Lichens from Johannes V. Jensen Land, N Greenland, the northermost arctic land area

Author: Hansen, Eric Steen

Source: Willdenowia, 39(1) : 179-186

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.39.39119

ERIC STEEN HANSEN[1]

Lichens from Johannes V. Jensen Land, N Greenland, the northermost arctic land area

Abstract

Hansen E. S.: Lichens from Johannes V. Jensen Land, N Greenland, the northermost arctic land area. – Willdenowia 39: 179-186. – Online ISSN 1868-6397; © 2009 BGBM Berlin-Dahlem.
doi:10.3372/wi.39.39119 (available via http://dx.doi.org/)

165 taxa of lichens are reported from three localities in Johannes V. Jensen Land in N Greenland. Their associations are briefly indicated. *Cladonia libifera* and *Parmelia skultii* are new to Greenland. 130 taxa are new to Johannes V. Jensen Land. Geology and climate of the area are described. The lichen flora is fairly rich in spite of the extremely unfavourable climatic conditions prevailing in this northernmost land area on earth.

Additional key words: Arctic, lichenized fungi, *Parmelia skultii,* lichen diversity, lichen ecology

Introduction

Lichenological exploration was undertaken by the author at the north coast of Greenland in late July and August 2007. The field work was carried out as part of the Long Term project, which is an IPY (International Polar Year 2007-08) activity. The aim of Long Term is to investigate climatic and environmental change along the coasts of N Greenland over the Holocene period.

The investigated localities are situated in Johannes V. Jensen Land, which is separated from Peary Land by Frederick E. Hyde Fjord and represents the northermost land area on earth. The central part of Johannes V. Jensen Land is covered by extensive ice caps and glaciers. The mountains rise to altitudes of c. 1500-1800 m. Quaternary deposits with numerous glacial erratic boulders are widely distributed along the coast, while different metamorphic rocks dominate in the inland. The annual mean temperature and the summer mean temperature is -19 °C and 0.2 °C, respectively, at Kap Morris Jesup (Bay 1992). The winters are very cold. The annual precipitation is somewhat higher than that of southernmost Peary Land, which is a true arctic desert. Most of the precipitation is falling as snow.

With its high-arctic climate Johannes V. Jensen Land is among the most inhospitable and inaccessible areas in the arctic, and it is therefore no matter for surprise its lichen flora has been almost totally unknown until recently. The physician Roderich Corner collected lichens in the Frigg Fjord area in the southern part of Johannes V. Jensen Land during a British expedition in the summer of 1995. The material, which contains 41 species of lichens, has recently been published by the author (Hansen 2008). Olivier Gilg, Francheville, France, collected a few lichens on Kaffeklubben Ø in July 2007. This small island is situated in M C Kinley Hav about 2 km from the coast. They were handed over to the author for determination and are included in the present paper.

Somewhat better explored is the southerly adjacent Peary Land. The Swedish botanist Thorild Wulff collected 64 lichen taxa in the westernmost part of that region at c. 83°N in June 1917 (Lynge 1923). In the summer of 1988 the author collected about 90 taxa of lichens in the Jørgen Brønlund Fjord area in southern Peary Land (Hansen 1995a). Holmen (1957) and Bay

1 Natural History Museum of Denmark, Botanical Museum, University of Copenhagen, Gothersgade 130, 1123 Copenhagen K, Denmark; e-mail: erich@sum.ku.dk

(1992) have outlined the previous botanical work in Peary Land.

Material and methods

The following three localities in Johannes V. Jensen Land were investigated in the summer 2007 (Fig. 1): I. Kap Morris Jesup, 83°39'N, 33°22'W, 26.-31.7.2007 (E. S. Hansen); II. Constable Bugt, 83°34'N, 32°01'W, 1.-22.8.2007 (E. S. Hansen); III. Kaffeklubben Ø, 83°39'N, 30°37'W, 5.7.2007 (O. Gilg).

Lichens were collected at numerous sample plots at Kap Morris Jesup and Constable Bugt and at a few plots on Kaffeklubben Ø. The collected material, a total of c. 550 specimens of lichens, was studied with Zeiss light microscopes. Selected specimens of *Cladonia, Hypogymnia* and *Lepraria* were identified by means of TLC, and a collection of *Parmelia skultii* was checked with DNA technique. The material is deposited in the herbarium of the Botanical Museum, University of Copenhagen (C). 14 lichen species are being distributed with fascicle 31 of "Lichenes Groenlandici Exsiccati" (LGE).

Annotated list of lichens

The following list of lichens presents the results of the author's collection activities. About 10 specimens collected by O. Gilg are include. The list cannot be considered representative as regards *Aspicilia* and a number of lecideoid lichens. The lichenicolous fungi of Johannes V. Jensen Land and Peary Land 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. An asterisk (*) preceding the name indicates that the taxon is an addition to the known lichen flora of Johannes V. Jensen Land. 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. – II: on siliceous rock, *415* ap.

**Acarospora fuscata* (Schrad.) Th. Fr. – II: on siliceous rock, *347* ap.

**Acarospora molybdina* (Wahlenb.) A. Massal. – II: on siliceous rock with limonite coating, *205* st.

**Acarospora rhizobola* (Nyl.) Alstrup – II: on mineral soil, *348* ap.

**Acarospora sinopica* (Wahlenb.) Körb. – II: on siliceous rock with limonite coating, *(205)* ap.

**Alectoria nigricans* (Ach.) Nyl. – I: on soil, *86* st, *99* st, *135* st; II: on soil, *212* st, *274* st, *308* st, *456* st, *511* st.

