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Contribution to the moss flora of Calypsostranda in Wedel Jarlsberg Land, Spitsbergen

ABSTRACT: Botanic investigations were carried through on the Calypsostranda strandflat, southern coast of Bellsund. Among flora communities 35 moss species were distinguished. Connections between moss habitats and ecologic conditions were studied.

Key words: Arctic, Spitsbergen, moss flora.

Introduction

Materials were collected during the expedition organized by the Institute of the Earth Sciences, Maria Curie-Skłodowska University from Lublin, Poland. During investigations of flora in Calypsostranda (*cf.* Rzętkowska 1987) special attention was paid to the prevailing moss species. This paper completes information on mosses in Spitsbergen. Geobotanical investigations in the whole southern coast of Bellsund are continued (Święś 1988a, b; Karczmarz and Święś 1988).

Investigated area is formed of several raised marine beaches at altitudes from 25 to 120 m a.s.l. (Fig. 1). These beaches are composed of clay, sand, shingle and till (Pękal 1987). Beach-forming deposits were transformed into the Gelic Cambisols, arctic brown soils of good infiltration and low humidity. On their surface fissure and stone polygons developed (Pl. 1, Fig. 1). In depressions, erosive dissections and below snowbeds a ground is water-saturated. In these places arctic gley soils — Gelic Gleysols with polygons of different shape occur (Klimowicz and Uziak 1987).

Differences in thickness of active layer of permafrost on the Calypsostranda depend on terrain exposure, water conditions, flora cover and date of measurements (Repelewska-Pękałowa and Gluza 1988, Repelewska-Pękałowa,

