ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN—POLONIA
VOL. XLV, 12 SECTIO C 1990

Instytut Biologii UMCS
Zakład Systematyki i Geografii Roślin

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Bryophytes Collected in Arctic Tundra of Dyrstad Region (Western Spitsbergen) in 1988

Mszaki zebrane na arktycznej tundrze w rejonie Dyrstad (Zachodni Spitsbergen) w r. 1988

The bryological materials were collected in 1988 in Dyrstad region on the south-western coast of Bellsund on Spitsbergen (Fig. 1) during the Third Geographical Expedition of Maria Curie-Skłodowska University in Lublin. We have had relatively scarce data about the bryoflora of this coast since the studies on the flora of mosses made by Berggren (1). The more recent works contain detailed data about the bryoflora of only few regions or about the distribution of the rare moss species occurring there (4—7, 15). In the list presented by Kuc (8) there are dot maps of the localities of mosses found on Spitsbergen from the times of Berggren (1) to 1970.

METHODS

The work characterizes bryological relations against the ecological and floristic differentiation of the dense Arctic tundra. Field investigations were conducted from June to August in 61 representative areas of 6 types (A—F) and 8 sub-types of the local tundra on the area of about 100 m^2. The investigation sites are characterized in a separate chapter of the present work (Fig. 1), considering topography and the properties of habitat-floristic tundra. The results of these studies are presented in Table 1. The data concerning the degrees of cover and persistence of the main dominating bryophytes in all forms of tundra are given in Table 2. Figure 2 presents dot distribution of 4 scarce species of mosses on the islands of Svalbard. All the known localities of these plants (8) and the new ones from the coast of Bellsund, which were described earlier (7), have been taken into consideration.

INVESTIGATION AREA

Localization and geomorphology

The examined Dyrstad region lies on the western coast of Spitsbergen on the north-western coast of Wedel Jarlsberg Land over the fiord Bellsund. The main geomorphological features of the region (11) are presented in the attached map (Fig. 1).

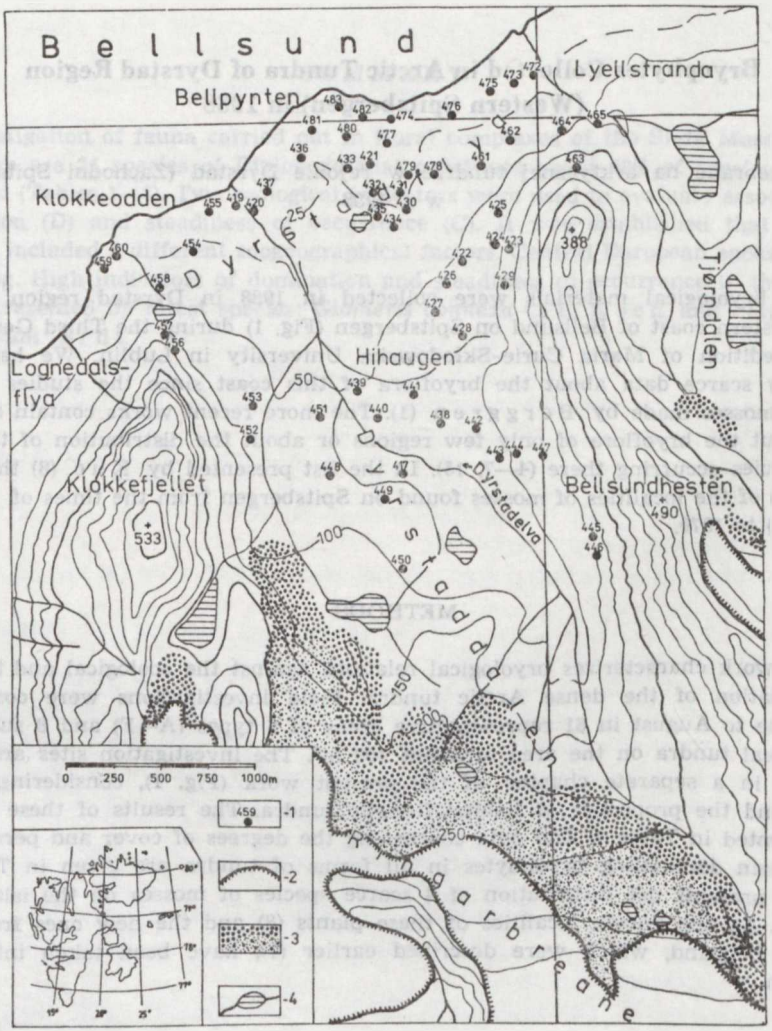

Fig. 1. The investigation area in the region of Dyrstad: 1 — the studies sites of bryophytes, 2 — glaciers, 3 — terminal, ground and ablation moraines, 4 — rivers and lakes

Fig. 2. The distribution of scarce mosses on the archipelago of Svalbard: 1 — *Fissidens osmundoides*, 2 — *Trichostomum arcticum*, 3 — *Conostomum tetragonum*, 4 — *Campylium zemliae*; a — new and formerly published sites (7), b — known sites (8)

Dyrstad region is clearly distinguished into two landscape units: the sea plain (Dyrstadflya) and mountainous valley (Dyrstaddalen). Dyrstadflya is situated between semicircularly connected, prolate massifs of Bellsundhesten (388—745 m), Klokkefiellet (533 m), Kolven (570 m), Ringaren (685 m) and Storgubben (832 m). The enumerated heights have steep slopes and precipitous, narrow ridges (Figs. 3, 4) from the side of Dyrstad. The stony heaps of scree and degraded rocky terraces are frequent under the rocky ridges and gullies. At the foot of the heights, on the borderline of Dyrstadflya and Dyrstaddalen there are the ridges of thick-

stone nival moraines and rubble glaciers. In the upper section of Dyrstaddalen one observes glacial landscape. The upper part of that valley from the southern west is closed by the branches of Ringabreane glacier. At the foot of the ice tongues, from 100 m above sea level there are frequent stony terminal, lateral and ground moraines as well as stony--gravelly river drifts. In the central and bottom section of Dyrstaddalen the most frequent are clay-stony soli-fluctive grounds, which are cut with cryoplanational terraces and degraded rocky taluses.

The landscape of all the region of Dyrstadflya and the gate of Dyrstaddalen is dominated by a complete system of isostatically raised sea terraces. Most frequently, these are flat, sloping and rollershaped forms with differentiated height between 17 and 80 m above sea level. In the region of Dyrstadflya the main landscape form is constituted by lower steps of sloping sea terraces 17—25 m above sea level. On the sea coast one can find the lowest, 5—10 m, narrow sea terrace with preserved storm ridges. The terraces 35—45 m high dominate in the region of the borderline between Dyrstadflya and Dyrstaddalen. A terrace 60 m high principally forms the bottom of the lower section of Dyrstaddalen. A terrace 80 m high is found on the rim of the lower section of Dyrstaddalen under the northern slope of Bellsundhesten. The surface of the enumerated sea terraces is built from mixed gravel, sandy and clay formations mixed in different proportions, and the rocks of very different sizes and origin. In the latter one can often come across weathering shells of the fossil sea fauna. The oldest rocky bedding in the region of Dyrstad is formed by pre-Cambrian metamorphic rocks of Hecla Hoek formation (2).

