

Contribution to the hepatic flora of the north coast of Hornsund (S.W. Svalbard)

I. REJMENT-GROCHOWSKA

INTRODUCTION

The hepatics were collected by Dr M. Kuc, on the North coast of Hornsund, in the area between Torell's and Horn's glaciers, long. $15^{\circ}00'$ — $16^{\circ}30'$ E. and l. $77^{\circ}00'$ — $77^{\circ}10'$ N., during the Polish Polar Expedition to Spitzbergen, organized by the Commission of the III-rd International Geophysical Year, in 1958.

The materials are deposited at the Institute of Plant Systematics and Plant Geography of the University of Warsaw, where the hepatics have been elaborated, and the Institute of Botany of the Polish Academy of Sciences in Kraków.

Grateful acknowledgements are due to Miss K. I. Ladyzhenskaya of the Institute of Botany of the Acad. of Sciences in Leningrad, where I elaborated the materials for some time. I am deeply thankful to Prof. Dr H. Persson of the Naturhistoriska Riksmuseet in Stockholm and Dr R. Grolle of the Institute of Botany of the University of Jena for examining some doubtful species. I should also like to thank Prof. Dr B. Fott from the Charles University in Prague for making available to me the comparative herbarium materials during my stay in Prague.

I would also like to express my thanks to Dr M. Kuc, a member of this expedition, for making available to me the materials of hepatics from Spitzbergen for examination.

The arrangement of genera in this paper follows Arnell, 1956.

The island group of the Spitzbergen has been investigated by many bryologists; some of them have collected the bryophytes themselves, while others examined the collections assembled by someone else.

In 1867, S. O. Lindberg described Malmgreen's materials together with other collections from the Swedish expeditions of 1858 and 1861.

In 1875, S. Berggren described the morphology and geography of the Hepaticae spitzbergenses collected by himself.

In 1877, S. O. Lindberg corrected his statement concerning *Clevea hyalina* found in Spitzbergen as referring to *Sauteria alpina*. In 1889, he announced the discovery of *Scapania spitzbergensis*, collected by Berggren.

In 1898, during a scientific expedition to the Spitzbergen and König Karls Land bryophytes were collected by A. G. Nathorst and investigated by H. W. Arnell (1900) who in his paper reported 17 species of hepatics, some of them (*Cephalozia*

bicuspidata, *Harpanthus flotovianus*, *Orthocaulis gracilis*, *Lophozia ventricosa*, *L. longidens*) have not been included in the last work of S. Arnell and Mårtensson (1959) in which the authors have examined 66 Spitzbergen hepatics.

GENERAL REMARKS ON THE BRYOPHYTE FLORA

The agents of surface denudation are so active in the Arctic that they give a chance only to a poor vegetation which consists of an intricate assemblage of vascular plants; among them there are carpets and tufts of bryophytes. The hepatic flora of Spitzbergen is very variable, which is caused by instability in habitat conditions which vary here depending on topography and the substratum.

On the morainic deposits, erratic boulders and stones, on the nunataks, in the crevices and on the shelves, of the rocks in the wet and tranquil places there arise low, dark, crustaceous carpets, sometimes pure or else mixed. It is the initial stage of development of the hepatic flora, which is composed, above all, of the following species: *Anthelia juratzkana*, *Gymnomitrium concinnatum*, *Blepharostoma trichophyllum* var. *brevirete*, *Scapania obcordata*, *Cephaloziella arctica*, *Lophozia groenlandica*,

The large stretches of morainic clay, sand, gravel and detritus on Rotjesfjellet. Revdalen and Fannytoppen do not have a rich flora of hepatics; in the midst of the mosses, such as *Polytrichum piliferum*, *P. hyperboreum*, *Bartramia ithyphylla* and *Distichum inclinatum*, some hepatics occur such as, *Tritomaria quinquedentata*, *Chandonanthus setiformis*, *Saccobasis polita* and *Barbilophozia hatcheri*.

The tops of mountains and of nunataks such as Arikammen, Bratteggdalen (637 m.), Deillegga and Bergenova are well drained and almost devoid of any hepatics or else these grow only in small numbers as *Anthelia juratzkana*, *Blepharostoma trichophyllum* var. *brevirete*, *Cephaloziella arctica*, *Gymnomitrium concinnatum*.

The areas in which the vegetation of bryophytes is somewhat richer are situated on the slopes, at about 100—200 m. altitude above the glacier; they are divided by cliffs, edges and shelves. On these exposed slopes and hill-sides some vascular plants, such as *Saxifraga oppositifolia*, *Cerastium alpinum*, *Dryas octopetala* and *Salix polaris* are consolidated by mosses and hepatics. The most important and dominant species of mosses and of hepatics intermingled with them are: *Dicranum elongatum*, *D. groenlandicum*, *Aulacomnium turgidum*, *Tritomaria quinquedentata*, *Lophozia wenzelii*, *Sphenobolus minutus*, *Ptilidium ciliare*, *Barbilophozia hatcheri*, and *Chandonanthus setiformis*. The other hepatics, such as *Lophozia groenlandica*, *Leiocolea heterocolpos*, *Cephaloziella arctica*, grow on the surface of the carpet of mosses and cover it with a thick layer. These moss communities appear to represent the tundra — the final stage of colonization on the moraine areas, on Hynesfjellet-Southern slope, Revdalen and Rotjesfjellet on the Western slope.

