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TREAARSEXPEDITIONEN TIL CHRISTIAN DEN X's LAND 1931-34
UNDER LEDELSE AF LAUGE KOCH

THE VASCULAR PLANTS OF NORTHEAST GREENLAND FROM 74°30′ TO 79°00′ N. LAT.

AND

A SUMMARY OF ALL SPECIES FOUND IN EAST GREENLAND

BY

GUNNAR SEIDENFADEN AND THORV. SØRENSEN

WITH 60 FIGURES IN THE TEXT AND 4 PLATES

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PREFACE

The present work provides a systematic survey of the species of higher plants found in the northernmost part of the working area of the Danish Three-year Expedition to East Greenland 1931—34. Thus it forms an immediate continuation of the papers previously published on the more southerly parts of that area, viz. GELTING's systematic work from the area northward from 73°15′ N. lat. (GELTING 1934) and the corresponding work by THORV. SØRENSEN on the area from 71°00′ to 73°30′ N. lat. (SØRENSEN 1933). While these two works, on account of the long space of time the authors spent within the respective areas, must be said to give a fairly exhaustive picture of their floras, the present paper hardly gives a complete idea of what species occur, or of their distribution within the area investigated. Only a fraction of the time employed for the investigation of the central part of the area of the Three-year Expedition was at our disposal, and none of us wintered in the region. After seeing how much new information was gathered from the investigation made of central East Greenland, we have realised that the region north of Sabine Island might supply several more surprises in a floristic respect. If nevertheless we think it justifiable to publish our present knowledge of the flora, it is partly because the Three-year Expedition has now been completed, partly because it must be regarded as most probable that for several years to come no comprehensive botanical investigations will be made in these northern tracts.

At the same time as the Danish Three-year Expedition was at work in the area north of Scoresby Sound, other expeditions, too, displayed an extraordinary activity, thus foreign expeditions within the same area, and foreign and Danish expeditions in the regions south of it. Our knowledge of the flora of East Greenland has advanced with giant strides during the last ten years. OSTENFELD's summary list (OSTENFELD 1926) has therefore gone out of date with astonishing rapidity. For the benefit of such scientists as may want such a list for their study of other floras, we have found it natural, besides taking a survey of the last part of the

coast, to supply as complete a list as possible of all the species which have been found in East Greenland, with an indication of their distribution in broad features. A comparison of this list with that of OSTENFELD just mentioned will show the exceedingly large amount of new information gained; but at the same time it will possibly be realised how much work still remains to be done before our knowledge of the flora of Greenland can be said to be complete. In the preparation of this paper we have made use of the herbarium of the Botanical Museum of Copenhagen, and of the copious literature available on the subject, and it is our hope that the work gives a fairly true and complete picture of the conditions. On the other hand, during our stay in Greenland we realised how necessary it is for gaining a right understanding of the systematic units that one has, as it were, lived with the plants in nature, and that one does not allow oneself to be influenced by a too one-sided museum investigation of herbarium material. Our conception of the flora in the regions we have not visited ourselves may therefore perhaps be open to criticism on closer inspection.

During the preparation of the present paper we have received help and kindness from many quarters. To Mag. scient. PORSILD we are indebted for much good advice. Our thanks are due to the keeper of the Botanical Museum at Berlin-Dahlem for material sent to us, and to our colleagues at the Botanical Museum of Copenhagen. We are greatly indebted to our comrades and assistants during the stay of the expedition in Greenland, more especially to the leader of the expedition, Dr. LAUGE KOCH, not only for his never failing interest and helpfulness during the excursions in Greenland, but also for his help in the preparation and publication of the investigations after the return of the expedition.

Copenhagen, February 12, 1937.

THE VASCULAR PLANTS OF NORTHEAST GREENLAND

I. List of the Localities.

The first expedition to visit the regions here treated was the Zweite deutsche Nordpolarfahrt, which in the years 1869—70 wintered on Sabine Island, and which partly by ship partly by sledge traversed the country northward to Danmarkshavn. No actual botanist took part in the expedition, for which reason the material collected is rather sparse. The most valuable collections from our area are those secured by the ship's surgeon Dr. PANSCH from Shannon Island, which were worked up by BUCHENAU & FOCKE (1874) after the return of the expedition. Scattered information on the vegetation north of Sabine Island may be found here and there in the expedition report proper (KOLDEWEY 1874), but only on the commonest plants, thus especially *Cassiope tetragona*, which was used as fuel in the camps. As botanical localities, however, only the three places visited on Shannon Island and the south coast of Kuhn Island are included in the subjoined list. A great number of species listed by BUCHENAU & FOCKE are only indicated as "of common occurrence" or the like; when the original herbarium material could not be obtained, we therefore found it most correct not to include these statements.

The plants collected on the DUC D'ORLEANS's expedition to Northeast Greenland in 1905 were determined by OSTENFELD (1908). The material included relatively few species collected in three localities (Nos. 22, 23, 41) between 76°39′ and 77°36′ N. lat. Altogether 29 species of vascular plants were collected on this expedition.

A great increase in our knowledge of the flora of the most northerly regions of East Greenland was supplied by the Danish expedition 1906—08, the Danmark Expedition. The investigations centred round Danmarkshavn (76°46′ N. lat.), but collections were brought home from some few places farther north also. The results were published by LUNDAGER (1912) and OSTENFELD & LUNDAGER (1911), and the list comprises 93 species of vascular plants. This expedition for the first time brought home plants from a locality so far north as the Mallemukfjæld (80°10′ N. lat.).

The two following expeditions to East Greenland, the Alabama Expedition 1909—12 and J. P. Koch's expedition 1912—13, included no botanists, and no botanical collections were brought home. However, here and there the expedition reports (J. P. KOCH 1913) contain some information on the higher plants of the regions traversed by the expeditions.

The plans for the Danish Three-year Expedition 1931—34 included an investigation of the flora within the area of the expedition, the country between Scoresby Sound (c. 70° N. lat.) and Danmarkshavn (c. 77° N. lat.). In the central parts of the area, on Ella Island and Clavering Island, botanists wintered in 1931—32, and from these regions plant lists are available, for the area 71°00′ to 73°30′ N. lat. published by SØRENSEN (1933) and for the area 73°30′ to 74°30′ N. lat. published by GELTING (1934). In GELTING's paper is also incorporated part of our knowledge in 1932 of the flora of the northernmost working area of the expedition. In 1931 the ship of the expedition paid a short visit at Hochstetter Foreland, where SEIDENFADEN made collections at Petersbugt, and in addition another member of the expedition, A. SCHWARCK, made some few collections during a sledge journey in the spring of 1932. Finally some few data were available on the flora of Grandjean Fjord and Fliegely Fjord, which had been visited by BACKLUND and SEIDENFADEN on a rapid journey by motorboat in the summer of 1932. All this information was partially incorporated in GELTING's aforementioned paper.[1])

It was highly desirable, however, that further investigations should be made in the regions north of Sabine Island, and the present authors therefore went northward in the expedition ship s. s. "GUSTAV HOLM" on its voyage in the summer of 1933.

The ship left Eskimonæs, Clavering Island, on August 6, and returned to this place on the 22nd of the same month. Our excursion thus lasted for merely a fortnight, and part of the time was used for the voyage.

The original plan was to confine investigations to the area south of Danmarkshavn, as laid down in the programme of the expedition; however, when the "GUSTAV HOLM" went northward after a short stay at Danmarkshavn, a reconnaissance by airplane having shown that there was ice-free water northward, we decided to take advantage of this unique opportunity to try to gain some insight into the flora of this almost completely unknown part of the coast. The large fjord complex Skærfjord north of Germania Land was observed from the airplane to be completely ice-free, and one of us (TH. SØRENSEN) therefore went into this fjord by motorboat, while the other (SEIDENFADEN) continued by the ship northward to try to get ashore farther north. However, the

[1]) Also a few plants collected in Loc. 14, Nanok, by the geologist R. BØGVAD are included.

latter was only able to land in a single place, viz. Norske Island, the northernmost point reached by the ship.

An examination of the maps in figs. 1—2 will show that we lack information in some degree of the inner parts of the fjords south of Danmarkshavn. We were aware of this even in 1933, and the next year, 1934, it was therefore our plan to make an attempt to push into Bessel Fjord and Ardencaple Inlet. However, in 1934 the ice conditions were so difficult as had never been experienced before, and we did not, therefore, succeed in pushing north of Wollaston Foreland.

As it cannot be expected that these regions will be visited by botanists for a number of years, we thought it right to publish the results gained so far. The subjoined list therefore includes all our present knowledge of the distribution of the higher plants on the east coast of Greenland north of Sabine Island. As a more or less natural northern limit we have taken the large glacier north of Lambert Land. A glance at the map of North Greenland will show that, especially after LAUGE KOCH's air reconnaisances in 1933, the regions round Holm Land actually form a continuous ice-free connection with the country round Danmark Fjord and onward to Peary Land, while north of Skærfjord ice-free areas are almost absent and apart from Lambert Land are reduced to narrow, interrupted coast stretches and numerous islets.

Below a list is given of the localities for which information on the higher plants is available, comprising those of earlier expeditions as well as those of the Three-year Expedition. The localities will be given as far as possible in the succession south to north. Reference is further made to the maps in figs. 1 and 2, pp. 10—11.

Loc. 1. The south coast of Kuhn Island.

(74°43′ N. lat., 20°08′ W. long.).

This coast was visited by the German expedition on its journeys in the winter of 1869—70. Notes on the vegetation are found here and there in the general expedition report. The Germans called the island "Kohleninsel" (KOLDEWEY 1874).

Loc. 2. Cape Hamburg, Kuhn Island.

(74°46′ N. lat., 19°58′ W. long.).

This place was visited by SEIDENFADEN on August 7, 1933. The locality is a slope with a southeastward exposure. The substratum consists of clay shales and sandstones (Cretaceous), but the scree contained an extremely large amount of gneiss originating from the mountains behind. At the time of the visit the whole slope was very moist owing to the soaking water from the perennating snow-patches. The vegetation was especially luxuriant along the numerous small brooks. The locality is the northernmost locality for *Epilobium arcticum* SAMUELS. in Greenland (cf. p. 53).

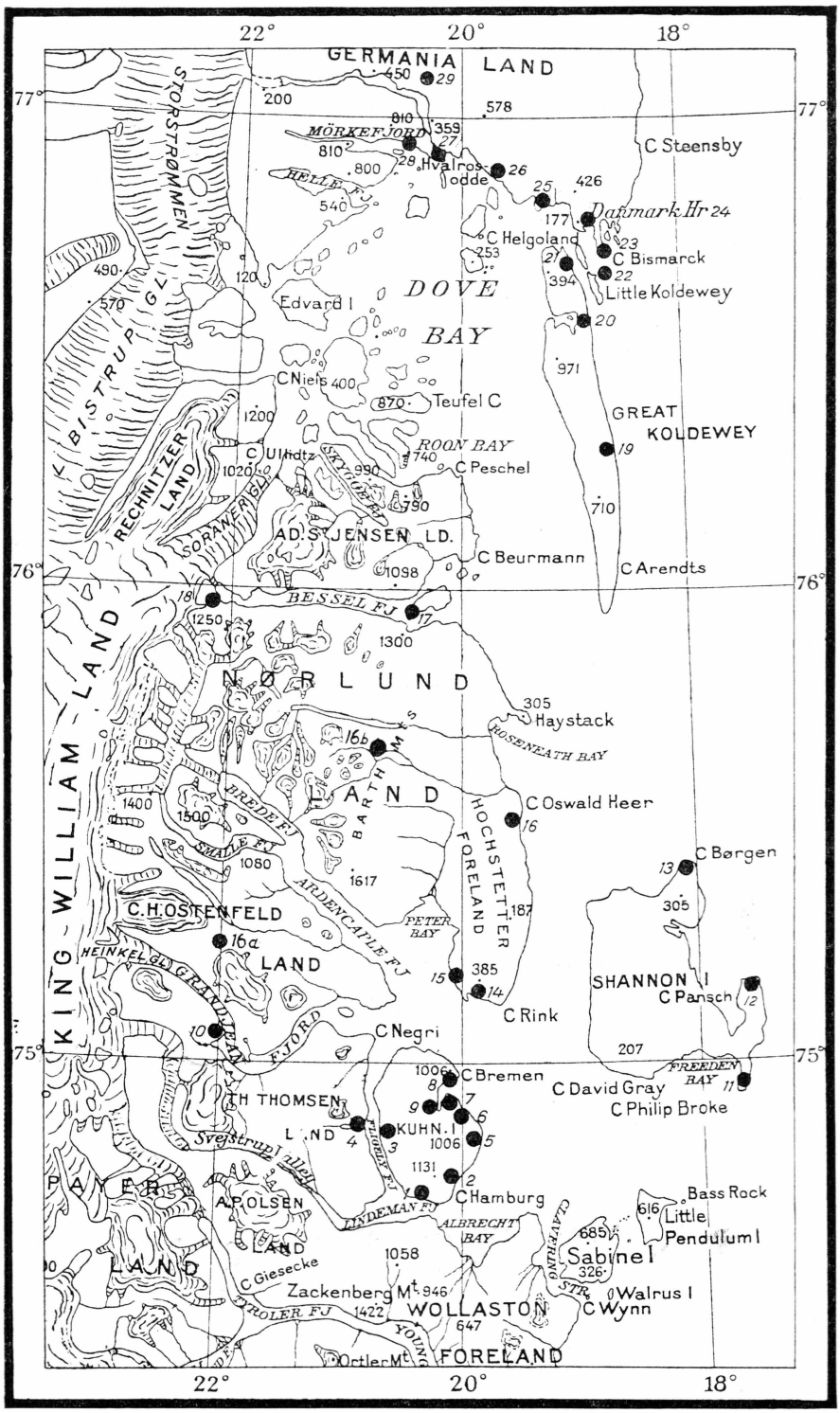


Fig. 1. Map of the southern part of the district, showing the situation of localities 1—29.

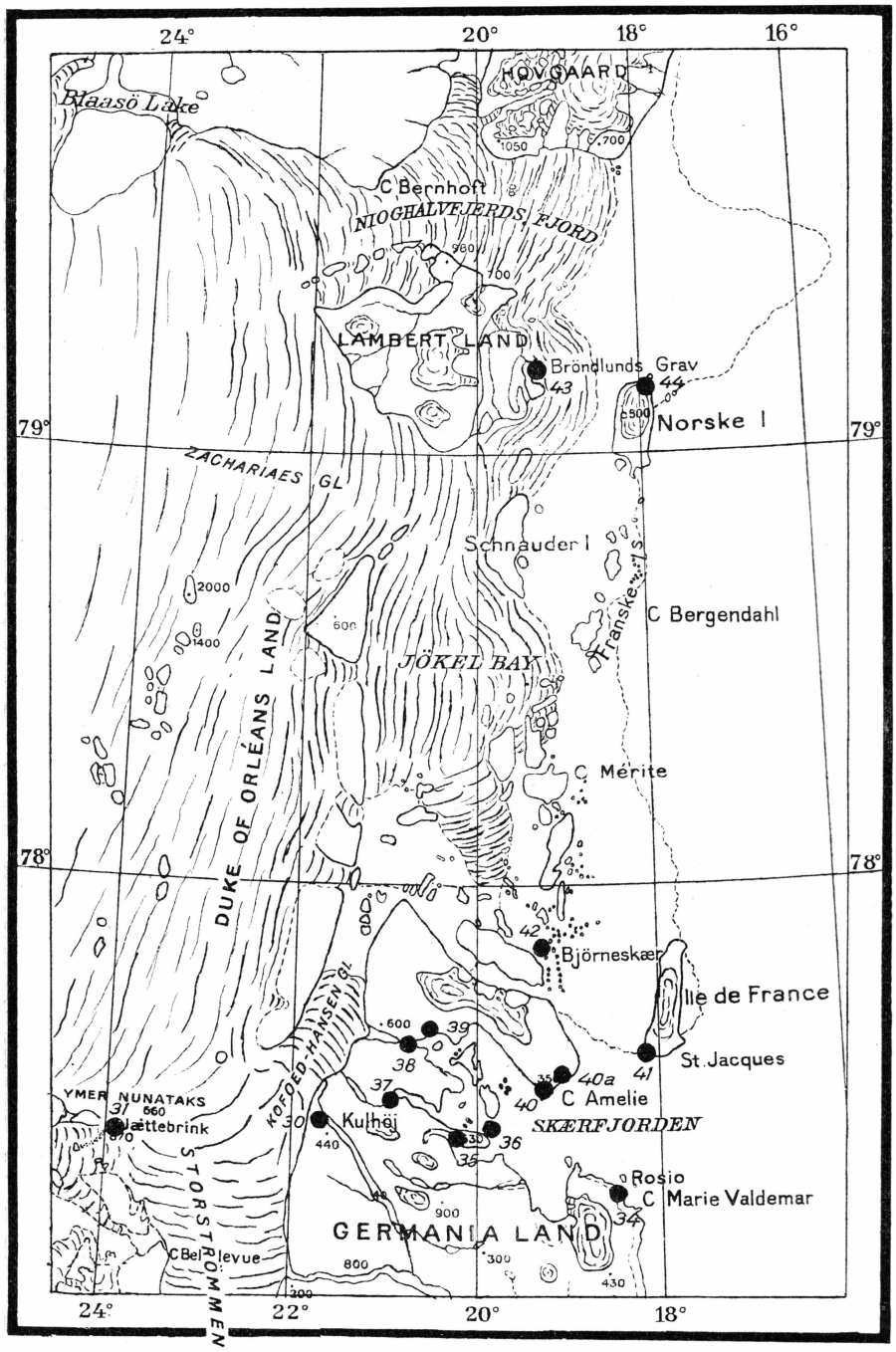


Fig. 2. Map of the northern part of the district, showing the situation of localities 30—44. (cf. also the special map of Skærfjord, fig. 5, p. 20).

Loc. 3. West coast of Kuhn Island, opposite Lakseelv.
(74°49′ N. lat., 20°43′ W. long.).

Visited by BACKLUND on his journey through Fliegely Fjord in August, 1932. No collections were made, but BACKLUND noted several species, among others *Betula nana*.

Loc. 4. Lakseelv, Th. Thomsen Land.
(74°50′ N. lat., 20°45′ W. long.).

SCHWARCK, one of the members of the Three-year Expedition, visited this place in May, 1932, during a sledge journey, and collected some plants, which are mentioned by GELTING (1934).

Loc. 5. Cape Maurer, Kuhn Island.
(74°52′ N. lat., 19°44′ W. long.).

The locality, which is situated slightly south of the easternmost point of Kuhn Island, was visited by TH. SØRENSEN on August 7, 1933. Only the slopes rising evenly from the coast were investigated. Geologically this coastal belt is built up of Mesozoic sediments (Jurassic-Neocomian, KOCH 1929, p. 177), chiefly soft shales, which show a strong inclination to mechanic disintegration and formation of glaciers of moving soil. The soil is clayey, and no doubt rather highly calcareous. — Behind the gravelly raised beaches there extend damp, grassy flats. Otherwise the slopes are characterised by strong solifluction, which prevents the formation of a closed cover of vegetation. A little way back from the coast, however, there occur older stagnant moving soil glaciers with a surprisingly luxuriant vegetation. On the whole gramineous plants dominate, whereas the dwarf-shrub heath is hardly represented.

Loc. 6. East coast of Kuhn Island,
between Cape Maurer and the mouth of Bastian Bay.
(74°55′ N. lat., 19°55′ W. long.).

The place was but cursorily visited by the authors on August 8, 1933. Only the flat foreshore, which conveys the impression of being a lagoon more or less dried up, was investigated. Behind the foreshore the gneiss rises in steep walls. The soil consists mainly of gneiss blocks and wet sand deposits traversed by flat canals and shallow-watered lakelets partially dried up. The vegetation is chiefly a shore vegetation. Physiognomically conspicuous are the large, flat cushions of flowering *Stellaria humifusa* (cf. fig. 3 and fig. 48).

Loc. 7. South side of the mouth of Bastian Bay.
(74°56′ N. lat., 20°03′ W. long.).

The place was visited by SEIDENFADEN on August 8, 1933; however, his stay there was very short. The locality was a flat slope with a north-

G. SEIDENFADEN phot. 3893.

Fig. 3. The flat shore with a dense cover of vegetation in locality 6 south of Bastian Bay, east coast of Kuhn Island. The light-coloured patches are formed of large individuals of *Stellaria humifusa*; cf. fig. 48 p. 135 August, 8, 1933.

ward exposure and with a scanty vegetation, only about 40 species being found. The snow seemed to have lingered long over the greater part of the area; this was evidenced among other things by the large number of just open *Ranunculus glacialis*.

Loc. 8. North side of the mouth of Bastian Bay.

(74°58′ N. lat., 20°02′ W. long.).

Visited the night of August 8, 1933, by TH. SØRENSEN. The mountains are made up of granite. In spite of the southward exposure of the locality it leaves a poor impression botanically, the lower parts of the territory being chiefly occupied by gravelly and stony flats with a very scattered vegetation of *Draba*, *Saxifraga*, and similar species, and by extensive block fields; in the latter large cushions of *Grimmia* are often found among the blocks. Along a river debouching in the northwestern corner of the bay, however, a great deal of continuous vegetation is found, partly herb-grass slopes, partly *Cassiope* vegetation, extending in narrow belts, and growths of *Salix arctica-Chamaenerium latifolium* in the parts of the river bed which are flooded in the spring. — An ascent was made to altitudes of 150—200 m. The snow-drifts had as a rule melted, but the snow-patch vegetation was but relatively poorly

developed, evidently on account of lack of fine soil in the growth substrate. Thus only a single, very poor growth of *Salix herbacea* was observed.

Loc. 9. Head of Bastian Bay.

(74°54′ N. lat., 20°11′ W. long.).

On the night of August 8, 1933, SEIDENFADEN paid a short visit to the place, where a short excursion was made into the river valley extending towards the west. The fairly narrow and shady valley bottom contained only a rather scanty vegetation. About 30 species were noted.

Loc. 10. Grandjean Fjord.

(C. 75°00′ N. lat., 22°00′ W. long.).

The fjord was visited for the first time in 1932 on a topographic-geological reconnaissance voyage, however, time did not allow of any botanical investigations to be made. Some few species were, however, noted (SEIDENFADEN); especially noteworthy is *Betula nana*, which seems to have its northern limit here. Interesting also is *Sedum roseum*, which grew abundantly on a southwardly exposed slope on which a colony of sea-gulls had settled.

Loc. 11. Cape Philip Broke, Shannon Island.

(74°54′ N. lat., 17°40′ W. long.).

While Shannon Island was not visited by the botanists of the Three-year Expedition, it was visited repeatedly by the German expedition 1869—70. Most of the collections were made by PANSCH on July 24, 1870. He describes the locality as follows (KOLDEWEY 1874, I, p. 635): "In floristischer Beziehung bot der eintägige Aufenthalt wenig Resultate. Es konnte nichts Neues gesammelt werden und Alles war nur eine Wiederholung dessen, was wir auf Sabine-Insel beobachtet hatten. Das Eigenthümliche dieses Theils der Insel waren die weiten, sanft wellenförmigen Flächen, in denen nur hier und da ein kleines Wasser dahinfloss. Ueberall sah man noch deutlich die Wirkungen des Frühlingsschnees und des leise rieselnden Thauwassers. Jetzt war der Boden stellenweise ganz ausgedörrt und dabei oft von klaffenden Spalten vielwinkelig durchzogen. Hier waren also keine geeigneten Stellen für die Weiden, und ausser kleinen Büscheln von Gräsern und Seggen fanden sich auch eigentlich nur solche Pflanzen, deren überirdische Theile im Winter ganz oder fast ganz schwinden. Am meisten geltend machten sich um diese Zeit die Blüten von *Saxifraga flagellaris* WILLD., *Ranunculus nivalis* L. und *Papaver nudicaule* L. Auch von *Saxifraga caespitosa* L., *Stellaria humifusa* ROTTB. und *Cerastium alpinum* L. fanden wir neben sterilen viele kräftig blühende Exemplare."

For PANSCH's mention of *Ranunculus nivalis*, see p. 56.

Loc. 12. Cape Pansch, Shannon Island.

(75°10′ N. lat., 17°38′ W. long.).

This place, too, was visited by PANSCH in July, 1870. He states as follows (KOLDEWEY I, 1874, p. 637): "Auf dem dürren Boden des sanft ansteigenden Hügellandes sah es recht öde aus, doch erschienen weiterhin schon viele gut entwickelte und blühende Pflanzen der bekannten Arten (*Papaver*, *Pedicularis*, *Saxifraga*, *Cerastium* u. s. w.). Auf dem Gipfel des Hügels hatten sich in den geschützten Spalten und an den Felskanten, obgleich es die nördliche Seite war, mehrere Pflanzen, besonders ein schönes gelbblühendes Hungerblümchen (*Draba alpina* L.) und die *Oxyria digyna* L. zu unerwarteter Stärke und Grösse entwickelt."

Loc. 13. Cape Börgen, Shannon Island.

(75°23′ N. lat., 18°00′ W. long.).

The northernmost point of Shannon Island was visited by PANSCH in the last days of July, 1870. He describes it as follows (KOLDEWEY I, 1874, p. 639): "Dies war der ödeste Punkt, den ich auf ebenem Boden in Grönland sah. Nirgends Moose, nirgends auch nur die kleinste Spur von Flechten! Als wir ohne Rock in der warmen Vormittagssonne langsam diesen Hang hinaufquälten, da fielen uns die heissen öden pflanzenarmen Gegenden der Schweizer Kalkalpen wieder ein. Hier aber war es nicht sowohl der ungeeignete sterile Boden, als vielmehr der Mangel an feuchten Niederschlage, der die Ansiedelung und das Gedeihen von Pflanzen unmöglich machte."

Loc. 14. Nanok, Hochstetter Foreland.

(75°09′ N. lat., 19°48′ W. long.).

Some few collections were made in 1930 by BØGVAD, who wintered at the Danish hunting station. Later the place was visited by SEIDENFADEN in August, 1931. On August 8, 1933, during our northward voyage, we had an opportunity of making an excursion from the hunting station for a couple of hours, though only to an altitude of about 50 m, across the flat foreland, which rises very evenly towards the dome-shaped Muschelberg. The ground is made up of weathered rocks of the Eleonore Bay Formation (Algonkium) (KOCH 1929, p. 55), which form a fertile substrate for vegetation. The vegetation is completely dominated by gramineous plants. Of special interest was a comparatively broad belt of morassy, almost horizontal flats ("denuded bog" cfr. p. 125) extending below a series of recently melted snow-drifts; these flats were often inundated, and bore a slightly conspicuous vegetation of *Koenigia*, various *Saxifraga* species, *Phippsia*, etc., among big tufts of *Deschampsia brevifolia* and high cushions of *Cerastium Regelii*, *Stellaria longipes*,

Melandryum apetalum, etc. This type of vegetation is exceedingly characteristic of the outer coast, but is rarely so beautifully developed as it was in this place.

Loc. 15. Petersbugt, Hochstetter Foreland.
(75°13′ N. lat., 20°00′ W. long.).

During the first visit of the Three-year Expedition to this place in August, 1931, SEIDENFADEN made investigations in the flat territory northeast of the place in which the wintering house of the expedition was later built. The specimens collected here are published by GELTING (1934).

Loc. 16. Cape Oswald Heer.
(75°35′ N. lat., 19°30′ W. long.).

The plants were collected by SCHWARCK on May 15, 1932.

Loc. 16 a. Kildedal west of Slamsø, C. H. Ostenfeld Land.
(75°15′ N. lat., 22°00′ W. long.).

This locality was visited by T. JOHANSEN in 1933, on a sledge journey. The material collected contained ten common species all collected about 200 m above the sea.

Loc. 16 b. Western end of Agnete Lake, C. H. Ostenfeld Land.
(75°40′ N. lat., 20°30.′ W long.).

The locality was visited by T. JOHANSEN on a sledge journey in 1933. A number of plants were collected, of which the new form of *Primula*, described in p. 76, is particularly noticeable. Unfortunately the plants from this as well as the preceding locality were included in our investigations so late that we were compelled for technical reasons to denote the localities 16 a and 16 b; it should, however, be stated that the two localities are situated at a distance from locality 16, even though they have been given the same number.

Twenty-two species have been identified from the material brought home by T. JOHANSEN from this locality.

Loc. 17. Trumsø, at the mouth of Bessel Fjord.
(75°56′ N. lat., 20°25′ W. long.).

The locality is situated at the westernmost corner of the island. On a sledge journey on May 12, 1932, SCHWARCK collected a number of plants which have been published by GELTING (1934).

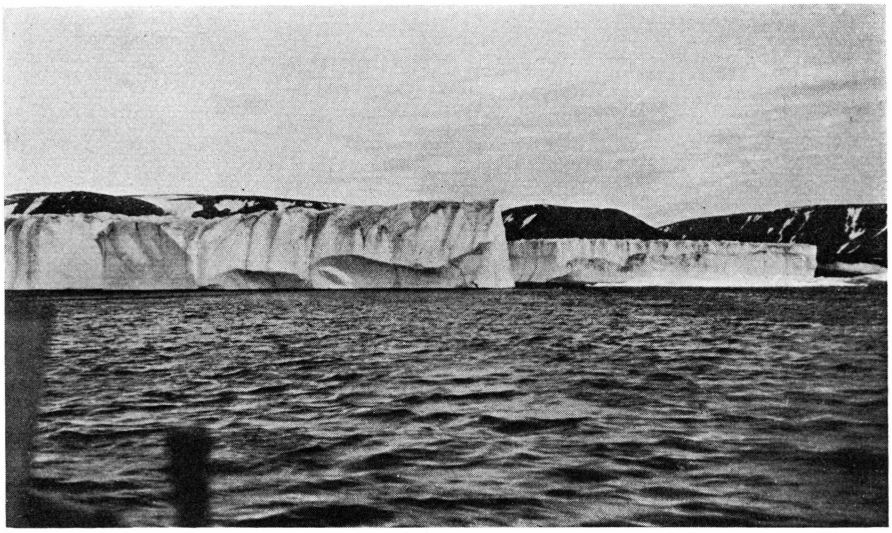
Loc. 18. The head of Bessel Fjord.
(75°57′ N. lat., 22°02′ W. long.).

According to GELTING (1934, p. 25), all the plants collected by SCHWARCK on May 5, 1932, in this locality were found on the south side of the fjord at an altitude of 450 m.

Loc. 19. North of Trækpas, Koldewey Island.

(76°17′ N. lat., 18°36′ W. long.).

The locality was visited by the present authors on August 10, 1933. The ground is made up of disintegrated Mesozoic deposits (KOCH 1929, p. 165). The slopes, rising rather precipitously from the sea, are very much affected by solifluction. A closed cover of vegetation is almost entirely absent. Here and there, where the solifluction is not too intense, a snow-patch vegetation may, however, be met with which is distinguished by a paucity of individuals, but a comparatively good development of the



G. SEIDENFADEN phot. 3183.

Fig. 4. The coast at Loc. 19, north of Trækpas, Koldewey Island, is blocked up by large drifting icebergs, and on the whole the foreland is much exposed to the open sea. August 10, 1933.

individual plants. Thus the soil proves to be well suited as a growth substrate, which is further indicated by the huge, but scattered tufts of *Poa abbreviata*, *Poa Hartzii*, *Poa glauca*, and *Puccinellia angustata* on the clay slopes exposed to the winds and consequently early free of snow. With the exception of these slopes, the soil was an almost impassable morass at the time of our visit.

A landing was made on the shore a little north of the locality, in the gneissic area. Here the solifluction was far less conspicuous than on the sedimentary substratum. Only some few plants were collected or noted (Loc. 19 a).

Loc. 20. East coast of Koldewey Island in the pass leading to Berg Fjord.

(76°34′ N. lat., 18°11′ W. long.).

The locality was but cursorily visited by the authors on August 10, 1933. Gneiss rocks with a sparse vegetation, with the exception of a

shallow-watered tarn with a surrounding mossy vegetation of gramineous plants. Of these, *Carex subspathacea* and *Pleuropogon Sabinei* were especially predominant.

Loc. 21. Store Koldewey Island.
(c. 76°40′ N. lat., 18°50′ W. long.).

Store Koldewey Island was visited by LUNDAGER of the Danmark Expedition. The locality is stated in OSTENFELD & LUNDAGER (1911, p. 4) to be situated in the above latitude and longitude.

Loc. 22. Maroussia Island.
(76°39′ N. lat., 18°35′ W. long.).

This small island, situated just south of Cape Bismarck, was first visited by the Belgica Expedition in 1905. During the Danmark Expedition LUNDAGER visited the island, and made some collections.

Loc. 23. Cape Bismarck, Germania Land.
(76°42′ N. lat., 18°37′ W. long.).

Visited by the DUC D'ORLEANS and LUNDAGER.

Loc. 24. Danmarkshavn.
(76°46′ N. lat., 18°46′ W. long.).

The Danmark Expedition wintered in this place, whence the greater part of LUNDAGER's collections are derived (LUNDAGER 1912). Under this locality we have further included the localities Harefjæld, Basiskær, and Termometerfjæld, all of which are situated in the immediate vicinity of the wintering station.

The place was next visited in 1933 by TH. SØRENSEN, first on August 10, when only some few plants were collected in the immediate surroundings of the wintering station, and subsequently on August 16, when an excursion was made to the heights east of, and the flat land northwest of the station.

Loc. 25. Stormkap.
(76°49′ N. lat., 19°08′ W. long.).

Visited repeatedly by LUNDAGER on the Danmark Expedition. In 1933, on the night of August 11, the present authors made collections in the surrounding area. The terrain was rather flat. Of special interest was the halophilous vegetation found round some shallow-watered lakelets at a distance from the coast of 1—2 km.

Loc. 26. Eastern parts of Dove Bay.
(c. 76°50′ N. lat., c. 19°30′ W. long.).

Under this locality we have included all the collections of the Danmark Expedition designated by LUNDAGER by the following local names: Snenæs, Lille Snenæs, Moskusoksefjælde, Dove Bugt.

Loc. 27. Hvalrosodden.
(76°55′ N. lat., 20°11′ W. long.).

Visited by LUNDAGER.

Loc. 28. Outer parts of Mørkefjord.
(c. 76°57′ N. lat., c. 20°30′ W. long.).

Under this locality are included three of LUNDAGER's most westerly localities, viz. Bastionen, Rypefjæld, and Fuglenæbsfjæld.

Loc. 29. Valley between Annexsø and Sælsø.
(77°08′ N. lat., 20°42′ W. long.).

Visited by a sledge party of the Danmark Expedition.

Loc. 30. Kulhøj, Germanialand, western part.
(77°27′ N. lat., 21°37′ W. long.).

Visited by a sledge party during the Danmark Expedition.

Loc. 31. Ymers Nunatak.
(77°24′ N. lat., 24°00′ W. long.).

Visited by a sledge party of the Danmark Expedition, which collected some few plants here.

Loc. 32. Eastern parts of Dronning Louise Land.
(c. 76°45′ N. lat., 24°00′ W. long.).

In his popular expedition report on the journey across the inland ice in 1912—13 J. P. KOCH (1913, p. 190) gives a brief account of the occasional plants observed by him in the eastern part of Dronning Louise Land during his stay there (cf. below).

Loc. 33. Western parts of Dronning Louise Land.
(c. 76°35′ N. lat., 25°00′ W. long.).

In his popular expedition report (l. c. p. 190) J. P. KOCH states that in these parts he only observed *Cerastium alpinum*, and writes as follows (translated from the Danish):

»The eastern part of the country may be said to be fairly fertile in view of the higharctic conditions. Right down at the edge of the inland ice the vegetation is rather sparse; one meets here the stunted arctic willow, several grass species, *Dryas*, *Saxifraga*, poppy, and several other flower-bearing plants. But higher up the vegetation grows more luxuriant, in several places forming a closed grass-cover, which is evidently haunted by the hares, and in which the musk-oxen, too, are probably compelled to seek their food.

The western part of Dronning Louise Land, however, is very barren; but even here one encounters a sparse vegetation, immediately one comes

upon snow-free stretches. Here I found on that day in April a *Cerastium alpinum* in flower 800 m above the sea. The flower was from the preceding year. It had been overtaken by the winter suddenly setting in and had been given no time to develop entirely. As it stood there with fresh colours, but frozen entirely stiff, it pricked my imagination with the question, whether the cold meant death to it or was only identical with a hibernation, from which it would be able to wake up next summer and continue its flowering."

Loc. 34. Cape Marie Valdemar.

(77°17′ N. lat., 18°26′ W. long.).

Visited by LUNDAGER on the Danmark Expedition. On August 15, 1933, the place was visited by TH. SØRENSEN. The country is fairly flat. Apart from the dry gravel flats along the shore and the bird hills the landscape is distinguished botanically by a high degree of uniformity, physiognomically as well as floristically. Endless flats of water-saturated polygon fields marked by big stone blocks with few and stunted plants along their margins.

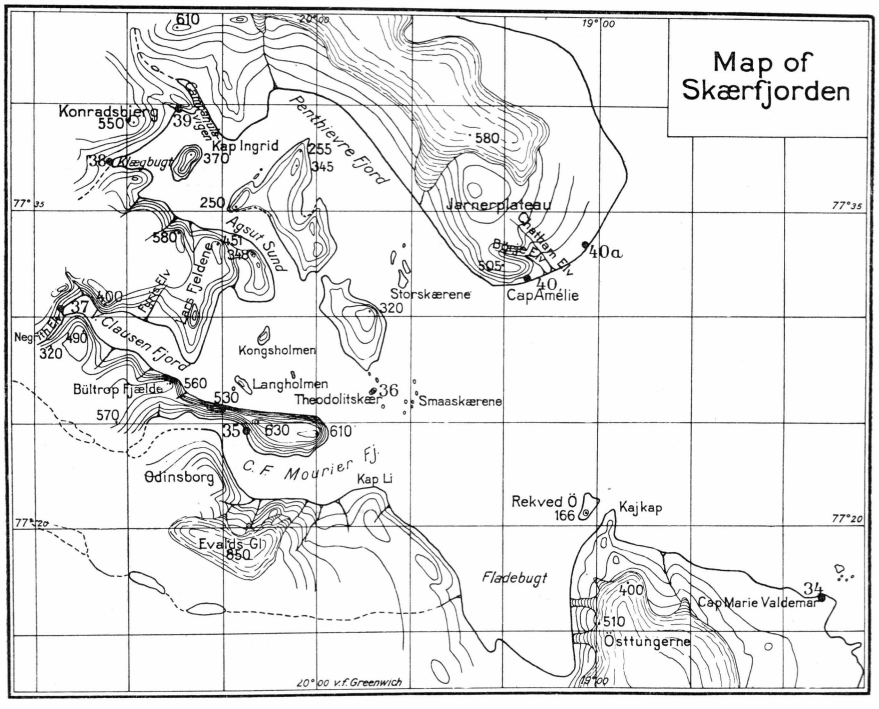
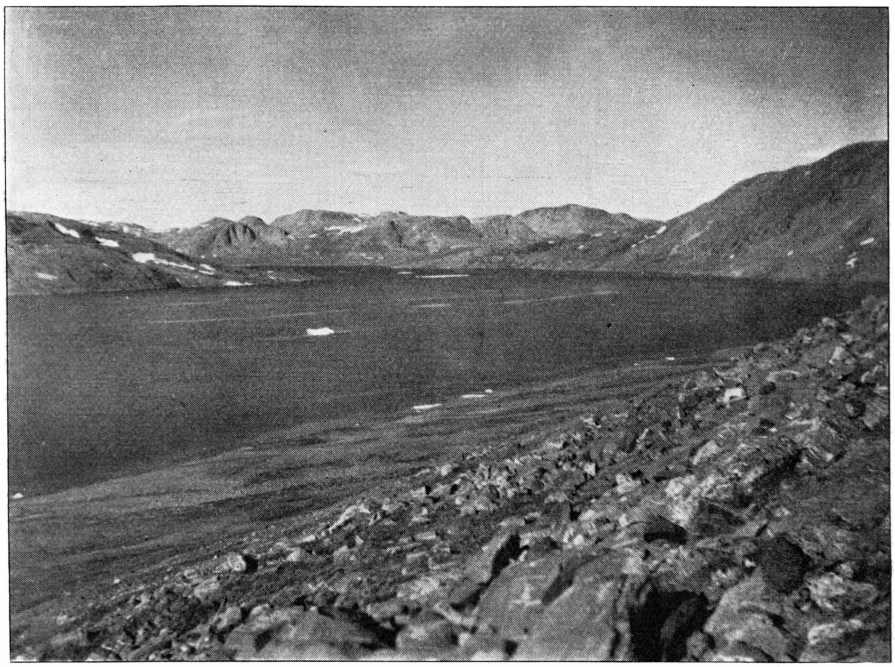


Fig. 5. Map of Skærfjord, showing the situation of the localities. This map was constructed by MALMQVIST during his stay in the region in August, 1933, and contains a number of significant geographical corrections. We are very grateful to Dr. MALMQVIST for his kind permission to publish the map here for the first time.



MALMQUIST phot. Aug. 15, 1933.

Fig. 6. North coast of C. F. Mourier Fjord, looking towards the west. The narrow foreland is dissected by rivulets, which form small deltas at the shore. Above the foreland, block-fields.

Locs. 35—39. The localities in Skærfjord,

all visited by TH. SØRENSEN in 1933.

(cf. the map, fig. 5, p. 20).

Loc. 35. C. F. Mourier Fjord, north side.

(77°25′ N. lat., 20°15′ W. long.).

The locality was visited on August 15, 1933. The terrain, which has a southward exposure, rises gradually, or by steps, towards the back-country. The rocky substratum, which crops out in many places, seems to consist of granite. Parts of the loose soil, however, seem to originate from sedimentary, more calcareous rocks. The vegetation therefore varies in patches, and a large number of species is represented. Over wide stretches of the lower portions of the slopes the vegetation is rather poor, while at a somewhat greater altitude more luxuriant slopes and cliffs with *Vaccinium* and with *Cassiope* heaths on the more level stretches are found. Similarly, snow-patch vegetation alternates with dry grass slopes and hills. — The soil was generally dry as compared with the localities visited along the outer coast, which agrees well with experience gained in more southerly regions, viz. that the melting of the snow takes place relatively early in the inner fjords.

Loc. 36. Theodolitskær.

(77°27′ N. lat., 19°48′ W. long.).

The locality was visited on the night of August 14. It is a quite small rocky island (granite) of inconsiderable height. The vegetation is chiefly confined to rock crevices, the sheltered places below the steep rock walls, and bird hills. The number of species found was not very high, since i. a. all swamp vegetation was lacking.

Loc. 37. Head of V. Clausen Fjord.

(77°30′ N. lat., 20°55′ W. long.).

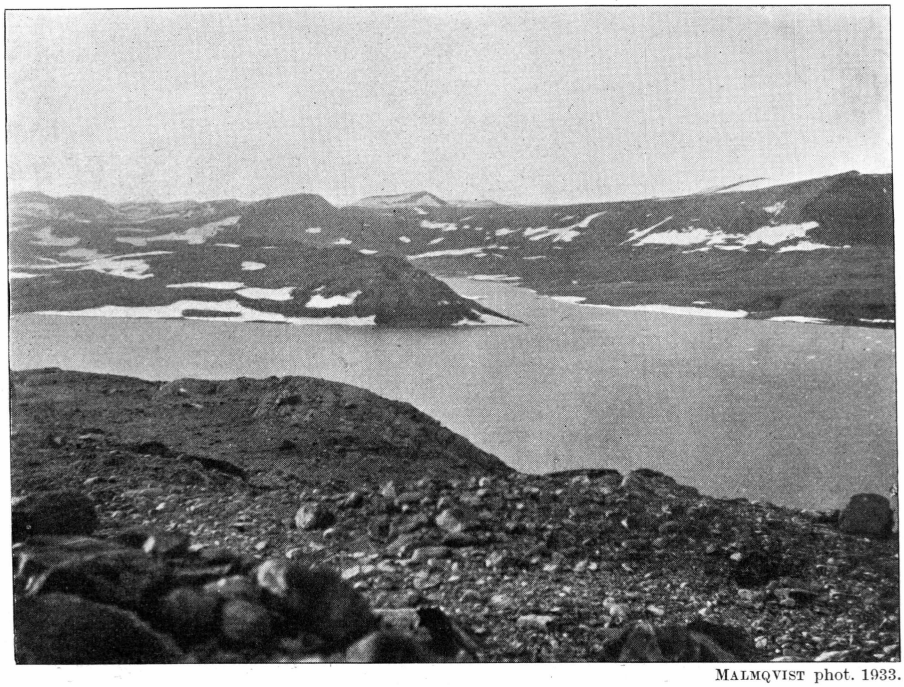
The locality, which was visited on August 14, is situated at the head of the narrow fjord, sheltered on all sides by rather precipitous mountain sides, though comparatively open towards the south. The solid rock is granite. In the loose soils, however, a local mixture of sedimentary rocks is traceable. The situation is on the whole exceptionally favourable for the vegetation, which here exhibits an extraordinary luxuriance. The flat, moist ground nearest the fjord is occupied by grass meadows, whereas the dry hills with a southward exposure exhibit an impressive wealth of flowers, *Potentilla nivea*, *Arnica alpina*, *Melandryum triflorum*, *M. affine*, *Draba cinerea*, *Lesquerella arctica*, *Campanula uniflora*, etc., and on the dry sand knolls *Carex supina* forms well-developed growths. From a distance the steep, somewhat higher-lying slopes appear to be shrubby. At the outset one might expect to find *Betula nana* there; however, it is absent. *Vaccinium uliginosum* and *Salix arctica* form the main constituents of the vegetation, but are replaced in patches by *Dryas*, *Rhododendron*, and *Cassiope*. — The vegetation of this locality may no doubt be considered the maximum of what nature is able to produce in these latitudes.

Loc. 38. Head of Klægbugt.

(77°37′ N. lat., 20°44′ W. long.).

Visited on August 13. The locality comprises partly the flat stretches rising evenly in continuation of the bay, partly the steep, southwardly exposed slopes north of the bay, which continue into the country and form the northern boundary of the flat land. — Apart from the sheltering islands in front of the bay, this is rather open towards the broader part of the Skærfjord, and as far as can be judged from the distribution of the vegetation, it is often exposed to violent gales.

Over wide stretches of the flat country the soil consists of clay of such a nature that in a water-saturated condition its adhesiveness renders any passage across it absolutely impossible. On desiccation the soil turns hard as stone, and its surface is criss-crossed by a system of deep cracks. However, this soil is far from devoid of vegetation, but the plants occur singly or form scattered sods, which literally swim on the



MALMQVIST phot. 1933.

Fig. 7. North side of Klægbugt, seen from C. Drost Island.

sticky mass. The clay flats rise evenly to an altitude of about 100 m, where they are replaced by dry, windswept sand hills. In many places, especially where water oozes out, the southwardly exposed mountain slopes support a luxuriant vegetation of grasses, herbs, and dwarf-shrubs.

Loc. 39. North side of Klægbugt.

(77°40′ N. lat., 20°54′ W. long.).

The locality was visited on August 13. The ground rises evenly to about 200 m. The soil is chiefly made up of loose material. Nearest the shore large perennating snow-drifts occurred. Above them there followed slopes of moving soil with a scattered vegetation. Somewhat higher still there occurred extensive areas of grass and *Carex* vegetation, which is watered, and in many places literally irrigated by the thaw-water from the perennating snow-patches extending along a steep slope. At the levels above 100 m the solid rock crops out everywhere. In the more sheltered places *Cassiope*, *Dryas*, and grass heaths alternate according to moisture and snow-covering. These types of vegetation, alternating with mountain crests more or less devoid of vegetation, though here and there with conspicuous growths of *Poa glauca* and *Calamagrostis arundinacea var. purpurascens*, continue up to 500 m altitude, when the ground descends rather abruptly towards the narrow Campanula Fjord.

Loc. 40. Cape Amelie.
(77°32′ N. lat., 19°20′ W. long.).

The place was visited on sledge-journeys by the Danmark Expedition and on August 12—13, 1933, by TH. SØRENSEN. Plants were collected on a rock slope facing the sea, with a southward exposure, and with ledges up to about 100 m altitude; furthermore on the flatter stretches east thereof, consisting of gravelly, much windswept hills, here and there with intermediate stagnant spits of moving soil with a comparatively luxuriant grass-herb vegetation at the very front, and in front of them diminutive "snow-patches". Large perennating snow-flats extend in many places from the sea far into the country. The surface configuration of the underlying country rises in places in the form of islands above the surface of the snow, and in such places a poor snow-patch vegetation forms small patches surrounded on all sides by the snow-field.

Loc. 40 a. East of Cape Amelie.
(77°33′ N. lat., 19°10′ W. long.).

The locality was rather cursorily investigated by TH. SØRENSEN on August 12, 1933. Of interest is notably the vegetation on a fairly broad shore, which continues upwards into *Pleuropogon Sabinei-Deschampsia brevifolia* swamps watered by the snow-patches lying above. Some highly windswept clay slopes with tufted grass vegetation about half a kilometre back from the coast were searched during a rapid excursion. Apart from the shore swamp the vegetation in this locality was rather sparse.

Loc. 41. Cape St. Jacques.
(77°36′ N. lat., 18°12′ W. long.).

The collections from this place, the most southerly point of Ile de France, were made on the expedition of the DUC D'ORLEANS in 1905 (OSTENFELD 1908).

Loc. 42. Bjørneskær.
(77°50′ N. lat., 19°18′ W. long.).

Visited by various sledge parties during the Danmark Expedition. Very few plants were collected.

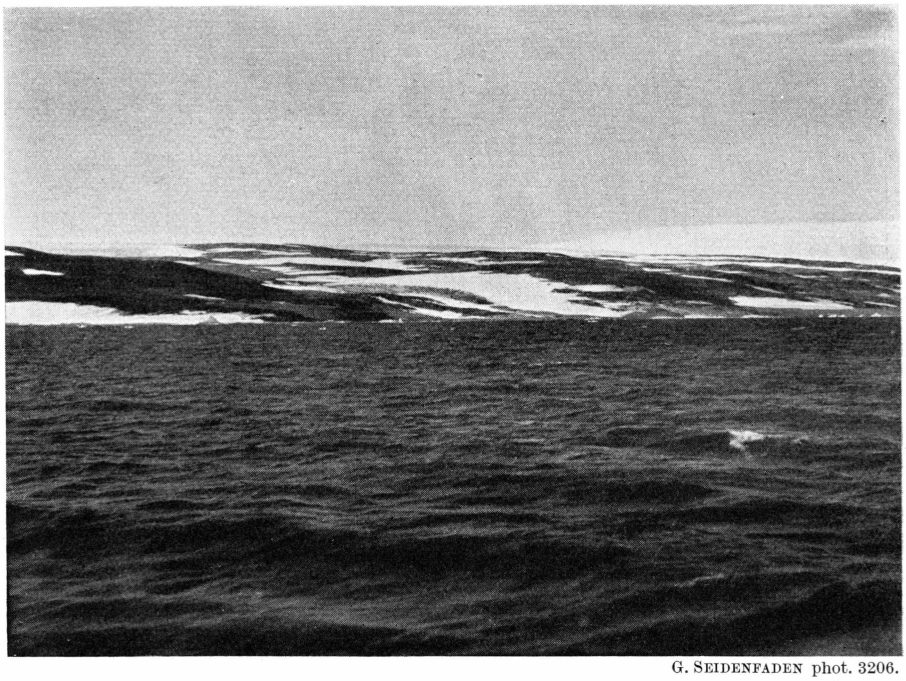
Loc. 43. Lambert Land.
(79°08′ N. lat., 19°15′ W. long.).

In 1907, on the Danmark Expedition, J. P. KOCH collected some few species at Brønlund's Grave.

Loc. 44. Norske Island.
(79°12′ N. lat., 17°50′ W. long.).

This locality, the northernmost locality of the Three-year Expedition, was visited by SEIDENFADEN on August 15, 1933. On account of the

exceptionally favourable ice conditions the s. s. "GUSTAV HOLM" succeeded in beating all earlier records, pushing northward to this place; however, since this undertaking was attended with great risk, we naturally stayed here for a very short time only, and could not possibly move very far from the anchorage. An investigation was made of the shore and the nearest mountain slopes in the northwestern corner. Even from a long distance the place looked bleak and desolate (cf. fig. 8), exposed,



G. SEIDENFADEN phot. 3206.

Fig. 8. Norske Island, seen from the east at a distance. The picture shows the exposed position of the island, and conveys an impression of the large perennating snow-flats, which extend right down to the surface of the sea. August 15, 1933.

as it was, to the effects of the ice-stream; and considering the short period of summer in these northern tracts, it was natural that now, in the middle of the summer, the country should be covered with snow over wide stretches which will probably never melt away. Moreover it must be assumed that fog is a frequent phenomenon during the greater part of the summer when this is favourable, that is, when the amount of ice is inconsiderable; thus during the greater part of the time we spent here the fog was so dense that we hardly dared leave the ship.

As might be expected, extremely few plants grew in the area investigated; they may probably be taken to be representives at any rate of that half of the island which is exposed towards the east. Altogether only 28 species of higher plants were found, and no closed plant communi-

G. SEIDENFADEN phot. 3894.

Fig. 9. The coast at the northeastern corner of Norske Island. Only very few plants grow on the flat plain. The only dominating plant seen in the black belt of lichens is *Luzula confusa*, forming dense tufts which are dry and withered on the eastward side (cf. fig. 39, p. 106). Among these tufts some few specimens of *Cerastium alpinum* and sterile specimens of *Papaver radicatum* were found. Furthermore few and scattered specimens of the following species were found spread over the coastal plain: *Saxifraga oppositifolia*, *Stellaria longipes*, *Saxifraga tenuis*, and *Cardamine bellidifolia* (cf. fig. 15, p. 58). All the other plants brought home from Norske Island were collected in rock crevices and similar places higher up on the island. August 15, 1933.

ties were observed. The coastal plain was dominated by scattered, windswept tufts of *Luzula confusa*, among which weak individuals of some few species occurred (cf. fig. 9 and the accompanying text). Of the few species which had found a shelter in depressions and rock crevices higher up on the island *Dryas*, in particular, deserves mention; at times it was able to form continuous carpets of the size of perhaps a quarter of a square metre; it was a form not observed farther south and differing distinctly from the other *Dryas* forms (cf. p. 58).

II. List of Vascular Plants.

Pteridophyta

EQUISETACEAE.

1. *Equisetum arvense* L.

LINNÆUS: Sp. pl., 1753, p. 1061.

OSTENFELD & LUNDAGER 1911, p. 6. — GELTING 1934, p. 27.

Localities: 2. North of Cape Hamburg (G. S.)[1]); 5. Cape Maurer (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas, Store Koldewey Isl. (S. & S.); 20. Pass to Berg Fjord, Koldewey Isl. (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 39. North side of Klægbugt, Skærfjord (TH. S.).

Within the area here treated as well as in more southerly parts of East Greenland the species seems to be represented by a low-growing arctic ecotype, and is possibly referable to *var. riparia* (FRIES) MILDE (cf. BØCHER 1933, p. 96). Fertile plants were found in several places. — Forma *campestris* (C. F. SCHULTZ) MILDE with sporophyllous heads on the assimilating shoots were observed in Loc. 38, the north side of Klægbugt. This form differs conspicuously from the commonly occurring form, and not only morphologically but also ecologically shows points of resemblance to *E. palustre*, being apparently associated with slopes with a favourable water circulation, the northernmost substitute for the subarctic spring-bog (cf. TH. SØRENSEN 1933, p. 18).

As will appear from the above, the plant is not very common within the area, its northernmost locality being Klægbugt in 77°40′ N. lat. The species has not been found by the non-botanist collectors in the eastern part of North Greenland, the nearest locality being Wulff Land. We think, however, that future expeditions will be able to fill the gap, so that the plant will be found along the whole coast of Greenland.

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[1]) The following abbreviations for the collectors have been used: C. & P. = COPELAND and PANSCH of the German Expedition in 1869. — DUC D'O. = The French Expedition in 1905. — L = LUNDAGER of the Danmark-Expedition, other collectors of that expedition are FREUCHEN and J. P. KOCH. If we have seen any of the specimens collected by the above-mentioned collectors, a ! is added. — Our own collections are marked G. S. (SEIDENFADEN) or TH. S. (SØRENSEN) or S. & S. (both). — BG. means BØGVAD, cf. the foot note p. 8.

2. *Equisetum variegatum* SCHLEICH.

SCHLEICHER: Catal. Plant. Helvet., 1807, p. 27.

OSTENFELD & LUNDAGER 1911, p. 7.

Localities: 8. North side of mouth of Bastian Bay, Kuhn Isl. (TH. S.); 14. Nanok (S. & S.); 25. Stormkap (S. & S.); 26. Moskusoksefjælde (L.); Skærfjord (TH. S.); 35. North coast of C. F. Mourier Fjord; 37. Head of V. Clausen Fjord; 38. Head of Klægbugt; 40 a. East of Cape Amelie (TH. S.).

The head of Klægbugt (77°37′ N. lat.) is the northernmost place in East Greenland in which this species has hitherto been found. The localities in North Greenland are almost the same as those of the preceding species. — Sporophyllous heads were not observed in this species.

LYCOPODIACEAE.

3. *Lycopodium Selago* L.

LINNÆUS: Sp. pl., 1753, p. 1102.

OSTENFELD & LUNDAGER 1911, p. 7.

Localities: 7 & 8. South and north sides of mouth of Bastian Bay. Kuhn Isl. (S. & S.); 14. Nanok (S. & S.); 24. Danmarkshavn (L.); 25. Stormkap (S. & S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.).

The north side of Klægbugt in Skærfjord (77°40′ N. lat.) is the northernmost locality of the species in East Greenland. In Northwest Greenland the species has been found northward to 79°07′ N. lat. (cf. OSTENFELD 1925, p. 6).

Regarding this species, too, we think it most likely that the gap between the two places mentioned is due to insufficient investigation.

All the specimens observed in this part of Northeast Greenland are referable to *f. appressa* DESV. — The species normally develops both sporangia and bulbils within the area.

POLYPODIACEAE.

4. *Cystopteris fragilis* (L.) BERNH.

BERNHARDI: Vers. Anord. Farnkr., 1806, p. 27.

OSTENFELD & LUNDAGER 1911, p. 6.

Localities: Near 24. Danmarkshavn and landward (L.!); 24. Danmarkshavn (TH. S.); 35. North coast of C. F. Mourier Fjord (TH. S.); 36. Theodolitskær (TH. S.); 39. North side of Klægbugt (TH. S.).

Along the coast from Klægfjord to Thule the plant has been found in one place only, viz. Cape Schmelck at the head of Independence Bay (cf. OSTENFELD 1915, p. 375). However, precisely this locality makes it very probable that the species will be found in the intermediate areas in the future, so that, like the three above-mentioned species, it belongs to the "circumgreenlandic" species.

5. *Woodsia glabella* R. Br.

R. Brown in Richardson: App. Franklin Journ., 1823, p. 754.

Duc d'Orleans 1908, p. 10 (sub. nom. *Woodsia ilvensis* (L.) R. Br. *var. glabella* (R. Br.) Trautv.), — Ostenfeld & Lundager 1911, p. 6.

Localities: 8. North side of mouth of Bastian Bay, Kuhn Isl. (Th. S.); 23. Cape Bismarck (Duc d'Orleans); 24. Danmarkshavn (L.!); 25. Stormkap (L.!); 40. Cape Amelie (Th. S.).

In North Greenland this species has been found by Freuchen at Cape Schmelck at the head of Independence Fjord (Ostenfeld 1915, p. 375) and in some few places on Inglefield Land. Most likely the plant is distributed along the coast of the northern half of Greenland. In East Greenland it has its southern limit at Aneriteq in 61°32′ N. lat. (cf. Seidenfaden 1933, p. 46), in West Greenland at 66°45′ N. lat.

Spermatophyta
DICOTYLEDONES
BETULACEAE.

6. *Betula nana* L.

Linnæus: Sp. pl., 1753, p. 983.

Gelting 1934, p. 31.

Localities: 3. Opposite Lakseelv, Kuhn Isl. (Backlund); 4. Lakseelv (Schwarck); 10. Betula Harbour in Grandjean Fjord (G. S.).

