow on different substrates, for example, soil, litter and mosses. Lichenicolous fungi are not dealt with in the present paper apart from some taxa with independent lichen thallus such as *Caloplaca castellana* and *Epilichen scabrosus*. In a late growth phase a number of these species, for example, *Caloplaca alcarum* and *Rhizocarpon viridiatrum*, are able to survive without their host in a purely autonomous state. In the following, some selected plant communities more or less rich in lichens are described.

*A. Terricolous vegetation.* – Different types of snow bed communities more or less rich in lichens are widely distributed on Upernavik Ø indicating that the terricolous vegetation on the island is strongly influenced by its low arctic, oceanic climate. The snow beds occur at all altitudes up to 150 m, but are generally best developed on N facing slopes in the lowland. A rocky ledge near the settlement holds a mixed snow bed – heath vegetation with *Carex bigelowii*, *Cassiope tetragona*, *Harrimanella hypnoides*, *Loiseleuria procumbens* and the dominant *Salix herbacea* as the most important phanerogams. The following lichens occur in this association: *Cetraria islandica*, *Cetrariella delisei*, *Cladonia borealis*, *C. mitis*, *C. pyxidata*, *C. stygia*, *C. trassii*, *Flavocetraria cucullata*, *F. nivalis*, *Ochrolechia frigida*, *Peltigera aphthosa*, *P. didactyla*, *Pertusaria oculata*, *Psoroma tenue*, *Solorina crocea* (dominant), *Sphaerophorus globosus*, *Stereocaulon alpinum* and *Thamnolia vermicularis*. Part of the ledge is evidently covered by a thick layer of snow during winter, while another part is more wind exposed and with lesser snow in the winter period.

An E facing snow bed-like community dominated by *Cassiope* and with *Harrimanella*, *Salix herbacea* and *Silene acaulis* occurs at c. 70 m in a hilly area. It contains lichens such as *Cetraria islandica*, *Cladonia amaurocraea*, *C. mitis*, *C. pyxidata*, *Flavocetraria nivalis*, *Ochrolechia frigida*, *Peltigera malacea*, *Pertusaria oculata*, *Psoroma tenue* and *Sphaerophorus globosus*. More typical *Salix herbacea* snow beds with lichens such as *Cetrariella delisei*, *Cetraria islandica*, *Cladonia bellidiflora*, *C. borealis*, *C. mitis*, *C. trassii*, *Dactylina ramulosa*, *Ochrolechia frigida*, *Pertusaria oculata*, *Psoroma tenue* and *Stereocaulon alpinum* are very common on Upernavik Ø. *Salix herbacea* covers up to 50 % and *Carex bigelowii* 5 % in these snow beds. *Cassiope* and *Salix herbacea* form a characteristic vegetation mosaic together with lichens such as *Cladonia mitis*, *Flavocetraria cucullata* and *F. nivalis* on tops partly exposed to strong winds. Similar mixed snow beds also occur in other parts of Greenland, for example SE Greenland (Hansen 1978).

A snow bed-like vegetation composed exclusively by lichens and mosses, for example, *Racomitrium lanuginosum*, was found at c. 100 m. It consists of the following lichens: *Alectoria nigricans*, *Arthrorhaphis alpina*, *Cetraria islandica*, *C. islandica*, *Dactylina arctica*, *Ochrolechia grimmiae*, *Pertusaria dactylina*, *P. oculata* and *Solorina crocea*. Most of the microlichens mentioned are pioneers on bare soil. Two comparatively rare lichens, viz. *Arctocetraria nigricascens* and *Lecanora geophila*, occur c. 10 m above this place (at 110 m altitudes).

*Empetrum hermaphroditum-Vaccinium uliginosum* heaths cover large areas along the coast of Upernavik Ø, but patches with this vegetation can also be found at altitudes above 100 m in the middle of the island. The community, which is best developed on N facing habitats such as rocky ledges, is characterized by the following lichens: *Alectoria nigricans*, *A. ochroleuca* (dominant at some sites), *Cetraria muricata*, *Cladonia amaurocraea*, *C. borealis*, *C. mitis*, *C. pyxidata*, *C. stygia*, *Flavocetraria cucullata*, *F. nivalis*, *Ochrolechia frigida*, *Sphaerophorus globosus* and *Thamnolia vermicularis*. This heath type is widely distributed along the coasts of Greenland (Hansen 1995). The *Empetrum-Vaccinium uliginosum* heaths are characterized by being covered by a thin layer of snow during winter allowing diaspores – usually thallus fragments and whole thalli – to be detached and transported over long distances by the wind.