In the large depressions with a high fluctuating water table there arise wet silt communities. The mosses can benefit from the poor food substances more than the

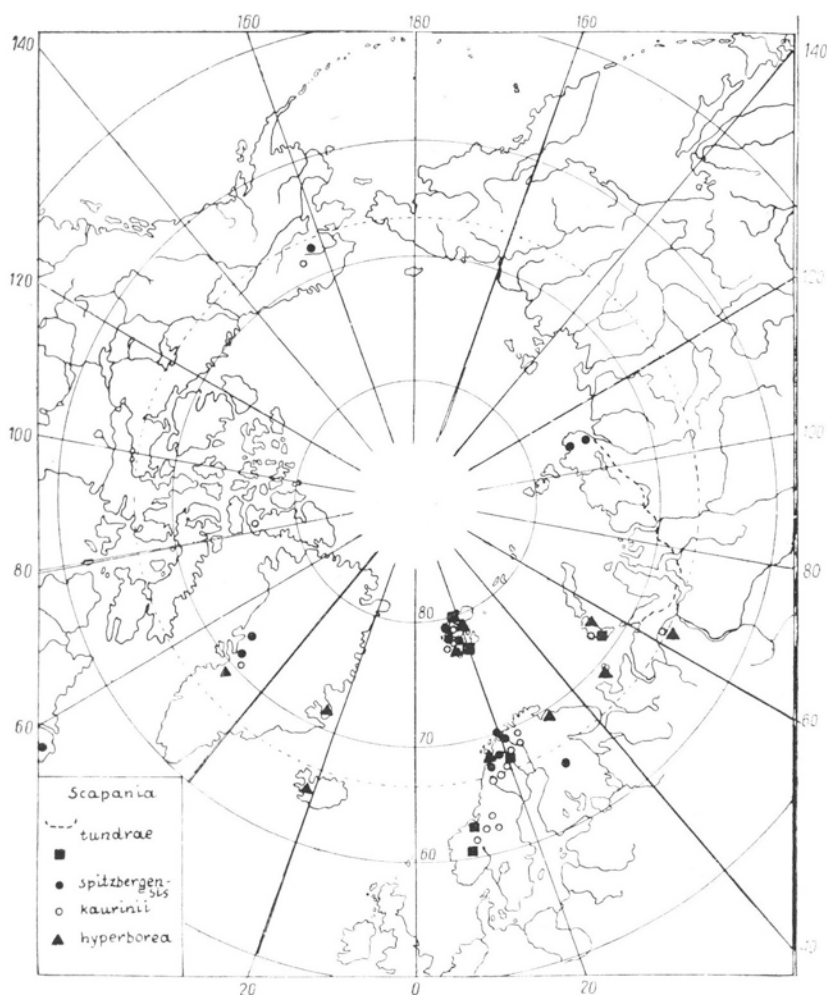


Fig. 1. Distribution of *Scapania tundrae*, *S. obcordata*, *S. spitzbergensis*, *S. hyperborea*, *S. kaurinii*.

higher plants and form there mossy marshes or a wet tundra. On the humus and peat, in places sometimes submerged, or among the mosses, on the peat-bog of Brat-teggdalen, Rotjesfjellet, Revdalen, there grow *Gymnocolea inflata*, *Scapania paludicola*, *S. hyperborea*, *S. tundrae* associated with *Drepanocladus revolvens*, *Calliergon stramineum* and *Messea triquetra*.

On the polygonal fields in the intervening tracts between the polygons filled with humous soil in Revdalen there are some pure carpets of pioneer species of hepatics, such as *Blepharostoma trichophyllum* var. *brevirete*.

In the collection that I have examined there are some species common in this region, such as: *Anthelia juratzkana*, *Ptilidium ciliare*, *Cephaloziella arctica*, *Chandonanthus setiformis*, *Leiocolea heterocoplos*, *Tritomaria quinquedentata*, *Scapania*

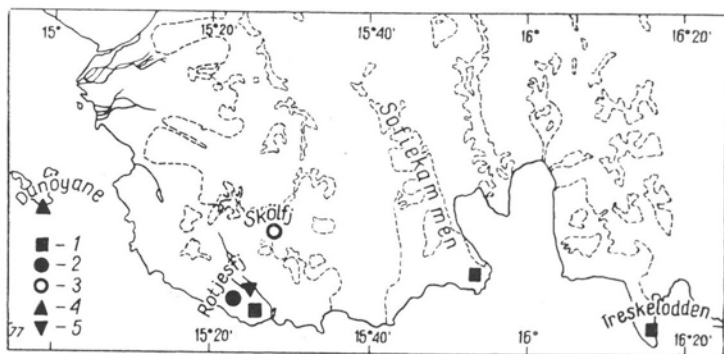


Fig. 2. Finds of the arctic species of *Scapania* on the north coast of Hornsund: 1 — *S. obcordata*; 2 — *S. spitzbergensis*, 3 — *S. hyperborea*; 4 — *S. kaurinii*, 5 — *S. tundrae*.

obcordata and *Gymnomitrium concinnatum*. Other rare species, only once or twice noted in these materials are: *Gymnocolea inflata*, *Orthocaulis quadrilobus*, *Scapania kaurinii*, *S. spitzbergensis*, *S. curta*, *S. hyperborea*.