Twigs of *Betula nana* were shown to the Danish hunters at Hvalrosodden, who tell us that they are fairly sure they have seen the species at the shores of Sælsø in Germania Land (Loc. 29, 77°08′ N. lat.). As long as we have not been able to verify this statement, Betula Harbour in Grandjean Fjord must be considered the northernmost known locality of the species in East Greenland (75°00′ N. lat.).

CARYOPHYLLACEAE.

7. *Arenaria ciliata* L.

Linnæus: Sp. pl., 1753, p. 425.

Subsp. *pseudofrigida* Dahl & Ostf.

Dahl & Ostenfeld in: Nyt Mag. f. Naturvidensk., 55, Kristiania 1918, p. 217.

Ostenfeld & Lundager 1911, p. 17 (sub nom. *A. ciliata L. var. humifusa* (Wbg.) Hartm.), — Gelting 1934, p. 33.

Localities: 2. North of Cape Hamburg (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 15. Petersbugt (G. S.); 17. Trumsø (Schwarck); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 37. Head of V. Clausen Fjord (Th. S.); 40. Cape Amelie (Th. S.).

The area of this species in Greenland has been discussed by Gelting (1934, p. 269). It is restricted to East Greenland, where it is found between Cape Dalton (69°25′ N. lat.) and Cape Amelie (77°32′ N. lat.).

A detailed description of the different forms within the *Arenaria ciliata* group and a mapping of them has been supplied by NORDHAGEN (1935, p. 49). Cf. fig. 10, p. 31.

8. *Cerastium alpinum* L. s. l.

LINNÆUS: Sp. pl., 1753, p. 438.

KOLDEWEY 1874, p. 635, p. 639, — BUCHENAU & FOCKE 1874, p. 38, — DUC D'ORLEANS 1908, p. 6, — OSTENFELD & LUNDAGER 1911, p. 19, — J. P. KOCH 1913, p. 190, — GELTING 1934, p. 34.

Localities: 2. Cape Hamburg, Kuhn Isl. (G. S.); 3. Opposite Lakseelv, Kuhn Isl. (BACKLUND); 4. Lakseelv (SCHWARCK); 5. Cape Maurer (TH. S.); 6. South of mouth of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 10. Grandjean Fjord (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16. Cape Oswald Heer (SCHWARCK); 16 b. Kildedal (JOHANSEN!); 17. Trumsø (SCHWARCK); 18. Head of Bessel Fjord (SCHWARCK); 19. North of Trækpas (S. & S.); 20. Opposite the head of Berg Fjord, Store Koldewey Isl. (S. & S.); 21. Store Koldewey Isl. (L.!); 22. Maroussia Island (DUC D'ORL.); 23. Cape Bismarck (DUC D'ORL.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); 29. Valley between Annexsø and Sælsø (FREUCHEN!); 31. Ymers Nunatak (FREUCHEN); 33. Western part of Dronning Louise Land (J. P. KOCH); 34. Cape Marie Valdemar (L.!, TH. S.); Skærfjord: all localities 35-39 (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.); 41. Cape St. Jaques (DUC D'ORL.); 42. Bjørneskær (J. P. KOCH!); 44. Norske Island (G. S.).

This very common species was found in nearly all the localities visited. In North Greenland also it is stated to be common, and has been found by all travellers. A circumgreenlandic species.

9. *Cerastium Regelii* OSTENF.

OSTENFELD in: Vidensk. Selsk. Skr. I Mat. nat. Kl. 1909, No. 8, Kristiania 1910, p. 10.

OSTENFELD & LUNDAGER 1911, p. 20 (sub. nom. *Cerastium alpinum f. pulvinata* SIMM.), — GELTING 1934, p. 39.

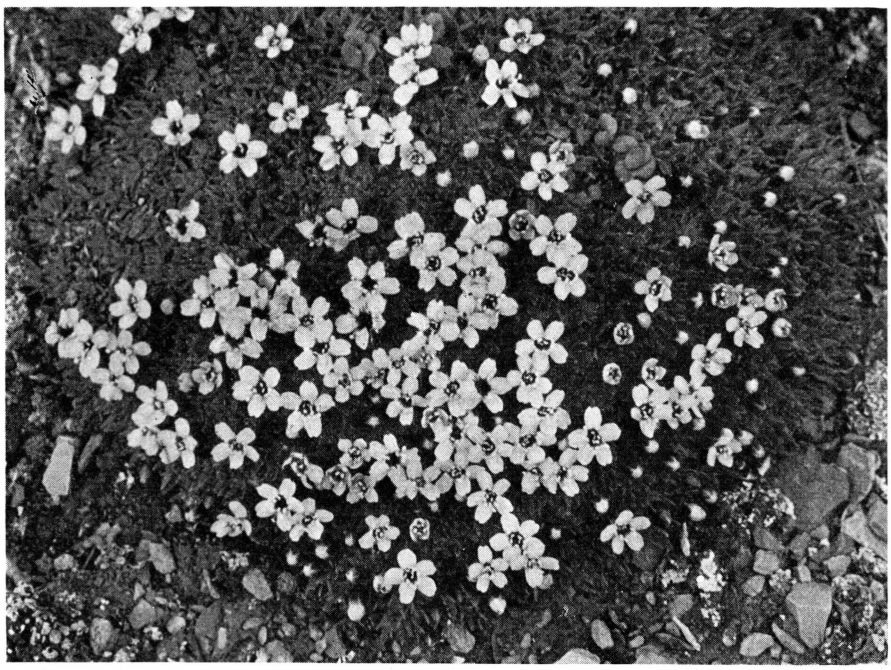
Localities: 2. North of Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas, Koldewey Isl. (S. & S.); 20. Opposite Berg Fjord, Koldewey Isl. (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 40 a. East of Cape Amelie (TH. S.); 43. Lambert Land (J. P. KOCH).

The distribution of this interesting species was discussed by GELTING (1934, p. 42 ff).

According to GELTING (l. c. p. 35 f.), *C. alpinum f. pulvinata* SIMM. is a synonym of *C. Regelii* OSTF., which must be considered a well defined species. However, in snow-patches and other wet habitats *alpinum* forms, compactly tufted, are often found, and very sparsely hairy

G. SEIDENFADEN phot. 3772.

Fig. 10. *Arenaria ciliata* subsp. *pseudofrigida*. About $^2/_3$ size. Habitat: dry, stony, bare mountain field (Fjældmark) at Hird Bay, Clavering Island. July 22, 1933.



G. SEIDENFADEN phot. 3880.

Fig. 11. *Silene acaulis*. About $^2/_3$ size. Habitat: dry mountain field (Fjældmark) at Cape Broer Ruys, Hold-with-Hope. August 15, 1934. At this date only the flowers in the part of the tuft facing south were open.

transitional forms between these and *C. Regelii* may occasionally be met with. If herbarium specimens are not available, earlier records in the literature of *C. alpinum f. pulvinata* can only with the greatest reservation be assigned to *C. Regelii*. In Greenland the species is limited to den northeastern part of the country, extending southward to Scoresby Sound and on the north coast to about 50° W. long. (cf. p. 155).

10. *Melandryum affine* J. VAHL.

J. VAHL: Fl. Dan. fasc. 40, p. 5, 1843, (tab. 2173, cf. ibid. fasc. 37, 1836, p. 4).

OSTENFELD & LUNDAGER 1911, p. 17.

Localities: 2. Cape Hamburg (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 26. Lille Snenæs (L.!); 34. Cape Marie Valdemar (TH. S.); 35. C. V. Mourier Fjord (TH. S.); 36. Theodolitskær (TH. S.); 37. V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.).

TH. SØRENSEN (1933, p. 27) and subsequently GELTING (1934, p. 47) united *M. affine* J. VAHL and *M. triflorum* (R. BR.) J. VAHL under the name *M. triflorum* (R. BR.) J. VAHL emend. REG. & TIL. However, during continued investigations in the field, especially in these northern tracts, the authors have realised that there is evidence for keeping these two species of VAHL separate, although apparently intermediary forms may occur, especially in the inner fjords. — A detailed account of the polymorphy of the East Greenland *Melandrya* will later be published by TH. SØRENSEN.

The species has its southern limit in 70°20′ N. lat. on the east coast and extends round the north coast and down the west coast to about N. lat. 65°38′.

11. *Melandryum apetalum* (L.) FENZL.

FENZL in: LEDEBOUR: Fl. Ross. I, 1842, p. 326.

var. *arctica* TH. FRIES.

TH. FRIES in: Kungl. Vet. Akad. Förh. Övers. 1869, p. 133.

OSTENFELD & LUNDAGER 1911, p. 17, — GELTING 1934, p. 46.

Localities: 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 26. Lille Snenæs (L.!); 35. C. V. Mourier Fjord (TH. S.); 37. Head of Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 42. Bjørneskær (J. P. KOCH!).

The species has its southern limit at Cape Dalton (69°25′ N. lat.). Distribution otherwise almost like that of the preceding species.

Cf. figs. 12—13.

12. *Melandryum triflorum* (R. Br.) J. Vahl.

J. Vahl: Fl. Dan. fasc. 40, p. 5, 1843, tab. 2356.

Ostenfeld & Lundager 1911, p. 17, — Gelting 1934, p. 47.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 8. North side of mouth of Bastian Bay (Th. S.); 11. Cape Philip Broke (C. & P.!); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 22. Maroussia (L.!); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.); 26. Lille Snenæs (L.!); 26. Moskusoksefjælde (L.!); 31. Ymers Nunatak (Freuchen!); 34. Cape Marie Valdemar (Th. S.); Skærfjord, all localities (35—39) (Th. S.); 40. Cape Amelie (Th. S.); 40 a. East of Cape Amelie (Th. S.).

G. Seidenfaden phot. 3833-34.

Fig. 12—13. *Melandryum apetalum.* Both abt. $^2/_5$ size. Habitat: The denuded bog at Nanok, Hochstetter Foreland, cf. p. 125 et seq., Aug. 8, 1933.

Seems to be endemic of Greenland. Southern limit in East Greenland is 70°06′ N. lat., goes round the north coast and down to about 65°40 N. lat. on the west coast.

13. *Minuartia biflora* (L.) Schinz & Thell.

Schinz & Thelling in: Bull. Herb. Boiss., 2. Sér. VII, 1907, p. 403.

Ostenfeld & Lundager 1911, p. 18 (sub nom. *Alsine biflora* (L.) Wahlenb.) — Gelting, 1934, p. 49.

Localities: 2. Cape Hamburg (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 15. Petersbugt (G. S.); 24. Danmarkshavn (L.!); 25. Stormkap (S. & S.); 40. Cape Amelie (Th. S.).

The species becomes distinctly sparser northward, and there is hardly any doubt that our northernmost locality, Cape Amelie (77°32′ N. lat.), very nearly indicates the true northern limit of the species in East

Greenland. — In West Greenland the species has not been found north of Melville Bay.

14. *Minuartia Rossii* (R. BR.) GRAEBN.

GRAEBNER in: ASCHERSON & GRAEBNER: Synops. Mittel-Europ. Fl., Bd. 5, p. 772, 1918.

OSTENFELD & LUNDAGER 1911, p. 18 (sub nom. *Alsine Rossii* (R. BR.) FENZL.

Localities: 14. Nanok (S. & S.); 27. Hvalrosodden (L.!).

The species seems to be rather rare in Greenland, even though it may be assumed that it has often been overlooked by collectors. It should, however, be pointed out that on our excursion from the hunting station Nanok we were able to find only one specimen. In East Greenland it has only been found in six places, the southernmost in latitude 73°12′ N. (cf. TH. SØRENSEN 1933, p. 33), the northernmost in the above-mentioned locality, Hvalrosodden, in latitude 76°55′ N. Besides these it has only been found in some places in North Greenland about 50° to 55° W. long.

15. *Minuartia rubella* (WBG.) GRAEBN.

GRAEBNER in: ASCHERSON & GRAEBNER: Synopsis Mittel-Europ. Flor. Bd. 5, 1918, p. 733.

OSTENFELD & LUNDAGER 1911, p. 18 (sub nom. *Alsine verna* (L.) WAHLENB. p. 733), — GELTING 1934, p. 50.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 26. Lille Snenæs (L.!); 29. Valley between Sælsø and Annexsø (L.!); 31. Ymers Nunatak (FREUCHEN!); 34. Cape Marie Valdemar (TH. S.); Skærfjord, all localities 35—39: (TH. S.); 40. Cape Amelie (TH. S.).

The species is found along the whole coast of Greenland except the southern part of the east coast (cf. SEIDENFADEN 1933, pp. 51 and 101).

A circumgreenlandic species.

16. *Sagina intermedia* FENZL.

FENZL in: LEDEBOUR: Fl. Ross. I, 1842, p. 339.

OSTENFELD & LUNDAGER 1911, p. 18.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 34. Cape Marie Valdemar (TH. S.); Skærfjord, all localities

35—39: (Th. S.); 40 Cape Amelie (Th. S.); 40 a. East of Cape Amelie (Th. S.).

One of the circumgreenlandic species.

17. *Silene acaulis* L.

Linnæus in: Sp. pl. Ed. 2., Vol. I, 1762, p. 603.

Ostenfeld & Lundager 1911, p. 17, — Gelting 1934, p. 53.

Localities: 2. Cape Hamburg (G. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16 a. Kildedal (Johansen!); 16 b. Agnetesø (Johansen!); 17. Trumsø (Schwarck); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 34. Cape Marie Valdemar (L.!); Skærfjord, all localities, 35—39 (Th. S.); 40. Cape Amelie (Th. S.).

One of the commonest species in Greenland. Circumgreenlandic. (Cf. fig. 11, p. 31).

18. *Stellaria humifusa* Rottb.

Rottbøll in: Kjøbenh. Selsk. Skr. X. 1770, p. 447, tab. 4, fig. 14.

Koldewey 1874, p. 635, — Ostenfeld & Lundager 1911, p. 19.

Localities: 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S., cf. fig. 48, p. 135); 9. Head of Bastian Bay (G. S.); 11. Cape Philip Broke (C. & P.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); near 26. "ved Bugten" (L.!); Skærfjord, all localities, 35—39, except 36. Theodolitskær (Th. S.); 40 a. East of Cape Amelie (Th. S.).

In East Greenland the northernmost locality known is the north side of Klægbugt (77°40′ N. lat.), in West Greenland the species has been found as far north as Inglefield Land, Rensselaer Bay, in 78°40′ N. lat. (cf. Ostenfeld 1925, p. 12).

Cf. also fig. 3 and fig. 48 and the text p. 135.

19. *Stellaria longipes* Goldie.

Goldie in: Philosoph. Journ. Vol. VI, 1822, p. 327.

Buchenau & Focke 1874, p. 38, — Duc d'Orleans 1908, p. 6, — Ostenfeld & Lundager 1911, p. 19, — Gelting 1934, p. 55.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of the mouth of Bastian Bay (Th. S.); 9. Head of Bastian Bay (G. S.); abt. 12. Shannon (C. & P.); 14. Nanok (S. & S.) 15. Petersbugt (G. S.); 16. Cape Oswald Heer (Schwarck); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 23. Cape Bismarck (Duc d'Orl.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.); 30. Kulhøj (Freuchen!); 34. Cape Marie Valdemar (L.!, Th. S.); Skærfjord: all localities, 35—39

(TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'ORL.); 42. Bjørneskær (J. P. KOCH!); Lambert Land (J. P. KOCH!); 44. Norske Island (G. S.). Cf. fig. 43, p. 126.

This species, which is found throughout North and West Greenland, seems to be lacking in Southeast Greenland. Its southern limit is here 63°28′ N. lat. (cf. DEVOLD & SCHOLANDER 1933, p. 64).

CRASSULACEAE.

20. *Sedum roseum* (L.) SCOP.

SCOPOLI in: Flor. Carniol. Ed. II, 1, 1772, p. 326.

GELTING 1934, p. 55.

Locality: near 10. Maagenæs, Grandjean Fjord (G. S.).

This is the northernmost locality of the species so far known in Greenland. In West Greenland the species has not been found north of 69°16′ N. lat. (Godhavn). The name Maagenæs (Gull cape) is derived from a large colony of sea-gulls found here. It is no doubt due to the nitrous manure that the species occurs so far to the north.

CRUCIFERAE.

21. *Braya purpurascens* (R. BR.) BGE.

BUNGE apud LEDEBOUR in: Flor. Ross. I, 1842, p. 195.

OSTENFELD & LUNDAGER 1911, p. 25.

Localities: 5. Cape Maurer (TH. S.); 14. Nanok (G. S.); 24. Danmarkshavn (L.!); 25. Stormkap (L.!, S. & S.); 26. Snenæs and Lille Snenæs (L.!);Dovebugt (L.!); 27. Hvalrosodden (L.!); Skærfjord (TH. S.): 37. Head of V. Clausen Fjord, 38. Head of Klægbugt, 39. North side of Klægbugt; 40 a. East of Cape Amelie (TH. S.).

The species is found along the north coast of Greenland. In East Greenland it has its southern limit in Scoresby Sound in 71°25′ N. lat. (cf. KRUUSE 1904, p. 163). Cf. fig. 14, p. 37.

22. *Braya Thorild-Wulffii* OSTENF.

OSTENFELD in: Medd. Grønl. LXIV, 1923, p. 176, pl. III, figs. 1—4.

OSTENFELD & LUNDAGER 1911, p. 25 (sub nom. *B. purpurascens* (R. BR.) BGE. quoad loc. cit.).

Localities: 26. Lille Snenæs (L.!); 31. Ymers Nunatak (FREUCHEN!); 39. North side of Klægbugt (TH. S.).

One of the rarest arctic plants. The new locality is merely the fourth locality of the species, since outside the area here treated it has only been found in one place on the north coast of Greenland, viz. Gunnar Andersson Valley (82°28′ N. lat.) by THORILD WULFF (cf. OSTENFELD1923, p. 235).

It is a particularly well-founded species, since even at the first glance in nature it appears quite different from *B. purpurascens*. On a superficial examination it is more reminiscent of a *Draba*, more especially *D. subcapitata*, than of a *Braya*. In the locality on the north side of Klæg-

G. SEIDENFADEN phot. 3776.

Fig. 14. *Braya purpurascens*. About $^2/_3$ size. Habitat: Granatdalen, southwestern part of Clavering Island (GELTING loc. No. 33). Date: July 19, 1933.

bugt only one colony of the species was found. Here it was fairly abundant, growing in clayey moving soil in company with *Braya purpurascens*, *Puccinellia angustata*, *Poa abbreviata*, *Poa Hartzii*, *Draba subcapitata*, *Draba cinerea*, and *Melandryum triflorum*.

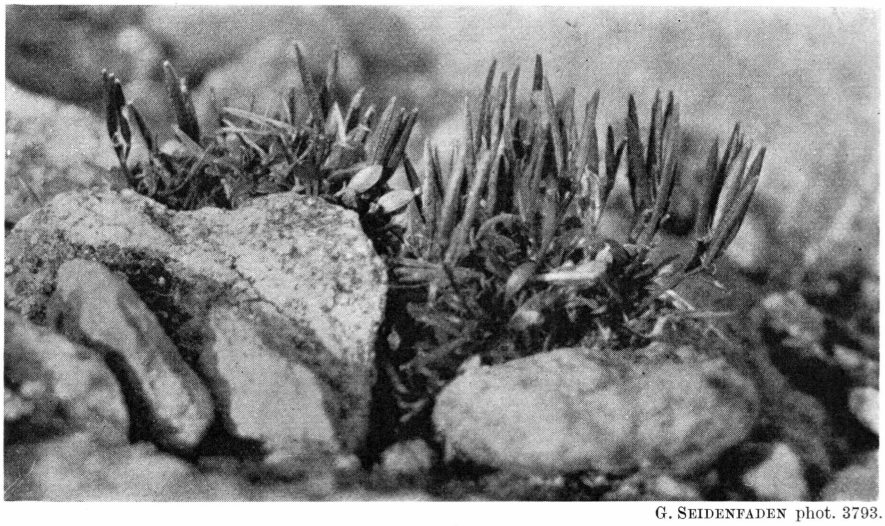
The southern limit of the species is Lille Snenæs (76° 54′ N. lat.).

For the sake of completeness it should be added that we do not agree with O. E. SCHULZ (1924, p. 364) in his view that *Braya Thorild-Wulffii* OSTF. is a synonym of *Braya purpurascens* (R. BR.) BGE. *var. dubia* (R. BR.) O. E. SCHULZ, which in contrast to our species hardly differs from the main species *Braya purpurascens* (R. BR.) BGE.

23. *Cardamine bellidifolia* L.

LINNÆUS in: Sp. pl. 1753, p. 654.

DUC D'ORLEANS 1908, p. 6, — OSTENFELD & LUNDAGER 1911, p. 23.



G. SEIDENFADEN phot. 3793.

Fig. 15. *Cardamine bellidifolia*. About nat. size. Habitat: The coast of Norske Island, cf. fig. 9, p. 26. Date: August 15, 1933.

Localities: 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 22. Maroussia Island (DUC D'O.); 23. Cape Bismarck (DUC D'O.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L. !); 34. Cape Marie Valdemar (TH. S.); Skærfjord all localities, 35—39, except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S).; 41. Cape St. Jacques (DUC D'O.); 44. Norske Island (G. S.). Cf. fig. 15.

Found throughout the whole of Greenland except the southernmost parts.

24. *Cardamine pratensis* L.

LINNÆUS in: Sp. pl. 1753, p. 656.

OSTENFELD & LUNDAGER 1911, p. 22.

Localities: 5. Cape Maurer (TH. S.); 24. Danmarkshavn (L.!).

The species, which has its northern limit within the area (76°46′ N. lat.), seems here to reproduce exclusively by vegetative propagation.

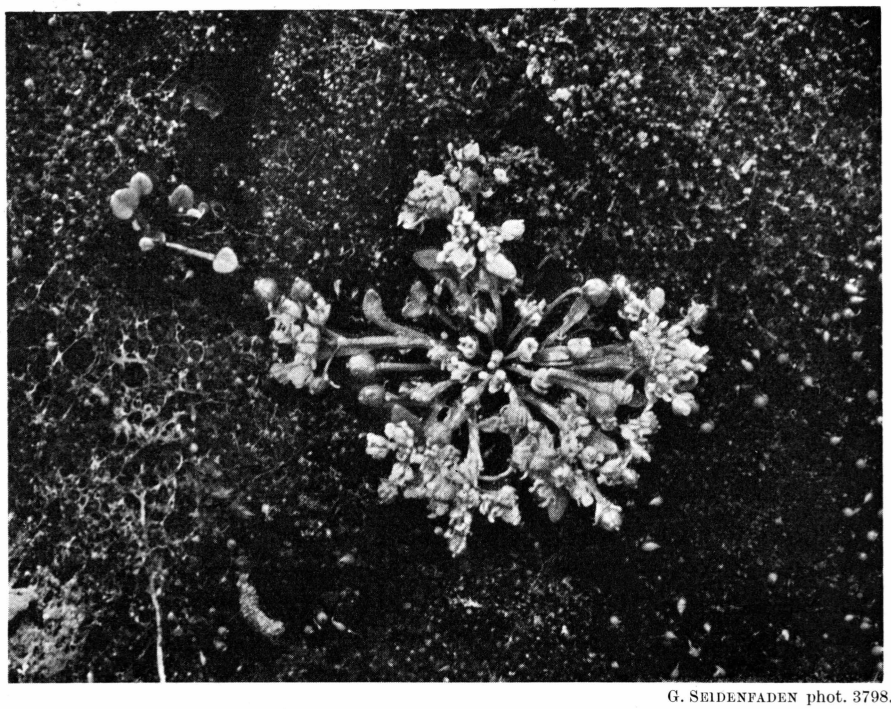
25. *Cochlearia officinalis* L.

Linnæus in: Sp. pl. 1753, p. 647.

var. groenlandica (L.) Gelert and *var. oblongifolia* (DC.) Gelert.

Gelert in: Andersson & Hesselmann: Spetsbergens kärlväxtflora. Bih. t. Kungl. Sv. Vet. Akad. Handl. Bd. 26. Avd. III, No. 1. Stockholm 1900, pp. 37—39.

Ostenfeld & Lundager 1911, p. 22, — Gelting 1934, p. 65.



G. Seidenfaden phot. 3798.

Fig. 16. *Cochlearia officinalis* var. *groenlandica* about nat. size. Locality: The lagoon, Loc. 6, south of Bastian Bay, Kuhn Island, cf. p. 134. Date: Aug. 8, 1933.

Localities: 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S.) cf. fig. 16; 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 22. Maroussia (L.!); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 26. Snenæs (L.!); 27. Hvalrosodden (L.!); Skærfjord all localities 35—39, except 36. Theodolitskær (Th. S.); 40a. East of Cape Amelie (Th. S.).

Not found in the eastern parts of North Greenland.

Gelert's two varieties, *groenlandica* and *oblongifolia*, seem to be poorly separated. Forms referable to *var. groenlandica* are predominant; the material from Loc. 40 a, East of Cape Amelie, only should possibly be referred to *var. oblongifolia*.

Draba L.

During our stay of several summers in Northeast Greenland we have especially directed our attention to the polymorphic species and groups of species of which *Draba* is one of the most interesting, so we have gradually succeeded in arriving at a fairly rational conception of the species within this genus. A relatively natural delimitation of the species must in our opinion be based chiefly on quite habitual characters in connection with observations on the distribution of the forms in nature according to the environment. However, an inevitable consequence of this would be that finer morphological characters, of which the hairiness has hitherto, and not without ground, occupied the first place, must necessarily sometimes be reduced to the second rank. — Mrs. ELIS. EKMAN's thorough treatment of the *Drabae* of Greenland is very elaborate, in so far as her hair-systematics are carried through with such consistency that after some practice it will not cause great difficulty to place any individual in her system, by which the requirements of systematics has been fulfilled from a museum point of view. However, in the case of *Draba*, investigation in the field leads involuntarily to a certain devaluation of the conventional notion of species which keeps strictly to the type specimens often picked out at random from the wealth of forms, and to a re-orientation in regard to the problem of hybridization. — Hybrids no doubt occur, but hardly in nearly such a great amount as Mrs. EKMAN's lists of species might suggest. It has turned out that all the *Drabae* of East Greenland are self-pollinating, the anthers opening and emptying the pollen over the stigma even before the flower opens. Another proof of the probability of the "intermediate forms" not being hybrids in the general sense, is that we often find growths which consist chiefly of intermediary forms between the actually quite hypothetical "species" in the strictest sense. — There can hardly be any doubt that we shall often here be concerned with self-pollinating pure lines as to whose origin it is wisest not to give any opinion as long as it cannot be based on experimental investigations covering a series of years.

With the concept of the species maintained below, the species appear in their habitual aspect as well as in their ecological differentiation according to environment with as great distinctness as the other phanerogams of Northeast Greenland (cf. the list p. 112 et seq.).

As is the case within other groups of species, the species of the genus *Draba* enumerated below are by far of no equal value in regard to morphological and ecological amplitude. Since nature has not delimited all species or forms with equal distinctness, a certain subjective valuation of the characters is inevitable, a valuation which instinctively suggests itself as a result of observations in the field in the natural habitat of the plants, but which unfortunately it is difficult to explain through a con-

sistent schematic presentation. — Thus it should be mentioned here that for instance *D. cinerea* and *D. lactea* in our delimitation form rather strongly variable form groups, whose detailed division we have for the time being had to disregard, while within the *D. alpina* s. l. group we have found evidence for a distinction between relatively well-founded, more closely delimited species. (These should perhaps rather be designated subspecies or varieties, a question, however, which can merely be of theoretical interest.)

In the succeeding survey of localities we have only mentioned such from which material is kept in the Herbarium of the Botanical Museum of Copenhagen. The same applies to our statements as to the distribution of the species in West Greenland; here we have found it natural to disregard the diversified records found in the available literature, but to judge entirely on the basis of the available herbarium material.

26. *Draba alpina* L. (s. str.)

Linnæus in: Sp. Fl., 1753, p. 642.

Ostenfeld & Lundager 1911, p. 24.

Localities: 2. Cape Hamburg (G. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.) and 19 a, on crystalline rocks; 27. Hvalrosodden (L.!); 38. Head of Klægbugt (Th. S.); 40 a. East of Cape Amelie (Th. S.); 44. Norske Island (G. S.).

The separation of *D. alpina* (s. str.) from the closely related species *D. Gredinii* and *D. Bellii*, more especially from the latter, may sometimes cause some difficulty. Normally *D. alpina* has purely yellow, *D. Bellii* light sulphur-coloured, and *D. Gredinii* whitish-yellow corollas; however, not even the colour of the flower can always be used as a distinguishing mark; thus forms which should doubtless be referred to *D. alpina*, sometimes appear with lighter shades of yellow. As regards the hairiness, *D. Bellii* is always abundantly covered with rough, branched hairs on the leaves, and fairly abundantly on the siliques, while *D. alpina* varies somewhat. It would seem necessary to refer to *D. alpina* such forms also whose leaves are moderately covered and whose siliques are more sparsely covered with hairs. *D. Gredinii* is generally more sparsely pilose on the leaves and has glabrous capsules. The leaves of all three species are more or less distinctly ciliate by long simple hairs, a character which is but little conspicuous in *D. Bellii* on account of the strong pilosity of the blade.

In addition to the above-mentioned characters, more or less variable, we attach special importance to the differences in the stature, growth-form, and habitat of the three species. *D. Bellii* is the most typical chamaephyte with a strong inclination to form cushions like, for instance, *Silene acaulis*. In dwarf-shrub vegetations, where, unlike the two other

species, it may sometimes occur, it has a particularly well developed mesocorm and an erect growth, almost like *Cerastium alpinum*. While *D. alpina* and *D. Gredinii* are closely associated with damp or wet soil covered with snow in the winter, *D. Bellii* may in addition be met with in dry places exposed to the wind. *D. Gredinii* is evidently especially associated with very wet moving clay, where it spreads its leaf rosettes over the wet substrate, growing in small carpets, the individual rosettes being here connected by the elongated and branched, but, owing to the solifluction, subterranean mesocorm. When growing in more stationary substrates it becomes more densely tufted.

In brief, *Draba Bellii* is characterised by its occurrence in medium-damp to dry soil and by its well-developed above-ground mesocorm; *Draba alpina* by its occurrence in medium-damp to wet soil and by a moderate development of the mesocorm; and finally, *Draba Gredinii* by occurring in very wet soil and often (in case of solifluction) by having a mainly subterranean mesocorm.

All three species are more or less associated with calcareous soil, *Draba alpina*, however, being more indifferent than *D. Bellii* and (?) *D. Gredinii*. In East Greenland *D. Bellii* is very closely associated with distinctly calcareous soil.

As will appear from the above, the consequence of a delimitation of species, in our opinion natural, will be that we shall have two comparatively sharply defined extreme forms both in regard to morphology and ecology, viz. *Draba Bellii* and *Draba Gredinii*, and a more ample intermediate form, *Draba alpina*.

Within the area treated here *Draba alpina* belongs to the less frequent *Drabae*. It has a northern distribution in Greenland, having its southern limit in East Greenland at Cape Daussy in 68°44′ N. lat., in West Greenland at Egedesminde in 68°40′ N. lat.

27. *Draba Bellii* HOLM.

HOLM in: FEDDE's Repert. III, 1907, p. 338.

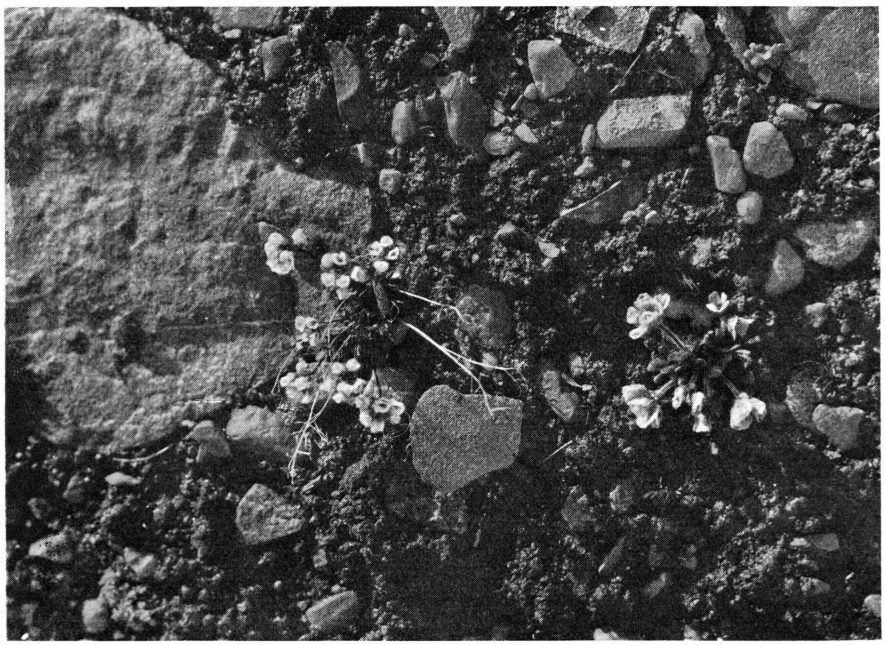
OSTENFELD & LUNDAGER 1911, p. 24, 25 (sub nom. *Draba alpina* et *Draba alpina var. glacialis* (ADAMS) DICKIE quoad loc. cit.), — GELTING 1934, p. 71.

Localities: 14. Nanok (BG., S. & S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); 31. Ymers Nunatak (FREUCHEN!); 35. C. F. Mourier Fjord (TH. S.); 37. V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North coast of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.).

For the delimitation of the species from *Draba alpina*, see above under that species. On account of its many-stemmed tufts and sulphur-

coloured flowers *Draba Bellii*, when well-developed, is one of the most magnificent and most conspicuous *Drabae* within the area.

In the inner fjords it seems generally to be more frequent than *Draba alpina*, and altogether it seems to be more closely associated with areas with a continental climate than the latter. It seems to be of frequent occurrence along the north coast of Greenland. In East Greenland it has



G. SEIDENFADEN phot. 3802.

Fig. 17. *Draba lactea* (left) and *Draba Bellii* (right). About $^1/_2$ size. Locality: Nanok, Hochstetter Foreland. Date: Aug. 8, 1933.

its southern limit in the interior of Scoresby Sound, viz. on Røde Ø (70°29′ N. lat.), in West Greenland at Vaigat in c. 70°12′ N. lat.

28. *Draba cinerea* ADAMS.

ADAMS in: Mem. Nat. Mosc. V., 1817, p. 103.

OSTENFELD & LUNDAGER 1911, p. 23, 24 (sub nom. *Draba hirta* L. and *Draba hirta var. arctica* (J. VAHL) S. WATSON quoad loc. cit.).

Localities: 5. Cape Maurer (TH. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); 29. North of Sælsø (FREUCHEN!); 31. Ymers Nunatak (FREUCHEN!); 35. C. F. Mourier Fjord (TH. S.); 37. V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.).

Apart from EKMAN's *Draba groenlandica* and *Draba ovibovina* (EKMAN 1929, pp. 489, 492), the species is rather variable, more especially as regards the length of the raceme and the shape of the silique. As we fail to see that the type of hairiness, which has supplied the chief diagnostic characters for the two afore-mentioned species erected by EKMAN, should *a priori* be considered a more essential character than the far more conspicuous characters just mentioned, all the forms discussed here are included under *Draba cinerea* (cf. also GELTING 1934, p. 74). There is all the more reason to do so since the species of EKMAN belonging to the *cinerea* group do not even seem to form well delimited units as regards the hairiness.

It is a northern species, and next to *Draba lactea* the most frequent *Draba* species within the area. It grows principally in places exposed to the wind, and is a frequent plant on the bird hills. It is distributed along the north coast of Greenland; in East Greenland it has its southern limit at Cape Brewster in 70°12′ N. lat., and in West Greenland it has been found as far south as Ikatok in 66°45′ N. lat.

29. *Draba daurica* DC.

DE CANDOLLE in: Systema II, 1821, p. 350, et Prodr. I, 1824, p. 170.

OSTENFELD & LUNDAGER 1911, p. 24 (sub nom. *Draba hirta* L. quoad loc. cit.).

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 8. North side of mouth of Bastian Bay (TH. S.); 26. Lille Snenæs (L.!); 35. C. F. Mourier Fjord (TH. S.); 37. V. Clausen Fjord (TH. S.); 40. Cape Amelie (TH. S.).

Morphologically the species occupies an intermediary position between *Draba cinerea* and *Draba lactea*, though it is most closely related to the former. Its glabrous pods as compared with the stellate-haired ones of *Draba cinerea* seem as a rule to be a good distinguishing character. *Draba daurica* may have slightly hairy siliques, but if so, the hairs are mostly simple, not stellate as in *Draba cinerea.*

Forms with a very sparse hairiness of the leaves and of a more slender stature are at hand from Loc. 2, Cape Hamburg. According to EKMAN's nomenclature these specimens should probably be referred to *Draba daurica* × *rupestris*. Judging from the hairiness we are here concerned with pure *Draba rupestris*, but according to the habitual characters they should doubtless be placed under *Draba daurica* (*Draba rupestris* has its northern limit in Scoresby Sound).

Draba daurica is a more southern species than *Draba cinerea* and *Draba lactea*, and it is one of the least frequent *Drabae* within the area, where it is associated with the most favourable, southwardly exposed

habitats, more especially with the dwarf-shrub vegetations or the medium-dry grass vegetation associated with the latter.

The species has a more northerly distribution in East than in West Greenland; thus in East Greenland it is found between Cape Dalton and Cape Amelie (69°20′ to 77°32′ N. lat.), while in West Greenland it has its southern limit in 63°05′ N. lat. and its northern limit in 74°18′ N. lat.

30. *Draba fladnizensis* Wulf.

Wulfen in: Jacquin, Miscel. I, 1778, p. 147.

Ostenfeld & Lundager 1911, p. 24 (quoad loc. cit.).

Localities: 27. Hvalrosodden (L.!); 35. C. F. Mourier Fjord (Th. S.); 37. V. Clausen Fjord (Th. S.); 38. Head of Klægbugt (Th. S.); 39. North side of Klægbugt (Th. S.); 40. Cape Amelie (Th. S.).

Just as difficult as it is to keep *Draba fladnizensis* and *Draba lactea* apart diagnostically, just as easy it is to keep the two species distinct on the basis of habitus and occurrence. A satisfactory separation of these species results in a narrow *Draba fladnizensis* and an ample *Draba lactea*. Forms which according to Ekman's nomenclature should be classed as *Draba fladnizensis* × *lactea*, one of the most frequent *Draba* forms in East Greenland, are here simply regarded as *Draba lactea*.

The species is exceedingly characteristic of the favourably exposed steep fronts of the grass-grown stagnant glaciers of moving soil. It is absent from West Greenland, and in East Greenland it has its southern limit in Hurry Inlet (70°30′ N. lat.). Probably it is only of sparse occurrence north of Skærfjord; the northernmost locality here is the north side of Klægbugt in 77°40′ N. lat.

31. *Draba Gredinii* Ekman.

Elis. Ekman in: Sv. Bot. Tidsskr. Bd. 27, 1933, p. 102.

Ostenfeld & Lundager 1911, p. 24 (sub nom. *Draba alpina*, etc., quoad loc. cit.).

Localities: 2. Cape Hamburg (G. S.); 19. North of Trækpas (S. & S.); 21. Store Koldewey Isl. (L.!); 24. Danmarkshavn (L.!, Th. S.); 27. Hvalrosodden (L.!); 38. Head of Klægbugt (Th. S.); 40 a. East of Cape Amelie (Th. S.); 44. Norske Island (G. S.).

Mrs. Ekman's (l. c.) conception of the species seems somewhat obscure. She states: "The late Professor Ostenfeld has noted (in schedula) that he believes this form to be of hybridous origin; and he may be right. In this case *D. Gredinii* must be interpreted as a hybrid between *D. alpina* (or *D. Bellii*) and *D. lactea*." Ekman then discusses whether *Draba alpina* or *Draba Bellii* or both may be supposed to be one of the parent species. — Furthermore it will be noted that the greater number of the specimens cited are labelled "*D. Gredinii* mihi", and

curiously enough several specimens, just as characteristic as the others, are labelled "*D. alpina* × *lactea*". These latter are not included in EKMAN's list of stations of *D. Gredinii*. — If we are concerned with the hybrid *D. alpina* × *lactea*, the name *Gredinii* is superfluous, since O. E. SCHULZ (1927, p. 264) had already proposed the name *D. Wichurae* for this plant after WICHURA, who first described it from Lappland. SCHULZ states that the plant is sterile. EKMAN's statement for *Gredinii*, "Petala albida — pallide sulphurea" is possibly a reminiscence from SCHULZ's *D. Wichurae*. *D. Gredinii* seems never to have sulphur-coloured flowers (which are characteristic of *D. Bellii*), but flowers varying from whitish-yellow to white (rare). In the colour of the flowers as well as in other respects the species seems to have little in common with *D. Bellii*. It comes nearer to *D. alpina*; however, it seems excluded that it is a *Draba lactea* hybrid. In Loc. 19, Store Koldewey Island, in which we observed the species most abundantly developed, *D. lactea* was not found at all. Against the hybrid theory it may further be mentioned that *D. Gredinii* from Greenland is only known from the east coast, while it has not been found in West Greenland, where *Draba alpina* and *Draba lactea* are of common occurrence throughout the whole northern part.

In a flowering state the plant, as mentioned above, is distinguished by the colour of the flower, but it is still easier to recognise when fructifying by the short scapes with the egg-shaped, acute, somewhat inflated siliques forming almost like an umbel on the spreading pedicles. The leaves are distinguished from those of *Draba alpina* by being relatively broader, the weaker of them almost entirely rounded, the more vigorous often with a tooth at the middle. It is characteristic that from this point to the tip the margin of the leaf is straight, or even slightly concave, while the corresponding part of the leaf of *Draba alpina* has convex margins. (For the relation of the species to *Draba alpina*, see also that species).

From East Greenland the species is at hand from several localities between Cape Dalton (69°25′ N. lat.) to the south and Norske Island (79°12′ N. lat.) to the north. It is rather strictly confined to the outer coast, in accordance with its occurrence on the always wet moving soil (cf. the map fig. 53, p. 189). In the Botanical Museum of Copenhagen some specimens from Spitsbergen and Novaya Zemlja are found, too. Thus it might be justifiable to designate *D. Gredinii* as an eastern species for the area treated here.

In order to call the attention of future investigators to the species, the localities of the species outside Greenland will be enumerated below after the collections of the Botanical Museum of Copenhagen.

Spitsbergen:

Bell Sound, leg. J. VAHL, July 1838.

Bell Sound, leg. A. J. MALMGREN; 24. VII. 1864.

Green Harbour, leg. Th. M. Fries; 1. VIII. 1868.
Kobbebay, leg. Th. M. Fries, August 1868.
Bell Sound, Mitterhooken, leg. A. G. Nathorst, 1. VII. 1882.
Wijdebay, Østfjorden, leg. Thorild Wulff, 6. VIII. 1899.
Colbay, leg. Hanna Resvoll-Dieset, 8. VII. 1908.
Sassenbay, leg. Hanna Resvoll-Dieset, 2. IX. 1908.

(All the specimens from Bell Sound are unusually narrow-leaved).

Novaya Zemlja:
Sinus Besimannaja, leg. F. R. Kjellman & A. N. Lundström, 2—6 VII. 1875.
Insula Mejduscharskij (Meshduscharskij Island) leg. Th. Holm, 10. VIII. 1882.
South of Arkangel Bay, leg. B. Lynge, 12. VIII. 1921.

32. *Draba lactea* Adams.

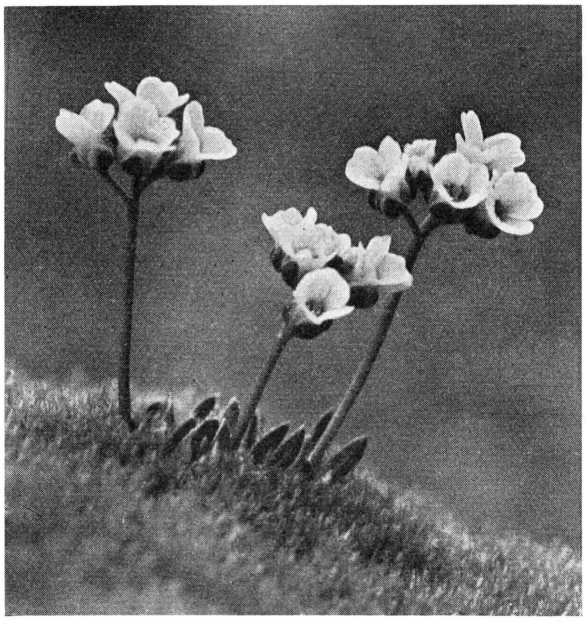
Adams in: Mem. Soc. Nat. Mosc., 1817, p. 104.

Ostenfeld & Lundager 1911, p. 24 (sub nom. *Draba fladnizensis* quoad loc. cit.).

Localities: 2. Cape Hamburg (G. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of the mouth of Bastian Bay (Th. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.), cf. fig. 17; 19 a. North of Trækpas (not in sedimentary, only on crystalline rocks) (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (Th. S.); Skærfjord: all localities 35—39 (Th. S.); 40. Cape Amelie (Th. S.); 40 a. East of Cape Amelie (Th. S.); 44. Norske Island (G. S.).

Draba lactea is beyond comparison the most frequently occurring *Draba* within the area. In the delimitation made by us, as it seems quite natural and without constraint, it is perhaps also the most variable species. Its variability may perhaps be most adequately expressed by saying that it has its place within the triangle *daurica-fladnizensis-subcapitata*, *daurica* indicating the acute angle. Its relation to *Draba daurica* is mentioned under that species, and its relation to *Draba fladnizensis* under that species. It need only be added here that the forms in question are characterised morphologically by their comparatively tall, slender scapes with distant siliques in long racemes and often sparse or actually lacking hairiness of stellate hairs on the leaves, and elongated, often branched mesocorms. Ecologically it is characterised by its frequent occurrence in the damp grass vegetation on the surfaces of the stagnant glaciers of moving soil. Forms approaching *Draba subcapitata* are distinguished by the compact, tufted growth of this species (short meso-

corm), short, stout scapes, and close-set, short and broad siliques; ecologically such forms are characterised by their occurrence on the uppermost dry edges of the snow-patches of the flat slopes. Forms which rather belong to this group often have an exceedingly abundant cover of stellate hairs on their leaves (EKMAN's *Draba lactea* × *nivalis*, synonym *Draba pseudopilosa* POHLE); especially in Loc. 40, Cape Amelie, such forms were by far the commonest, growing in damp sand. Here they were partially



G. SEIDENFADEN phot. 3803.

Fig. 18. *Draba lactea*. About $^{2}/_{1}$ size. Locality: C. Broer Ruys, Hold-with-Hope. Date: August 15, 1934. The plant grows in a dense layer of moss.

still in the flowering stage, and were distinguished by their extraordinarily small dirty-white flowers. Thus at this point it tends towards *Draba subcapitata*, and despite its abundant covering with stellate hairs seems to have no relation to *Draba nivalis*.

With offshoots to the grass vegetation and to the uppermost edges of the snow-patches almost right up to the tops of the wind-exposed hills, the main occurrence of *Draba lactea* is found in the constantly wet, often moss-covered central parts of the snow-patches (cf. fig. 18), where it is most frequently represented by forms which morphologically also constitute the centre of the species.

Draba lactea shuns markedly calcareous soil; thus it is entirely absent from Loc. 5, Cape Maurer, and Loc. 19, Trækpasset (whereas it is found on the crystalline rocks in Loc. 19 a).

In East Greenland the species has its southern limit at Cape Ravn in 68°03′ N. lat., extends around the north of Greenland and down the west coast southward to 62°50′ N. lat., Jensens Nunatakker.

33. *Draba micropetala* Hooker.

Hooker in: Parry's Sec. Voy. App., 1825, p. 385.

Duc d'Orleans 1905, p. 6 (sub nom. *Draba alpina*), — Ostenfeld & Lundager 1911, p. 24 (sub nom. *Draba alpina* quoad loc. cit.).

Localities: 2. Cape Hamburg (G. S.); 6. South of Bastian Bay (S. & S.); 8. North side of the mouth of Bastian Bay (Th. S.); 14. Nanok (S. & S.); 20. Opposite Berg Fjord (S. & S.); 22. Cape Bismarck (L.!); 24. Danmarkshavn (Th. S.); 25. Stormkap (S. & S.); 34. Cape Marie Valdemar (Th. S.); 35. C. F. Mourier Fjord (Th. S.); 37. V. Clausen Fjord (Th. S.); 38. Head of Klægbugt (Th. S.); 40. Cape Amelie (Th. S.); 41. Cape St. Jacques (Duc d'O.!); 44. Norske Island (G. S.).

The species is most closely related to the *Draba alpina* group; in the more or less abundant hairiness of the leaves, with rough, branched hairs, it approaches *Draba Bellii*. In a flowering state it is well separated from *D. Bellii* and *D. alpina* by its small greyish-pale yellow corollas, and fruiting it is particularly easily recognisable owing to its slender, in the fruit-bearing part mostly flexuous scapes and characteristic oblong siliques, in contrast to *D. alpina*'s and *D. Bellii*'s very vigorous and rigid scapes with ovoid or elliptical siliques. The silique varies from glabrous to slightly hairy. Transitional forms to *D. Bellii* seem to be rare, probably i. a. because the two species are absolutely separated ecologically, *D. Bellii* being decidedly a calcicolous plant, while *D. micropetala* never occurs on calcareous soil. Thus it is absent, like *D. lactea*, in Loc. 5, Cape Maurer, and Loc. 19, Trækpasset. Transitional forms to *D. alpina* may occasionally occur. Ecologically the species is especially characteristic of the wet, late-melting snow-patches with moss vegetation. It is the most exclusive snow-patch *Draba* within the area.

A distinctly northern species, which extends around the north of Greenland and in West Greenland has its southern limit as far north as Thule in 76°30′ N. lat., while in East Greenland it extends much farther south, viz. to Scoresby Sound, where it is exceedingly common in the coastal area, but is absent from the inner fjords.

We have employed the name *Draba micropetala* Hooker for the group of micropetalous *Chrysodrabae* which is to a certain extent variable, though fairly well delimited from *Draba alpina* and *Draba Bellii*, and which was previously divided by Ekman (1931) into two species, *D. micropetala* Hooker and *D. oblongata* R. Br. (cf. also Ekman 1933, p. 359).

Draba macrocarpa ADAMS (ADAMS in: Nouv. Mem. Soc. Nat. Mosc. III, 1834, p. 249). TOLMATSCHEW (1931) has found that *Draba macrocarpa* ADAMS (*Draba alpina forma glacialis* KJELLMAN) occurs in Greenland. To this we must remark that on closer examination he will very possibly find even more of the Russian — North Siberian *Draba* species (see e. g. TOLMATSCHEW & PJATKOW 1930) in Greenland. We wish, however, to express ourselves here in favour of the view that not a too categorical but a more practical viewpoint should be adopted in the treatment of the species within a limited area. The natural, and accordingly the practical, boundary lines between the species within the circumpolar groups of *Chrysodrabae* are evidently not the same in Greenland as in Siberia, even though identical forms may occur. However, for the present we must refrain from expressing an opinion of TOLMATSCHEW's *Draba macrocarpa* ADAMS, and be content to point out that the herbarium specimens cited by TOLMATSCHEW do not form any unit (cf. also EKMAN 1931, p. 474 ff.). Some specimens from the localities in Greenland found n the Botanical Museum of Copenhagen and referred by TOLMATSCHEW to *Draba macrocarpa*, we refer to *Draba micropetala* HOOKER, indicating the outer limit of this species towards *Draba alpina*. The size of the flower is intermediate between *D. micropetala* and *Draba alpina*, but otherwise the form is by its stature rather a *Draba micropetala*. The specimens of SIMMONS cited by TOLMATSCHEW from Ellesmere Land seem to be referable to *D. Bellii*. In this connection attention must merely be called to TOLMATSCHEW's statement that he has seen specimens of *Draba macrocarpa* from KNUD RASMUSSEN's Fifth Thule Expedition. In the publication on the collections of this expedition just out (J. GRØNTVED 1936) EKMAN states expressly that specimens corresponding to TOLMATSCHEW's diagnosis (evidently prepared on the basis of Siberian specimens) were not represented at all.

Even though the extra-Greenland material which has been at our disposal is not particularly large, we think it possible to state that in the western Arctic, that is, Greenland and North America, *Draba alpina* and *Draba micropetala* are well separated, while proceeding eastward to Spitsbergen and Eurasia the limits are more blurred. *Draba macrocarpa* seems to represent the transition between the *Draba alpina* and *Draba micropetala* groups, the size of the flower and the shape of the leaf corresponding rather to the *Draba alpina* group, while the mode of growth and the infructescense resemble those of *Draba micropetala* (s. l.).

34. *Draba nivalis* LILJEBL.

LILJEBLAD in: N. Act. Reg. Soc. Scient. Upsaliensis V. 6. 1799, p. 47, et in: Sv. Vet. Akad. Handl. 1793, p. 208.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 16 b. Agnetesø (JOHANSEN); 19. North of Trækpas (only on crystalline

G. SEIDENFADEN phot. 3804.

Fig. 19. *Draba subcapitata*. About $^4/_5$ size. Locality: Nanok, Hochstetter Foreland. Date: August 8, 1933.

rocks) (S. & S.); 24. Danmarkshavn (TH. S.); 35. C. F. Mourier Fjord (TH. S.) 40. Cape Amelie (TH. S.).

The least variable and morphologically most isolated *Draba* species within the area. Like *Draba daurica*, it is of sparse occurrence, and is only met with in rather dry, favourably exposed places, often in association with the bird-hill vegetation.

The species is distributed over the whole coast of Greenland with the exception of central and eastern North Greenland. The northernmost locality recorded is Inglefield Land, Advance Bay in 79°20′ N. lat.

35. *Draba subcapitata* SIMMONS.

SIMMONS in: Rep. Sec. Arct. Exp. Fram 1898—1902, No. 2, 1906, p. 87, tab. I et fig. 3.
OSTENFELD & LUNDAGER 1911, p. 24.

Localities: 5. Cape Maurer (TH. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.) (cf. fig. 19); 19. North of Trækpas (both on sedimentary and crystalline rocks) (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (TH.S.); 26. Lille Snenæs (L.!); 31. Ymers Nunatak (FREUCHEN); 34. Cape Marie Valdemar (L.!, TH. S.); 35. C. F. Mourier Fjord (TH. S.); 37. V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.); 44. Norske Island (G. S.).

Next to *Draba lactea* and *Draba cinerea* it is the commonest *Draba* within the area. The species shows some variation in stature and hairiness. The amplitude of variation lies between *Draba lactea* and the micropetalous *Chrysodrabae*. Under *Draba lactea* the tendency of that species to variation in the direction of *Draba subcapitata* is mentioned, but actual transitional forms between *Draba lactea* and *Draba subcapitata* rarely occur. The species is most frequent on calcareous soil, but is not strictly associated with such soil. Like *Draba cinerea* it occurs chiefly in places exposed to the wind and free of snow in the winter, but in contrast to the latter, it is closely associated with mineral soil, and thus avoids the bird hills with their deposits of pit-like material.

It is decidedly a northern species, which extends around the north of Greenland. In West Greenland it has its southern limit on the Nugsuak Peninsula in about 70°30′ N. lat. In East Greenland it does not extend south of Scoresby Sound.

36. *Eutrema Edwardsii* R. BR.

ROBERT BROWN in: App. PARRY Voy. Disc. (Chloris Melvilliana 1823), p. 267.

OSTENFELD & LUNDAGER 1911, p. 22.

Localities: 14. Nanok (S. & S.); 24. Danmarkshavn (L.!); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40 a. East of Cape Amelie (TH. S.).

A northern species which has its southern limit on the east coast in the Scoresby Sound area, where it has been found in a single place in Hurry Inlet (70°30′ N. lat.). It extends around the north of Greenland, and on the west coast it is found southward to Nordostbugten in about the same latitude (70°36′ N.).

Rather sparse within the area. Only found in calcareous localities.

37. *Lesquerella arctica* (WORMSKJ.) S. WATSON.

S. WATSON in: Proc. Am. Acad. 1888, vol. 23, p. 254.

OSTENFELD & LUNDAGER 1911, p. 23, — GELTING 1934, p. 82.

Localities: 14. Nanok (BØGVAD); 15. Petersbugt (G. S.); 25. Stormkap (L.!, S. & S.); 26. Snenæs (L.!); 26. Dovebugt (L.!); 27.

Hvalrosodden (L.!); 29. Valley between Annexsø and Sælsø (FREUCHEN!); Skærfjord (TH. S.): 35. North side of C. F. Mourier Fjord, 37. Head of V. Clausen Fjord, 39. North side of Klægbugt.

A northern species, like the preceding one, and with almost the same distribution within Greenland. In East Greenland its southern limit is found in the interior of Scoresby Sound (70°27′ N. lat.), in West Greenland at the head of Disko Bay (69° N. lat.).

This species also is not particularly common within the area. It seems to prefer calcareous soil.

HIPPURIDACEAE.

38. *Hippuris vulgaris* L.

LINNÆUS in: Sp. pl. 1753, p. 4.

OSTENFELD & LUNDAGER 1911, p. 29.

Localities: 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.).

Stormkap (76°49′ N. lat.) is the northernmost known locality of this species in East Greenland. In West Greenland its northern limit is in about the same latitude.

OENOTHERACEAE.

39. *Chamaenerium latifolium* (L.) SWEET.

SWEET in: Hort. Brit. Ed. 2., 1830, p. 198.

BUCHENAU & FOCKE 1874, p. 40 (sub nom. *Epilobium latifolium*), — OSTENFELD & LUNDAGER 1911, p. 29 (sub nom. *Epilobium latifolium*), — GELTING 1934, p. 84.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 8. North side of the mouth of Bastian Bay (TH. S.); 15. Petersbugt (G. S.); 24. Danmarkshavn and landward (L.!); 25. Stormkap (S. & S); 26. Lille Snenæs (L.!); 37. Head of V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.).

The species, which is circumgreenlandic, seems to decrease considerably in frequency in the northern parts of the area, and similarly the development of the individual plants is less vigorous here. Thus in the Skærfjord area the luxuriant sole growths of this species in the river deltas, so conspicuous in more southerly regions, were lacking.

40. *Epilobium arcticum* SAMUELS.

SAMUELSSON in: Bot. Not. Lund. 1922, p. 260.

Locality: 2. Cape Hamburg (G. S.) (74°46′ N. lat.).

This species was first found in East Greenland by SEIDENFADEN in 1929 (cf. SEIDENFADEN 1930, p. 370), but since then it has been found in some seven or eight places in East Greenland. The above-mentioned

locality is the northernmost known in Greenland. Its southern limit is Vardekløft in Scoresby Sound, latitude 70°36′ N.

PAPAVERACEAE.

41. *Papaver radicatum* ROTTB.

ROTTBØLL in: Kjøbenhavns Selskabs Skrifter, Deel 10, p. 455, tab. 8, fig. 24.

KOLDEWEY I, 1874, pp. 327, 635, 637, — BUCHENAU & FOCKE, 1874, p. 28 (sub. nom. *Papaver nudicaule*), — DUC D'ORLEANS 1908, p. 6, — OSTENFELD & LUNDAGER 1911, p. 22, — J. P. KOCH, 1913, p. 190, — GELTING 1934, p. 85.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of the mouth of Bastian Bay (G. S.); 8. North side of the mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 11. Cape Philip Broke (C. & P.); 12. Cape Pansch (C. & P.); 14. Nanok (BG., S. & S.); 15. Petersbugt (G. S.); 18. Head of Besselfjord (SCHWARCK); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 22. Maroussia Island (DUC D'O.); 23. Cape Bismarck (DUC D'O.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 27. Hvalrosodden (L.!); 29. Between Annexsø and Sælsø (FREUCHEN!); Eastern part of Dronning Louise Land (J. P. KOCH); 34. Cape Marie Valdemar (L.!, TH. S.); Skærfjord 35—39: all localities (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.); 42. Bjørneskær (J. P. KOCH!); 43. Lambert Land (J. P. KOCH); 44. Norske Island (G. S.).