The soil conditions prevailing on Upernavik Ø are acid. Therefore it was a little surprising to find a well developed *Dryas integrifolia* heath with lichens preferring neutral-alkaline soil. The



community is probably influenced by an adjacent basic dyke or similar rocks just as it can be observed in, for example, SE Greenland (Hansen 1978). *Dryas* is the dominant dwarf shrub species in the community, which occurs on a N facing rocky ledge at 120 m, while *Silene acaulis* and *Carex nardina* occur less abundantly. This community contains the following lichens: *Alectoria nigricans*, *A. ochroleuca*, *Cetraria islandica*, *Cladonia amaurocaea*, *Flavocetraria cucullata*, *F. nivalis* (dominant), *Ochrolechia frigida*, *Peltigera venosa*, *Sphaerophorus globosus*, *Stereocaulon alpinum* and *Thamnolia vermicularis*. This composition of the species indicates that the habitat is almost free of snow during winter.

**B. Saxicolous vegetation.** – The numerous gneissic boulders occurring in the lowland support a characteristic vegetation of epilithic lichens known from most other parts of Greenland (Hansen 1995). *Parmelia saxatilis* and *Sphaerophorus fragilis* or *Orphniospora moriopsis* are often the dominant species on the top face. *Allantoparmelia alpicola*, *Arctoparmelia incurva*, *Aspicilia mastrucata*, *Lecanora atrosulphurea*, *Melanelia hepatizon*, *Ophioparma ventosa*, *Parmelia omphalodes*, *Pseudephebe minuscula*, *Umbilicaria hyperborea*, *U. proboscidea*, *U. torrefacta* and *U. virginis* are additional more or less common lichens on the boulders. *Lecanora atrosulphurea* is comparatively common on siliceous boulders at Qaanaaq. Its distribution in Greenland has previously been outlined by Hansen (1984) and Thomson (1997). Gneissic rocks occurring above 100 m hold epilithic vegetation consisting of somewhat fewer species, for example, *Pseudephebe minuscula*, *Rhizocarpon geographicum*, *R. grande*, *R. inarense*, *Stereocaulon vesuvianum* and *Umbilicaria lyngei*. *Lecanora chloroleprosa* and *Stereocaulon botryosum* are restricted to moist rock faces.

Limonite-covered gneissic rocks hold an interesting vegetation dominated by lichens with a rust-red or ochreous thallus such as *Acarospora sinopica*, *Lecidea silacea*, *Miriquidica atrofulva*, *Porpidia flavocaerulescens*, *P. melinodes* and *Tremolecia atrata* (dominant). The last mentioned species has a wide vertical distribution on Upernavik Ø and occurs both immediately above the coastal *Verrucaria ceuthocarpa* belt and on the highest tops on the island. *Lecanora polytropa* and *Umbilicaria torrefacta* also occur frequently on these more or less iron-rich rocks.

The rich bird life of Upernavik Ø, in particular gulls and other sea birds, favours via the produced guano the nitrophilous lichen flora on the rocks. Seashore rocks hold a characteristic vegetation consisting of lichens such as *Acarospora molybdina*, *Caloplaca alcarum*, *Dimelaena oreina*, *Lecanora contractula*, *Physcia caesia*, *P. dubia*, *P. tenella* var. *marina*, *Rhizocarpon geminatum*, *Umbilicaria arctica*, *U. decussata*, *Xanthoria candelaria* and *X. elegans* (dominant). *Tremolecia atrata* sometimes forms mosaic vegetation with these species. The nitrophilous lichen vegetation on projecting rocks and boulders at some distance from the coast is usually dominated by *Xanthoria elegans*, but species such as *Melanelia infumata*, *Parmelia saxatilis*, *Phaeophyscia sciastra* and *Umbilicaria hyperborea* also occur on these rocks. *Placynthium asperellum*, *Vestergrenopsis isidiata* and *Xanthoria soredata* are restricted to moist, vertical rock faces.

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