CONCLUSIONS

The species of hepatics which appear in the Arctic live here under different habitat conditions than in the European mountains, for instance *Gymnomitrium concinnatum*, *Lophozia wenzelii*, *Tritomaria quinquedentata*, *Sphenolobus minutus* grow in the far North on the tundra and peat-bogs; in the European mountains in the South, however develop above all on the rocks or on the humus covering the rocks.

The specific ecology of these arctic areas has influenced the morphology of hepatics; they form ascendent stems, low, crutaceous tufts, grey or brown-black in colour which are almost as strongly fastened to the boulders and rocks as the lichens. The wall-cells of the leaves are usually thick and dark-brown and the leaves are often convex, closely adhering to stem.

The sterility of the Spitzbergen hepatics is a universal feature in the collection investigated; I found only in three cases sporogons on very short stalks, belonging to the three species of *Anthelia juratzkana*, *A. julacea* and *Prasanthus suecicus*. In the three other species, *Gymnocolea inflata*, *Lophozia groenlandica* and *Cephaloziella subdentata* I noticed only female inflorescences (perianths) but without sporogons. In some species of *Scapania* and in *Barbilophozia hatcherii* in a few cases I found only the antheridia. It may be supposed that in these arctic regions the reaching of maturity by the antheridia and archegonia is rather rare, the fertilization operation is not easy, and for this reason the sporangia are very rare. The maturation of spores is probably long; during this time the fungi developed into the perianths, the spores with elaters surrounded by hyphae of fungi are together transported by the wind. It would be interesting to know whether the spores formed here by these species of hepatics are viable at all.

Reproduction very often takes place by means of the gemmae which arise in

great quantity under all habitat conditions on the apices of the stems and on the margins of the leaves. Among the hepatics which always have gemmae are: *Lophozia groenlandica*, *L. alpestris*, *Barbilophozia hatcheri*, *Orthocaulis elongatus*, *Tritomaria quinquedentata*, *Scapania obcordata*, *S. tundrae*, *S. kaurinii*, *S. curta*, *S. hyperborea*, *Cephaloziella arctica*. The vegetative gemmae play certainly a major role in the dispersal of hepatics.

The hepatics found in Spitzbergen, according to Polunin (1947) and Schuster (1951), may be classified into the following groups: 1. arctic — with a restricted, almost exclusively arctic distribution, *Orthocaulis quadrilobus*, *Lophozia groenlandica*, *Gymnomitrium coralloides*, *Scapania kaurinii*, *S. hyperborea*, *S. tundrae*, *S. spitzbergensis*, *S. obcordata*, *Anthelia julacea*, *Cephaloziella arctica*, *Blepharostoma trichophyllum* var. *brevirete*. 2. arctic-alpine — with a slight extension or relict distribution in the Subarctic, they are: *Orthocaulis elongatus*, *Barbilophozia hatcheri*, *Leiocolea heterocolpos*, *Lophozia wenzelii*, *Saccobasis polita*, *Solenostoma sphaerocarpum* var. *nana*, *Chandonanthus setiformis*, *Tritomaria scitula*, *Cephalozia ambigua*, *Anthelia juratzkana*, *Prasanthus suecicus*. I think that to this group probably belongs *Gymnomitrium concinnum*, which in Europe and in the western Arctic spreads at the lower altitudes of the subalpine belt. In N. and NE. Fennoscandia it is also widespread in the coniferous forest belt and extends down to the sea level (Mårtensson 1955). 3. species with a distribution in the Arctic-alpine and Subarctic-subalpine regions — here belong most of the species found in Svalbard reported within this group, *Lophozia alpestris*, *Gymnocolea inflata*, *Sphenobolus minutus*, *Tritomaria quinquedentata*, *Scapania irrigua*, *S. curta*, *S. paludicola*, *S. subalpina*, *Cephalozia bicuspidata*, *Cephaloziella subdentata*, *Ptilidium ciliare*, *Preissia quadrata*. I think *Marchantia alpestris* should be classed to this group, but in consequence of its little known area, this classification is not certain. 4. species with a distribution in the Subarctic-subalpine region are, *Lophozia longidens*, *Isopaches bicrenatus*, *Nardia geoscyphus*. 5. ubiquitous species: *Riccardia pinguis*, *Marchantia polymorpha*, *Cephalozia media*.

Generally speaking, until 1959 the number of the species of hepatics reported from Spitzbergen was 55. In 1959 Arnell a. Mårtensson extended this list to 66 species. In the examined collection I found 42 species; among them only *Gymnocolea inflata*, *Isopaches bicrenatus*, *Solenostoma sphaerocarpum* var. *nana*, *Nardia geoscyphus* are new to Spitzbergen. The list of 69 Spitzbergen hepatics amounts to about 15 per cent. of European species.

ENUMERATION OF SPECIES

Abbreviations

Ariekm. = Ariekammen

Braemfj. = Braemfjellet

Bratteggdl. = Bratteggdalen

Fannytp. = Fannytoppen

Gulliksenfj. = Gulliksenfjellet

Hansbr. = Hansbreen

Hyrnefj. = Hyrnefjellet

Luciakm. = Luciakammen

Luciapnt. = Luciapynten

Revbn. = Revbotnen

Revdl. = Revdalen

Rotjesfj. = Rotjesfjellet

Skjersd. = Skjerstranda

Skoddefj. = Skoddefjellet

Skölfj. = Skölfjellet

Sofiekm. = Sofiekammen

Torbjörnsenfj. = Torbjörnsenfjellet

Riccardia pinguis (L.) Gray — It is not common and has been found only once in the region comprised by the researches, on Rotjesfj. Its solitary thalii grow on the peat in a carpet of moss, such as *Drepanocladus exannulatus* or *Campyllum polygamum*.

