

NORSK POLARINSTITUTT  
SKRIFTER NR. 124

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OLAF I. RØNNING

SOME NEW CONTRIBUTIONS  
TO THE FLORA OF SVALBARD



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### **Abstract.**

This paper deals with some problems concerning the flora of Svalbard. Attempts have been made to elucidate the species within the critical genera *Cerastium*, *Draba*, *Festuca*, *Poa*, and *Potentilla*, and identification keys have been prepared for the Svalbard species of these genera.

Eight species new to Svalbard are described, i. e. *Carex capillaris*, *Draba gredinii*, *Euphrasia arctica*, *Festuca baffinensis*, *Potentilla rubricaulus*, *Saxifraga hyperborea*, *Saussurea alpina*, and *Sibbaldia procumbens*.

The existence in Svalbard of a few species, previously reported there only with some uncertainty, is discussed. The species in question are *Draba bellii*, *D. micropetala*, *Festuca brachyphylla*, *F. hyperborea*, and *Poa alpina*.

The last part of the paper deals with species with some taxonomic combinations now generally accepted, i. e.: *Cardamine nymanii*, *Colpodium vacillans*, *Eriophorum triste*, *Pedicularis dasyantha*, and *Sedum arcticum*.



In the years 1957, 1958 and 1960 the Zoological and Botanical departments of Tromsø Museum jointly undertook botanical expeditions to Svalbard. In 1957 Bjørnøya was the object of investigations. In 1958 and 1960 the searches were concentrated in certain areas of the island Vestspitsbergen. More detailed information can be found in the Annual Reports of Tromsø Museum for 1957, 1958 and 1960. In addition, I visited Spitsbergen in 1959, and particularly the areas around Kongsfjorden.

During these journeys there have been made a number of discoveries of plants not previously known in Svalbard, or observations of critical genera or species. In addition, investigation has been made into the ecology of the plants, and mosses and fungi in particular have been collected. Certain of these results, especially those concerned with discoveries of phytogeographic interest, and other information which may be of value for the taxonomic arrangement of the plants, will be given in the following pages.

Where nothing to the contrary is specifically stated, the material on which the investigations are based is preserved in the herbarium of Tromsø Museum. In what follows the plants are, for practical reasons, arranged alphabetically.

### **Carex capillaris L.**

This species, which is new for Svalbard, was found about 79° 26' N, near the head of Bockfjorden, a branch of the large Woodfjorden on the north coast of Vestspitsbergen. It is found here in the vicinity of the hot springs ("Trollkildene") in quite considerable quantities. It appears to be limited to the area which is under the influence of the hot springs and which therefore has quite a high soil temperature even in winter. It grew in several places quite close to the open springs, but never at the water edge. The subsoil in these regions is very chalky, with a pH of 6.8 to 7.2. The form which grows here is not very different from the Scandinavian, though perhaps on the whole it is much smaller.

Besides this species, two others that were new for Spitsbergen were found in this area, viz. *Sibbaldia procumbens* and *Euphrasia arctica*. It may well be asked why precisely this area with the hot springs, not to mention a number of other peculiarities, is the only place where three vasculars grow.

Probably the reason why they manage to survive here is to be found in the high soil temperature, which is very nearly constant all the year round. It was typical, for that matter, that outside the area influenced by the hot springs the

species were not found. I do not believe that they have been carried here from afar. I find it more likely that in earlier times these species had a much wider distribution, including perhaps the greater part of Svalbard. It is possible that a worsening of the climate may have reduced the living conditions for these species below the minimum. This little area of distribution in innermost Bockfjorden would then be the only locality with good enough conditions for them, and so represent the last little remainder of an earlier larger area of distribution in Svalbard.

*C. capillaris* has an abundance of varieties and a very wide circumboreal distribution. It occurs in Central America and in Central European and Central Asian mountains. There are several sub-species of it.

Specimens from Svalbard are of comparatively low growth, from 4 to 8 cm. high but fully fertile. Usually there are found two hanging spikes with light brown fruit. It differs from the common Scandinavian forms in being smaller and having a brown inflorescence.

### **Cerastium L.**

In 1956 HULTÉN published a revision of the *Cerastium alpinum* complex. From this it appears that the following species are found in Svalbard: *C. arcticum* LGE. and *C. regelii* OSTENF. *C. alpinum* L. which is widely distributed in Scandinavia, for instance, does not occur in its pure form, but only as a hybrid with these species. That is to say the forms of these species which display the typical "alpinum hairs".

*C. cerastoides* (L.) BRITTON has also been found in Svalbard, i. e. on Bjørnøya (RØNNING 1959) and this locality is at present the most northerly that is known. But its existence within the Spitsbergen group can in my opinion well be imagined. Of the varieties which HULTÉN lists under *C. arcticum* the following are found in Svalbard:

var. *arcticum* HULT. Plants with almost smooth leaf-surface and short stiff hairs along the edge.

var. *procerum* HULT. This grows scattered, not in typical tufts, and has an upright growth. The variety is doubtful in my opinion, and may possibly be explained as modifications due to habitat.

var. *vestitum* HULT. Yellowish-green plants which have sepals with broad membranous edge. Flowers arranged singly on long stalks.

var. *sordidum* HULT. Dark green plants with dark tapering sepals. Inflorescence usually abundantly branched.

Of these varieties, var. *arcticum*, var. *vestitum* and var. *sordidum* are quite common in Svalbard and are widely distributed there. All the varieties prefer gravelly localities, but var. *vestitum* and var. *arcticum* occur in rather moister places than var. *sordidum* which prefers drier localities. Transitional forms between the varieties are very common, and a sure identification can often be very difficult.

### **Draba L.**

A definite determination of the arctic *Draba* often involves great difficulties. Not only does the genus present many critical species, but the synonymy which



has grown up over long years with inadequate knowledge of its taxonomy has made it almost impossible to form a picture of the species which are represented in Svalbard.