One of the commonest species within the area. Widely distributed throughout the greater part of Greenland, being absent from the southernmost part only. It occurs in different forms. The various Greenland subspecies within this collective species have not yet been closely studied.

POLYGONACEAE.

42. *Koenigia islandica* L.

LINNÆUS in: Mant. pl. I, 1767, p. 35.

Localities: 5. Cape Maurer (TH. S.) 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (TH. S.); 25. Stormkap (S. & S.); 38. Head of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.).

Not previously recorded from this part of Greenland. Its northernmost locality in East Greenland thus seems to be Klægbugt in latitude 77°37′ N. In West Greenland it has been found as far north as about 76°30′ N. lat. (Cf. fig. 42, p. 126).

43. *Oxyria digyna* (L.) HILL.

HILL in: Hort. Kew., 1768, p. 158.

KOLDEWEY I, 1874, pp. 635 and 637, — BUCHENAU & FOCKE, 1874,

p. 47, — Duc d'Orleans 1908, p. 8, — Ostenfeld & Lundager 1911, p. 16, — Gelting 1934, p. 90.

Localities: 2. Cape Hamburg (G. S.); 7. South side of the mouth of Bastian Bay (G. S.); 8. North side of the head of Bastian Bay (Th. S.); 9. Head of Bastian Bay (G. S.); 11. Cape Philip Broke (P.); 12. Cape Pansch (P.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 23. Cape Bismarck (Duc d'O.!); Germanialand: common everywhere (L.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.); 34. Cape Marie Valdemar (Th. S.); Skærfjord 35—39: all localities except 36. Theodolitskær (Th. S.); 40. Cape Amelie (Th. S.); 40 a. East of Cape Amelie (Th. S.).

A circumgreenlandic species, commonly distributed within the area.

44. *Polygonum viviparum* L.

Linnæus in: Sp. pl. 1753, p. 360.

Buchenau & Focke 1874, p. 47, — Duc d'Orleans 1908, p. 8, — Ostenfeld & Lundager 1911, p. 16, — Gelting 1934, p. 90.

Localities: 2. Cape Hamburg (G. S.); 4. Lakseelv, Th. Thomsen Land (Schwarck); 5. Cape Maurer (Th. S.); 7. South side of the mouth of Bastian Bay (G. S.); 8. North side of the mouth of Bastian Bay (Th. S.); 10. Grandjean Fjord (G. S.); 14. Nanok (Bøgvad!, S. & S.); 15. Petersbugt (G. S.); 16 a. Kildedal (Johansen!); 16 b. Agnetesø (Johansen!); 17. Trumsø (Schwarck!); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); Germanialand: rather common (L.); 23. Cape Bismarck (Duc d'O.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 37. Head of V. Clausen Fjord (Th. S.); 38. Head of Klægbugt (Th. S.); 39. North side of Klægbugt (Th. S.); 40. Cape Amelie (Th. S.).

A circumgreenlandic species. Very common along the whole coast. Even though it was not found on Norske Island though searched for, we regard it as circumgreenlandic, especially because it has been found to be common along the north coast of Greenland.

RANUNCULACEAE.

45. *Ranunculus affinis* R. Br.

Robert Brown in: App. Parry Voy. Disc. (Chloris Melvilliana) 1823, p. 265.

Localities: 5. Cape Maurer (Th. S.); 14. Nanok (S. & S.); 38. Head of Klægbugt (Th. S.); 40 a. East of Cape Amelie (Th. S.).

Skærfjord (77°37′ N. lat.) is the northernmost locality in which the species has hitherto been found. In East Greenland it has its southern limit at Cape Daussy in latitude 68°40′ N. In West Greenland it is likewise found in a belt between about 66°30′ and 79° N. lat.

The species grows on calcareous and clayey moving soil, and seems

chiefly to be associated with the same places as *Potentilla rubricaulis* It occurs abundantly in the locality in Klægbugt, but otherwise it seems to be rare within the area.

46. *Ranunculus glacialis* L.

LINNÆUS in: Sp. pl. 1753, p. 553.

OSTENFELD & LUNDAGER 1911, p. 20.

Localities: 6. South of Bastian Bay (S. & S.); 7. South side of the mouth of Bastian Bay (G. S.); 8. North side of the mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); Skærfjord 35—39: all localities except 38. Head of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.).

This species, which in Greenland has only been found on the east coast, where it is rather common in the area between Angmagssalik (65°56′ N. lat.) and Skærfjord (77°40′ N. lat.), is characteristic of the lower edges of perennating snow-patches or glacier fronts where the fresh thaw-water percolates through gravel and stones. Being associated with such wet localities, it is most frequent along the outer coast (cf. the map in fig. 52, p. 188).

47. *Ranunculus hyperboreus* ROTTB.

ROTTBØLL in: Kjøbenhavns Selsk. Skr. Deel 10, 1770, p. 458, tab. 4, fig. 16.

OSTENFELD & LUNDAGER 1911, p. 21.

Localities: 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 14. Nanok (S. & S.); 20. Opposite Berg Fjord (S. & S.); 22. Maroussia Island (L.!); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.).

Even if the species has not been found in the parts of eastern North Greenland not investigated by botanists, we think it most likely that the species is circumgreenlandic. (Cf. fig. 46, p. 129).

48. *Ranunculus nivalis* L.

LINNÆUS in: Sp. pl. 1753, p. 553.

Localities: 2. Cape Hamburg (G. S.); 8. North side of the mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 24. Danmarkshavn (TH. S.); 35. North coast of C. F. Mourier Fjord (TH. S.); 37. Head of V. Clausen Fjord (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.).

KOLDEWEY (1874, I, p. 635) records *Ranunculus nivalis* from Cape Philip Broke and "*Ranunculus*" ("Hier erhoben sich auf saftigem Stengel die gelben Blüten des Ranunkels") from Cape Börgen (l. c. p. 640). As the species has not been kept apart from *Ranunculus sulphureus* (cf.

Buchenau & Focke, 1874, p. 28), we have not included these statements in the list of localities above.

In East Greenland the species is much rarer than *Ranunculus sulphureus*. It has its southern limit in Scoresby Sound. The northernmost place in which the species has been found so far is Skærfjord (77°40′ N. lat.). Ostenfeld & Lundager state expressly that the species has not been brought back from Danmarkshavn; however, since it was found in this place by Th. Sørensen, it has possibly escaped the attention of Lundager.

In East Greenland the species seems to increase in frequency northward and it might perhaps be assumed to extend round the north of Greenland, even though it has not been brought home from these parts. Indicative hereof is further the fact that the species flowers before *Ranunculus sulphureus*, which, too, may perhaps be the cause why it has not been brought home, since collectors principally secure flowering individuals. If the two species grow together, *R. nivalis* will mostly be out of flower, while *R. sulphureus* will be in flower.

49. *Ranunculus pygmaeus* Wbg.

Wahlenberg in: Fl. lappon. 1812, p. 157.

Ostenfeld & Lundager 1911, p. 20.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S.); 8. North side of the mouth of Bastian Bay (Th. S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L.!); 35. North coast of C. F. Mourier Fjord (Th. S.); 38. Head of Klægbugt (Th. S.); 39. North side of Klægbugt (Th. S.); 40. Cape Amelie (Th. S.).

The north side of Klægbugt (77°40′ N. lat.) is the northernmost locality of the species in East Greenland. In West Greenland it has been found northward to Murchison Sound in about 77°50′ N. lat. (cf. Ostenfeld 1925, p. 15).

Distributed throughout the area, but far less frequent than in more southerly regions.

50. *Ranunculus sulphureus* Soland.

Solander in: Phipps: Voy. N. Pole. London 1774, p. 202.

Duc d'Orleans 1908, p. 6, — Ostenfeld & Lundager 1911, p. 20, — Gelting 1934, p. 96.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S.); 14. Nanok (Bøgvad, S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 22. Maroussia Island (L.!); 23. Cape Bismarck (L.!); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.);

26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.!); 42. Bjørneskær (J. P. KOCH).

The species extends from Cape Dalton (69°25′ N. lat.) on the east coast of Greenland along the north coast and onwards to Disko Bay (68°35′ N. lat.) on the west coast. The species is fairly common within the area.

ROSACEAE.

51. *Dryas octopetala* L.

LINNÆUS in: Sp. pl. 1753, p. 501.

KOLDEWEY I, 1874, p. 639, — BUCHENAU & FOCKE 1874, p. 38, — DUC D'ORLEANS 1908, p. 5 (sub nom. *Dryas octopetala f. minor* HOOKER), — OSTENFELD & LUNDAGER 1911, p. 28 (sub nom. *Dryas octopetala f. minor* HOOKER), — J. P. KOCH 1913, p. 190, — GELTING 1934, p. 97.

Localities: 2. Cape Hamburg (G. S.); 4. Lakseelv, Th. Thomsen Land (SCHWARCK); 5. Cape Maurer (TH. S.); 7. South side of the mouth of Bastian Bay (G. S.); 8. North side of the mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 13. Cape Börgen (P.!); 14. Nanok (BØGVAD, S. & S.); 15. Petersbugt (G. S.); 16. Cape Oswald Heer (SCHWARCK!); 16 a. Kildedal (JOHANSEN!); 16 b. Agnetesø (JOHANSEN!); 18. Head of Bessel Fjord (SCHWARCK!); 19. North of Trækpas (S. & S.); 21. Store Koldewey Island (L.!); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Dovebugt (L.!); 31. Ymers Nunatak (L.!); 32. Eastern parts of Dronning Louise Land (J. P. KOCH); 34. Cape Marie Valdemar (L.!, TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 40 a. East of Cape Amelie (TH. S.;) 41. Cape St. Jacques (DUC D'O., L.).

51 a. *Dryas integrifolia* M. VAHL.

M. VAHL in: Skriv. Naturh. Selsk. Kjøbenhavn IV, II 1798, p. 171.

OSTENFELD & LUNDAGER 1911, p. 28.

Locality: 44. Norske Island (G. S.).

Dryas octopetala belongs to the commonest species within the area. It is here represented by *var. minor* HOOKER, which it is often difficult to distinguish from *Dryas integrifolia*. Typical forms of *D. integrifolia* have not been found within the area except on Norske Island, whence SEIDENFADEN has brought home a large material of *integrifolia* forms, and *D. octopetala* proper does not seem to be represented on Norske Island. — From Hyde Fjord on Peary Land also (coll. J. P. KOCH, Danmark-Expedition) *integrifolia* only is at hand, while otherwise both forms occur along the north coast of Greenland as far as the region of Cape York. From this point only *D. integrifolia* extends southward along the whole

west coast. From the greater part of the east coast, where *Dryas octopetala* is the predominant form, scattered occurrences of *D. integrifolia* are recorded, chiefly from the inner fjord ramifications. *Dryas octopetala* seems to have its southern limit in about 69° N. lat. on the east coast, while *D. integrifolia* occurs at Angmagssalik in about 65°30′ N. lat. Cf. also p. 157.

52. *Potentilla emarginata* Pursh.

Pursh in: Fl. Am. Septentri., 1814, p. 353.

Buchenau & Focke 1874, p. 39, — Duc d'Orleans 1908, p. 5, — Ostenfeld & Lundager 1911, p. 28, — Gelting 1934, p. 101.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (Bøgvad!, S. & S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 23. Cape Bismarck (Duc d'O.!); 24. Danmarkshavn (Th. S.); Harefjæld & Renskæret (L.!); 25. Stormkap (L.!); 26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (L.!, Th. S.); Skærfjord: all localities (35—39) (Th. S.); 40. Cape Amelie (Th. S.); 41. Cape St. Jacques (L.).

A northern species, found from Angmagssalik, round along the north coast to about 66°55′ N. lat. on the west coast (cf. the map in fig. 58, p. 196). While in central East Greenland it is chiefly associated with the outer coast, in Skærfjord it occurs right to the head of the fjord, as shown above. It is the commonest *Potentilla* species and moreover one of the commonest herbs within the area.

53. *Potentilla nivea* L. (s. l.)

Linnæus in: Sp. pl. 1753, p. 499.

Ostenfeld & Lundager 1911, p. 27, — Gelting 1934, p. 103.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16 b. Agnetesø (Johansen!); 18. Head of Bessel Fjord (Schwarck); 21. Store Koldewey Island (L.!); 22. Maroussia Island (L.!); 23. Cape Bismarck (L.!); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.); 26. Lille Snenæs (L.!); 26. Dovebugt (L.); 27. Hvalrosodden (L.!); 29. Valley between Sælsø and Annexsø (L.!); 31. Ymers Nunatak (Freuchen!); Skærfjord: all localities (35—39) (Th. S.).

Potentilla nivea is of common occurrence and very rich in forms within the area. For the delimitation of the species, see Th. Sørensen 1933, p. 61 ff.; *Potentilla Pedersenii* Rydb. is referred to *P. nivea.*

A northern species with almost the same distribution in East Greenland as *P. emarginata.* Like the latter, it is found southward as far as

Angmagssalik (66°08′ N. lat.). In West Greenland various forms of it have been found somewhat farther south, in more or less alpine localities.

54. *Potentilla pulchella* R. BR.

ROBERT BROWN in: Ross: Voy. Ed. 2, 1819, p. 193.

OSTENFELD & LUNDAGER 1911, p. 28.

Localities: 5. Cape Maurer (TH. S.); 14. Nanok (S. & S.); 19.

G. SEIDENFADEN phot. 3850.

Fig. 20. *Potentilla pulchella*. About $^1/_2$ size. Locality: East coast of Hurry Inlet, Scoresby Sound. Date: c. June 15, 1933.

North of Trækpas (S. & S.); 21. Store Koldewey Island (L.!); 22. Maroussia Island (L.!); 24. Danmarkshavn (TH. S.); 24. Harefjæld (L.!); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 26. Dovebugt (L.!); 31. Ymers Nunatak (FREUCHEN); 35. North coast of C. F. Mourier Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40 a. East of Cape Amelie (TH. S.); 41. Cape St. Jacques (L.).

A northern species, which in East Greenland has its southern limit in 69°45′ N. lat. It extends around the north of Greenland, and its southernmost occurrence in West Greenland is an isolated locality in 66°56′ N. lat.

It grows mostly near the shore, and especially to the south it is associated with the outer coast. (Cf. fig. 20).

55. *Potentilla rubella* SOER.

TH. SØRENSEN in: GELTING: Medd. Gr. Bd. 101, No. 3, 1934, p. 106 ff., Pl. 1—3.

Locality: Cape Maurer (TH. S.).

The species, which is endemic to Northeast Greenland, in addition to the locality mentioned is only known from the south coast of Clavering Island. At Cape Maurer only some few specimens of it were found in a river delta; probably here, as in the localities on

G. SEIDENFADEN phot. 3851.

Fig. 21. *Potentilla rubricaulis*. About $^3/_5$ size, Locality: Cape Broer Ruys, Hold-with-Hope. Date: August 15, 1934.

Clavering Island, it occurs in greater numbers on the mountain slopes at higher levels.

56. *Potentilla rubricaulis* LEHM.[1]).

LEHMANN in: Nov. et minus cogn. Stirp. Pugillus II, Hamburg 1856, p. 11., et in: Revisio Potentillarum iconibus illustr. Breslau & Bonn 1856, p. 68.

Localities: 5. Cape Maurer (TH. S.); 38. Head of Klægbugt (TH. S.).

[1]) As it is very desirable that there should be agreement between this and previous works on the flora of Northeast Greenland (GELTING 1934, TH. SØRENSEN 1933), we retain this name, although very probably the East Greenland material is more closely related to the Asiatic *sericea* group than to the American forms belonging to the *nivea* group (in casu *P. rubricaulis*).

The *Potentilla* flora of Northeast Greenland will be treated by TH. SØRENSEN in another paper, and we shall not, therefore, discuss in greater detail here the question as to the identity of "*Potentilla rubricaulis* LEHM."

In East Greenland the species has its southern limit in the region of Scoresby Sound, at Hurry Inlet (70°50′ N. lat.). Within our area it seems to be rare. It is mainly restricted to wet, clayey and calcareous solifluction soil. The northernmost locality known is the north side of Klægbugt in latitude 77°40′ N. (Cf. fig. 21).

SALICACEAE.

57. *Salix arctica* PALL. (s. l.).

PALLAS in: Fl. Ross. II, 1790, p. 86.

KOLDEWEY I, 1874, pp. 583, 635, 639, — BUCHENAU & FOCKE 1874, p. 48, — DUC D'ORLEANS 1908, p. 8, — OSTENFELD & LUNDAGER 1911, p. 15, — J. P. KOCH 1913, p. 190, — GELTING 1934, p. 114.

Localities: 2. Cape Hamburg (KOLDEWEY, G. S.); 4. Lakseelv, Th. Thomsen Land (SCHWARK); 5. Cape Maurer (TH. S.); 6. South of Bastion Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 10. Grandjean Fjord: Maagenæs (G. S.); 11. Cape Philip Broke (P.); 13. Cape Börgen (P.); 14. Nanok (BØGVAD!, S. & S.); 15. Petersbugt (G. S.); 16a. Kildedal (JOHANSEN!); 16b. Agnetesø (JOHANSEN!); 17. Trumsø (SCHWARCK); 18. Head of Bessel Fjord (SCHWARCK); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Maroussia Island (DUC D'O.); 23. Cape Bismarck (DUC D'O.); 24. Danmarkshavn (L., TH. S.); 25. Stormkap (S. & S.); 32. Eastern parts of Dronning Louise Land (J. P. KOCH); 34. Cape Marie Valdemar (L., TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.); 42. Bjørneskær (J. P. KOCH); 44. Norske Island (G. S.).

The variability of the Greenland *Salix arctica* in its widest sense is well-known and must be presumed to be due to varying conditions of habitat and to differences in their genetic constitution. A division of the material, which would result in a confusion of hybrids and triple hybrids, would, considering our present knowledge of the nature of the "pure" species, seem unfounded and would in our opinion not serve the purpose. See also p. 157.

One of the commonest plants within our area.

58. *Salix herbacea* L.

LINNÆUS in: Sp. pl. 1753, p. 1018.

OSTENFELD & LUNDAGER 1911, p. 16.

Localities: 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 24. Danmarkshavn (one place) (L.!).

After our rather thorough investigation of Skærfjord we feel fairly certain that the species does not occur within the area, so that it can

be stated with a probability bordering on certainty that its northern limit is Danmarkshavn (76°46′ N. lat.), where it was found in a single place by LUNDAGER, but was not found again by us during our short stay there. The species extends around the south of Greenland and is found on the west coast as far north as Igdloluarsuit in Murchison Sound (77°47′ N. lat.), that is to say, in about the same latitude as on the east coast.

SAXIFRAGACEAE.

59. *Saxifraga caespitosa* L.

LINNÆUS in: Sp. pl. 1753, p. 404.

subsp. *eucaespitosa* ENGL. & IRMSCH.

ENGLER & IRMSCHER in: ENGLER's Pfanzenreich IV, 117, 1916, p. 369.

KOLDEWEY 1874, I, p. 635, — BUCHENAU & FOCKE 1874, p. 41 (sub nom. *Saxifraga caespitosa var. groenlandica*), — DUC D'ORLEANS 1908, p. 7, — OSTENFELD & LUNDAGER 1911, p. 26 (sub nom. *Saxifraga groenlandica*), — GELTING 1934, p. 119.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 8. North side of mouth of Bastian Bay (TH. S.); 11. Cape Philip Broke (P.!); 14. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 22. Maroussia Island (DUC D'O.); 23. Cape Bismarck (DUC D'O.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L.!); 28. Rypefjæld (L.!); 34. Cape Marie Valdemar (TH. S.); 35. North coast of C. F. Mourier Fjord (TH. S.); 37. Head of V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.!); 44. Norske Island (G. S.).

A circumgreenlandic species.

Within the area, in which the species is of rather frequent occurrence, but rarely in great numbers, it is represented exclusively by f. *uniflora*.

60. *Saxifraga cernua* L.

LINNÆUS in: Sp. pl. 1753, p. 403.

DUC D'ORLEANS 1908, p. 7, — OSTENFELD & LUNDAGER 1911, p. 26, — GELTING 1934, p. 120.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 23. Cape Bismarck (DUC D'O.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (L.!, TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie

(TH. S.); 40 a. East of Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.!); 43. Lambert Land (J. P. KOCH!); 44. Norske Island (G. S.).

A circumgreenlandic species, very common within the area.

61. *Saxifraga flagellaris* WILLD.

WILLDENOW in: STERNBERG: Revis. Saxifr., 1810, p. 25.

KOLDEWEY I, 1874, p. 635, — OSTENFELD & LUNDAGER 1911, p. 25, — GELTING 1934, p. 121.

G. SEIDENFADEN phot. 3868.

Fig. 22. *Saxifraga flagellaris*. About $^4/_5$ size. Locality: Cape Broer Ruys, Hold-with-Hope. Date: August 15, 1934.

Localities: 2. Cape Hamburg (G. S.); 11. Cape Philip Broke (P.); 19. North of Trækpas (S. & S.); 23. Cape Bismarck (L.!); 24. Danmarkshavn (L.!, TH. S.); 31. Ymers Nunatak (FREUCHEN); 38. Head of Klægbugt (TH. S.); 40a. East of Cape Amelie (TH. S.).

A typically northern species, found from Bontekoe Island (73°08′ N. lat.) at the east coast of Greenland, round along the north coast down to Saunders Island near Thule (76°30′ N. lat.) on the west coast.

Found in only a few localities within the area and always on calcareous soil.

62. *Saxifraga hieraciifolia*, W. & K.

WALDSTEIN & KITAIBEL in: Pl. rare Hung. I, 1802, p. 17, tab. 18.

Locality: 2. Cape Hamburg (G. S.).

This rare plant is only found on the east coast from Cape Stewart

(70°25′ N. lat.) and northward, the northernmost locality being Cape Hamburg (74°46′ N. lat.).

63. *Saxifraga Hirculus* L.

LINNÆUS in: Sp. pl. 1753, p. 402.

Locality: 2. Cape Hamburg (G. S.).

The distribution of this plant in Greenland is fairly interesting.

G. SEIDENFADEN phot. 2169.

Fig. 23. *Saxifraga Hirculus*. About ½ size. Locality: Wollaston Foreland. Date: July 31, 1931.

In East Greenland it is only found from Bontekoe Island (73°08′ N. lat.) northward to the above-mentioned place (74°46′ N. lat.), being rather common everywhere along the outer coast. In addition the species has a small area of occurrence in Northwest Greenland, having been found on Inglefield Land (cf. OSTENFELD 1925, p. 19, SIMMONS 1909) and on Saunders Island near Thule (cf. OSTENFELD 1923, p. 204). (Cf. fig. 23).

64. *Saxifraga Nathorsti* (DUSÉN) HAYEK.

A. VON HAYEK in: Monogr. Stud. Gatt. Saxifr. I. Denkschr. d. Kaiserl. Akad. d. Wissensch. Math. Nat. Kl. Bd. 77, Wien 1905, p. 661. Taf. I, fig. 22. Taf. II, fig. 17—18.

Localities: 14. Nanok (S. & S.); 15. Petersbugt (G. S.).

For the distribution, etc., of this interesting species, which is endemic to Northeast Greenland, see TH. SØRENSEN 1933, p. 77 et seq. Later the species has been found (by GELTING and TH. SØRENSEN) in the Scoresby Sound area: viz. at Vargodden, Hurry Inlet, in latitude 70°53′ N.

65. *Saxifraga nivalis* L.

LINNÆUS in: Sp. pl. 1753, p. 401.

BUCHENAU & FOCKE 1874, p. 41 (?), — DUC D'ORLEANS 1908, p. 7, — OSTENFELD & LUNDAGER 1911, p. 26, — GELTING 1934, p. 126.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 43. Lambert Land (J. P. KOCH); Norske Island (G. S.).

65a. *var. tenuis* WBG.

WAHLENBERG in: Fl. lappon. 1812, p. 114.

OSTENFELD & LUNDAGER 1911, p. 26.

Localities: 2. Cape Hamburg (G. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 34. Cape Marie Valdemar (TH. S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.); 40a. East of Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.!); 44. Norske Island (G. S.).

The species is represented by two forms, the main species and *var. tenuis*, which in their extreme forms, it is true, are exceedingly characteristic (cf. figs. 24—25), but which are often difficult to keep distinct, since intermediary forms frequently occur. Both forms are circumgreenlandic, *var. tenuis* seems to increase in frequency towards the north.

Both forms are of common occurrence within the area.

66. *Saxifraga oppositifolia* L.

LINNÆUS in: Sp. pl. 1753, p. 402.

KOLDEWEY I, 1874, pp. 493, 577, — BUCHENAU & FOCKE 1874, p. 40, — DUC D'ORLEANS 1908, p. 7 — OSTENFELD & LUNDAGER 1911, p. 25, — J. P. KOCH 1913, p. 190, — GELTING 1934, p. 128.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian

G. SEIDENFADEN phot. 3874 & 76.

Fig. 24—25. *Saxifraga nivalis* and *S. nivalis var. tenuis*. Both about nat. size. Locality: main species: East coast of Hurry Inlet, Scoresby Sound; the variety: Norske Island. Date: m. sp. June 20, 1933; var. August 15, 1933.

Bay (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 14. Nanok (BØGVAD!, S. & S.); 15. Petersbugt (G. S.); 15. near Muschelberg (KOLDEWEY); 16b. Agnetesø (JOHANSEN!); 17. Cape Oswald Heer (SCHWARCK); 18. Head of Bessel Fjord (SCHWARCK); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 23. Cape Bismarck (DUC D'O.!); 24. Danmarkshavn (L.!, TH. S.); Near 24. "6 Meilen n. v. Danmarkshavn" (KOLDEWEY); 25. Stormkap (L.!, S. & S.); 26. Lille Snenæs (L.!); 31. Ymers Nunatak (FREUCHEN!); 32. Eastern parts of Dronning Louise Land (J. P. KOCH); 34. Cape Marie Valdemar (L.!, TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 40a. East of Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O. L.!); 42. Bjørneskær (J. P. KOCH!); 43. Lambert Land (J. P. KOCH); 44. Norske Island (G. S.).

A circumgreenlandic species. Very common within the area.

67. *Saxifraga rivularis* L.

LINNÆUS in: Sp. pl. 1753, p. 404.

DUC D'ORLEANS 1908, p. 7, — OSTENFELD & LUNDAGER 1911, p. 26, — GELTING 1934, p. 129.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 20. Opposite Berg Fjord (S. & S.); 22. Maroussia Island (L.!); 24. Danmarkshavn (L.!, TH. S.); 24. Harefjæld & Varderyggen (L.!); Near 24. Renskæret (L.!); 25. Stormkap (L.!, S. & S.); 34. Cape Marie Valdemar (TH. S.); 35. North coast of C. F. Mourier Fjord (TH. S.); 37. Head of V. Clausen Fjord (TH. S.); 40. Cape Amelie (TH. S.); 40a. East of Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.); 44. Norske Island (G. S.).

The species has not hitherto been found in North Greenland. In East Greenland its northern limit is Norske Island (78°12′ N. lat.), in West Greenland it has been found northward to Rensselaer Bay, Inglefield Land (78°40′ N. lat.). Thus the species is distributed throughout the whole of Greenland except the north coast proper.

68. *Saxifraga stellaris* L.

LINNÆUS in: Sp. pl. 1753, p. 400.

var. comosa RETZ.

RETZIUS in: Fl. Scand. Prodrom. 1779, p. 79.

OSTENFELD & LUNDAGER 1911, p. 26.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of

Bastian Bay (G. S.). 14. Nanok (S. & S.); 19. North of Trækpas (S & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 34. Cape Marie Valdemar (Th. S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (Th. S.); 40. Cape Amelie (Th. S.); 40a. East of Cape Amelie (Th. S.); 42. Bjørneskær (J. P. Koch!); 44. Norske Island (G. S.).

Although the species has not been found in the small non-investigated eastern parts of North Greenland, we consider it most probable that the species has a closed northern distribution, extending from Cape Dalton (69°25′ N. lat.) on the east coast, around the north coast, and down the west coast to about 64° N. lat. (Cf. fig. 41, p. 124).

The species is of common occurrence within the area.

CAMPANULACEAE.

69. *Campanula uniflora* L.

Linnæus in: Sp. pl. 1753, p. 163.

Ostenfeld & Lundager 1911, p. 31.

Localities: 8. North side of mouth of Bastian Bay (Th. S.); 14. Nanok (S. & S.); Germanialand: here and there (L.); 24. Danmarkshavn (L.!, Th. S.); 26. Snenæs (L.!); 35. North coast of C. F. Mourier Fjord (Th. S.); 36. Theodolitskær (Th. S.); 37. Head of V. Clausen Fjord (Th. S.); 38. Head of Klægbugt (Th. S.); 40. Cape Amelie (Th. S.).

Skærfjord (77°37′ N. lat.) is the northernmost locality of the species in East Greenland. In West Greenland it has been found as far north as Inglefield Land (cf. Ostenfeld 1925, p. 20.).

COMPOSITAE.

70. *Arnica alpina* (L.) Olin.

Olin in: Dissert. Arnica. Upsala 1799, p. 11.

Ostenfeld & Lundager 1911, p. 31.

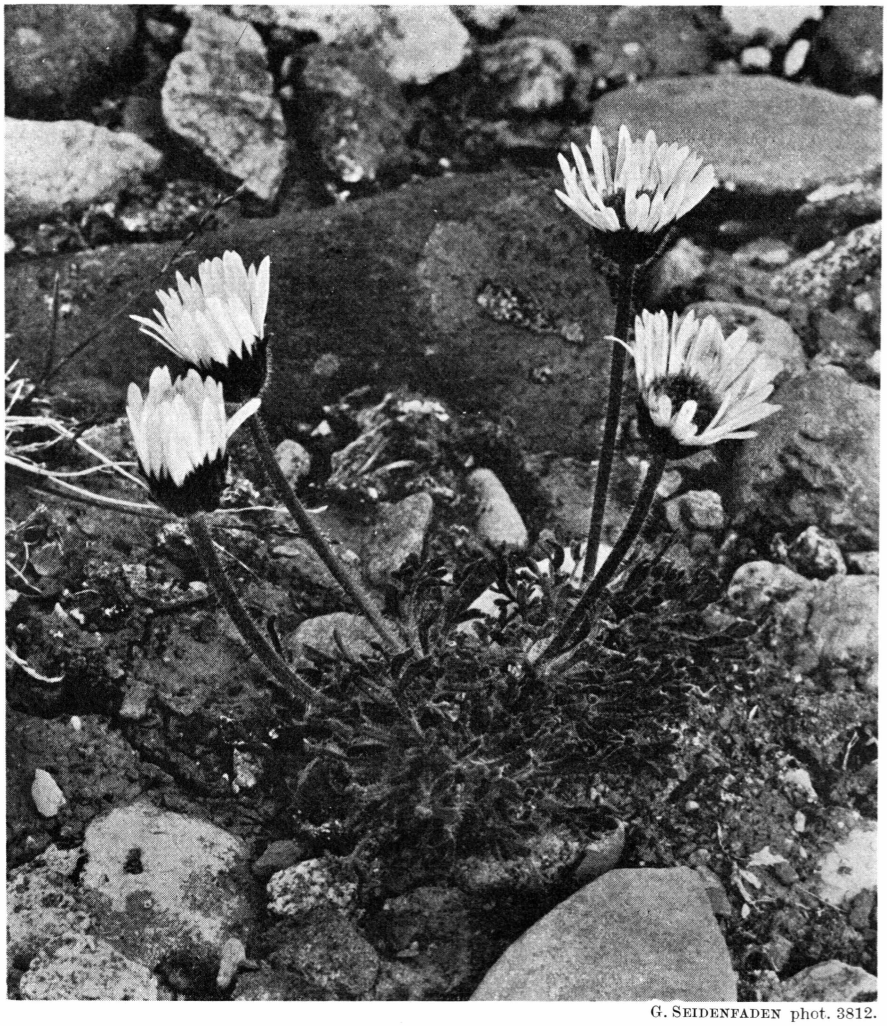
Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 24. Danmarkshavn and at "Bastionen" (L.!); 27. Hvalrosodden (L.!); 28. Fuglenæbsfjæld (L.!); 37. Head of V. Clausen Fjord (Th. S.); 40. Cape Amelie (Th. S.).

In East Greenland the northern limit of the species is Cape Amelie (77°32′ N. lat.), in West Greenland Murchison Sound (77°47′ N. lat.). Within the area it becomes rare towards the north, where it is associated with the warmest southwardly exposed habitats.

71. *Erigeron compositus* Pursh.

Pursh in: Fl. Am. Septentr. II, 1816, p. 535.

Ostenfeld & Lundager 1911, p. 31.

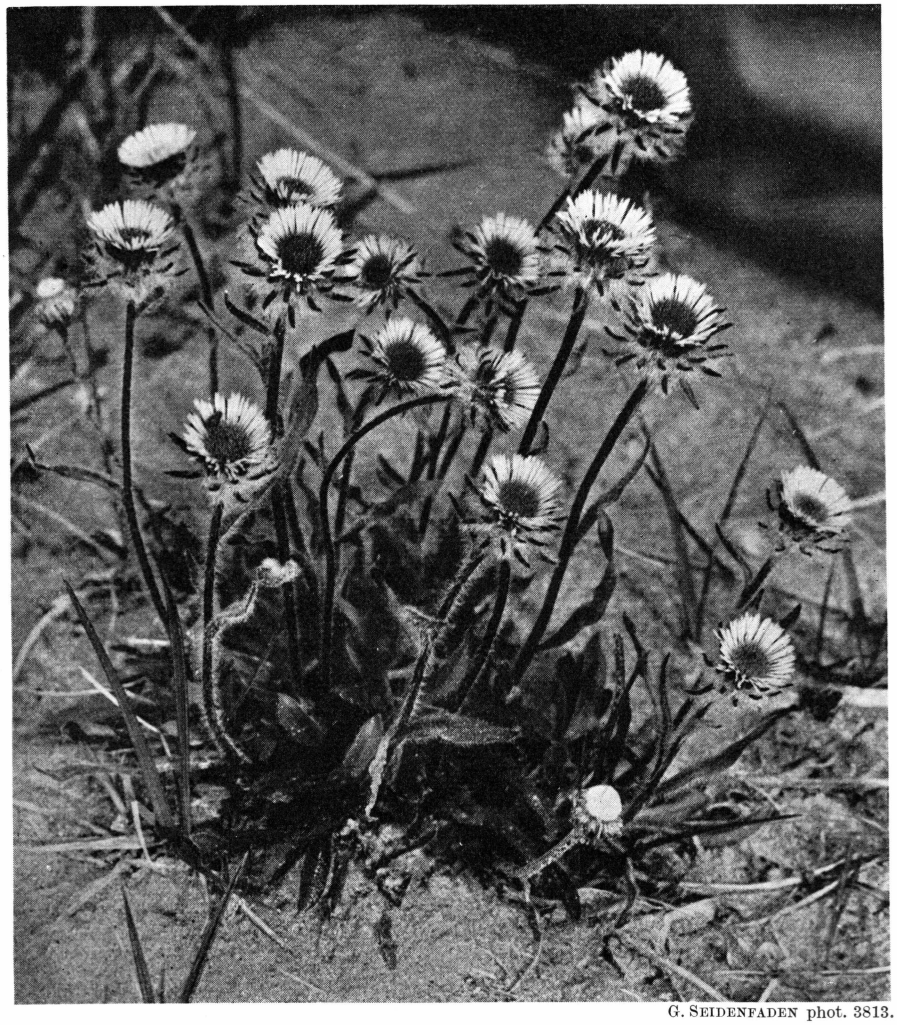


G. SEIDENFADEN phot. 3812.

Fig. 26. *Erigeron compositus*. About nat. size. Locality: Hird Bay, Clavering Island. Date: July 22, 1933.

Localities: 24. Danmarkshavn (TH. S.); 25. Stormkap (S. & S.); 26. Snenæs (L.!), Moskusoksefjælde (L.!); 35. North coast of C. F. Mourier Fjord (TH. S.); 37. Head of V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.).

A rather rare species, which has a quite peculiar distribution on the east coast. It has been found at Cape Schmelck in Independence Bay, and seems to be fairly common again in the Skærfjord complex and on Germanialand, but we failed to find it between Danmarkshavn and the Pendulum Islands. South of Scoresby Sound it has been found in a



G. SEIDENFADEN phot. 3813.

Fig. 27. *Erigeron uniflorus var. eriocephala.* About $^1/_2$ size. Locality: Granatdal, Clavering Island (GELTING 1933, Loc. 33). Date: July 19, 1933.

single place only, namely at the Morænenæsset in latitude 63°29′ N. (cf. BJØRLYKKE 1932, p. 6).

Its distribution in Greenland is indicated on the map in fig. 56, p. 194.

72. *Erigeron unalaschkensis* (DC.) VIERH.

VIERHAPPER in: Monogr. Erig., Beih. Bot. Zentr. 19, 2, 1906, p. 492.

Locality: 2. Cape Hamburg (G. S.).

Cape Hamburg is the northernmost locality recorded from East Greenland. To the south it extends towards the southernmost point of Greenland, but is rare south of Angmagssalik; on the west coast it is

found in almost the same latitudes, being alpine along the southern third of the coast.

73. *Erigeron uniflorus* L.

LINNÆUS in: Sp. pl. 1753, p. 864.

var. eriocephala (J VAHL) VIERH.

VIERHAPPER in: Monogr. Erig., Beih. Bot. Zentr. 19, 2, 1906, p. 512.

Locality: 2. Cape Hamburg (G. S.).

Erigeron eriocephalus J. VAHL cannot, apparently, be kept distinct from *Erigeron uniflorus* L., even though the extreme forms of *E. eriocephalus* exhibit a fairly characteristic appearance (cf. fig. 27). From the above-mentioned locality some few specimens, which seem to approach the main species, are at hand in addition to the fairly characteristic specimens of *E. eriocephalus*.

It is only with reservation that we designate this species as circumgreenlandic, and was it not for the one locality on the north coast of Greenland, J. P. Koch Fjord in the west coast of Peary Land, the species seems to have a distinct northern limit both in East and West Greenland, since it has not been found in North Greenland apart from the locality mentioned (TH. WULFF, cf. OSTENFELD 1923, p. 242). Nor has it been found in Northwest Greenland north of 77°40′ N. lat. and we did not observe it north of Cape Hamburg (74°46′ N. lat.).

A northern distribution of *Erigeron uniflorus*, more especially of *var. eriocephala* rather than *E. unalaschkensis*, seems to be in good agreement with the ecology of the two species, since, judging from observations made in more southerly areas, *Erigeron eriocephalus* is not by far so strictly associated with sheltered herb slopes, but occurs in far more exposed places than *E. unalaschkensis*.

74. *Taraxacum arcticum* (TRAUTV.) DAHLST.

DAHLSTEDT in: Ark. f. Botan. Stockholm, IV, 1905, No. 8, p. 8.

DUC D'ORLEANS 1908, p. 8 (sub nom. *T. arcticum*), — OSTENFELD & LUNDAGER 1911, p. 32 (sub nom. *T. arcticum* and *f. albiflora*), — GELTING 1934, p. 139.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 22. Maroussia Island (DUC D'O.); Germanialand: rather common (L.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L.!); 37. Head of V. Clausen Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.!).

Ostenfeld & Lundager (l. c. p. 32) states that in the material of the Danmark-Expedition both the main species, with yellow flowers, and the variety, with white flowers, were represented. We have looked through the material kept in the Herbarium of Copenhagen, but found no specimens with yellow flowers; this did not surprise us, since during our botanical work of several summers in East Greenland we have been unable to find such plants. We therefore consider it a fact that *Taraxacum arcticum* in East Greenland has white flowers. (Dahlstedt's (l. c.) statement as to the colour of the flowers is very obscure, and it would seem probable that within the Eurasiatic part of its area of distribution, too, *Taraxacum arcticum* has white flowers, at any rate in a living state, and that *Taraxacum phymatocarpum f. albiflora* Kjellman (*Taraxacum arcticum f. albiflora* (Kjellm.) Dahlst.) is simply a synonym of *Taraxacum arcticum* (Trautv.) Dahlst.

The species is a distinctly northeastern species in Greenland, extending along the north coast to about 50° W. long. (Wulff Land) and in East Greenland southward to 70°20′ N. lat.

75. *Taraxacum phymatocarpum* J. Vahl.

Jens Vahl in: Flor. dan. XIII, fasc. 39, 1840, p. 6, Tab. 2298.

Buchenau & Focke 1874, p. 43, — Ostenfeld & Lundager 1911, p. 32.

Localities: 5. Cape Maurer (Th. S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.); 26. Snenæs (L.!); 28. Rypefjæld (L.!); 35. North coast of C. F. Mourier Fjord (Th. S.); 36. Theodolitskær (Th. S.); 38. Head of Klægbugt (Th. S.); 39. North side of Klægbugt (Th. S.); 40. Cape Amelie (Th. S.).

A typical northern species, which extends around the north of Greenland and in East Greenland has its southern limit in the Scoresby Sound area. It is of common occurrence within the area. In the Skærfjord complex it seems to be more abundantly represented than *T. arcticum*, especially in markedly calcareous localities.

76. *Taraxacum pumilum* Dahlst.

Dahlstedt in: Arkiv f. Botan. Stockholm, IV, No. 8, 1905, p. 27.

Locality: 39. North side of Klægbugt (77°40′ N. lat.) (Th. S.).

A typically northwestern species, which outside Greenland is known from a few localities only in the northernmost parts of the Canadian Archipelago. From Greenland it was formerly recorded only from Gunnar Andersson Valley, Wulff Land (82°28′ N. lat., c. 49°30′ W. long.). Cf. the map fig. 51, p. 187, on which two localities in Ellesmere Land are also indicated; some few other localities are found farther towards the west.

In the new locality in the Skærfjord area only a single small colony was found at the foot of a southwardly exposed mountain wall, where it grew in company with *Cystopteris fragilis*, *Potentilla nivea*, *Erigeron compositus*, and *Trisetum spicatum*. Here it was in a flowering stage on August 13, 1933, and both by the colour of its flowers (bright yellow, in contrast to the white flowers of *T. arcticum* and the sordid-yellow ones of *T. phymatocarpum*) and by its habitus it differed conspicuously from the other *Taraxaca* of the area. By its inclination to form dense, many-headed tufts it bears greater resemblance to *T. phymatocarpum* than to *T. arcticum*, but is otherwise distinctly separated from the latter also, and we do not agree with FERNALD (1933, p. 373) in his supposition that *T. pumilum* (and *T. hyparcticum*) are inseparable from *T. phymatocarpum*.

EMPETRACEAE.

77. *Empetrum nigrum* L.

LINNÆUS in: Sp. pl. 1753, p. 1022.

var. hermaphrodita (LGE.)[1])

LANGE in: Consp. Flor. Groenl. 1880, p. 18.

BUCHENAU & FOCKE 1874, p. 45, — OSTENFELD & LUNDAGER 1911, p. 29.

Localities: 1. Kuhn Island (KOLDEWEY!); 8. North side of mouth of Bastian Bay (TH. S.); 24. Danmarkshavn (L.!); 25. Stormkap (L.!).

As the species was not found in any of the places visited in the Skærfjord area, though it was eagerly searched for, it most probably has its northern limit in East Greenland on Germania Land. It seems, however, to be rather rare; neither at Stormkap nor at Danmarkshavn was it found during our short visits in 1933.

ERICACEAE.

78. *Cassiope tetragona* (L.) D. DON.

D. DON in: Edinbg. New Philos. Journ. 1834, p. 157.

KOLDEWEY I 1874, pp. 327, 358, 567, 574, 582, 639 (sub nom. *Andromeda tetragona*), — BUCHENAU & FOCKE 1874, p. 44 (sub nom. *Andromeda tetragona*), — DUC D'ORLEANS 1908, p. 29, — OSTENFELD & LUNDAGER 1911, p. 29, — GELTING 1934, p. 147.

Localities: 1. South of Mt. Schwarze Wand (KOLDEWEY); 2. Cape Hamburg (KOLDEWEY, G. S.); 3. West coast of Kuhn Island (BACKLUND); 4. Lakseelv, Th. Thomsen Land (SCHWARCK); 5. Cape Maurer (KOLDEWEY); 7. South side of mouth of Bastian Bay (G. S.); 8. North

[1]) Cf. O HAGERUP, Dansk Bot. Arkiv 5, 2, 1927.

side of mouth of Bastian Bay (Th. S.); N. of 8. Cape Bremen (Koldewey) Ab. 12. Shannon (Koldewey!); 9. Head of Bastian Bay (G. S.); 13. Cape Börgen (P.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16b. Agnetesø (Johansen!); 20. Opposite Berg Fjord (S. & S.); 23. Cape Bismarck (Duc d'O.!); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 26. Dovebugt (L.!); 27. Hvalrosodden (L.!); 28. Rypefjæld (L.!); 34. Cape Marie Valdemar (L.!, Th. S.); Skærfjord: all localities (35—39) (Th. S.); 40. Cape Amelie (Th. S.); 44. Norske Island (G. S.).

A northern species, common from Angmagssalik (66°05′ N. lat.) around the north coast and down the west coast to about 64° N. lat. (cf. the map in Bøcher 1933, p. 49, and the discussion of the distribution by Porsild 1935, p. 71).

79. *Rhododendron lapponicum* (L.) Wbg.

Wahlenberg in: Fl. Suec. 1824, p. 249.

Buchenau & Focke 1874, p. 45, — Ostenfeld & Lundager 1911, p. 30, — Gelting 1934, p. 140.

Localities: 1. Kuhn Island (Koldewey); 2. Cape Hamburg (G. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 14. Nanok (S. & S.); 16b. Agnetesø (Johansen!); Germanialand: only in the interior: 26. Moskusoksefjælde (L.!); 27. Hvalrosodden (L.!); 28. Rypefjæld, Fuglenæbsfjæld, Pustervig (L.!); Skærfjord: only in the interior: 35. North coast of C. F. Mourier Fjord (Th. S.); 37. Head of V. Clausen Fjord (Th. S.); 38. Head of Klægbugt (Th. S.).

In these parts of East Greenland the plant seems mainly to be restricted to the interior of the fjords, the northernmost locality being situated in latitude 77°37′ N. In West Greenland the species has been found northward to Advance Bay, Inglefield Land (79°07′ N. lat.).

Within our area the species becomes distinctly less frequent towards the north, where it is limited to the most favourable southwardly exposed slopes.

80. *Vaccinium uliginosum* L.

Linnæus in: Sp. pl. 1753, p. 350.

Buchenau & Focke 1874, p. 44, — Ostenfeld & Lundager 1911, p. 30, — Gelting 1934, p. 149.

Localities: 2. Cape Hamburg (G. S.); 3. West coast of Kuhn Island (Backlund); 4. Lakseelv, Th. Thomsen Land (Schwarck); 5. Cape Maurer (Th. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 10. Grandjean Fjord (G. S.); 14. Nanok (S. & S.); 16b. Agnetesø (Johansen!); 20. Opposite Berg Fjord (S. & S.); From 24. Danmarkshavn landward to Dovebugt (L.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.);

Skærfjord all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.).

Skærfjord (77°40′ N. lat.) is the northernmost locality of the species in East Greenland. In West Greenland it has been found northward to about 79°10′ N. lat. Cf. the map in fig. 59, p. 197.

PLUMBAGINACEAE.

81. *Armeria vulgaris* WILLD.

WILLDENOW in: Enum. plant. Hort. Berol. 1809, p. 333.

var. sibirica (TURCZ.) ROSENV.

ROSENVINGE in: Andet Till. t. Grønl. Fanerog. og Karkrypt., Medd. Gr. Bd. 3,3. 1892, p. 683.

OSTENFELD & LUNDAGER 1911, p. 30 (sub nom. *Statice armeria* L., *var. sibirica* (TURCZ.) ROSENV.), — GELTING 1934, p. 157.

Localities: 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L.!); 29. Between Sælsø and Annexsø (FREUCHEN!); 35. North coast of C. F. Mourier Fjord (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.).

Found along the whole coast of Greenland except the southern part of East Greenland (cf. SEIDENFADEN 1933, p. 79) and the western parts of North Greenland.

Of occasional occurrence within the area.

POLEMONIACEAE.

82. *Polemonium boreale* ADAMS.

ADAMS in: Mem. Soc. natur. de Moscou, V, 1817, p. 92.

Locality: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.).

In Greenland this interesting plant has only been found in a very small area along the east coast, between Knudshoved (73°42′ N. lat.) and Cape Maurer (74°52′ N. lat.) mentioned above. Within this area, however, it is rather common along the outer coast (cf. fig. 28).

PRIMULACEAE.

83. *Primula sp.* (*nov.*?).

Locality: 16 b. Western end of Agnetesø, Nørlund Land (JOHANSEN!).

This interesting material, which was kindly placed at our disposal, consists of a collection of scapes with umbels carrying mature and semimature capsules. The plant seems to be referable with some degree of certainty to the group *Vernales* PAX (PAX & KNUTH 1905), which is all the more surprising, since this group is purely eurasiatic without

G. SEIDENFADEN phot. 3846.

Fig. 28. *Polemonium boreale*. About $^1/_2$ size. Locality: Hird Bay, Clavering Island (GELTING 1934, Loc. 17). Date: July 22, 1933.

actual arctic occurrences. It has been impossible to identify the material with any known form, for which reason we assumes it to be a new species. It is to be hoped that the seed will germinate, so that we may be able to see a whole living plant. We take the opportunity to express to T. JOHANSEN our cordial thanks for the very interesting material.

SCROPHULARIACEAE.

84. *Pedicularis flammea* L.

LINNÆUS in: Sp. pl. 1753, p. 609.

OSTENFELD & LUNDAGER 1911, p. 31.

Localities: 2. Cape Hamburg (G. S.); 28. Rypefjæld in the inner part of Dovebugt (L.!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.).

In the northern part of our area the species has only been found in the interior of the fjords, and presumably it has its northern limit in Skærfjord (77°40′ N. lat.). From this place it extends round the south coast of Greenland and up the west coast to about 76° N. lat.

Of somewhat local and freakish occurrence, being associated with calcareous soil.

85. *Pedicularis hirsuta* L.

LINNÆUS in: Sp. pl. 1753, p. 609.

KOLDEWEY I, 1874, pp. 637, 639, — BUCHENAU & FOCKE 1874, p. 46, — DUC D'ORLEANS 1908, p. 7, — OSTENFELD & LUNDAGER 1911, p. 31, — GELTING 1934, p. 156.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 12. Cape Pansch (KOLDEWEY); 13. Cape Börgen (KOLDEWEY); 14. Nanok (BØGVAD!, S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); Near 21. Lille Koldewey Island (THOSTRUP!); 22. MaroussiaIsland (DUC D'O., L.!); 23. Cape Bismarck (DUC D'O.!); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 27. Hvalrosodden (L.!); 29. Between Sælsø and Annexsø (FREUCHEN!); 34. Cape Marie Valdemar (TH. S.); Skærfjord: all localities (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.); 42. Bjørneskær (J. P. KOCH!).

A northern species, extending from Angmagssalik on the east coast of Greenland, around the north coast and down the west coast to about 64° N. lat.

One of the commonest species within the area.

MONOCOTYLEDONES.

CYPERACEAE.

86. *Carex aquatilis* WBG.

WAHLENBERG in: Kungl. Sv. Vet. Akad. Handl. 24, 1803, p. 165.

var. stans (DREJ.) BOOTT[1]).

BOOTT in: Illustr. IV, 1867, tab. 544, 545 fig. 2.

Localities: 24. Danmarkshavn (TH. S.); 25. Stormkap (S. & S.); 28. Rypefjæld (L.!); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40 a. East of Cape Amelie (TH. S.).

Carex aquatilis var. stans has not hitherto been recorded from East Greenland. OSTENFELD & LUNDAGER (l. c. p. 10) states, however, that the collections of *C. rigida* are "in several respects different from the type and resemble *C. aquatilis v. stans*".

As the rhizome, which undoubtedly represents the most distinct point of difference between *C. aquatilis v. stans* and *C. rigida*, is lacking in the specimens mentioned, it is understandable that OSTENFELD did not dare to record the species for the area on the basis of this single find. In the two localities in Klægbugt, Skærfjord, TH. SØRENSEN

[1]) Cf. the foot-note p. 162.

found growths of typical specimens quite identical with those known from Northwest Greenland.

The specimens from the other localities are of a peculiar low-growing type, which both in regard to habitat and in certain morphological characters resembles *Carex subspathacea*. At Danmarkshavn and Stormkap our plant forms growths mixed with that species or *C. rigida* or both of these species, on wet, sandy or clayey areas near the shore. Owing to the particular characteristic hue which each species lends to the sward, they were all conspicuously different even from a distance.

In addition the species was observed by TH. SØRENSEN in 1933 at Cape Hooker, Scoresby Sound, here, too, growing on a sandy shore in company with *Carex subspathacea*.

On the basis of an inspection of the Greenland *Carex* material kept in the Botanical Museum of Copenhagen we can add the following localities for East Greenland:

Grønnedal, Clavering Island, 74°15′ N. lat., leg. SEIDENFADEN 1930 (No. 749). Published by SEIDENFADEN and subsequently by GELTING as *C. rigida*.

Tasiusak, 65°37′ N. lat., leg. KRUUSE, also published by KRUUSE (1905, p. 275) as *Carex rigida*.

The low *Carex* form described here, which seems rather to be referable to *C. aquatilis*, should possibly be regarded as a special variety, all the more so since it does not seem to occur in West Greenland.

C. aquatilis v. stans is a northern species in Greenland, being known from some few localities on the north coast of Greenland (OSTENFELD 1923, 1925) and Thule (76°30′ N. lat.) in Northwest Greenland; between this place and Nugsuak Peninsula (about 70°50′ N. lat.) no locality is recorded from the west coast. Judging from herbarium material it seems to be common within a small area from Nugsuak Peninsula to 68° N. lat., its southern limit being thus Okatorssuit in latitude 68°15′ N.

87. *Carex atrofusca* SCHK.

SCHKUHR in: Beschr. u. Abbild. bek. u. nicht beschr. Arten von Riedgr. No. 90, Wittenberg 1801, p. 106, tab. 284 Y, No. 82.

Localities: 2. Cape Hamburg (G. S.); 7. South side of mouth of Bastian Bay (G. S.); 14. Nanok (S. & S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.).

This interesting species is restricted to the middle part of the east and the west coasts. In East Greenland it is found between Cape Stewart (70°25′ N. lat.) and Skærfjord (77°40′ N. lat.), in West Greenland from 69° N. lat. to Thule (cf. GELTING 1934, p. 158).

The species is a calciphilous plant and accordingly occurs sporadically within the district. — Cf. fig. 29, p. 81.

88. *Carex capillaris* L.

LINNÆUS in: Sp. pl. 1753, p. 977.

GELTING 1934, p. 159.

Localities: 2. Cape Hamburg (G. S.); 4. Lakseelv, Th. Thomsen Land (SCHWARCK); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 16a. Kildedal (JOHANSEN!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.).

Previously *Carex capillaris* was only known as far north as the southernmost part of our area. It proved, however, to be fairly common in the area of Skærfjord, its northernmost locality being in 77°40′ N. lat., but here always in the most favourably exposed places. In Northwest Greenland it is known as far north as 79°10′ N. lat. Thus the species seems to be absent only from the north coast proper and the northernmost part of the east coast, where, however, the botanical investigations made are very deficient.

89. *Carex incurva* LIGHTF.

(*Carex maritima* GUNN. cf. p. 162).

LIGHTFOOT in: Fl. scot. II, 1777, p. 544, tab. 24.

OSTENFELD & LUNDAGER 1911, p. 10, — GELTING 1934, p. 160.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (TH. S.); 25. Stormkap (S. & S.); 28. Rypefjæld (L.!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.).

Occurs along the whole west coast as far as Washington Land; on the east coast only between Scoresby Sound and Skærfjord.

The species is of common occurrence within our area, not least in the northernmost parts (the Skærfjord complex).

90. *Carex misandra* R. BR.

ROBERT BROWN in: Chloris Melvilliana, App. Parry Voy. Disc. 1823, p. 283.

OSTENFELD & LUNDAGER 1911, p. 10, — GELTING 1934, p. 165.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 24. Danmarkshavn (L.!, TH. S.);

G. SEIDENFADEN phot. 3781.

Fig. 29. *Carex atrofusca*. About $^1/_2$ size. Locality: At the lake behind the station on Ella Island. Date: Aug. 1, 1933.

25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 42. Bjørneskær (J. P. KOCH!); 44. Norske Island (G. S.).

The fact that the species has not been found in the eastern parts of North Greenland is probably due to the deficient investigation. We regard the species as a northern species, ranging from Angmagssalik on the east coast, round the north coast, and down the west coast to about 66° N. lat.

Very common within our area. Cf. the map in fig. 57, p. 195.

91. *Carex nardina* FR.

ELIAS FRIES in: Nov. Mant. II, 1839, p. 55.

OSTENFELD & LUNDAGER 1911, p. 9, — GELTING 1934, p. 166.

Localities: 2. Cape Hamburg (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16b. Agnetesø (JOHANSEN!); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Dovebugt (L.!); 27. Hvalrosodden (L.!); 31. Ymers Nunatak (FREUCHEN); 34. Cape Marie Valdemar (L.!,TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 44.Norske Island (G. S.).

A circumgreenlandic species, though rather rare to the south, especially to the southeast (cf. SEIDENFADEN 1933, p. 83). It is very common within our area.

92. *Carex pedata* WBG.

WAHLENBERG in: Flora lappon. 1812, p. 239.

Locality: 8. North side of the mouth of Bastian Bay (TH. S.).

The species seems to be very rare in our district. It has not been found north of the above-mentioned locality (74°58′ N. lat.). Probably it has its northern limits on Kuhn Island, where only a few, very small, specimens were observed. Towards the south it has been found in several places as far as Langø (67°05′ N. lat.) (KRUUSE 1905, p. 196).

On the west coast it has a similar distribution, not having been found north of Melville Bay.

In the regions south of our area it is only common locally, associated as it is with calcareous localities, chiefly in the inner fjords.

93. *Carex rigida* GOOD.

(*Carex concolor* R. BR., cf. p. 163).[1])

GOODENOUGH in: Transact. Linn. Soc. II, 1794, p. 193, tab. 22.

OSTENFELD & LUNDAGER 1911, p. 10.

Localities: 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 20. Danmarkshavn (TH. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.); 28. Moskusoksefjælde (L.); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.).

[1]) Cf. the foot-note p. 163.

The species has not been found in North Greenland, its northernmost locality in West Greenland being Thule (cf. OSTENFELD 1923, p. 195). In East Greenland its northern limit is for the time being the north side of Klægbugt (77°40′ N. lat.).

The species is fairly common throughout the area, but seems to be less frequent along the outer coast.

94. *Carex rupestris* ALL.

ALLIONI in: Flora Pedemontana II, 1785, p. 264, tab. 92, fig. 1.

OSTENFELD & LUNDAGER 1911, p. 9, — GELTING 1934, p. 171.

Localities: 4. Lakseelv, Th. Thomsen Land (SCHWARCK); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 16. Head of Bessel Fjord (SCHWARCK); 16b. Agnetesø (JOHANSEN!); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 34. Cape Marie Valdemar (TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 44. Norske Island (G. S.).

In East Greenland the species has been found from Angmagssalik (65°56′ N. lat.) to Norske Island (78°12′ N. lat.), in West Greenland in almost the same latitudes.

The species is of common occurrence in the district.

95. *Carex saxatilis* L.

LINNÆUS in: Sp. pl. 1753, p. 976.

OSTENFELD & LUNDAGER 1911, p. 11 (sub nom. *Carex pulla)*.

Localities: 5. Cape Maurer (TH. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 24. Danmarkshavn and landward around 26. Dovebugt (L.); 24. Danmarkshavn (TH. S.); 25. Stormkap (S. & S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.).