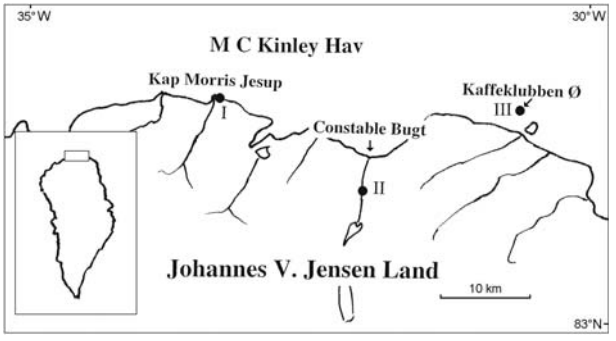

Fig. 1. The investigated localities in N Greenland – I. Kap Morris Jesup; II. Constable Bugt; III. Kaffeklubben Ø.

Alectoria ochroleuca (Hoffm.) A. Massal. – I: on soil, *136* st; II: on soil, *211* st, *319* st, *408* st.

**Amandinea punctata* (Hoffm.) Coppins & Scheid. – II: on soil, *257* ap.

**Arctocetraria nigricascens* (Nyl.) Kärnefelt & A. Thell – I: among mosses on soil, *90* st. – The species is restricted to the northernmost parts of Greenland (Hansen 1995b).

**Arthrorhaphis alpina* (Schaer.) R. Sant. – I: on mineral soil, *143* st; II: on mineral soil, *354* st, *416* st.

**Arthrorhaphis citrinella* (Ach.) Poelt – II: on mosses and mineral soil, *213* st, *473* st.

**Aspicilia candida* (Anzi) Hue – I: on siliceous rock, *130* ap; II: on siliceous rocks, *305* ap, *391* ap, *(398)* ap. – The species is restricted to rocks with high contents of calcium (Brodo & al. 2001; Thomson 1997).

**Baeomyces carneus* Flörke – I: on clayey soil, *160* st; II: on mineral soil, *447* st, *477* st, *502* st.

**Baeomyces rufus* (Huds.) Rebent. – II: on mineral soil, *294* st.

**Bellemerea subsorediza* (Lynge) R. Sant. – I: on siliceous rock, *(76)* st.

Brodoa oroarctica (Krog) Goward – I: on siliceous rocks, *67* st, *110* st, *125* st; II: on siliceous rocks, *194* st, *238* st, *240* st, *250* st, *313* st, *(364)* st, *433* st, *479* st, *496* st, *526* st.

**Bryocaulon divergens* (Ach.) Kärnefelt – I: on soil, *(86)* st, *(136)* st; II: *309* st, *409* st, *(468)* st.

**Bryonora castanea* (Hepp) Poelt – I: on soil, *146* ap.

Bryoria chalybeiformis (L.) Brodo & D. Hawksw. – I: on soil, *95* st; II: on soil, *310* st, *(315)* st, *410* st, *455* st, *504* st, *512* st.

**Buellia papillata* (Sommerf.) Tuck. – I: on litter, *158* ap; II: on soil, mosses and litter, *259* ap, *281* ap, *(282)* ap, *356* ap.

**Caloplaca alcarum* Poelt – I: on siliceous rock together with *Lecanora contractula, 80* ap; II: on old musk ox bone, *(362)* ap.

**Caloplaca castellana* (Räsänen) Poelt – I: on *Rhizocarpon geminatum* on siliceous rock, *72* ap; II: on *R. geminatum* on siliceous rock with limonite coating, *393* ap.

**Caloplaca cerina* (Ehrh. ex Hedw.) Th. Fr. – I: on mosses, litter and old bone, *(41)* ap, *82* ap, *(105)* ap, *(148)* ap; II: on mosses, litter, dead twig of *Salix arctica* and old bone, *(224)* ap, *(293)* ap, *(332)* ap, *(363)* ap, *(489)* ap, *525* ap.

**Caloplaca jungermanniae* (Vahl) Th. Fr. – II: on soil, *381* ap.

**Caloplaca magni-filii* Poelt – I: on *Miriquidica nigroleprosa* on siliceous rock, *(122)* ap. – Most previous collections of *C. magni-filii* are from the central parts of W and E Greenland (Hansen & al. 1987).

**Caloplaca tetraspora* (Nyl.) H. Olivier – II: on mosses and litter, *282* ap, *(331)* ap, *352* ap.

Caloplaca tiroliensis Zahlbr. – I: on mosses, litter and dry animal droppings, *41* ap, *105* ap, *106* ap, *159* ap; II: on mosses, litter, twig of *Salix arctica* and musk ox excrements, *224* ap, *(228)* ap, *229* ap, *276* ap, *332* ap, *440* ap, *489* ap, *514* ap.

**Caloplaca tominii* L. I. Savicz – I: on mineral soil, *(28)* st; II: on mineral soil and litter, *226* st; *394* st.

**Candelariella aurella* (Hoffm.) Zahlbr. – II: on old bone of musk oxen, *(362)* ap, *(363)* ap.

**Candelariella dispersa* (Räsänen) Hakul. – II: on *Placynthium asperellum* on siliceous rock, *414* ap.

**Candelariella placodizans* (Nyl.) H. Magn. – I: on soil, mosses and litter, *37* st, *(91)* st, *93* st, *108* st, *146* st; II: on soil, mosses and litter, *(220)* st, *270* ap, *(282)* st, *293* st, *462* st.

Candelariella terrigena Räsänen – I: on mineral soil, *(28)* ap; II: on soil, *(239)* st, *(334)* ap, *490* st.

**Candelariella vitellina* (Hoffm.) Müll. Arg. – I: on siliceous rocks, *(13)* ap, *15* ap, *(78)* ap; II: on siliceous rocks, *(200)* st, *(240)* ap, *(347)* ap, *(454)* ap; III: on siliceous stones, *(543)* st, *546* ap.

**Candelariella xanthostigma* (Ach.) Lettau – II: on animal droppings, *351* st, *(489)* st.

**Catapyrenium cinereum* (Pers.) Körb. – II: on soil, *235* st, *322* pe.

**Cetraria islandica* (L.) Ach. – I: among mosses on soil, *63* st, *170* st; II: among mosses on soil, *424* st, *450* st, *460* st, *(476)* st, *(492)* st.