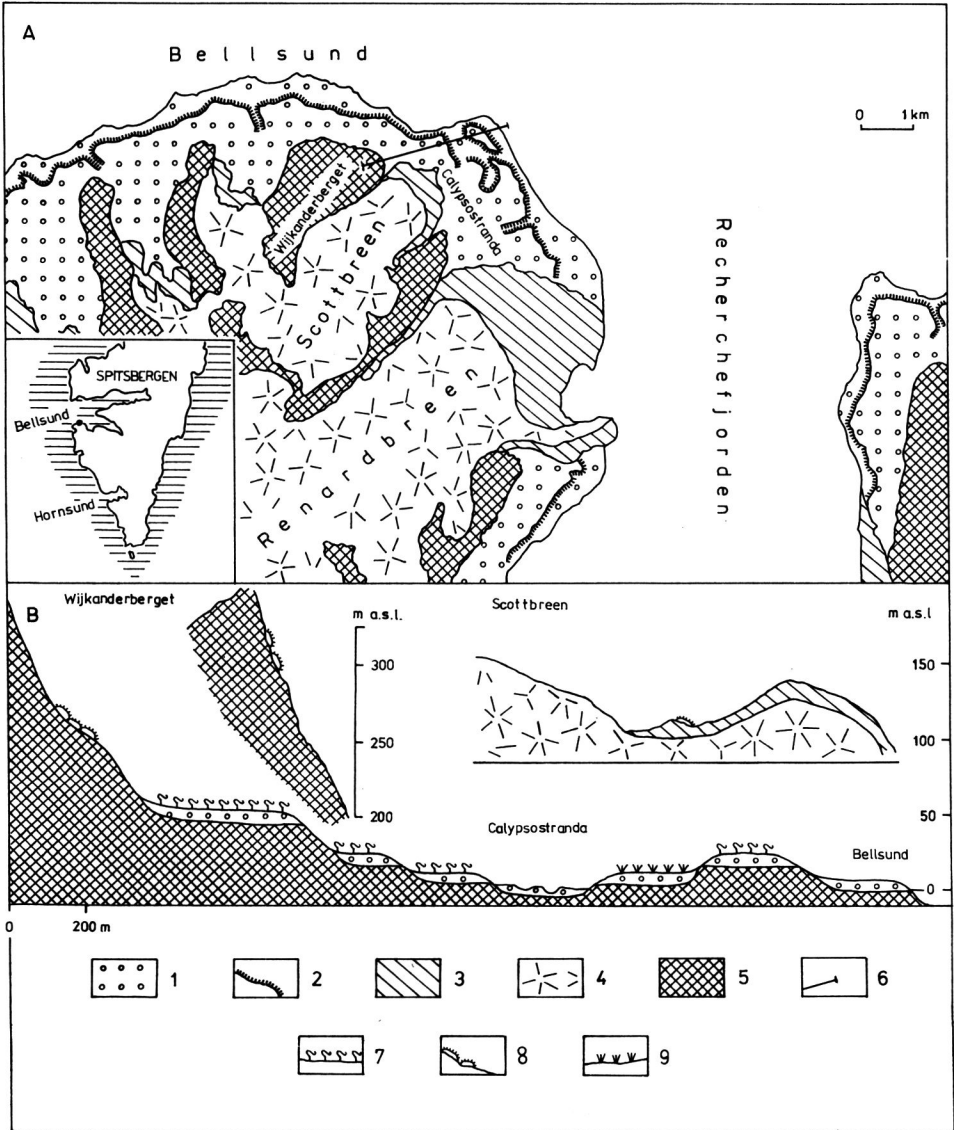


Fig. 1. Sketch of investigated area in Bellsund (A) and section of raised marine beaches (B): 1 — shingle-sandy marine deposits, 2 — edge of marine beach 25 m a.s.l., 3 — intramorainal zone, 4 — glaciers, 5 — mountains, 6 — section line, 7 — deflation tundra communities, 8 — moss turfs, 9 — wet grass-moss communities

Gluzza and Pękala 1988). At the beginning of July the active layer was to 0.7 m thick while at the end of August to 0.67—1.75 m.

Mountain slopes composed of Precambrian metamorphic rocks (Hecla Hoek Formation) were also investigated. Due to intensive weathering,

mountain slopes are covered with rock debris. They are often fertilized by bird excrements.

Botanic observations were also made on ice-cored moraines and in intramorainal zones of glaciers.

Weather conditions were determined on the basis of mean daily values of meteorologic elements measured in 1986 and 1987 from June to August (Gluza 1987, 1988). Frequent cloudiness, high air humidity (83%) and high wind speeds (4.1 — 4.8 m/s) reaching 24 m/s during gusts are the characteristic features in summer in Calypsostranda area. Mean daily air temperature at 2 m above the ground was equal 4.9 and 3.8°C in successive years while precipitation 0.5 and 0.6 mm, and evaporation 1.2 and 1.8 mm respectively. Surface temperature was higher and varied depending on lithology, its water content and flora cover. In the daytime the warmest places occurred over stony soils while the coldest ones over a wet moss. Temperature differences between such places were equal 2—3°C.

Revision of species

List of 35 moss species from different habitats and phytocoenoses was prepared on the basis of botanic field observations. According to Euroala (1968) as well as Gugnacka-Fiedor and Noryśkiewicz (1982), this list indicates the species characteristic (char. sp.) for different communities. Specimens of the studied mosses were deposited in the herbarium of the Institute of Botany, Polish Academy of Sciences in Cracow.

Moss flora in Calypsostranda includes:

Polytrichaceae

Polytrichum alpinum Hedw. — rock debris under bird cliff, snowbed with *Nostoc commune*; char. sp. of lichen tundra; mesophyte, acidophilous.

Ditrichaceae

Ditrichum flexicaule (Schwaegr.) Hampe — marine terraces overgrown with deflation tundra; char. sp. of deflation tundra: xerophyte, heliophilous, basophilous (Elvebakk 1982).

Distichium capillaceum (Hedw.) B.S.G. — snowbed with *Nostoc commune*; char. sp. of dry moss tundra; calciphilous.

Dicranaceae

Dicranum groenlandicum Brid. — rock debris under bird cliff; char. sp. of dry moss tundra.

Oncophorus wahlenbergii Brid. — marine terraces overgrown with deflation tundra; char. sp. of fresh moss tundra.

Dicranoweisia crispula (Hedw.) Milde — marine terraces overgrown with deflation tundra, wet communities of grasses and mosses in erosive

dissections; with sporogons; xerophyte, heliophilous, widely acidophilous (Elvebakk 1982, 1984).