TH. SØRENSEN has previously (1933, p. 122) pointed out that *Carex saxatilis* L. and *C. rotundata* WBG. in Greenland cannot be kept distinct. This view was all the more justified, since a comparison between the Greenland material of "*Carex rotundata*" and specimens from Scandinavia has shown that all previous records of *C. rotundata* from Greenland must be due to a mistake, since they concern *Carex saxatilis*. The confusion is possibly due to the fact that *C. saxatilis* in Greenland often occurs in a particularly tall, narrow-leaved form, "*Carex rotundata var. elatior* LGE" (LANGE Conspectus Flora Groenlandica 1880, p. 152, Fl. Dan. 1883, Tab. MMMXLIX), which should rightly be referred to *Carex saxatilis*.

Thus in Greenland *Carex saxatilis* is distributed from the south point along both the east and the west coast, on the west coast having

its northern limit at Thule (76°30′ N. lat.), on the east coast on the north side of Klægbugt (77°40′ N. lat.).

The species is distributed throughout our area, though somewhat locally, being apparently associated with calcareous soil. It is most frequent in the inner fjords.

96. *Carex subspathacea* WORMSKJ.

WORMSKJOLD in: Flor. Danica, fasc. 26, 1816, p. 4, tab. 1530.

OSTENFELD & LUNDAGER 1911, p. 10 (sub nom. *Carex salina* WAHLENB. *var. subspathacea* (WORMSKJ.) TUCKERM.).

Localities: 5. Cape Maurer (TH. S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn, "in only one place" (L.!); 24. Danmarkshavn (TH. S.); 25. Stormkap (S. & S.).

As the species was not found in the localities in Skærfjord despite eager search, we regard it as most probable that it has its northern limit on the south coast of Germania Land (about 76°50′ N. lat.). Moreover it extends around the south of Greenland and up the west coast to near Nugsuak.

The species grows on sandy and clayey soil near the shore and at shore lagoons, sometimes in company with *Carex aquatilis var. stans*. In more northerly parts the latter species seems to replace *Carex subspathacea* to some extent.

97. *Carex supina* WBG.

WAHLENBERG in: Kungl. Sv. Vet. Akad. Handl. 24, 1803, p. 158.

Localities: Skærfjord: 35. North coast of C. F. Mourier Fjord (TH. S.); 37. Head of V. Clausen Fjord (TH. S.).

It is interesting that this species, which was previously believed to have its northern limit at Cape Giesecke, 74°30′ N. l. (cf. GELTING 1933, p. 177[1]), has now been found in the inner ramifications of Skærfjord, whereas it was not found in the localities visited by us along the intermediate stretch of the coast. On considering the further occurrences of the species in East Greenland, one will obtain a good idea of the peculiar distribution of this very continental species (cf. STEFFENS 1925, p. 12). In Southeast Greenland the species has only been found in the inner ramifications of the Angmagssalik fjord complex (KRUUSE 1905, p. 275), in Scoresby Sound in the inner parts only (l. c. p. 196), in the Franz Joseph Fjord area it is common in the interior and occurs here and there in the outer fjord ramifications, especially above 200 m. altitude (cf. TH. SØRENSEN 1933, p. 124), in the Eskimonæs area only in the outer fjords and in the inner fjords (cf. GELTING 1934, p. 176). South of Angmagssalik, where large fjord complexes are almost absent, the species has not yet been found (cf. SEIDENFADEN 1933, p. 100).

[1]) This locality is situated on Payer Land, not on Wollaston Foreland, as stated by GELTING (l. c.).

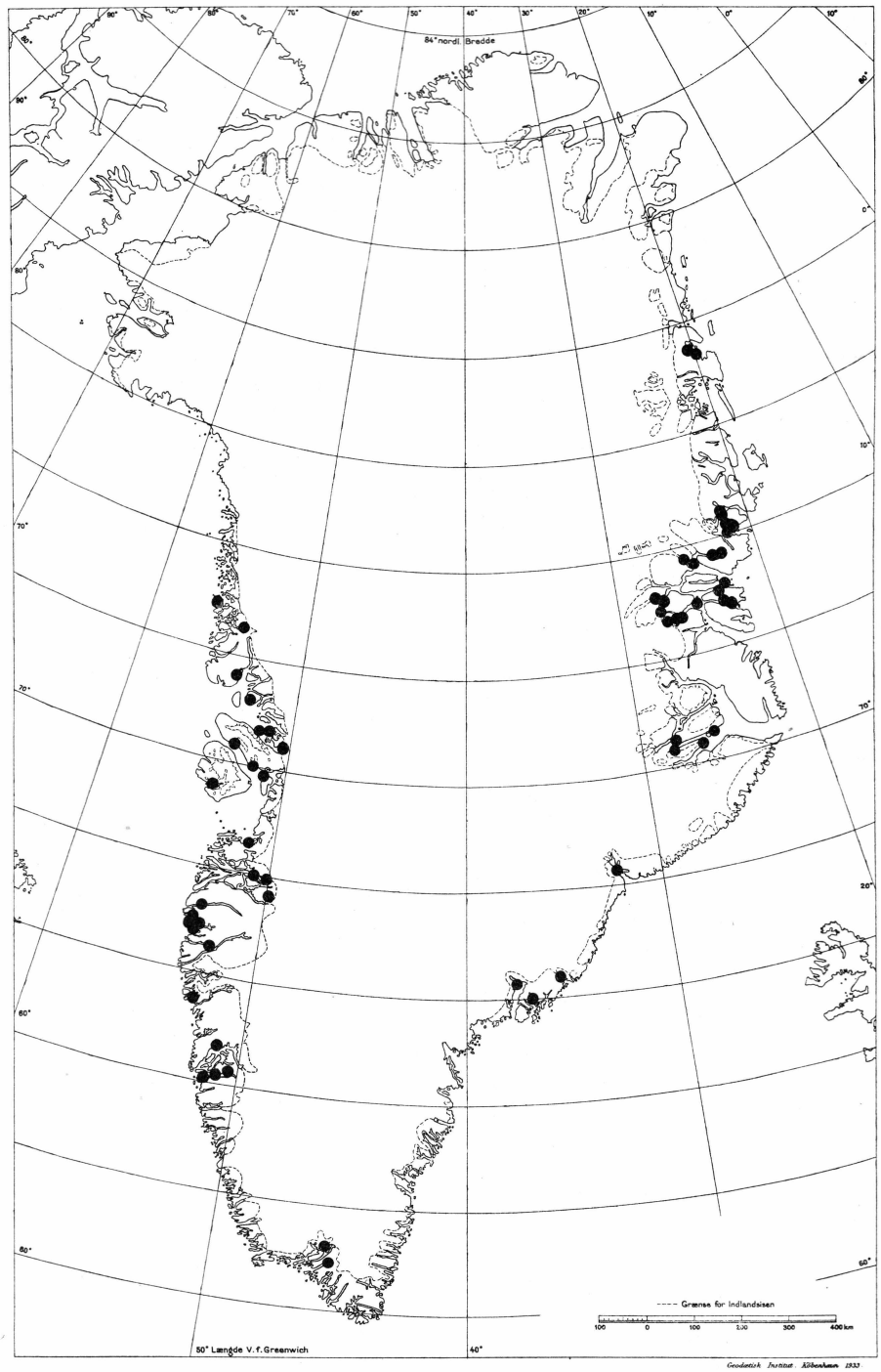


Fig. 30. The distribution in Greenland of *Carex supina* WBG.
(Mapped in February, 1937).

In West Greenland the species has not been found north of about 72°30′ N. lat. Cf. the map in fig. 30.

98. *Carex ursina* DEW.

DEWEY in: Caricography. Amer. Journ. of Sc. and Arts 1826, Appendix ibid. 1835, p. 240.

Localities: 5. Cape Maurer (TH. S.); 25. Stormkap (S. & S.).

The species has not previously been found north of Sabine Island (cf. GELTING 1934, p. 177). As it was not found in Skærfjord, we assume that its northern limit must be the south coast of Germania Land, where it must be rather rare, having quite escaped the attention of LUNDAGER.

The area of the species in East Greenland is rather limited, its southern limit being Dunholm near Turner Sound in about 69°55′ N. lat. (cf. KRUUSE 1905, p. 192). In West Greenland the area is nearly the same, but the species has not been found north of Nugsuak Peninsula and it extends farther south than on the east coast.

At Stormkap the species was found both at the shore (small and sterile individuals) and away from the coast near a small shallow-watered lake, where the specimens were larger and abundantly fructifying.

99. *Kobresia bipartita* (ALL.) DALLA TORRE.

DALLA TORRE in: Anleit. Best. Alpenpflanz. 1882, p. 330.

OSTENFELD & LUNDAGER 1911, p. 9, — GELTING 1934, p. 178.

Localities: 2. Cape Hamburg (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); Skærfjord all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.).

In East Greenland the species is limited to the areas between Scoresby Sound and Skærfjord. In West Greenland it extends farther south, but has not been found north of Melville Bay.

Occurs locally and in patches, nearly always in company with *Carex atrofusca*. Most frequently the species forms less vigorous and much lower tufts than in more southerly regions.

100. *Elyna Bellardii* (ALL.) K. KOCH.

K. KOCH in: Linnæa, 21, 1848, p. 616.

OSTENFELD & LUNDAGER 1911, p. 9 (sub nom. *Cobresia Bellardi* (ALL.) DEGLAND.), — GELTING 1934, p. 178.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 16. Cape Oswald Heer (SCHWARCK); 16b. Agnetesø (JOHANSEN!); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.); 44. Norske Island (G. S.).

Even though the species hat not yet been found in the little investigated areas in the eastern parts of North Greenland, we consider it most probable that the species is circumgreenlandic, though as a continental species it has only been found in the inner parts of the large fjords of Southeast Greenland. A map showing the distribution in Green-

G. SEIDENFADEN phot. 3815.

Fig. 31. *Eriophorum callitrix*. About $^2/_3$ size. Locality: Cape Oswald, Ella Island. Date: Aug. 1, 1933.

land was given by SEIDENFADEN (1933, p. 103); to this must now be added the twelve new localities in our area.

The species was found to be well developed in the fjords within our area, while it was absent from the most exposed localities along the outer coast.

101. *Eriophorum callitrix* CHAM.

CHAMISSO in: C. A. MEYER: Mem. Sav. Etrang. Petersbg. 1, 1831, p. 203.

Localities: 8. North side of mouth of Bastian Bay (TH. S.); 39. North side of Klægbugt (TH S.).

In a paper dealing exclusively with this species (SEIDENFADEN & SØRENSEN 1933) we have given a map of the localities of the species in East Greenland at that time. Since the paper was written, the species has been found in several other places, thus, apart from the two mentioned above, by GELTING (1934, p. 180) in five localities round the interior of Tyrolerfjord and Copeland Fjord, further at Røjevand on the north-west coast of Loch Fyne, and in two localities on the eastern part of the south coast of Clavering Island. Finally, in 1933, GELTING, SEIDENFADEN, and SØRENSEN found the species in two localities in Scoresby Sound, viz. Cape Stewart and the head of Hurry Inlet.

When we published our paper in 1933, we had no photograph of the species in its habitat; such a photograph is therefore given here, although it was not taken within the area treated here (fig. 31).

In our two localities the species was fairly abundant and fructifying.

102. *Eriophorum polystachyum* L.

LINNÆUS in: Sp. pl. 1753, p. 52.

var. tristis TH. FR.

TH. M. FRIES in: Övers. Kungl. Sv. Vet. Akad. Förhandl. 26. Årg. 1869, Stockholm 1870, p. 135.

OSTENFELD & LUNDAGER 1911, p. 9, — GELTING 1934, p. 180.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (TH. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 10. Grandjean Fjord: Maagenæs (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 20. Opposite Berg Fjord (S. & S.); Germanialand: very common (L.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L.!); 28. Rypefjæld (L.!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.).

Besides these, KOLDEWEY mentions (1874 I, p. 639) an *Eriophorum* from Cape Börgen on Shannon Island; he states no further particulars, but most probably it is this species.

As to the distribution in Greenland of the variety and the main species, cf. p. 164 and the map in SEIDENFADEN (1933, p. 104).

103. *Eriophorum Scheuchzeri* HOPPE.

HOPPE in: Bot. Taschenb. 1800, p. 104.

OSTENFELD & LUNDAGER 1911, p. 8, — GELTING 1934, p. 181.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 20. Opposite Berg Fjord (S. & S.); Germanialand: "common" (L.); 24. Danmarks-

havn (L.!, Th. S.); 25. Stormkap (S. & S.); 28. Rypefjæld (L.!); 37. Head of V. Clausen Fjord (Th. S.); 38. Head of Klægbugt (Th. S.); 39. North side of Klægbugt (Th. S.); 40. Cape Amelie (Th. S.).

A circumgreenlandic species.

The species seems to be a little sparser within our area than immediately south of it.

GRAMINEAE.

104. *Alopecurus alpinus* Sm.

Smith in: Fl. Brit. 3, 1829, p. 1386.

Duc d'Orleans 1908, p. 9, — Ostenfeld & Lundager 1911, p. 11, — Gelting 1934, p. 183.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of Bastian Bay (Th. S.); 9. Head of Bastian Bay (Th. S.); 14. Nanok (Bøgvad!, S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); Germanialand: "very common" (L.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.); 26. Dovebugt (L.!); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (Th. S.); Skærfjord: all localities (35—39) (Th. S.); 40. Cape Amelie (Th. S.); 41. Cape St. Jacques (Duc d'O.!); 42. Bjørneskær (J. P. Koch); 43. Lambert Land (J. P. Koch).

A northern species, found along the north coast and down the east coast to Turner Sound (69°45′ N. lat.) (cf. Kruuse 1904, p. 196), on the west coast southward to Holstensborg (67°00′ N. lat.).

Very common everywhere within the area, apparently increasingly common northward.

105. *Arctagrostis latifolia* (R. Br.) Griseb.

Grisebach in: Ledebour Fl. Ross. IV, 1853, p. 434.

Ostenfeld & Lundager 1911, p. 13, — Gelting 1934, p. 184.

Localities: 2. Cape Hamburg (G. S.); 4. Lakseelv, Th. Thomsen Land (Schwarck); 5. Cape Maurer (Th. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16a. Kildedal (Johansen!); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); Germanialand: "common" (L.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (L.!, Th. S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (Th. S.); 40. Cape Amelie (Th. S.).

In East Greenland the species extends from Scoresby Sound to Cape Amelie; on the west coast it has been found northward from Disko;

further it occurs in the western parts of North Greenland, probably the species extends around the whole north coast.

Very common within the area.

106. *Calamagrostis arundinacea* (L.) ROTH.

ROTH in: Tent. Flor. German. 1, 1788, p. 33.

var. purpurascens (R. BR.) GELERT.

GELERT in: GELERT & OSTENFELD: Flora arctica 1, 1902, p. 103.

GELTING 1934, p. 185.

Localities: 10. Grandjean Fjord: Maagenæs (G. S.); 37. Head of V. Clausen Fjord (TH. S.); 39. North side of Klægbugt (TH. S.).

A continental plant, which in our area is found only in a few places in the interior of the fjords. Its distribution in East Greenland is very like that of the other continental species, being limited to the inner fjords northward from Scoresby Sound. The species is not included in SEIDENFADEN's list (1933), but it has later been found in Southeast Greenland by DEVOLD & SCHOLANDER (1933, p. 136), viz. in the inner parts of the Akernernârmîn fjord complex (c. 63° 32'N. lat.).

On the west coast, too, the species occurs in the interior of the southern fjords, and extends northward to about 72—73° N. lat.

In one of the localities in Skærfjord (north side of Klægbugt) the species was only found on some bird hills at 300—500 m altitude.

107. *Deschampsia brevifolia* R. BR.

ROBERT BROWN in: Supp. App. PARRY: Voy. 1824, p. 291.

Syn: *Deschampsia arctica* (TRIN.) OSTENFELD in: Medd. Gr. 64, 1923, p. 167.

OSTENFELD & LUNDAGER 1911, p. 11 (sub nom. *Aira caespitosa* L. *var. arctica* (TRIN.) SIMMONS.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 24. Danmarkshavn (L.!); 38. Head of Klægbugt (TH. S.); 40a. East of Cape Amelie (TH. S.).

var. pumila LEDEB.

LEDEBOUR in: Fl. Ross. IV, 1853, p. 422.

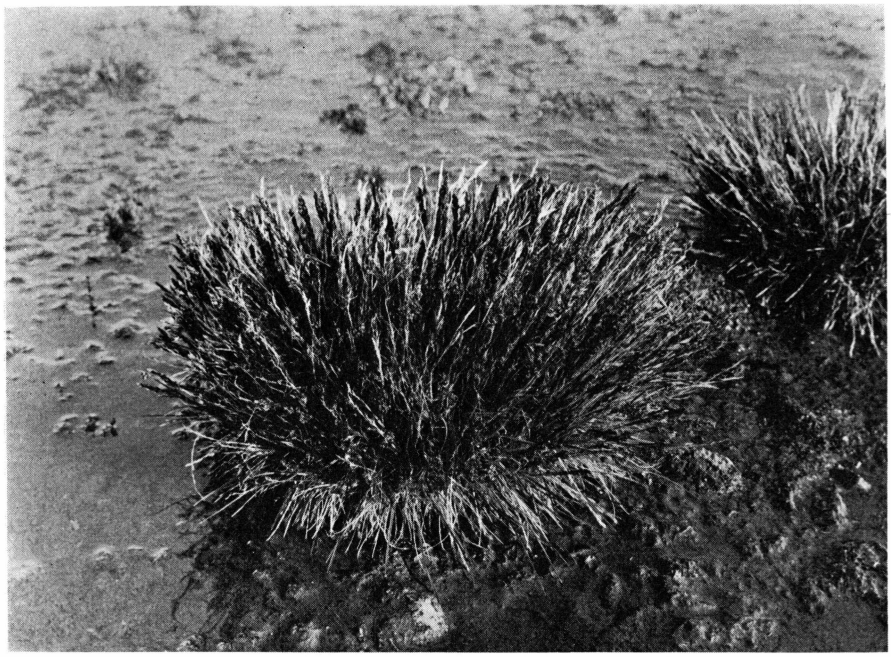
Syn: *Deschampsia pumila* (LEDEB.) OSTENFELD in: Medd. Gr. Vol. 64, 1923, p. 169.

OSTENFELD & LUNDAGER 1911, p. 12 (sub nom. *Aira caespitosa* L. *var. pumila* LEDEB.).

Localities: 5. Cape Maurer (TH. S.); 14. Nanok (S. & S.), cf. fig. 32; 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Dovebugt (L.!); 35. North coast of C. F. Mourier Fjord (TH. S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40a. East of Cape Amelie (TH. S.).

As regards the systematics of these *Deschampsia* forms we follow GELTING (1934, p. 186) in so far as we regard it as impossible to keep

the two forms distinct. In their extreme forms the varieties are especially well separated, but in certain localities, for instance Danmarkshavn, whence precisely OSTENFELD had material at his disposal for a characterisation of the two forms, numerous transitional forms occur. As distinguishing characters we principally use the shape (and colour) of the panicles, a character which is conspicuous even on observation of the plants in their habitat. To the main species we refer forms with contracted



G. SEIDENFADEN phot. 3799.

Fig. 32. *Deschampsia brevifolia var. pumila.* About $^1/_4$ size. Nanok, Hochstetter Foreland. Aug. 8, 1933.

panicles, usually rounded at both ends, usually dark purplish, shining. All specimens without such panicles, but with panicles which in an open state are conical, and in a folded state are thin and acute, are referred to *var. pumila*, although in this way we must consider OSTENFELD's *arctica* from Germanialand, Lakseelv at Danmarkshavn (lowermost figure on the plate p. 168 in OSTENFELD l. c.), which has been determined on the basis of the proportion between the length of the pale and its hairs, as *var. pumila.*

The chief difficulties in keeping the two forms distinct are that forms with stiff and coarse leaves combined with open pale glaucous panicles often occur. In agreement with our statements set forth above we refer such forms to *var. pumila.* (See fig. 32).

Deschampsia brevifolia seems to have a more northerly area of distribution in Greenland than *var. pumila*. Only the main species is known from the north coast proper; in West Greenland it has not been found south of Thule (76°30′ N. lat.), on the east coast we have observed it southward to 73°36′ N. lat. (viz. Holland Island, visited on Aug. 10, 1934).

The variety *pumila* is known on the west coast from Disko in the south to Thule in the north, and on the east coast from Hold-with-Hope (c. 73°30′ N. lat.) in the south to our northernmost locality in the Skærfjord complex (north side of Klægbugt, 77°40′ N. lat.).

The two varieties mostly occur in company, the main species usually forming big tufts on more or less bare, wet soil, while *var. pumila* in addition forms an even turf often mixed with hypnoid mosses on inundated or water-saturated soil. In our area *var. pumila* is the most frequent form.

108. *Festuca brachyphylla* SCHULTES.

SCHULTES in: Mant. III, 1827, p. 646.

Syn: *F. brevifolia* R. BR. (non MUEHLENB.), *F. ovina* L. varr. of most of the previous authors on Greenland, cf. SCHOLANDER 1934, p. 69 ff.

OSTENFELD & LUNDAGER 1911, p. 15 (sub nom. *F. ovina* L. *subsp. brevifolia* (R. BR.) HACKEL), — DUC D'ORLEANS 1905, p. 10 (sub nom. *F. ovina* L. *f. brevifolia* (R. BR.) GELERT).

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 16a. Kildedal (JOHANSEN!); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 26. Dovebugt (L.!); 34. Cape Marie Valdemar (TH.S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 40a. East of Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.!); 44. Norske Island (G. S.).

All the normally fructifying Greenland forms, as shown by SCHOLANDER (1934, p. 69ff), must be referred to *F. brachyphylla*, and in this paper, unlike in our previous publications on the flora of East Greenland, we therefore use that name.

The species has been found along the whole coast of Greenland except the easternmost part of the north coast, whence no collections are at hand. No doubt, however, it can justly be regarded as circumgreenlandic.

The species is very common throughout the area, and as in the Franz Joseph Fjord district, it is represented by various forms (cf. TH. SØRENSEN 1933, p. 137).

109. *Festuca rubra* L.

LINNÆUS in: Sp. pl. 1753, p. 74.

GELTING 1934, p. 193.

Localities: 5. Cape Maurer (TH. S.); 15. Petersbugt (G. S.).

A southern species, which has not been found in the northern part of the area in question. We therefore consider it most probable that it has its northern limit at Hochstetter Foreland. In the northern most part of its aren only the variety *var. arenaria* (OSB.) FR. occurs; in the southern parts of the east coast, south of about 66° N. lat., and in West Greenland, *var. arenaria* occurs in company with forms with glabrous spikelets and forms intermediate between these two forms.

110. *Festuca vivipara* (L.) SM.

J, E. SMITH in: Fl. Brit. I., 1804, p. 114.

Syn: *F. ovina* L. *var. vivipara* HORN., cf. SCHOLANDER 1934, p. 73 ff.

OSTENFELD & LUNDAGER 1911, p. 15 (sub nom. *F. ovina* L. *var. brevifolia* (R. BR.) HACKEL "viviparous").

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 14. Nanok (S. & S.); 25. Stormkap (S. & S.); 26. Dovebugt (L.!); 37. Head of V. Clausen Fjord (TH. S.); 39. North side of Klægbugt (TH. S.); 40. Cape Amelie (TH. S.); 40a. East of Cape Amelie (TH. S.).

A northeastern species in Greenland, which, as far as is known, extends from the Sommerdalen (c. 50° W. long.) on the north coast down the east coast to about 63° N. lat. (Umanaq).

In South Greenland another form occurs, viz. *F. vivipara var. hirsuta* (LANGE) SCHOL. (DEVOLD & SCHOLANDER 1933, p. 140), whose area only to a small extent coincides with that of the main species, since on the east coast, as far as is shown by the material of the Botanical Museum of Copenhagen, it has its northern limit in Akorninarmiut (c. 63°30′ N. lat.), whence it extends around the south point of Greenland and up the west coast as far as Sukkertoppen in about 65°25′ N. lat. (cf. also DEVOLD & SCHOLANDER l. c. footnote p. 140).

Festuca vivipara is fairly common within our area, especially in the outer fjords, less frequent in the innermost valleys and fjords.

111. *Hierochloë alpina* (LILJEB.) R. & S.

ROEMER & SCHULTES in: Linn. Syst. Veg. 2, 1817, p. 515.

OSTENFELD & LUNDAGER 1911, p. 11, — GELTING 1934, p. 194.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16a. Kildedal (JOHANSEN!); 16b. Agnetesø (JOHANSEN!); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord

(S. & S.); Germanialand: common everywhere (L.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.).

While the species is found on the north coast and along the whole western coast of Greenland, in Southeast Greenland it is only found in the inner parts of the fjords, viz. in Scoresby Sound, in the interior of Kangerdlugssuak (DEVOLD & SCHOLANDER 1933, p. 142), and in a few places south of Angmagssalik (cf. SEIDENFADEN 1933, p. 90 and DEVOLD & SCHOLANDER l. c.). A typical continental species (cf. p. 192).

The species is of common occurrence throughout our area.

112. *Phippsia algida* (SOLAND.) R. BR.

ROBERT BROWN in: Chloris Melvilliana. App. PARRY: Voy. disc. 1823, p. 285.

BUCHENAU & FOCKE 1874, p. 54, — DUC D'ORLEANS 1908, p. 9, — OSTENFELD & LUNDAGER 1911, p. 13.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (cf. fig. 45) (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); abt. 12. Shannon (KOLDEWEY); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 22. Maroussia Island (DUC D'O.); Germanialand: "rather common" (L.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Dovebugt (L.!); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (DUC D'O.!); 43. Lambert Land (J. P. KOCH); 44. Norske Island (G. S.).

A circumgreenlandic species.

Common throughout the area. (Cf. fig. 45, p. 128).

113. *Pleuropogon Sabinei* R. BR.

ROBERT BROWN in: Chloris Melvilliana. App. PARRY. Voy. disc. 1823, p. 289, tab. D.

OSTENFELD & LUNDAGER 1911, p. 13.

Localities: 14. Nanok (S. & S.); 20. Opposite Berg Fjord (S. & S.); Germanialand: "rather common "(L.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 38. Head of Klægbugt (TH. S.); 39. North side of Klægbugt (TH. S.); 40a. East of Cape Amelie (TH. S.).

A northern species. Its southern limit in East Greenland is Kalkdal and other places in Hurry Inlet (c. 70°45′ N. lat.). In West Greenland the species has been found southward to Thule (76°30′ N. lat.).

Commonest in the northernmost part of the area (Skærfjord), abundantly flowering especially in shallow-watered tarns, more sparsely flowering often in mossy swamps.

114. *Poa abbreviata* R. Br.

Robert Brown in: Chloris Melvilliana App. Parry: Voy. disc., 1823, p. 287.

Duc d'Orleans 1908, p. 9, — Ostenfeld & Lundager 1911, p. 15.

Localities: 5. Cape Maurer (Th. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 22. Maroussia Island (Duc d'O.!); 24.

G. Seidenfaden phot. 3840.

Fig. 33. *Poa abbreviata*. About $^1/_3$ size. Nanok, Hochstetter Foreland. Aug. 8, 1933.

Danmarkshavn (L.!, Th. S.); 25. Stormkap (L.!, S. & S.); 27. Hvalrosodden (L.!); 29. Between Sælsø and Annexsø (Freuchen!); 31. Ymers Nunatak (Freuchen!); 34. Cape Marie Valdemar (L.!, Th. S.); Skærfjord: all localities (35—39); 40. Cape Amelie (Th. S.); 41. Cape St. Jacques (L.); 43. Lambert Land (J. P. Koch); 44. Norske Island (G. S.).

A northern species, found southward to Angmagssalik on the east coast, to Disko on the west coast. (Cf. fig. 33).

115. *Poa arctica* R. Br.

Robert Brown in: Chloris Melvilliana., App. Parry: Voy. disc., 1823, p. 288.

(Buchenau & Focke 1874, p. 55), — Duc d'Orleans 1908, p. 9 (sub. nom. *Poa cenisia* All.), — Ostenfeld & Lundager 1911, p. 14 (sub nom. *Poa cenisia* All.), — Gelting 1934, p. 206.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16b. Agnetesø (JOHANSEN!); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.); 23. Cape Bismarck (DUC D'O.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Dovebugt (L.!); 27. Hvalrosodden (L.!); 34. Cape Marie Valdemar (L., TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (L.); 44. Norske Island (G. S.).

According to NANNFELDT's investigations (1934) this species should be distinguished from *Poa rigens* HARTM., with which it has sometimes been confused in Greenland; however, until a closer examination of the whole herbarium material has been done, the question about the identity of the Greenland "*Poa rigens*" (cf. SEIDENFADEN 1933, p. 93) and the determination of its area of distribution in Greenland must remain open. For the present we regard it as a form of *Poa pratensis*, and in our list p. 179 we have classed it under that species.

Poa arctica is a northern species, which extends around the north of Greenland. In East Greenland it is commonly distributed southward to Angmagssalik, where it seems to have its southern limit at Cape Wandel (66°18′ N. lat.), in West Greenland as far as the southern part of Godthaab Fjord ("iter Ameralik" J. VAHL).

The species is very common everywhere within our area. (Cf. fig. 34).

116. *Poa glauca* M. VAHL.

MARTIN VAHL in: Flora danica fasc. 17, 1790, p. 3, Tab. 964.

OSTENFELD & LUNDAGER 1911, p. 15, — GELTING 1934, p. 209.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 16a. Kildedal (JOHANSEN!); 16b. Agnetesø (JOHANSEN!); 18. Head of Bessel Fjord (SCHWARCK); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 26. Dovebugt (L.); 31. Ymers Nunatak (FREUCHEN); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 40a. East of Cape Amelie (TH. S.).

A circumgreenlandic species, though it seems to be very rare at the southeast coast (cf. SEIDENFADEN 1933, p. 92; DEVOLD & SCHOLANDER 1933, p. 146).

Very common and rich in forms within the area. Cf. fig. 35.

G. SEIDENFADEN phot. 3841.

Fig. 34. *Poa arctica*. About $^2/_3$ size. Cape Broer Ruys, Hold-with-Hope. Aug. 14, 1934.

117. *Poa Hartzii* GDGR. emend. SOER.

TH. SØRENSEN in: Medd. Gr. Vol. 101, No. 3, 1933, p. 145.

OSTENFELD & LUNDAGER 1911, p. 15 (sub nom. *Poa abbreviata* et *Poa cenisia* (?) quoad loc. cit.).

Localities: 5. Cape Maurer (TH. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (L.!, sub nom. *P. abbreviata*); 25. Stormkap (S. & S.); 26. Dovebugt (L.!, sub. nom. *P. cenisia*); 27. Hvalrosodden (L.!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.); 40a. East of Cape Amelie (TH. S.).

The distribution of this species was mapped by TH. SØRENSEN (l. c.). In West Greenland, as far as is known, it is chiefly limited to the coast of Vaigat (c. 70° N. lat.)[1]). Its area of distribution in East Greenland

[1]) Cfr. foot-note p. 165.

has been extended both to the south and the north by the investigations in 1933, since GELTING and SØRENSEN observed the species in several localities in Hurry Inlet in Scoresby Sound, and it seems to be of common occurrence in the Skærfjord complex, too. (Cf. fig. 36).

118. *Poa pratensis* L. s. l.

LINNÆUS in: Sp. pl., 1753, p. 67.

GELTING 1934, p. 198.

Localities: 4. Lakseelv (SCHWARCK); (5. Cape Maurer (TH. S.)); 15. Petersbugt (G. S.).

As long as a revision of the Greenland forms of *Poa pratensis* has not been made, we prefer to use the collective designation *P. pratensis* for the normally fructifying forms. At any rate it must probably be admitted that the introduction of *Poa alpigena* (TH. FR.) LINDM. in the Greenland list of species serves no purpose, since it appears from the material of the Herbarium of the Botanical Museum of Copenhagen that this name covers an almost equally heterogeneous complex as the former "*Poa pratensis*".

The specimens observed by TH. SØRENSEN at Cape Maurer grew near an old Norwegian hunting hut and are not identical with the form growing in the adjoining areas to the south. They must be presumed to have recently been introduced from Norway.

The normally fructifying *P. pratensis* has its northern limit within our area, the above-mentioned localities being the northernmost localities known. In West Greenland they are not known north of Laksefjord (c. 72°30′ N. lat.).

118a. *Poa alpigena* (E. FRIES) LINDM. var. *colpodea* (TH. FRIES) SCHOL. SCHOLANDER in: Skrifter om Svalb. og Ishavet No. 62, 1934, p. 89.

OSTENFELD & LUNDAGER 1910, p. 14 (sub nom. *P. pratensis* L. *f. colpodea* (TH. FR.), — GELTING 1934, p. 199 (sub nom. *P. alpigena* (E. FR.) LINDM. var. *prolifera* SIMM.)

Localities: 2. Cape Hamburg (G. S.); 8. North of Bastian Bay (TH. S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (TH. S.); 27. Hvalrosodden (L.!); 38. Head of Klægbugt (TH. S.).

In his thorough treatment of viviparous grasses from Svalbard (Spitsbergen) SCHOLANDER (l. c.) distinguishes between two viviparous *pratensis* (*alpigena*) forms, one of which, in particular, which he denotes with the name stated above, is comparatively well separated from the other *Poa* forms fairly numerous in the eastern Arctic. According to the description and figure, our plant (the only viviparous "*Poa pratensis*" in East Greenland) should belong to this form. In order to be quite certain, however, we applied to Dr. SCHOLANDER, who after an investigation of the matter confirms the correctness of the identification, and

we wish here to express our thanks to Dr. SCHOLANDER. This author indicates the possibility of a polyphyletic origin of the viviparous *Poae*, stating: "it seems possible that the whole series between *Poa rigens* var. *vivipara* and *Poa alpigena* var. *vivipara* can at every stage produce a var. *colpodea*, all of which may closely resemble one another, probably by reason of a convergence produced by the very extreme environment." (l .c. p. 91). Furthermore it is mentioned that the viviparity should possibly be regarded as a pathological phenomenon, and if so, the plant would have to spread by means of the stolons (l. c. p. 91). This supposition might gain all the more credence, since it is a fact that the spikelets transformed into propagation organs can very often be observed to adhere in a withered state to the erect culms throughout the winter (this observation, too, was made by SCHOLANDER, l. c. p. 89), while for instance *Festuca vivipara* always shed its bulbils in the autumn. Experiments in germination made by TH. SØRENSEN during his wintering at Eskimonæs 1934—35 showed, however, that the bulbils (removed from the panicle and sown in the autumn) of our *Poa* germinated just as numerously as the bulbils of *Festuca vivipara* though a little more slowly. As a sign of pathological conditions in the plant SCHOLANDER states that "the chlorophyll distribution in the blades and the spikelets may be uneven and patchy" (l. c. p. 91). Similarly, GELTING states about our plant from East Greenland that it is "at times etiolated over large parts of the stem and leaves" (l. c. p. 200). Curiously enough TH. SØRENSEN during his last wintering in the same place (Eskimonæs) did not observe such phenomena, which accordingly may perhaps in some cases be due to a casual damage by frost or desiccation, as it may rather often be observed for instance in *Arctagrostis latifolia*, in which the uppermost half of the panicle may be more or less defect. However, since the "hypertrophied" bulbils are well suited for a propagation of the plant, it seems to us in some degree a dispute of words whether the viviparity should be considered a pathological phenomenon.

That SCHOLANDER expresses himself with such great reservation on the systematic value of *P. alpigena v. colpodea*, is probably owing to the fact that the abundance of forms of viviparous *Poae* of the *pratensis* group is greater in the eastern parts of the Arctic than for instance in East Greenland. In the same connection it should also be taken into consideration that the identification of viviparous forms is much more difficult than of normally fructifying forms, since the different development of the bulbils under extremely favourable and extremely unfavourable conditions of nutrition here are particularly remarkable, which evidently is reflected for instance in GELTING's statement "that the viviparous forms seem to be more or less hypertrophied, sometimes even to monstrosity" (l. c. p. 200), and SCHOLANDER's statement that

"the spikelet .... is frequently composed only of two small claw-shaped glumae" (l. c. p. 91) to all appearance is not an expression of actually abnormal or pathological conditions, but rather that we are here concerned with especially luxuriant forms and starved forms respectively.

As long as a polyphyletic origin of morphologically identical forms has not been proved experimentally, we may claim as our opinion that the viviparous *Poae* should be regarded as just as well-founded species as for instance the apogamous species of *Taraxacum* and *Hieracium*. Such a view as regards our viviparous *Poa* from East Greenland is all the more natural if we look upon its distribution. It is true that its area in East Greenland coincides with that of the normally fructifying "*alpigena*", extending over nearly three degrees of latitude; but the two forms will hardly be found growing in company, as they are associated with different soils, and even partially with different climatic zones, the viviparous form, unlike the other form, being found in the outer coast zone.

Our viviparous form is a distinctly northern type. Its southernmost locality known in East Greenland is Fleming Inlet (c. 71°50′ N. lat.), whence it extends northward as far as the Skærfjord complex. Information on the plant from the regions farther north is lacking, but it is probable that it occurs on the north coast, since it is at hand from Thule, but it is not recorded from West Greenland south of this point. SIMMONS collected it on Ellesmere Land (the N. W. Greenland and the Ellesmere Land plants have been identified by SCHOLANDER). Thus its distribution in Greenland is of precisely the same type as for instance *Draba micropetala* and *Saxifraga flagellaris*. It seems to us, therefore, that in regard to distribution, too, the plant is a well defined species, so there is no reason whatever to assume another origin of this species in Greenland than of those just mentioned, that is, there seems to be no evidence that it has originated in Greenland from a normally fructifying related form.

For the sake of completeness it may be mentioned that in Northwest Greenland there further occurs another viviparous *Poa* of the *pratensis* group. GELTING (l. c.) holds the same view as to the delimitation of the species as that maintained here, but the locality cited, however, viz. Nugssuak Peninsula, West Greenland, (70°47′ N. lat.), seems to refer to another form. — In view of the fact that SCHOLANDER has given the clearest definition of our plant and moreover applies the oldest name, we give it here under SCHOLANDER's name.

119. *Puccinellia angustata* (R. BR.) RAND & REDF.

RAND & REDFIELD in: Fl. Mount. Desert Isl. Maine. Cambridge, Mass., 1894.

OSTENFELD & LUNDAGER 1911, p. 14 (sub nom. *Glyceria angustata* (R. BR.) FRIES).

Localities: 5. Cape Maurer (Th. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 22. Maroussia Island (L.!); Germanialand: "common" (L.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); 26. Lille Snenæs (L.!); 31. Ymers Nunatak (Freuchen!); 35. North coast of C. F. Mourier Fjord (Th. S.); 38. Head of Klægbugt (Th. S.); 39. North side of Klægbugt (Th. S.); 40a. East of Cape Amelie (Th. S.).

South of Scoresby Sound the species has only been found in one place viz. at Angmagssalik (cf. Kruuse 1905, p. 279). Seidenfaden (1933, p. 93) quotes the species as found by Bjørlykke (1932, p. 7) in a place in Southeast Greenland, but Devold & Scholander (1933, p. 148) have examined Bjørlykke's specimens more closely and refer them to *P. retroflexa*. For the present we must therefore maintain that in East Greenland south of Scoresby Sound the species has only been found at Angmagssalik by Kruuse (determ. Holmberg(!)). The species probably extends around the north of Greenland, and has been found on the west coast as far south as c. 66° N. lat.

The species grows on clayey flats and slopes near the shore. It seems to occur throughout the area wherever such habitats are found (cf. fig. 37).

120. *Puccinellia phryganodes* (Trin.) S. & M.

Schribner & Merrill in: Contr. U. S. Nat. Herb. 13, 1910, p. 78.

Ostenfeld & Lundager 1911, p. 14 (sub nom. *Glyceria maritima* (Huds.) Wahlbg. *forma reptans* (Hartm.) Simmons).

Localities: 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S., cf. fig. 47); 9. Head of Bastian Bay (G. S.); 19. North of Trækpas (S. & S.); Germanialand: "rather common" (L.); 23. Cape Bismarck (L.!); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (Th. S.); 40a. East of Cape Amelie (Th. S.).

Although the species has not been recorded from the eastern parts of North Greenland, we think it most probable that the plant should be placed among the circumgreenlandic species.

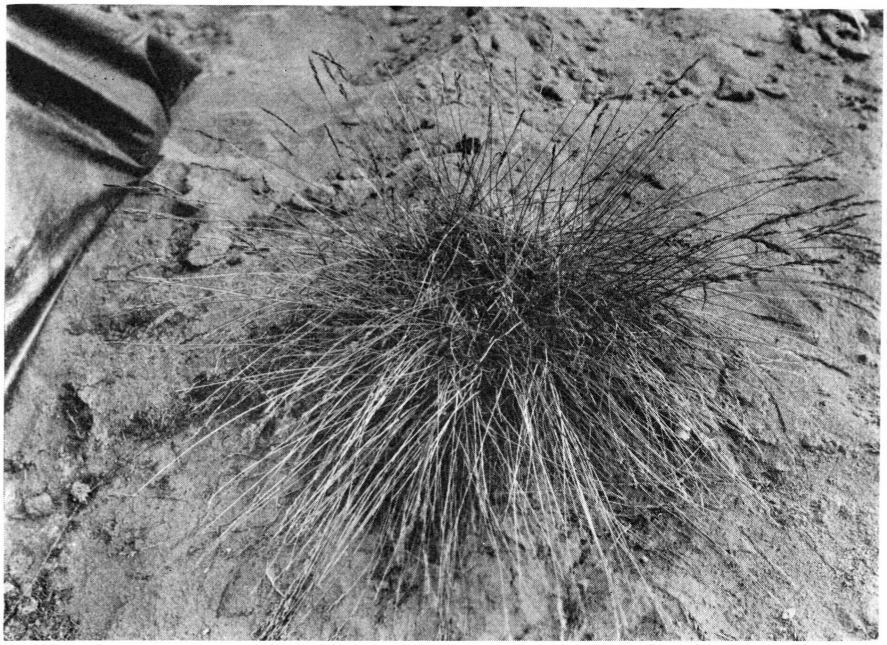
The species is very common within the area, being found in most places in which a suitable flat shore is present.

121. *Puccinellia Vahliana* (Liebm.) S. & M.

Schreibner & Merrill in: Contr. U. S. Nat. Herb. 13, 1910, p. 78.

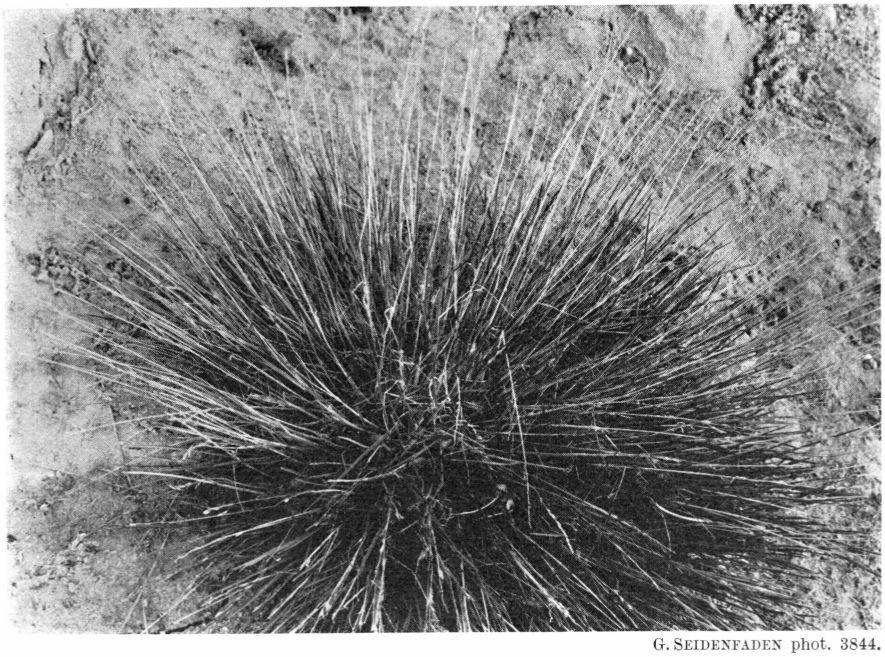
Localities: 14. Nanok (S. & S.); 17. North of Trækpas (S. & S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (Th. S.).

This northern species, which has its southern limit in Scoresby Sound, has not previously been recorded from the area in question.



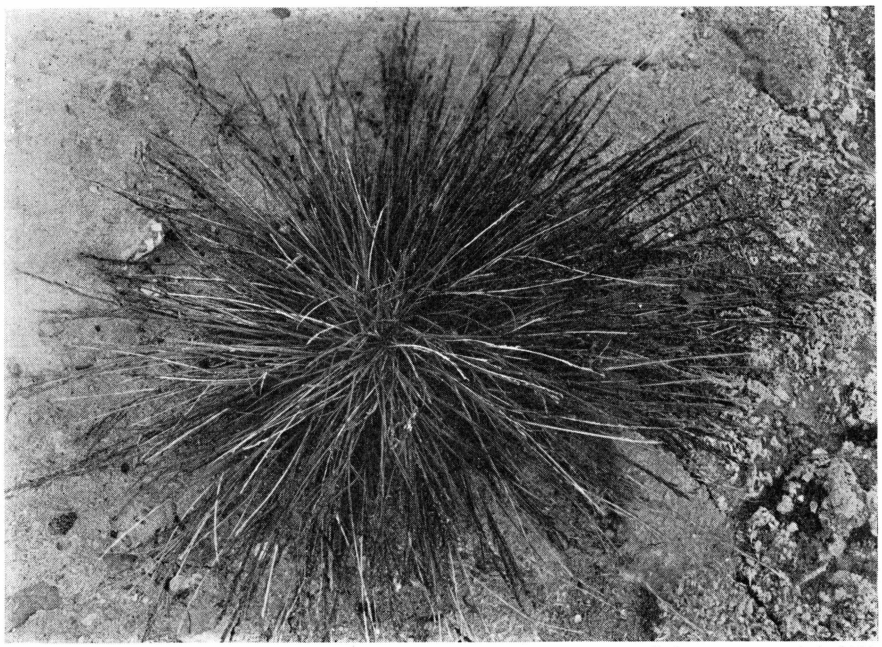
G. SEIDENFADEN phot. 3843.

Fig. 35. *Poa glauca*. About $^1/_5$ size. Granatdal, Clavering Isl. Date: July 19, 1933.



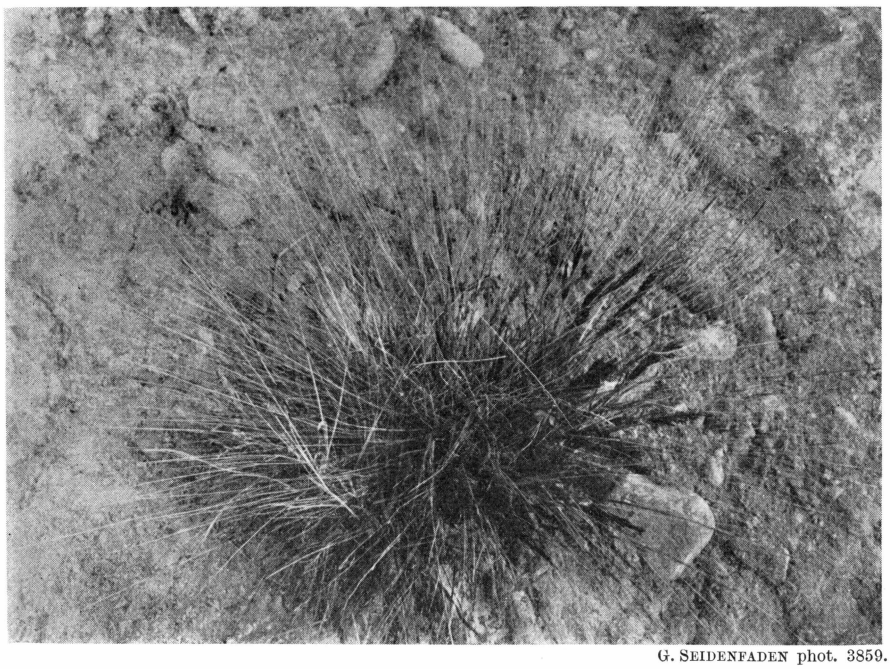
G. SEIDENFADEN phot. 3844.

Fig. 36. *Poa Hartzii*. About $^1/_5$ size. Granatdal, Clavering Isl. Date: July 19, 1933.



G. SEIDENFADEN phot. 3856.

Fig. 37. *Puccinellia angustata*. About $^1/_5$ size. Granatdal, Clavering Isl. July 19, 1933.



G. SEIDENFADEN phot. 3859.

Fig. 38. *Puccinellia Vahliana*. About $^1/_5$ size. Granatdal, Clavering Isl. July 19, 1933.

In West Greenland it has been found from Disko northward, yet only in one place north of Melville Bay, viz. in Mac Cormic Bay in Murchison Sound in 77°45′ N. lat.

As appears from the list of localities, it has been found in a fairly great number of localities, but rarely in great numbers, often only, single individuals occur (cf. fig. 38).

122. *Trisetum spicatum* (L.) RICHTER.

P. RICHTER in: Plant. Europ. I, 1890, p. 59.

OSTENFELD & LUNDAGER 1911, p. 13.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 9. North side of mouth of Bastian Bay (TH. S.); Germanialand: "rather rare" (L.); 24. Danmarkshavn (L.!, TH. S.); 26. Dovebugt (L.!); 27. Hvalrosodden (L.!); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.).

A circumgreenlandic species.

Common throughout the area except in the most exposed localities at the outer coast, from which it is absent.

JUNCACEAE.

123. *Juncus biglumis* L.

LINNÆUS in: Sp. pl., 1753, p. 328.

OSTENFELD & LUNDAGER 1911, p. 8.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); Germanialand: rather common (L.); 24. Danmarkshavn (L.!, TH. S.); 25. Stormkap (S. & S.); 31. Ymers Nunatak (FREUCHEN!); Skærfjord: all localities (35—39) except 36. Theodolitskær (TH. S.); 40. Cape Amelie (TH. S.).

Even if the plant has not been found north of Skærfjord and in the eastern parts of North Greenland, the species is most probably a circumgreenlandic species.

Very common within the area.

124. *Juncus castaneus* SMITH.

SMITH in: Comp. Flor. Britt. I, 1829, p. 383.

OSTENFELD & LUNDAGER 1911, p. 7.

Localities: 2. Cape Hamburg (G. S.); 16a. Kildedal (JOHANSEN!); 16b. Agnetesø (JOHANSEN!); 24. Danmarkshavn: Thermometerfjæld

(L.!); the harbour (Th. S.); 25. Stormkap (S. & S.); 37. Head of V. Clausen Fjord (Th. S.); 38. Head of Klægbugt (Th. S.).

Skærfjord is the northernmost locality of the species so far known in East Greenland. Its southern limit is Angmagssalik (Kruuse), but it has not been found on the coast between this place and Scoresby Sound (cf. Bøcher 1933, p. 10). In West Greenland it has a more southerly distribution, ranging from about 63° N. lat. to 72°30′ N. lat.

The species is apparently rare and rather sparse within our area; it doubtless has its northern limit in the Skærfjord complex.

125. *Juncus triglumis* L.

Linnæus in: Sp. pl., 1753, p. 328.

var. *Copelandi* Buchen.

Buchenau & Focke in: Zweite Deut. Polarf., Botanik 1874, p. 51.

Syn: *Juncus albescens* (Lge.) Fernald in: Rhodora 26, 1924, p. 202.

Ostenfeld & Lundager 1911, p. 8, — Gelting 1934, p. 216.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); South side of Bastian Bay (G. S.); 14. Nanok (S. & S.); 15. Petersbugt (G. S.); 19. North of Trækpas (S. & S.); 24. Danmarkshavn (L.!, Th. S.); 25. Stormkap (S. & S.); Skærfjord: all localities (35—39) except 36. Theodolitskær (Th. S.).

The species is widely distributed in Greenland, on the west coast northward to about 78° N. lat. (Inglefield Land), on the east coast to the Skærfjord complex. It seems, however, to be rare in Northwest Greenland, whence it has not been brought home from Melville Bay and Thule, and on the east coast southwards from Scoresby Sound. The main species is only known from a few finds near the south point of Greenland.

Of common occurrence within our area, especially in the Skærfjord complex.

126. *Luzula arcuata* (Wbg.) Sw.

Swartz in: Summ. syst. Veg. Scand. 1814, p. 13.

var. *confusa* (Lindeb.) Kjellm.

Kjellman in: Vegaexp. Vet. Iakt. 1, Stockholm 1882, p. 277.

Duc d'Orleans 1908, p. 9. — Ostenfeld & Lundager 1911, p. 8, — Gelting 1934, p. 217.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (Th. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (Th. S.); 9. Head of Bastian Bay (G. S.); Shannon Island (Koldewey!); 14. Nanok (Bg.!, S. & S.); 15. Petersbugt (G. S.); 16b. Agnetesø (Johansen!); 17. Trumsø (Schwarck); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 23. Cape Bismarck (Duc d'O.!); 24. Danmarks-

havn (L.!, TH. S.); 25. Stormkap (L.!, S. & S.); 26. Lille Snenæs (L.!); 27. Hvalrosodden (L.!); 31. Ymers Nunatak (L.!); 34. Cape Marie Valdemar (L.!, TH. S.); Skærfjord: all localities (35—39) (TH. S.); 40. Cape Amelie (TH. S.); 41. Cape St. Jacques (L.); 43. Lambert Land (L.); 44. Norske Island (G. S., cf. fig. 39).

A circumgreenlandic species. All the northern specimens belong

G. SEIDENFADEN phot. 3831.

Fig. 39. *Luzula arcuata* var. *confusa* from the shore of Norske Island, cfr. fig. 9. About $^2/_5$ size. Culms only found on the west side of the tuft, the east side turning towards the sea. Aug. 15, 1933.

to the variety. In Southeast Greenland transitional forms to the main species occur (cf. SEIDENFADEN 1933, p. 96).

One of the commonest species within our area. Cf. figs. 9 and 39.

127. *Luzula nivalis* (LÆSTAD) BEURLIN.

BEURLIN in: Botan. Not. Lund 1853, p. 55.

DUC D'ORLEANS 1908, p. 9, — OSTENFELD & LUNDAGER 1911, p. 8.

Localities: 2. Cape Hamburg (G. S.); 5. Cape Maurer (TH. S.); 6. South of Bastian Bay (S. & S.); 7. South side of mouth of Bastian Bay (G. S.); 8. North side of mouth of Bastian Bay (TH. S.); 9. Head of Bastian Bay (G. S.); 14. Nanok (S. & S.); 16b. Agnetesø (JOHANSEN); 19. North of Trækpas (S. & S.); 20. Opposite Berg Fjord (S. & S.); 21. Store Koldewey Island (L.!); 24. Danmarkshavn (TH. S.); 25.

Stormkap (L.!, S. & S.); 34. Cape Marie Valdemar (L.!, Th. S.); Skærfjord: all localities (35—39) (Th. S.); 40. Cape Amelie (Th. S.); 41. Cape St. Jacques (Duc d'O.!); 44. Norske Island (G. S.).

A northern species, found in North Greenland and down the east coast to Scoresby Sound, on the west coast southward to about 66° N. lat.

Common throughout the area, especially to the north just as frequent as the preceding species.

LILIACEAE.

128. *Tofieldia coccinea* Richards.

Richardson in: App. Franklin Journ. 1823, p. 736.

Ostenfeld & Lundager 1911, p. 7.

Localities: 2. Cape Hamburg (G. S.); 6. North side of mouth of Bastian Bay (Th. S.); 16b. Agnetesø (Johansen!); 26. Lille Snenæs (L.!), Dovebugt (L.); 37. Head of V. Clausen Fjord (Th. S.); 40. Cape Amelie (Th. S.).

In East Greenland the species is found between Scoresby Sound and Skærfjord, in West Greenland between Nordre Strømfjord (67°42′ N. lat.) and Inglefield Land (77°47′ N. lat.).

Not common within the area, found in small numbers only in the various localities.

III. Remarks on the Flora and Vegetation of Northeast Greenland 74°30′—79° N. lat.

By Th. Sørensen.

In accordance with the list given above a total of 127[1]) species of vascular plants are found within our area. The adjoining area to the south, comprising the coastal stretches from Liverpool Coast to Sabine Island (71°00′ to 74°30′ N. lat.)[2]), the actual working area of the Danish Three-year Expedition, shows a number of species amounting to 184. Thus the difference between the number of species in the two areas is 57. Only two of the species of our area have not been found in the Franz Joseph Fjord area, viz. *Braya Thorild-Wulffii* and *Taraxacum pumilum*. This means that of the 184 species of the Franz Joseph Fjord archipelago no less than 59, or about one-third, are lacking in the area situated north of it and treated in this paper. It should be stated at once, however, that this estimate doubtless gives a somewhat exaggerated impression of the decline of the flora, since the northern area has not been so well investigated in a botanical respect as the southern area; notably the southernmost fjords within our district have been deficiently investigated. Precisely these fjords must be assumed to harbour the northernmost outposts of a number of southern species. Even though we may guess with some approach to certainty what species may come into question, I shall refrain from any extrapolation, which will always be founded on a personal estimate, and will accordingly lack all objectivity. As to species whose actual northern limit may come into question, it can be stated with some degree of certainty that it lies within the southern part of our area, so that a statement as to the absence of a species will be the more absolutely accurate the farther we proceed towards the north.

On examining how the large flora decline is distributed among the systematic main groups, we shall see that it is fairly equally distributed, the reduction of the monocotyledons, however, being a little over one-third, while the dicotyledons and the vascular cryptogams each show a

[1]) *Primula* sp. (cf. p. 76) not included.

[2]) Named in the following pages the Franz Joseph Fjord area.

reduction of a little below one-third. Actually the number of species decreases with astonishing uniformity within the comparatively well represented families, the only ones which are numerically comparable. Thus within the *Caryophyllaceae*, the *Ranunculaceae*, the *Rosaceae*, and the *Cyperaceae* the reduction of the number of species is almost exactly one-third, whereas within the *Cruciferae* and the *Saxifragaceae* it is only one -fourth. Of the relatively well represented narrower systematic groups the *Bicornes* and the *Gramineae* alone exhibit some deviations, since as regards the *Bicornes* no less than four of the eight species of the southern area have disappeared in the northern area, while *Gramineae* show the quite unique phenomenon that only four of the twenty-one species disappear. Furthermore it should be mentioned for comparison that of the 24 *Carex* species no less than eleven disappear.

Without entering into a closer discussion of these figures, it should be pointed out that the decline is greatest within the two — though far from equivalent — groups, *Bicornes* and *Carex*, which might at the outset be supposed to be particularly well-suited for arctic climates. It seems to me, however, that precisely the great decline within these groups afford unmistakable evidence that in our area we have definitely passed from the arctic tundra zone into the high-arctic polygon soil or solifluction zone in narrower sense.

Far more interesting, so it seems to me, is a consideration of the distribution of the flora decline among the different types of vegetation. However, here an attempt will first be made to give a brief account of the occurrence of the most important types of vegetation within our area.

Since a number of the arctic "communities" do not appear as actual closed vegetations — as would be demanded in temperate zones as the prerequisite for a division of the vegetation into plant communities — I have, i. a. to apply a uniform principle of division, attempted to use in its widest sense the growth substrate conditioning the vegetation instead of the latter alone, making every allowance for the vegetation proper, as a basis for the division. The lack of adequate terms is severely felt, and the division must be regarded merely as a preliminary attempt. — As a conceptual common designation for these units based on external factors and vegetation I employ the term *ecosystem* (TANSLEY 1935, p. 299). For the localised concrete unit within an ecosystem the term *ecotope* (TH. SØRENSEN 1936) is used. The ecosystem, then, is the collective concept of a number of ecotopes connected by similarity in vegetation and observable physical conditions, i. e. an ecotope type.

The ecosystems I designate according to those characteristics of the growth substrate which are most conpicuous and, as far as can be judged, most essential to the vegetation, as for instance the configuration and exposure of the surface, the moisture and consistence

Table I. Survey of the main ecosystems and vegetation types of N. E. Greenland 74°30′—79° N. lat.