Soils

Totally, in the region of Dyrstad there are about 18 forms of soils and soil grounds (9). The soils of brown and boggy types are relatively best formed and most frequent. They mainly occur on the higher steps of sea terraces and on the old stony-gravelly river drifts. The brown soils are formed on drier, more compact habitats with more mineralized gravelly-sandy bedding. The boggy and peat soils are characteristic of the depressions with the bedding which is very moistened, compact, clayey or loamy. On other habitats there are mostly soil grounds, difficult to determine, of lythosol types (mountain massifs, rocky terraces, glacial and nival moraines, heaps of scree, stony-gravelly river drifts) or of rigosol type (sandy and gravel sea terraces, weathered rocky rubble at the foot of the mountains, etc.). The soils which are difficult to determine occur on the solifluction grounds with the outflows of clayey and stony tra-

verses. Even those locally best shaped ones belong to shallow soils, strongly skeletal ones. Most frequently these are the soils rich in $CaCO_3$ and usually neutral, only exceptionally acid ones.

Water relationships and climate

The river network in the region of Dyrstad, and especially in the region of Dyrstaddalen is fairly well developed. The main river is the Dyrstaddelva, with numerous side tributaries of the water coming from the melting glaciers and the permafrost bedding as well as from the atmospheric falls. This river at its mouth at the sea gulf flows in a canyon 15 m deep.

In the region of Dyrstadflya and Dyrstaddalen there are a few small periglacial lakes. They fill the depressions situated on the present and historic ground and ablation moraines as well as on sea terraces and mountain massifs (Fig. 1).

In full summer the surface of the bedding in the region of Dyrstad is most often moderately moistured (Dyrstaddalen) or considerably dried (Dyrstaddalva). The areas that are permanently wet and marshy occur in the hollows at the hill-sides, and around the lakes and the overflow--arms of the rivers.

The climatic conditions of the Dyrstad region can be only provisionally determined on the basis of comparative studies carried out on different area in Western Spitsbergen (10, 12—14). The mean yearly air temperature in the region of Dyrstad is about —5°C, and the mean yearly sum of atmospheric falls is within the limit of 400 mm. Besides, the region of Dyrstad, on account of the specific design of mountain tops from the direction of southern east to northern west, is probably a little drier and warmer than the regions from the east and west. This probably follows from the fact that in the region of Dyrstad, as compared with the neighbouring regions, there is a greater share of dry and warm foehn winds which reduce the cooling influence of the sea.

PLANT COMMUNITIES OF THE TUNDRA

In the region of Dyrstad there occur almost the same habitat-floristic forms of the Arctic tundra as those which have been so far characterized on the south-eastern coast of Bellsund (7, 15).

There are 6 types in 8 sub-types of the habitat-floristic tundra in the investigated area (Table 1). Relatively best formed areas of dense tundra occur on the space spreading from the sea coast in Dyrstadflya to the

central section of Dyrstaddalen (Fig. 1). This usually takes place on sea terraces, on old stony and gravel drifts and on highly weathered slopes between the heaps of scree. In this situation the most spread is the type of dry tundra (A) in tre grey-lichen form with *Cerataria* sp. (Ab). It is shaped on the outwashed, gravelly-stony and stony bedding, on the surface of the lower steps of sea terraces. Within the enumerated type of tundra, on the habitats of slightly protuberant surfaces and with more compact loamy-stony bedding with shallow brown soil there occur numerous but small areas of dry tundra (Fig. 3) which is distinguished by the dominating plants: *Dryas octopetala* (Ac) and *Racomitrium lanuginosum* (Ad). On the driest, gravelly-sandy-stony habitats there occur scarce areas of dry tundra in the sub-type of patchy tundra (Aa).

Mesophilous mixed tundra (B) dominates on solifluction, loamy-stony grounds, permanently rather moist, with clayey and stony polygonal crowns. It is characterized by a big share of mosses, lichens and flowering plants. The most frequent and most numerous among the latter include the following: *Salix polaris*, *Saxifraga oppositifolia*, *Silene acaulis* and *Equisetum variegatum*. In the local depressions, on a compact clayey, very wet and marshy bedding tundra of marshy, mossy-grassy type (E) spreads. The most characteristic flower plant for this type of tundra is the dominating: *Deschampsia caespitosa* ssp. *alpina*. Close to the overflow-arms of periglacial waters and around the lakes (Fig. 4) there occurs compact area of the type of tundra of wet morasses (F) included in 2 tundra sub-types, stony-gravelly riverine overflow-arms (Fa) and slimy-clayey swamps situated near the lakes (Fb).

The tundra of the type of coprophilous morass on the mountainside (D) is frequent on the mountain slopes, and especially at the foot, between the heaps of scree, below the sites where birds usually stay, on old mineral-humus rocky terraces. Besides, the morasses of mesophilous type (C) are fairly frequent. They are most often developed either on the stony bottom of dried streams (Ca) or on the loamy-stony solifluction grounds (Cb).

On the loose, dried and barren bedding there occur scarce successive plants of the type of an Arctic desert. It usually occurs in the youngest stony glacial morained and on the stony-gravelly river drifts as well as on the stony ridges and on the slopes. The communities of lichens lying on the rocks are relatively best developed on the enumerated habitats. Scarce clamps of flowers, bryophytes and lichens usually occur only on the microhabitats most convenient for the plants situated for example in degraded fissures or on rocky stone heaps with shallow fossil soil.

LOCALIZATION AND DESCRIPTION OF THE SITES

Localizations of the sites of mosses examined by F. Święs in the region of Dyrstad (Fig. 1), together with the dates of their collection are presented in Table 1 in numerical sequence in accordance with their order.

439. Dyrstaddalen, extremely NE part on E side of the river, a flat ridge of the sea terrace, 60 m a.s.l. The pebble-gravelly bedding with shallow soil, dry spotted tundra, 1988.7.31.

417. Dyrstaddalen, central-northern part at the river overflow-arm, 70 m a.s.l., 2° SW. Old sandy-gravelly outwash between the rivers, dry, grey lichen tundra with *Cetraria* sp., 1988.7.29.

419. Dyrstadflya, NW, on W part of the river mouth, 15 m a.s.l., 2° NW. A sea terrace, pebble-gravelly, dry, grey lichen tundra with *Cetraria* sp., 1988.7.30.