Anthelia julacea (L.) Dum. — Rare. It is difficult to distinguish this sterile species from *A. juratzkana*, because in this region the stems of *A. julacea* are only a few millimetres long, but the leaves are crenulate at the tops and their cell walls are thick. It was reported from Spitzbergen by Berggren, but Arnell and Mårtensson (1958) claim, that its occurrence in Spitzbergen was not established. One tuft of this species was found with the sporangia fixed on short stalks and hidden in the perianthium and the leaves at the top of the stem. On the tops of the mountains Ariekm. and Rotjesfj. at about 380 m. altitude, on the soil, associated with *Saccobasis polita*.

Anthelia juratzkana (Limpr.) Trevis — It is one of the most common hepatics of W. Spitzbergen, grows on morainic material, on streambanks, in the late snow areas. In this collection it is one of the only three species with sporogonia that I have found. The stalk of the sporangium here is very short and the sporangium is entirely hidden in the perianths. The spores and elateres are compressed in a ball and probably all together transported by the wind. It is often associated with *Gymnomitrium concinnum*, *Cephaloziella arctica*, *Scapania obcordata* and *Blepharostoma trichophyllum* var. *brevirete*. The new localities are: Torbjörnsenfj. S.-on the top, Rotjesfj.-Hansa glacier, Sofiekm. on the slope of Luciakm., Ariekm.

Ptilidium ciliare (L.) Nees — Common in Svalbard and the other arctic regions, on the dry tundra among the mosses and the lichens, or on the morainic gravel covered by a thick carpet of bryophytes. It grows standing up as higher plants do. Tuva W.-542 m., Rotjesfj. W.-210 m., nunatak Bergenova, Dunöyane, Fugleberget E.S.

Blepharostoma trichophyllum (L.) Dum. var. *brevirete* Bryhn and Kaal. — Very common species. It forms pure, low, dark brown tufts on the shelves of the rocks and in crevices, on fine-grained soil of alluvial solifluxion, or on the surface of thick moss-carpet in the tundra. It is often intermingled with bryophytes. A very variable species, always sterile and consequently in this state it is difficult to distinguish typical forms from the variety *brevirete*. Schuster (1951), agreeing with Frye and Clark (1943) described the var. *brevirete* as a variety under *Blepharostoma arachnoideum*, both these forms having the very short leaf-cells. However, A. Arnell (1951, 1956) published the species *B. trichophyllum* with the variety *brevirete*; the typical forms has long leaf cells and the variety has short ones, little or no longer than broad, cuticle distinctly papillate and the lateral wall-cells a little inflated. In the present collection the length of the cells is not constant and the proportion of length to width is variable. Nevertheless the leaves consist mostly of three segments with cells about 18–27 μ long and 18–25 μ wide, with thick, papillate, greyish wall-cells. In agreement with Arnell a. Mårtensson (1959), I think that it is only the var. *brevirete* that

appears in Spitzbergen; the main species does not seem to occur in this region. The new localities are: Fugleberget S. E., Dunöyane, Fannytp., Revdl., Rotjesfj., Sofiekm., Bratteggdl. — at 637 m., Skölfj. E.-associated with *Tritomaria scitula*, *Gymnomitrium concinnum* and *Cephaloziella arctica*.

Cephaloziella subdentata Warnst. — Scarce in W. Svalbard. Only solitary stems associated with *Lophozia groenlandica* grow on the surface and in the midst of the carpet of dead and living mosses, such as *Polytrichum* sp., *Dicranum* sp., on Vesletuva — 542 m. In this locality the stems have been found only with perianths, but without sporogonia. The cell walls of the female bracts, perianths and leaves are thick, the bracts strongly dentate.

Cephaloziella arctica Bryhn and Douin — Common. On the morainic clay and dry tundra intermingled with mosses and hepatics such as *Tritomaria quinquedentata*, *Leicolea heterocolpos* or *Lophozia groenlandica* or on the surface of the carpet of dead or living mosses, where it forms crustaceous tufts, pure or else associated with *Gymnomitrium concinnum*, *Blepharostoma trichophyllum* var. *brevirete*, *Anthelia juratzkana*, *Chandonanthus setiformis*. A very variable species, the taxonomy of which has been discussed by Arnell (1950), it is characterized by its dark-coloured walls, the reddish-violet colouring of the tips of the leaves, its subovate-ovoid lobes and its relatively large cells. The new localities on Spitzbergen are: Gulliksenfj., Hyrnefj. S., Skölfj. E., Dunöyane-on the mosses, Skiersd. on the soil, Ariekm. where it covers a tuft of *Tetraplodon*, Rotjesfj. at 380 m. of altitude on the N. E. slope and Hansa glacier on morainic clay.