After studying the species in the field in recent years I have arrived at the conclusion which is rendered in the following classification key for the Svalbard species.

- A. Flowers yellow. Scapes and leaves hairy. No cauline leaf.
  - B. Leaves with acute apex. Flowers large, with petals longer than sepals.
    - C. Flowers sulphur-yellow. Siliques glabrous or nearly so. *D. alpina* L.
    - C. Flowers yellow or bright yellow. Siliques broad with rounded apex, hairy with both branched and unbranched hairs. Styles distinct.  
*D. bellii* HOLM.
  - B. Leaves with rounded apex. Leaf-surface densely pubescent with stellate hairs, stiff simple hairs along edge of leaf. Flowers bright yellow.
    - D. Pale yellow or whitish flowers. Siliques large and rounded with distended appearance. *D. gredinii* EKMAN.
    - D. Bright yellow petals, only slightly longer than sepals. Style short.
    - E. Siliques acute, three times as long as broad. *D. oblongata* R. BR.
    - E. Siliques rounded. Style minute. Petals narrow.  
*D. micropetala* HOOK.
- A. Flowers white. Leaves more or less hairy. Scapes hairy or glabrous.
  - F. Scapes and siliques glabrous.
    - G. Leaves pubescent with simple, forked and stellate hairs.  
*D. lactea* ADAMS.
    - G. Pubescence of leaves sparse, with simple hairs. Scape with a single cauline leaf.  
*D. fladnizensis* WUY.
  - F. Pubescence of scapes distinct. Pubescence of leaves dense. A few coarse teeth along margin. Siliques hairy or glabrous.
  - H. Pubescence of leaves closely pannose-stellate, no forked or simple hairs. Whole plant looks grey.
    - I. Siliques glabrous or very scantily hairy.
      - K. Leaf margin entire. Leaf pubescent with close stellate hairs.  
*D. nivalis* LILJEBL.
      - K. Leaves with few coarse teeth, sparsely hairy with few stellate hairs. Scape with two or more cauline leaves. *D. daurica* D. C.
    - I. Siliques densely hairy. Leaves stellate pannose. Two or more cauline leaves.  
*D. cinerea* ADAMS.
  - H. Scapes and leaves hairy with simple and various forked hairs. Stellate hairs may occur.
    - L. Siliques hairy. Scapes with one to three cauline leaves. Leaves with coarse teeth. Inflorescence elongated. *D. norvegica* GUNN.
    - L. Siliques glabrous. Scapes short, without cauline leaves. Inflorescence capitate. Leaves with long simple hairs and prominent midrib.  
*D. subcapitata* SIMM.

Quite apart from *D. gredinii*, which is dealt with separately, *D. bellii*, *D. micropetala* and *D. oblongata* have been very variously regarded by those botanists who have concerned themselves with the flora of Svalbard. The species are all more or less yellow-flowered, and stand taxonomically very close to each other, especially *D. bellii* and *D. micropetala*.

Of the three species named, only *D. oblongata* is discussed by RESVOLL-HOLMSEN (1913 and 1927). *D. bellii* and *D. oblongata* are dealt with by SCHOLANDER (1934). HADAČ (1944) discusses *D. oblongata* and *D. micropetala*, but also lists *D. macrocarpa* ADAMS, which in his opinion includes most of the previously described forms of *D. bellii* from Svalbard. It is difficult to form a clear judgment as to how these writers view the various species. I have attempted below to give a description of these three species.

*Draba oblongata* R. BR. To this species are assigned forms with pale yellow flowers and broad petals considerably longer than the sepals. The culm is noticeably hairy and leafless. The leaves are entire, with stellate hairs on the surfaces and unbranched hairs along the edge. The siliques are narrow, at least three times as long as broad, oblong-elliptical, and narrow considerably towards the tip. (See diagram in HOLMEN 1957).

*Draba micropetala* HOOK. To this species must be assigned forms with yellow flowers having very small petals which do not meet at their edges and are longer than the sepals. The siliques are oval, blunt-tipped, and with a diminutive style. Flowering specimens are most easily recognised by the narrow petals and fruiting specimens by the form of the silique. In Svalbard it appears to grow particularly in high-lying parts and well away from the sea. It seems to prefer drier localities in windswept places.

The petals and siliques are shown in Fig. 1.

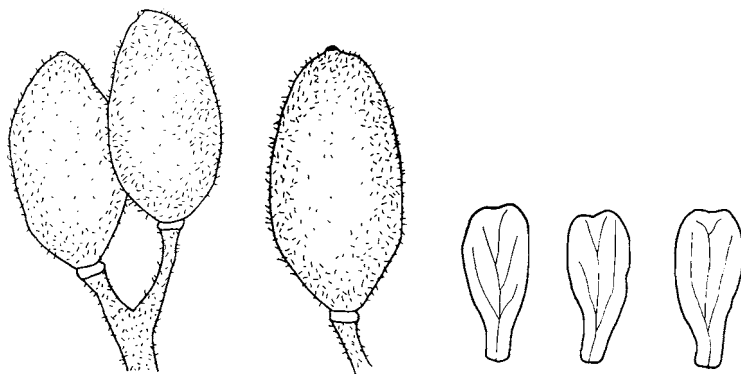


Fig. 1. Siliques and petals of *D. micropetala* Hook.  
Siliques approx.  $\times 4$ , petals  $\times 6$ .

*Draba bellii* HOLM. Within the limits of this species must be included plants which have entire leaves with coarse hair. The flowers are pale yellow, with broad petals longer than the sepals. The siliques are hairy and oval, slightly longer than they are broad, so that they can often give the impression of being almost round.

The tip of the siliques is often a little askew. The petals and siliques are shown in Fig. 2. The species is found all over Svalbard and grows especially in gravelly places that are well covered with snow in winter.