		Occurrence	Distribution		Ecosystem		Vegetation type	Number of species	
					Dry		*Xerophilous*		
	Deflation	General	I	(0)	I.	Barren ground	Desert	23	
	Deflation	Special	I		II.	Loess fields and terraces	Steppe	9	
	Deflation	Special	I	(0)	III.	Disintegrating summits and crests	—	9	Slight Solifluction (only VI)
	Deflation	Special	(I)	0	IV.	Bird places	—	20	Slight Solifluction (only VI)
	Deflation	Special	I		V.	Sunny slopes	Herb slopes	14	Slight Solifluction (only VI)
	Deflation	Special	I	0	VI.	Clayey flats and raised beaches	—	14	Slight Solifluction (only VI)
					Moderately moist		*Mesophilous*		
		Special	I		VII.	Sheltered precipices and rock ledges	Copses	21	
		No	—	—	—	Sheltered sunny slopes	Herb mats proper		
		Special	I	(0)	VIII.	Fronts of (stagnant) earth glaciers	Grassy brinks	23	
	Inflation	General	I	(0)	IX.	Well drained fields (Fossil polygon fields)	Ericaceous heaths	13	
					Moist to wet		*Hygrophilous*		
		Special	I	0	X.	Sheltered sunny slopes and patches	Meagre herb mats	35	
	Inflation	General	(I)	0	XI.	Snow patches and (active) polygon fields	Snow-patch veg. proper	16	Solifluction (XI—XV)
Deflation or moderate inflation (relatively unaffected)		No	—	—	—	Stagnant (fossil?) sliding slopes	Knolly bogs		Solifluction (XI—XV)
Deflation or moderate inflation (relatively unaffected)		Special		0	XII.	Constantly irrigated fields	"Denuded bogs"	26	Solifluction (XI—XV)
Deflation or moderate inflation (relatively unaffected)		General	I	0	XIII.	Earth glaciers and sliding slopes	Grassy meadows	26	Solifluction (XI—XV)
Deflation or moderate inflation (relatively unaffected)		Special	(I)	0	XIV.	Solifluction clay (morasses)	—	22	Solifluction (XI—XV)
Deflation or moderate inflation (relatively unaffected)		Special	I	0	XV.	Water-soaked ground	Swamps	15	Solifluction (XI—XV)
Deflation or moderate inflation (relatively unaffected)		No	—	—	—	Seasonally overflowed or submerged ground	Alluvial meadows		
Deflation or moderate inflation (relatively unaffected)		Special	I	0	XVI.	Fresh alluvial flats (River deltas)	—	15	
Deflation or moderate inflation (relatively unaffected)		Special	I	0	XVII.	Pools and tarns	Fresh water veg.	5	
Deflation or moderate inflation (relatively unaffected)		Special	I	0	XVIII.	Sea-shore lagoons	Salt marshes	10	

of the soil; all these are conspicuous characters — also in part as regards the landscape — during the work in the field in the growth period.

The characteristic ecosystems observed in our area are given in Table I, altogether 18. The table further contains three ecosystems, without numbers, which occur in the Franz Joseph Fjord area but are lacking northward, since reference to them will be made later. Along with the ecocystems the corresponding vegetation type is added if a fairly adequate designation is available. As a further explanation of Table I the following may serve: The first column, Occurrence, indicates whether the ecosystem in question appears as large continuous areas which characterises the landscape, when it is termed "general"; or, despite its general distribution, only as smaller, interrupted parts, when it is termed "special". The next two columns indicate whether the ecosystem belongs chiefly to the outer coast zone (the zone of relatively oceanic climate) termed "0", or to the inner fjord zone (the zone of continental climate) termed "I". ( ) indicates that the type is less frequent than in the other zone. The column "Number of species" refers to Table II, which illustrates the occurrence of the species in the different ecosystems, an × indicating that the species either occurs "principally" in the particular ecosystem, that is to say, it is confined to that system, if found in the locality at all — or occurs with great frequency and in well-developed specimens. Of course other species than those marked with a cross may quite well occur more or less casually.

The factor which — here as well as, and especially, in all regions with a continental climate — must no doubt be regarded as the most effective delimiting factor, is the water supply, for which reason the ecosystems on the basis of this factor are divided into three groups, 1) dry, 2) moderately moist, and 3) moist to wet. Two other factors are of exceedingly great importance for the distribution of the vegetation as well as for the development of the landscape-form, being each in its own way, partly as a cause of, partly as a consequence of, the moisture of the soil, absolutely associated with this latter factor. These are the snow-cover in winter and solifluction[1]).

The dry ecosystems are largely associated with deflation and lack of solifluction, the wet ecosystems with inflation and solifluction, although this will not always necessarily be the case. As regards the coincidence of the factors pointed out here, reference is made to Table I.

Of very great importance for the floristic building up of the vegetation and accordingly for the differentiation proper of the minor plant communities is the soil, more especially its content of lime. The effect of this factor appears to a small extent only from the table; it should,

[1]) The notion solifluction is here used in its widest sense, as more closely defined in "Bodenformen und Pflanzendecke", Medd. om Grønl. Bd. 93 Nr. 4, p. 7 (1935).

Table II. The Distribution of Species in the Main Ecosystems of N. E. Greenland 74°30′—79°00′ N. lat.

	Ecosystems																				
	Dry							Moderately most			Moist to wet										
	I. Barren ground	II. Loess fields and terraces	III. Disintegrating summits and crests	IV. Bird places	V. Sunny slopes	VI. Clayey flats and raised beaches	VII. Sheltered precipices and rock ledges	VIII. Fronts of earth glaciers	IX. Well-drained fields	X. Sheltered sunny slopes and patches	XI. Snow-patches and polygon fields	XII. Constantly irrigated fields	XIII. Earth glaciers and sliding slopes	XIV. Solifluction clay	XV. Water-soaked ground	XVI. Fresh alluvial flats	XVII. Pools and tarns	XVIII. Sea-shore lagoons
Equisetum arvense	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	—	—
— *variegatum*	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	×	—	—
Lycopodium Selago	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
Cystopteris fragilis	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
Woodsia glabella	—	×	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
Betula nana	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
Arenaria ciliata pseudofrigida	×	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—
Cerastium alpinum	×	—	—	×	×	—	×	—	—	×	—	—	—	—	—	—	—	—
— *Regelii*	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	×	—	—
Melandryum affine	×	—	×	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—
— *apetalum*	—	—	—	—	—	—	—	—	—	×	—	×	×	—	—	×	—	—
— *triflorum*	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—
Minuartia biflora	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
— *Rossii*	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
— *rubella*	×	×	×	×	×	—	—	—	—	×	—	—	—	—	—	—	—	—
Sagina intermedia	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	×
Silene acaulis	×	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
Stellaria humifusa	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×
— *longipes*	—	—	—	—	—	—	—	×	×	×	—	×	×	—	—	×	—	—
Sedum roseum	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
Braya purpurascens	—	—	—	—	—	×	—	—	—	—	—	—	—	×	—	—	—	—
— *Thorild-Wulffii*	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—
Cardamine bellidifolia	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—	—
— *pratensis*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—
Cochlearia officinalis var.	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—	×
Draba alpina	—	—	—	—	—	—	—	×	—	×	—	—	—	×	—	—	—	—
— *Bellii*	—	—	—	—	—	×	—	—	—	×	—	—	—	—	—	—	—	—
— *cinerea*	×	×	×	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—
— *daurica*	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
— *fladnizensis*	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—
— *Gredinii*	—	—	—	—	—	—	—	—	—	×	—	—	—	×	—	—	—	—
— *lactea*	—	—	—	—	—	—	—	—	—	×	×	×	×	—	—	×	—	—

Table II (continued).

	Ecosystems																					
	Dry							Moderately moist			Moist to wet											
	I. Barren ground	II. Loess fields and terraces	III. Disintegrating summits and crests	IV. Bird places	V. Sunny slopes	VI. Clayey flats and raised beaches	VII. Sheltered precipices and rock ledges	VIII. Fronts of earth glaciers	IX. Well-drained fields	X. Sheltered sunny slopes and patches	XI. Snow-patches and polygon fields	XII. Constantly irrigated fields	XIII. Earth glaciers and sliding slopes	XIV. Solifluction clay	XV. Water-soaked ground	XVI. Fresh alluvial flats	XVII. Pools and tarns	XVIII. Sea-shore lagoons
Draba micropetala	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
— *nivalis*	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—
— *subcapitata*	×	—	—	—	—	×	—	—	—	—	—	—	—	×	—	—	—	—
Eutrema Edwardsii	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—
Lesquerella arctica	×	—	×	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—
Empetrum nigrum	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
Hippuris vulgaris	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—
Chamaenerium latifolium	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	
Epilobium arcticum	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
Papaver radicatum	×	×	—	×	—	—	—	—	×	—	—	—	—	—	—	—	—	—
Koenigia islandica	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
Oxyria digyna	—	—	—	—	—	—	—	—	—	×	×	×	—	—	—	×	—	—
Polygonum viviparum	—	—	—	—	—	—	×	×	×	×	—	×	×	—	—	×	—	—
Ranunculus affinis	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—
— *glacialis*	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—
— *hyperboreus*	—	—	—	—	—	—	—	—	—	—	—	×	—	—	×	—	×	—
— *nivalis*	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
— *pygmaeus*	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
— *sulphureus*	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
Dryas octopetala	×	×	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—
Potentilla emarginata	×	—	—	×	—	—	—	—	—	×	—	—	×	—	—	—	—	—
— *nivea*	—	—	×	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—
— *pulchella*	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—
— *rubella*	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—
— *rubricaulis*	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—
Salix arctica	×	—	—	—	—	—	×	×	×	×	—	—	×	×	—	×	—	—
— *herbacea*	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
Saxifraga caespitosa	×	—	—	—	—	—	×	—	—	×	—	—	—	—	—	—	—	—
— *cernua*	—	—	—	—	—	—	—	—	—	×	×	×	—	—	—	—	—	—
— *flagellaris*	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—
— *hieraciifolia*	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
— *Hirculus*	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—

Table II (continued).

	Ecosystems																				
	Dry						Moderately moist			Moist to wet											
	I. Barren ground	II. Loess fields and terraces	III. Disintegrating summits and crests	IV. Bird places	V. Sunny slopes	VI. Clayey flats and raised beaches	VII. Sheltered precipices and rock ledges	VIII. Fronts of earth glaciers	IX. Well-drained fields	X. Sheltered sunny slopes and patches	XI. Snow-patches and polygon fields	XII. Constantly irrigated fields	XIII. Earth glaciers and sliding slopes	XIV. Solifluction clay	XV. Water-soaked ground	XVI. Fresh alluvial flats	XVII. Pools and tarns	XVIII. Sea-shore lagoons			
Saxifraga Nathorsti	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—			
— *nivalis*	×	—	—	×	×	—	×	—	—	—	—	—	—	—	—	—	—	—			
— — *tenuis*	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	—			
— *oppositifolia*	×	×	—	—	×	—	—	—	—	×	—	—	—	—	—	—	—	—			
— *rivularis*	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	×			
— *stellaris comosa*	—	—	—	—	—	—	—	—	—	—	×	×	—	×	—	—	—	—			
Campanula uniflora	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—			
Arnica alpina	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—			
Erigeron compositus	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
— *unalaschkensis*	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—			
— *uniflorus s. l.*	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—			
Taraxacum arcticum	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—			
— *phymatocarpum*	—	—	—	—	—	×	—	—	—	—	—	—	—	×	—	—	—	—			
— *pumilum*	?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
Cassiope tetragona	—	—	—	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—			
Rhododendron lapponicum	—	—	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—			
Vaccinium uliginosum	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—			
Armeria vulgaris var.	—	—	—	—	—	—	—	×	—	—	—	—	×	—	—	—	—	—			
Polemonium boreale	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—			
Pedicularis flammea	—	—	—	—	—	—	—	×	—	—	—	—	×	—	—	—	—	—			
— *hirsuta*	×	—	—	—	—	—	—	—	×	×	×	—	—	—	—	—	—	—			
Carex aquatilis stans	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	×			
— *atrofusca*	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	—			
— *capillaris*	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—			
— *incurva*	—	—	—	—	—	—	—	—	—	—	—	—	×	×	—	×	—	—			
— *misandra*	×	—	—	—	—	—	—	×	—	×	—	×	×	×	—	—	—	—			
— *nardina*	×	×	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—			
— *pedata*	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—			
— *rigida*	—	—	—	—	—	—	—	×	×	×	—	—	×	—	—	—	—	—			
— *rupestris*	—	×	×	×	×	—	×	×	—	—	—	—	—	—	—	—	—	—			
— *saxatilis*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—			
— *subspathacea*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	×			
— *supina*	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			

Table II (continued).

	Ecosystems																				
	Dry							Moderately moist			Moist to wet										
	I. Barren ground	II. Loess fields and terraces	III. Disintegrating summits and crests	IV. Bird places	V. Sunny slopes	VI. Clayey flats and raised beaches	VII. Sheltered precipices and rock ledges	VIII. Fronts of earth glaciers	IX. Well-drained fields	X. Sheltered sunny slopes and patches	XI. Snow-patches and polygon fields	XII. Constantly irrigated fields	XIII. Earth glaciers and sliding slopes	XIV. Solifluction clay	XV. Water-soaked ground	XVI. Fresh alluvial flats	XVII. Pools and tarns	XVIII. Sea-shore lagoons
Carex ursina	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×
Elyna Bellardi	—	×	—	×	—	—	×	×	—	—	—	—	—	—	—	—	—	—
Eriophorum callitrix	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	—
— *polystachyum triste*	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	—	—	—
— *Scheuchzeri*	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	×	×	—
Kobresia bipartita	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—
Alopecurus alpinus	—	—	—	—	—	—	—	—	—	—	—	×	×	—	×	—	×	—
Arctagrostis latifolia	—	—	—	—	—	—	—	—	—	—	—	—	×	×	×	—	—	—
Calamagrostis arundinacea var.	—	—	×	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Deschampsia brevifolia arctica	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
— — *pumila*	—	—	—	—	—	—	—	—	—	—	—	×	—	—	×	—	—	—
Festuca brachyphylla	×	—	—	×	×	—	—	×	—	—	—	×	—	—	—	—	—	—
— *rubra*	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—
— *vivipara*	—	—	—	—	—	—	—	×	—	—	—	×	—	—	—	—	—	—
Hierochloe alpina	—	—	—	×	—	—	×	×	×	—	—	—	—	—	—	—	—	—
Phippsia algida	—	—	—	—	—	—	—	—	—	—	×	×	—	—	—	—	—	×
Pleuropogon Sabinei	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—
Poa abbreviata	×	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—
— *alpigena colpodea*	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—
— *arctica*	—	—	—	×	—	—	×	×	×	×	—	—	×	—	—	—	—	—
— *glauca*	×	—	—	×	×	×	×	×	—	—	—	—	—	—	—	—	—	—
— *Hartzii*	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—	—	—	—
— *pratensis s. l.*	—	—	—	—	—	—	×	×	—	—	—	—	—	—	—	—	—	—
Puccinellia angustata	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	×
— *phryganodes*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×
— *Vahliana*	—	—	—	—	—	—	—	—	—	—	—	×	—	×	—	—	—	—
Trisetum spicatum	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—
Juncus biglumis	—	—	—	—	—	—	—	—	—	×	×	×	×	—	—	—	—	—
— *castaneus*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—
— *triglumis*	—	—	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—
Luzula arcuata confusa	×	—	—	×	—	—	—	×	×	×	×	—	×	—	—	—	—	—
— *nivalis*	—	—	—	—	—	—	—	—	×	×	×	×	×	—	—	—	—	—
Tofieldia coccinea	—	—	—	—	—	—	×	—	×	—	—	—	—	—	—	—	—	—

however, be pointed out that the clayey soil, which is much exposed to solifluction, is also very calcareous, whereas the sandy soil must be regarded as comparatively poor in lime. It can, however, be laid down with a fair degree of certainty that actually acid soils do not occur at all within our area owing to the continentality of the climate. An actual leaching of the soil can only have taken place in the fossil solifluction fields. These are chiefly occupied by the *Cassiope* heath, which in fact is the only plant community that gives rise to traces of the formation of raw humus. Thus the *Cassiope* heath is the only community in which there is any possibility at all of finding pH values which lie below the neutral point.

With reference to Tables I and II a brief description of the most distinct ecosystems of the area will now be given. (In addition to the characterisation of the ecosystem, the corresponding vegetation type is as far as possible stated).

I. Dry Barren Ground. — Desert.

This ecosystem dominates in the inner fjord regions as also very frequently in the outer coast zone, and appears everywhere — though in different variations — as flat, windswept stretches, as hills in broken ground and as wind-exposed slopes and cliffs with an unfavourable exposure. The vegetation is very sparse, the plants occurring at large intervals, and stretches almost entirely free from vegetation may often be met with. — Hardly a single species occurs here which is not found in other vegetation types, in which they often occur in more vigorously developed specimens. If we were to mention some species actually characteristic of this ecosystem, it must be *Saxifraga oppositifolia*, *Poa abbreviata*, *Carex nardina*, *Erigeron compositus*, the three former of which are very common, whereas the latter is less frequent and absent locally. Altogether the species growing here seem to represent the most central element in the flora of the area, which has evidently unlimited powers of resistance to the desiccating storms of the winter with the grinding action of the ice spicules and sand grains. By far the majority of the species form compact tufts, which are often worn off so as to form wedges on the side indicating the direction of the prevalent winds. In addition to the four species mentioned above, a number of cushion-plants may be mentioned: *Dryas octopetala*, *Draba subcapitata*, *Papaver radicatum*, *Saxifraga caespitosa*, *Minuartia rubella*, *Arenaria ciliata pseudofrigida;* and principally on soil a little less desiccating: *Silene acaulis*, *Carex misandra*, *Luzula arcuata confusa*, *Cerastium alpinum*, and *Potentilla emarginata*. Other pulvinate plants seem to reduce their tufts in these extremely exposed habitats, such as *Poa glauca*, *Festuca brachyphylla*, *Draba cinerea*. The latter, as often, also, *Lesquerella*

arctica and *Papaver radicatum*, frequently form "pillar forms", vegetative starvation forms (cf. Pl. I). Species which form neither tufts nor "pillar forms" are *Melandryum affine*, *Saxifraga nivalis*, *Pedicularis hirsuta*, the latter, however, only on less desiccating soil. Of woody plants, in addition to *Dryas*, only *Salix arctica* occurs, mostly with an old knotted root neck, whose shoots mostly dry out and die in the course of the winter.

This ecosystem is the most perfectly valid manifestation of the arctic "cold" desert.

II. Dry Loess Fields and Terraces. — Steppe.

The designation loess fields might perhaps seem less happily chosen for an ecosystem which is not actually distributed over large surfaces within our area. However, since such are extremely beautifully developed in the inner Franz Joseph Fjord region, and since the smaller fragments met with for instance in the Skærfjord complex on rock ledges and in similar terrain descending by steps unmistakably represent the northern offshoots of these loess fields, I do not hesitate in applying this term for the latter also. The soil consists of fine sand. As regards vegetation, it represents the arctic continental grass-steppe, characterised above all by *Elyna Bellardi*. The vegetation forms a fairly dense, though somewhat small-tufted covering, mostly formed by *Elyna Bellardi*. Some further components of speciel importance are *Carex nardina*, *Carex rupestris*, and *Dryas octopetala*. Other species of common occurrence are *Saxifraga oppositifolia*, *Minuartia rubella*, *Draba cinera*, *Papaver radicatum*. Furthermore, *Woodsia glabella* must be mentioned, which, however, is rare within our area. Of ecosystems with a continuous cover of vegetation this is undoubtedly the one most characteristically free of snow or but slightly snow-covered in winter, even though it seems to be protected against the most violent effects of the wind. Only in the spring is it watered by the snow melting at higher levels; in the summer the soil is exceedingly dry. It is typically associated with the inner fjord zone.

III. Dry Disintegrating Summits and Crests.

This ecosystem is associated with areas of crystalline rocks (granite gneiss). — Where these rocks crop out through the looser strata, they are decomposed by wind and frost erosion. In this way sharp-edged gravel and sand are formed, which will remain as a layer across the projecting rocks or fill the crevices when the rock surface is jagged or uneven. Such summits are most frequently free of snow in the winter, and exposed to excessive desiccation and insolation in the summer. Particularly characteristic here is *Carex supina*, which, however, is rare within the area and has only been found in the inner fjords, where the vege-

tation of the aforesaid summits is best developed. Other very characteristic species, which are just as characteristic on the bird hills, are *Potentilla nivea*, *Calamagrostis arundinacea purpurascens*, and *Draba cinera*. Of other species the following may be mentioned: *Carex rupestris*, *Minuartia rubella*, *Melandryum affine*, *Lesquerella arctica*, and *Erigeron compositus*. — This ecosystem is perhaps the one which areally is of least importance within our area.

IV. Bird Places.

This ecosystem is the only one in which the higher animal-life plays a noticeable role. Although there is no rich bird-life within our area, the supply of organic nutritious matter derived from the excrements left by the birds in their resting and outlook places — small elevations

Phot. G. SEIDENFADEN No. 3774.

Fig. 40. *Arnica alpina*. Xerophilous Herb Slope at Granatdal, Clavering Isl. Date: July 19, 1933. About $^1/_3$ size.

rising slightly above the nearest surroundings — is of essential importance for the vegetation. The nature of the soil seems to be less important, since the uppermost layer will in all cases consist of a very dry, somewhat peaty mass. No species[1]) is exclusively associated with the bird places, and when exposed to draught and deflation it is clear that it will largely be constituents from the above-mentioned ecosystems that will be found here. The most characteristic species is perhaps *Poa glauca*, which, however, in the moister outer coast localities is replaced by *Poa arctica* and *Hierochloe alpina*. Further, *Elyna Bellardi*, *Carex rupestris*, and *Calamagrostis arundinacea purpurascens* are chiefly restricted to the bird places of the inner fjords; the latter, however, is rare. *Paa Hartzii* and *Potentilla pulchella* occur chiefly only in the vicinity of the shore. Of species hardly lacking on any bird place may be mentioned, in addition to *Poa glauca: Cerastium alpinum*, *Minuartia rubella*, and *Draba cinera*. Other very frequent species are: *Melandryum triflorum*, *Melandryum affine*, *Potentilla emarginata*, *Potentilla nivea*, *Saxifraga nivalis*, *Papaver radicatum*, *Luzula arcuata confusa*, *Festuca brachyphylla*. Finally, the rather rare *Draba nivalis* should be mentioned, which especially seems to occur on favourably exposed slopes in connection with the bird places. On the very dry (and meagre?) bird places the plants often occur in the vegetative state only, since they have already begun to wither at midsummer. Here various rosette chamaephytes form "pillar forms". Those represented in Pl. 1 originate from a dry clay hill but slightly affected by birds, at Stormkap (Loc. 25).

V. Dry Sunny Slopes. — Xerophilous Herb Slopes.

This is the ecosystem of the warm and dry slopes with a southward exposure, not subjected to any noteworthy deflation in the winter. During the strong insolation of the spring such slopes will become free of snow before the air temperature becomes positive, but on the other hand they are exposed to excessive desiccation in the summer. The vegetation is a continentally marked herb-vegetation, hardly able to cover the ground. Particularly characteristic species are *Arnica alpina* (cf. fig. 40), *Campanula uniflora*, and the species present in the southernmost part of the area only, viz. *Festuca rubra* and *Erigeron uniflorus eriocephalus*. Of especially frequent species may further be mentioned: *Cerastium alpinum*, *Minuartia rubella*, *Melandryum affine*, *Saxifraga oppositifolia*, *Saxifraga nivalis*, and the two fairly rare species *Arenaria ciliata pseudofrigida* and *Draba nivalis*. Gramineous plants are chiefly represented by *Poa glauca*, *Festuca brachyphylla*, *Carex rupestris*. —

[1]) I. e. of vascular plants; for the lichen and moss flora the case is no doubt different.

This ecosystem is lacking in the exposed outer-coast localities, and even in the inner fjords it is of minor areal importance.

VI. Dry Clayey Flats and Raised Beaches.

Clayey flats are almost only found at rather inconsiderable heights near the shore, often at the mouths of rivers which here cut down through the strata, forming steep banks. These flats no doubt represent ancient sea-bottom, laid dry by the general upheaval to which the whole of Northeast Greenland seems to have been subjected. Owing to their situation at the lower levels they are no doubt sheltered from the excessive effects of deflation in the winter, even though they are hardly covered by any considerable layer of snow. Evidently they are exposed to the effects of solifluction in the spring; later in the summer the soil grows so hard through desiccation that the plants can be taken up only with difficulty without breaking at the root neck at the surface of the ground. Unlike most of the above-mentioned ecosystems, this one is exceedingly well characterised floristically, a number of species being principally associated with it. They are mostly represented by exceptionally vigorous individuals, but most frequently occurring at large intervals. Particularly characteristic species are *Puccinellia angustata*, *Poa Hartzii*, *Potentilla pulchella*, *Braya purpurascens;* to these species may further be added *Braya Thorild-Wulffii* in the only locality in which it was found. The following species, too, are among the most frequent: *Poa abbreviata*, *Poa glauca*, *Draba subcapitata*, *Draba cinerea*, *Draba Bellii*, *Lesquerella arctica*, *Taraxacum phymatocarpum*, *Melandryum triflorum*, and at times *Potentilla nivea.* This ecosystem attained a particularly fine development in Loc. 19, Store Koldewey Island, Loc. 38 and 39, the localities in Klægbugt, and Loc. 40a, East of Cape Amelie.

Dry, recent, raised beaches, separating the strand lagoons from the sea, must be referred to this ecosystem. In our area, however, they are often almost free from vegetation. The most characteristic plant here is perhaps *Potentilla pulchella.*

VII. Moderately moist sheltered Precipices and Rock Ledges. — Copses.

This ecosystem is developed in places supplied with water till late in the summer, either in the form of surface water on the less steep slopes or as "ground water" from rock crevices on the steep mountain slopes. The vegetation is dominated by dwarf-shrubs, and even though it hardly attains heights comparable with the *Calluna* heaths of the temperate zones, I should hardly hesitate to designate it as copses, since, like the willow and birch scrubs of the less high-arctic regions, it constitutes the maximum of what the geographic latitude allows in the direction

of manifest luxuriance. The dominating species is *Vaccinium uliginosum*, which within our area can be said with no little right to replace *Betula nana* of the somewhat more southerly areas; *Betula nana* has its northern limit in our southernmost fjords. Besides *Vaccinium*, *Salix arctica* is a dominating species, and, especially on the upper (dry) parts of the steep slopes, *Dryas octopetala;* while *Cassiope tetragona* joins it on the lower (moister) parts of the slopes. A less frequent species is *Rhododendron lapponicum* as also *Empetrum nigrum*, which, however, is entirely absent from the northern part of the area (the Skærfjord complex). The most characteristic of the scrubs is perhaps, among the herbs, *Draba daurica*, which, on the other hand, is rather rare. *Cystopteris fragilis* and *Sedum roseum*, which are likewise rare, the latter soon reaching its northern limit occur in the rock crevices on the copse-clad slopes, where the dwarf-shrub vegetation is not too closed.

Other species common in the ecosystem are *Cerastium alpinum*, *Polygonum viviparum*, *Poa glauca*, *Poa arctica*, *Hierochloe alpina*, *Carex rupestris*, *Elyna Bellardi*, and, especially in rock crevices devoid of shrub vegetation, *Saxifraga caespitosa* and *Saxifraga nivalis*. Of rarer species within the area may be found *Tofieldia coccinea* and *Poa pratensis*, the latter of which has its northern limit in the southernmost parts of the area. — This ecosystem is absent from the outer coast zone, and only in the inner sheltered heads of the fjords is it of any noticeable importance for the physiognomy of the landscape. Especially beautifully developed copses occurred at the head of V. Clausen Fjord, Loc. 37.

VIII. Fronts of (stagnant) Earth Glaciers. — Grassy Brinks.

Earth glaciers belong to the most conspicuous features in the microrelief of the landscape. Many earth streams, especially in the inner fjord regions, are evidently stagnant or move at a very slow rate, probably as a consequence of a change in the climate towards greater aridity. The surface of the slowly moving earth stream is often covered with a grass vegetation, which grows the more luxuriant the more one approaches their distal part. The front proper rises from the gound below as an often quite perpendicular brink, $^1/_2$ to $^3/_4$ m high, which, if the exposure is somewhat favourable, carries the most luxuriant grass vegetation found at all in the area. Both by their perpendicular face and their vegetation these grassy brinks are so well defined as compared with the rest of the surface that they must be considered a separate ecosystem. Its number of species is large, although it consists chiefly of species which are very frequent in other systems, too. Some few species, however, are peculiar to this ecosystem, viz. *Draba fladnizensis*, which does not belong to the most frequent species of the area, and *Carex capillaris*, which is rarely lacking in any ecotope of this type. This is the only

place in which *Rhododendron lapponicum* occurs outside the copses. In Franz Joseph Fjord *Poa pratensis* is exceedingly characteristic of this type. Of the species rare within our area *Woodsia glabella* is sometimes found here. Otherwise gramineous plants dominate; thus *Poa arctica*, *Poa glauca*, *Hierochloe alpina*, *Festuca brachyphylla*, *Festuca vivipara*, *Carex rigida*, *Carex misandra*, *Carex nardina*, *Carex rupestris*, *Elyna Bellardi*, and *Luzula arcuata confusa*. Of herbs notably the following occur: *Polygonum viviparum*, *Stellaria longipes*, *Pedicularis flammea*, *Draba alpina*, and *Armeria vulgaris*. Finally the dwarfshrub vegetation is often rather strongly represented by *Salix arctica* and *Dryas octopetala*.

This ecocystem is chiefly limited to the middle and inner fjord regions, the movements of the earth glaciers along the outer coast being so violent that a distinct front will hardly form. Areally the system occupies an extremely small part of the land.

IX. Moderately moist, well drained Fields (Fossil[1]) Polygon Fields). — Ericaceous Heaths.

This ecosystem is one of the few systems within the area which principally manifests itself by its vegetation, the patches and belts of brown *Cassiope* heath so conspicuous in the landscape. A close investigation of the substratum shows, however, that there is a surprising connection between the *Cassiope* heath and the fossil structure fields, which by the leaching and washing of the finer particles from the soil prisms have obtained a sandy-gravelly character. The stone drainage between the soil prisms further contributes to a lively water circulation during the melting period of the snow, and later in the summer to aeration of the soil. The common distribution of this ecosystem seems moreover to be one of the most striking proofs of a change of climate, accomplished in a rather recent geologic time — and perhaps still going on — from a more oceanic to a more continental state.

The vegetation is entirely dominated by *Cassiope tetragona*. *Lycopodium Selago* is exclusively associated with the *Cassiope* heath, but is rare within the area. *Tofieldia coccinea*, which is likewise fairly rare, is limited to the copses and to the heath. All the other species of common occurrence in the *Cassiope* heath occur to a smaller or greater extent as ubiquists. The most important of these are *Salix arctica*, *Carex rigida*, *Poa arctica*, *Hierochloe alpina*, *Luzula arcuata confusa*, *Luzula nivalis*, *Polygonum viviparum*, *Papaver radicatum*, *Pedicularis hirsuta*, and *Stellaria longipes*.

The *Cassiope* heath is snow-covered in the winter, but not exposed to any considerable accumulation of snow. It is commonest in the inner fjords, and decreases towards the outer coast, but is lacking in the most

[1]) cf. SØRENSEN 1935. Kap. IV, p. 54 ff.

exposed outer coast localities only. It occupies a fairly considerable part of the area.

X. Wet, sheltered sunny Slopes and Patches. — Meagre hygrophilous Herb Mats.

This ecosystem forms the wet counterpart to ecosystem V, the dry, sunny slopes, and is sometimes found in continuation of the latter in the lower zones of the slopes; mostly, however, it is developed separately, since it has a far more common distribution than the latter. Moreover, it is characterised by a moderate accumulation of snow in the winter, a favourable exposure, and a supply of water during nearly the whole growth period. The vegetation is a decidedly hygrophilous herb vegetation; often mosses, too, occur. It may be difficult to decide what to call this vegetation. Actually it indicates the herb mats of the area. However, in more southerly regions a similar vegetation type would, no doubt, both as regards physiognomy and composition of species, be designated a snow-patch vegetation. Provisionally, therefore, I will merely term it "meagre herb mats" (luxuriant snow-patch vegetation).

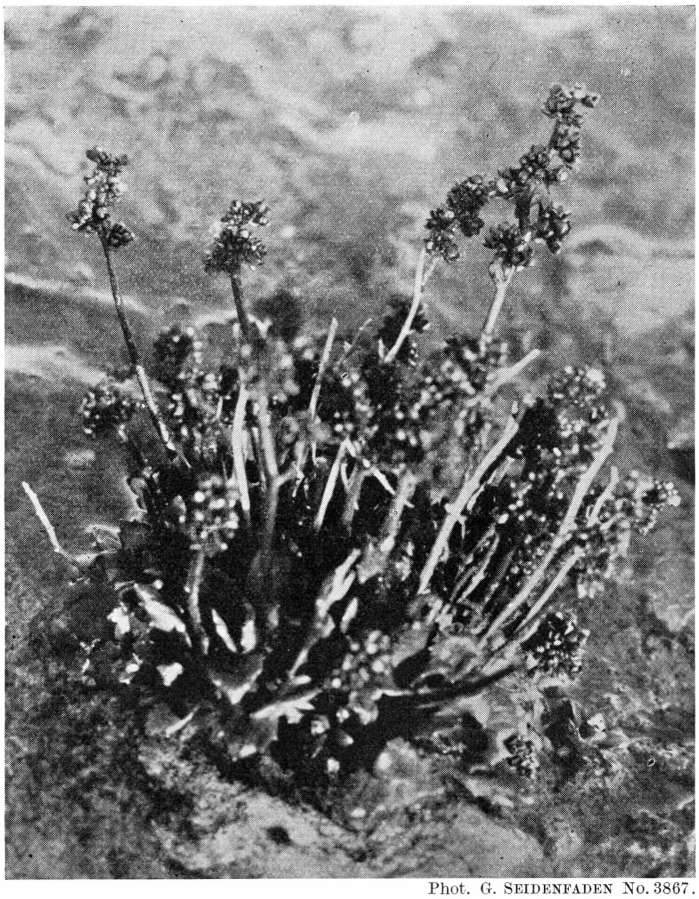
Several species are almost exclusively associated with this ecosystem, viz. *Taraxacum arcticum*, *Ranunculus pygmaeus* (especially the inner fjords), *Ranunculus nivalis*, *Ranunculus sulphureus*, and *Trisetum spicatum*, all of which are of common occurrence throughout the area. Further there occur *Minuartia biflora*, which is rare, and *Salix herbacea* (not on distinctly calcareous soil), *Erigeron unalaschkensis*, and *Epilobium arcticum*, which have their northern limits in the southern part of the area. Of other species, less strictly associated with this ecosystem, but most abundantly developed here, may be mentioned *Silene acaulis*, *Oxyria digyna*, *Melandryum apetalum*, *Draba lactea* (not on decidedly calcareous soil), *Draba alpina*, *Draba Bellii* (the two latter chiefly on calcareous soil), *Saxifraga cernua*, *Saxifraga caespitosa*, *Draba Gredinii* (only in the outer coast zone on calcareous soil). A series of more ubiquistic species occur, too, viz. *Salix arctica*, *Polygonum viviparum*, *Pedicularis hirsuta*, *Cerastium alpinum*, *Stellaria longipes*, *Minuartia rubella*, *Cardamine bellidifolia* (hardly on decidedly calcareous soil), *Cochlearia officinalis var.* (especially near the shore), *Saxifraga oppositifolia*, *Potentilla emarginata*, *Poa arctica*, *Carex misandra*, *Carex rigida* (not on decidedly calcareous soil), *Luzula arcuata confusa*, *Luzula nivalis*, and *Juncus biglumis*.

It is obvious that an ecosystem like this, which is developed both in the inner fjord and the outer coast zones and on all kinds of soil, does not in the same degree as several of the aforementioned ecosystems constitute a unity, hence it should be noted that not all the above-mentioned species can occur in the same delimited ecotope. A further division which would have to take into consideration both the soil and

the climatic zones, would take us too far, and moreover the observation material within the area is too small. — In spite of its general distribution, the type must be regarded as special, since it always occurs in small fragments and occupies a small part of the area.

XI. Snow-patches and (active) Polygon Fields. — Snow-patch Vegetation.

This ecosystem may to a great extent be called the counterpart of type I, Dry Barren Fields, characterised by aridity and deflation, since it shows the opposite extremes of an abundant water supply and inflation. Just as the latter is most widely distributed in the inner fjord zone, the ecosystem here concerned has its main area in the outer coast zone, where it characterises the landscape, appearing in the summer as large, almost horizontal flats of water-saturated polygon fields with water



Phot. G. SEIDENFADEN No. 3867.

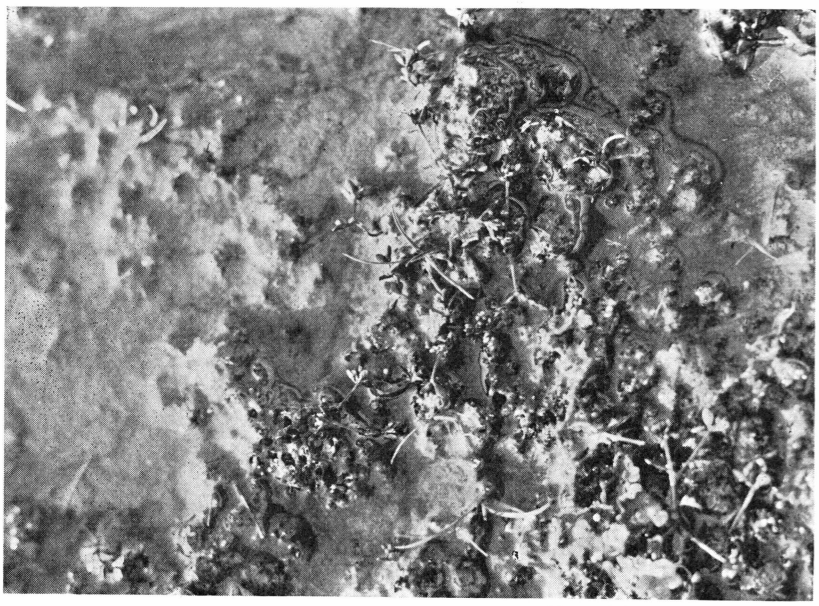
Fig. 41. *Saxifraga stellaris comosa*. Size about $^1/_1$. Kuhn Isl. South of Bastian Bay (Loc. 6). August 8, 1933.

standing between the stones in the stone framework. In the winter and till late in the early summer it is characterised by an immense accumulation of snow, which results in a late melting of the snow in the spring. Since the ecosystem in the inner fjord regions is localised to depressions and ravines, it rather conveys the impression here of the surface and vegetation type which is generally designated snow-patches. The vegetation is not very conspicuous, consisting of quite small, scattered plants in the polygon field, chiefly associated with the borders of the polygons. A number of species are especially characteristic of the vegetation, but there is not a single of these which does not occur either in the preceding or the succeeding type. The most characteristic species are *Draba micropetala* (absent from clearly calcareous soil), *Sagina intermedia*, *Phippsia algida*, *Saxifraga stellaris comosa*, *Saxifraga nivalis tenuis*, and *Cardamine bellidifolia*. Just as common, but with a wider ecological amplitude, are *Juncus biglumis*, *Luzula arcuata confusa*, *Luzula nivalis*, *Pedicularis hirsuta*, *Saxifraga cernua*, *Draba lactea* (absent from decidedly calcareous soil). Somewhat less frequent are *Saxifraga rivularis*, *Ranunculus glacialis*, and *Cochlearia officinalis var.*

Next to type I, it is the most commonly distributed ecosystem, occupying large areas particularly along the outer coast. In Loc. 34, Cape Marie Valdemar, this system covered continuous stretches of several kilometres.

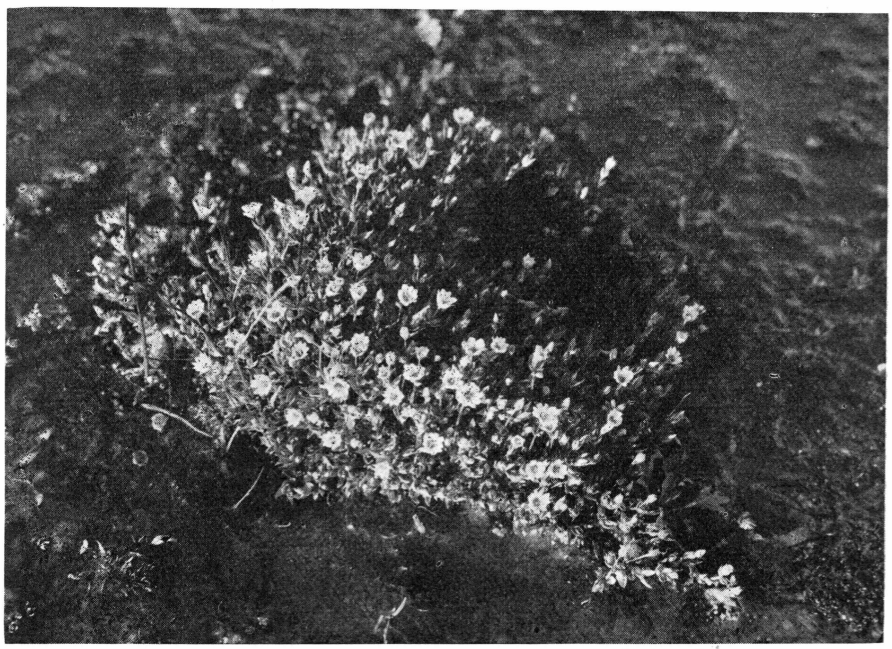
XII. Constantly irrigated Fields. — Denuded Bogs.

This is one of the most interesting and most distinctive ecosystems of the area. It is found developed in belts, which may often be very broad where even and slightly sloping areas occur below the snow-fans accumulated in the lee of steep slopes in the terrain. Throughout the summer, water from the melting snow-fan seeps quite slowly across the surface, which, with the exception of its uppermost (hindmost) zone, which represents the preceding ecosystem, is evidently subjected to deflation in the winter. The cover of vegetation is very peculiar, forming patches of diminutive, more or less scattered plants separated by large grass tussocks. This type of vegetation I have designated "denuded bogs", which may perhaps at first seem somewhat inconsistent and in need of a closer explanation: It has precisely the same position in the terrain as the knolly bogs of such common occurrence farther south in the Franz Joseph Fjord area. These bogs are remarkable for their sharp distinction between a supra-aquatic phase, represented by the knolls with dense moss, grass, and dwarf-shrub vegetation, and an infra-aquatic phase, represented by the paths between them. While the supra-aquatic phase plays the leading part there, the infra-aquatic phase is the dominant feature of the "denuded bogs", the supra-aquatic phase being



Phot. G. SEIDENFADEN No. 3829.

Fig. 42. *Koenigia islandica*. Size about $^1/_1$. Hochstetter Foreland, Nanok (Loc. 14). August 8, 1933.



Phot. G. SEIDENFADEN No. 3882.

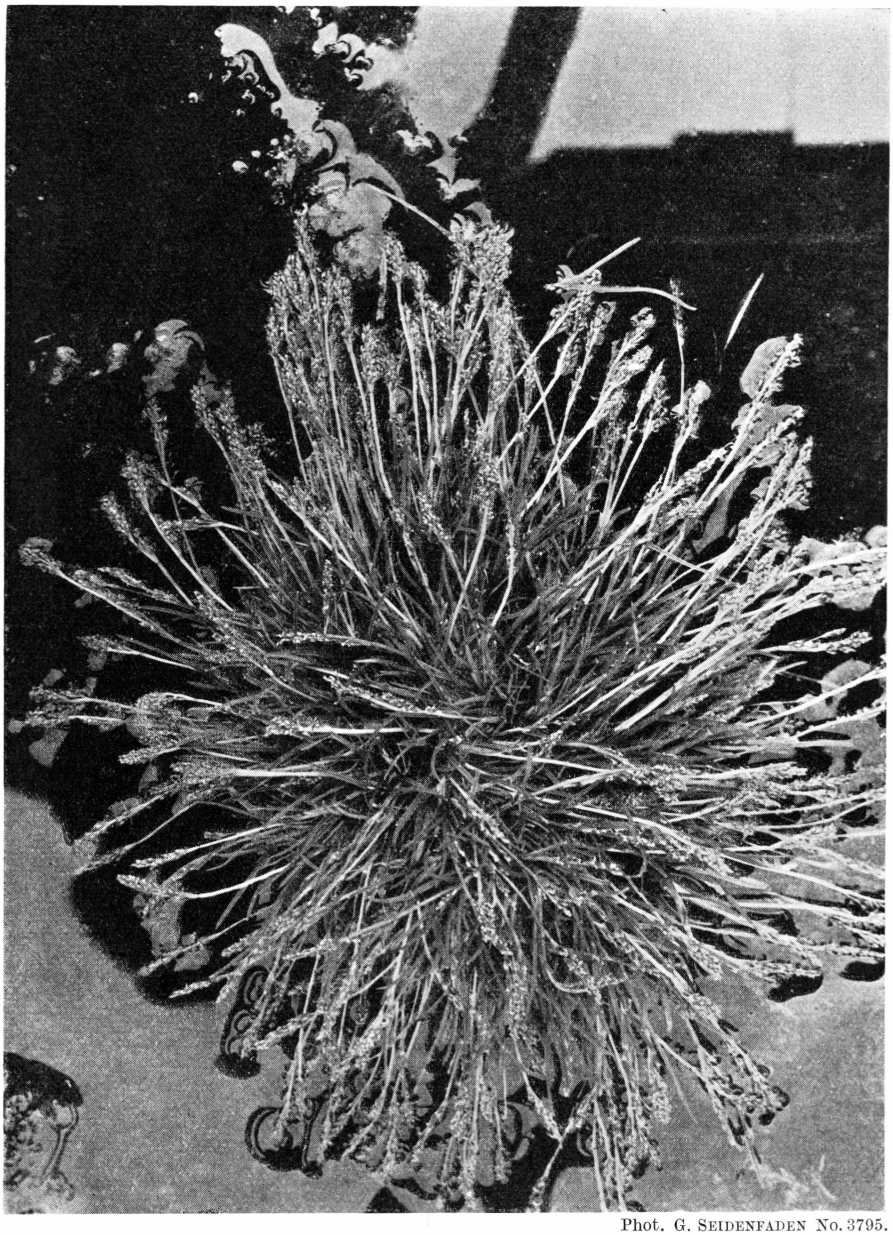
Fig. 43. *Stellaria longipes*. Size $^1/_2$. Hochstetter Foreland, Nanok (Loc. 14). August 8, 1933.

Phot. G. SEIDENFADEN No. 3797.

Fig. 44. *Cerastium Regelii*. Size about $^3/_4$. Hochstetter Foreland, Nanok (Loc. 14). August 8, 1933.

represented by the high, solitary tussocks only, formed notably by *Deschampsia brevifolia* and *Carex misandra*.

Most specific for this vegetation is *Koenigia islandica*, the only annual plant of the area (fig. 42), further *Cerastium Regelii* (fig. 44), *Deschampsia brevifolia* and *v. pumila*. Just as characteristic are two species, which, however, are very rare, viz. *Minuartia Rossii* and *Saxifraga Hirculus*, the latter reaching its northern limit in the southern part of the area. Very common species are *Sagina intermedia*, *Saxifraga stellaris comosa*, *Saxifraga nivalis tenuis*, *Saxifraga cernua*, *Phippsia algida*, *Juncus biglumis*, *Draba micropetala*, *Draba lactea*, *Stellaria longipes*, *Luzula nivalis*, *Carex misandra*, *Festuca brachyphylla*, *Festuca vivipara*, *Alopecurus alpinus*, *Oxyria digyna*, *Melandryum apetalum*, and *Polygonum viviparum*. Less common are *Ranunculus glacialis*, *Ranunculus hyperboreus*, and *Puccinellia Vahliana*. — In addition to the



Phot. G. SEIDENFADEN No. 3795.

Fig. 45. *Phippsia algida*. Size about $^1/_1$. Kuhn Isl., South of Bastian Bay (Loc. 6). August 8, 1933.

normally caespitose species, several other species here show an abnormally strong inclination to form big, domed cushions thus for instance *Stellaria longipes* (fig. 43) and *Melandryum apetalum* (fig. 12—13, p. 33).

The ecosystem of constantly irrigated fields with the vegetation of "denuded bogs" is strictly associated with the outer coast zone, and may

Phot. G. SEIDENFADEN No. 3860.

Fig. 46. *Ranunculus hyperboreus*. Size about $^1/_2$. Kuhn Isl., south of Bastian Bay (Loc. 6). August 8, 1933.

be characterised as the most decidedly higharctic-oceanic system of the area.

Where developed immediately above the shore, its vegetation may form even transitions to the shore lagoons. This was especially the case in Loc. 6, Kuhn Island south of Bastian Bay (whence figs. 45 and 46).

XIII. Earth Glaciers and Sliding Slopes. — Grassy Meadows.

Earth glaciers have already been mentioned under Type VIII. The ecosystem here considered comprises the body of the earth glaciers, their proximal part often belonging to Type XI with snow-patch vegetation, and their distal front representing Type VIII. The surface of the earth glaciers is even and as a rule slightly sloping; in the central parts, however, often with a slight formation of polygons (bare earth bulges). The vegetation must rather be characterised as a grassy meadow. The composition of species varies remarkably according to the content of lime in the soil. Of gramineous plants the following are particularly common: *Arctagrostis latifolia*, *Alopecurus alpinus*, *Poa arctica*, *Carex rigida*, *Carex misandra*, *Eriophorum polystachyum triste*, *Luzula arcuata confusa*, *Luzula nivalis*, *Juncus biglumis;* and associated with calcareous soil we find: *Carex atrofusca*, *Kobresia bipartita*, *Juncus triglumis*, *Carex incurva*, *Eriophorum callitrix* (rare in the area); finally, especially characteristic of the earth bulges: *Carex pedata*, which has its northern limit in the southern part of the area. Characteristic herbs are *Melandryum apetalum*, *Armeria vulgaris*, *Pedicularis flammea*, *Eutrema Edwardsii* (the two latter on calcareous soil). Important species are, further, *Polygonum viviparum*, *Potentilla emarginata*, *Stellaria longipes*, *Draba lactea*, and *Salix arctica*. Quite characteristic, but not particularly common, are *Equisetum arvense* and *Equisetum variegatum*.

These grassy meadows are of general occurrence and areally rather equal to the *Cassiope* heath, though perhaps of somewhat greater frequency. The ecosystem forms no actual unity, since the vegetation varies somewhat according to the climatic zone and more especially according to the soil. A closer division, however, will be left out of consideration here.

XIV. Wet Solifluction Clay. Morasses.

This ecosystem is in the first place characterised by the violent effects of solifluction to which the soil is exposed. Throughout the summer the wet clay forms quite an impassable morass, and only by balancing on the often scattered big boulders and the "swimming" islets of grass vegetation can one avoid being caught in the sticky mass. The vegetation is reminiscent of "denuded bogs", the plants occurring at intervals on the wet clay interrupted by the often strongly cushion-shaped patches, a few decimetres broad, of a dense grass vegetation. Exclusively associated with the ecosystem are *Ranunculus affinis*, *Potentilla rubricaulis*, *Saxifraga flagellaris*, *Potentilla rubella* (only found in Loc. 5, Cape Maurer); especially characteristic, though not exclusively associated with the ecosystem are: *Eutrema Edwardsii*, *Taraxacum phymatocarpum*, *Draba*

Gredinii (only in the outer coast zone), *Puccinellia Vahliana*, *Poa alpigena colpodea*, and at times *Polemonium boreale* (only in the southernmost part of the area). The commonest species are: *Arctagrostis latifolia*, *Eriophorum polystachyum triste*, *Carex misandra*, *Saxifraga stellaris comosa*, *Eriophorum Scheuchzeri*, and *Salix arctica*. Less frequent are *Carex incurva*, *Braya purpurascens*, *Draba subcapitata*, *Draba alpina*, *Equisetum variegatum*, and *Equisetum arvense*.

The ecosystem is distributed over all the climatic zones of the area, though perhaps most frequently near the outer coast, and it is evidently exclusively associated with calcareous soil. This ecosystem plays but an inconsiderable part within the area.

XV. Water-soaked Ground. — Swamps.

This ecosystem comprises depressions and flat ground completely saturated or literally inundated with water, not affected by solifluction, or at any rate not to such an extent that it prevents a continuous vegetation. The vegetation is decidedly a grass vegetation, often with an abundance of hypnoid water mosses at the bottom. Exclusively associated with this system are *Carex saxatilis*, *Juncus castaneus*, and *Cardamine pratensis* (very rare). Characteristic are, further, *Deschampsia brevifolia pumila*, *Pleuropogon Sabinei*, and, near the sea-shore, *Carex subspathacea* and *Carex aquatilis stans*. Of common occurrence are also *Eriophorum Scheuchzeri*, *Alopecurus alpinus*, *Arctagrostis latifolia*, *Eriophorum polystachyum triste;* less common are *Ranunculus hyperboreus*, *Carex atrofusca*, *Eriophorum callitrix*, and *Equisetum arvense*.

The ecosystem is found in all the climatic zones of the area and on all kinds of soil. The vegetation varies from place to place, since the individual species, as is the case in the swamps of temperate regions, show a certain tendency, though less marked here, to occur in pure growths. No doubt the soil, too, is of importance in that respect. This system occupies but a small percentage of the area.

XVI. Fresh Alluvial Flats (River Deltas). — Alluvial Pioneer Vegetation.

The sandy and stony river beds, which often expand into conical deposit flats in their lower course, constitute a well defined ecosystem characterised by more or less violent inundation during the melting period of the spring. In the summer the water-supply of the flats is still abundant, in part assuming the character of groundwater; for the loose material permits a plentiful passage of water across the level of the relatively deep-lying frozen layer. The vegetation is scattered and its density and character varying in patches, being corroded away locally by the

torrential water masses of the spring. The most characteristic species is *Chamaenerium latifolium*, which often also dominate physiognomically. Characteristic are further two species, which, however, play no great role in the area, as they soon reach their northern limit, viz. *Saxifraga Nathorsti* and *Polemonium boreale*. Of species likewise fairly characteristic, but less frequent, may be mentioned *Poa alpigena colpodea*, *Carex incurva*, *Equisetum arvense*, and *Equisetum variegatum*. In addition the following species may be pointed out as the commonest: *Salix arctica*, *Polygonum viviparum*, *Oxyria digyna*, *Stellaria longipes*, *Draba lactea*, *Melandryum apetalum*, and, in the outer coast zone only, now and then *Cerastium Regelii*. Besides there is hardly any limit to the number of species within the area which may occasionally appear in this ecosystem, for if casually introduced from the most diversified communities, they may quite exceptionally find favourable conditions for colonisation. More especially the upper parts of the delta cones in the gorges between the huge stones and blocks that are often deposited here, occasionally afford conditions for a varied and luxuriant, but very scattered vegetation. Not only does the very heterogeneity of the composition of the species give the vegetation a stamp of casualty; but also the polymorphous species and groups of species, as for instance *Potentilla nivea*, *Poa glauca*, *Draba*, and *Melandryum*, may sometimes be represented by an imposing wealth of forms growing among each other, which in the more "stiffened" ecosystems are distributed with a certain law-directed regularity. Such a mixture of forms may be taken as an unmistakeable sign of unstable and temporary conditions. The vegetation of the river deltas should, even in its most typical form, be considered a perpetuating pioneer vegetation.

In spite of its internal heterogeneity, this ecosystem forms a well delimited unity, and is naturally in all essentials associated with the low coast zone extending landwards from the shore. Areally it occupies but a small part of the coast land.

XVII. Pools and Tarns. — Fresh Water Vegetation.

This ecosystem is of quite subordinate importance within the area, and its higher vegetation is of slighter importance still, since it is not by far all fresh-water accumulations that harbour a vegetation of vascular plants. The only actual hydrophyte of the area is *Hippuris vulgaris*, though it has not been found in its northern part (the Skærfjord complex). The most characteristic and conspicuous fresh-water plant is no doubt *Pleuropogon Sabinei*, which is more luxuriantly developed when occurring as a real waterplant than in the adjacent marsh vegetation, where it is frequent too. Of fructifying plants there further occur *Ranunculus*

Phot. G. SEIDENFADEN No. 3857.

Fig. 47. *Puccinellia phryganodes* (to the right, small specimens of *Stellaria humifusa*). About $^1/_2$. Kuhn Isl., south of Bastian Bay (Loc. 6). August 8, 1933.

hyperboreus and *Eriophorum Scheuchzeri*, while *Alopecurus alpinus* here only forms narrow-leaved vegetative stages of development. The higher vegetation of the fresh waters is limited to the above-mentioned five species.

XVIII. Sea-shore Lagoons. — Salt Marshes.

As the country mostly faces the sea by steep walls, this ecosystem is of comparatively little importance within the area. Often it is associated with the outermost corners of the river deltas, where the amount of fresh water supplied by the shifting courses of the rivers through the delta cone is minimal. The vegetation is formed by rather few species, only three of which are invariably associated with soil saturated with sea-water, viz. *Puccinellia phryganodes* (fig. 47), *Stellaria humifusa* (fig. 48), the most important salt marsh plants of the area, and *Carex ursina*, which is rare and not found in the Skærfjord complex. Not strictly associated with the sea-water lagoons, but occurring at higher levels also, are *Carex subspathacea*, *Carex aquatilis stans*, *Cochlearia officinalis var.*, and *Puccinellia angustata*. Finally three species should be mentioned which often occur as facultative halophytes at the margins of the shore lagoons, where, together with *Stellaria humifusa*, they form a kind of shore snow-patch vegetation, viz. *Sagina intermedia*, *Phippsia algida*, and *Saxifraga rivularis*, the latter, however, probably represented by a special "salt ecotype", distinguished morphologically by a lower and more compact growth, more succulent stems and leaves, and a lighter green colour (lack of anthocyanin) than the normal form on salt-free soil. — As was the case with the fresh-water swamps, the dominating species often form pure growths without any admixture of other species. The *Stellaria humifusa* salt marsh is especially peculiar and conspicuous, each single individual of *Stellaria* forming a big, flat mat covered with white flowers (cf. fig. 48 and fig. 3, p. 13).

After the above survey of the most important ecosystems of the area and the distribution of the species among these, we shall consider the number of species, in all 59, which disappear between Liverpool Coast (i. e. 71° N. lat.) and the southern boundary of the area under consideration (i. e. c. 74°30′ N. lat.). On the basis of our knowledge gained through several years of the conditions under which these species occur in the Franz Joseph Fjord region (s. l.), where they have their northern limit, the majority of them can be naturally grouped into ecosystems as defined above, but we have here to consider some few more ecosystems not developed in the area treated above. Such a reference of the species to ecosystems is here all the more easy, since most of the species near the limit of their distribution are more distinctly associated with certain habitats than in the central parts of their area.

The question which we are here to decide, is, in brief: Where would these species grow if they were to be found within our area, or, with the terminology here applied, to what ecosystems would they belong,

Phot. G. SEIDENFADEN No. 3881.