Barbilophozia hatcheri (Evans) Loeske — Not rare, very variable, sometimes difficult to distinguish from *B. lycopodioides*, grows on the surface of the moss carpet and among the mosses, especially *Dicranum* sp., in crevices and shelves of the rocks, on the soil between stones. Gemmae are frequent on the top of the stem and at the tops of the youngest leaves. The new localities on the Spitzbergen belong to: Rotjesfj. W. slopes, Torbjørnsenfj. W. slopes, nunatak Styrkjernet E. slopes.

Gymnocolea inflata (Huds.) Dum. — Rare in the region of researches, found only once, on the moraine — clay of Sofiekm., with perianths, associated with *Scapania obcordata*. A very variable species, completely different from low-land ones in the moderate zone; the stems are shorter and the leaves smaller. It has not been reported from W. Spitzbergen by Arnell and Mårtensson (1959).

Isopaches bicrenatus (Schmid.) Buch — Rare in this district, found only once on the soil and intermingled with the mosses on Rotjesfj. The rounded, thick-walled cells of the leaves, the leaves gemmiparous characteristically dentate, the reddish-brown and stellate-angular gemmae are the good diagnostic features for this species. It is a new species for Spitzbergen; but it has been listed from Norway by Jörgensen (1934), from Sweden by H. W. Arnell (1925).

Solenostoma sphaerocarpum (Hook.) Steph. var. *nana* (Nees) K. M. — The variety was not reported on Svalbard. The stems are simple, only a few millimetres long with numerous rhizoids, and with dense imbricate leaves. In the present collection it is found on the detritus of the crystalline rocks, in the sunny locality of Fugle-

berget, associated with *Scapania obcordata* and *Anthelia juratzkana*; on the morainic clay on the E. side of Hansa glacier. Previously this variety was not reported from Spitzbergen.

Leiocolea heterocolpos (Thed.) Buch — Rare in the siliceous areas of Spitzbergen, where it grows on the soil among stones and boulders, on the dry rocks exposed to the S., associated with *Blepharostoma trichophyllum* var. *brevirete*, *Gymnomitrium concinnatum*, *Tritomaria quinquedentata*, sometimes on the upper surface of a thick carpet of mosses: Rotjesfj.-Hansa glacier, Fugleberget E., Hynesfj. S.-dry tundra, Gulliksenfj., Bratteggdl. at an altitude of 637 m, Skjersd.

Lophozia wenzelii (Nees) Steph. — Not frequent, grows on the acidophil substratum, on the surface of the irrigated rocks among the mosses and hepatics, such as *Dicranum elongatum*, *Sphenolobus minutus*, *Tritomaria quinquedentata*, *Ptilidium ciliare*. A very variable species, sometimes difficult to distinguish from *Lophozia alpestris*. The new localities belong to: Gulliksenfj. W., Fugleberget E.-S., Rotjesfj. at about 380 m.

Lophozia alpestris (Schleich) Evans — Rare in the examined collection. It grows on the morainic clay on the E. slope of Styrkjernet nunatak, associated with *Cephalozia ambigua*, *Cephaloziella arctica*, *Scapania obcordata*. The stellate, numerous gemmae are brown in colour. It was reported the last time by S. Arnell a. Mårtensson (1959).

Lophozia longidens (Lindb.) Macoun — Probably rare in this region. Grows in small patches on the dead mosses, associated with *Blepharostoma trichophyllum* var. *brevirete* and *Cephaloziella arctica* on the W. slopes of Torbjørnsenfj. Gemmae very often, numerous on the tops of the stems and the upper leaves. It was reported at Svalbard by H. Arnell (1900).

Lophozia groenlandica (Nees) Macoun — Not common; it grows on the gravel between granite stones and on the surface of the moss carpets consisting of the species of *Dicranum* sp., *Aulacomnium palustre*, *Tritomaria quinquedentata* a.o. Collected with the perianthia blown up and folded in the upper part, but without the sporangia. The apices of the lobes are pointed or with gemmae in great quantities. It forms tufts together with *Cephaloziella arctica*. The recent localities belong to Gulliksenfj. W. and Rotjesfj. N.E. slopes at 380 m. Previously reported at Svalbard only once, by S. Arnell a. Mårtensson (1959).

Nardia geoscyphus (De Not.) Lindb. — Probably rare in Hornsund. Only once found in Brettaggd. on the wet soil, in small patches, associated with *Blepharostoma trichophyllum* var. *brevirete*. In the present collection the plants are fertile, with retuse-emarginate bracts, the leaves below the perichaetial bracts are concave with some antheridia. The stems are about 5—8 mm. long, the leaves reddish-brown pigmented. This species is for the first time reported from Spitzbergen, but in the North it is known from Greenland, Alaska, the Canadian-coast of Hudson Bay Newfoundland, Norway, N. Swedish Lappland.

Orthocaulis quadrilobus (Lindb.) Buch — Found only twice in this collection. In Luciapnt. at about 300 m. of altitude it appears in moss carpets consisting of *Campyllum stellatum*, *Drepanocladus revolvens* and *Philonotis tomentella*. In

Revvatnet it grows in pure patches on the moist tundra. The stems brownish black, 3–5 cm long, more slender and delicate than *O. floerkei*. The leaves distant, divided into 3–4 lobes, acute at the apices.