Cetraria muricata (Ach.) Eckfeldt – I: among mosses on soil, *87* st, *134* st; II: among mosses on soil, *(233)* st, *271* st, *(310)* st, *312* st, *(471)* st, *503* st, *(512)* st, *(528)* st.

Cetrariella delisei (Bory ex Schaer.) Kärnefelt & A. Thell – I: among mosses on soil, *84* st, *(87)* st, *96* st, *163* st, *173* st; II: among mosses on soil, *233* st, *371* st, *372* st.

**Cladonia alaskana* A. Evans – II: among mosses on soil, *461* st, *468* st, *470* st. – Thallus contains usnic acid (TLC). The species has a scattered distribution in NW and N Greenland (Hansen 1989,1997, 2007).

**Cladonia borealis* S. Stenroos – I: among mosses on soil, *103* st, 187 st; II: among mosses on soil, *277* st, *315* st, *(330)* st. – Thallus contains usnic acid and barbatic acid (TLC).

**Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng. – II: on soil, *216* st.

**Cladonia galindezii* Øvstedal – II: on mosses, *217* st. – The species has been rarely reported from Greenland (Bültmann & Lüntherbusch 2008).

**Cladonia libifera* L.I. Savicz – II: on mosses and soil, *421* st. – The species is similar to *C. pyxidata* (Zhurbenko & Ahti 2005).

Cladonia pocillum (Ach.) Grognot – I: among mosses on soil, *24* st, *43* st, *(90)* st, *117* st, *140* st; II: among mosses on soil and litter, *215* st, *275* st, *(282)* st, *339* st, *(412)* st, *427* st.

**Cladonia pyxidata* (L.) Hoffm. – II: on soil, (*316* st), *318* st, *476* st. – Thallus contains fumarprotocetraric acid (TLC).

**Cladonia stricta* (Nyl.) Nyl. – II: on mosses and litter, *224* st, *469* st, *507* st. – Thallus contains atranorin (TLC).

Collema substellatum H. Magn. – I: on mineral soil, *(25)* st, *34* st, *46* st; II: on mineral soil including loess, *245* st, *(406)* ap.

Collema undulatum var. *granulosum* Degel. – II: among mosses on soil, *303* st, *321* st, *329* st, *406* st.

**Dacampia hookeri* (Borrer) A. Massal. – I: on soil, *157*.

**Dactylina arctica* (Hook.) Nyl. – I: among mosses on soil, *138* st.

**Dactylina ramulosa* (Hook.) Tuck. – I: among mosses on soil, *83* st, *(90)* st, *97* st, *141* st; II: among mosses on soil, *195* st, *459* st.

**Dimelaena oreina* (Ach.) Norman – II: on siliceous rock, *368* st.

**Diploschistes muscorum* (Scop.) R. Sant. – II: on soil, *227* ap, *248* ap.

**Flavocetraria cucullata* (Bellardi) Kärnefelt & A. Thell – I: among mosses on soil, *(85)* st, *94* st, *161* st; II: among mosses on soil, *(212)* st, *355* st, *377* st, *(450)* st.

Flavocetraria nivalis (L.) Kärnefelt & A. Thell – I: among mosses on soil, *19* st, *85* st, *(104)* st, *137* st; II: among mosses on soil, *252* st, *(455)* st.

**Fulgensia bracteata* (Hoffm.) Räsänen – I: on mineral soil, *21* st, *(48)* st; II: on mineral soil, *214* st, *272* st, *326* ap, *399* st, *418* st, *443* st, *(492)* st, *494* st.

**Fuscopannaria praetermissa* (Nyl.) P. M. Jørg. – II: on mosses, *405* st, *465* st.

**Hypogymnia austerodes* (Nyl.) Räsänen – II: on mosses and soil, *516* st.

Hypogymnia subobscura (Vain.) Poelt – II: on soil, litter and mosses, *247* st, *(298)* st, *353* st, *419* st, *(492)* st, *495* st, *517* st.

**Lecanora atromarginata* (H. Magn.) Hertel & Rambold – I: on siliceous rocks, II ap, *13* ap, *(65)*

ap; II: on siliceous rock, *(526)* ap; III: on siliceous stone, *548* ap.

**Lecanora contractula* Nyl. – I: on siliceous rocks, *8* ap, *(12)* ap, *(80)* ap; II: on siliceous rocks and old musk ox bones, *(200)* ap, *(226)* ap, *(362)* ap, *(363)* ap.

**Lecanora dispersa* (Pers.) Sommerf. – I: on siliceous rock, *(180)* ap.

**Lecanora epibryon* (Ach.) Ach. – I: on soil, litter and mosses, *32* st, *51* ap, *(92)* ap, *111* ap, *151* ap; II: on soil and mosses, *231* ap, *388* ap.

**Lecanora fuscescens* (Sommerf.) Nyl. – II: on twigs of *Salix arctica, 276* ap, *(517)* ap.

**Lecanora geophila* (Th. Fr.) Poelt – II: among mosses on soil, *220* st, *384* st, *(485)* st.

Lecanora hagenii var. *fallax* Hepp – I: on mosses, litter and animal droppings, *(41)* ap, *(105)* ap, *(106)* ap, *(148)* ap, *167* ap; II: on mosses, litter, twigs of *Salix arctica* and animal droppings, *(224)* ap, *(228)* ap, *(296)* ap, *(332)* ap, *400* ap, *(525)* ap.

**Lecanora intricata* (Ach.) Ach. – II: on siliceous rocks, *241* ap, *453* ap; III: on siliceous rock *(545)* ap.

**Lecanora leucococca* Sommerf. – I: on siliceous rock, *(65)* ap.

**Lecanora luteovernalis* Brodo – II: on mineral soil, *234* st, *325* ap.

**Lecanora polytropa* (Ehrh. ex Hoffm.) Rabenh. – I: on siliceous rock, *(868)* ap; II: on siliceous rocks, *376* ap, *(499)* ap.