Fig. 48. *Stellaria humifusa*, about $^3/_4$ size. Kuhn Isl., south of Bastian Bay (Loc. 6). August 8, 1933.

provided that they were to grow under conditions corresponding to their requirements as to habitat at their northern limit? If we proceed quite schematically, we shall arrive at the following survey of which species "are lacking" in each ecosystem (cf. Table I):

Ecosystem	I:	0	species	lacking.	
—	II:	1	—	—	(*Braya humilis*).
—	III:	1(?)	—	—	(*Arabis arenicola*)
—	IV:	0	—	—	
—	V:	3	—	—	(*Arctostaphylos alpina*, *Campanula rotundifolia*, *Rumex Acetosella*).
—	VI:	2	—	—	(*Agropyrum violaceum*, *Braya linearis*).
—	VII:	6	—	—	(*Pyrola grandiflora*, *Pedicularis lapponica*, *Phyllodoce coerulea*, *Carex sparsiflora*, *Ranunculus auricomus var. glabrata*, *Lycopodium annotinum;* the latter might perhaps with equal right be referred to the accompanying plants of the *Cassiope* heath).
—	VIII:	3	—	—	(*Euphrasia latifolia*, *Thalictrum alpinum*, *Carex scirpoidea*).
—	IX:	0(1)	—	—	(*Lycopodium annotinum*, see under VII).
—	X:	0	—	—	
—	XI:	0	—	—	
—	XII:	1	—	—	(*Sagina caespitosa*).
—	XIII:	1	—	—	(*Carex alpina*).
—	XIV:	0	—	—	
—	XV:	3(4)	—	—	(*Calamagrostis neglecta*, *Dupontia Fisheri*, *Carex pseudolagopina*[1]) (*Carex rariflora*, see below)).
—	XVI:	0(1)	—	—	(alternatively 1 species, *Saxifraga aizoides*, see below).
—	XVII:	3	—	—	(*Potamogeton filiformis*, *Ranunculus trichophyllus* var., *Callitriche verna*).
—	XVIII:	1	—	—	(*Carex glareosa*. In addition may be mentioned two disappearing species, from sandy shores, *Honckenya peploides* and *Matricaria inodora nana*.

Thus 27 (29) of the 59 disappearing species are accounted for. There remain, then, 32 (30) species which occur in the Franz Joseph

[1]) See p. 166.

Fjord region but are lacking in our district; consequently they belong to ecosystems not represented in the latter district.

No less than 17 of these remaining species are associated in the Franz Joseph Fjord area with (and in an essential degree form) a type of vegetation which may more correctly be designated the herb mats proper (for the area); it occurs in the lowest-lying (moistest) parts of sunny slopes, or in a narrow belt in front of slopes and steep rock-walls exposed to the sun where the snow-cover is too slight, or melts too early, to afford conditions for an actual snow-patch vegetation. The 17 species are as follows: *Carex Lachenalii*, *Arabis alpina*, *Veronica alpina*, *Pinguicula vulgaris*, *Chrysosplenium tetrandrum*, *Cassiope hypnoides*, *Poa alpina*, *Sibbaldia procumbens*, *Potentilla Crantzii*, *Draba crassifolia*, *Taraxacum brachyceras*, *Antennaria alpina*[1]), *Botrychium Lunaria*, *Luzula spicata*, *Gentiana nivalis*, *Gentiana tenella*, and *Gentiana detonsa*. *Chrysosplenium tetrandrum* seems to be principally associated with old Eskimo settlements, though occurring under similar conditions as the rest of the species.

Although these species differ somewhat as to the degree of moisture they require (the sequence given above indicates in broad features the gradation from moister to drier habitats), they are all so closely related ecologically that provisionally they must be referred to the same main type, that is, they belong to the same ecosystem. This ecosystem constitutes, in fact, a perfectly valid counterpart in the moderately moist series to Ecosystem V in the dry and Ecosystem X in the wet series, and might suitably be termed Moderately Moist Sheltered Sunny Slopes (cf. Table I). — For the sake of completeness only it should be mentioned that four of the rare (southern) species of our area, to the south belong characteristically to this ecosystem, viz. *Salix herbacea*, *Saxifraga hieraciifolia*, *Erigeron unalaschkensis*, and *Minuartia biflora*.

Four (three) of the remaining species belong, in the Franz Joseph Fjord area, to a type of vegetation widely distributed there, viz. the knolly bog, representing the vegetation of Stagnant (fossil?) Sliding Slopes (cf. Table I). By the sliding action of the earth through the ages the gradient of the proximal parts of the sliding slopes has gradually become so inconsiderable that the water circulation is at present not very lively, and the water therefore becomes more or less stagnant. The structure (the knolls) of the resulting bog still bears the stamp of the markings in the immediately subjacent mineral substratum formed by earlier(?) solifluction phenomena. This ecosystem is practically not represented in our area. The species which disappear together with the knolly bog are: *Carex parallela*, *Tofieldia palustris*, *Minuartia stricta*,

[1])incl. *Antennaria Porsildii* EL. EKMAN.

and *Carex rariflora* (the latter also in swamps); the species first mentioned, in particular, is very strictly associated with the type of vegetation just mentioned. The knolly bog is an exceedingly well characterised type, at any rate physiognomically, and considering its common distribution south of, and its total disappearance in, our area, the number of its disappearing species seems remarkably low.

Finally, seven species belong to an ecosystem of Seasonally Overflowed or Submerged Ground, most frequently sandy and well drained, occurring along rivulets and small desiccating pools. It is chiefly represented in the inner fjord of the Franz Joseph Fjord area, but can hardly be ascertained with certainty within our area. The cause of its disappearance to the north might be the delayed melting of the snow there, a process which takes place all the summer, for which reason there is no lowering of the water level in the pools nor any partial desiccation of the rivulets. — The corresponding vegetation type might perhaps be termed alluvial meadows. The species belonging to this type which have disappeared from our area are as follows: *Saxifraga aizoides* (which in part, also, belongs to the river deltas), *Juncus arcticus*, *Cerastium trigynum*, *Triglochin palustre*, *Carex microglochin*, *Carex bicolor*, and *Carex capitata*. — It may be added that a species which is very rare within our area, belongs to this ecosystem farther south, besides occurring frequently in river deltas, viz. *Saxifraga Nathorsti*.

The species still left which disappear to the northward are *Potentilla stipularis*, *Primula stricta*, *Saxifraga tricuspidata*, and *Viscaria alpina*. I shall refrain here from any grouping of these species, as I do not know under what conditions they occur in Northeast Greenland.

As the decline of the flora shows a one-sided tendency, amounting, as it does, to 59 species in the direction south-north and to two species only in the opposite direction, it is not possible to point to any ecosystem within our area which is not known from the regions to the south of it, whereas, as shown above, (at least) three distinct ecosystems represented in the adjacent area to the south have disappeared. About half of the reduction in species, in all 28, falls on these ecosystems. Altogether the disappearing species are chiefly concentrated on ecosystems which are characterised by an intensive utilisation of the insolation due to a southward exposure; thus 17 of the 28 species mentioned; further[1]), for moderately moist precipices six species, for dry sunny slopes three species, and for fronts of earth glaciers three species, altogether 29 species. The decline is relatively the largest among the water plants, viz. three, since only one actual water plant is left (*Hippuris vulgaris*), and it is likewise fairly large for the swamps.

[1]) cf. p. 136.

The large decline in the flora of water and swamp plants can be regarded as definitive for the particular ecosystems, for with the increasing geographical latitude these here reach the critical point for the vegetation as regards the heat factor, and especially as regards the duration of positive temperatures in the growth substrate. The question is evidently more problematic for the ecosystems which are characterised by a southward exposure ("Sydberg", Southern Mountains).

"The advantage", i. e. the increase of the insolation due to the southward exposure of a locality, will vary with the geographical latitude; theoretically it will be nil as compared with another, for instance a northerly, exposure, at equator and near the North Pole; it will attain its maximum somewhere between these extreme points. In what latitude insolation is comparatively most increased by a southward exposure may perhaps be computed mathematically; at any rate it may be taken for granted that it will decrease north of our area. This, again, means that "Sydberg" as a botanical concept moves towards its extinction, so that, finally, exposure in any direction is only to be regarded as an important factor for the vegetation in relation to the direction of the wind and accordingly to the position of the snow-cover. The consequence of this will be that "dry sheltered slopes" becomes an unrealisable notion, and that "Sydberg" and snow-patch become identical. These conditions are hardly realised in their extreme consequences in the latitude in which land is known on the globe. But certain facts within the area here treated point in that direction; an ecosystem like X, "Moist to Wet Sheltered Sunny Slopes", in our area harbours a vegetation which in more southerly regions — even in the Franz Joseph Fjord area — compared with the southwardly exposed types of vegetation occurring there must be regarded as a (less extreme) snow-patch vegetation. — The consequence of these considerations will be, then, that north of our area to a less degree than within this area we shall to all propability meet with vegetation types which, even with an extreme modification of the concept "Sydberg", must be considered to belong to that category, although within Greenland — even in the northernmost localities — exposure — in one direction or another — will hardly be found to be a condition at all of the vegetation, or of the occurrence of the majority of the species present here. — Thus, according to the above, our flora decline within the "Sydberg" ecosystems may quite well be regarded as definitive.

Even though the ecosystems for our area are fairly ample concepts, so that conditions within ecotopes referred to the same system may naturally vary within certain limits, the computation made of the distribution of the species decline among the ecosystems seems to justify the inference that the systems which lose the (relatively) greatest number of species from south to north, must be assumed to be near their northern

limits in our area, in contrast to the systems which continue from south to north without any of their species reaching their geographical limit of distribution. In other words: the more exclusively associated with such a "dying" ecosystem a species is, the nearer will the species be to its complete extinction, moving in the direction of its flora decline, in this case towards the north. The sole proof of the correctness of such an assumption can, of course, only be derived from the final determination of the northern limits of the species on the basis of direct observations, and the question concerning the decline of the flora, as discussed above, might thus seem to be of little interest. A more accurate establishment of the boundaries of the area of the ecosystems, and a closer knowledge of the ecosystematic characteristics of the species at the limits of their area will, however, give a considerably more plastic picture of causality conditions relative to the limit of distribution of the species — in this case the northern limit — than a single indication of the geographical latitude.

It must, however, be conceded that the problems touched upon here are in the last instance to a certain degree sham problems, since any grouping, at the same time as it serves to supply a good general view of the conditions, conceals the actual state of affairs; all the more so because we have no certainty that the groups are equivalent, even though they are natural enough themselves. Each single species, including the complex of all the factors conditioning its presence, in the last instance constitutes the final unity of an ecosystem as such. But considering the large number of species of any area and the infinitude of possibilities in the gradation of the environmental factors by which we are faced, we can only after a grouping adapted to the given conditions arrive at the ecology of each single species, which must, presumably, in the last instance be the object of ecological plant geography. By the division of our area of investigation into ecosystems, here attempted merely in broad features, it was also our purpose to meet the demand of descriptive plant geography for an illustration of the vegetation conditions in relation to the landscape itself, which must be the sole purpose of descriptive plant geography. — Only by a mutual utilisation of the results of the two lines of enquiry can we expect to arrive at a comprehensive understanding of the connection between the landscape forms of an area, its physiognomy, and its vegetation.

A SUMMARY OF THE VASCULAR PLANTS FOUND IN EAST GREENLAND

I. Introductory Remarks.

As stated in the introduction, we have found it natural to conclude this work by adding a list of the species which according to our present knowledge of the flora of Greenland occur along the east coast. We have based this list on the literature that has appeared since the publication of OSTENFELD's list (1926). This literature is given below in the succession south to north in accordance with the areas treated in the individual papers:

1. M. P. PORSILD. Stray Contributions to the Flora of Greenland I. Medd. om Grønl. Bd. 77, 1930, p. 8 et seq. — The paper deals with the flora of South Greenland; however, Mr. PORSILD has visited one of the localities on the east coast referred to by us.
2. GUNNAR SEIDENFADEN. The Vascular Plants of South-East Greenland 60° 04′ to 64° 30′ N. lat. Medd. om Grønl. Bd. 106, No. 3, 1933.
3. J. DEVOLD & P. F. SCHOLANDER. Flowering Plants and Ferns of Southeast Greenland. Skr. Svalbard og Ishavet Nr. 56, 1933. — Comprises the flora south of Angmagssalik and of Kangerdlugssuak, in 68° 15′ N. lat.
4. TYGE W. BØCHER. Phytogeographical Studies of the Greenland Flora. Medd. om Grønl. Bd. 104, No. 3, 1933. — Investigations in Kangerdlugssuak and the regions north of it towards Scoresby Sound.
5. TYGE W. BØCHER. Studies on the Vegetation of the East Coast of Greenland. — Ibid. Bd. 104, No. 4, 1933. — The same area as 4.
6. THORV. SØRENSEN. The Vascular Plants of East Greenland from 71° 00′ to 73° 30′ N. lat. — Ibid. Bd. 101, No. 3, 1933.
7. PAUL GELTING. Studies on the Vascular Plants of East Greenland between Franz Joseph Fjord and Dove Bay (73° 15′—76° 20′ N. lat.). Ibid. Bd. 101, No. 2, 1934. — The two latter papers include the earlier records by VAAGE (1932), SEIDENFADEN (1930, 1931), and others.

Besides from the papers cited above we have drawn information from various unpublished notes, thus especially such made by SØREN-

SEN and GELTING for a not yet published work on some investigations in the Scoresby Sound district. Further from various more recent material, brought home partly from Southeast Greenland[1]), partly from the more northerly parts of East Greenland visited by the Danish Three-year Expedition 1931—1934.

To the subjoined list we shall further add the following explanatory remarks.

1. The geographical division of the districts

(cf. the map in fig. 49).

For practical reasons we have not followed the division applied by OSTENFELD (1926). Thus for instance as regards the delimitation of the southernmost district, we have used the boundary applied by SEIDENFADEN (1933), in 60° 04′ N. lat. The boundary between Districts 1 and 2 has for practical reasons been drawn in about 65° 00′ N. lat., for a belt extends here in which botanical collections are entirely lacking. District 1 accordingly comprises the area 60° 04′—65° 00′ N. lat.

District 2 is the district of Angmagssalik, its northern boundary having been drawn in the area in which KRUUSE's investigations stopped (1904) and those of BØCHER began, that is, in about 68° 00′ N. lat.

District 3 comprises the area which in recent times has chiefly been investigated by BØCHER (1933) and DEVOLD & SCHOLANDER (1933), i. e. Kangerdlugssuak and the coast north of this fjord, the northern limit being Cape Brewster; no collections have been made inside this cape along the south coast of Scoresby Sound. The last two districts accordingly correspond to OSTENFELD's Districts III and IV.

The northern boundary line of the Scoresby Sound District (4) we have likewise drawn through a place of the coast in which no botanist has so far been at work; the few collections made (coll. A. NOE-NYGAARD 1933, unpublished) available from the Storfjord (c. 71° 05′ N. lat.) we have referred to the Scoresby Sound region. Thus the boundary has been drawn along the inner water-shed between the Nordvest Fjord and the Davy Sound complex, and strikes the outer coast at 71° 10′ N. lat. This corresponds to OSTENFELD's District V.

The next two districts, Districts 5 and 6, have been taken directly from SØRENSEN and GELTING, and thus here there is no similarity with OSTENFELD's division. Owing to the deep fjords within these areas in connection with the accurate investigations it will be natural to

[1]) To our great regret we have had no access, however, to the essential part of the material brought home by the Seventh Thule Expedition from Angmagssalik. Our list will therefore, as regards District 2, probably have to be supplemented by some few new finds, which we hope will be published shortly by BØCHER (1938?).

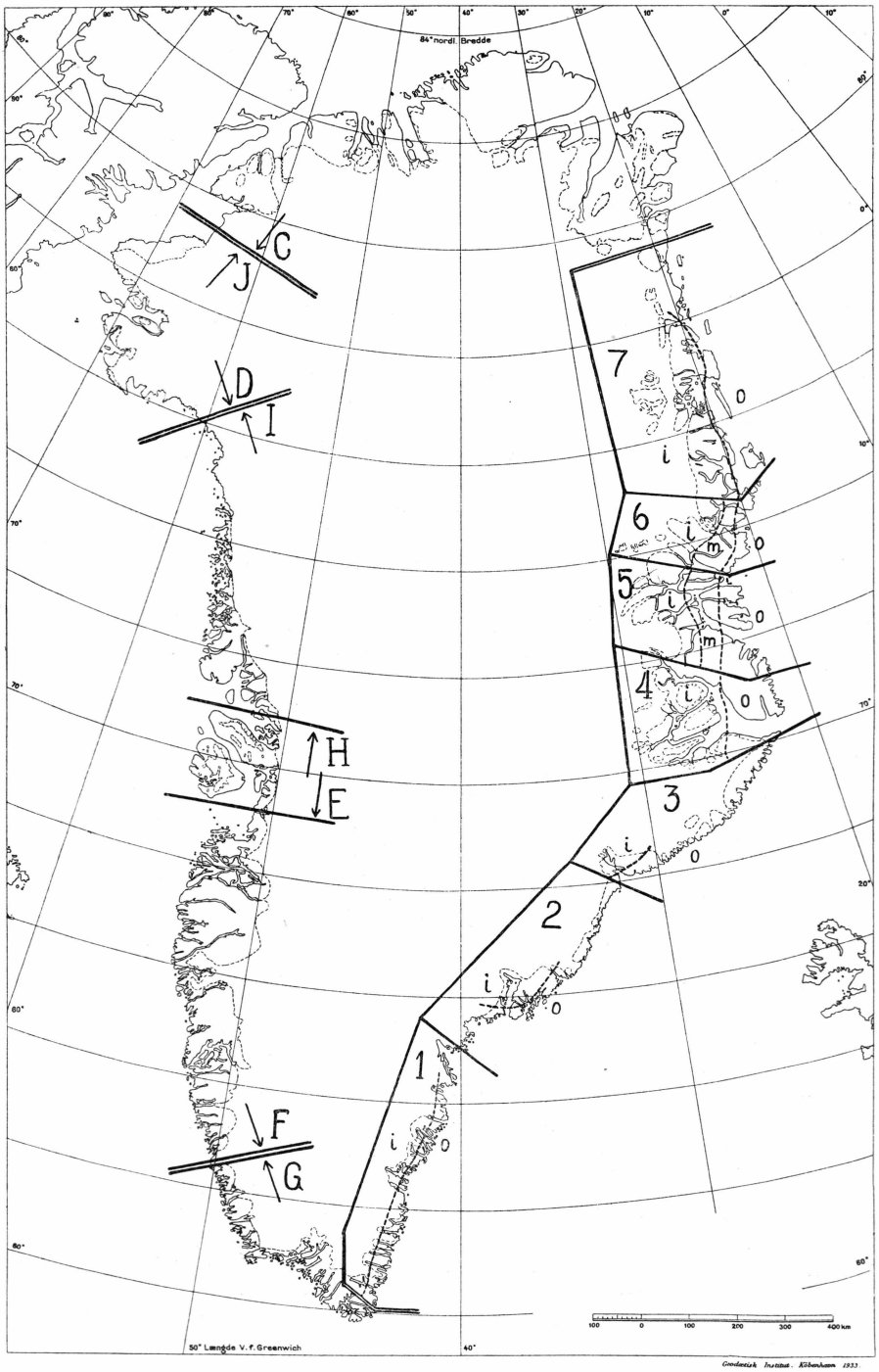


Fig. 49. Map showing the districts in East Greenland and the limits in West Greenland, cf. the text p. 146.

maintain these districts in a general view, even though in this way each district will extend over a smaller number of latitudes than the more southerly districts.

The northern limit of our northernmost district (7), too, deviates from that of OSTENFELD (see further p. 9).

Thus we shall have the following seven districts:

District	1 :	60° 04′ —	65° 00′	N. lat.
—	2 :	65° 00′ —	68° 00′	—
—	3 :	68° 00′ —	70° 09′	—
—	4 :	70° 09′ —	71° 10′	—
—	5 :	71° 10′ —	73° 15′	—
—	6 :	73° 15′ —	74° 40′	—
—	7 :	74° 40′ —	79° 30′	—

Within the individual districts we have further attempted a division into fjord localities and outer coast localities (i and o in the table). Such a division will, of course, be rather arbitrary, and if it is to be fairly well-founded, it must at any rate be made by a person who has himself been at work in the area in question. It is therefore possible that our division of Districts 1—2 and in part District 4 will be altered by later investigators. In places where the investigators have themselves drawn such lines of division, they have, of course, been maintained; this for instance applies to District 3, in which BØCHER separates the interior of Kangerdlugssuak; likewise we have maintained the division into three zones, inner, middle, and outer (i, m, o in the table) as proposed by SØRENSEN and GELTING, even though this may seem a little illogical; at any rate it gives a fuller information without having caused greater troubles for the compilation of the list. An × indicates that the species has been found in the area; the interrogation marks will be explained under the individual species.

2. The distribution of the species outside East Greenland.

In order to give as full information as possible in the simplest possible way about the distribution of the species outside the areas comprised by the list, a column indicating letters A—L and a—h has been added.

The meaning of the letters A to L appears partly from fig. 49. Thus they have reference to the distribution of the species in the remaining part of Greenland. They are to be understood as follows:

A. comprises species not found outside East Greenland.
B. comprises species occurring in a practically continuous area outside

East Greenland, i. e. are found both in North Greenland and the whole of West Greenland, but in contrast to the L-species, the entirely »circumgreenlandic« species, they occur in patches in East Greenland and are absent from several districts. This is a rather small group; the species that are of special interest will be mentioned in the following.

C—F. are such species which have a continuous area of distribution from the northern part of East Greenland along the north coast of Greenland and some way down the west coast. Thus the

C. species are such as extend around the north of Greenland, but not beyond the Humboldt Glacier in about 79° 30′ N. lat. The

D. species occur along the north coast of Greenland and some way down the west coast, viz. to Melville Bay in about 75° 30′ N. lat. The

E. species are found along the north coast of Greenland, and have their southern limit on the west coast north of Disko Bay (Jacobshavn Glacier in 69° 10′ N. lat.). The

F. group includes the species which extend around the north of Greenland, and have their southern limit in West Greenland between Jacobshavn Glacier and Frederikshaab Isblink in 62° 30′ N. lat.

Similarly, groups G—J comprise species which extend from East Greenland around the south of Greenland and have their northern limit on the west coast, thus the

G. species have their northern limit south of 62° 30′ N. lat. The

H. species have their northern limit on the Nugssuak Peninsula or in the intermediate area (i. e. between 62° 30′ and c. 70° 50′ N. lat.). The

I. species have their northern limit between 70° 50′ N. lat. and the Melville Bay (75° 30′ N. lat.). The

J. group finally comprises such species as are found right from the southern point of Greenland and have their northern limit between Melville Bay and Humboldt Glacier, i. e. between 75° 30′ and 79° 30′ N. lat., but have not hitherto been found on the north coast.

There remain, then, two categories of plants, viz. the

K. species, whose distribution is divided into two (or more) areas, one on the east coast and another on the west coast; thus they are »polycentric« in Greenland. The

L. group, finally, comprises such species as are found throughout the whole of Greenland, viz. are »circumgreenlandic«.

As our work principally deals with East Greenland, we have found no reason to investigate more closely the distribution of the species in West Greenland; this question must be dealt with in another and more comprehensive study. Our records therefore are based in the first instance on OSTENFELD's list, and this may be justified, since at the time OSTENFELD worked out his list West Greenland had been comparatively well investigated. Only as regards such species in which we took a special interest we have studied the more recent literature and the Herbarium.

As regards the other division into groups denoted by the letters a—h it refers to the distribution of the East Greenland species outside Greenland, and have been taken directly from OSTENFELD, unless new species or new conceptions of species necessitated another procedure. Thus these letters mean the same as in OSTENFELD (cf. OSTENFELD 1926, p. 24), only that we have chosen small letters in order to avoid confusion. OSTENFELD's division is as follows:

a. Species found in North America, but not in Europe.
b. Species found in North America and Iceland, but not in other parts of Europe.
c. Species found in North America and Europe, but not in Iceland and Scandinavia.
d. Species found in North America, and in Europe, but not in Iceland.
e. Species found in Europe, but not in eastern North America.
f. Species found in Arctic Europe (and Asia), but not in Scandinavia and Iceland, nor in North America.
g. Species found in North America, Iceland and Eurasia (circumpolar species).
h. Species not known outside Greenland (endemic species).

Finally, in order to further indicate the geographical distribution of the species in East Greenland, the last column in the table gives as accurately as possible the northern and southern limits of the species in East Greenland, if such exist.

3. The meaning of the letters B, DS, G, S, S & S, TH. S, after the names of species in the list.

As regards a number of species cited in our list maps of distribution on which each locality known is specially indicated, have been published in recent years. In order to call attention to these maps we have added in the list letters referring to the papers in which the maps are published. The following abbreviations have been applied:

B — Bøcher 1933, p. 45 et seq.

DS — Devold & Scholander, 1933, p. 198 et seq. These maps do not comprise the whole of Greenland, like the remaining ones, but only the stretch of the coast visited by the Norwegian expeditions, viz. the east coast between 59° and 64° 30′ N. lat.

G — Gelting, 1934, pp. 43, 113, and 262—283.

S — Seidenfaden, 1933, p. 103 et seq.

S & S — The maps in the present paper, p. 85 et seq., with the exception of the map showing the distribution of *Eriophorum callitrix* Cham., which is found in Seidenfaden & Sørensen, 1933, p. 16.

Th. S. — Sørensen, 1933, pp. 66 and 154.

In his last work Porsild (1935, p. 71 et seq.) sharply criticised a map prepared by the method that only such places whence the species is recorded with certainty are indicated by a dot, while such places in the literature in which the species is only recorded as »common in the district«, or the like, have been disregarded. Of course we must admit that Porsild is right in his criticism, notably as regards the species in question, even though we are aware that such a criticism may be raised towards the greater number of, or all, the maps that have been prepared in this way. But these maps have the advantage that they are objective in so far as they only include undoubted records and disregard subjective suppositions. The danger of generalising appears in some degree e. g. from the maps accompanying Fernald's papers in which Greenland is included; and the most recent investigations in East Greenland have shown in many respects that it is not always justified, as done by Ostenfeld in his list, to determine the occurrence of a species in a certain district by »interpolation« (cf. Seidenfaden 1933, p. 100).

Naturally these dot-maps will easily give an erroneous idea of the distribution of the species, especially, of course, because the species has not generally been collected in the areas in which it is frequent, whereas it will always arouse the interest along the margins of its area. This is precisely the case for instance with the species mentioned by Porsild, *Cassiope tetragona*. In this case hatching or a similar mode of indicating its presence might be preferable, even though this would be subjective in some degree.

Another error associated with the dot-maps, which seems to us even more dangerous, is the varying degree of investigation and the extremely unequal knowledge of the various districts. In Greenland these differences are very great, thus for instance the Disko Island, where Porsild has been staying for more than twenty years, as compared with regions along the north and east coast where nobody ever

set foot ashore. Thus being aware that the investigations during the first twenty years of this century have been concentrated about Disko, while the last 5—10 years have chiefly centred round certain parts of East Greenland, one will at once be sceptical about the supposition that precisely these regions should contain areas in which the plants have subsisted during the latest glaciation of Greenland. Altogether it is possibly too early on the basis of our present knowledge of the distribution of the species to put forward general theories about the cause of this distribution (cf. further p. 184).

If nevertheless we prefer this mode of preparation of our maps, and aim at attaining a complete mapping of all the plant species of Greenland, it is because in this way we hope to be able to spare ourselves and others looking through the collections of our museum in future, and in part the earlier literature, partly to call the attention of future investigators to places in which they should especially search for the particular species.

It applies to all the maps cited in the list that they are already out of date. This even applies to our own maps in the present paper, as we have not had access to the collections brought home from Southeast Greenland (the Angmagssalik district) in 1933 by the Seventh Thule Expedition. The maps must therefore be supplemented when BØCHER's paper has been published. As regards the other maps, they have, naturally, been unable to include the records which are first published in the present paper, but further they have nearly all of them been worked out simultaneously, so that to a botanist unfamiliar with the conditions it is associated with some difficulty to ascertain how much each author has succeeded in including. To facilitate the work for such scientists, we shall state below what can be done at present (February, 1937) to make the maps up to date.

The earliest dot-maps are found in the paper by SEIDENFADEN (1933). Accordingly they lack the information given by GELTING (1934), SØRENSEN (1933), BØCHER (1933), DEVOLD & SCHOLANDER (1933), and PORSILD (1935).

All those enumerated above are lacking in BØCHER's maps (1933), and as regards most species further the records of SEIDENFADEN (1933).

DEVOLD & SCHOLANDER's maps (1933), on the other hand, lack the localities given in SEIDENFADEN's maps (1933), which were published at the same time. These maps comprise only the area visited by the Norwegian expeditions.

SØRENSEN's maps (1933) only comprise species which are not found in areas visited afterwards, and hence only our records in the present work shold be inserted.

GELTING's maps (1934) lack only the records published after 1934.

It should be added that our maps include records from the Scoresby Sound area, whence a publication (by GELTING and SØRENSEN) will appear later. Finally, we recently received a collection of plants from the areas of West Greenland situated between 72° and 78° N. lat., collected at our request on Dr. F. SALOMONSEN's zoological expedition in 1936, for which we here wish to tender him our best thanks.

II. Systematical Remarks on the List.

In by far the greater number of cases there will hardly be any doubt as to how the systematic units included in the list should be understood. On the whole we have followed the same view as adopted in OSTENFELD's list or the majority of the works on which the list is based. As to several species, however, our view has been changed in various respects by the investigations of recent years; this, of course, is especially true of the more dubious species, our material of which has been increased through the work of the most recent expeditions, which have thus enabled us to undertake more detailed studies. Moreover, a number of species have been found which are not included in OSTENFELD's list.

Finally, the quite correct denomination of the species causes some difficulty. As regards the arctic species, in particular, there has often been great disagreement as to the correct nomenclature owing to the insufficiency of the older material and the more or less unsatisfactory diagnoses. Notably Professor FERNALD of the Gray Herbarium and his collaborators have in recent years done a great work in regard to the nomenclature, and the latest American works contain many nomenclatural surprises to a Scandinavian botanist.

We have considered to what extent we were to let these views influence our list of the vascular plants of East Greenland. In our previous works on the various parts of the coast the question has seemed to us to be of fairly subordinate importance, because the botanists which were in the first instance to work with them would always know with what plants they were concerned. The case would, of course, be somewhat different if we were to work out a survey like the present one, it being our hope that it will be of use within a greater circle. It will always be difficult for a non-arctic botanist to make direct comparisons between our »European« flora lists and the American ones.

Yet we have preferred to maintain the nomenclature hitherto used by Scandinavian botanists in the present list. For the list forms a kind of termination of our synoptic investigations in East Greenland, and it would, no doubt, only create confusion if we were now suddenly to employ a perhaps more logical, but, we dare say, in some few cases not yet quite stabilised nomenclature.

The study of nomenclatural questions is precisely in recent years in such a rich development at many different fronts that a number of alterations are still to be expected. It is to be hoped that a closer cooperation may be established between the investigators of the East and West Arctic, so that agreement may be arrived at as to certain divergent views, which, though they do not seem particularly important to us, may cause some delay in our comparisons between the floras of the different parts of the Arctic.

As stated above, we have therefore in the main applied the nomenclature used in recent years by Scandinavian botanists. If the nomenclature differs as regards certain species in the list, such species have been marked with an asterisk after the specific name. The species as to which we wish to make other systematic remarks, have been marked with an asterisk, too. The various remarks have been gathered below, where the species are dealt with in the same order as in the main list.

Remarks on the species marked with an asterisk in the list.

Lycopodium alpinum L. and ***L. complanatum*** L. have recently been subjected to a close investigation by PORSILD (1935, VI). On his authority we have omitted from the list KRUUSE's records (1906, p. 283) of *L. complanatum* L. *β chamaecyparissus* (A. BR.) ROSENV. The specimens brought home have been examined by PORSILD, who refers them to *Lycopodium alpinum* L. *f. umbrosa* PORSILD (l. c. p. 23). The specimens brought home by BØGVAD in 1932 from two localities in Southeast Greenland and determined by SEIDENFADEN (1933, p. 43) on the basis of a comparison with herbarium material as *L. complanatum* L. subsp. *chamaecyparissus* A. BR., however, seem to be justly referable to the Greenlandic form of *Lycopodium complanatum* L.

Athyrium alpestre (HOPPE) RYL. In accordance with DEVOLD & SCHOLANDER (1933, p. 18) we refer the form occurring in East Greenland to var. *americana* BUTTERS. The abundant occurrence of the species on the southeast coast of Greenland can accordingly hardly be interpreted as due to the eastern occurrence of the species, as assumed by SEIDENFADEN (1933, p. 107), but may possibly be due to other factors.

Dryopteris dilatata (HOFFM.) A. GRAY is used by us as a general name for a form complex not yet elucidated. The Danish specialist in ferns, Dr. C. CHRISTENSEN, has referred the East Greenland specimens examined by him to *D. spinulosa* (O. F. MÜLLER) KUNTZE var. *americana* (FISCHER) WEATHERBY (cf. PORSILD, 1930, p. 8). On the other hand, the distinguished connoisseur of the Scandinavian fern-flora, Professor

HOLMBOE, has examined the forms brought home from the east coast of Greenland by Norwegian expeditions, and states (cf. DEVOLD & SCHOLANDER, 1933, p. 21) that the more well-developed forms are indistinguishable from the Scandinavian *Dryopteris austriaca* (JACQ.) WOYN., while, on the other hand, none of them can be referred to *D. spinulosa* (MÜLL.) KUNTZE s. str. For the present we dare not, therefore, take up a definite standpoint as to this intricate question, but maintain the name used by OSTENFELD.

Woodsia ilvensis (R. BR.) BAB. Various authors, thus most recently DEVOLD & SCHOLANDER (l. c. p. 22), have distinguished between the two species, *Woodsia ilvensis* (= *W. ilvensis* R. BR. *α rufidula* (MICHX.) KOCH) and *Woodsia alpina* (BOLT.) GRAY (= *W. hyperborea* R. BR.). These two species have been listed as one, as we thought it impossible to distinguish between them in all cases.

Juniperus communis L. Only the dwarf-form, *forma nana* WILLD., occurs in East Greenland.

Betula glandulosa MICHX. s. l., cf. DEVOLD & SCHOLANDER (1933, p. 69) and SEIDENFADEN (1933, p. 48). Forms which may indicate a hybridization with *Betula nana* have been found in two localities in about 63° 03′ N. lat., near the southern limit of the latter species. Besides, hybrids with *B. pubescens* seem to occur on the most southerly part of the coast.

Callitriche anceps FERN. has in the course of time often been confused with *C. hamulata* KÜTZ. Professor SAMUELSSON has previously examined the material kept in the herbarium of the Botanical Museum of Copenhagen, and in our treatment of the material we follow in the main SAMUELSSON. In accordance herewith *C. anceps* is the most widely distributed of the two species, extending on the east coast northward to Angmagssalik and on the west coast to Disko, whereas *C. hamulata* is a more southern type with its northern limit on the east coast in 63° 03′ N. lat. (DEVOLD & SCHOLANDER, 1933, p. 55); on the west coast it extends almost to 68° 40′ N. lat. It is peculiar that the third species found in East Greenland, *Callitriche verna* (L.) LØNNR., seems to extend farther north on the east coast (72° 42′ N. lat.) than on the west coast (69° 45′ N. lat.). But these three species are recorded from comparatively few localities in Greenland, presumably they have often been overlooked.

Arenaria ciliata L. ***subsp. pseudofrigida*** OSTF. & DAHL is the only *A. ciliata* form occurring in East Greenland. For the distribution, etc., see further GELTING (1934, p. 269) and NORDHAGEN (1935, p. 49).

Cerastium Regelii OSTF. GELTING (1934, p. 39) records the species from West Greenland (Hare Island) on the basis of a photograph and

a description of a *Cerastium* published by PORSILD (1912, p. 374). In order to have this isolated occurrence on the west coast of Greenland verified, we applied to Mag. PORSILD, who kindly informed us that *C. Regelii* does not occur in West Greenland. Mag. PORSILD likewise placed a large material of *C. alpinum* from West Greenland at our disposal, i. a. the specimen figured. Neither this nor other similar specimens deviating from the typical *C. alpinum* can be referred to *C. Regelii*, since they differ from that species by having longer leaves tapering towards the base, a looser, more prostrate growth, and longer and more acute sepals.

In accordance with the above we have listed the species as a C-species. Apparently the species is absent from Northwest Greenland; thus it is not represented in the material recently brought home from Thule and Melville Bay by F. SALOMONSEN, although it includes a number of small *Caryophyllaceae* such as *C. alpinum* and *Stellaria humifusa.*

Cerastium trigynum VILL. = *C. lapponicum* CR. = *C. cerastioides* (L.) BRIT.

Melandryum affine J. VAHL and ***M. triflorum*** (R. BR.) J. VAHL and their mutual relations have previously been discussed, i. a. by SØRENSEN (1933, p. 27 et seq.), who did not keep the two forms distinct. However, during later investigations in the field SØRENSEN has arrived at the result that it is actually possible to distinguish between the two species. The correct name for *M. affine* in Greenland and North America seems to be *Lychnis* (§ *Melandrium*) *furcata* (RAF.) FERN., cf. FERNALD in Rhodora Vol. 34, 1932, p. 22.

Stellaria borealis BIG. = *S. calycantha* (LEDEB.) BONG.

Braya linearis ROUY. Both SEIDENFADEN (1930, 1931), SØRENSEN (1933), and GELTING (1934) have erroneously referred this species to *B. glabella* RICHARDS. However, the question as to the identity of our species was explained already by SCHULZ (1924).

Braya Thorild-Wulffii OSTF. Cf. p. 36.

Draba Bellii HOLM. Cf. p. 42.

Draba daurica DC. = *Draba hirta* (*borea*) in part, in OSTENFELD (1926). According to FERNALD (1934 a, p. 333) the earliest valid name for this plant seems to be *Draba glabella* PURSH.

Draba fladnizensis WULFEN is considered by us an eastern species, the North American specimens previously referred to this species having been found to constitute a separate species, viz. *Draba Allenii* FERNALD (1934 a, p. 289).

Draba Gredinii El. EKMAN, cf. p. 45.

Draba lactea ADAMS = *D. fladnizensis* WULFEN var. *heterotricha* (LINDBLOM) BALL = *Draba Wahlenbergii* ex parte in OSTENFELD (1926).

Draba micropetala HOOK. = *Draba Adamsii* LEDEB. in OSTENFELD (1926), cf. OSTENFELD (1923).

Draba rupestris R. BR. As our species as regards the material from Greenland seems to include both *Draba rupestris* R. BR. and *D. norvegica* GUNN., the collective name, according to FERNALD (1934 a, p. 293), should be *D. norvegica* GUNN.

For a further discussion of the *Draba* species, see p. 40.

Empetrum nigrum L. All the material examined by us belong to the variety *var. hermaphroditum* (LANGE) = *E. hermaphroditum* (LANGE) HAGERUP (1927). For further discussion regarding this question, see SØRENSEN (1933, p. 96).

Epilobium palustre L. As regards the isolated northern occurrence, see BØCHER (1933, p. 4) and SEIDENFADEN (1933, p. 57).

Polygala serpyllaceum WEIHE (= *P. depressum* WEND.). A single specimen of this species, which is new to Greenland, was found by the Norwegian expedition in 1932 (cf. DEVOLD & SCHOLANDER, 1933, p. 55).

Polygonum heterophyllum LINDM. ***var. boreale*** (LANGE) LINDM. Cf. PORSILD (1932, p. 28).

Ranunculus affinis R. BR. To at any rate a number of our specimens from Northeast Greenland it applies that they correspond closely to the descriptions and figures of *R. pedatifidus* J. E. SM. given by FERNALD (1934, p. 93) (see also FERNALD 1917, p. 138); hence it would perhaps be more logical to apply this evidently earlier name.

Ranunculus auricomus L. and ***var. glabrata*** LYNGE was found in Greenland by SØRENSEN (1933, p. 53).

Ranunculus trichophyllus CHAIX. According to DREW (1936) only the *var. eradicata* (LÆST.) DREW occurs in Greenland.

Alchemilla acutidens BUSER has been found in one place only in Greenland. Cf. DEVOLD & SCHOLANDER (1933, p. 37).

Alchemilla filicaulis BUSER = *A. minor* HUDS. subsp. *filicaulis* (BUSER) LINDB. fil. The *Alchemilla vulgaris* L. s. l. forms have been investigated by DEVOLD & SCHOLANDER (l. c. p. 35). From a single place in the Lindenow Fjord area they mention the occurrence of *A. minor* HUDS. = *A. filicaulis* BUSER *f. vestita* BUSER. The specimens brought home by BØGVAD in 1932, listed by SEIDENFADEN (1933, p. 61) under *A. filicaulis* BUSER, have not yet been more closely examined[1]).

[1]) The determinations have lately been confirmed by ROTHMALER.

Alchemilla pseudomicans Bøcher. Cf. Bøcher 1933, p. 16.

Dryas integrifolia M. Vahl is regarded by Sørensen (1933) and Gelting (1934) as a variety of *D. octopetala* L. Since outside the areas treated by them the two forms are distributed over widely different tracts, and do neither of them occur throughout the whole of East Greenland, we have found it natural to give them as two species in the present list in contrast to what has been done above (cf. p. 58). It is true that along the coast from Scoresby Sound to Skærfjord *Dryas* occurs as a complex of intermediate forms, and *D. integrifolia* is only found in the inner fjords and is hardly ever typical; on the other hand it is interesting to note that only pure *D. integrifolia* occurs in Angmagssalik, while *D. octopetala* seems to have its southern limit in about 69° N. lat. In West Greenland only *D. integrifolia* occurs, since *D. octopetala* has its southern limit at Thule (76° 30′ N. lat.). Along the north coast of Greenland also *D. integrifolia* seems to be the main form, though intermediary forms apparently occur (cf. Ostenfeld, 1923, p. 239). In this connection it is interesting to note, as stated above (p. 58), that only pure *D. integrifolia* specimens have been brought home from our most northerly locality in East Greenland (Norske Island, 78° 12′ N. lat.)[1]). Thus it would seem that in East Greenland and to some extent in North Greenland two species meet, one coming from the east and one from the west, or, more hypothetically, that *D. integrifolia*, the older form in Greenland, forms hybrids with *D. octopetala* coming from the east; in these hybrids the *D. integrifolia*-characters are probably to be regarded as recessive.

Potentilla Crantzii Beck = *P. maculata* Pour. = *P. alpestris* Hall f.

Potentilla emarginata Pursh. This species was treated by Malte (1934, p. 177), who divided *P. emarginata* into two species; according to this the species occurring in Greenland should apparently be named *P. hyparctica* Malte.

Potentilla rubella Soer. See Gelting, 1934, p. 106.

Potentilla rubricaulis Lehm. See p. 61 and Sørensen, 1933, p. 64.

Potentilla stipularis L. ***var. groenlandica*** Soer. See Gelting, 1934, p. 112.

Salix arctica—glauca s. l. As we found it impossible on the basis of herbarium material to explain in detail this greatly varying form complex, which can probably only be done by a close examination of the genetic relations, we found it natural to list all the East Greenland *Salix* material, with the exception of *S. herbacea*, under this name. If we follow Floderus (1923, and later determinations of material from the various expeditions), we shall have three types, viz. *Salix arctica* Pall., *S. arctophila*

[1]) although the other form was much searched for.

COCK.[1]), and *S. glauca* L., which, however, seem to be extremely rare as pure species. Further, following FLODERUS, it would seem that to the north the triple hybrid is particularly common, possibly with the exclusion of *S. arctophila* farthest north. To the south, on the contrary, disappears *S. arctica*; thus SEIDENFADEN (1933, p. 64 et seq.) did not find traces of mixing with this species in individuals from the area south of 64° 30′ N. lat., while DEVOLD & SCHOLANDER (1933, p. 70) record the triple hybrid southward to about 63° N. lat. In the part of the coast south of this latitude forms referable to the hybrid *S. arctophila* × *glauca* are most commonly met with.

Chrysosplenium tetrandrum (N. LUND) TH. FR. was found in Greenland for the first time in 1931, around Clavering Island (74° N. lat.), cf. GRØNTVED (in Bot. Tidsskr. 1931), VAAGE (1933, p. 22) and GELTING (1934, p. 116). It is exclusively associated with old Eskimo house ruins.

Saxifraga caespitosa L. ***subsp. eucaespitosa*** ENGL. & IRMSCH. and ***subsp. decipiens*** (EHRH.) ENGL. & IRMSCH. = *Saxifraga groenlandica* in OSTENFELD's list.

Saxifraga Nathorsti (DUSÉN) HAYEK, see p. 65 and SØRENSEN 1933, p. 77.

Saxifraga nivalis L. In addition *S. nivalis var. tenuis* WBG. has been found in all districts, but since transitional forms seem to occur, we have not listed it as a separate species. The two forms seem to have the same distribution in East Greenland, the variety, however, being more frequent to the north and seems to be especially associated with the outer coast.

Ligusticum scotium L. = *Haloscias scoticum* in OSTENFELD's list.

Linnaea borealis L. DEVOLD & SCHOLANDER (1933, p. 93) have the only record of this plant from one locality in East Greenland. All the West Greenland specimens of this species belong to *var. americana* (FORB.) REHD.; DEVOLD & SCHOLANDER do not state which form is present in their locality.

Antennaria alpina (L.) GÄRTN., here including *A. Porsildii* E. EKMAN, cf. SØRENSEN, 1933, p. 90.

Antennaria labradorica NUTT., cf. SEIDENFADEN, 1933, p. 72. Our colleague, T. BØCHER, has made a careful study (not yet published) of the forms of *Antennaria* from Southeast Greenland, and he agrees with us that we are here concerned with an isolated occurrence of *A. labradorica*, whose distribution in Greenland is otherwise limited to the west coast between 69° and 79° N. lat. However, in his opinion the specimens referred by SEIDENFADEN to *A. intermedia* (ROSENV.) POR-

[1]) = *S. chloroclados* FLOD. cf. SEIDENFADEN 1933, p. 64 ff.

SILD have been wrongly determined; more probably they belong to a form of *A. labradorica*, and accordingly we have omitted *A. intermedia* from the list. The form mentioned by SEIDENFADEN (l. c. p. 72) under "105, *Antennaria* sp." according to BØCHER (kind verbal information) comes very close to *A. alpina*.

Erigeron borealis (VIERH.) SIMM = *Trimorpha borealis* VIERH.

Erigeron uniflorus L. s. l. Under this species we include *E. eriocephalus* J. VAHL. However, this does not mean that we underestimate the difference between the two forms; *E. eriocephalus* is no doubt a distinctly northern form, and evidently the only form occurring in the most northerly parts of Greenland. Cf. further p. 72. In 1933 TH. SØRENSEN observed forms which should possibly be referred to *E. uniflorus* s. str., at Terneskær in Gael Hamkes Bay (74° 00′ N. lat.). But very possibly a number of doubtful forms from the northern area represent the hybrid *E. eriocephalus* × *E. unalaschkensis*. With our present knowledge of these forms it would hardly serve any purpose to draw more or less artificial distributional limits between *E. uniflorus* and *E. eriocephalus*.

Matricaria inodora L. We agree with MALTE (1934, p. 192) that the right varietal name for the Greenland form is *var. nana* (HOOK). TORR., and not the name hitherto usually accepted, viz. *var. grandiflora* (HOOK.) OSTF.

The ***Hieracium*** species of Southeast Greenland have been uniformly treated, since both the new Norwegian and the new Danish materials as well as the earlier herbarium materials have been examined by Dr. OMANG, Oslo. The results arrived at by Dr. OMANG have been published in the two floras from Southeast Greenland (DEVOLD & SCHOLANDER, 1933, p. 100; SEIDENFADEN, 1933, p. 112) and in two special papers (OMANG, 1932, 1933).

In accordance with these results we have to do with ten *Hieracium* species, besides *Hieracium alpinum* (L.) BACKH. All these species, with the exception of *H. groenlandicum* (cf. below), are endemic to Greenland; four of them have so far been brought home from the southeast coast only. Their presumed relationships and distribution may be summarised as follows:

I) Section *Alpina*
   a) *Eualpina:*
      H. alpinum L. W: nl: 62° 22′, E: nl: 71° 05′
   b) *Nigrescentia:*
      H. hyparcticum W: nl: 61° 13′, E: nl: 66° 18′
      H. stelechodes only East Gr., at 63° 31′

c) *Depilata:*
H. lividorubens W: nl: 67° 10′, E: nl: 60° 34′

II) Section *Prenanthoidea*
a) *Alpestria:*
H. groenlandicum W: nl: 69° 35′: E: nl: 66° 18′
H. ivigtutense W: nl: 67°: E: only at 61° 06′
H. Scholanderi only East Greenland, 60° 07′ and 60° 29′
b) *Euprenathoidea:*
H. amitsokense W: nl: 60° 18′: E: only at 60° 31′

III) Section *Foliosa:*
H. rigorosum W: nl: 61° 43′: E: nl: 63° 30′
H. Devoldii, only East Gr. at 60° 30′
H. nepiocratum, only East Gr. at 60° 34′

The fact alone that all the Greenland forms of *Hieracium* occur on the east coast, while four are absent on the west coast, seems to point towards an easterly origin. This seems to be especially distinct as regards *H. alpinum*, which on the east coast has been found northward to Storefjord (not published previously, collected by NOE-NYGAARD in 1933) in Liverpool Coast (cf. the map, fig. 51), and as will appear from the above list, several of the other forms, too, are more widely distributed along the east coast, except, perhaps, the specially West Greenlandic form *H. ivigtutense*, which is only recorded from one locality on the east coast. The same probably applies to *H. amitsokense*, which, however, has only been found in the southernmost part of the west coast. Closely related to the latter is finally the twelfth *Hieracium* species in Greenland, *H. Sylowi* OMANG, which is only at hand from a single locality in the most southerly part of Greenland (cf. OMANG, 1933 a, p. 119). Transitional forms between this and *H. amitsokense*, though most closely related to the latter, are recorded by OMANG (l. c.) from some few places on the east coast. Such a form has been found as far north as 63° 30′ N. lat. on the east coast.

PORSILD (1932, p. 76 et seq.) (without knowing the new East Greenland finds) discusses the Greenland forms, in connection with the question as to their origin. The new East Greenland finds do not add anything new to PORSILD's observations apart from corroborating his assumption that the immigration of the parent forms goes much farther back than the time of the ancient Northmen. PORSILD especially bases his assumption on the fact that *H. groenlandicum* has spread to eastern America, New Foundland, and the regions round the southern Labrador. The occurrences in East Greenland are new arguments in favour of PORSILD's assumption, and without entering further into the matter, which does not seem to us to be sufficiently elucidated until a more

abundant material is available, we are convinced that the Greenland *Hieracia*, which have their area in common with so many other relicts from a post-glacial heat period, represent adaptation forms of types immigrated into Greenland from the east during such a period (cf. p. 191).

The ***Taraxacum*** species of Southeast Greenland have been studied by DAHLSTEDT (cf. DEVOLD & SCHOLANDER, 1933, p. 105, and SEIDENFADEN, 1933, p. 75).

FERNALD (1933, pp. 378 & 383) as well as ABBE (1936, p. 160) apply the name *T. lapponicum* KIHLM. to *T. croceum* DAHLST., and the name *T. lacerum* GREENE to *T. groenlandicum* DAHLST. We do not regard ourselves capable of taking a standpoint to these taxonomical questions.

Phyllodoce coerulea (L.) BAB. (in BABINGTON: Manual Brit. Bot. ed. I (1843), p. 194) in earlier publications dealing with East Greenland has erroneously been referred to the genus *Bryanthus* (cf. HULTÉN, 1930, p. 26).

Vaccinium uliginosum L. See H. E. PETERSEN, 1933, and O. HAGERUP, 1934.

Gentiana detonsa ROTTB. In his most recently published paper PORSILD (1935, IX) gives a detailed account of the taxonomical history of this species. Upon his authority we use the above-mentioned name for the plant found by SØRENSEN in a single locality in Northeast Greenland, and mentioned by him (1933, p. 101) under the name previously applied, viz. *G. serrata* GUNN.

Thymus Serpyllum L. s. l. An account of the Greenland form of this species has recently been published by PORSILD (1935, VIII). The species is further mentioned by DEVOLD & SCHOLANDER (1933, p. 89), who in addition to the common hairy form (*Th. arcticus* (DUR.) RONN. = *Th. Serpyllum* L. *var. prostrata* HORN. = (according to DEV. & SCH.) *Th. britannicus* RONN., of which three names the one first mentioned should be used) mention a form with glabrous leaf-surfaces, and refer it to *Thymus neglectus* RONN. We have not kept these two species distinct in our list, as their distribution in Greenland is still unknown. *Th. neglectus* has hitherto only been recorded from a number of localities on the east coast within the area of *Th. arcticus*.

Transitional forms between the two species occur, but according to DEVOLD & SCHOLANDER they are rather rare.

Pyrola grandiflora RAD. = *P. rotundifolia* L. *v. grandiflora* (RAD.) DC., cf. MALTE (1934, p. 182).

Primula sp., cf. p. 76.

Primula stricta HORN. i. e. *Primula farinosa groenlandica* excl. *P. egaliksensis f. violacea* FERN. in OSTENFELD's list (1926) = *P. mistassinica* MICHX. excl. *var. groenlandica* WARM. in PORSILD (1920).

Previously there has been great confusion as regards the nomenclature of the Greenland *Primulae*. In OSTENFELD's list the species is stated under the above-mentioned name to have a western, exclusively American, distribution. However, subsequently the group has been examined by FERNALD (1928), according to whom *P. stricta* is distributed in the arctic parts of the old and the new world (l. c. p. 66).

Armeria vulgaris WILLD. Two forms of this species are recorded from Greenland, viz. a northern *var. sibirica* (TURCZ.) ROSENV. and a southern *var. maritima* (WILLD.) ROSENV.

Galium Brandegeei GRAY, cf. PORSILD, 1930, p. 24.

Limosella aquatica L. ***f. tenuifolia*** HOFFM., cf. DEVOLD & SCHOLANDER (1933, p. 80).

Euphrasia latifolia PURSH. The right name is *E. arctica* LGE., cf. FERNALD, 1933, p. 301.

Veronica alpina L. s. l., with which is included *V. Wormskjoldii* ROEM. & SCHULT., cf. DEVOLD & SCHOLANDER, 1933, p. 82 et seq.

Carex alpina SW. = *C. Halleri* GUNN. FERNALD (1933, p. 398) discusses the taxonomy of this species, which should be called *C. Vahlii* SCHKUHR.

Carex aquatilis WBG. ***var. stans*** (DREJ.) BOOTT, see p. 78[1]).

Carex bicolor ALL. has previously been recorded from the Angmagssalik district and the interior of Scoresby Sound (KRUUSE, 1905, p. 194). A revision of the specimens in question by SØRENSEN showed that they are *Carex rufina* DREJER.

Carex canescens L. DEVOLD & SCHOLANDER (1933, p. 115) record *Carex helvola* BLYTT from two localities in Lindenow Fjord, which is commonly regarded as the hybrid *C. canescens* × *Lachenalii*.

Carex glareosa WBG. The greater part, though not all of the Greenland material should be referred to *var. amphigena* FERNALD = *C. marina* DEW. cf. FERNALD, 1906, p. 47[2]).

Carex incurva LIGHTF. The taxonomy of this species has been discussed by FERNALD (1933, p. 395), and we agree with him that the right name of *C. incurva* is *C. maritima* GUNNERUS, a name that has

[1]) We are not quite certain that BOOTT's plant is identical with the *Carex stans* DREJER, so the right name of our Greenland plant should possibly be *Carex stans* DREJ.

[2]) See further ERLANDSSON in Bot. Not. Lund, 1937, which appeared during the printing of the present paper and could not therefore be discussed.

also been accepted by Scandinavian authors, cf. for instance SCHOLANDER (1934, p. 56). On the other hand, FERNALD (1933, p. 217) mentions a form, *C. Langeana* nom. nov., which he considers identical with the plant drawn by LANGE in Fl. Dan. Pl. 2843 as *C. duriuscula* LANGE not C. A. MEYER. It would seem that the original specimens of LANGE's *C. duriuscula* examined by us are possibly depauperate forms of *C. incurva* from dry places. In our opinion *C. duriuscula* LGE. is not a synonym of *C. Langeana* FERN.

Carex Lachenalii SCHK. = *C. bipartita* ALL., cf. MACKENZIE (1923, p. 348).

Carex nardina FR. The form *C. nardina var. Hepburnii* (BOOTT) KÜKENTH. = *C. Hepburnii* BOOTT mentioned by earlier authors does not occur in Greenland (cf. MACKENZIE, 1931, p. 22). Cf. further DEVOLD & SCHOLANDER (1933, p. 121) and SCHOLANDER (1934, p. 58).

Carex pedata WBG. = *C. glacialis* MACKENZIE (1910, p. 244).

Carex pseudolagopina SOER. See p. 167.

Carex rigida GOOD. According to FERNALD (1934, p. 91) the right name of this plant is *C. concolor* R. BR.[1]).

Carex rufina DREJER, see *C. bicolor* above. The species is not recorded by HARTZ (1896), the specimen from the Nordostbugt being recorded as *C. bicolor*.

Carex salina WBG. = *C. lanceata* DEW. (DEWEY in: Am. Journ. Sc. Vol. 29, p. 249, 1836), cf. MACKENZIE (1935, p. 416).

Carex saxatilis L. We include here all former records of *Carex rotundata* WBG., cf. p. 83.

Carex sparsiflora (WBG.) STEUD. (= *C. vaginata* TAUSCH.). Found in one locality in 1932, new to the flora of Greenland, cf. GELTING (1934, p. 174).

We agree with L. H. BAILEY (1889) and other American authors that the usual American variety should be regarded as a separate species, *C. saltuensis* L. H. BAILEY (l. c.). This species seems to have rather a southern distribution, and to occur on much damper soil than *C. sparsiflora*. However, in the Botanical Museum of Copenhagen the rich American material named »*Carex vaginata* TAUSCH.« includes a sheet with well-developed specimens which seems to be referable to the European-Icelandic-East Greenlandic *C. sparsiflora*. These specimens have been collected by M. O. MALTE, and bear the statement: 25.—26. Aug. 1937, No. 1185—88, Baffin Land: Lake Harbour 62° 49′ N. lat., 69° 55′ W. long. Rich, grassy slopes.

It is interesting that this locality seems to lie north of the hitherto

[1]) According to POLUNIN, (Canad. Field Naturalist LI, Nr. 8, p. 112, 1937) the type specimen of *Carex concolor* R. BR. is identical with *Carex aquatilis var. stans* of BOOTT.

known localities of *C. saltuensis*, and the indication of the habitat, "rich, grassy slopes", corresponds to the demands of the European forms, not to those of *Carex saltuensis*, which is most frequently recorded from *Sphagnum* bogs. Hence we must regard the area of distribution of *C. sparsiflora* as extending both west and east of Greenland.

Eriophorum callitrix CHAM. Cf. p. 87 and SEIDENFADEN & SØRENSEN, 1933.

Eriophorum polystachyum L. The distribution of this species is figured by SEIDENFADEN (1933, p. 104). As mentioned by SØRENSEN (1933, p. 127 et seq.), we are actually concerned with two different forms of different distribution, since to the north only the form *var. tristis* TH. FR. occurs, having its southern limit in Scoresby Sound on the east coast of Greenland and near Umanak in the same latitude on the west coast. Transitional forms occur in West Greenland in the last-mentioned area, while in East Greenland the two forms are separated by a gap of about eight degrees of latitude.

Kobresia bipartita (ALL.) D. T. If the name of *Carex Lachenalii* (cf. p. 163) is altered, the name of the present plant should be altered, too, the right name according to MACKENZIE (1923, p. 349) being *K. simpliciuscula* (WBG.) MACK.

Scirpus caespitosus L. SEIDENFADEN (1933, p. 87), in accordance with the earlier authors, gives the East Greenland variety as *var. austriaca* (PALLA) ASCH. DEVOLD & SCHOLANDER (1933, p. 131) have studied the question in more detail, and in agreement with FERNALD's nomenclature (FERNALD, 1921, p. 24) use the name *var. callosa* BIG.

Alopecurus aristulatus MICHX. According to FERNALD (1930, p. 221). the right name is *A. aequalis* SOBOL.

Agropyrum violaceum (HORNEM.) LGE. According to MALTE (1932) this name cannot be used, as it represents two species, viz. *A. latiglume* (SCRIBN. & SMITH) RYDB. and *A. trachycaulum* (LINK) MALTE, of which only the former is present in East Greenland.

Calamagrostis arundinacea (L.) ROTH. All the East Greenland specimens belong to *var. purpurascens* (R. BR.) GELERT.

Calamagrostis confinis (WILLD.) NUTT. (= *C. hyperborea* LANGE). In East Greenland the species has only been found in a few places by the Norwegian expeditions, cf. DEVOLD & SCHOLANDER, 1933, p. 134.