Pottiaceae

Tortula ruralis (Hedw.) Gaertn., Meyer & Scherb. — rock debris under bird cliff; char. sp. of dry moss tundra; xerophyte, heliophilous, circumneutral (Elvebakk 1982).

Grimmiaceae

Schistidium rivulare (Brid.) Podp. — marine terraces overgrown with deflation tundra, rock debris; with sporogons.

Racomitrium lanuginosum (Hedw.) Brid. — rock debris; char. sp. of lichen tundra; hygrophyte, heliophilous, preferentially acidophilous (Elvebakk 1982, 1984).

Splachnaceae

Aplodon wormskioldii (Hornem.) R. Brown — wet communities of grasses and mosses in erosive dissections; with sporogons; nitrophilous.

Splachnum vasculosum Hedw. — wet communities of grasses and mosses in erosive dissections — flooded places; with sporogons; char. sp. of snowbeds.

Bryaceae

Pohlia cruda (Hedw.) Lindb. — snowbed with *Nostoc commune*, rock debris; with sporogons; char. sp. of fresh moss tundra; indifferent (Elvebakk 1982).

Leptobryum pyriforme (Hedw.) Wils. — till in intramorainal zone; with sporogons; mesophyte, nitrophilous, indifferent.

Bryum pseudotriquetrum (Hedw.) Gaertn., Meyer & Scherb. — wet communities of grasses and mosses in erosive dissections; char. sp. of dry moss tundra; helophyte, heliophilous, calciphilous.

Bryum imbricatum (Schwaegr.) B.S.G. syn. *Bryum inclinatum* (Brid.) Bland. — till in intramorainal zone; with sporogons.

Mniaceae

Plagiomnium ellipticum (Brid.) T. Kop. — rock debris under bird cliff.

Catoscopiaceae

Catoscopium nigratum (Hedw.) Brid. — wet communities of grasses and mosses in erosive dissections; hygrophyte, heliophilous, calciphilous.

Bartramiaceae

Philonotis tomentella Mol. — wet communities of grasses and mosses in erosive dissections.

Aulacomniaceae

Aulacomnium palustre (Hedw.) Schwaegr. — rock debris under bird cliff; char. sp. of snowbeds; hygrophyte, acidophilous.

Aulacomnium turgidum (Wahlenb.) Schwaegr. — wet communities of grasses and mosses in erosive dissections — hummock tundra in flooded zone; char. sp. of fresh moss tundra; mesophyte, heliophilous, preferentially acidophilous (Elvebakk 1982).

Cratoneuraceae

Cratoneuron filicinum var. *curvicaule* (Jur.) Mönk. — marine terraces overgrown with deflation tundra; char. sp. of dry moss tundra.

Amblystegiaceae

Campylium stellatum (Hedw.) C. Jens. — marine terraces overgrown with deflation tundra; char. sp. of deflation tundra; helophyte or hygrophyte, heliophilous, calciphilous or indifferent.

Campylium polygamum (B.S.G.) C. Jens. — marine terraces overgrown with deflation tundra; char. sp. of snowbeds.

Hygrohypnum polare (Lindb.) Loeske — marine terraces overgrown with deflation tundra.

Drepanocladus uncinatus (Hedw.) Warnst. — marine terraces overgrown with deflation tundra, rock debris differently fertilized; char. sp. of snowbeds; mesophyte, acidophilous.

Drepanocladus revolvens (Sw.) Warnst. — marine terraces overgrown with deflation tundra, wet communities of grasses and mosses in erosive dissections; char. sp. of snowbeds; helophyte, heliophilous, slightly calciphilous.

Calliargon sarmentosum (Wahlenb.) Kindb. — wet communities of grasses and mosses in erosive dissections; char. sp. of snowbeds; calciphilous.

Calliargon richardsonii (Mitt.) Kindb. — wet communities of grasses and mosses in erosive dissections.

Brachytheciaceae

Tomentypnum nitens (Hedw.) Loeske — rock debris under bird cliff; char. sp. of dry moss tundra; helophyte, heliophilous, indifferent (Elvebakk 1984).

Brachythecium turgidum (Hartm.) Kindb. — rock debris under bird cliff.