**Lecanora swartzii* (Ach.) Ach. subsp. *swartzii* – I: on siliceous rocks, *(147)* st, *(175)* st.

**Lecidea atrobrunnea* (Ramond ex Lam. & DC.) Schaer. – I: on siliceous rock, *72* ap; II: on siliceous rock, *206* ap.

**Lecidea auriculata* Th. Fr. – I: on siliceous rocks, *62* ap, *(125)* ap; II: on siliceous rock, *204* ap.

**Lecidea lapicida* var. *pantherina* Ach. – II: on siliceous rock, *(454)* ap.

**Lecidea ramulosa* Th. Fr. – I: on litter, *186* st; II: on soil, *403* st.

Lecidea tesselata Flörke – I: on siliceous rocks, *(5)* ap, *10* ap, *(11)* ap, *17* ap; II: on siliceous rocks, *202* ap, *242* ap

**Lecidella bullata* Körb. – I: on siliceous rocks, *2* ap, *4* ap, *6* ap, *12* ap, *38* ap; II: on siliceous rocks, *264* ap, *379* ap, *522* ap.

**Lecidella euphorea* (Flörke) Hertel – II: on old musk ox bone and twig of *Salix arctica, (363)* ap, *(517)* ap.

**Lecidella stigmatea* (Ach.) Hertel & Leuckert – I: on siliceous rocks, *(8)* ap, *(66)* ap; II: on siliceous rock, *198* ap.

**Lecidoma demissum* (Rutstr.) Gotth. Schneid. & Hertel – II: on soil, *524* ap.

**Lepraria caesioalba* (de Lesd.) J. R. Laundon var. *caesioalba* – II: among mosses on soil, *286*.

**Lepraria caesioalba* var. *groenlandica* L. Saag – I: on mosses on soil, *165*.

**Lepraria eburnea* J. R. Laundon – II: on mosses and soil, *491*.

**Lepraria gelida* Tønsberg & Zhurb. – I: on mosses, *92*.

**Lepraria neglecta* (Nyl.) Erichsen – II: among mosses on soil, *288, 436*.

**Lepraria vouauxii* (Hue) R. C. Harris – II: among mosses on soil, *300, 340*.

Leptogium lichenoides (L.) Zahlbr. – I: on mosses on soil, *53* ap; II: on mosses on soil, *412* st.

**Lichenomphalia alpina* (Britzelm.) Redhead & al. – II: on clayey soil, *463*.

**Lobothallia melanaspis* (Ach.) Hafellner – II: on old musk ox bone, *(363)* ap.

**Lopadium coralloideum* (Nyl.) Lynge – I: on mosses on soil, *149* ap. II: on mosses on soil, *441* ap.

**Massalongia carnosa* (Dicks.) Körb. – II: on mosses on soil, *287* st, *333* st.

**Megaspora verrucosa* (Ach.) Hafellner & V. Wirth – II: on mosses on soil, *389* ap.

Melanelia infumata (Nyl.) Essl. – I: on siliceous rocks, *(80)* st, *(102)* st, *(176)* st; II: on siliceous rocks, *(195)* st, *279* st, *380* st, *396* st, *523* st.

**Melanelia stygia* (L.) Essl. – I: on siliceous rocks, *118* st, *(122)* st; II: on siliceous rocks, *200* st, *464* st.

**Miriquidica garovaglii* (Schaer.) Hertel & Rambold – II: on siliceous rocks, *367* ap, *499* st.

**Miriquidica nigroleprosa* (Vain.) Hertel & Rambold – I: on siliceous rocks, *(67)* st, *(122)* ap, *126* st, *129* st.

**Myxobilimbia lobulata* (Sommerf.) Hafellner – I: on soil and mosses, *185* ap; II: on soil, *295* ap, *383* ap, *385* ap.

**Ochrolechia frigida* (Sw.) Lynge – I: on soil and litter, *91* st, *109* st, *(117)* st; II: on soil and mosses, *232* st.

**Ochrolechia lapuënsis* (Räsänen) Räsänen – I: on litter, *166* st.

**Ochrolechia upsaliensis* (L.) A. Massal. – II: on soil and mosses, *246* ap, *467* ap, *(492)* ap.

**Orphniospora moriopsis* (A. Massal.) D. Hawksw. – I: on siliceous rock, *132* ap.

**Parmelia skultii* Hale – II: among mosses on mineral soil, *254* st, *311* st, *330* st, *411* st, *423* st, *466* st.

**Peltigera didactyla* (With.) J. R. Laundon – II: on mosses on soil, *210* st, *290* st, *530* st.

Peltigera leucophlebia (Nyl.) Gyeln. – I: on mosses on soil, *26* st, *148* ap; II: *208* st, *267* st, *(291)* st, *327* st, *474* st.

**Peltigera malacea* (Ach.) Funck – II: on mosses on soil, *249* st, *255* st, *457* ap, *531* st.

Peltigera rufescens (Weiss) Humb. – I: among mosses on soil, *89* st, *98* st, *172* ap; II: among mosses on soil and litter, *218* st, *291* st, *328* st, *373* st, *458* st, *478* st, *505* st, *520* st.

**Peltigera venosa* (L.) Baumg. – I: on soil, *171* ap.

**Pertusaria coriacea* (Th. Fr.) Th. Fr. – II: on mosses, soil and litter, *236* ap, *273* ap, *323* ap, *370* ap, *435* ap, *471* ap, *492* ap.

**Pertusaria dactylina* (Ach.) Nyl. – II: on soil, *324* ap, *(355)* ap, *449* ap, *475* ap, *515* ap.

**Pertusaria geminipara* (Th. Fr.) C. Knight ex Brodo – I: on mosses on soil, *142* st.

Phaeophyscia sciastra (Ach.) Moberg – I: among mosses on rock, *114* st.

**Phaeorrhiza nimbosa* (Fr.) H. Mayrhofer & Poelt – I: on mineral soil, *28* ap, *48* ap; II: on mineral soil including loess, *(207)* ap, *222* ap, *269* ap, *(254)* ap, *256* ap, *375* ap, *448* ap.

