

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

Author: Hansen, Eric Steen

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ERIC STEEN HANSEN<sup>1</sup>

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

### Abstract

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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 (Lyngé 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

<sup>1</sup> 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 included. 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.

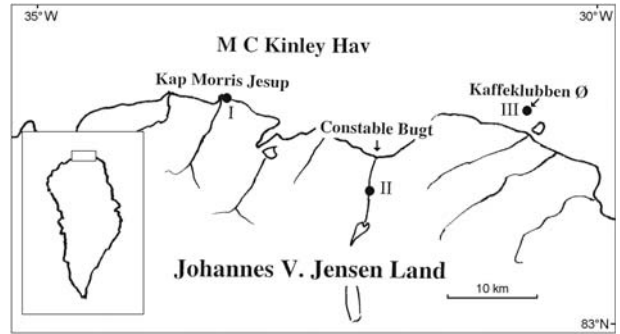


Fig. 1. The investigated localities in N Greenland – I. Kap Morris Jesup; II. Constable Bugt; III. Kaffeklubben Ø.

- 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.) Rebert. – II: on mineral soil, 294 st.
- \**Bellemeria subsorediza* (Lyngé) 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 *Miriqidica 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 tirolensis* 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 atomarginata* (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 tessellata* 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 stigmataea* (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.) Lyngø – 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.) Lyngø – 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) Lyngby – 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.
- Pseudophebe 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 *Sporastatia 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. viridiatum*. 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 radicum* 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. tirolensis*, *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 nimbosea*, *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*, *Perusaria 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 radicum* and the lichens *Baeomyces carneus*, *Caloplaca tominii*, *Cladonia pocillum*, *Diploschistes muscorum*, *Flavocetraria nivalis*, *Fulgensia bracteata*, *Hypogymnia subobscura*, *Lecanora geophila*, *Lepraria caesia*, *L. eburnea*, *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 different species of *Caloplaca*, for example, *C. tirolensis*, 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. tirolensis*, *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 atomarginata*, *Lecidea tessellata*, *Lecidella bullata*, *Physcia caesia*, *Pleopsideum 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 soredata*. *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 polytropica*, *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 polytropica*, *Lecidea tessellata*, *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 polytropica*, *Melanelia infumata*, *Miriquidica garavaglii*, *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 soredata* 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).

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