436. Dyrstadflya, NW (Bellpynten). sloping sea terrace, approx. 120 m to NW from a small lake, 20 m a.s.l., 2° N. A pebble-gravelly bedding, dry, grey lichen tundra with *Cetraria* sp., 1988.7.30.

437. Dyrstadflya, NW (Bellpynten), sloping sea terrace, approx. 250 m a.s.l., off the coast and 200 from the river mouth, 15 m a.s.l., 2° N. A stony-gravelly bedding, dry, grey lichen tundra with *Cetraria* sp., 1988.7.30.

441. Dyrstaddalen, NNE, about 120 m to S of the river in Hihaugen, the foot of the side of the sea terrace, 55 m a.s.l., 5° NW. A gravelly-sandy bedding, dry, grey lichen tundra with *Cetraria* sp., 1988.7.31.

453. Dyrstaddalen, NNWW, sloping sea terrace at Klokkefjellet, under a nival moraine, 75 m a.s.l., 2° NE. A pebble-gravelly bedding, dry, lichen tundra with *Cetraria* sp., 1988.7.31.

454. Dyrstadflya, SSWW, sloping sea terrace, under NW slope of Klokkefjellet, about 30 m off the coast, 40 m a.s.l., 5° N. A pebble-gravelly bedding, dry, grey lichen tundra with *Cetraria sp.*, 1988.7.31.

455. Dyrstadflya, NNW, sloping sea terrace, about 200 m to W of the river mouth and about 100 m off the coast, 15 m a.s.l., 2° NE. A pebble-gravelly bedding, dry, grey lichen tundra with *Cetraria* sp., 1988.8.1.

465. Dyrstadflya, SSEE, sloping sea terrace, to W side of the river's canyon, W of Tjorndalen, under NE slope of Bellsunhesten, 45 m a.s.l., 2° N. A loamy-stony bedding, dry, grey lichen tundra with *Cetraria* sp., 1988.8.2.

473. Dyrstadflya, NNEE, sloping sea terrace, about 300 m off the sea coast, about 150 m from the canyon of the river from Tjorndalen, 20 m a.s.l., 2° N. A pebble--gravelly bedding, dry, grey lichen tundra with *Cetraria* sp., 1988.8.2.

475. Dyrstadflya, NNE, a sloping sea terrace, about 120 m off the coast and 550 from the river with Tjorndalen, 15 m a.s.l., 4° N. A pebble-stony bedding, dry, grey lichen tundra with *Cetraria* sp., 1988.8.3.

438. Dyrstaddalen, NE, about 300 m to E of the main river, protruding, a sloping ridge of the sea terrace, 80 m a.s.l., 2—10° SW. A clayey-stony bedding with a shallow layer of brown soil, dry tundra with *Dryas octopetala*, 1988.7.30.

447. Dyrstaddalen, NEE, on a flattened top, in S part of a small height under Bellsundhesten, 150 m a.s.l., 2—5° S. A clayey-rubble bedding with a shallow layer of brown soil, dry tundra with *Dryas octopetala*, 1988.8.31.

450. Dyrstaddalen, central-western part, a sloping ridge of an inselberg height in N part, 95 m a.s.l., 2° W. A clayey-rocky bedding with a shallow layer of brown soil, dry, loose tundra with *Dryas octopetala*, 1988.7.31.

422. Dyrstadflya, SSEE, under NWW slope, about 150 m from Bellsundhesten 60 m a.s.l., 2—5° NW. A sloping ridge of a roller-shaped sea terrace, a sandy-gravelly bedding, dry, mossy tundra with *Racomitrium lanuginosum*, 1988.7.30.

426. Dyrstadflya, SSE, between N part of Bellsundhesten and Hihaugen, SE edge of a sloping ridge of a small height, 80 m a.s.l., 2—5° S. A degraded rocky terrace, dry morass with *Racomitrium lanuginosum*, 1988,7.30.

457. Dyrstadflya, SSWW, Klokkefjellet NE part, the foot of NE slope, 100 m a.s.l., 45° NEE. Degraded rocky blocks, dry morass with *Racomitrium lanuginosum*, 1988.8.1.

472. Dyrstadflya, NNEE, a sloping sea terrace, about 250 m off the coast, on the canyon of the river with Tjorndalen, 20 m a.s.l., 2° N. A pebble-gravelly bedding with a shallow layer of brown soil, dry mossy tundra with *Racomitrium lanuginosum*, 1988.8.2.

476. Dyrstadflya, NNE, a sloping sea terrace, under the skerries, about 110 m off the coast and 700 m from the river from Tjorndalen, 2° N, a clayey-gravelly--stony bedding, mesophilous mixed tundra, 1988.8.8.

479. Dyrstadflya, NE, a sea terrace, a valley lowering on a sloping side of a small height, about 450 m to NWW of NW slope of Bellsundhesten and about 500 m off the coast, 35 m a.s.l., 5° NW. A solifluction, clayey-stony bedding with obscure traverses, mesophilous mixed mossy-floral tundra, 1988.8.3.

421. Dyrstadflya, NE, a sea terrace, about 650 m to E of the river, about 500 m from the top of Bellpynten, 20 m a.s.l., 2—5° NW. A solifluction, clayey-stony bedding with obscure traverses mesophilous mixed tundra, 1988.7.3.

418. Dyrstaddalen, NWW, central-northern part, at the river overflow-arm, 71 m a.s.l., 2° SW. Old clayey-stony river sediments, mesophilous morass, silted, 1988.7.29.

430. Dyrstadflya, SE, about 550 m off the coast, a sea terrace, a sloping ridge of a small height, 40 m a.s.l., 2—5° NW. A solifluction clayey-stony bedding with frost cracks, with weakly marked traverses, mesophilous mixed tundra, 1988.7.30.

442. Dyrstaddalen, NEE, between a small river and the foot of a small height under Bellsundhesten, 80 m a.s.l., 2° W. A solifluction, clayey-stony bedding, with traverses, 1988.7.31.

451. Dyrstaddalen, NNW, between the river a nival moraine, under Klokkefjellet, 60 m a.s.l., 2° NE. A solifluction, clayey-rocky, polygonal bedding, 1988.7.31.

459. Dyrstadflya, NEWW (Klokkeoden), a sloping sea terrace, under NW slope of Klokkefjellet, about 150 h off the sea coast 12 m a.s.l., 2° N. A pebble-gravelly bedding, mesophilous mixed tundra, 1988.8.1.

461. Dyrstadflya, SEE, a sloping sea terrace, about 200 m from NW slope of Bellsundhesten, 30 m a.s.l., 2° NW. A solifluction clayey-rocky bedding, mesophilous mixed, mossy-floral tundra, 1988.8.2.

464. Dyrstadflya, SSEE, a sea terrace, a sloping N foot of Bellsundhesten under the nival moraine, about 250 m from the canyon of the river from Tjorndalen, 40 m a.s.l., 5° N. A clayey-stony bedding, mesophilous mixed tundra, 1988.8.2.