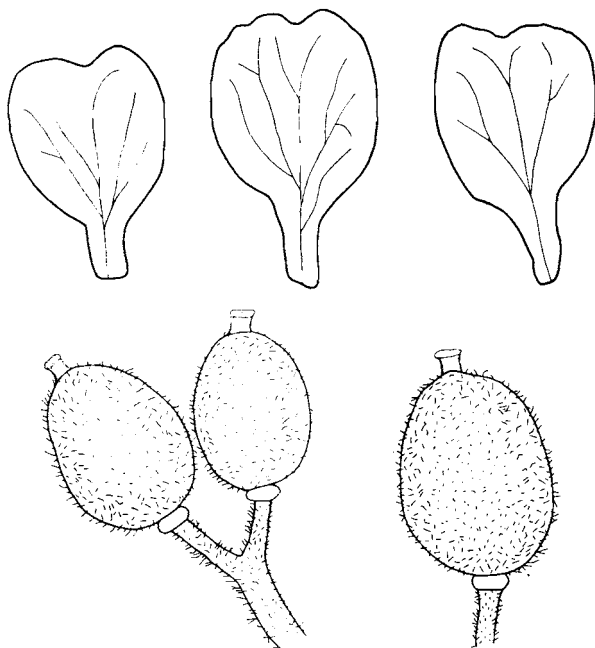


Fig. 2. Siliques and petals of *D. bellii* HOLM.  
Siliques approx. x4, petals x6.

The two species *D. micropetala* and *D. oblongata*, in particular, have usually been treated as one species. In "Flora USSR" TOLMACHEV (1939) distinguished between them by the clear characteristics named above. HOLMEN (1957, p. 61) agrees with TOLMACHEV in this and supports his exposition with clear diagrams. According to SCHOLANDER (1934, p. 37) *D. oblongata* is supposed to have siliques equally rounded at both ends. This is true for *D. micropetala* but not for *D. oblongata* which has somewhat tapering siliques. HADAČ (1944) cites *D. macrocarpa* for Svalbard and refers to *D. bellii* forms as synonyms of this species. It is not altogether clear how HADAČ limits the species, and in general it has been little dealt with in Arctic botanical literature. It is also possible that in the identification of *D. macrocarpa* there may occur confusion with *D. gredinii*.

The difference between the two species *D. micropetala* and *D. bellii* is clearer. They are distinct both in the form of the petals and in the form and hairiness of the siliques. Figs. 1 and 2 should show these differences clearly.

A good deal of the confusion that prevails within the genus taxonomically must to some extent be blamed on the fact that various people who have concerned themselves with the Arctic *Drabae* have laid the main stress on different characteristics. EKMAN builds principally on the hairiness of the plant. It appears, however, that this can vary with the habitat; in particular it is important to observe that wind, snow and sand can affect the hairiness of the plant, especially the

actual density of the hair (GELTING 1934). It must be more important to lay stress on the flowers and siliques, but both of these should be available for the determination, especially of critical species. Many new descriptions of *Drabae* throughout the years would have been unnecessary if only the requirement had been met to describe only plants with fully developed flowers and siliques, together with study of the plant in its natural habitat.

*Draba gredinii* EKMAN.

This species was described by EKMAN (1933) from Greenland, although his description and diagnosis are hardly distinguished for their clarity. The rightful position of the species and its relation to other *Draba* species are clarified by SEIDENFADEN and SØRENSEN (1937). It differs from the other *Drabae* in the following respects. At the flowering stage it differs in that the flowers are considerably paler than, for instance, *D. alpina*, and may be almost pure white. It is easier to distinguish the species at the fruiting stage in that the siliques are elliptical or distinctly egg-shaped (see Fig. 3). Also important is the fact that the siliques appear inflated and large, and that they are fastened by short stalks in a racemose inflorescence. The leaves are rounded at the tip, with straight or concave edges. It differs from *D. alpina* in being less hairy, having paler flowers and glabrous siliques. *D. gredinii* is a little-known species. It has never before been discussed in works on the flora of Svalbard, but was first recorded there by EKMAN (1933). It is, however, mentioned from several localities in Svalbard by SEIDENFADEN and SØRENSEN (1937, pp. 46–47). Of these localities may be mentioned: Bellsund (leg. I. VAHL 1838, MALMGREN 1864, NATHORST 1882), Green Harbour (leg. FRIES 1868), Kobbebay (leg. FRIES 1868), Wiidebay in Østfjord (leg. TH. WULFF 1899), Colebay and Sassenbay (leg. RESVOLL-DIESET 1908). Since then it has been found by the present author in several places in Svalbard. It is probable that it has also been collected by other investigators, and that by going through collections of *D. alpina* L., *D. macrocarpa* ADAMS and *D. bellii* HOLM. var. *svalbardensis* LID, one would discover many new localities for this species. It grows most frequently in damp gravelly localities, especially where solifluction takes place. The distribution of *D. gredinii* is as yet little known in detail. It has not been reported from Arctic North America, and from Greenland only on the east, where it is found in the area from about 68° N to 79° 12' N. The specimens from Svalbard resemble those from east Greenland. It is not mentioned in Flora USSR although it has been shown to exist in Novaya Zemlya (SEIDENFADEN and SØRENSEN 1937). More remarkable is the fact that in the herbarium in Copenhagen are to be found typical specimens of the species from southern Norway, in the following localities: Kongsvoll, Dovre (leg. BLYTT 1839), Knudshøe, Gederyggen (leg. BLYTT), Kongsvoll, Dovre (leg. A. E. LINDBLOM), S. Knudshøe (1916 Herb. WILL. THOMASEN).

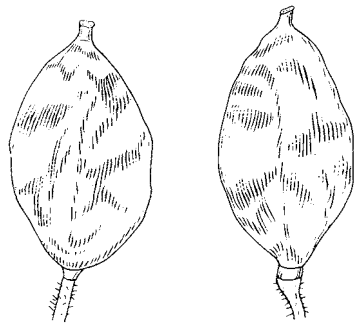


Fig. 3. Siliques of *D. gredinii* EKMAN.  
Approx. x4.

