Biologiske Skrifter
udgivet af
Det Kongelige Danske Videnskabernes Selskab
Bind **9**, nr. 4

Biol. Skr. Dan. Vid. Selsk. **9**, no. 4 (1958)

THE FLOWERING PLANTS OF GREENLAND

A TAXONOMICAL AND CYTOLOGICAL SURVEY

BY

C. A. JØRGENSEN, TH. SØRENSEN
AND M. WESTERGAARD

København 1958
i kommission hos Ejnar Munksgaard

DET KONGELIGE DANSKE VIDENSKABERNES SELSKAB udgiver følgende publikationsrækker:

THE ROYAL DANISH ACADEMY OF SCIENCES AND LETTERS *issues the following series of publications:*

	Bibliographical Abbreviation
Oversigt over Selskabets Virksomhed (8°) *(Annual in Danish)*	Overs. Dan. Vid. Selsk.
Historisk-filosofiske Meddelelser (8°)	Hist. Filos. Medd. Dan. Vid. Selsk.
Historisk-filosofiske Skrifter (4°) *(History, Philology, Philosophy, Archeology, Art History)*	Hist. Filos. Skr. Dan. Vid. Selsk.
Matematisk-fysiske Meddelelser (8°)	Mat. Fys. Medd. Dan. Vid. Selsk.
Matematisk-fysiske Skrifter (4°) *(Mathematics, Physics, Chemistry, Astronomy, Geology)*	Mat. Fys. Skr. Dan. Vid. Selsk.
Biologiske Meddelelser (8°)	Biol. Medd. Dan. Vid. Selsk.
Biologiske Skrifter (4°) *(Botany, Zoology, General Biology)*	Biol. Skr. Dan. Vid. Selsk.

Selskabets sekretariat og postadresse: Dantes Plads 5, København V.

The address of the secretariate of the Academy is:

Det Kongelige Danske Videnskabernes Selskab,
Dantes Plads 5, København V, Denmark.

Selskabets kommissionær: EJNAR MUNKSGAARD's Forlag, Nørregade 6, København K.

The publications are sold by the agent of the Academy:

EJNAR MUNKSGAARD, *Publishers,*
6 Nörregade, København K, Denmark.

Biologiske Skrifter
udgivet af
Det Kongelige Danske Videnskabernes Selskab
Bind **9**, nr. 4

Biol. Skr. Dan. Vid. Selsk. **9**, no. 4 (1958)

THE FLOWERING PLANTS OF GREENLAND

A TAXONOMICAL AND CYTOLOGICAL SURVEY

BY

C. A. JØRGENSEN, TH. SØRENSEN
AND M. WESTERGAARD

København 1958
i kommission hos Ejnar Munksgaard

CONTENTS

Synopsis.

The paper gives a revised list of the flowering plants of Greenland with cyto-taxonomical comments. The authors have counted the chromosome numbers of 237 species from different parts of Greenland. These numbers, together with those already known, are presented in a complete list comprising 437 species of flowering plants. 51 species in which apomictic reproduction is proved or assumed, are listed. 46 sexual species show "intraspecific polyploidy". The chromosome number is known for 91 per cent of the species and 65 per cent have been counted on Greenland material. 86 per cent of the monocotyledons are polyploids, against 62 per cent of the dicotyledons.

PRINTED IN DENMARK
BIANCO LUNOS BOGTRYKKERI A-S

I. Introduction.

With the growth of the science of chromosome cytology at the end of the nineteenth and the beginning of the twentieth century, a large amount of chromosome numbers of flowering plants became accumulated. This body of facts, when brought to bear on taxonomical problems, in most cases gave valuable support to the conventional conception of the Linnean species as a natural unit of classification of the plant kingdom. Within the Linnean species constant chromosome numbers were generally found, whereas the numbers often differ from one species to another.

Although the evolutionary point of view, since Darwin generally accepted as the fundamental biological principle by all taxonomists, requires a change of one species into another, very little was at the beginning of this century known of the mechanism of species formation in plants.

Between 1910 and 1920, however, a sufficiently large number of chromosome counts had been made to show the existence in the plant kingdom of a simple numerical system. In many genera the species have chromosome numbers which are multiples of a common basic number. This fact forms the basis of the hypothesis of species formation, set forward by Winge (1917), by means of chromosome doubling following species hybridization. The hypothesis has since then, as is well-known, become experimentally verified, replicas of Linnean species having been produced in this way.