Entodontaceae

Orthothecium intricatum (Hartm.) B.S.G. — marine terraces overgrown with deflation tundra; calciphilous.

Orthothecium chryseon (Schwaegr.) B.S.G. — marine terraces overgrown with deflation tundra; char. sp. of snowbeds.

Plagiotheciaceae

Isopterygium pulchellum (Hedw.) Jaeg. — marine terraces overgrown with deflation tundra; mesophyte, calciphilous.

Hypnaceae

Hypnum bambergeri Schimp. — marine terraces overgrown with deflation tundra; calciphilous.

Hylocomiaceae

Hylocomium splendens (Hedw.) B.S.G. — rock debris; char. sp. dry moss tundra; mesophyte, indifferent (Elvebakk 1982).

Final remarks

Investigated area is composed of widespread marine terraces overgrown with flora communities of deflation tundra (Pl. 1). Mosses are sparse in these communities due to a low water content in the ground and low contents of nutrients. A lot of moss species are xerophytes, heliophytes and orophytes. Grass-moss communities with *Deschampsia alpina* (L.) R. & S. (Hofmann 1968, Philippi 1973) occurred in places which remained wet during the vegetation period. In these phytocoenoses moss forms compact turf covers (Pl. 2, Fig. 1). In flooded zones *Splachnum vasculosum* prevailed, while *Dicranoweisia crispula* was a very common species on dry and wet soils. Due to its acidophily this moss is a very good indicator to distinguish silicate and carbonate rock debris (Elvebakk 1984). Debris surfaces form often a substrate for development of moss turfs (Pl. 2, Fig. 2; Pl. 3, Fig. 1). They grow much more intensively when beneath bird colonies. In such case characteristic lawn communities develop (Hartmann 1980) with *Polytrichum alpinum*, *Tortula ruralis*, *Plagiomnium ellipticum*, *Aulacomnium palustre*, *Tomentypnum nitens* and *Brachythecium turgidum*. These species readily develop in similar fertile places of different regions of Svalbard (Eurola and Hakala 1977). *Racomitrium lanuginosum* is the most characteristic species on silicate debris. This moss is absent on basal rocks (Elvebakk 1984). Moss patches also occur in intramorainal zones on a clay-muddy material (Pl. 3, Fig. 2; Pl. 4). They are composed there of *Leptobryum pyriforme* and *Bryum imbricatum*. Detailed distribution of these species in Svalbard is still unknown. Center of occurrence of *Leptobryum pyriforme* seems to be located in the western coast of Spitsbergen, while in the interior and on the other islands this species is only occasionally noted (Kuc 1963, Philippi 1973).