Orthocaulis elongatus (Lindb.) Evans — Rare. Only once found in the investigated territory, on the humous soil between the polygonal fields in Revdl. — E. W. Spitzbergen, associated with *Blepharostoma trichophyllum* var. *brevirete*. Plants a few millimetres long, brown coloured. The upper leaves dense, the lower ones distant, bilobed, the lobes pointed or obtuse, trigons large, brown. Gemmae brown, stellate. Amphigastria well developed, lanceolate or sometimes bilobed. Previously it was only once reported from Svalbard by S. Arnell and O. Mårtensson (1959).

Saccobasis polita (Nees) Buch — Rather rare, grows in the tufts of mosses or on wet soil, in crevices of the rocks, associated with *Dicranum flexicaule*, *Blepharostoma trichophyllum* var. *brevirete*, *Anthelia juratzkana*. The new localities are: Arie km., Fannytp. E., nunatak Deilegga.

Sphenolobus minutus (Cr.) Steph. — Rather common and invariable species, grows intermingled with tufts of *Polytrichum* sp. and *Dicranum* especially *D. elongatum*, *Lophozia wenzelii*, *Blepharostoma trichophyllum* var. *brevirete*, sometimes associated with *Leicolea heterocolpos*. It appears on the dry tundra, in crevices and shelves of rocks, on nunatak slopes, in Gulliksenfj., Braemfj. S., Rotjesfj.-Hansa glacier, Bratteggdl. on the top, at 637 m.

Chandonanthus setiformis (Ehrh.) Mitt. — Common in W. Spitzbergen, forms unmixed loose, brownish tufts on the rocks and in the crevices, associated with *Andreaea petrophila*, *Cephaloziella arctica*, *Ptilidium ciliare*, or else grows on the morainic gravel and detritus, intermingled with *Racomitrium lanuginosum* and *Polytrichum piliferum*: Skoddefj.-Arie km. on the top, at 617 m. altitude, W. Tuva-542 m., Rotjesfj., Luciapnt., Torbjörnsenfj., nunatak Bergenova.

Tritomaria quinquedentata (Huds.) Buch — The most common species in W. Svalbard, very variable, with a wide ecological amplitude, grows in thick carpets of bryophytes, such as *Dicranum* sp., *Aulacomnium palustre*, *A. turgidum*, *Barbilophozia hatcheri*, *Leicolea heterocolpos* and *Cephaloziella arctica* on both wet and dry tundras, rocks and stones covered by humus. It spreads from the coast of Hornsund to the top of mountains and nunataks: Revdl., Rotjesfj. at 380 to 100 m. and below, on the tundra and Hansa glacier, Bratteggdl. W. on the top at 637 m., on the slopes of Gulliksenfj., Torbjörnsenfj. W., Dunöyane, Fuglebergsletta, Fannytp. E.

Tritomaria scitula (Tayl.) Jörg. — Not rare in the region of W. Svalbard in Hornsund where the area seems to be rather siliceous but this species is rather a calciphil one; it is distinguishable from *T. quinquedentata* and the species of *Lophozia* by its almost equally threelobed leaves and its reddish clusters of gemmae. Found in the following localities: nunatak Deilegga on the clay and morainic detritus, associated with *Blepharostoma trichophyllum* var. *brevirete*; Skölfj. E. on the clayey soil, together with *Gymnomitrium concinatum*, *Cephaloziella arctica* a.o.; Rotjesfj. and Arie km.

Scapania obcordata (Berggren) S. Arnell (*Sarcoscyphus obcordatus* Berggren) —

Rather common. On the fine-grained, black, morainic soil of the cape of Treskelodden, of Sofiekm., on the polygonal fields covered with humus-soil of Rotjesfj. and on the dry tundra on the E. slopes of Styrkjernet. It is associated with *Drepanocladus* sp., *Anthelia juratzkana*, *Cephaloziella arctica* and *Gymnocolea inflata*. It forms large and low tufts nearly black or reddish-black in colour. The shoots are up to 8 mm long. The leaves bilobed, convex, without keel, commissure rounded, the dorsal lobe not much smaller than the ventral one; obtuse or rounded at the apex. Marginal cells of the leaves about $12 \times 20 \mu$, interior cells only a little larger, and basal cells of the leaves up to $25-40 \mu$. Wall-cells brown, thick without particular distinguished trigons. Cuticle finely striped. Gemmae very often one-celled, on the top of the shoots, pale-green, $10 \times 15 \mu$ in size. Its distribution is not well known because it has been well distinguished from *S. lapponica*. The last time this species has not been reported by Arnell a. Mårtensson (1959).

Scapania curta (Mart.) Dum. — Rare. Only once found on Dunöyane island associated with *Cephaloziella arctica*, *Blepharostoma trichophyllum* var. *brevirete*, *Ptilidium ciliare* and *Calliergon stramineum*. It forms here low and brown tufts on the peat. Reported by Arnell a. Mårtensson (1959) from W. Spitzbergen as a rare species.

Scapania irrigua (Nees) Dum. — Only twice found in this collection: on the peat-bog of Hansa glacier on Rotjesfj., it forms here the large, brownish patches together with *Drepanocladus* sp. and *Calliergon* sp., on the moist soil of Styrkjernet E. nunatak.