474. Dyrstadflya, NNE, at the E edge of Bellpynten, a sloping sea terrace over the coast, 10 m a.s.l., 2° N. A clayey-gravelly pebble bedding mesophilous mixed tundra, 1988.8.3.

477. Dyrstadflya, NNE, about 250 m to N of the Bellpynten gulf, the bottom of a tunnel-like lowered sea terrace, 20 m a.s.l., 2° N. A clayey-gravelly-stony bedding, mesophilous mixed tundra, 1988.8.3.

480. Dyrstadflya, central-northern part (Bellpynten), a sloping sea terrace, about 300 m off the coast, about 250 m to NE of the lake, 20 m a.s.l., 2° N. A solifluction,

clayey-stony bedding, with obscure traverses, mesophilous mixed mossy-floral tundra, 1988.8.3.

481. Dyrstadflya, central-northern part, the slope of a tunnel-like lowered sea terrace, about 350 m to SSE of the top of Bellpynten, 20 m a.s.l., 2° N. A stony--clayey bedding, mesophilous mixed mossy-floral tundra, 1988.8.3.

482. Dyrstadflya, central-northern part, a sloping sea terrace, about 250 m to SEE of the top of Bellpynten, 20 m a.s.l., 2° N. A clayey-stony bedding, mesophilous mixed mossy-floral tundra, 1988.8.3.

483. Dyrstadflya, central-northern part, a sloping sea terrace, about 150 m to SSE of the top of Bellpynten, 15 m a.s.l., 2° N. A strongly sandy bedding, mesophilous mixed mossy-floral tundra, 1988.8.3.

420. Dyrstadflya, NNW, the bottom of the canyon to E part of the river bed, about 200 m from its mouth, 5 m a.s.l., 2° W. A stony-gravelly river terrace, mesophilous morass of the type lying on the area where the snow occurs for a long time, 1988.7.3.

425. Dyrstadflya, SEE, the bottom of the lowering at the foot of NW slope of Bellsundhesten, 75 m a.s.l., 2° NW. Degraded mineral-humus rubble of the rocky type, mesophilous compact morass, 1988.7.30.

428. Dyrstadflya, SSEE, between N parts of Hihaugen and Bellsundhesten, the bottom of the lowering between small heights, 70 m a.s.l., 2° NW. A stony, mineral--humus bedding, mesophilous compact morass, 1988.7.30.

460. Dyrstadflya, NNWW (Klokkeodden), a sloping sea terrace, about 150 m off the sea coast, 15 m a.s.l., 2° NW. A clayey-gravelly-pebble bedding, mesophilous compact brown morass, 1988.8.1.

427. Dyrstadflya, SSE, between N parts of Hihaugen and Bellsundhesten, a sloping NW foot of a small height, 60 m a.s.l., 2° NW. A moist, clayey-rubble bedding, mesophilous dense morass, 1988.7.30.

440. Dyrstaddalen, extremely NE part, a sloping sea terrace, about 300 m to SE of the river overflow-arm, 60 m a.s.l., 2° NW. A solifluction, clayey-stony bedding, with obscure traverses, mesophyilous mossy tundra, 1988.7.31.

444. Dyrstaddalen, NEE, a sloping pass between small heights under Bellsundhesten, 110 m a.s.l., 2° SW. A solifluction clayey-gravelly bedding, mesophilous dense morass, 1988.7.31.

448. Dyrstaddalen, NW, below, to W side of the river fork, a sloping foot of a small height, 80 m a.s.l., 2° NE. A solifluction, clayey-stony bedding, with obscure traverses, mesophilous mixed mossy-floral tundra, 1988.7.31.

449. Dyrstaddalen, NE, above, to W side of the river fork, a sloping foot of the height, 85 m a.s.l., 2° NE. A solifluction, clayey-stony bedding, with clear traverses, mesophilous mixed mossy-floral tundra, 1988.7.31.

423. Dyrstadflya, SSEE, steep NW foot of Bellsundhesten, 120 m a.s.l., 45° W. A stony, mineral-humus bedding, mesophilous, coprophilous morass on the slope, 1988.7.30.

429. Dyrstadflya, SSEE, the slope of the foot of Bellsundhesten, above the nival moraine, 130 m a.s.l., 20° W. A stony, mineral-humus bedding, mesophilous, coprophilous morass on the slope, 1988.7.30.

445. Dyrstaddalen, SEE, the slope of the foot of Bellsundhesten, 175 m a.s.l., 45° W. A stony, mineral-humus bedding, dense coprophilous morass on the slope, 1988.7.31.

446. Dyrstaddalen, SEE, the slope of the foot of Bellsundhesten, 170 m a.s.l., 45° W. A stony, mineral-humus bedding, dense coprophilous morass on the slope, 1988.7.31.

456. Dyrstadflya, SSWW, Klokkefjellet NE part, the foot of NE slope, 110 m a.s.l., 45° NE. A stony, mineral-humus bedding, mesophilous, coprophilous morass on the slope, 1988.8.1.

463. Dyrstadflya, SSEE, the foot of N slope of Bellsundhesten, over the nival moraine, 120 m a.s.l., 45° N. A stony, mineral-humus bedding, mesophilous, coprophilous morass on the slope, 1988.8.2.

431. Dyrstadflya, NE, a sea terrace, a flat bottom of the lowering under the small heights, 30 m a.s.l. A silty-loamy bedding marshy grassy-mossy tundra on the water overflow-arm, 1988.7.30.

433. Dyrstadflya, almost central part, a sea terrace, flooded, a flat bottom of a tunnel-like lowering, 30 m a.s.l. A loamy, silty, marshy grassy-mossy tundra on the water overflow-arm, 1988.7.30.

478. Dyrstadflya, NE, a sea terrace, a valley lowering between small heights, about 350 m to NW from NW slope of Bellsundhesten and about 550 m off the coast, 30 m a.s.l., 2° NW. A marshy, loamy bedding, marshy mossy-grassy tundra, 1988.8.3.

432. Dyrstadflya, NE, a sea terrace and a flat bottom of an accumulative plain, 30 m a.s.l. A loamy bedding, moist dense morass, 1988.7.30.

443. Dyrstaddalen, NEE, the slope of a lowering between small heights under Bellsundhesten, 90 m a.s.l., 5° SW. A solifluction, loamy bedding, flooded, dense morass, 1988.7.31.

462. Dyrstadflya, SSE, a sloping sea terrace, about 250 m from NW slope of Bellsundhesten, a flat lowering under the slope, 30 m a.s.l., 2° N. A clayey-stony bedding, flooded dense morass on the water overflow-arm, 1988.8.2.

452. Dyrstaddalen, NNWW, a flat lowering at the foot of Klokkefjellet, under the nival moraine, 90 m a.s.l. A loamy bedding, flooded dense morass on the water overflow-arm, 1988.7.31.