Physcia caesia (Hoffm.) Fürnr. – I: on siliceous stone, *61* st; II: on siliceous rocks, *191* st, *378* st, *432* st, *492* st.

**Physcia dubia* (Hoffm.) Lettau – I: on siliceous rocks, *(80)* st, *(102)* st, *(176)* st, *180* st; II: on siliceous rocks, *192* st, *(399)* st, *431* st, *(525)* st.

**Physcia tenella* (Scop.) DC. var. *tenella* – I: on siliceous rock, *36* st; II: on siliceous rock, *278* st.

Physconia muscigena (Ach.) Poelt – I: on mosses, soil and litter, *20* st, *29* st, *(88)* st, *113* st; II: on mosses and soil, *228* st, *230* st, *(290)* st, *335* st, *482* st, *521* st.

**Placynthium asperellum* (Ach.) Trevis. – I: on siliceous rock, *66* st; II: on siliceous rock, *(414)* st.

Pleopsidium chlorophanum (Wahlenb.) Zopf – I: on siliceous rocks, *35* ap, *101* ap, *131* ap, *147* ap, *(175)* ap; II: on siliceous rock, *366* ap.

**Polyblastia sendtneri* Kremp. – I: on mineral soil, *(21)* pe; II: on mineral soil, *402* pe.

**Porpidia flavocaerulescens* (Hornem.) Hertel & A. J. Schwab – I: on siliceous rock with limonite coating, *122* st, *123* st, *129* st.

**Porpidia flavicunda* (Ach.) Gowan – II: on siliceous rock, *395* ap.

**Porpidia speirea* (Ach.) Kremp. – I: on siliceous stone, *(76)* ap.

**Protoblastenia terricola* (Anzi) Lynge – II: on soil, *401* ap.

**Protopannaria pezizoides* (Weber) P. M. Jørg. & S. Ekman – II: among mosses on soil, *336* ap.

**Protoparmelia badia* (Hoffm.) Hafellner – I: on siliceous stone, *73* ap.

Pseudephebe minuscula (Nyl. ex Arnold) Brodo & D. Hawksw. – I: on siliceous rocks, *40* st, *(75)* st, *(122)* st, *178* st; II: on siliceous rocks, *196* st, *(205)* st, *(238)* st, *(454)* st; III: on siliceous stones, *543* st, *(546)* st.

**Psora decipiens* (Hedw.) Hoffm. – II: on mineral soil, *207* ap.

**Psora rubiformis* (Ach.) Hook. – II: on mineral soil including loess, *219* ap, *(258)* st, *374* ap, *506* ap, *519* ap.

Psoroma tenue Henssen – II: on mosses and litter, *251* ap, *285* ap, *331* ap, *428* ap.

**Rhizocarpon copelandii* (Körb.) Th. Fr. – I: on siliceous stone, *71* ap.

**Rhizocarpon disporum* (Nägeli ex Hepp) Müll. Arg. – I: on siliceous stone, *75* ap.

**Rhizocarpon geminatum* Körb. – I: on siliceous rocks, *(65)* ap, *70* ap, *76* ap, *(79)* ap; II: on siliceous rocks, *346* ap, *(393)* ap, *(453)* ap, *510* ap.

**Rhizocarpon geographicum* (L.) DC. – I: on siliceous rocks, *78* ap, *79* ap, *127* ap; II: on siliceous rocks, *199* ap, *201* ap, *243* ap, *453* ap; III: on siliceous stones, *(543)* ap, *544* ap, *(545)* ap, *(547)* ap.

**Rhizocarpon intermediellum* Räsänen – I: on siliceous rock, *182* ap. – The species is also known from, e.g., central E Greenland (Hansen 1982).

Rhizocarpon jemtlandicum (Malme) Malme – I: on siliceous rock, *124* ap.

**Rhizocarpon pusillum* Runemark – I: on *Sporastatia testudinea* on siliceous rock, *(68)* ap; II: on *Sporastitia testudinea* on siliceous rocks, *(345)* st, *(364)* ap, *425* ap, *501* ap, *508* ap.

**Rhizocarpon renneri* Poelt – II: on *Dimelaena oreina* on siliceous rocks (obs.).

**Rhizocarpon superficiale* (Schaer.) Vain. – I: on siliceous rocks, *77* ap, *128* ap, *174* ap, *175* ap; II: on siliceous rocks, *497* ap, *498* ap.

**Rhizocarpon viridiatrum* (Wulfen) Körb. – II: on siliceous rocks, *(346)* ap, *(454)* ap.

Rhizoplaca melanophthalma (DC.) Leuckert & Poelt – I: on siliceous rocks, *59* ap, *(102)* ap, *107* ap, *(177)* ap; II: on siliceous rocks, *369* ap, *451* ap, *500* ap.

**Rinodina mniaraea* (Ach.) Körb. var. *mniaraea* – I: on soil rich in humus, *154* ap; II: on soil and litter, *338* ap, *358* ap, *390* ap.

**Rinodina olivaceobrunnea* C. W. Dodge & G. E. Baker – I: on litter, *112* ap.

**Rinodina roscida* (Sommerf.) Arnold – II: on litter, *(338)* ap.

Rinodina turfacea (Wahlenb.) Körb. – I: on mosses on soil, (*149*) ap; II: on mosses, soil, litter and animal droppings, *298* ap, *(315)* ap, *(318)* ap, *(351)* ap, *(358)* ap, *(476)* ap, *528* ap.

Solorina bispora Nyl. – I: on mineral soil, *45* ap, *100* ap, *144* ap; II: on mineral soil, *225* ap, *350* ap.

**Solorina crocea* (L.) Ach. – II: among mosses on soil, *422* st, *472* st.

Solorina saccata (L.) Ach. – I: on mineral soil, *23* ap, *145* ap, *183* ap; II: on mineral soil, *317* ap, *387* ap, *429* ap, *529* ap.