If these localities are genuine it is a west-arctic amphi-atlantic species. As it has not yet been proved to exist in North Norway it is, in Scandinavia, a southern unicentric species with appearances in Svalbard. In this respect it resembles, for instance, *Phippsia concinna* (TH. FR.) LINDEB.

**Euphrasia arctica Lge.**  
**(Syn. *E. frigida* Pugsl.)**

This species is new for Svalbard. It was also found in some places within the area with hot springs ("Trollkildene") at the inner end of Bockfjorden on the north coast of Vestspitsbergen. All the finds occurred in well sheltered places, usually down in the hollow near the hot springs where the soil temperature is high. It was always found together with *Sibbaldia procumbens*. Previously the only species known from Svalbard was an annual, viz. the very small *Koenigia islandica* L. This species is distributed over most parts of Svalbard. It is otherwise with *E. arctica*, which is also an annual. But this, even if not a large plant, is considerably larger than *Koenigia*. The prerequisite for an annual's ability to survive in a locality is that it sets ripe seeds every year. In a locality with such a high soil temperature as by the hot springs in Bockfjorden there exists every possibility that this condition will be met. Thus this is the only locality in Svalbard where the species has found satisfactory living conditions. Together with the other species which have their only locality in Svalbard here, *Sibbaldia procumbens*, *Carex capillaris* and *Poa alpina* s. str., *E. arctica* must be presumed to have its last remnants here after a wider distribution when climatic conditions were better. Another remarkable thing that may be mentioned here is that *Marchantia polymorpha* was found both with reseptacles with masses of gemmiferous cups. In some of the warm basins that were found *Chara aspera* WILLD. var. *spitsbergensis* NORDST. grew in large quantities. For all these species it is a fact that this habitat is by far the most northerly in the world. *E. arctica*, as it appears in Svalbard, is relatively small in growth, 1 to 3 cm high, unbranched and hairy both on stem and leaf. The leaves lie very close to the culm, they are broad and blunt-toothed, especially the lowest ones. The flowers are twice as long as the calyx. The capsule is longer than the calyx and hairy on the surface, but with longer stiff hair along the edge.

*E. arctica* is a species with many forms, which were divided by CALLEN (1952) into five varieties, of which four are amphi-atlantic. Of the varieties listed by CALLEN, the specimens from Svalbard must preferably be assigned to the amphi-atlantic *E. arctica* var. *submollis* (JØRG.) CALLEN. This is the northern and arctic island variety of the species, though it is possible that it has been so long isolated that it represents a separate form, but this is difficult to decide and will require more searching study of collections over many years.

**Festuca L.**

The problems surrounding the *Festuca* species in Svalbard have been discussed by several authors who have dealt with aspects of Svalbard's flora. Most

of them emphasise that the genus consists of several species or forms which are connected by transitional forms.

In her survey of Svalbard's flora (1913 and 1927) RESVOLL-HOLMSEN lists two species, viz. *F. rubra* which appears in the variety var. *arenaria* (OSB.) LGE. (= var. *mutica* HARTM., *F. cryophila* V. KREZ ET BOBR.) and *F. ovina* L. The latter, according to RESVOLL-HOLMSEN, can also appear in the variety var. *brevifolia* (R. BR.) HARTM. FLOVIK (1938) also, and quite rightly, deals with *F. ovina* var. *vivipara* L., and later investigations have corroborated him (SCHOLANDER 1934). The most thorough and exhaustive treatment of Svalbard's *Festuca* species is to be found in SCHOLANDER (1934). After investigating the flora on Nordaustlandet, he concludes by saying that in this area there are found three species of the genus *Festuca*, viz. *F. brachyphylla* SCHULTES, *F. rubra* L. var. *arenaria* (OSB.) E. FRIES (according to newer nomenclature this becomes *F. rubra* L. var. *mutica* HARTM., or *F. cryophila* V. KREZ ET BOBR.) and *F. vivipara* (L.) SM. All non-viviparous forms within the *F. ovina* complex are thus included by SCHOLANDER under a separate form-series with the common name *F. brachyphylla* SCHULTES.

After a vast amount of material of the *Festuca* genus had been collected during my stays in Svalbard in 1958–59–60, and this material had been sifted, I came to the conclusion that collections provisionally assigned to *F. brachyphylla* could be naturally divided into three groups, distinguishable from each other by clear and distinct characteristics. Some intermediate forms can occur, but are rare. The most characteristic and easily determinable form must be assigned to *F. baffinensis* POLUNIN. The remainder of the material falls into two groups, and in accordance with HOLMEN's investigations of the *Festuca* species in north-east Greenland (1952 and 1957) I must place these under *F. brachyphylla* SCHULTES s. str. and *F. hyperborea* HOLMEN. Although they are closely related, each of these must be regarded as a separate species, divided from each other by clear characteristics. According to HOLMEN's investigation (1952) they have also different chromosome numbers, as *F. brachyphylla* is hexaploid and *F. hyperborea* is tetraploid.

Thus it must be concluded that five distinct species of the genus *Festuca* occur in Svalbard, if one adheres to the conception of species within the arctic *Festuca* which is generally accepted to-day. Below is given a key which can be used for the identification of the *Festuca* species of Svalbard:

- A. Spikelets normally viviparous *F. vivipara* (L.) SM.
- A. Spikelets not viviparous
  - B. Plants with curved stolons or loosely caespitose *F. rubra* L. coll.
  - B. Plants densely caespitose, without stolons
    - C. Upper part of culm closely pubescent. *F. baffinensis* POLUN.
    - C. Plants glabrous, panicle narrow
      - D. Panicle 2–6 cm. Plants shiny. Leaves stiff and straight. Glumes nearly of equal length. *F. brachyphylla* SCHULTES.
      - D. Panicle 1–2 cm. Plants dull blue. Leaves curved. Glumes of different lengths and minutely hairy. *F. hyperborea* HOLMEN.