458. Dyrstadflya, NWW, a flat lowering under N slope of Klokkefjellet, below the nival moraine, 30 m a.s.l. A silty-loamy bedding, flooded dense morass on the water overflow-arm, 1988.8.1.

424. Dyrstadflya, SSEE, a flat bottom of the lowering between the foot of NW slope of Bellsundhesten and roller-shaped sea terrace, 90 m a.s.l. A stony bedding, flooded dense morass on a water flow, 1988.7.30.

434. Dyrstadflya, central-northern part, a sea terrace, about 50 m off the lake, a flat local lowering, 26 m a.s.l. A loamy bedding, dense, brown, flooded morass on the lake, 1988.7.30.

435. Dyrstadflya, central-northern part, a sea terrace, a flat bottom of a dale-like lowering, at the E rim of a small lake, 26 m a.s.l. A loamy bedding, dense, dark green, flooded morass on the lake, 1988.7.30.

RESULTS OF THE STUDIES

1. The area of the region of Dyrstad on West Spitsbergen (Fig. 1) is distinguished by differentiated geomorphological, hydrological and soil conditions which determine the development of 8 forms from 6 types of Arctic tundra (Table 1). The main floristic elements of all groups of

Fig. 3. Dyrstadllya, NE part under the slope of Bellsundhiesten; dry grey-lichen tundra with *Cetraria* sp.
Phot. by F. Święs

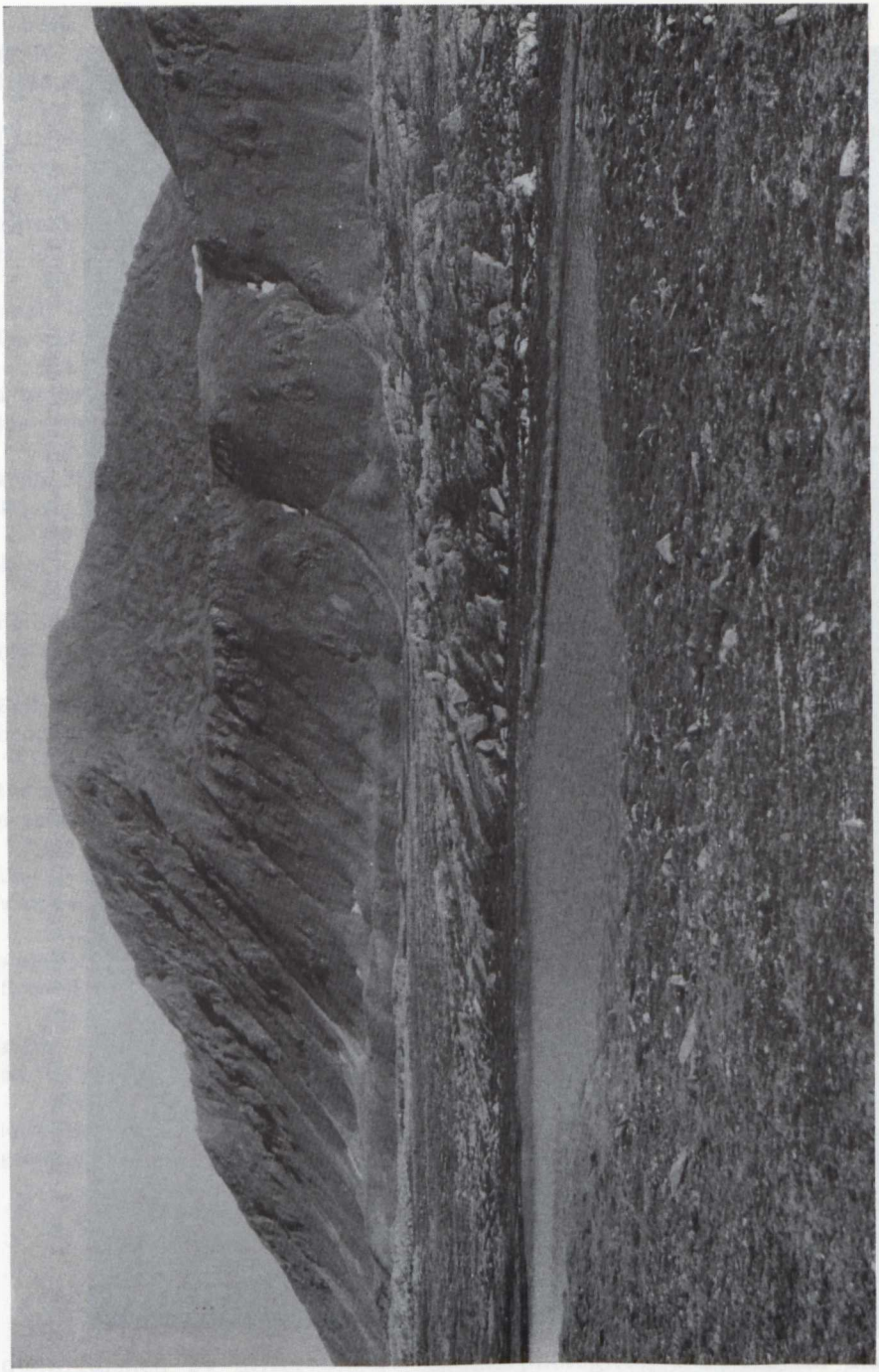

Fig. 4. Dyrstadflya, NE part under the slope of Bellsundhesten; flooded morass on the bank of the overflow-arms of periglacial waters

Phot. by F. Święs

Table 1. The frequency of bryophytes in different types of tundra in the region of Dyrstad