**Sphaerophorus fragilis* (L.) Pers. – II: on soil, *209* st.

**Sporastatia testudinea* (Ach.) A. Massal. – I: on siliceous rocks, *(4)* ap, *5* st, *(68)* ap, *(72)* ap, *(78)* ap; II: on siliceous rocks, *197* st, *345* ap, *364* ap, *(498)* st, *(508)* st; III: on siliceous stone, *547* st.

**Staurothele fissa* (Taylor) Zwackh – I: on siliceous rocks, *(65)* pe, *(70)* pe.

Stereocaulon alpinum Laurer – I: among mosses on soil, *139* st; II: among mosses on soil, *(411)* st.
**Stereocaulon botryosum* Ach. – I: on siliceous rock, *121* st.
**Stereocaulon glareosum* (L. I. Savicz) I. M. Lamb – I: on sandy and gravelly soil, *27* st, *(52)* st, *115* st, *133* st, *153* ap; II: on mineral soil, *223* ap, *253* ap, *316* st, *426* ap, *(472)* st, *487* st.
**Stereocaulon vesuvianum* Pers. – I: on siliceous rock, *152* st.

Thamnolia vermicularis var. *subuliformis* (Ehrh.) Schaer. – I: on soil, *22* st, *44* st, *162* st; II: on soil and litter, *289* st, *(308)* st, *(342)* st, *(492)* st.
**Toninia sedifolia* (Scop.) Timdal – I: on mineral soil, *25* ap, *49* ap; II: on mineral soil, *221* st, *349* ap.
**Tremolecia atrata* (Ach.) Hertel – I: on rocks with limonite coating, *(71)* ap, (*78*) ap, *(122)* ap; II: on rocks with limonite coating, *299* ap, *343* ap, *454* ap.

Umbilicaria decussata (Vill.) Zahlbr. – I: on siliceous rocks, *(36)* st, *58* st, *(80)* st, *177* st; II: on siliceous rocks, *(193)* st, *(199)* st, *314* ap, *(347)* st, *(420)* st; III: on siliceous stones, *(543)* st, *546* st.
Umbilicaria krascheninnikovii (Savicz) Zahlbr. – II: on siliceous rocks, *283* ap, *413* ap. – Most previous collections are from the northernmost parts of Greenland, in particular NE Greenland (Hansen 1995b; Thomson 1984).
Umbilicaria lyngei Schol. – I: on siliceous rocks, *62* st, *120* st, *(177)* st; II: on siliceous rocks, *193* st, *(320)* st, *337* st, *419* st, *509* st, *518* st.
**Umbilicaria proboscidea* (L.) Schrad. – I: on siliceous rocks, *119* ap, *(122)* st.
Umbilicaria virginis Schaer. – I: on siliceous rocks, *60* ap, *(122)* st; II: on siliceous rocks, *280* ap, *320* ap, *(399)* st, *420* ap, *480* ap, *(498)* st.

**Xanthoria candelaria* (L.) Th. Fr. – I: on siliceous rocks and litter, *80* st, *102* st, *181* st, *184* st; II: on siliceous rocks, litter and mosses, *268* st, *(284)* st, *392* st, *445* st, *(525)* st.
**Xanthoria elegans* (Link) Th. Fr. – I: on siliceous rocks and stones, *1* ap, *3* ap, *14* ap, *16* ap, *69* ap, *176* ap: II: on siliceous rocks and old musk ox bone, *190* ap, *284* ap, *362* ap, *363* ap, *444* ap; III: on siliceous stones, *541* st, *542* ap, *(543)* ap, *(544)* st, *(548)* st.
**Xanthoria sorediata* (Vain.) Poelt – I: on siliceous rocks, *65* st, *(66)* st, *(70)* st; II: on siliceous rock, *344* st.

Discussion

Of the 165 lichens reported in the present study 86 taxa are terricolous, 63 saxicolous and the remaining either muscicolous, lichenicolous or growing on other substrates such as twigs, old bones and animal droppings. Numerous lichens are able to grow on more than one type of substrate. Lichenicolous fungi are not dealt with in the present paper apart from some taxa with more or less reduced lichen thallus such as *Caloplaca magni-filii* and *Candelariella dispersa* and species having an independent lichen thallus in a late growth phase such as *Caloplaca alcarum, C. castellana, Rhizocarpon pusillum* and *R. viridiatrum*. In the following, some selected plant communities more or less rich in lichens are described.

A. *Terricolous vegetation*. — Fairly well-developed heath patches occur near the coast at Kap Morris Jesup. They have a distinct polygonal structure, and the soil is neutral to slightly alkaline and generally poor in humus. Phanerogams such as *Draba* spp., *Dryas integrifolia* Vahl (and *Dryas* hybrids), *Papaver radicatum* Rottb. ex DC., *Saxifraga oppositifolia* L. (dominant) and *Salix arctica* Pall. cover the top of the tussocks together with a number of lichens, for example, *Cladonia borealis, C. pocillum, Fulgensia bracteata, Peltigera rufescens, Physconia muscigena* and *Thamnolia vermicularis*. Ice wedges are often colonized by *Salix arctica, Dryas integrifolia* and different mosses and are generally poor in lichens, but species such as *Lepraria gelida, Lopadium coralloideum* and *Myxobilimbia lobulata* can occasionally be found growing on mosses in this special habitat. The macrolichens, *Arctocetraria nigricascens, Cetrariella delisei, Dactylina ramulosa, Lecidea ramulosa, Peltigera leucophlebia, P. venosa, Solorina bispora* and *S. saccata* occur more or less abundantly together with *Melandrium apetalum* Fenzl, *Ranunculus sulphureus* Soland. and *Saxifraga flagellaris* Willd. ex Sternb. in fen-like places moistened by meltwater. Species such as *Buellia papillata, Caloplaca cerina, C. tiroliensis, Lecidea ramulosa, Rinodina olivaceobrunnea* and *R. turfacea* mainly grow on litter in this type of heath, while *Alectoria nigricans, A.ochroleuca, Bryocaulon divergens, Bryoria chalybeiformis, Cetraria muricata, Flavocetraria cucullata* and *F. nivalis* prefer somewhat drier, fell-field like habitats. A steppe-like community characterized by lichens such as *Caloplaca tominii, Collema substellatum, Leptogium lichenoides, Phaeorrhiza nimbosa, Polyblastia sendtneri* and *Toninia sedifolia* occurs on fine-grained, mineral soil in exposed, sunny places. This vegetation is comparable with corresponding communities in, for example, southern Peary Land and Kronprins Christian Land in NE Greenland (Hansen 1993a, 1995a, Alstrup & al. 2000). It is noteworthy that otherwise very common and widely distributed lichens such as *Cetraria islandica* and *Dactylina arctica* are extremely rare at Kap Morris Jesup.