Calamagrostis Langsdorffii (LINK) TRIN. = *C.canadensis* (MICHX.) NUTT. *var. Langsdorffii* (LINK) INMAN. As pointed out by DEVOLD & SCHOLANDER (l. c. p. 134) the relations of the Greenland forms to

their nearest relatives in the east and west should be more closely investigated.

Calamagrostis neglecta (EHRH.) GÄRTN., MEY. & SCHERB. DEVOLD & SCHOLANDER are of opinion that the greater part of the East Greenland material should be referred to the dwarf-form *var. borealis* LÆST., under which name DUSÉN (1901, p. 58) lists the specimens found by him in Northeast Greenland.

Deschampsia brevifolia R. BR. Cf. p. 90.

Elymus arenarius L. All Greenland forms belong to *var. villosa* E. MEY.

Festuca brachyphylla SCHULTES. See p. 92.

Festuca rubra L. See p. 93.

Festuca vivipara (L) SM. and ***var. hirsuta*** SCHOL. see p. 93.

Phippsia algida (SOLAND.) R. BR. = *Catabrosa algida.* FR.

Poa annua L. has been introduced into Greenland and has been found in two places only on the east coast, viz. at Angmagssalik (cf. BØCHER, 1933, p. 10) and in Lindenow Fjord near the Danish hunting station (cf. DEVOLD & SCHOLANDER, 1933, p. 146).

Poa alpigena (FR.) LINDM. ***var. colpodea*** (TH. FR.) SCHOLANDER. Cf. p. 98.

Poa arctica R. BR. Cf. p. 95.

Poa Hartzii GDGR. Cf. p. 97 and SØRENSEN, 1933, p. 145, where in addition a map of the distribution of the species is given[1]).

Poa nemoralis L. For the present we list this species in accordance with OSTENFELD (1926) as occurring northward to Angmagssalik. The systematic position of the East Greenland forms, notably their relation to *Poa glauca* VAHL, deserves a more detailed investigation.

Poa pratensis L. s. l. Cf. p. 98.

Puccinellia retroflexa (CURT.) HOLMB. This difficult form complex, too, deserves a closer investigation.

Vahlodea atropurpurea FR. = *Deschampsia atropurpurea* (WBG.) SCHEELE.

Juncus bufonius L. was brought home among some other small plants collected by NOE-NYGAARD in 1933 in Storfjord (71° 05′ N. lat.). Owing to its other occurrences in Southern Greenland it was previously regarded as an "old Norse plant"; however, as assumed by PORSILD (1932) regarding the northern occurrences in West Greenland, we do not

[1]) According to Mag. PORSILD (kind verbal information), the locality in Southwest Greenland (Neria) should be cancelled, a confusion having taken place during the mounting.

doubt that the plant has come to Storfjord without human aid; the place has not previously been visited by Europeans, hardly even by Eskimos, so an introduction by man seems quite unlikely. We regard it as most probable that the species, which apparently thrived well, as it bore ripe fruits, even though the individuals were rather small and contained one capsule only, has been transported to the place by birds.

Juncus subtilis E. MEY. FERNALD (1934, p. 92) has subjected the West Greenland forms, hitherto listed under the name *J. supinus* MOENCH, to a closer investigation, with the result that they should all of them be referred to the former, American, species. It has been collected from one place only in East Greenland, viz. Angmagssalik (KRUUSE, 1906, p. 269). We have attempted to undertake an examination of the material found in the Herbarium; however, it is very poor and contains no well-developed individuals; yet we think it possible to refer it with some degree of certainty to the American species, which thus obtains an area of distribution on the east coast in addition to the three limited areas on the west coast of Greenland (cf. PORSILD, 1935, p. 62).

Juncus triglumis L. The systematic position of the Greenlandic form was discussed by FERNALD (1924, p. 301), who thought it possible to separate an American-Greenlandic form, *J. albescens* (LGE.) FERN., from the Eurasian one. However, on the basis of a larger material it has been established, both by DEVOLD & SCHOLANDER (1933, p. 110) and SØRENSEN (1933, p. 159), that such a difference hardly exists, and in agreement with SØRENSEN we therefore refer the East Greenland form to *var. Copelandi* BUCHEN. Only from a couple of localities on the southernmost part of the west coast specimens are at hand which should be referred to the main species.

Luzula arcuata WBG. and ***Luzula confusa*** LINDEB. We have found it impossible to keep these two species distinct in East Greenland, though to the north the form *confusa* seems to be the only one present; however, the two forms pass evenly into one another, especially on approaching the southeast coast (cf. SEIDENFADEN, 1933, p. 96).

Luzula frigida (BUCH.) SAM. and ***L. multiflora*** (EHRH.) LEJ. seem to behave in the same manner in Southeast Greenland as the two forms just mentioned (cf. SEIDENFADEN, l. c., p. 96).

Tofieldia palustris HILL. = *T. minima* (HILL.) DRUCE.

Sparganium affine SCHNIZL. is at hand from Angmagssalik. In addition DEVOLD & SCHOLANDER (1933, p. 152) records "per exclutionem" a single leaf of a *Sparganium* brought home from the Myrodden, 63° 30′ N. lat.

Appendix.

Carex pseudolagopina SOER. nov. sp.

Carex sectionis Canescentes FRIES.

Planta cinereo-viridis, laxe caespitosa; culmis 10—20 cm altis, rigidis, arcuato-erectis, trigonis, superne scabriusculis; foliis planis, subcarinatis 1.5—2 mm latis, subrigidis, culmis parce brevioribus vel subaequilongis, vaginis pallide brunneis; spiculis 2—3 gynaecandris, subglobosis, 4—6 mm longis, ebracteatis, approximatis; quarum laterales flosculis staminatis paucissimus instructae sunt; squamis subinvolutis, ovatis, obtusis, dilute-castaneis dorso pallidiore, nervo ante apicem evanescente, marginibus late albo-hyalinis; utriculis squamas superantibus, suberectis, subcoriaceis, plano-convexis, elliptico-ovatis, 3 mm longis, 2 mm latis, flavescenti-brunneis, glabris dense punctulatis, 15—20 nervosis, basi abrupte contracta, rostro conico brevissimoque, marginibus ± scabro, antice breve fisso.

Hab. in paludibus muscosis. — Distributio: Groenlandia orientale ca. 70°—74° lat. bor., Groenlandia occidentale ca. 70°—72° lat. bor. et Spitsbergen.

Typus ex Groenlandia orientali: Ellaø: Cape Oswald. (No. 3279).

Icon. Tabula nostra 2 et 4, a, c.

Affinis *C. Heleonasti* EHRH. differt follis latioribus, culmis humilioribus rigidioribusque, spiculis paucioribus, squamis obtusioribus, utriculis suberectis, brevioribus rostris.

var. solida SOER. nov. var.

Differt a type statura robustiore, spiculis globosis, 3—5 mm diametro, squamis subrotundis, utriculis late ovatis, ca. 2.5 mm longis, apice rotundatis, erostratis, antice vix fissis.

Inter plantas typicas ad Cap. Oswald inveni. (No. 3279 a).

Icon. Tabula nostra 3 et 4, e, f.

In spite of its undoubted relationship to *C. Heleonastes* the species shows a certain habitual resemblance to *C. Lachenalii*, with which it has previously been confused.

In a previous paper (SØRENSEN, 1933, p. 114) I have called attention to a deviating form of the presumed *C. Lachenalii* from lowland swamps on Ella Island and Ymer Island. A closer investigation has shown that this swamp-form actually represents a well defined species, *Carex pseudolagopina*, as defined above, much more closely related to *C. Heleonastes*.

In East Greenland *C. pseudolagopina* seems to be exceedingly characteristic of the mossy cyperaceous swamps, drying out more or less in the summer, on mineral soil round shallow-watered lakes, and at their outlets on raised strandflats. — In accordance with its habitat

it produces mostly obliquely upright, elongated, rhizome-like shoots, so that its caespitose growth is less marked; only on the areas devoid of a closed vegetation along the banks of the lakes it forms actual tufts.

Habitually it differs distinctly from *C. Lachenalii* by its rigid, short culms and its inflorescence very insignificant in relation to the stout culm; it is further conspicuous that both the lower spikelets often are directed towards the same side, the heads are thus apparently onesided.

This species is no doubt calciphilous. It has only been observed at small altitudes, mostly in swamps near the shore, whose slightly halophilous character is sometimes marked by the occurrence of *Carex subspathacea*. It further seems to be associated with the inner fjord areas, having not been observed along the outer coast. As far as appears from the collections of the Botanical Museum of Copenhagen, the distribution of the species is rather peculiar, since it is limited to East Greenland between Scoresby Sound and Clavering Island and to the Disko region in West Greenland. Thus it belongs to the bicentric species of Greenland (cf. GELTING, 1934, p. 265). While it is commonly distributed in the Franz Joseph Fjord area, it seems hardly to be frequent on Disko, where, however, it was collected as early as by THORE FRIES (as *C. glareosa*). Thus JOHS. GRØNTVED has kindly placed his rich collections of *C. glareosa* and *C. Lachenalii* (collected in 1935, not yet published) from this place at my disposal; however, the species was not represented by a single specimen. — Besides from Greenland the species is at hand from Spitsbergen. — It seems to be absent from Northern Scandinavia (cf. HOLMBERG 1929).

Var. solida is a form of an even more peculiar character, and even more different from *C. Heleonastes* than the main form, in company with which it occurred near Langesø and Rundsø, Cape Oswald, Ella Island. Transitional forms to the main species seem to occur here, cf. Pl. 4, b, d.

It should only be stated here that the species *Carex amblyorhyncha*, recently described by KRECZETOWICZ (KOMAROV: Flora URSS, III, 1935, p. 595) from Eastern Siberia, is no doubt closely related to *C. pseudolagopina*. *C. amblyorhyncha* seems, however, to be less different from the *Heleonastes*-type than our Greenland species, which by a further reduction in size and number of spikelets seems to be a specific high-arctic representative of the *Heleonastes* group. — Thus *C. pseudolagopina* is a new example of the peculiarly obscure connection between Siberia and East Greenland in a plant-geographical respect.

Below a list will be given of all the localities of *Carex pseudolagopina*, represented by herbarium specimens in the collections of the Botanical Museum of Copenhagen.

East Greenland:

Liverpool Land. Head of Hurry Inlet: Vargodden, abt. 70° 55′ N. lat., 22° 30′ W. long., leg. Th. Sørensen 8. VII. 1933 (No. 872)[1]).

Lyell Land. Cape Hedlund, abt. 72° 40′ N. lat., 26° 08′ W. long., leg. Th. Sørensen 20. IX. 1931. (No. 3277).

Ella Island. Cape Oswald: Ulvedalen, abt. 72° 52′ N. lat., 25° 10′ W. long. leg. Th. Sørensen 22. VII. 1932. (No. 3278).

Ella Island. Cape Oswald: Swamp near Langesø, abt. 72° 53′ N. lat., 25° 10′ W. long., leg. Th. Sørensen 22. VII. 1932. (No. 3279, type, and No. 3279. a., type of var.).

Ella Island. Cape Oswald: Swamp near Rundesø, abt. 72° 53′ N. lat., 25° 10′ W. long., leg. Th. Sørensen 29. VII. 1933 (No. 3281).

Ella Island. Cape Elisabeth, abt. 72° 52′ N. lat., 24° 50′ W. long., leg. Th. Sørensen 26. VII. 1932. (No. 3280).

Hudson Land. Prospektdal, abt. 73° 35′ N. lat., 22° 30′ W. long., leg. Th. Sørensen 3. VIII. 1934 (No. 5001 and 5002).

Hudson Land. North side of Head of Moskusoxefjord, abt. 73° 38′ N. lat., 22° 10′ W. long., leg. G. Seidenfaden 15. VIII. 1929 (No. 270)[1]).

Hudson Land. Head of Loch Fyne, West side, abt. 73° 42′ N. lat., 21° 55′ W. long., leg. G. Seidenfaden 3. VIII. 1929 (No. 185)[1]).

Hudson Land. Head of Loch Fyne, abt. 73° 42′ N. lat., 21° 50′ W. long. leg. G. Seidenfaden 4. VIII. 1930 (No. 899)[1]).

Hudson Land. Granitdal, abt. 73° 43′ N. lat., 22° 08′ W. long., leg. G. Seidenfaden 7. VIII. 1929 (No. 222)[1]).

Clavering Island. Granatdal, abt. 74° 08′ N. lat., 21° 20′ W. long., leg. Th. Sørensen 18. VII. 193. (No. 3283).

West Greenland:

Disko Island. Igdlutjait[3]), 70° 12′ N. lat., 54° 40′ W. long. leg. Th. M. Fries 10. VII. 1871[2]).

Ingnerit Fjord, Magdlaq, 71° 07′ N. lat., 51° 48′ W. long., leg. M. P. Porsild and R. T. Porsild 12—13. VII. 1929[1]).

Spitsbergen:

Sassenbay, Rendal, abt. 78° 20′ N. lat., 18° E. long., leg. A. G. Nathorst 15. VII. 1882[1]).

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[1]) Labelled *C. Lachenalii* Schk. (*C. lagopina* Wbg.).

[2]) Labelled *C. glareosa* Wbg.

[3]) According to kind verbal information by Mag. Porsild the right name of this locality is Igdlorpait.

III. List of the vascular Plants, found in East Greenland.

District	1	2	3	4	5	6	7	cf. p. 146 ff.	nl: northern limit in East Greenland sl: southern limit in East Greenland
An * refers to the explanation given p. 153 ff. All other explanation to this list is found p. 143 ff.	60°04′—65°00′	65°00′—68°00′	68°00′—70°00′	70°00′—71°10′	71°10′—73°15′	73°15′—74°40′	74°40′—79°30		
	i o	i o	i o	i o	i m o	i m o	i o		
Equisetum arvense L.	××	××	—×	××	×××	×××	××	Lg	circumgreenlandic
— *variegatum* SCHLEICH.	××	×—	—×	××	×××	×××	××	Lg	circumgreenlandic
Lycopodium alpinum L.*	××	××	××	×—	——	——	——	Hg	nl: 70°34′
— *annotinum* L.	××	××	×—	××	×—	——	——	Ig	nl: 72°44′
— *complanatum* L.*	—×	——	——	——	——	——	——	Hd	nl: 62°48′
— *Selago* L.	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Botrychium boreale (FR.) MILDE **DS**	××	——	——	——	——	——	——	Hd	nl: 63°31′
— *lanceolatum* (GMEL.) ÅNGST. **DS**	×—	××	—×	——	——	——	——	Hg	nl: 68°33′
— *Lunaria* (L.) SW.	××	—×	—×	×—	——×	——	——	Hg	nl: 71°40′
Asplenium viride HUDS. **DS**	×—	××	×—	——	——	——	——	Gd	nl: 66°08′
Athyrium alpestre (HOPPE) RYL. **DS***	××	——	——	——	——	——	——	Gg	nl: 63°33′
Cystopteris fragilis (L.) BERNH.	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Dryopteris dilatata s. l. * **DS**	××	——	——	——	——	——	——	Hg	nl: 61°32′
— *Filix Mas* (L.) SCHOTT **DS**	××	——	——	——	——	——	——	Gg	nl: 60°35′
— *fragrans* (L.) SCHOTT	——	——	——	×—	——	——	——	Ka	in one place: 70°56′
— *Linneana* C. CHR.	××	××	——	——	——	——	——	Hg	nl: 66°20′
— *Phegopteris* (L.) C. CHR.	××	×—	——	——	——	——	——	Hg	nl: 66°18′
Polystichum Lonchitis (L.) ROTH.	××	××	—×	——	——	——	——	Hg	nl: 68°33′
Woodsia glabella R. BR.	—×	××	—×	××	×××	×××	—×	Fd	sl: 61°32′
— *ilvensis* (R. BR.) BAB.*	××	××	××	××	——	——	——	Ig	nl: 71°05′
Selaginella selaginoides (L.) LINK **DS**	××	——	——	——	——	——	——	Hg	nl: 63°34′
Juniperus communis L. **DS***	××	××	×—	——	——	——	——	Hg	nl: 68°20′
Betula glandulosa s. l. * **DS, S.& S**	××	——	——	——	——	——	——	Ha	nl: 61°24′

— *nana* L. **DS**	—×	××	—×	××	×××	×××	×—	Kg	sl: 63°28′; nl: 75°00′
Callitriche anceps Fern. *	—×	—×	——	——	——	——	——	Ha	nl: 65°37′
— *hamulata* Kütz. **DS**	××	——	——	——	——	——	——	Hg	nl: 63°03′
— *verna* (L.) Lønnr. **DS**	××	—×	×—	×—	×—	——	——	Hg	nl: 72°42′
Arenaria ciliata L. *subsp. pseudofrigida* Dahl&Ostf.*G	——	——	—×	××	—××	×××	××	Ae	sl: 69°25′; nl: 77°32′
Cerastium alpinum L.	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *Regelii* Ostf. * **G**	——	——	——	—×	——×	—××	—×	Cc	sl: 70°27′
— *trigynum* Vill. *	××	××	××	××	——×	—×—	——	Hg	nl: 73°15′
Honckenya peploides (L.) Ehrh.	××	××	—×	×—	×××	×××	——	Jg	nl: 74°37′
Melandryum affine J. Vahl *	——	——	——	××	×××	×××	××	Fd	sl: 70°20′
— *apetalum* (L.) Fenzl	——	——	—×	××	—××	×××	××	Fd	sl: 69°25′
— *triflorum* (R. Br.) J. Vahl *	——	——	——	××	—××	×××	××	Fh	sl: 70°06′
Minuartia biflora (L.) Sch. & Th.	××	××	××	××	×××	×××	—×	Jg	nl: 77°32′
— *groenlandica* (Retz.) Ostf. **DS**	××	——	——	——	——	——	——	Ha	nl: 61°55′
— *Rossii* (R. Br.) Gräbn.	——	——	——	——	—×—	—××	××	Kc	sl: 73°12′; nl: 76°55′
— *rubella* (Wbg.) Gräbn	×—	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *stricta* (Sw.) Hiern **G**	——	——	——	××	×××	×××	——	Kg	sl: 70°05′; nl: 74°31′
Sagina caespitosa (J. Vahl)Lge	—×	—×	——	——	——	——×	——	Id	nl: 73°30′
— *intermedia* Fenzl	××	××	××	××	—××	×××	××	Lg	circumgreenlandic
— *Linnaei* Presl	××	××	—×	——	——	——	——	Hg	nl: 68°52′
— *procumbens* L. **DS**	—×	——	——	——	——	——	——	Gg	nl: 60°50′
Silene acaulis L.	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Stellaria borealis Big. *	××	××	——	——	——	——	——	Hg	nl: 66°08′
— *humifusa* Rottb.	××	××	—×	××	×××	×××	××	Jg	nl: 77°33′
— *longipes* Goldie **DS**	×—	——	—×	××	×××	×××	××	Fd	sl: 63°28′
— *media* (L.) Cyr. **DS**	—×	——	——	——	——	——	——	He	nl: 61°32′
Viscaria alpina (L.) G. Don	××	—×	××	××	——×	——	——	Ig	nl: 73°10′
Cornus suecica L. **DS**	××	——	——	——	——	——	——	Hg	nl: 61°37′
Sedum acre L.	——	—×	——	——	——	——	——	Ae	only at 65°39′
— *annuum* L. **DS**	××	××	—×	——	——	——	——	He	nl: 68°33′
— *roseum* (L.) Scop.	××	××	××	××	×××	×××	×—	Hg	nl: 75°00′
— *villosum* L.	——	××	—×	——	——	——	——	Kg	sl: 65°35′; nl: 68°49′
Arabis alpina L.	××	××	××	××	——×	—×—	——	Ig	nl: 73°15′
— *arenicola* (Richards.) Gelert	——	——	——	—×	——×	——	——	Ka	sl: 70°27′; nl: 71°58′
— *Holboellii* Hornem.	×—	——	—×	×—	——	——	——	Ha	nl: 70°29′
Braya humilis (C. A. Mey.) Robins.	——	——	——	——	×××	×××	——	Ka	sl: 72°54′; nl: 74°30′

District	1	2	3	4	5	6	7	cf. p. 146 ff.	nl: northern limit in East Greenland sl: southern limit in East Greenland
An * refers to the explanation given p. 153 ff. All other explanation to this list is found p. 143 ff.	60°04′—65°00′	65°00′—68°00′	68°00′—70°00′	70°00′—71°10′	71°10′—73°15′	73°15′—74°40′	74°40′—76°		
	i o	i o	i o	i o	i m o	i m o	i o		
Braya linearis ROUY *	——	——	——	×—	××—	××—	——	Ke	sl: 70°29′; nl: 74°13′
— *purpurascens* (R. BR.) BGE.	——	——	——	—×	×××	×××	××	Ed	sl: 70°25′
— *Thorild-Wulffii* OSTF. *	——	——	——	——	———	———	××	Dh	sl: 76°54′
Cardamine bellidifolia L.	××	××	××	××	×××	×××	××	Fg	sl: 61°10′
— *pratensis* L.	××	—×	—×	—×	—××	×××	—×	Jg	nl: 76°46′
Cochlearia officinalis L. var.	××	××	—×	××	—××	×××	××	Lg	circumgreenlandic
Draba alpina L.s.str. *	——	——	—×	××	——×	×××	××	Fg	sl: 68°44′
— *aurea* M. VAHL **DS**	××	××	——	×—	———	———	——	Ia	nl: 70°30′
— *Bellii* HOLM *	——	——	——	×—	—××	×××	××	Ec	sl: 70°29′
— *cinerea* ADAMS *	——	——	——	××	×××	×××	××	Fd	sl: 70°12′
— *crassifolia* GRAHAM **G**	——	×—	××	××	——×	—××	——	Kd	sl: 66°08′; nl: 74°11′
— *daurica* DC. *	——	——	—×	××	×××	×××	××	Kg	sl: 69°25′; nl: 77°32′
— *fladnizensis* WULF. *	——	——	——	—×	×××	×××	××	Af	sl: 70°30′; nl: 77°40′
— *Gredinii* EKMAN * **S. & S.**	——	——	—×	—×	——×	—××	××	Af	sl: 68°25′; nl: 79°12′
— *incana* L. **DS**	××	××	——	——	———	———	——	Hg	nl: 66°18′
— *lactea* ADAMS *	——	——	—×	××	×××	×××	××	Fd	sl: 68°31′
— *micropetala* HOOKER *	——	——	——	—×	——×	×××	××	Dc	sl: 70°25′
— *nivalis* LILJEBL. *	××	××	××	××	×××	×××	××	Jg	nl: 77°32′
— *repens* M. V. BIEB. * **G**	——	——	——	—×	———	———	——	Af	only at 70°46′
— *rupestris* R. BR. *	××	××	××	××	———	———	——	Hg	nl: 71°05′
— *subcapitata* SIMM. **G**	——	——	——	—×	—××	×××	××	Ec	sl: 70°25′
Eutrema Edwardsii R. BR. **G**	——	——	——	—×	—××	×××	××	Ec	sl: 70°30′
Lesquerella arctica (WORMSK.) WATS.	——	——	——	××	×××	×××	××	Ea	sl: 70°27′
Subularia aquatica L.	——	—×	——	——	———	———	——	Kg	only at 65°37′
Empetrum nigrum L. *var.* *	××	××	××	××	×××	×××	××	Jg	nl: 76°49′
Hippuris vulgaris L. **DS**	××	—×	——	×—	×××	×××	—×	Jg	nl: 76°49′

Chamaenerium angustifolium (L.) Scop.	××	××	——	——	——	——	——	Hg	nl: 66°19′
— *latifolium* (L.) Sweet	××	××	××	××	×××	×××	××	Lb	circumgreenlandic
Epilobium arcticum Sam.	——	——	——	—×	—×	×××	—×	Kf	sl: 70°36′; nl: 74°46′
— *anagallidifolium* Lam.	××	××	—×	——	——	——	——	Hg	nl: 69°18′
— *Hornemanni* Rchb.	××	××	——	——	——	——	——	Hg	nl: 66°10′
— *lactiflorum* Hausskn.	××	××	—×	——	——	——	——	Hg	nl: 69°18′
— *palustre* L. *	×—	——	—×	——	——	——	——	Hg	(nl: 69°15′)
Lathyrus maritimus (L.) Fr. **DS**	××	——	——	——	——	——	——	Gg	nl: 60°35′
Papaver radicatum Rottb.	—×	×—	××	××	×××	×××	××	Fg	sl: 62°45′
Polygala serpyllaceum Weihe * **DS**	×—	——	——	——	——	——	——	Ae	only at 63°28′
Koenigia islandica L. **G**	××	××	××	××	×××	×××	××	Jg	nl: 77°37′
Oxyria digyna (L.) Hill	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Polygonum heterophyllum Lindm. *	—×	——	——	——	——	——	——	Hg	only at 60°04′
— *viviparum* L.	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Rumex Acetosella L. **G**	×—	×—	——	××	×××	××—	——	Ig	nl: 74°30′
Montia lamprosperma Cham. **DS**	××	——	——	——	——	——	——	Hg	nl: 63°32′
Coptis groenlandica (Oed.) Fern.	××	××	——	——	——	——	——	Ha	nl: 66°20′
Ranunculus acer L.	—×	—×	——	——	——	——	——	He	nl: 65°53′
— *affinis* R. Br. *	——	——	—×	××	—××	—××	××	Kc	sl: 68°40′; nl: 77°37′
— *auricomus* L. *cum var.**	——	——	—×	×—	—×—	——	——	Ae	sl: 69°00′; nl: 73°10′
— *glacialis* L. **G, S. & S.**	——	—×	××	—×	—×	×××	××	Ae	sl: 65°30′; nl: 77°40′
— *hyperboreus* Rottb.	××	××	—×	××	×××	×××	××	Lg	circumgreenlandic
— *nivalis* L.	——	——	—×	××	—××	×××	××	Kd	sl: 69°25′; nl: 77°40′
— *pygmaeus* Wbg.	××	××	××	××	×××	×××	××	Jg	nl: 77°40′
— *reptans* L.	——	—×	——	——	——	——	——	Kg	only at 65°38′
— *sulphureus* Soland.	——	——	—×	××	—×	×××	××	Ec	sl: 69°45′
— *trichophyllus* Chaix. *var.**	× ?	—×	——	××	×××	—×—	——	Jg	nl: 74°28′
Thalictrum alpinum L.	××	××	—×	××	—××	—×—	——	Hg	nl: 73°38′
Alchemilla alpina L.	××	××	—×	——	——	——	——	Hg	nl: 68°33′
— *acutidens* Buser *	——	××	——	——	——	——	——	Ae	only at 65°52′
— *filicaulis* Buser *	××	××	—×	——	——	——	——	Hg	nl: 69°20′
— *glomerulans* Buser **B, DS**	××	××	—×	×—	——	——	——	Hg	nl: 70°25′
— *pseudomicans* Böcher *	××	——	—×	——	——	——	——	Ah	nl: 68°12′
Comarum palustre L. **DS**	—×	××	——	——	——	——	——	Hg	nl: 66°10′
Dryas integrifolia M. Vahl *	——	××	——	×—	—×—	×——	—×	Ba	see p. 58
— *octopetala* L.	——	——	—×	××	×××	×××	××	Dg	sl: 69°05′

District	1	2	3	4	5	6	7	cf. p. 146 ff.	nl: northern limit in East Greenland sl: southern limit in East Greenland
An * refers to the explanation given p. 153 ff. All other explanation to this list is found p. 143 ff.	60°04′—65°00′	65°00′—68°00′	68°00′—70°00′	70°00′—71°10′	71°10′—73°15′	73°15′—74°40′	74°40′—79°30′		
	i o	i o	i o	i o	i m o	i m o	i o		
Potentilla anserina L.	××	××	——	——	———	———	——	Hg	nl: 66°10′
— *Crantzii* BECK *	××	××	××	××	—××	×××	——	Hg	nl: 74°13′
— *emarginata* PURSH * **S. & S.**	——	×—	××	××	×××	×××	××	Fc	sl: 66°08′
— *nivea* L. s. l. *	——	×—	××	××	×××	×××	××	Fd	sl: 66°08′
— *pulchella* R. BR.	——	——	—×	—×	—×—	×××	××	Ec	sl: 69°45′
— *Ranunculus* LGE. **DS**	×—	——	——	——	———	———	——	Ka	sl: 63°07′; nl: 63°32′
— *rubella* SOER. *	——	——	——	——	———	—××	—×	Ah	sl: 74°10′; nl: 74°52′
— *rubricaulis* LEHM. * **THS**	——	——	——	—×	—×—	—××	××	D?	sl: 70°50′
— *stipularis* L. *var.** **G**	——	——	——	——	———	——×	——	Af	only at 74°10′
— *tridentata* SOLAND.	××	××	—×	——	———	———	——	Ha	nl: 68°10′
Rubus saxatilis L. **DS**	×—	——	——	——	———	———	——	Ke	only at 62°30′
Sibbaldia procumbens L.	××	××	××	××	——×	———	——	Ig	nl: 73°10′
Salix arctica-glauca s. l. *	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *herbacea* L.	××	××	××	××	×—×	×××	—×	Jg	nl: 76°46′
Chrysosplenium tetrandrum (N. LUND.) TH. FR. *	——	——	——	——	———	—××	——	Ad	sl: 74°06′; nl: 74°15′
Saxifraga aizoides L. **DS, G**	——	××	—×	××	×××	×××	——	Kg	sl: 65°38′; nl: 74°30′
— *Aizoon* L. **DS**	××	××	××	×—	———	———	——	Ig	nl: 70°25′
— *caespitosa* L. *subspp.**	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *cernua* L. **DS**	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *flagellaris* WILLD. **B, S. & S.**	——	——	——	——	——×	—××	××	Dc	sl: 73°08′
— *hieraciifolia* W. & K. **G**	——	——	——	—×	×××	×××	—×	Ad	sl: 70°25′; nl: 74°46′
— *Hirculus* L. **G**	——	——	——	——	——×	—××	—×	Kg	sl: 73°08′; nl: 74°46′
— *Nathorsti* (DUSÉN) HAYEK * **THS**	——	——	——	—×	—××	×××	—×	Ah	sl: 70°50′; nl: 75°18′
— *nivalis* L. *	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *oppositifolia* L.	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *rivularis* L.	××	××	××	××	×××	×××	××	Jg	nl: 79°12′

— *stellaris* L.	××	××	——	——	———	———	——	Hg	nl: 66°58′
— — *var. comosa* Retz.	——	——	—×	××	×××	×××	××	Fd	sl: 69°25′
— *tricuspidata* Rottb. **G**	——	——	—×	—×	——×	———	——	Ka	sl: 69°05′; nl: 71°25′
Angelica Archangelica L. **DS**	××	×—	——	——	———	———	——	He	nl: 66°19′
Ligusticum scoticum L. *	×—	——	——	——	———	———	——	Hg	nl: 60°34′
Viola labradorica Schrank	—×	——	——	——	———	———	——	Ha	only at 60°31′
— *palustris* L.	××	—×	——	——	———	———	——	Hg	nl: 65°53′
Mertensia maritima (L.) Don.	×—	—×	——	——	———	———	——	Kg	sl: 63°07′; nl: 65°37′
Campanula rotundifolia L.	××	××	××	××	×××	×××	——	Ig	nl: 74°30′
— *uniflora* L.	——	××	××	××	×××	×××	××	Kg	sl: 66°05′; nl: 77°37′
Linnaea borealis L.*	×—	——	——	——	———	———	——	Kd	only at 63°28′
Antennaria alpina (L.) Gärtn. *	××	××	××	××	—××	××—	——	Jg	nl: 74°25′
— *groenlandica* Porsild **DS**	××	××	—×	——	———	———	——	Ha	nl: 66°19′
— *labradorica* Nutt. *	×—	——	——	——	———	———	——	Ka	only at 63°28′
Arnica alpina (L.) Olin **B**	——	×—	××	××	×××	×××	××	Kd	sl: 66°07′; nl: 77°47′
Erigeron borealis (Vierh.) Simm. *	××	——	——	——	———	———	——	Hg	nl: 63° 32′
— *compositus* Pursh **DS, S. & S.**	×—	——	——	××	—××	×××	××	Ba	sl: 63°29′
— *unalaschkensis* (DC.) Vierh.	××	××	××	××	×××	×××	—×	Kg	nl: 76°46′
— *uniflorus* L. s. l. *	××	××	—×	××	——×	×××	—×	Lg	circumgreenlandic
Gnaphalium norvegicum Gunn.	××	××	——	——	———	———	——	Hg	nl: 66°06′
— *supinum* L. **S. & S.**	××	××	××	—×	———	———	——	Hg	nl: 70°25′
Hieracium alpinum (L.) Backh. * **S. & S.**	××	××	××	××	———	———	——	Ge	nl: 71°05′
— *amitsokense* (Almq.) Dahlst. *	—×	——	——	——	———	———	——	Gh	only at 60°31′
— *Devoldii* Omang *	—×	——	——	——	———	———	——	Ah	only at 60°30′
— *groenlandicum* (Arv. Touv.) Almq.*	××	×—	——	——	———	———	——	Hh	nl: 66°18′
— *hyparcticum* Almq. *	××	××	——	——	———	———	——	Gh	nl: 66°18′
— *ivigtutense* (Almq.) Omang *	—×	——	——	——	———	———	——	Hh	only at 61°06′
— *lividorubens* Almq. *	××	——	——	——	———	———	——	Hh	nl: 60°34′
— *nepiocratum* Omang *	×—	——	——	——	———	———	——	Ah	only at 60°34′
— *rigorosum* (Læst.) Almq. *	—×	——	——	——	———	———	——	Gh	nl: 63°30′
— *Scholanderi* Omang *	—×	——	——	——	———	———	——	Ah	nl: 60°29′
— *stelechodes* Omang *	×—	——	——	——	———	———	——	Ah	only at 63°31′
Matricaria inodora L. *var.* *	——	——	——	——	×——	—××	——	Ag	sl: 72°42′; nl: 74°10′
Taraxacum arcticum (Trautv.) Dahlst.	——	——	——	—×	×××	×××	××	Cf	sl: 70°20′
— *brachyceras* Dahlst. *	——	——	×—	—×	—××	—××	——	Ke	sl: 68°10′; nl: 74°10′
— *croceum* Dahlst. *	××	××	××	—×	———	———	——	Hg	nl: 71°05′

District	1	2	3	4	5	6	7	cf. p. 146 ff.	nl: northern limit in East Greenland sl: southern limit in East Greenland
An * refers to the explanation given p. 153 ff. All other explanation to this list is found p. 143 ff.	60°04′—65°00′	65°00′—68°00′	68°00′—70°00′	70°00′—71°10′	71°10′—73°15′	73°15′—74°40	74°40′—79°30′		
	i o	i o	i o	i o	i m o	i m o	i o		
Taraxacum maurostylum DAHLST. *	×—	——	——	——	———	———	——	Gh	nl: 63°03′
— *phymatocarpum* J. VAHL	——	——	——	××	×××	×××	××	Ec	sl: 70°20′
— *pumilum* DAHLST. **S. & S.**	——	——	——	——	———	———	×—	Ca	sl: 77°37′, cf. p. 73.
— *purpuridens* DAHLST. *	×—	——	? —	——	———	———	——	Ae	63°22′—32′ (nl: 68°16′?)
— *rhodolepis* DAHLST. *	×—	——	——	——	———	———	——	Ae	only 63°07′ (and 60°31′?)
Diapensia lapponica L.	××	××	××	××	———	———	——	Ig	nl: 71°00′
Arctostaphylos alpina (L.) SPRENG. **G**	——	——	—×	××	×××	×××	——	Kd	sl: 68°45′; nl: 74°30′
Cassiope hypnoides (L.) DON	××	××	××	××	——×	—×—	——	Ig	nl: 74°07′
— *tetragona* (L.) DON **B**	——	××	××	××	×××	×××	××	Fd	sl: 66°05′
Loiseleuria procumbens (L.) DESV.	××	××	××	——	———	———	——	Ig	nl: 68°10′
Phyllodoce coerulea (L.) BAB. *	××	××	××	××	——×	———	——	Ig	nl: 72°10′
Rhododendron lapponicum (L.) WBG. **DS**	××	××	××	××	×××	×××	××	Jd	nl: 77°37′
Vaccinium uliginosum L. s.l.* **S. & S.**	××	××	××	××	×××	×××	××	Jg	nl: 77°40′
Gentiana aurea L.	×—	×—	——	——	———	———	——	Hg	nl: 66°05′
— *detonsa* ROTTB. *	——	——	——	——	—×—	———	——	Kg	only at 72°54′
— *nivalis* L.	××	××	—×	——	——×	———	——	Hg	nl: 72°45′
— *tenella* ROTTB. **S. & S.**	——	——	——	—×	×—×	×××	——	Kg	sl: 70°30′; nl: 74°33′
Thymus Serpyllum L. s. l. *	××	××	×—	——	———	———	——	He	nl: 68°20′
Pinguicula vulgaris L. **S. & S.**	××	××	××	×—	×——	———	——	Hg	nl: 73°10′
Plantago juncoides LAM. **DS**	××	—×	——	——	———	———	——	Hg	nl: 65°33′
Armeria vulgaris WILLD. *var.*	——	—×	——	—×	×××	×××	××	Kg	sl: 65°31′; nl: ab. 81°
Polemonium boreale ADAMS **G**	——	——	——	——	———	——×	—×	Ac	sl: 73°42′; nl: 74°52′
Primula sp. *	——	——	——	——	———	———	×—	Ah	only at 75°40′
— *stricta* HORNEM. *	——	——	——	——	——×	×——	——	Kg	sl: 72°50′; nl: 73°46′
Pyrola minor L.	××	××	××	——	———	———	——	Hg	nl: 68°33′
— *grandiflora* RAD. *	——	×—	—×	××	×××	×××	——	Ka	sl: 66°08′; nl: 74°36′

Galium Brandegeei Gray *	——	—×	——	——	———	———	——	Ka	only at 65°37′
— *triflorum* Michx. **DS**	××	——	——	——	———	———	——	Hd	nl: 62°40′
Bartschia alpina L. **B**	××	××	××	——	———	———	——	Ig	nl: 68°43′
Euphrasia latifolia Pursh *	××	××	××	××	×××	×××	——	Ig	nl: 74°30′
Limosella aquatica L. **DS** *	×—	——	——	——	———	———	——	Kg	only at 63°35′
Pedicularis flammea L.	××	××	××	××	×××	×××	××	Ig	nl: 77°40′
— *hirsuta* L.	——	××	××	××	×××	×××	××	Fd	sl: 65°35′
— *lapponica* L.	——	——	—×	××	×××	××—	——	Kd	sl: 69°05′; nl: 74°30′
Rhinanthus groenlandicus Chab. **DS**	××	——	——	——	———	———	——	Hg	nl: 60°35′
Veronica alpina L. s. l. * **DS**	××	××	××	××	——×	———	——	Hg	nl: 71°58′
— *fruticans* Jacq. **DS**	××	××	—×	×—	———	———	——	He	nl: 70°15′
Carex alpina Sw. * **DS**	××	——	—×	××	×××	××—	——	Ig	nl: 74°25′
— *aquatilis* Wbg. *var.* *	——	—×	——	—×	———	—×—	××	Fg	sl. 65°37′
— *atrata* L.	××	—×	——	——	———	———	——	Ge	nl: 66°20′
— *atrofusca* Schk. **G**	——	——	——	—×	×××	×××	××	Kd	sl: 70°25′; nl: 77°40′
— *bicolor* All. *	——	——	——	——	—×—	—×—	——	Kg	sl: 72°54′; nl: 73°37′
— *brunnescens* (Pers.) Poir. **DS**	××	—×	——	——	———	———	——	Hg	nl: 65°56′
— *canescens* L. * **DS**	××	——	——	——	———	———	——	Hg	nl: 63°32′
— *capillaris* L.	×—	××	××	××	×××	×××	××	Jg	nl: 77°40′
— *capitata* L.	××	—×	—×	——	×——	———	——	Ig	nl: 72°42′
— *deflexa* Hornem. **DS**	××	——	——	——	———	———	——	Ha	nl: 64°23′
— *glareosa* Wbg. *	××	××	—×	××	×——	×××	——	Jg	nl: 74°37′
— *incurva* Lightf. *	——	——	×—	××	×××	×××	××	Kg	sl: 68°15′; nl: 77°40′
— *Lachenalii* Schk. *	××	××	××	××	×××	×××	——	Ig	nl: 74°33′
— *Macloviana* D'Urv. **DS**	××	××	—×	×—	———	———	——	Hg	nl: 70°20′
— *microglochin* Wbg.	——	—×	×—	×—	××—	××—	——	Kg	sl: 66°20′; nl: 74°30′
— *misandra* R. Br. **S. & S.**	——	——	×—	××	×××	×××	××	Fd	sl: 68°20′
— *nardina* Fr. * **DS**	×—	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *parallela* (Læst.) Sommerf.	——	——	——	××	×××	×××	——	Ae	sl: 70°26′; nl: 74°22′
— *pedata* Wbg. *	——	—×	××	××	—××	××—	—×	Kg	sl: 66°17′; nl: 74°58′
— *pseudolagopina* Soer. *	——	——	——	—×	××—	—×—	——	Kf	sl: 70°53′; nl: 74°12′
— *rariflora* (Wbg.) Sm.	××	××	——	××	×××	××—	——	Ig	nl: 74°30′
— *rigida* Good. *	××	××	××	××	×××	×××	××	Jg	nl: 77°40′
— *rufina* Drej. * **DS**	××	××	×—	×—	———	———	——	He	nl: 71°22′
— *rupestris* All.	——	×—	×—	××	×××	×××	××	Kg	sl: 65°56′; nl: 79°12′
— *salina* Wbg. *	—×	——	——	——	———	———	——	Hg	only at 60°04′

District	1	2	3	4	5	6	7	cf p. 146 ff.	nl: northern limit in East Greenland sl: southern limit in East Greenland
An * refers to the explanation given p. 153 ff. All other explanation to this list is found p. 143 ff.	60°04′—65°00′	65°00′—68°00′	68°00′—70°00′	70°00′—71°10′	71°10′—73°15′	73°15′—74°40′	74°40′—79°30′		
	i o	i o	i o	i o	i m o	i m o	i o		
Carex saxatilis L. *	××	—×	××	××	×××	×××	××	Jg	nl: 77°40′
— *scirpoidea* MICHX.	××	××	××	××	×××	××—	——	Id	nl: 74°22′
— *sparsiflora* (WBG.) STEUD. *	——	——	——	——	———	—×—	——	Ag	only at 74°10′
— *stylosa* C. A. MEY	××	——	——	——	———	———	——	Gd	nl: 63°06′
— *subspathacea* WORMSK.	××	××	—×	××	×××	×××	—×	Hg	nl: 76°49′
— *supina* WBG. **S. & S.**	——	×—	×—	××	×××	××—	×—	Kc	sl: 66°10′; nl: 77°30′
— *ursina* DEW.	——	——	—×	—×	×××	×××	—×	Kc	sl: 69°55′; nl: 76°49′
Elyna Bellardii (ALL.) KOCH **S**	×—	××	×—	××	×××	×××	××	Lg	circumgreenlandic
Eriophorum callitrix CHAM. * **S. & S., G**	——	——	——	—×	×××	×××	××	Ac	sl: 70°25′; nl: 77°40′
— *polystachyum* L. * **DS, S**	××	——	——	××	×××	×××	××	Bg	lacking 61°37′—70′ 00°
— *Scheuchzeri* HOPPE	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Kobresia bipartita (ALL.) D. T.* **DS**	——	——	——	××	×××	×××	××	Kd	sl: 70°26′; nl: 77°40′
Scirpus caespitosus L. *var.* * **B, DS**	××	××	××	——	———	———	———	Ig	nl: 68°33′
Agropyrum violaceum (HORNEM.) LGE. * **DS**	×—	——	——	——	—×—	—××	——	Kg	see p. 000
Agrostis borealis HARTM. **DS**	××	××	××	××	———	———	——	Id	nl: 70°27′
— *canina* L.	××	—×	——	——	———	———	——	Hg	nl: 65°38′
Alopecurus alpinus SM.	——	——	—×	—×	—××	×××	××	Fc	sl: 69°45′
— *aristulatus* MICHX. *	——	—×	——	——	———	———	——	Kg	only 65°35—58′
Anthoxanthum odoratum L. **DS**	××	——	——	——	———	———	——	Ge	nl: 63°20′
Arctagrostis latifolia (R. BR.) GRISEB.	——	——	——	—×	×××	×××	××	Ed	sl: 70°20′
Calamagrostis arundinacea (L.) ROTH *var.* * **DS**	—×	——	—×	××	×××	×××	×—	Jd	nl: 77°40′
— *confinis* (WILLD.) NUTT. * **DS**	×—	——	——	——	———	———	——	Ha	nl: 63°08′
— *Langsdorffii* (LINK) TRIN. * **DS, S. & S.**	××	——	——	——	———	———	——	Hd	nl: 63°24′
— *neglecta* (EHRH.) GÄRTN. * **DS**	××	××	——	××	—××	—×—	——	Jg	nl: 74°10′
Deschampsia alpina R. & S.	××	××	×—	——	———	———	——	He	nl: 66°36′
— *brevifolia* R. BR. *	——	——	——	——	———	——×	××	Da	sl: 73°28′

— *flexuosa* (L.) Trin.	××	××	——	——	——	——	——	Hg	nl: 66°08′
Dupontia Fisheri R. Br. **G**	——	——	——	——	——	×××	——	Kc	sl: 73°28′; nl: 74°33′
Elymus arenarius L. *var.* * **DS**	××	——	——	——	——	——	——	Ig	nl: 63°32′
Festuca brachyphylla Schultes *	××	××	× ?	××	×××	×××	××	Lg	circumgreenlandic
— *rubra* L. *	××	××	— ?	××	×××	×××	××	IG	nl: 75°13′
— *vivipara* (L.) Sm. s. str. *	×—	××	——	××	×××	×××	××	C?	sl: ca. 63°00′
— — *var. hirsuta* Schol. *	××	——	——	——	——	——	——	H?	nl. 63°30′
Hierochloë alpina (Liljeb.) R. & S. **DS**	××	——	×—	××	×××	×××	××	Bd	see p. 94
Nardus stricta L. **DS, S. & S.**	××	——	——	——	——	——	——	Ge	nl: 63°36′
Phippsia algida (Soland.) R. Br. *	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Phleum alpinum L.	××	××	××	——	——	——	——	Hg	nl: 68°31′
Pleuropogon Sabinei R. Br.	——	——	——	—×	——×	×××	××	Dc	sl: 70°50′
Poa abbreviata R. Br. **G**	——	——	——	—×	—××	×××	××	Ec	sl: 70°40′
— *alpigena* (Fr.) Lindm. *var. colpodea* (Th. Fr.) Schol*	——	——	——	——	——×	×××	××	Dc	sl: 71°50′
— *alpina* L.	××	××	××	××	×××	×××	——	Ig	nl: 74°25′
— — *var. vivipara* L.	——	—×	—×	—×	—××	—××	——	Ae	sl: 68°50′; nl: 73°33′
— *annua* L.*	×—	×—	——	——	——	——	——	Ge	60°30′ and 65°37′
— *arctica* R. Br. *	——	—×	××	××	×××	×××	××	Fd	sl: 65°54′
— *glauca* Vahl	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *Hartzii* Gdgr. * **THS**	——	——	——	—×	—×—	××—	××	Kc	sl: 70°25′; nl: 77°40′
— *nemoralis* L.*	××	××	——	——	——	——	——	Hg	nl: 66°18′
— *pratensis* L. s. l. *	××	××	×—	××	×××	×××	×—	Jg	nl: 75°13′
Puccinellia angustata (R. Br.) R. & R.	——	—×	——	—×	×××	×××	××	Fc	sl: 65°37′
— *phryganodes* (Trin.) S. & M. **DS**	××	××	—×	××	×××	×××	××	Ld	circumgreenlandic
— *retroflexa* (Curt.) Holmb. * **DS**	××	××	——	——	——	——	——	Jg	nl: 66°10′
— *Vahliana* (Liebm.) S. & M.	——	——	——	—×	—××	×××	××	Kc	sl: 70°40′; nl: 77°40′
Trisetum spicatum (L.) Richt.	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
Vahlodea atropurpurea Fr. * **DS**	××	——	——	——	——	——	——	Kd	sl: 60°30′; nl: 63°30′
Juncus arcticus Willd. **DS, G**	×—	×—	——	××	×××	××—	——	Ig	nl: 74°24′
— *biglumis* L.	××	—×	××	××	×××	×××	××	Lg	circumgreenlandic
— *bufonius* L. *	——	——	——	—×	——	——	——	Kg	only at 71°05′
— *castaneus* Sm.	——	×—	——	××	×××	×××	××	Kg	sl: 66°15′; nl: 77°37′
— *filiformis* L. **DS**	××	——	——	——	——	——	——	Gg	nl: 61°40′
— *squarrosus* L. **DS**	××	——	——	——	——	——	——	Ge	nl: 60°34′
— *subtilis* E. Mey. *	——	—×	——	——	——	——	——	Kg	only at 65°37′
— *trifidus* L.	××	××	××	××	——	——	——	Hg	nl: 70°27′

District	1	2	3	4	5	6	7	cf. p. 146 ff.	nl: northern limit in East Greenland sl: southern limit in East Greenland
An * refers to the explanation given p. 153 ff. All other explanation to this list is found p. 143 ff.	60°04′—65°00′	65°00′—68°00′	68°00′—70°00′	70°00′—71°10′	71°10′—73°15′	73°15′—74°40′	74°40′—79°30′		
	i o	i o	i o	i o	i m o	i m o	i o		
Juncus triglumis L. *var.* * **DS**	×—	—×	—×	××	×××	×××	××	Jg	nl: 77°40′
Luzula arcuata-confusa *	××	××	××	××	×××	×××	××	Lg	circumgreenlandic
— *frigida-multiflora* *	××	××	——	×—	———	———	——	Ig	nl: 70°30′
— *nivalis* (LÆST.) BEURL.	——	——	——	—×	×××	×××	××	Fd	sl: 70°25′
— *parviflora* DESV. **DS**	××	——	——	——	———	———	——	Hd	nl: 60°41′
— *spicata* (L.) DC.	××	××	××	××	×××	××—	——	Ig	nl: 74°25′
Triglochin palustre L.	×—	——	——	——	××—	×——	——	Hg	nl: 73°35′
Tofieldia coccinea RICHARDS	——	——	×—	××	×××	×××	××	Ka	sl: 68°16′; nl: 77°32′
— *palustris* HUDS. *	××	××	××	××	×××	××—	——	Ig	nl: 74°30′
Habenaria hyperborea (L.) R. BR.	××	—×	——	——	———	———	——	Hb	nl: 65°38′
— *straminea* FERN.	××	××	——	——	———	———	——	Hg	nl: 66°06′
Listera cordata R. BR. **DS**	××	——	——	——	———	———	——	Hg	nl: 63°32′
Potamogeton filiformis PERS.	——	—×	——	——	—×—	××—	——	Hg	nl: 74°25′
Sparganium affine SCHNIZL. *	×—	—×	——	——	———	———	——	Hg	nl: 65°37′

IV. Concluding Remarks.

On counting the species enumerated in the above list it will be seen that with the conception of the species maintained in this work we have arrived at 321 species of higher plants in East Greenland. The number of species for the various districts will appear from the subjoined table (Table IV). It will be seen that apart from District 1, which contains a number of specially southern species, and District 7, in which the flora-decline has exerted a great influence (cf. p. 138), the number of species is about the same. Perhaps attention should be called to the rather low number of species for District 3; it may be due to lack of investigation, but is possibly due to the apparent absence in this limited area of conditions suitable for a number of species, thus for instance shore and water plants, etc. (cf. BØCHER, 1933, p. 17).

Table IV further shows the distribution of the plants classified according to the categories A—H (cf. p. 146), i.e. the distribution of the plants of the various districts in the remaining parts of Greenland. From this it appears that 29 species, or about one-sixth of the species of each district, are common to all the districts and the remaining part of Greenland, i.e. are circumgreenlandic. About 50 per cent. of the East Green-

Table IV.

Districts	1	2	3	4	5	6	7	in all
A	8	4	6	11	11	15	10	28
B	3	1	2	4	4	4	4	4
C	1	1	..	3	3	3	4	4
D	..	..	1	4	6	7	8	8
E	..	..	2	10	10	10	10	10
F	4	10	15	21	20	21	21	21
G	17	5	2	1	..	..	..	17
H	88	60	36	19	12	7	2	89
I	31	29	23	25	20	16	2	31
J	24	23	20	23	23	23	18	24
K	10	20	22	35	40	38	22	56
L	29	29	29	29	29	29	29	29
in all...	215	182	158	185	178	173	130	321

land species extend around the south of Greenland and up the west coast; a summary investigation of the number of these found in Districts 2 to 7 will show that the number of species decreases rather gradually without sharp limits of flora-declines; 22 of these species extend northward to District 7. Similarly, 43 species extend along the north of Greenland (of course in addition to the 29 L-species). However, the southern limit of these species seems not to be so evenly distributed along the whole coast as the northern limits of the southern species, since 38 of the 43 species have been found southward to Scoresby Sound, while 18 only have been found in District 3. It is too early to say anything about the cause of this: possibly, however, it is due in large part to the investigations being more deficient along the southeast coast of Greenland; an investigation of the higher levels is especially desirable, but even though a number of species will possibly later be found at the mountain summits, we regard it as not improbable that the sudden decrease of the number of species near Scoresby Sound should be connected with the rather abrupt climatic limit which must be assumed to be found in this place (cf. SEIDENFADEN, 1933, p. 102 and BÖCHER 1933).

Twenty-eight of the species mentioned in the list have not hitherto been found in West Greenland (a comparison with OSTENFELD's list (1926), which contained nine such species, will show how much our knowledge of the flora of East Greenland has advanced in recent years). Probably eight of these are endemic species, while thirteen are "eastern-circumpolar" (groups e—f of the list), i.e., they have not been found in the eastern part of North America. This rather high figure seems to indicate a relatively late, more or less locally limited immigration of at any rate part of the East Greenland flora. Altogether about 11 per cent. of the East Greenland species are eastern species.

A further count of the species on the basis of groups a—h (cf. the meaning above, p. 148; that is to say, the occurrence of the species outside Greenland) has been made in the subjoined Table V.

It appears from the table that the circumpolar plants (c + d + g) are by far the most important within all the districts; apart from District 1, which is very rich in species, between 85 and 90 per cent. of the species of all the other districts are circumpolar.

The species endemic to Greenland (h) play no great role in the flora; without going further into the question, we call attention to this fact, which is of essential importance in investigations of the age of the flora of Greenland, especially in connection with the question as to the non-glaciated areas. An immediate comparison with the non-glaciated areas of northeastern America investigated by FERNALD is, of course, not permissible, since FERNALD, when arriving at a degree of endemism of 20—25 per cent. for such districts, operates with much narrower

bution of a large number of East Greenland species in the whole of Greenland. They were prepared by the dot-method previously mentioned; by applying this method the various species showed a colossal difference in distribution, which made it difficult for us to class the species in groups of distribution on that basis. Gradually, however, as we drew maps for a larger number of species, it proved possible to class them; we arrived at a limited number of groups whose species showed an interesting agreement in certain respects stated below.

In our grouping of the species we gave special attention to the occurrence of the species near their northern or southern limits of distribution, the difference in the position of these limits on the east and west coast, and in the case of isolated occurrences we have laid special stress on a comparison with the edaphic and climatic conditions prevailing in the habitat.

A number of species proved to have a fairly closed area of distribution, stopping more or less suddenly with a rather sharp limit. And this limit often occurred in rather different latitudes on the east and the west coast. Other species had likewise such a closed area, but beyond this the species was further found in isolated scattered occurrences. An investigation of the position of these occurrences, their climatic and edaphic conditions, gave us the impression that we were here concerned with relict occurrences, that they were survivors from a time when the species had a larger continuous distribution in Greenland. Finally, some species occurred which had no large continuous area of distribution, but were found in isolated patches only, often at intervals of some hundreds of kilometres, and frequently limited to some few very local occurrences on the east and west coast. These occurrences, too, showed agreement in habitat, and many of these species also we regard as relicts from an earlier, wider, distribution.

On the basis of these and various other observations which we shall not discuss here, since, as mentioned above, we think that closer investigations in Greenland are in many respects required, we shall briefly outline below the way in which, in our opinion, the East Greenland plants can be roughly grouped in different floral elements, which seem to show agreement in route or time of immigration.

I. As relatively recent immigrants into Greenland we regard a large number of species which have a smaller closed area in Greenland, and which at the same time show an "oblique" distribution, i.e. their distribution shows different northern or southern limits on the east and west coast. These species do not seem to have isolated occurrences outside their closed areas. Here we shall deal with four subdivisions.

a) Southeastern recent immigrants. The main distribution of these plants is found on the southeast coast of Greenland. As far as appears

from the more or less deficient investigations, they terminate with a fairly sharply defined limit towards the north; and it applies to all of them that their northern limit occurs considerably farther northward on the east than on the west coast. As an explanation of this fact, which seems rather peculiar on immediate observation, considering that the southwest coast might be supposed to afford greater possibilities than the narrow, more or less ice-bound southeast coast, we can hardly help thinking that we are here concerned with a purely historic phenomenon; it is natural to assume that the species in question have emigrated from Iceland to the nearest part of the east coast, about 62° to 65′ N. lat., whence they have spread towards the north and south, but have simply not yet spread so far on the west coast as they might if they had had sufficient time. As an example of this group we have chosen *Hieracium alpinum* (cf. fig. 51) and *Nardus stricta* (fig. 57). Other examples might be given, too (thus, i. a. *Alchemilla acutidens*, *Anthoxanthum odoratum*, *Polygala serpyllaceum*, *Sedum acre*, and *Viola palustris*), and in this connection it is important to note that representatives of this group are chiefly to be found among the e and f species, that is to say, the east-arctic ones, which do not occur in North America; thus of the 19 southern east-arctic species occurring in Greenland five are limited to the south-east coast, while nine extend farther north on the east than on the west coast.

b) Northeastern recent immigrants. Similarly, a number of plants have a closed northeastern distribution in Greenland with no isolated occurrences outside their area of distribution. There is hardly any other possibility than that these species have immigrated rather late from the northeast-arctic islands, via Spitsbergen. This is in accordance with the fact that none of these species are absent in the regions in question, while many of them are absent from Northeastern America. We have figured the distribution of *Draba Gredinii* (fig. 53), *Ranunculus glacialis* (fig. 52), and *Saxifraga flagellaris* (fig. 54). Of other examples might be mentioned *Taraxacum arcticum*, *Festuca vivipara s. str.*, *Poa alpigena var. colpodea*, *Polemonium boreale*, *Saxifraga hieraciifolia* (cf. the map of distribution for the two last-mentioned species by GELTING, 1934, pp. 270 and 262).

c) Southwestern recent immigrants have their main distribution in southwestern Greenland, and on the whole show symmetrical conditions with the I a group. We have figured *Calamagrostis Langsdorffii* (fig. 52) and *Betula glandulosa* (fig. 57), but might also have chosen *Mertensia maritima*, *Viola labradorica*, *Festuca vivipara* v. *hirsuta*, or others, e.g. *Eriophorum polystachyum s. str.* (as to this species, see the map of distribution by SEIDENFADEN (1933, p. 104) in connection with the explanation of the distinction between the two forms by SØRENSEN (1933, p. 127),

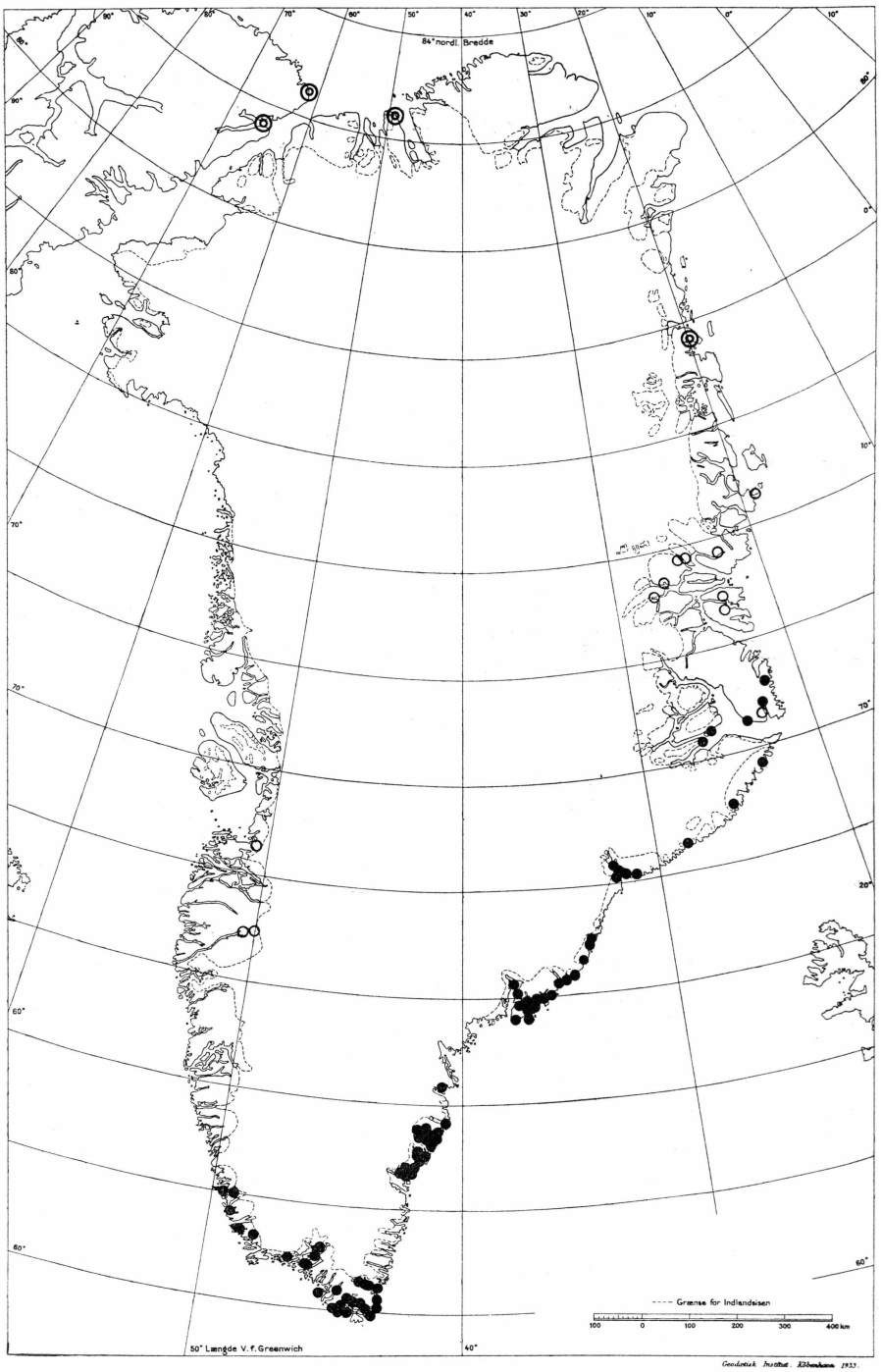

Fig. 51. The distribution of *Hieracium alpinum* (●). *Taraxacum pumilum* (◉) and *Gentiana tenella* (○) in Greenland (mapped February, 1937).