*Festuca brachyphylla* SCHULTES s. str.

The actual limits of the species have long been a controversial question, even if its individuality as compared with *F. ovina* L. has been clearly demonstrated. It has been listed under widely different names, among the commonest of which are: *F. ovina* L. var. *brevifolia* (R. BR.) HARTM., *F. brevifolia* R. BR., *F. ovina* L. var. *supina* (SCHUR.) HACKEL, *F. ovina* L. var. *violacea* GAND.

*F. brachyphylla* differs from the closely related species *F. baffinensis* and *F. hyperborea* in that the whole plant is smooth and shiny russet in colour. The culms stand high above the tuft of leaves. The panicle is from 2 to 6 cm long with rather pointed spikelets. The glumes are roughly all of the same length and quite smooth. The lemma narrows evenly to a projecting awn. It has been previously reported from Svalbard by several writers. It is most thoroughly discussed by DEVOLD and SCHOLANDER (1933) and SCHOLANDER (1934), but these descriptions also include forms which must be assigned to the two following species. According to HOLMEN (1952) it is hexaploid with chromosome number  $2n = 42$ . Wherever I have observed the plant out in its natural surroundings it has been growing on gravel and sandy ridges in open places. It grows most frequently on stony sand or gravel.

*F. supina* SCHUR., which is described as new for Svalbard by HADAČ (1944) must be reckoned as a form of this species.

*Festuca hyperborea* HOLMEN.

This species is closely related to the previous one, but differs from it in that the whole plant has a characteristically glaucous appearance. The spikelets have fewer blooms, and both glumes and lemma have scattered white hairs.

The species is stated to occur in Svalbard by HOLMEN (1957) and later investigations have confirmed this. Since the root-tip of this species was fixed in 1959 HOLMEN has found (and reported personally) that specimens from Spitsbergen are identical with the Greenland plants and also have the same chromosome number, i. e.  $2n = 28$ . The species grows in dry gravelly places with open sparse vegetation.

*Festuca baffinensis* N. POLUNIN.

This species has never before been reported from Svalbard. Of those dealt with here it is the most characteristic and well-defined species. It differs from the others in that the leaves are of about the same length as the culm, and the latter has a characteristic closely-packed pubescence on its upper half. The panicle is slight and darkened by violet-coloured spikelets which are set rather to one side.

With material from north-east Greenland HOLMEN (1952) found that the chromosome number is  $2n = 28$ . No determination has yet been made of the chromosome number from Svalbard material. The species has a wide ecological amplitude, but appears to prefer stony and sandy localities with open or scattered vegetation. Its distribution in Svalbard is as yet practically unknown. A typical

and well-defined collection was found in Sassendalen near the sea by the hunting hut. This is, so far, the only known locality for this species in Svalbard. It is probable that by checking the available material of *F. brachyphylla* coll. in the Scandinavian herbaria, especially in Oslo, one could add considerably to the number of localities.

### Poa L.

The determination of Arctic *Poae* is one of the most difficult problems in Arctic botany. The separate species can be very polymorphous, and the many viviparous forms which exist make classification still more difficult. In "Svalbards Flora" RESVOLL-HOLMSEN lists 5 species, viz. *P. pratensis* L., *P. arctica* R. BR., *P. alpina* L., *P. abbreviata* R. BR. and *P. glauca* VAHL. To-day it is considered that there are 6 species, as *P. hartzii* GAND. emend. has by SØRENSEN been shown to exist also in Svalbard (SØRENSEN 1933, SCHOLANDER 1934). According to the latest taxonomic investigations and the now prevailing view of the species, it can be said that the following species occur in Svalbard: *P. alpigena* (FR.) LINDM., *P. arctica* R. BR., *P. alpina* L., *P. glauca* VAHL, *P. abbreviata* R. BR. and *P. hartzii* GAND. emend. SØRENSEN. It is, however, considered that certain species consist of several varieties, some of which can be named with reasonable certainty. *P. alpigena* occurs, apart from the non-viviparous main form which is rare and entirely limited to powerfully nitrophilous places, in two varieties, viz. var. *vivipara* (MALMG.) SCHOL. and var. *colpodea* (TH. FRIES) SCHOL. Both are viviparous but var. *colpodea* has numerous tiny spikelets. With fully developed bulbils it has a typically bush-like appearance. In var. *vivipara* the spikelets are considerably larger, but the glumes and bracts are shorter. The top is also narrower and rather longer.

*P. arctica* also occurs, apart from the main form, in two varieties, var. *vivipara* (MALM.) SCHOL. and var. *caespitans* (SIMM.) NANNF. Var. *vivipara* is a viviparous form which grows interspersed with mosses on fairly dry or slightly damp ground. Var. *caespitans*, in contrast to the other forms of *P. arctica*, grows in loose tufts and lacks the characteristic long awns.

*Poa glauca* VAHL is also a very variable species, but it seems to be more homomorphous in Svalbard than in the other Arctic regions where it is distributed.

Below is given a key for the determination of the *Poa* species which have so far been discovered in Svalbard:

- A. Plants with stolons or loosely caespitose.
  - B. Panicle mostly compressed with branches of nearly equal length, 3 to 7 spikelets on each branch. *P. alpigena* (FR.) LINDM.
  - B. Panicle mostly spreading, lower branches longer than the upper, 2 to 3 spikelets at the tip of slender undulate branches. *P. arctica* R. BR.
- A. Densely caespitose, without stolons.
  - C. Basal leaves short, broad and keeled. Base covered with remnants of persistent pale grey sheaths. *P. alpina* L.
  - C. Basal leaves slender, acuminate towards apex.