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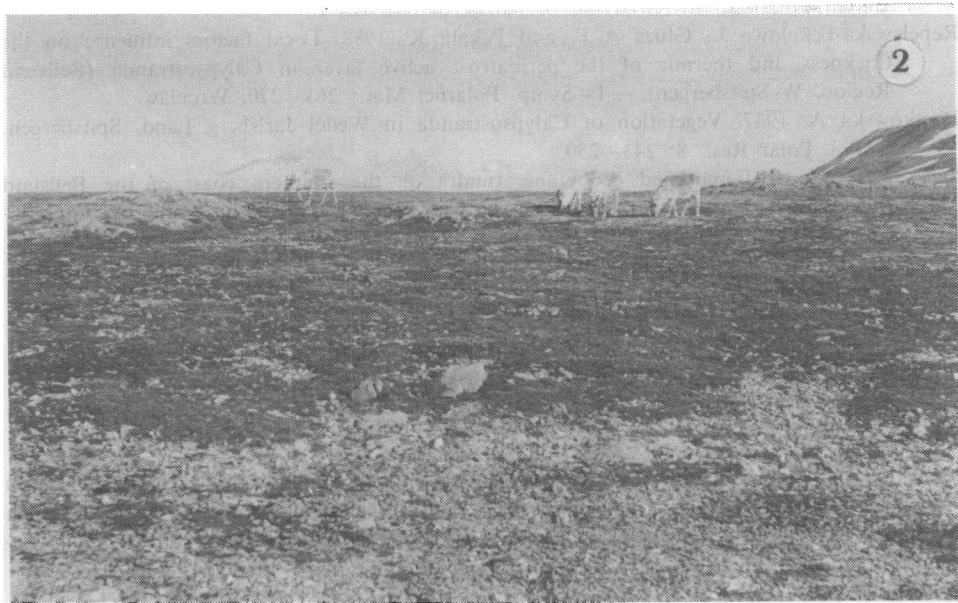
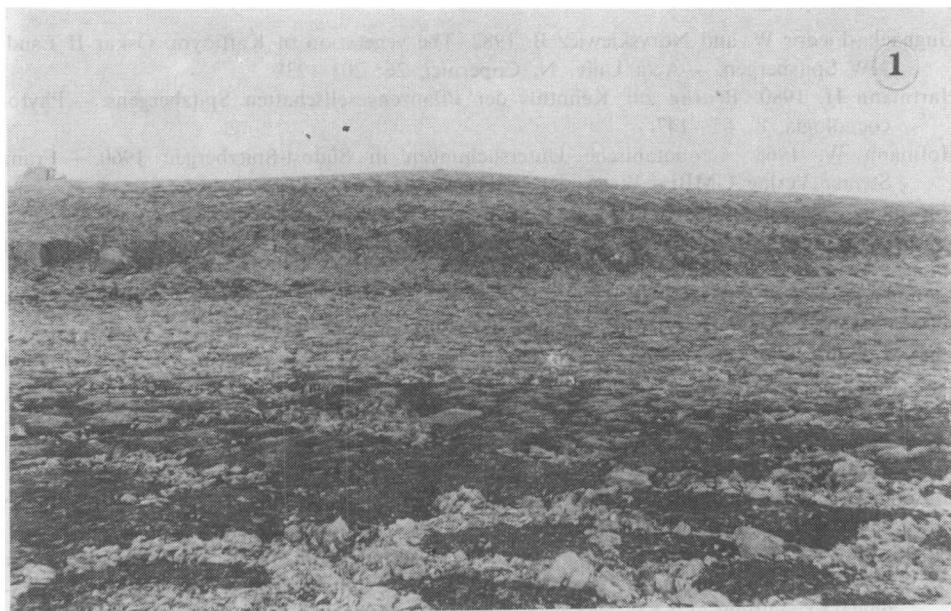
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Streszczenie

Tarasы morskie w rejonie równiny Calypsostranda na południowym wybrzeżu Bellsundu (Spitsbergen) pokryte są tundrą deflacyjną (pl. 1). Udział mchów w tego rodzaju zbiorowiskach jest niewielki. Na suchych powierzchniach tarasów występują przede wszystkim *Ditrichum flexicaule*, *Dicranoweisia crispula*, *Schistidium rivulare*. W obniżeniach terenu i rozcięciach erozyjnych, gdzie podłoże wykazuje podwyższoną wilgotność podczas całego sezonu wegetacyjnego, pojawiają się zbiorowiska trawiasto-mszyste, w skład których wchodzi m.in.: *Aplodon wormskioldii*, *Splachnum vasculosum*, *Aulacomnium turgidum*, *Calliergon sarmentosum*, *C. richardsonii* (pl. 2, fig. 1). Na rumowisku skalnym u podnóża pasma górskiego znaleziono *Racomitrium lanuginosum*, natomiast powierzchnia gruzowa nawożona ekskrementami ptaków, zdominowana była przez *Polytrichum alpinum*, *Plagiomnium ellipticum*, *Aulacomnium palustre*, *Tomentypnum nitens* oraz *Brachythecium turgidum* (pl. 2, fig. 2 i pl. 3, fig. 1). Na płatach mszystych występujących w strefach intramarginalnych lodowców znaleziono *Leptobryum pyriforme* oraz *Bryum imbricatum* (pl. 3, fig. 2 i pl. 4).