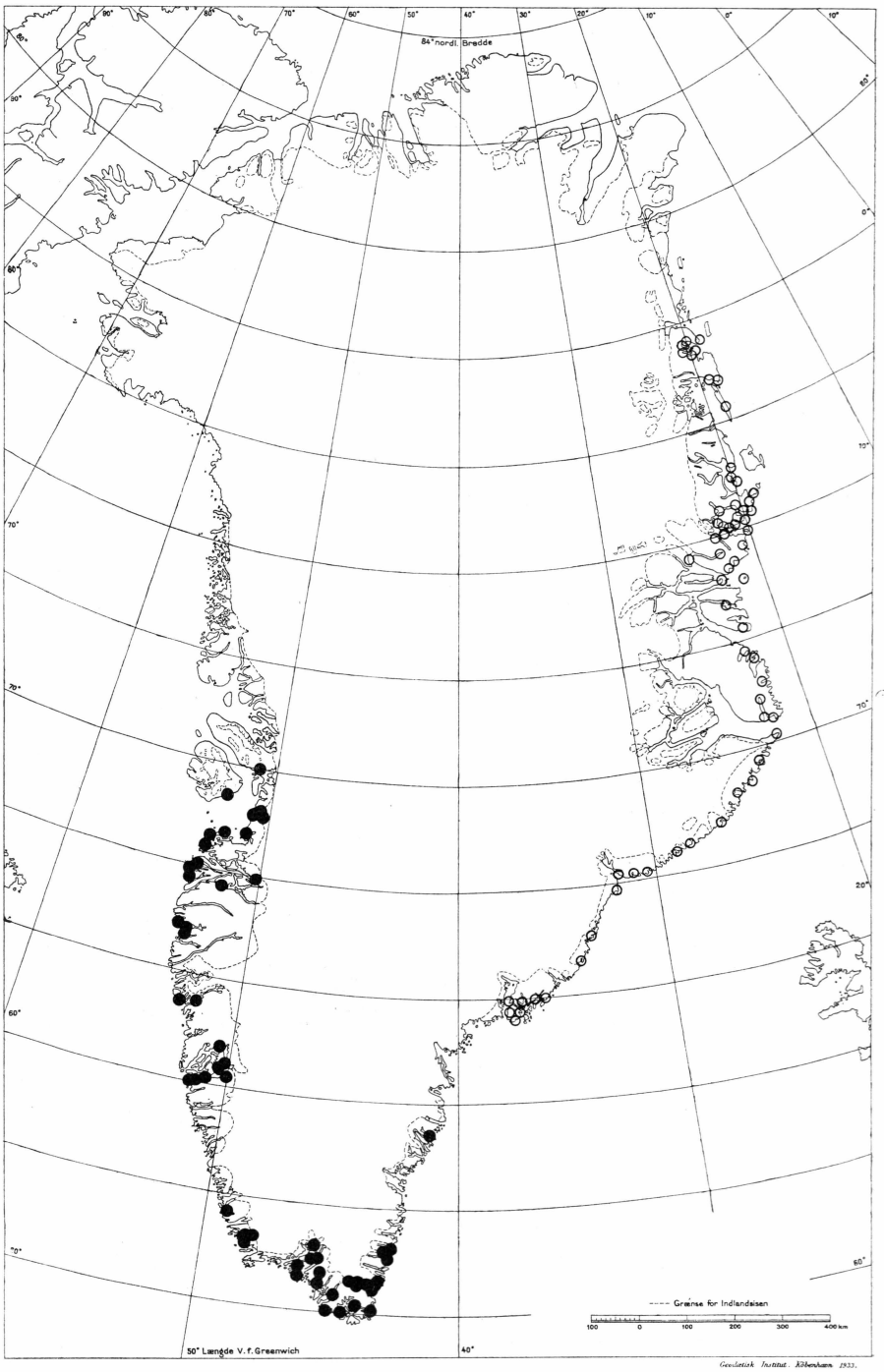

Fig. 52. The distribution of *Calamagrostis Langsdorffii* (●) and *Ranunculus glacialis* (○) in Greenland (mapped February, 1937).

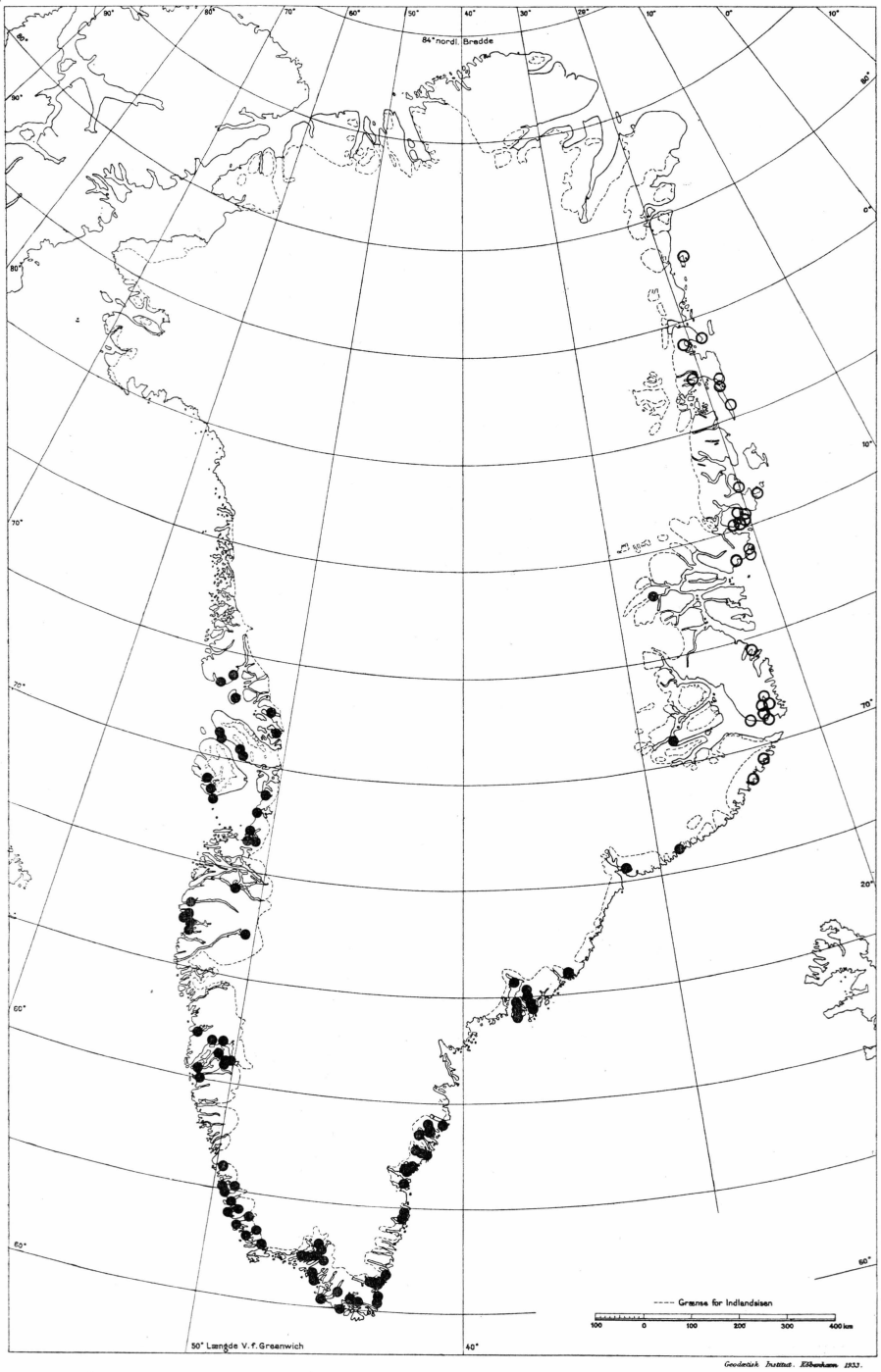

Fig. 53. The distribution of *Pinguicula vulgaris* (●) and *Draba Gredinii* (○) in Greenland (mapped February, 1937).

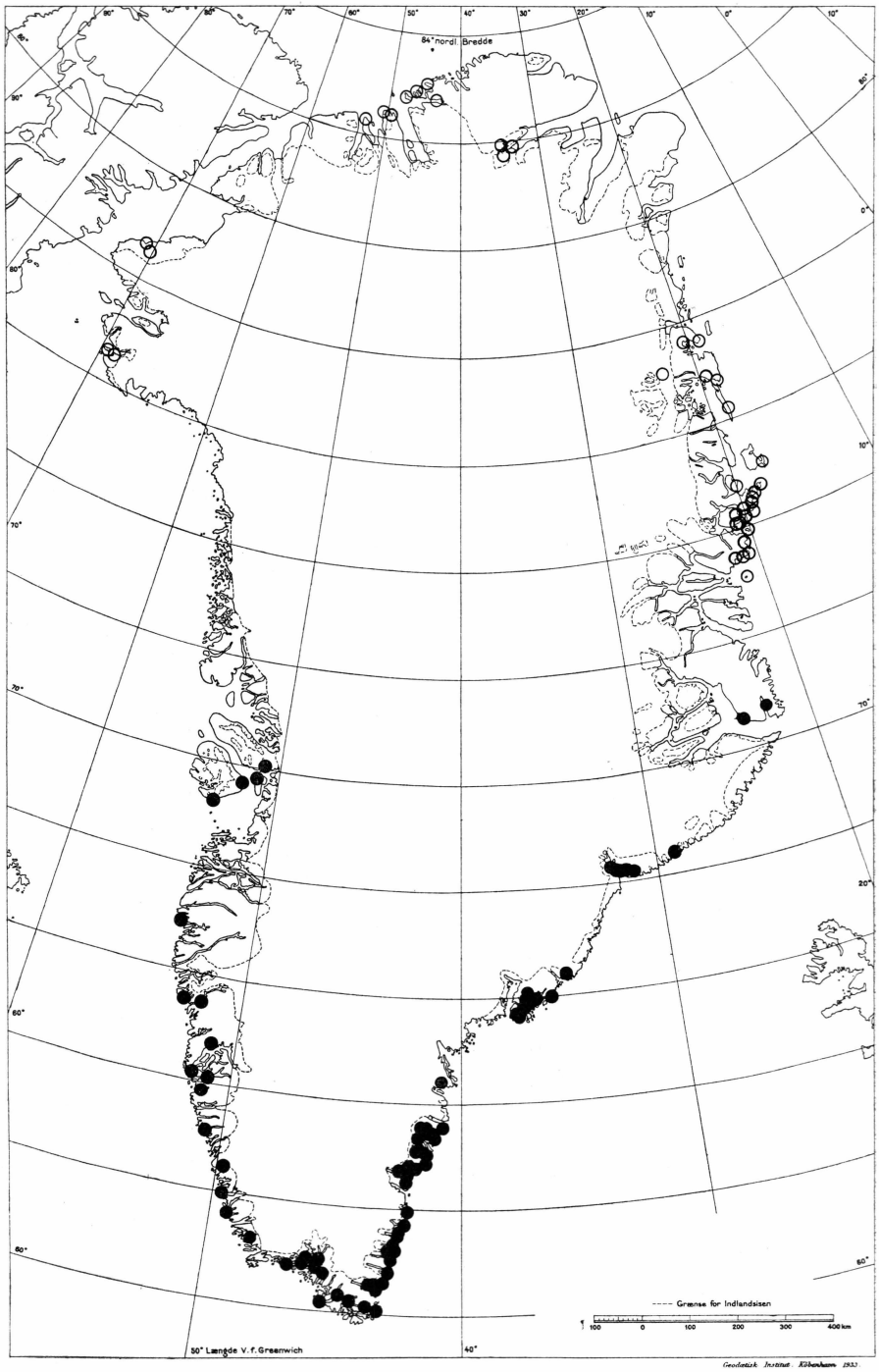

Fig. 54. The distribution of *Gnaphalium supinum* (●) and *Saxifraga flagellaris* (○) in Greenland (mapped February, 1937).

cf. further p. 164). Moreover, several of these species have not yet reached the east coast and are not, accordingly, included in this survey, thus for instance *Parnassia Kotzebuei* (mapped by BØCHER, 1933, p. 50).

d) Northwestern recent immigrants, immigrated across Smith Sound in rather recent times, will hardly have any representatives in the flora of East Greenland, with which we are concerned here. They are chiefly limited to the Thule district, and as they are to some extent high-arctic plants, which must be assumed to migrate slowly (cf. LYNGE, 1934, p. 139), the greater number of them will hardly have spread along the barren north coast. Reference should merely be made to the maps of the distribution of the species *Pedicularis capitata*, *Ranunculus Sabinei*, and *Hesperis Pallasii* prepared by GELTING (1934, pp. 262 and 267). As a representative of this subgroup we have drawn the presumably very incomplete map showing the distribution of *Taraxacum pumilum* (fig. 51). As long as investigations are lacking along the north coast and the northern part of the east coast we cannot expect to find more specimens of this group.

II. The immigrants of the post-glacial heat period. A very large group of the East Greenland southern species show a peculiar distribution, having a southern closed area and isolated occurrences farther north. This group, the greater part of which might also be called the Atlantic herb-slope plants, seems to have had a much wider distribution at a time when the climate was warmer. Outside their area of distribution these plants occur at present on warm slopes with a southward exposure (Norwegian: Li), preferring basaltic or calcareous localities, especially in the interior of the fjords, but also in favourable localities nearer the outer coast. As to all the East Greenland species for which we have drawn maps of distribution we have not limited our investigations to the east coast, but have extended them to the west coast, too; there the plants seem to behave in a similar manner, i.e. they have a closed area of distribution to the south and quite occasional occurrences farther north, around the inner fjords or in specially favourable localities. As representatives of this group we have chosen *Pinguicula vulgaris* (fig. 53) and *Gnaphalium supinum* (fig. 54), but a much greater number could be mentioned (*Habenaria*, *Potamogeton filiformis*, *Listera*, *Carex brunnescens*, *Alopecurus aristulatus*, *Scirpus caespitosus* (mapped by BØCHER, 1933, p. 46), *Deschampsia flexuosa*, the *Hieracium* species (cf. p. 160), *Veronica fruticans*, *Thymus*, *Thalictrum*, *Sedum annum*, *Saxifraga Aizoon*, *Ranunculus acer*, *Potentilla tridentata*, *Alchemilla glomerulans* (mapped by BØCHER, 1933, p. 47), *Pyrola minor*, *Comarum*, etc.). Altogether this group seems to be the largest. To these should possibly be added several of the species which have been provisionally referred by us to group I;

for it cannot be taken for granted that these species would have left relicts even if they had been more widely distributed in warmer climates, or because we have not yet succeeded in finding these relicts in this country, but little investigated so far.

III. The boreal steppe plants. By this name we denote a group of plants which have especially attracted our attention in the parts of East Greenland investigated during the last few years. At the present day these regions may have the most continental climate of the whole of Greenland, and in our opinion a number of the plants distributed here and in a few other places in Greenland, especially dry places in the interior warm fjords, have had a larger continuous area of distribution during a warm continental period, while at present they are found merely as relicts outside central East Greenland and in part there, too. We have figured *Gentiana tenella* (fig. 51) and *Carex supina* (fig. 30, p. 85); as other examples we may mention the other *Gentiana* species, and further *Agropyrum violaceum*, *Primula stricta*, *Minuartia stricta* (mapped by GELTING, 1934, p. 263), *Kobresia bipartita*, *Carex microglochin*, *Saxifraga aizoides*, *Arctostaphylos alpina*, *Carex atrofusca* (the three last-mentioned species mapped by GELTING, 1934, pp. 263, 267, and 283).

IV. The arctic desert plants are most closely related to the preceding group, though they are distinctly arctic species with a northern distribution in Greenland. In addition they are of scattered occurrence in more southerly dry fjord localities; here we take them to be relicts from a period with a more continental climate[1]). As examples of this group we have figured *Erigeron compositus* (fig. 56) and *Hierochloë alpina* (fig. 55), but to the same group we further refer species such as *Arnica alpina* (mapped by BØCHER, 1933, p. 48), *Lesquerella arctica*, and *Elyna Bellardii* (mapped by SEIDENFADEN, 1933, p. 103).

V. The ancient cold plants (probably including a great number of the circumgreenlandic plants) comprise very early immigrants into Greenland. This we infer from the fact that besides a continuous distribution to the north they are distinguished by isolated occurrences to the south, though if so, as a rule on the highest mountain summits only. The latter we regard as relicts from a colder period in Greenland, when the species were distributed around the most southerly point of Green-

[1]) It is the same idea which SEIDENFADEN (1933, p. 101 et seq.) has previously discussed in part, figuring as an example the distribution of *Elyna Bellardii* (l. c. p. 103). However, the meaning is not quite clear, since by a slip of mind he has written "inter" instead of "post" glacial. According to our present view we cannot agree, either, in referring all the species mentioned by SEIDENFADEN (l. c. p. 101) to our group IV.

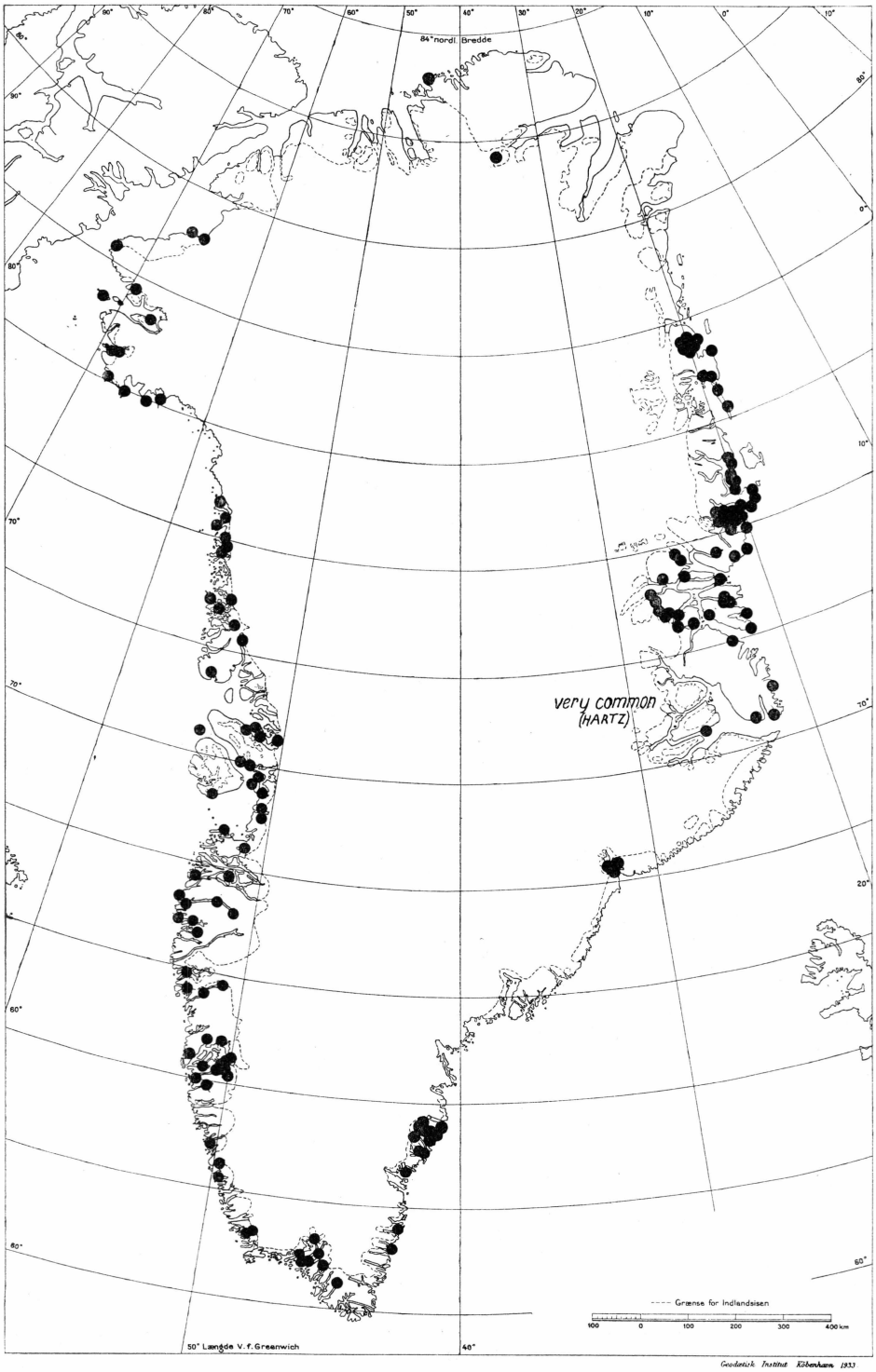

Fig. 55. The distribution of *Hierochloë alpina* in Greenland.
(Mapped February, 1937).

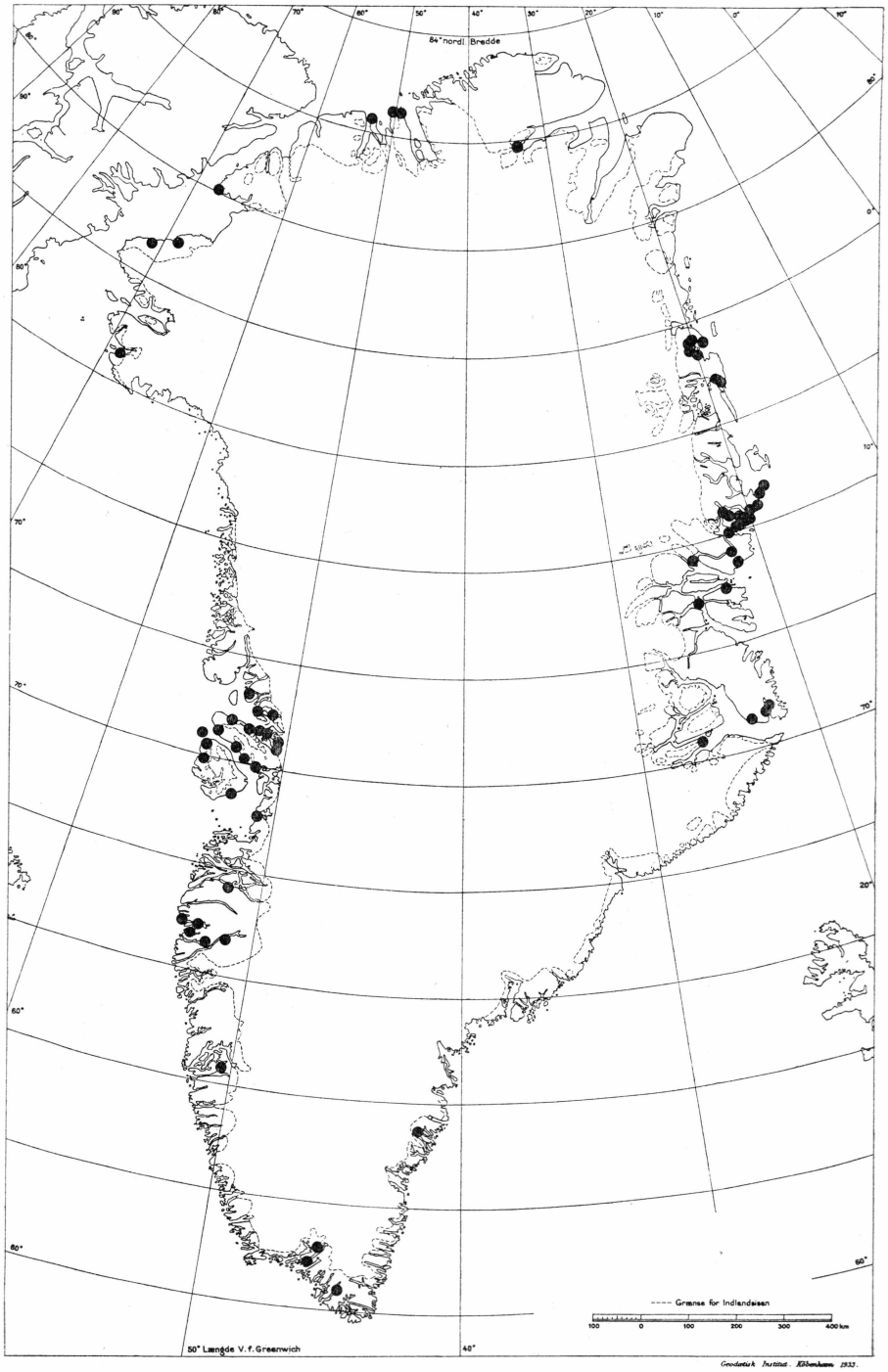

Fig. 56. The distribution of *Erigeron compositus* in Greenland.
(Mapped February, 1937).

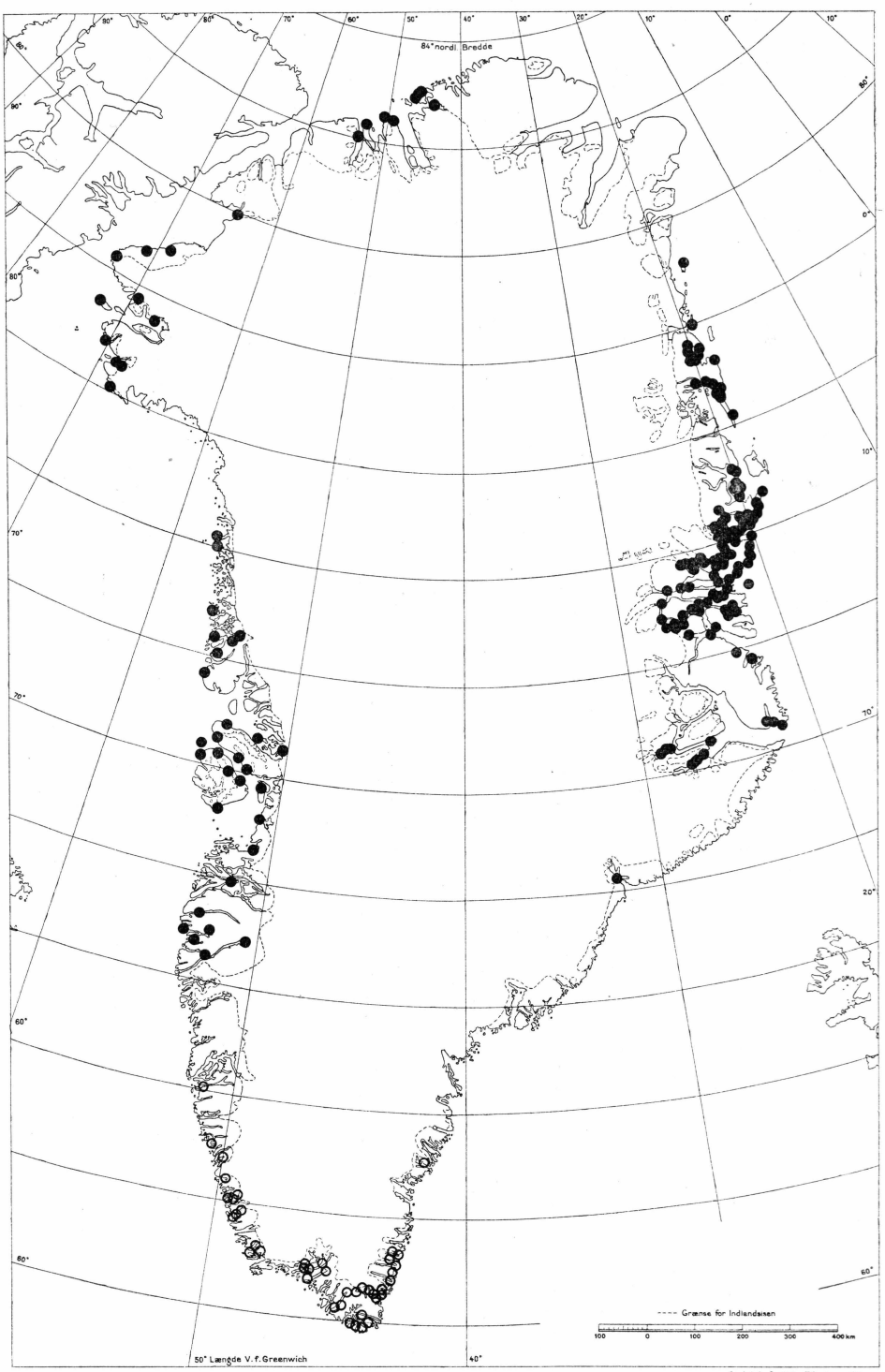

Fig. 57. The distribution of *Carex misandra* (●) and *Betula glandulosa* (○) in Greenland. (Mapped February, 1937).

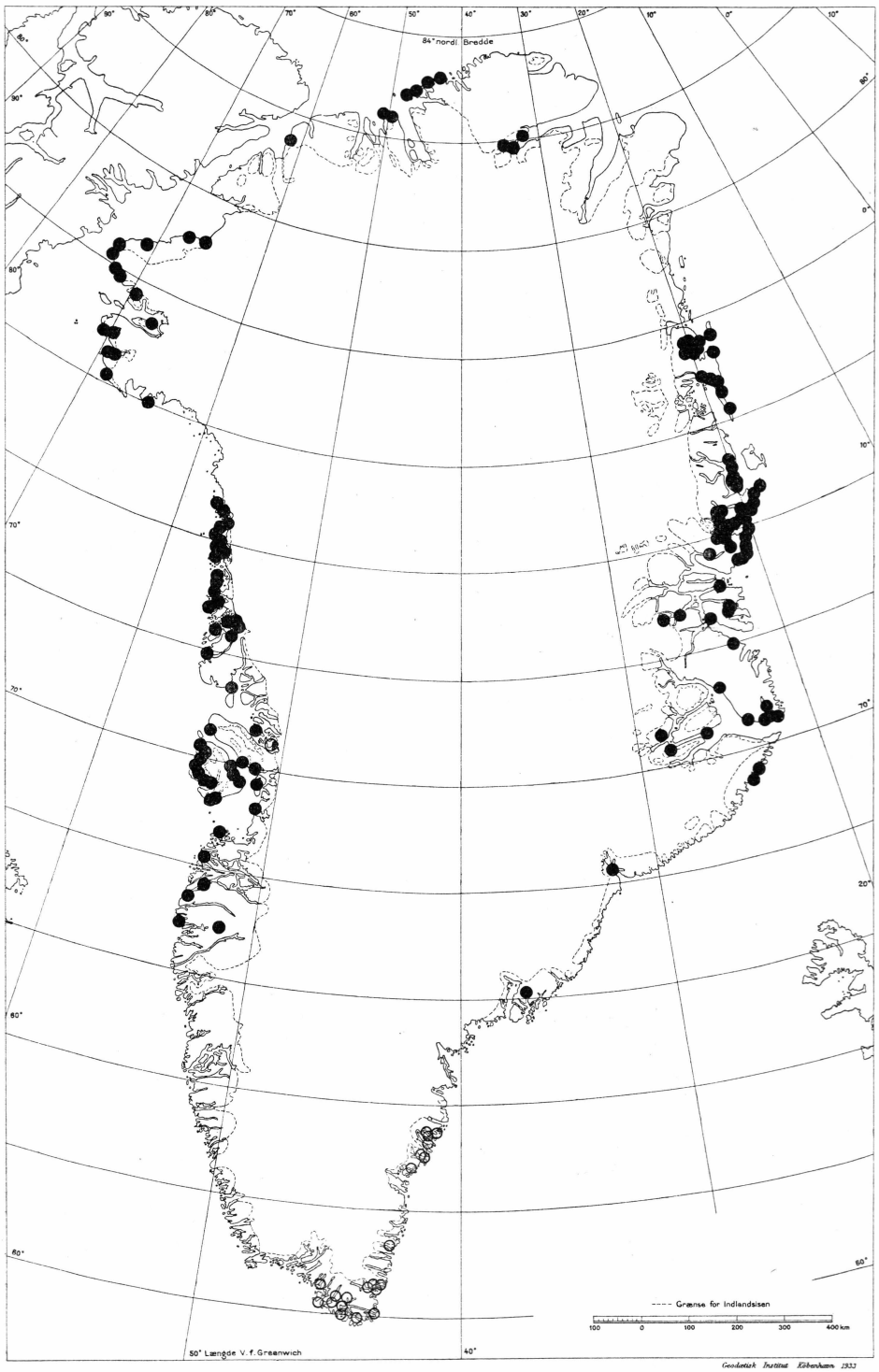

Fig. 58. The distribution of *Potentilla emarginata* in Greenland. The southernmost localities are alpine. (Mapped February, 1937).

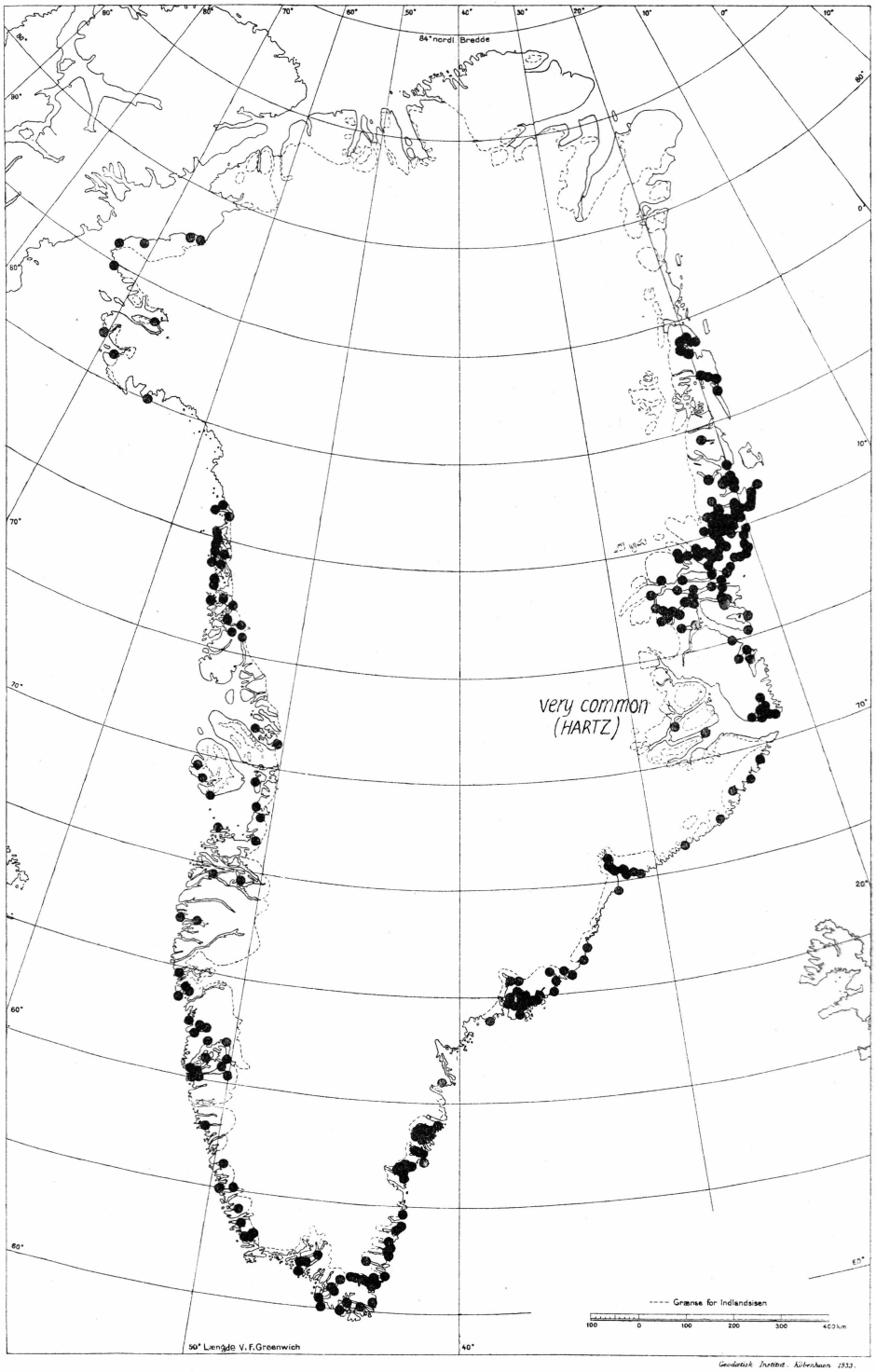

Fig. 59. The distribution of *Vaccinium uliginosum* in Greenland.
(Mapped February, 1937).

land. Here we still to some extent lack investigations of the alpine flora; but the investigations made so far, especially in Southwest Greenland, give a clue as to which plants should be referred to this group. As examples we have figured *Carex misandra* (fig. 57) and *Potentilla emarginata* (fig. 58); other examples are *Saxifraga stellaris var. comosa*, *Saxifraga cernua*, *Saxifraga oppositifolia*, *Cassiope tetragona* (mapped by BØCHER, 1933, p. 49), *Armeria vulgaris var. sibirica*, *Alopecurus alpinus*, *Carex nardina*, and *Potentilla nivea*.

Outside the groups defined here there are a number of plants about which we have not yet been able to form an opinion, thus for instance certain water plants, halophytes, endemic plants, etc. As a special group, however, may be erected:

VI. The ubiquists, which are remarkable by being widely distributed in Greenland, by having no southern limit, and by occurring in very different habitats and at different exposures. To the north, and often rather far to the north, they have a more or less sharp limit on both coasts, which seems to be determined exclusively by the temperature conditions of the vegetation period. As an example of such species we have figured *Vaccinium uliginosum* (fig. 59); this map is perhaps the one that says least, since as regards such a common species the same objections can rightly be raised against illustrations by means of maps as have been raised by PORSILD in his criticism of *Cassiope tetragona* (cf. above p. 149). For the sake of unity, however, we have preferred to prepare it by the same method as the other maps, though with the additional remark that the species will hardly be absent from many localities within the area. Of such ubiquists may be mentioned *Carex rigida*, *C. saxatilis*, *C. scirpoidea*, *Salix herbacea*, *Festuca rubra*, *Potentilla Crantzii*, *Campanula rotundifolia*, *Ranunculus pygmaeus*, *Tofieldia palustris*, *Koenigia islandica* (mapped by GELTING, 1934, p. 183), and *Saxifraga rivularis*.

We shall not here discuss further which species should in our opinion be referred to the above-mentioned groups, because several of our maps must still be said to be beset with a good deal of uncertainty. When we have on the whole recorded our considerations here, partly in outline, it is precisely because we think they may constitute an interesting working hypothesis, so that the attention of future investigators may be directed towards occurrences that may corroborate or invalidate such a working hypothesis. However, in order to be able to form some idea of how large a number of the East Greenland species can be referred to the different groups, we have made a computation on the basis of about two hundred species whose distribution we have closely studied and illustrated by maps. This computation seems to show that on the basis of our present knowledge of the distribution of the species we should refer:

about 20 per cent. to I. Comparatively recent immigrants,
— 30 — - II. Postglacial oceanic immigrants,
— 10 — - III. Boreal steppe plants,
— 5 — - IV. Arctic desert plants,
— 15 — - V. Ancient cold-plants, and
— 10 — - VI. Ubiquists,

while our knowledge of the remaining 10 per cent. is too limited to allow us to refer them to any of the groups. The figures given above should, of course, be regarded with every reservation; as stated above, it is especially difficult to distinguish between groups I and II, if relicts are absent; likewise the limitation in time between the two groups is a matter of judgement.

The difficulties connected with a further treatment of the theories about the history of the East Greenland flora at present are to some extent due to the fact that we have to go to other branches of science, especially Quaternary geology, to find out whether the picture we have formed exclusively on the basis of the present distribution of the species agrees with the geological history of the country and with the picture which climatologists may form on the basis of the information supplied by geologists studying the geology of the Quaternary period. And in this respect we lack information to a great extent. But in erecting the above-mentioned floral elements we could not avoid forming an opinion as to the climatic conditions of earlier times; thus we assume the existence in earlier times of a continental, more or less arid period, a warm, more humid period, etc.; even if observations which should fully prove the existence of such conditions seem to us to be as yet rather scattered we have tried to use them to form the basis of our theories. The most important contribution to the question as to a post-glacial heat period has been supplied by Ad. S. Jensen & P. Harder (1910), who reported the earlier literature; of special importance are the exceedingly interesting investigations made in 1906 by the two authors in the central part of West Greenland. Thus they succeeded in ascertaining in post-glacial marine deposits the presence of animal communities which gave a better idea of the temperature fluctuations after the latest glaciation than have been gained either before or after. Our fig. 60 is based on their curve showing the presumed relative temperature conditions.

Subsequent zoological investigations on the east coast of Greenland lend excellent support to the results arrived at by Ad. S. Jensen. Here mention should merely be made of the occurrence in Scoresby Sound, the only place on the east coast, of *Yoldia hyperborea*, which, unlike the other species of the area which are representatives of arctic animal communities, represents animal communities of a distinctly

boreal type, as known from the White Sea (cf. THORSON, 1934, p. 56 et seq.). No doubt we are fully justified in regarding the occurrence of the species in Scoresby Sound as of a relict nature. The distribution of *Mytilus edulis*, too, lends support to this assumption. It was found as early as 1899 as a fossil in the shore-lines of Northeast Greenland by NATHORST, who was aware that it supplied the proof of a warmer post-glacial climate (NATHORST, 1901, p. 303 et seq.). It occurs alive in several places within the area of Angmagssalik, but it has not been found on the east coast south of this place; E. BERTELSEN has kindly informed us that despite zealous search he failed to find it during his last expedition to Lindenow Fjord, and he regards it as a relict in the area of Angmagssalik. Finally we may mention the finding of *Pecten islandicus* in two places in the interior of the Franz Joseph Fjord district, the only places in which the species has been found alive on the east coast (THORSON, 1933, p. 59).

Thus the proofs of a post-glacial heat period are so definite that at present hardly anyone is in doubt as to its existence; but it is desirable that a more thorough-going Quaternary geological investigation should be devoted to the full elucidation of this point[1]). According to the theories of the climatologists such a heat period after an ice-age is accompanied during its first part by an arid climate (cf. e.g. WOEIKOF, 1910), and much would seem to show that we are justified in reckoning with the possibility that our group III, the boreal steppe plants, have immigrated during such a period; however, altogether the picture of Quaternary geology is too roughly outlined to render it justifiable for us to go further into theories than we have already done. Besides, there is a significant point; we must be fully aware of the conditions prevailing at the same time in North America and the eastern Arctic[2]); a synchronisation of ice-ages and post-glacial climates over wider areas will be required if we are to be certain that at such times when conditions in Greenland permitted an immigration of one or the other species, there were possibilities for such an immigration from the adjacent regions. And in that respect not only climate and ice movements, but also the accompanying up-heavels and subsidences will be of decisive importance. There are a great many problems to be solved before light can be thrown on the history of the immigration of the plants of the country.

However, what we think it possible even now to infer from our present knowledge of the distribution of the species is that the flora of Greenland can hardly have been limited to one or some few routes and times of immigration. On the other hand it is not necessary, in

[1]) At this moment such investigations are being made in Southwest-Greenland.

[2]) Cf. TOLMATSCHEW. (ТОЛМАЧЕВ, А. И : О Происхождении тундрового ландшафта.— Природа 1927, No. 9).

order to account for the often peculiar, polycentric or isolated occurrence of the species, to form theories about more or less problematic interglacial periods, or non-glaciated areas in the most different places, with relicts from such interglacial times, etc.

Briefly and with every reservation we may then give the picture we have so far formed of the immigration history of the East Greenland flora (which, of course, cannot be treated separately from the West Greenland flora, but hitherto we have chiefly limited ourselves to East Greenland). In order to facilitate the general understanding we give at the same time the very hypothetical figure, fig. 60, which is based on Ad. S. Jensen's relative temperature curve mentioned above, while we have added our view as to the relative precipitation. The picture is as follows:—

In Greenland there is a group of very early immigrants (group V etc.). They may have immigrated immediately after the last advance of the ice, or before, during an interglacial time; as yet it is difficult to say anything definite on this point. That they immigrated at a time with a colder climate than at present appears from their alpine relict occurrences to the south, which can hardly be otherwise accounted for.

After the last glaciation, and thus probably after group V, group IV immigrated (our doubt as to the time when this took place will appear from the interrogation marks in fig. 60). Then followed a period with temperatures higher than at present, accompanied by a dry climate, and group III, the boreal steppe plants, immigrated; in a climate like that prevailing at the present day they will leave only a few and very scattered relicts, to be sought for in the grassy heaths and similar places in the most continental areas.

At the same time as the temperature curve reaches its maximum, the precipitation will increase. That at that time the precipitation must have been much greater than at present, at any rate in Northeast Greenland, is rendered highly probable i. a. by the occurrence of the fossil solifluction phenomena pointed out by Th. Sørensen (1935). It should further be pointed out parenthetically that very probably the warmest period coincided with the greatest upheaval, when the land was much higher than at present, which further favoured an immigration. During the warm, humid period the large group II, the Atlantic herb-slope plants, immigrated and spread beyond their present area of distribution. With the falling temperature and smaller precipitation they receded southwards, in part leaving relicts in favourable localities. At the time when the climate had become almost as at present, group I immigrated; these plants have in part not yet reached their natural area of distribution. For the sake of completeness we might then in conclusion mention the group of plants whose immigration coincided with the activity

of the Europeans in the country; these plants are especially associated with the most densely inhabited parts of the west coast, and have been treated in more detail by PORSILD (1933).

The very rough picture given here supplies the working hypothesis on which we base our further investigations of the problems. In a sub-

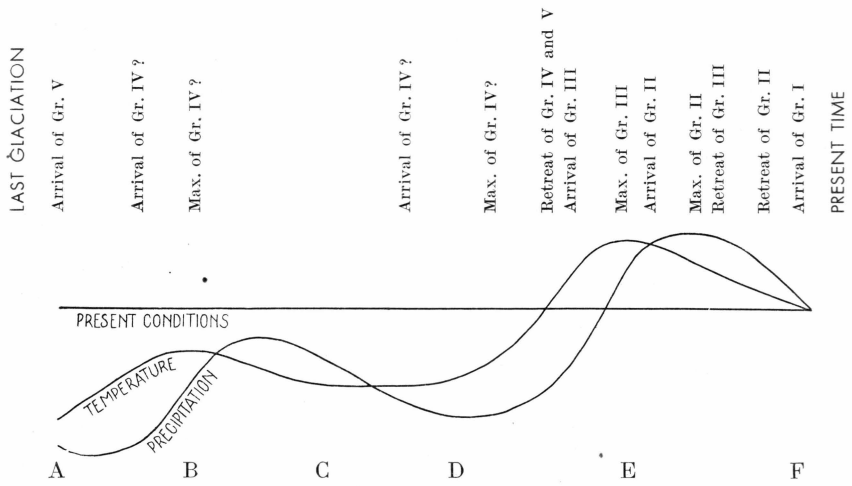

Fig. 60. A hypothetical diagram of the immigration of the East Greenland flora, in part explained in the text pp. 184—202. No attempt has been made to give the actual times, temperatures, and amounts of precipitation, but merely the temperature and precipitation relative to the present conditions. It should further be remembered that the diagram is not located to a fixed spot of the long Greenland coast. Therefore e. g. "Retreat of Gr. II" means "retreat from the places in which the climate is now too arctic-continental", viz. the northern and central parts of the coast, while they are stationary or perhaps even advancing in the south. Likewise "Retreat of Group V" means "retreat from the southern coast, which was becoming too hot and humid, but at the same time immigration to the mountains and towards the north".

The letters A to F have been taken directly from JENSEN & HARDER's figure, and illustrate the faunas in the marine layers of Orpiksuit, by means of which the relative temperature-curve has been drawn. The meaning of the letters is as follows: A = glacial formations; B = fine-clayey sand with *Balanus Hameri*; C = clay with *Mya ovata*; D = clay with *Yoldia arctica*; E = clayey sand with *Pecten islandicus*; F = strand gravel with *Zirphaea crispata* (cf. JENSEN & HARDER, 1910, p. 403 et seq.).

sequent paper we expect to be able to throw more light on these interesting conditions. It is our hope that along with our botanical investigations the Quaternary geological investigations so long needed will be made, so that we may arrive at greater clarity in the long discussed question of the immigration history of the Greenland flora.

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INDEX TO THE SPECIES MENTIONED

In the subjoined index the synonyms are printed in italics, and only the pages on which the synonym is mentioned are added; otherwise the reader is referred to the statements under the name used by us. If the species in question is found in Northeast Greenland north of 74° 30′ N. lat., and has thus been discussed in detail in the first part of the present paper, that page is printed in heavy type. If for particular reasons the species is mentioned under the systematical remarks in the second part of this paper, the page is printed in italics. An asterisk indicates that the page contains a figure of the species, and a † that the page contains a map of the distribution of the species in Greenland.

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Færdig fra Trykkeriet den 16. December 1937.

PLATES

Plate 1.

Pillar forms collected on a windblown summit. Stormkap (Loc. 25) August 11, 1933.

1. *Draba subcapitata*, 2. *Papaver radicatum*, 3. *Lesquerella arctica*, 4—5. *Potentilla nivea*. Size $^1/_1$. Phot. JUL. GRØNTVED.

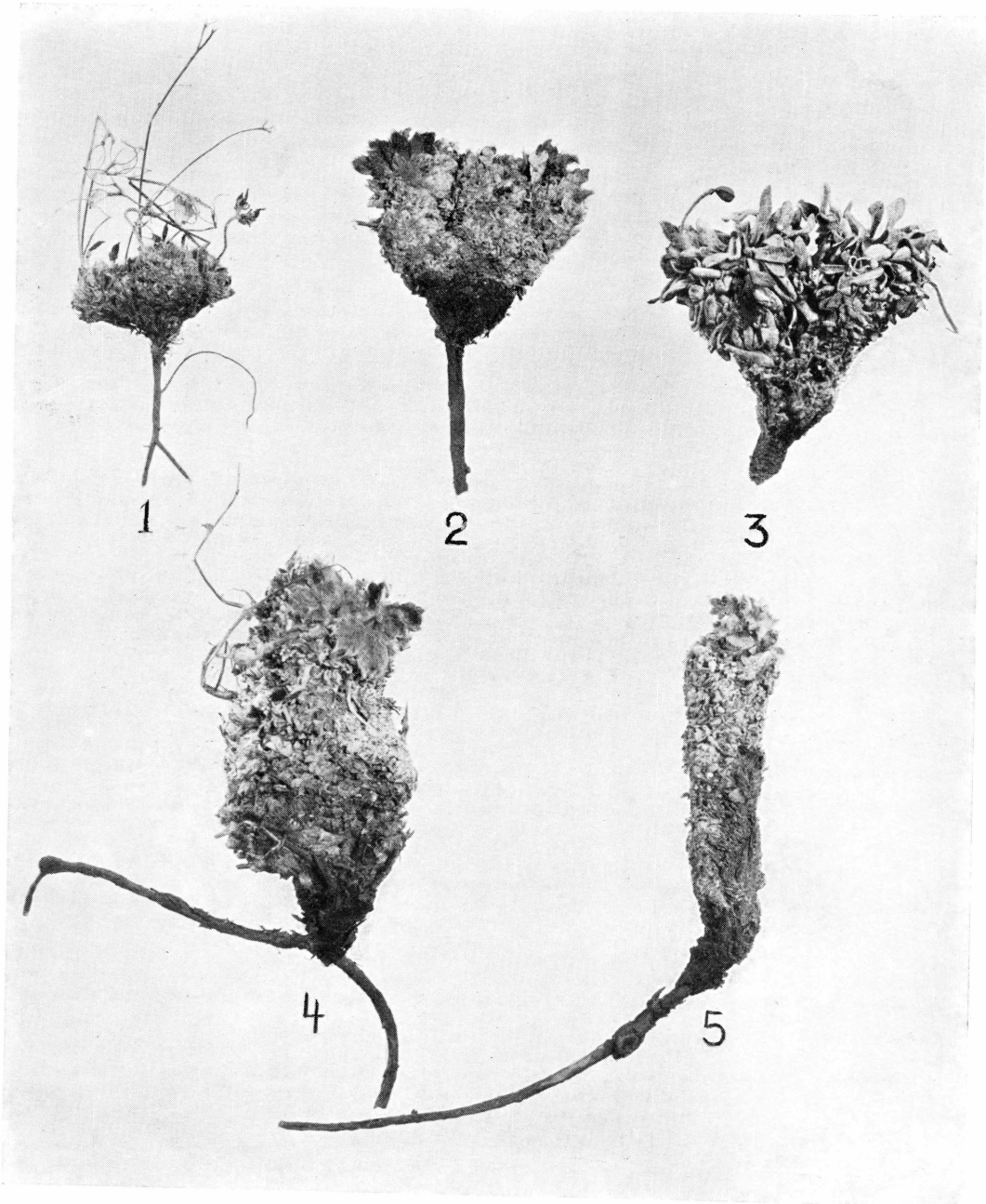
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Plate 2.

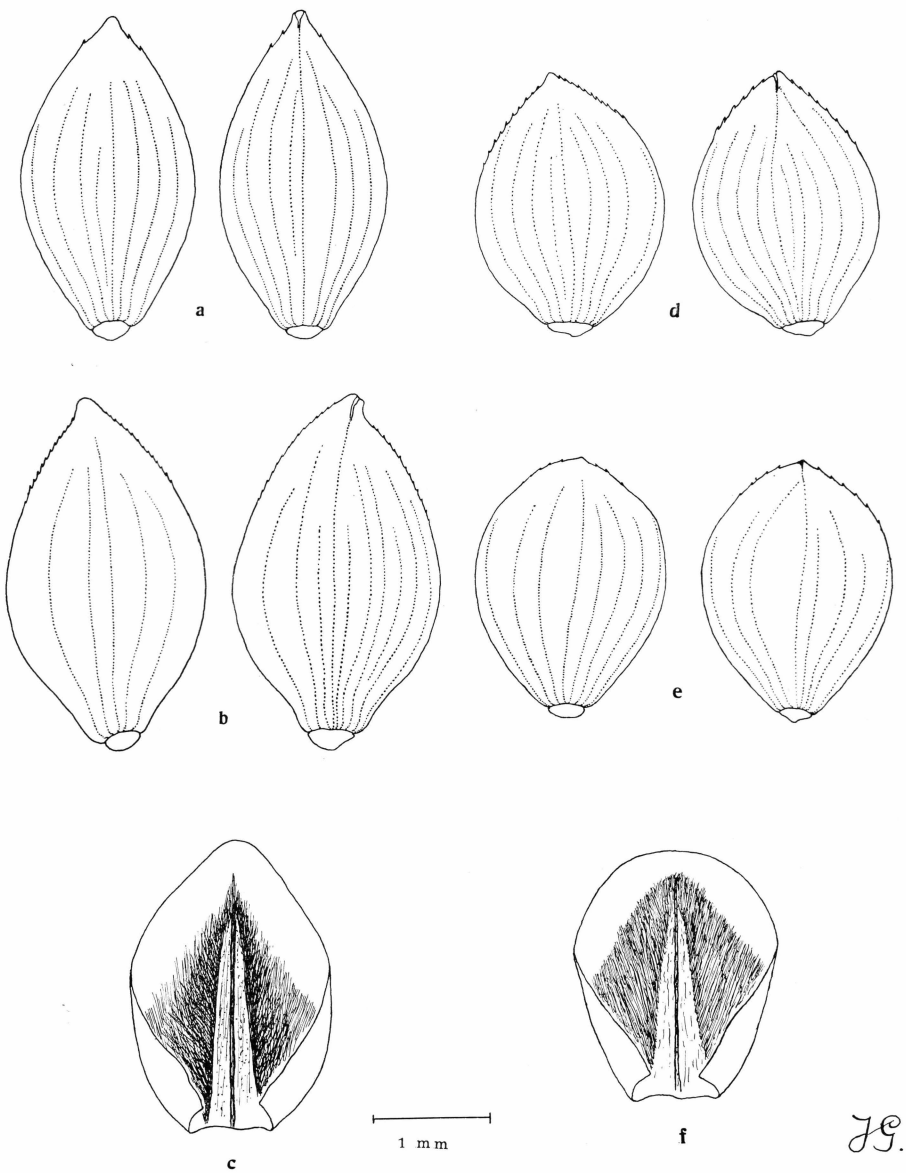
Carex pseudolagopina SOER. nov. sp. Loc. Ella Island, Cape Oswald (Nr. 3279) Size $^1/_1$. Phot. JUL. GRØNTVED.

Plate 3.

Carex pseudolagopina var. solida SOER. nov. var. Loc. Ella Island, Cape Oswald (Nr. 3279 a). Size $^1/_1$. Phot. JUL. GRØNTVED.

Plate 4.

a—c: *Carex pseudolagopina* Soer. nov. sp. d—f: *Carex pseudolagopina var. solida* Soer. nov. var. a, b, d, e: Utricles, to the left, ventral view, to the right, dorsal view. c, f: Scales of female spike, ventral view. a, c, e, and f have been drawn from the type-specimens, while b and d have been drawn from specimens intermediate between the main species and the variety.


a
d
b
e
c
1 mm
f