- D. Leaves flat. Panicle pyramidal with thin branches each having 1 to 3 spikelets, usually dark. *P. arctica* R. BR. var. *caespitans* (SIMM) NANNES.
- D. Leaves very much folded, short and stiff.
- E. Panicle branches scabrous. Upper culm leaf below middle of culm. Plant shiny blue-grey. *P. glauca* M. VAHL
- E. Panicle branches smooth. Lower sheath greyish and slightly inflated. Glumes and lemma with scarious margin.
- F. Panicle short, about twice as long as broad. Ligules short. Leaves curved. *P. abbreviata* R. BR.
- F. Panicle long, 3 to 4 times as long as broad. Leaves short and stiff. Ligules long and acute. *P. hartzii* GAND.

### *Poa alpina* L.

During my journeying in Svalbard I have encountered almost exclusively the viviparous variety of this species. Only once, viz. by the hot springs in the interior of Bockfjorden on the north coast, have I found plentiful specimens of the non-viviparous main form. In older literature no distinction is made between viviparous and nonviviparous forms. In only one case have I found in literature the non-viviparous main form recorded on Spitsbergen, viz. by HADAČ (1944). He reports *P. alpina* from Moskuhavn in Adventfjorden (*a. blühende*, nicht vivipare Form) (1944, p. 15). However, SCHOLANDER (1934) made it clear that viviparous growths need not affect the flowering of the species. All intermediate stages of stamens may be found, from fully developed to rudimentary (1934, pp. 82–88). That a specimen has flowers need not mean that it is not viviparous. HADAČ also reports semi-viviparous forms from the same locality, and as this is inhabited he suggests the possibility that they have been introduced. From Bjørnøya the main form is reported (RØNNING, 1959) from two localities, but these can likewise not be regarded as quite certain, as they may be young specimens where the bulbils are not developed.

In the vicinity of the hot springs there was found an abundance of non-viviparous *P. alpina* both singly and in tufts. Within the area influenced by the warmth of the soil var. *vivipara* was not seen. The locality was visited on August 2nd and again on the 7th, at which time viviparous growths, if any, should have been fully developed in so favourable a locality. It is possible that the soil-warmth can inhibit the plants from developing bulbils, in which case viviparity must be conditioned by climate. Probably the locality in Bockfjorden is the only definite occurrence of the form in Svalbard.

### **Potentilla rubricaulis** Lehm.

In RESVOLL-HOLMSEN's survey of Svalbard's flora (1913) there are included altogether five species under the genus *Potentilla*, viz. *P. multifida* L., *P. nivea* L., *P. maculata* POURR. (= *P. crantzii* (CR.) G. BECK.), *P. emarginata* PURSH. (= *P. hyparctica*) and *P. pulchella* R. BR. Of these species, *P. multifida*, reported from

Spitsbergen by NATHORST (1883) must be linked together with *P. pulchella*, and must be regarded as a form of this species.

Since then HULTÉN (1945) has isolated *P. chamissonis* which is a separate species of the *P. nivea*-group, and shown that it is also found in Svalbard. *P. nivea* s. str., on the other hand, is not represented there, though its variety *P. nivea* var. *subquinata* (LANGE) JAL. does occur. A species which has not previously been reported from Svalbard is the Greenland-American species *P. rubricaulis*. Since I have had the opportunity of studying this species in the field, and have gone through the material in the herbaria in Copenhagen and Stockholm, I have realised that this species, too, is found in Svalbard. It is characterised by long-stalked flowers which stand high above the tuft of leaves. The leaves may be pinnate or ternate. Usually there are five lobes, three larger ones above and two smaller ones farther down the leaf-stalk. On smaller leaves and those higher up the culm these small lower lobes may be absent. The leaf-stalk has bristly hair, and the undersurface of the leaf has a white tomentum, but this is always covered by long silky hairs which terminate in a tiny tuft at the tip of the leaf.

*P. rubricaulis* may be confused with very hairy forms within the *P. nivea*-group. The American-Siberian species *P. hookeriana* LEHM., which closely resembles *P. chamissonis*, may be confused with *P. rubricaulis*, but is not found in Svalbard.

*P. rubricaulis* has a northerly main distribution, chiefly in the eastern Arctic region of Canada and Greenland, where it occurs both on the east and the west. In the northern Arctic regions it most often appears in a particular form, var. *arctica* SIMM. (syn. *P. pedersenii* RYDB.). Only on the western side of North America, towards Alaska, does it occur south of the Arctic Circle.

I have found it in the field in the localities stated below, and have also listed the specimens of the species which are represented in the herbaria in Stockholm and Copenhagen. When the collections in Oslo have been checked it is to be anticipated that the number of localities will be considerably increased.

Isfjorden: Gipshook 1908 RESVOLL-DIESET K.; Sassenbay, Hyperithatten 1908 RESVOLL-DIESET K.; Cape Thordsen, by the waterfall, 1882 NATHORST, 1898 ANDERSSON and HESSELMAN; on the north coast: Reinsdyrflya, east side 1960 RØNNING; Woodfjorden Roosneset 1960 RØNNING; Bockfjorden at Schjelderupbren 1960 RØNNING; "Trollkildene" 1960 RØNNING.

Accordingly we can reckon that the following species occur in Svalbard: *P. pulchella* R. BR., *P. rubricaulis* LEHM., *P. chamissonis* HULT., *P. nivea* L. var. *subquinata* (LGE.) JAL., *P. hyparctica* and *P. crantzii* (CR.) G. BECK.

The appended key will be of help in differentiating between the *Potentilla* species of Svalbard:

- A. Basal leaves pinnate. Stems with 1 to 3 flowers.
  - B. Flowers small, with stems hardly extending above the tuft. Petals scarcely longer than sepals. *P. pulchella* R. BR.
  - B. Flowers large, stems standing high above the tufts. Petals longer than sepals and overlapping. *P. rubricaulis* LEHM.
- A. Leaves digitate, with 3 or 5 lobes.