Tundra types* and number of localites	A																			B																C									D						E			F							
	a	b											c			d																				a				b														a						b	
Mosses and hepatics	439	417	419	436	437	441	453	454	455	465	473	475	438	447	450	422	426	457	472	476	479	421	418	430	442	451	459	461	464	474	477	480	481	482	483	420	425	428	460	427	440	444	448	449	423	429	445	446	456	463	431	433	478	432	443	462	452	458	424	434	435
Cover of moss-layer in %	20	5	5	5	50	5	10	20	10	50	50	10	40	5	5	60	90	90	90	40	90	60	90	70	40	30	60	80	40	40	40	30	40	90	90	100	100	100	100	60	60	100	40	50	90	100	100	100	100	100	50	100	90	70	100	100	100	100	100	100	100
Number of species	5	7	4	11	5	3	6	5	4	15	6	8	6	15	5	12	13	20	8	8	2	15	11	9	9	7	7	15	10	10	8	7	8	7	6	16	7	9	11	3	11	16	6	10	5	20	29	2	32	23	30	6	26	10	12	21	7	9	7	16	19
Abietinella abietina /Hedw./ Fleisch.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Fissidens osmundoides Hedw.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Oncophorus virens /Hedw./ Brid.	.	+	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dicranum fuscescens Turn.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dicranum fragilifolium Lindb.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Catoscopium nigritum /Hedw./ Brid.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Blepharostoma trichophyllum /L./ Dum.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Racomitrium lanuginosum /Hedw./ Brid.	+	.	.	.	+	.	+	.	.	.	.	+	+	+	+	+	+	+	+	+	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	+	.	+	.	.	+	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Ditrichum flexicaule /Swaegr./ Hampe	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	+	+	.	.	.	+	+	.	+	.	.	.	+	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Polytrichum fragile Bryhn	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Pohlia cruda /Hedw./ Lindb.	.	.	.	+	.	.	.	+	.	+	.	.	.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	+	.	+	.	+	+	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Tortella fragilis /Hook. et Wils./ Limpr.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Cynodontium polycarpum /Hedw./ Schimp.	.	+	+	.	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.
Pohlia ludwigii /Schwaegr./ Broth.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.
Myurella julacea /Schwaegr./ B. S. G.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Hylocomium splendens /Hedw./ B. S. G.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.
Ptilidium ciliare /L./ Hampe	+	+	.	.	+	+	+	+	+	+	+	+	.	+	.	.	+	+	+	+	+	+	.	+	.	+	+	+	+	+	+	+	+	+	+	+	.	.	.	.	+	.	.	+	.	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.	.
Oncophorus wahlenbergii Brid.	+	+	+	+	+	+	+	.	.	+	.	.	.	.	.	+	+	.	.	+	.	.	.	+	.	+	+	+	.	.	+	+	+	+	+	+	.	.	+	.	.	.	+	+	+	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.
Polytrichum alpinum Hedw.	.	+	.	+	.	.	+	+	+	+	+	.	.	+	+	+	+	+	+	+	.	+	.	.	+	.	.	+	.	+	+	.	+	+	.	+	+	.	+	.	+	.	.	+	+	.	.	.	+	.	+	+	+	+	.	.	.	.	.	.	.
Bryum calophyllum R. Br.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	.	.	.
Distichium capillaceum /Hedw./ B. S. G.	.	.	.	+	.	.	.	.	.	+	+	+	+	+	.	.	.	+	+	.	+	.	+	+	+	.	.	+	+	+	+	+	+	.	.	+	+	+	+	+	+	+	.	+	.	.	.	.	+	.	+	+	+	+	.	+	.	.	.	.	.
Dicranum groenlandicum Brid.	.	.	+	.	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.
Drepanocladus uncinatus /Hedw./ Warnst.	+	.	+	+	+	+	+	+	.	+	+	+	+	+	.	+	.	+	+	+	.	+	+	.	+	+	.	+	.	+	+	.	+	.	+	+	+	+	+	+	.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Calliergon turgescens /Th. Jens./ Kindb.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	+	.	+	+	+	.	+	+	+	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	+	.	+	+	+	+	+	+	+	+
Drepanocladus revolvens /Sw./ Warnst.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	+	.	+	+	.	+	+	+	.	.	.	.	+	+	+	.	+	.	+	.	+	+	+	.	.	.	.	.	.	.	+	+	.	+	+	+	.	.	+
Tomenthypnum nitens /Hedw./ Loeske	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	+	+	.	.	.	+	.	+	+	.	.	+	+	.	.	.	.	.	.	+	.	.	.	.	.	+	.	+	.	+	+	.	+	+	.	.	+	.	+	+	+	.	+	+	+
Campylium stellatum /Hedw./ C. Jens.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	+	+	.	+	.	+	.	+	+	+	.	+	+	+	+	+	+	.	+	+	+	+	+	+
Lophozia groenlandica /Nees/ Macoun	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Sphenolobus minutus /Schreb./ Steph.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tortula norvegica /Web./ Wahlenb. ex Lindb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bryum rutilans Brid.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.
Orthothecium chryseon /Schwaegr./ B. S. G.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	+	+	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	+	+	.	.	+	.	.	.	.	.
Myurella apiculata /Hüb./ B. S. G.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.
Dicranum scoparium Hedw.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Plagiomnium rugicum /Laur./ Kop.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	+	+	.	.	.	.	.
Pohlia polimorpha Hoppe et Hornsch.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	+	.
Dicranum elongatum Schleich.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+	.
Aulacomnium turgidum /Wahlenb./ Schwaegr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	+	+	.	+	.	.	.	.	.	+	.	+	.	+	.	+	.	.	.	.	.	.	+	+
Calliergon sarmentosum /Wahlenb./ Kindb. var. fallaciosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.
Splachnum vasculosum Hedw.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Calliergon stramineum /Brid./ Kindb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	+	.	.	.	+	+	+	.	.	.	+	+
Calliergon richardsonii /Mitt./ Kindb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	+	+
Drepanocladus fluitans /Hedw./ Warnst.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+	+	.	.	.	.	+	.	+	.	+	+
Aplodon wormskjoldii /Horn./ R. Br.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Campylium polygamum /B. S. G./ Lange et Jens.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Bryum pallens Sw.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	+	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.
Tetraplodon mnioides /Hedw./ B. S. G.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Platydictya jungermannioides /Brid./ Crum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	+	+	.	.	+	.	.	.	.	.	.	.	.
Distichium inclinatum /Hedw./ B. S. G.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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Schistidium apocarpum /Hedw./ B. S. G.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
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Dicranella subulata /Hedw./ Schimp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Amblystegium serpens /Hedw./ B. S. G.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Philonotis tomentella Lor.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	+	+	.	+	.	+	+	.	.	.	.	.
Rhizomnium pseudopunctatum /B. S. G./ Kop.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	+	.	.	+	+	.	+	.	.	+	.	.	.	+	+
Aulacomnium palustre /Hedw./ Schwaegr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	+	.	.	+	.	.	.	.	+	+	.	+	+	+	+
Pohlia nutans /Hedw./ Lindb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Brachythecium mildeanum /Schimp./ Schimp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Polytrichum juniperinum Hedw.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.
Orthothecium rufescens /Brid./ B. S. G.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Brachythecium turgidum /Hartm./ Kindb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Bryum inclinatum /Brid./ Bland.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Trichostomum arcticum Kaal.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.
Bryum schleicheri Schwaegr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.
Drepanocladus vernicosus /Lindb./ Warnst.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Bryum bimum /Brid./ Turn.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+	.	+	.	+	.	.	+	.	.	.	.	.
Pohlia sphagnicola /B. S. G./ Lindb. et Arn.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	+
Cephaloziella grimsulana /Gott. et Rabenh./ Lac.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Bryum pseudotriquetrum /Hedw./ Schwaegr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	+	+	.	+	+	+	+
Orthothecium striatum Lor.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.
Cinclidium arcticum /B. S. G./ Schimp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	.	+	+	+	.	+
Meesia triquetra /Hook. et Tayl./ Ångstr.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	+	.	+	+
Calliergon trifarium /Web. et Mohr/ Kindb.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	+
Calliergon sarmentosum /Wahlenb./ Kindb. var. sarmentosum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+