Scapania hyperborea Jörg. — Rare. On the dry peat-bog of Rotjesfj. it has been found on a single site; it forms here dark-brown tufts together with *Drepanocladus* sp., *Calliergon stramineum* and *Cephaloziella arctica*. Leaves reddish-brown, dorsal lobe of the leaves convex, rounded, the commissure slightly arcuate. Gemmae at the margin of the leaves 1—2-celled, brown, $15 \times 25 \mu$. Cells in the middle of the leaves about 30μ wide, with distinct trigons. Previously reported from Spitzbergen by Arnell a. Mårtensson (1959).

Scapania tundrae (H. W. Arnell) Buch — Rare in this collection, on the peat-bog of Rotjesfj. E., it is here abundant, forms brownish, low tufts, associated with *Drepanocladus* sp., *Calliergon sarmentosum*, *Messea triquetra* a.o. The shoots are blackish-brown, margin of the leaves irregularly dentate, on the apices of the upper leaves 1—2-celled, brown gemmae. Arnell a. Mårtensson have noted it from W. Spitzbergen (1959).

Scapania paludicola Loeske, K. Müll. — Rare. On morainic clay, on the wet tundra on the banks of lakes it forms dark-brownish tufts on Bratteggdl., intermingled with *Polytrichum gracile*, *Drepanocladus* sp. and *Calliergon stramineum*.

Scapania kaurinii Ryan — Rare. On the moist humus and detritus, among stones and boulders, together with *Andreaea* sp. and *Ptilidium ciliare* on the island of Dunöyane- SW. Spitzbergen and below the summit of Torbjörnsefj. The apices of the stems are often pale, flagelliform, partly dead. On the living apical stems

there are pale-green gemmae, consisting of two cells, $14 \times 22 \mu$ in size. It forms compact, brown-black tufts. It reaches far North in Fennoscandia, Greenland, Ellesmere Island (Weimarck, 1937), the polar Ural (Pole, 1915).

Scapania subalpina (Nees) Lindb. — It is not frequent in Hornsund, only once found in the examined collection, grows on the acidophil substratum on the E. slopes of Rotjesfj., associated with *Calliergon* sp. It has not been reported from Svalbard but in the North it is known from Iceland, Greenland (Arnell, 1956), Jan Mayen (Jensen, 1900), Alaska (Persson a. Gjaerevoll, 1958), Newfoundland (Buch a. Tuomikoski, 1955) to New York.

Scapania spitzbergensis (Lindb.) K. Müll. — Rare. It forms compact, nearly unmixed tufts in crevices of the rocks on the E. slopes of Skölfj., associated only with *Dicranum fuscescens*. The species was first collected by Berggren and described by Lindberg in 1889. The tall to 5 cm, reddish-green pigmented stems and strongly dentate leaf-lobes are very characteristic diagnostic features in this species.

Cephalozia bicuspidata (L.) Dum. — Rather rare in Hornsund, represents here a very xeromorphic type, golden to brown pigmented, its stems have filiform shoots with small, pale leaves. It grows on acidic rocks covered with humus near Brattegga, associated with *Cephaloziella arctica*. The stems are sterile and similar to *C. ambigua*, but the cell-leaves are larger, the wall-cells thinner and the lobe-leaves longer than in *C. ambigua*.

Cephalozia ambigua Mass. — Not rare. On the morainic clay and dertitus, on the surfaces of moss carpets. In this region it is related to *Cephalozia bicuspidata*, from which it is often difficult to distinguish. In Hornsund it grows on Sofiekm.-near the Gogelar glacier, Rotjesfj. — Hansa glacier, Torbjörnsefj. S. — on the top of nunatak Styrkjernet E., Dunöyane on the dead mosses.

Cephalozia media Lindb. — Very scarce in W. Svalbard. Tundra on the morainic deposits in Fuglaberget ES., grows intermingled among the species *Dicranum* and *Drepanocladus*, together with *Lophozia wenzelii* and *Ptilidium ciliare*.

Prasanthus suecicus (Gottsche) Lindb. — Rare. It is only once found in the collection examined. Its agglomerated greyish, fertile stems form flat, crustaceous patches on the dry morainic clay on polygonal fields in Rotjesfj., together with *Gymnomitrium coralloides*, *Scapania obcordata*, *Anthelia juratzkana*, *Cephaloziella arctica*. This species is well known from NE. Fennoscandia, Siberia, Greenland, Jan Mayen, France and Austria. From Svalbard it was for the first time reported by Arnell a. Mårtensson in 1959.

Gymnomitrium coralloides Nees — More rare in W. Spitzbergen than *G. concinnum*, grows in the same ecological conditions as the previous species and has a wide amplitude as regards the requirement of a substratum. Torbjörnsefj. — associated with *Polytrichum piliferum*, Rotjesfj. — in crevices, Skoddefj. — 617 m. alt., Arie km. — on the soil.