C. Leaves, under-side, white-tomentose or covered with silky hairs.

D. Leaf petioles with long spreading hairs, or with dense pubescence of short hairs.

E. Dense whitish pubescence on under-side of leaves, always covered with long silky hairs forming tufts at leaf apex.

*P. rubricaulis* LEHM.

E. Whitish pubescence on under-side of leaves without silky tufts at leaf apex.

*P. chamissonis*.

D. Leaf petioles densely pubescent without spreading stiff hairs.

*P. nivea* L. var. *subquinata* (LGE.) JAL.

C. Under-side of basal leaves sparsely haired, lacking true tomentum.

F. Leaves ternate, mid-lobe sometimes with petiole. Flowers large, with petals longer than sepals. Densely tufted with upright stems.

*P. hyperctica* MALTE.

F. Basal leaves quinate. Flowers large. Petals flecked with orange near base.

*P. crantzii* (CR.) G. BECK.

### **Saxifraga hyperborea. R. Br.**

This species is closely related to *S. rivularis* L., but differs from the latter in the following respects.

It is considerably smaller than *S. rivularis*, from 2 to 5 cm high, and decidedly russet-anto-cyanin in colour. At least this shade dominates both culm and leaf, where the underside in particular may be red. Sepals and petals are reddish. The leaves are 3- or 4-lobed and reddish near the tip. *S. hyperborea* also usually lacks stolons. The species has previously been regarded as a variety of *S. rivularis*, but its existence in Svalbard has never before been definitely proved. Recent investigations by JØRGENSEN and others have shown that in Greenland the species has chromosome number  $2n = 26$ . FLOVIK (1940) gives the same value for *S. rivularis* from Svalbard. There are good grounds for believing, that the specimen counted by FLOVIK must have been a good *S. hyperborea*.

It was during the 1960 expedition that for the first time I realised the separateness of this species, and collected it in several localities. *S. hyperborea* grows in very wet places or on temporarily damp ground. It is often found interspersed with a tight carpet of moss, and then usually singly or a few together in loose clusters. The moss has very often proved to be *Paludella squarrosa*.

*S. rivularis* as a rule grows with many more plants together in tight clusters.

After previously-collected material has been re-examined it transpires that I have also collected this species before, for instance on Bjørnøya in 1957. Some of the material published under the name of *S. rivularis* (RØNNING 1958) must be transferred to *S. hyperborea*.

### **Saussurea alpina (L.) D. C.**

This species was collected by museum-curator PETER VALEUR on July 23rd 1960 at a hut on Kapp Berg south of Stormvika on the west coast. He kindly

passed it on to me. The species is European in distribution and occurs both in northern Europe and in the southern European mountain chains.

Its occurrence in Svalbard is in all probability due to human agency, as it was found near an old hunting hut, where it grew in a little patch of about 3 square yards. The specimens were in bud. No flowering specimens were observed. It is remarkable that it has survived so well, but this must be due to the powerful subterranean vegetative system.

### ***Sibbaldia procumbens* L.**

This species, too, is new for Svalbard, and was found right in near of the hot springs in Bockfjorden on the north coast of Vestspitsbergen. (See also under *Euphrasia frigida* and *Carex capillaris*.) The species grew in the immediate neighbourhood of the hot springs, and strictly within the area which is under the influence of the soil warmth from the springs. Quite typical of the growth of the species here was that it grew exclusively in compact groups in cavities or depressions in the terrain, and then most often on the southern slope. Even here, where otherwise the soil temperature varies relatively little during the year, it needs good protection by the snow in winter. It is also possible that the wind and wind erosion can play a decisive part in its growth.

Together with *Sibbaldia procumbens* there occurred *Equisetum arvense* L., *E. scirpoides* MICH., *Oxyria digyna* (L.) HILL, *Silene acaulis* (L.) JAC., *Poa alpina* L., *Polygonum viviparum* L., *Saxifraga cernua* L. and *Taraxacum* sp.

The locality in Bockfjorden at 79° 26' N is by far the most northerly occurrence in the world. In east Greenland it is found distributed as far north as 73° 10' while in Scandinavia and eastwards to the Kola peninsula it is quite common. Those forms of the species which are found in western and eastern North America, Greenland and Europe are very much like each other but those in the Central Asian mountains diverge.

### ***Stellaria calycantha* (Led.) Borg.**

In Svalbard this species has so far been found only on Bjørnøya about 74° 30' N. Its occurrence is discussed in more detail by RØNNING (1959). Farther north on Spitsbergen it is not found but its occurrence in favourable localities cannot be ruled out. The occurrence on Bjørnøya is the most northerly in which the species has been found.

### **Notes on the Taxonomy of Certain Plants in Svalbard.**

Various plants belonging to the flora of Svalbard have in recent years been transferred to other species or have been given new taxonomic ranking. It will be natural to include some of these plants here.

*Colpodium vacillans* (TH. FR.) POLUNIN. Species first indicated by TH. FRIES (1869) as *Catabrosa concinna* subsp. *vacillans*. Later it was ranked by ASPLUND (1911) as a species with the designation *C. vacillans*. By SCHOLANDER (1934) it was transferred to the genus *Puccinellia* as *P. vacillans* (TH. FR.) SCHOL. As was also pointed out by SCHOLANDER the species is most nearly related to *P. vahliianum*,

but when SØRENSEN (1953) transferred the latter to the genus *Colpodium*, POLUNIN, for the sake of consistency, did likewise with *P. vacillans* (POLUNIN 1959). The investigations I have carried out since, including those of the epidermic cells of the leaves (RØNNING, unpub.), show that this is a correct interpretation.

*Eriophorum triste* (TH. FR.) HADAČ and LØVE. This plant, the individual character of which has long been recognised, was first ranked as a separate species in 1950 (LØVE 1950). It had previously been regarded as a variety of *E. polystachyum* L. The taxonomic position of the species was cleared up by SØRENSEN as long ago as 1933. It is not common in Svalbard, but occurs in a few places in the inner fjord regions.