Together with scattered growths of *Salix arctica* and *Dryas* sp., *Cassiope tetragona* (L.) D. Don forms a very interesting snow-patch heath on the basal, E-exposed part of the mountain just west of Sifs Elv c. 6 km south of Constable Bugt. The heath consists of many more or less separate patches occurring in between the rocks and

boulders. It is surprisingly rich in lichens compared with more southern *Cassiope* heaths (Hansen 2006). The following lichen species were recorded in this community: *Alectoria nigricans, A. ochroleuca, Bryocaulon divergens, Cetraria islandica, C. muricata, Cladonia alaskana, C. borealis, C. chlorophaea, C. galindezii, C. libifera, C. pocillum, C. pyxidata, C. stricta, Dactylina ramulosa, Diploschistes muscorum, Hypogymnia subobscura, Lepraria vouauxii, Ochrolechia upsaliensis, Parmelia skultii, Peltigera leucophlebia, P. rufescens, Pertusaria coriacea, P. dactylina, Psora decipiens, P. rubiformis, Psoroma tenue, Solorina bispora, S. saccata, Stereocaulon alpinum* and *Thamnolia vermicularis*. *Cetrariella delisei* and *Solorina crocea* are restricted to the proper snow-patches in this area. Together with species of *Arthrorhaphis* and *Baeomyces, Candelariella placodizans* and *Myxobilimbia lobulata* colonize bare soil among the rocks. These *Cassiope* patches are like oases in the polar desert, which otherwise dominate the region. *Cassiope* also covers extensive areas on the W-exposed slopes on the other side of Sifs Elv, but these heath patches are somewhat poorer in lichens with *Flavocetraria cucullata, Stereocaulon alpinum* and *Thamnolia vermicularis* as remarkable exceptions.

Like the investigation area at Kap Morris Jesup the area on both sides of Sifs Elv has a well developed polygonal structure. In many places the top of the polygons holds a community composed predominantly of *Salix arctica, Saxifraga oppositifolia* (dominant), *Papaver radicatum* and the lichens *Baeomyces carneus, Caloplaca tominii, Cladonia pocillum, Diploschistes muscorum, Flavocetraria nivalis, Fulgensia bracteata, Hypogymnia subobscura, Lecanora geophila, Lepraria caesioalba, L. eburnean, L. neglecta, Megaspora verrucosa, Peltigera rufescens, Physconia muscigena, Protoblastenia terricola, Rinodina mniaraea, Solorina bispora, S. saccata, Thamnolia vermicularis* and *Toninia sedifolia*. *Salix arctica, Carex nardina* Fr., *Dryas* sp. and *Saxifraga oppositifolia* are often found growing together with different mosses in the cracks surrounding the polygons and in ice wedges as well. Lichens such as *Cladonia pocillum, Flavocetraria nivalis, Physconia muscigena* and *Thamnolia vermicularis* sometimes colonize the last mentioned habitat. Contrary to some ice wedges investigated in Inglefield Land in NW Greenland, *Cassiope* appears to avoid the ice wedges in the Constable Bugt area (Hansen 2002). The soil is more or less alkaline due to weathering materials from calcareous horizons on the mountains. *Peltigera didactyla* and differen species of *Caloplaca,* for example, *C. tiroliensis,* grow on polygons manured by musk oxen. Flat polygons on silt soil support thalli of *Collema substellatum*. Dead twigs of *Salix arctica* and animal droppings occur scattered on the ground. These substrates often hold lichens such as *Caloplaca cerina, C. tiroliensis, Lecanora fuscescens* and *L. hagenii* var. *fallax*.

B. *Saxicolous vegetation*. — Conspicuous, orange boulders coloured by *Xanthoria* thalli occur abundantly in the investigation area at Kap Morris Jesup. Small, stony elevations manured by different sea birds on the coastal plains hold *Xanthoria elegans,* and scattered, siliceous boulders support a nitrophilous lichen community composed of species such as *Lecanora atromarginata, Lecidea tesselata, Lecidella bullata, Physcia caesia, Pleopsidium chlorophanum, Protoparmelia badia, Pseudephebe minuscula, Rhizocarpon geographicum, R. intermediellum, R. superficiale, Rhizoplaca melanophthalma, Sporastatia testudinea* (infested with *Rhizocarpon pusillum*), *Umbilicaria decussata, U. lyngei, Xanthoria candelaria* and *X. elegans* (dominant). Rocks rich in oxidized iron hold lichens such as *Miriquidica nigroleprosa* (infested with *Caloplaca magni-filii*) and *Tremolecia atrata*. Some moist rock faces were found to be covered by *Staurothele fissa* and *Xanthoria sorediata*. *Melanelia stygia* forms up to 20 cm broad thalli on boulders situated on the top of mountain tops at some distance from the coast at Kap Morris Jesup. The following lichens were recorded on some small blocks composed of quartz occurring on a terminal moraine at Henson Bugt east of Kap Morris Jesup: *Lecanora polytropa, Miriquidica garavaglii, Physcia caesia, Pseudephebe minuscula, Rhizocarpon geographicum, Sporastatia testudinea* and *Xanthoria elegans*. Up to 20 cm broad and more than 1000 years old thalli of yellow species of *Rhizocarpon* were found occasionally on large boulders both at Kap Morris Jesup and Constable Bugt, but thalli with a diameter ranging from 1 to 2 cm are far more common on these localities. These thalli are calculated to be up to 200 years old. This is also the maximum age found for most lichens including the relatively fast-growing species, *Pseudephebe minuscula* and *Xanthoria elegans*.