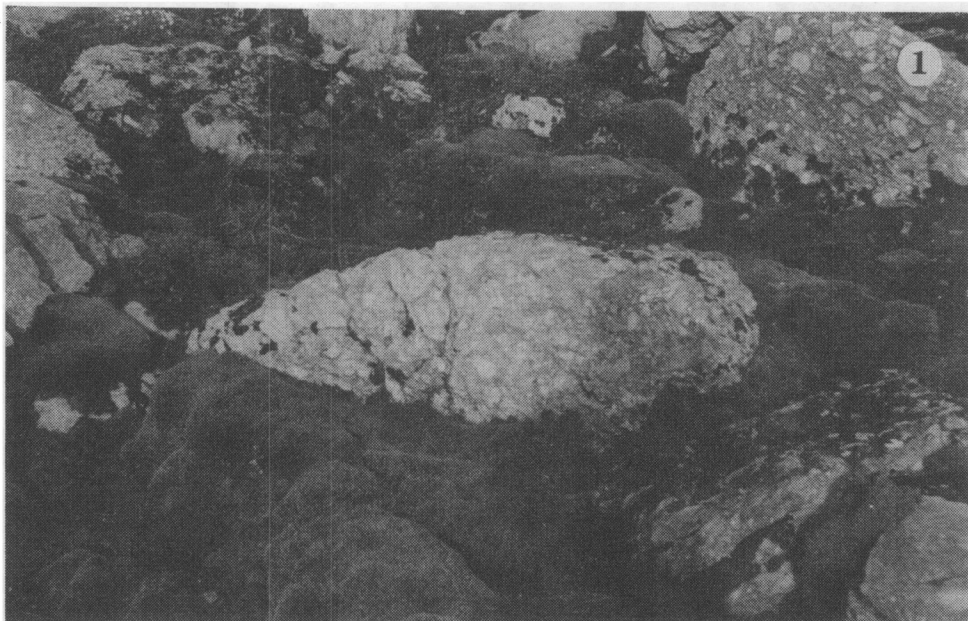
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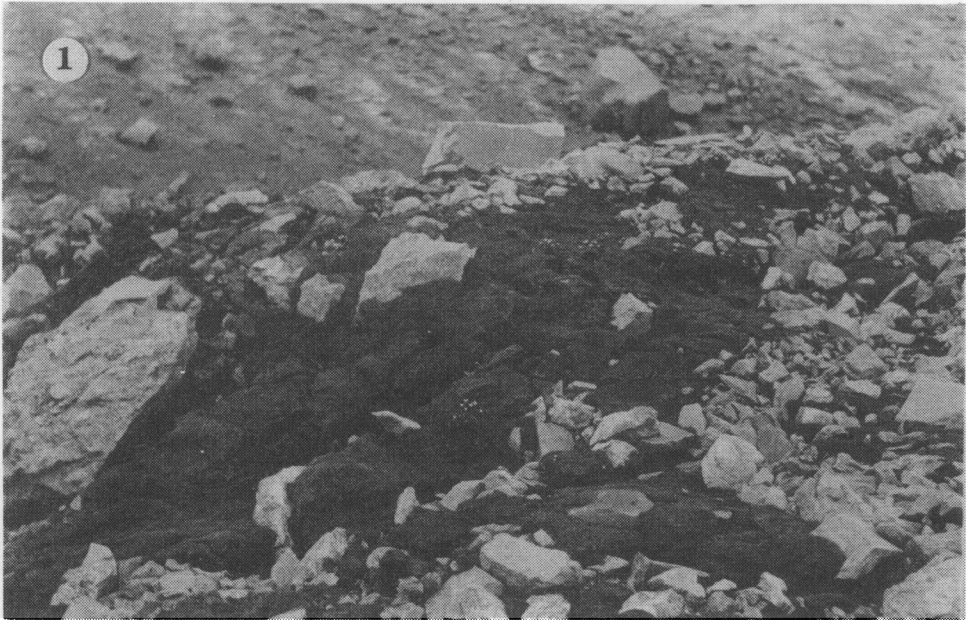
1. Calypsostranda, stony polygons on a marine beach
2. Calypsostranda, marine beaches overgrown with deflation tundra



1. Calypsostranda, moss patch on a marine beach
2. Wijkanderberget, lawn on rock debris



1. Wijkanderberget, moss patch on rock debris
2. Intramoraine zone of the Scott Glacier



1. Moss patch in the intramorainal zone of the Scott Glacier
2. Moss patch in the intramorainal zone of the Renard Glacier