*Sedum arcticum* (A. BOR.) RØNNING. *Sedum roseum* (L.) SCOP. is a variable species consisting of several races. The plants in Arctic Russia and Novaya Zemlya are, according to BORISOVA (Flora USSR, IX 1939) a separate species *Rhodiola arctica* A. BOR. and belong to the yellow-flowered forms within the *Sedum roseum*-complex. In 1958 the author (RØNNING 1959) listed the *Sedum roseum* from Bjørnøya under this species and at the same time set up the new combination in accordance with the generally accepted view of the taxonomy of the species *Sedum arcticum* (A. BOR.) RØNNING. I have not seen the specimens of this species from Forlandet in Spitsbergen, but presumably these must also be assigned to *Sedum arcticum*.

*Cardamine nymani* GAND. According to the investigations carried out by LØVQUIST (1956) the Svalbard plants of the *Cardamine pratensis*-complex must be transferred to another species, viz. *C. nymani* GAND. The distribution of the species is circumpolar.

*Pedicularis dasyantha* (TRAUTV.) HADAČ. In his work HADAČ (1944) reckons the Spitsbergen and Novaya Zemlya forms as one and the same species, *P. dasyantha*. This appears to be correct, since these plants obviously differ from the Greenland-American forms of *P. lanata*, both morphologically and geographically. Among other differences, the flower is considerably bigger and the galea quite hairy. The distribution of the plant includes Svalbard and Novaya Zemlya, as well as some uncertain localities in Arctic Russia south of Novaya Zemlya.

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NORSK POLARINSTITUTT

*Observatoriegt. 1, Oslo, Norway*

**Short account of the publications of Norsk Polarinstittutt.**

The two series, Norsk Polarinstittutt — SKRIFTER and Norsk Polarinstittutt — MEDDELELSER, were taken over from the institution Norges Svalbard- og Ishavsundersøkelser (NSIU), which was incorporated in Norsk Polarinstittutt when this was founded in 1948. A third series, Norsk Polarinstittutt — ÅRBOK, will be published with one volume per year, and the first volume, ÅRBOK 1960, will soon appear.

SKRIFTER includes scientific papers, published in English, French or German. MEDDELELSER comprises shorter papers, often being reprints from other publications. They generally have a more popular form and are mostly published in Norwegian.

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- Nos. 1—11. Resultater av De norske statsunderstøttede Spitsbergen-ekspeditioner.
- No. 12. Skrifter om Svalbard og Nordishavet.
- Nos. 13—81. Skrifter om Svalbard og Ishavet.
  - 82—89. Norges Svalbard- og Ishavsundersøkelser. Skrifter.
  - 90— . Norsk Polarinstittutt Skrifter.

In addition a special series is published: NORWEGIAN—BRITISH—SWEDISH ANTARCTIC EXPEDITION, 1949—52. SCIENTIFIC RESULTS. This series will comprise 6 volumes. Hitherto 20 papers have been published, and the series will probably be completed in 1963.

Topographic and hydrographic surveys make an important part of the work done by Norsk Polarinstittutt. A list of the published maps and charts is found on the back of SKRIFTER.

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**SKRIFTER**

**Skrifter nr. 1—89, see numbers of Skrifter previous to Nr. 100.**

- Nr.
- 90. HENIE, HANS: *Astronomical Observations on Hopen*. 1948. Kr. 3,00.
- 91. RODAHL, KÅRE: *Vitamin Sources in Arctic Regions*. 1949. Kr. 6,00.
- 92. RODAHL, KÅRE: *The Toxic Effect of Polar Bear Liver*. 1949. Kr. 12,50.
- 93. HAGEN, ASBJØRN: *Notes on Arctic fungi. I. Fungi from Jan Mayen. II. Fungi collected by Dr. P. F. Scholander on the Swedish-Norwegian Arctic Expedition 1931*. 1950. Kr. 2,00.
- 94. FEYLING-HANSEN, ROLF W. and FINN A. JØRSTAD: *Quaternary Fossils*. 1950. Kr. 8,25.
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- 96. BUTLER, J. R.: *Geochemical Affinities of some Coals from Svalbard*. 1953. Kr. 3,00.

## MAPS

General, geographical, topographical and technical maps:

DRONNING MAUD LAND			Kr.
Jutulgryta . . . . .	H 5	1:250,000 1961	5,55
H. U. Sverdrupfjella . . . . .	H 6	1:250,000 1961	5,55
Sør-Rondane . . . . .		1:250,000 1957	5.55
<b>GRØNLAND, Austgrønland</b>			
Eirik Raudes Land			
Frå Sofiasund til Youngsund . . . . .		1:200,000 1932	2.20
Claveringøya . . . . .		1:100,000 1937	. . . .
Geographical Society-øya . . . . .		1:100,000 1937	. . . .
Jordan Hill . . . . .		1:100,000 1937	. . . .
			} From: Karte von Nordostgrønland. Publ. by NSIU 1937. Limited stock, not for sale.
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<b>SVALBARD</b>			
Svalbard . . . . .		1:2,000,000 1958	2.20
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Van Keulenfjorden . . . . .	B 11	1:100,000 1952	5.55
Torellbreen . . . . .	B 12	1:100,000 1953	5.55
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Markhambreen . . . . .	C 12	1:100,000 1957	5.55
Sørkapp . . . . .	C 13	1:100,000 1947	5.55
Adventfjorden—Braganzavågen . . . . .		1:100,000 1941	2.20
Hopen . . . . .		1:100,000 1949	2.20
(Claims to land in Svalbard) . . . . .		1: 50,000 1927	2.20
Bjørnøya . . . . .		1: 25,000 1925	5.55
Bjørnøya . . . . .		1: 10,000 1925	. . . .
			} Latest edition.  } Preliminary map. each. 33 sheets. New ed. 1944 and 1955. Also as supplement to Skrifter Nr. 86. 6 sheets. Out of print.

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