Sporadic species: Ab - Isopterygium pulchellum /Hedw./ Jaeg. et Sauerb. - 417, Amphidium lapponicum /Hedw./ Schimp. - 436; Ad - Conostomum tetragonum /Brid./ Lindb. - 426, Anthelia juratzkana /Limpr./ Trev. - 426, Gymnomitrion concinnatum /Lightf./ Corda - 426, Kiaeria blyttii /B. S. G./ Broth. - 472. B - Dichodontium pellucidum /Hedw./ Schimp. - 421, Pohlia schimperi /C. Müll./ Andrews - 421, Bryoerythrophyllum recurvirostre /Hedw./ Chen. - 418, Kiaeria starkei /Web.et Mohr/ Hag. - 442. Ca - Bryum purpurascens /R. Br./ B. S. G. - 420, Drepanocladus exannulatus /B. S. G./ Warnst. - 420, Racomitrium canescens /Hedw./ Brid. - 460; Cb - Meesia longiseta Hedw. - 444. D - Cyrtomnium hymenophyllum /B. S. G./ K. Holmen - 445, Climacium dendroides /Hedw./ Web. et Mohr - 445, Bryum elegans Nees - 445, B. pallescens Schwaegr. -463, Polytrichum strictum Sm. - 456, Hypnum callichroum Brid. - 456, Mniobryum albicans Limpr. - 463. E - Drepanocladus sendtneri /Schimp./ Warnst. - 431, Timmia megapolitana Hedw. - 431, T. austriaca Hedw. - 478, Bryum cryophyllum Mart. - 431, Cinclidium stygium Sw. - 431, Calliergon obtusifolium Kar. - 431, Pterigynandrum filiforme Hedw. - 478. Fa - Bryum teres Lindb. - 443, Calliergon orbiculari-cordatum /Ren. et Card./ Broth. - 443; Fb - Paludella squarrosa /Hedw./ Brid. - 435.

Explanation: A — dry tundra: a — spotted, b — grey-lichen with *Certaria*, c — with *Dryas octopetala*, d — morass with *Racomitrium*; B — mesophilous mixed tundra; C — tundra of the mesophilous morass: a — on the stony bedding (where snow occurs for a long time), b — on the clayey-stony (solifluctional) bedding; D — tundra of the coprophilous morass of the slopes; E — marshy mossy-grassy tundra; F — tundra of the flooded morass: a — on the overflow-arms of the streams, b — at the banks of the lakes.

Table 2. Classes of the permanence and the degrees of cover of the main mossy dominants in different types of tundra in the region of Dyrstad

Types tundra* and number of localities		Racomitrium lanuginosum	Distichum capillaceum	Ptilidium ciliare	Drepanocladus uncinatus	Tomenthypnum nitens	Drepanocladus revolvens	Calliergon turgescens	Aulacomnium turgidum	Calliergon stramineum	Cinclidium arcticum	Mnesia triquetra
	a 439	4^{V}	.	2^{III}	2^{III}	.	.	.	.	.	.	.
	417	.	.	2^{III}	.	.	.	.	.	.	.	.
	419	.	.	.	3^{II}	.	.	.	.	.	.	.
	436	.	2^{II}	.	2^{II}	.	.	.	.	.	.	.
	437	4^{IV}	.	2^{II}	2^{III}	.	.	$+^{I}$	.	.	.	.
	441	.	.	2^{III}	.	.	.	.	.	.	.	.
	b 453	4^{V}	.	.	2^{III}	.	.	.	.	.	.	.
	454	.	.	3^{III}	1^{III}	.	.	.	.	.	.	.
A	455	.	.	2^{III}	.	.	.	.	.	.	.	.
	465	.	2^{II}	1^{II}	2^{II}	1^{I}	1^{I}	.	.	.	.	.
	473	.	2^{II}	1^{II}	3^{II}	.	.	.	.	.	.	.
	475	4^{V}	1^{II}	1^{II}	2^{II}	.	.	.	.	.	.	.
	438	1^{II}	1^{II}	.	2^{III}	.	.	.	.	.	.	.
	c 447	1^{I}	1^{I}	1^{I}	.	1^{II}	1^{I}	.	.	.	.	.
	450	2^{III}	.	.	.	.	.	.	.	.	.	.
	422	5^{V}	.	.	3^{III}	.	.	.	$+^{I}$	.	.	.
	d 426	5^{V}	.	1^{I}	.	1^{I}	.	.	1^{I}	.	.	.
	457	4^{V}	1^{II}	1^{I}	2^{II}	1^{I}	.	.	$+^{I}$	.	.	.
	472	4^{V}	1^{II}	1^{I}	2^{II}	.	.	.	.	.	.	.
	476	3^{V}	.	1^{I}	2^{II}	.	.	.	.	.	.	.
	479	.	1^{II}	$+^{I}$	.	.	.	.	.	.	.	.
	421	.	.	1^{I}	2^{II}	1^{I}	.	.	$+^{I}$	$+^{I}$	.	.
	418	.	1^{I}	.	2^{III}	.	1^{I}	.	.	.	.	.
	430	.	1^{II}	$+^{I}$	.	1^{I}	.	1^{I}	.	.	.	.
	442	.	1^{I}	.	1^{II}	1^{I}	1^{I}	1^{I}	.	.	.	.
	451	.	.	1^{II}	.	.	2^{III}	.	.	.	.	.
	459	3^{V}	.	1^{I}	.	.	.	1^{I}	.	.	.	.
B	461	.	1^{II}	$+^{I}$	2^{II}	1^{II}	2^{II}	1^{I}	1^{II}	.	.	.
	464	.	1^{II}	$+^{I}$	.	1^{II}	2^{II}	.	.	.	.	.
	474	.	1^{II}	1^{I}	1^{II}	.	2^{III}	1^{I}	.	.	.	.
	477	3^{IV}	1^{I}	1^{II}	1^{II}	.	.	1^{I}	.	.	.	.
	480	.	1^{I}	2^{II}	.	.	.	1^{I}	.	.	.	.
	481	3^{IV}	1^{I}	1^{II}	1^{II}	.	.	.	.	.	.	.
	482	.	.	1^{II}	.	.	.	$+^{I}$	.	.	.	.
	483	.	.	2^{II}	2^{II}	.	2^{II}	$+^{I}$	.	.	.	.
	420	1^{I}	1^{I}	$+^{I}$	1^{I}	1^{I}	1^{I}	1^{II}	1^{I}	.	.	.
	a 425	.	1^{I}	.	2^{II}	.	1^{II}	.	1^{I}	.	.	.
	428	$+^{I}$	1^{I}	.	1^{II}	.	.	.	1^{I}	.	.	.
	460	.	1^{I}	.	1^{I}		1^{II}	.	1^{I}	.	.	.
C	427	.	1^{II}	.	1^{II}	.	.	.	.	.	.	.
	440	1^{II}	1^{II}	$+^{I}$	.	.	1^{II}	$+^{I}$	1^{I}	.	.	.
	b 444	.	1^{I}	.	2^{II}	1^{I}	.	.	.	$+^{I}$	.	.
	448	.	.	.	2^{II}	.	1^{II}	.	.	.	.	.
	449	.	1^{I}	$+^{I}$	1^{II}	1^{I}	1^{I}	$+^{II}$	.	.	.	.
	423	.	.	.	2^{II}	.	.	.	.	.	.	.
	429	.	.	.	1^{II}	1^{II}	2^{II}	.	.	.	.	.
D	445	$+^{I}$	.	$+^{I}$	1^{I}	1^{II}	.	.	1^{II}	1^{II}	.	.
	446	.	.	.	1^{II}	.	.	.	.	.	.	.
	456	$+^{I}$	1^{I}	$+^{I}$	1^{I}	1^{I}	.	.	1^{II}	.	.	.
	463	.	.	.	1^{II}	1^{II}	.	.	.	2^{II}	.	.
	431	.	1^{I}	.	1^{II}	.	.	.	1^{II}	.	1^{II}	2^{III}
E	433	.	$+^{I}$	.	2^{III}	.	.	1^{II}		.	.	.
	478	.	1^{I}	.	1^{II}	2^{II}	3^{IV}	.	1^{II}	.	1^{III}	.
	432	.	1^{I}	$+^{II}$	1^{II}	.	3^{II}	2^{III}	.	2^{II}	.	.
	443	.	.	.	1^{II}	2^{II}	.	1^{II}	.	1^{II}	.	.
	a 462	.	1^{I}	.	1^{I}	1^{II}	3^{IV}	2^{II}	.	3^{III}	.	2^{IV}
	452	.	.	.	$+^{II}$	2^{III}	3^{IV}	2^{III}	.	.	3^{III}	.
F	458	.	.	.	$+^{I}$	.	4^{V}	2^{III}	.	.	3^{IV}	3^{IV}
	424	.	.	.	1^{I}	2^{III}	.	2^{III}	.	.	2^{III}	.
	b 434	.	.	.	$+^{II}$	2^{II}	.	2^{IV}	1^{III}	2^{III}	.	3^{III}
	435	.	.	.	$+^{I}$	2^{II}	3^{IV}	2^{III}	1^{III}	2^{III}	2^{III}	2^{III}