Gymnomitrium concinnum (Lightf.) Corda — Common on the moist soil — clay, shady rocks and in crevices, between boulders; grows in dense, low patches, associated with *Cephalozia ambigua*, *Cephaloziella arctica*, *Blepharostoma tri-*

- chophyllum* var. *brevirete*, *Anthelia juratzkana*. Rotjesfj. — Hansa glacier, Skölfj. E., nunatak Bergenova E., nunatak Deilegga, Ariekm., nunatak Stykjernet E.
- Marchantia polymorpha* (L.) Burgeff — Not common. In moist places, on the banks of streams, associated with *Climacium dendroides*, *Mnium rugicum*; on the W. slope of Rotjesfj. and the W. slope of Torbjörnsenfj. The thallus is green, long, with very well distinguished midrib and thin, nearly translucent wings, with gemmae-cups. It occurs throughout the areas of Fennoscandia (Mårtensson, 1955). Arnell S. and Mårtensson (1959) reported that all the present localities of this species in Spitzbergen (Lindberg, 1867; Berggren, 1875; Arnell H. W., 1900) belong to *M. alpestris*. I think the opinion is not correct and that in this region both species occur and *M. polymorpha* has a larger area than *M. alpestris*.
- Marchantia alpestris* (Nees) Burgeff — Only once found on the S. slope of Ariekm. at 60 m. in crevices of rocks, associated with *Saxifraga oppositifolia*. The thallus is thick and rigid, bluish-green, with gemmae-cups, divided into two short lobes; the middle-rib is not at all distinct. Arnella. Mårtensson (1959) reported it from W. Spitzbergen as a not infrequent species.
- Preissia quadrata* (Scop.) Nees — A rare species in this district, grows on acidophil substratum among the mosses; it prefers a rather calcareous substratum. Sofiekm., nearly in the mouth of the stream.

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Materiały do flory wątrobowców północnych wybrzeży Hornsundu
(płd.-zach. *Spicbergenu*)

Streszczenie

Wątrobowce zebrane zostały w r. 1958 przez dr M. Kuca podczas Polskiej Ekspedycji Polarnej na Szpicbergen, zorganizowanej przez Komitet III Międzynarodowego Roku Geofizycznego. Zbiory te pochodzą z północnych wybrzeży Hornsundu, leżących pomiędzy lodowcami Torell i Horn, 77°00—77°10, N. szer. geogr. i 15°00—16°30, W. dług. geogr.

Na tych terenach tworzą wątrobowce wraz z mchami i porostami pionierską roślinność w szczelinach skał, na powierzchni gliny i kamieni pochodzenia lodowcowego lub wchodzą w skład roślinności arktycznej tundry.

Pionierskie gatunki arktycznych wątrobowców tworzą płaskie, czarne lub szare, skorupiaste darnie silnie zespolone z podłożem; na tundrze i torfowiskach rosną wśród mchów.

Rozmnażanie tych wątrobowców odbywa się najczęściej w sposób wegetatywny, za pomocą obficie powstających rozmnózek. Zarodnie powstają rzadko, w badanej kolekcji znalazłam zarodnie tylko u trzech gatunków, a mianowicie: *Prasanthus suecicus*, *Anthelia juratzkana*, *A. julacea*. Zarodnie wykształcają się na krótkich trzonkach i dość wcześnie są zainfekowane grzybami. Często znaleźć można całą zawartość zarodni (zarodniki i sprężyce) spletaną strzępkami grzybów w kulistą masę. W nielicznych przypadkach powstają tu plemniki, jeszcze rzadziej spotkać można periancja, trudno jednak było w nich stwierdzić obecność rodni.

Znalezione w zbiorach z Hornsundu wątrobowce zaklasyfikować można zgodnie z Poluninem (1947) i Schusterem (1951) do następujących grup:

1. arktyczna, której gatunki mają zasięg ograniczony niemal wyłącznie do obszaru arktyki *Orthocaulis quadrilobus*, *Lophozia groenlandica*, *Gymnomitrium coralloides*, *Scapania kaurinii*, *S. hyperborea*, *S. tundrae*, *S. spitzbergensis*, *S. obcordata*, *Anthelia julacea*, *Cephaloziella arctica*, *Blepharostoma trichophyllum* var. *brevirete*.

2. arktyczno-alpejska, z gatunkami rozprzestrzensionymi w arktyce i na pewnych obszarach subarktycznych, *Orthocaulis elongatus*, *Barbilophozia hatcheri*, *Leiocolea heterocolpos*, *Lophozia wenzelii*, *Saccobasis polita*, *Solenostoma sphaerocarpum* var. *nana*, *Chandonanthus setiformis*, *Tritomaria scitula*, *Cephalozia ambigua*, *Anthelia juratzkana*, *Prasanthus suecicus* i być może do tej grupy zaliczyć można *Gymnomitrium concinnum*.

3. arktyczno-alpejska i subarktyczno-subalpejska, do której zaliczam większość gatunków, *Lophozia alpestris*, *Gymnocolea inflata*, *Sphenolobus minutus*, *Tritomaria quinquedentata*, *Scapania irrigua*, *S. curta*, *S. paludicola*, *S. subalpina*, *Cephalozia bicuspidata*, *Cephaloziella subdentata*, *Ptilidium ciliare*, *Preissia quadrata* i być może *Marchantia alpestris*, jednakże ze względu na mało znane rozmieszczenie tego gatunku trudno go zaklasyfikować z większą pewnością.

4. subarktyczno-subalpejska, *Lophozia longidens*, *Isopaches bicrenatus*, *Nardia geoscyphus*.

5. ubikwisty, *Riccardia pinguis*, *Marchantia polymorpha*, *Cephalozia media*.

Ogółem znalazłam 42 gatunki wątrobowców, a wśród nich *Gymnocolea inflata*, *Isopaches bicrenatus*, *Solenostoma sphaerocarpum* var. *nana* i *Nardia geoscyphus* zanotowane po raz pierwszy na Szczybie.