Nitrophilous lichens occur abundantly at Constable Bugt. A rock manured by snowy owls is densely covered by lichens of this type, for example, *Dimelaena oreina, Melanelia infumata, Rhizocarpon geminatum, Rhizoplaca melanophthalma, Umbilicaria decussata, U. krascheninnikovii, Xanthoria candelaria* and *X. elegans*. The first mentioned lichen is infested with *Rhizocarpon renneri* Poelt. *Brodoa oroarctica, Lecanora polytropa, Lecidea tesselata, Sporastatia testudinea* (with *Rhizocarpon pusillum*) and *Umbilicaria lyngei* are some additional lichens occurring on this rock. A similar community consisting of species such as *Lecanora polytropa, Melanelia infumata, Miriquidica garovaglii, Physcia caesia, P. dubia, Rhizocarpon geographicum, Xanthoria candelaria* and *X. elegans* was recorded on many erratic boulders in the lowland on both sides of Sifs Elv. The two last mentioned species usually cover large areas on boulders, where musk oxen stay in stormy weather. *Umbilicaria virginis* is very common on boulders on the talus slopes. Moist, enriched rock faces support *Xanthoria sorediata* and

Placynthium asperellum with *Caloplaca castellana* and *Candelariella dispersa*. "Ironstones" hold species such as *Acarospora sinopica, Porpidia flavocaerulescens* and *Tremolecia atrata*. Siliceous stones with high contents of calcium and covered with thalli of *Aspicilia candida* were found in a few places near the mountains.

Old musk ox bones represent a suitable substrate for lichens such as *Caloplaca cerina, Candelariella aurella, Lecidella euphoria* and *Lobothallia melanaspis*. The coastal species, *Caloplaca alcarum* and *Lecanora contractula,* also have a distinct preference for this substrate, although they most frequently grow on coastal rocks in Greenland (Hansen 1993b).

Acknowledgements

I am grateful to Kurt Kjær and Svend Funder for the invitation to participate in the Long Term expedition to N Greenland. I also wish to thank the following persons for help with identification and chemical investigation of selected lichens: Teuvo Ahti & Tor Tønsberg *(Cladonia),* Bruce McCune *(Hypogymnia),* Lauri Saag (*Lepraria*), Per Magnus Jørgensen *(Leptogium),* Arne Thell *(Parmelia skultii)* and Helmut Mayrhofer *(Rinodina).*

References

Alstrup V., Hansen E. S. & Daniels F. 2000: Lichenized, lichenicolous and other fungi from NE Greenland. – Folia Cryptog. Estonica **37:** 1-20.

Bay C. 1992: A phytogeographical study of the vascular plants of northern Greenland, north of 74 northern latitude. – Meddel. Grønland. Biosci. **36:** 1-102.

Brodo I. M., Sharnoff S. D. & Sharnoff S. 2001: Lichens of North America. – New Haven & London.

Bültmann H. & Lüntherbusch C. H. 2008: The *Cladonia cariosa* group in Greenland. – Abh. Westfäl. Mus. Naturk. **70:** 305-312.

Hansen E. S. 1989: The lichen flora of Qaanaaq (Thule), northwestern Greenland. – Mycotaxon **35:** 379-394.

Hansen E. S. 1982: Lichens from Central East Greenland. – Meddel. Grønland. Bioscience **9:** 1-33.

Hansen E. S. 1993a: *Collema substellatum* and *Fulgensia desertorum,* new to Greenland. – Lichenologist **25:** 451-458.

Hansen E. S. 1993b: The lichen flora of coastal and inland areas in the Godthåb fjord and the Ameralik fjord, southwestern Greenland. – Mycotaxon **68:** 249-269.

Hansen E. S. 1995a: The lichen flora of the Jørgen Brønlund Fjord area, northern Greenland. – Bibl. Lichenol. **57:** 187-198.

Hansen E. S. 1995b: Greenland Lichens. – Copenhagen.

Hansen E. S. 1997: Studies of the lichen flora of coastal areas in central West Greenland. – Nova Hedwigia **64:** 505-523.

Hansen E. S. 2002: Lichens from Inglefield Land, NW Greenland. – Willdenowia **32:** 105-125.

Hansen E. S. 2006: 3.3 Lichens. – Pp. 44-53 in: Klitgaard A. B., Rasch M. & Caning K. (ed.), Zackenberg Ecological Research Operations, 11th Annual Report 2005. – Copenhagen.

Hansen E. S. 2007: Lichens from Upernavik island, NW Greenland. – Willdenowia **37:** 353-362. [CrossRef]

Hansen E. S. 2008: A contribution to the lichen flora of Johannes V. Jensen Land, northern Peary Land, North Greenland. – Cryptog. Mycol. **29:** 25-33.

Hansen E. S., Poelt J. & Søchting U. 1987: Die Flechtengattung *Caloplaca* in Grønland. – Meddel. Grønland. Biosci. **25:** 1-52.

Holmen K. 1957: The vascular plants of Peary Land, North Greenland. – Meddel. Grønland **124:** 1-149.

Lynge B. 1923: Lichens collected on the north-coast of Greenland by the late Dr Th. Wulff. – Meddel. Grønland **64:** 279-288.

Santesson R., Moberg R., Nordin A., Tønsberg T. & Vitikainen O. 2004: Lichen-forming and lichenicolous fungi of Fennoscandia. – Uppsala.

Thomson J. W. 1984: American arctic lichens I. The macrolichens. – New York.

Thomson J. W. 1997: American arctic lichens II. The microlichens. – Wisconsin.

Zhurbenko M. & Ahti T. 2005: Contribution to the study of the lichen genera *Cladina* and *Cladonia* in the Russian Arctic, mainly from Taimyr Peninsula and Severnaya Zemlya. – Nova Hedwigia **81:** 79-95. [CrossRef]