* Explanation —see Table 1.

tundra include first of all brown mosses (95 species), partly the liverworts (7 species), numerous lichens and about 50 species of vascular plants.

2. The following species of mosses have the greatest share in the structure of the examined types of tundra in the region of Dyrstad: *Drepanocladus revolvens, D. uncinatus, Aulacomnium palustre, A. turgidum, Calliergon turgescens, Distichum capillaceum, Hylocomium splendens* (locally), *Polytrichum alpinum, Racomitrium lanuginosum, Tomenthypnum nitens* and from the liverworts only *Ptilidium ciliare* (Table 2).

3. The greatest numbers of the species composing the main element of the plant mass were observed on the tundra of coprophilous morass of the slopes (D) and on marshy mossy-grassy tundra (E). In the former case, there are 32 species, and in the latter — 30.

4. The proportion of bryophytes in the structure of 4 forms of dry tundra is considerable in respect of the cover of the bedding, but in the number of species it is rather limited, approx. 100 m^2 from 3 (6) to 32 species (Table 1).

5. The occurrence of calciphilous mosses (*Calliergon trifarium, C. turgescens* — with var. *tennue, Catoscopium nigritum, Distichium capillaceum, Meesia triquetra, Philonotis tomentella, Tortella fragilis* and *Trichostomum arcticum*) is connected with the distribution of moist (F) and dry (A) tundras, where one encounters the overflow-arm waters rich in calcium.

6. Nitrophilous mosses such as *Aplodon wormskjeldii, Splachnum vasculosum* and *Tetraplodon mnioides* were found in the sites where nitrogen compounds were deposited from the birds excrements on the tundra of coprophilous morass of the slopes (D). Only *Tetraplodon mnioides* still grows on the mixed mesophilous tundra (E) and the tundra of mesophilous morass (C).

7. The sites of scarce mosses such as *Calliergon obtusifolium, C. orbiculari-cordatum, C. trifarium, Campylium zemliae, Conostomum tetragonum, Cyrtomnium hymenophyllum, Dicranella subulata, Fissidens osmundoides, Isopterygium pulchellum, Meesia longiseta, Pohlia sphagnicola* and others are found in the zone of their concentrated ranges in the western and north-western parts of all the archipelago of Svalbard (Fig. 2).

8. Representatives of scarce arctic mosses of the investigated region and all Spitsbergen include: *Calliergon obtusifolium, C. orbiuculari-cordatum, Campylium zemliae, Conostomum tetragonum, Orthothecium rufescens* and *Trichostomum arcticum.*

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STRESZCZENIE

Scharakteryzowano florę mszaków w warunkach tundry arktycznej w rejonie Dyrstad na południowo-zachodnim wybrzeżu Bellsundu na Spitsbergenie Zachodnim (ryc. 1). Badania zostały przeprowadzone w r. 1988 na 61 stałych powierzchniach ok. 100 m² wśród 6 typów i 8 podtypów florystyczno-ekologicznych tundry (tab. 1—2, ryc. 3—4). Łącznie stwierdzono 102 gatunki mszaków, w tym 95 mchów z grupy *Bryales* i 7 wątrobowców. Na 1 stanowisku znajdowano 3(6)—32 gatunki. Określono, że znaczna część mszaków ma różną stałość niemal we wszystkich postaciach tundry. Inne mszaki rosły tylko w określonych typach lub podtypach tundry, a tylko 31 gatunków występowało sporadycznie w niektórych płatach tundry.

Pod względem ekologicznym na spitsbergeńskiej tundrze na uwagę zasługują mszaki siedlisk nitrofilnych (*Aplodon wormskjeldii, Splachnum vasculosum, Tetraplodon mnioides*) i kalcyfilnych (*Calliergon trifarium, C. turgescens* — z var. *tennue, Catoscopium nigritum, Distichium capillaceum, Meesia triquetra, Philonotis tomentella, Tortella fragilis, Trichostomum arcticum*). Znaczna część stwierdzonych gatunków należy do rzadkich lub lokalnie rozprzestrzenionych na wyspach archipelagu Svalbardu. Przykładem rzadkich arktycznych mchów w Bellsundzie są 4 gatunki o punktowym rozmieszczeniu na całym Svalbardzie (ryc. 2).