During the same years a cooperation between taxonomists and cytologists grew up (Cyto-Taxonomy). Large genera such as *Triticum, Crepis, Nicotiana, Gossypium,* and others were reinvestigated and the chromosome numbers (and the chromosome morphology) were found in some cases to support phylogenetic relationships already established, in others to call for a revision of them.

During the last two decades the much improved cytological technique has made chromosome counting much easier than before. Large scale investigations within the Linnean species, especially the collective ones, have in many cases revealed the existence of different, mostly polyploid chromosome numbers or different karyotypes within them, calling for a taxonomical revision. Where it has been carried out, a subdivision along the cytological lines was found to give a natural arrangement of the smaller units, the limitation of which could only have been drawn in this way.

During the same period chromosome cytology was brought to bear on problems of plant geography and plant ecology. It was found that geographical races of widespread species often have different chromosome numbers and that the same may be the case with different ecotypes. Such knowledge likewise calls for the establishment of smaller units to meet the requirements of the biological problems under discussion. HAGERUP's *Empetrum nigrum-hermaphroditum* case illustrates the first of these groups of problems, his *Orchis* case the other (HAGERUP, 1927, 1938).

The idea of some sort of correlation between the chromosome numbers of the species within a genus in which polyploidy is present, and their evolution and climatic tolerance was first touched upon by TÄCKHOLM (1920, 1922) in his cyto-taxonomical treatise on the genus *Rosa*.

The general trend expressed in the monographic treatments of other genera in which similar studies have been made is that the polyploids have a larger area and therefore a wider tolerance than the diploids to extreme conditions (SHIMOTOMAI (1933) on *Chrysanthemum*, MANTON (1934, 1937) on *Biscutella*, SOKOLOWSKAIA (1937) on *Agrostis*, STRELKOWA (1937) on *Alopecurus*, and LEHMANN (1941) on *Veronica*).

In the above-mentioned papers a genus was selected for study, but the problem of the significance of polyploidy in eco-geographical speciation can also be approached from another angle, taking the floras of limited areas as units the chromosome numbers of which are compared statistically. This was first done on a small scale by HAGERUP (1932) for the desert flora of Timbuktu, but it was the work of TISCHLER (1935) on the flora of Schleswig-Holstein, which was compared with that of Sicily and Iceland, that really started this line of research.

It was followed by Á. and D. LÖVE (1943) with a statistical analysis of the polyploidy frequencies of the floras of Denmark, Sweden, Norway, Finland, the Faroes, Iceland, and Spitsbergen.

The main conclusion of these studies was that polyploids are generally commoner in countries with extreme climatic conditions, or, as expressed by the LÖVES: The polyploidy percentage in the floras increase with increasing latitude.

The reliability of the results of such investigations of course depends on the chromosome numbers really being counted in material of plants from the countries under consideration.

The first papers by TISCHLER and by Á. and D. LÖVE do not meet this requirement. They are based on chromosome numbers extracted from the standard lists, and the origin is mostly either a Botanical Garden or it is not stated at all. The need for "geographically labelled" chromosome counts was generally felt, and during the last decades much work has been carried out to bring together a comprehensive material which is summarized in the chromosome lists of Á. and D. LÖVE (1948), TISCHLER (1950), and CLAPHAM *et al.* (1952).

Other extensions of the use of chromosome numbers is their possible relationship to the life-forms of plants (MÜNTZING, 1936, and GUSTAFSSON, 1948) and to the apomixis phenomena in different genera (TÄCKHOLM, 1920, 1922, GUSTAFSSON, 1946—47, NYGREN, 1954b).

The arctic floras offer many advantages for studies in which the classical botanical problems are elucidated from cytological viewpoints. First, the number of species is small, secondly, the different species have generally been studied more thoroughly than those of other regions; thirdly, the ecological system in the Arctic is simpler, the short vegetation period and the low temperature being the main limiting factors of plant life; and fourthly, the immigration of the plants is less complicated, due to the gradient of variation in the external factors being mostly one-sided.

The present paper deals with the flora of Greenland. A considerable number of chromosome counts from different parts of the country has been made. These numbers together with those already known are presented in an, as far as possible, complete, critically revised list of the flowering plants of Greenland. This material is taken as the starting-point of a discussion of the various problems on which cytological knowledge can be brought to bear.

II. A Brief Survey of the Exploration of the Flora of Greenland.

Greenland has for centuries been a favourite hunting ground for botanists, preferably Danes. The first European to visit Greenland since the Vikings, who lived there from 950 to app. 1450, was the clergyman Hans Egede, who landed at Godthaab in 1728. He as well as his son Poul Egede collected small herbaria, which still exist in the Botanical Museum of Copenhagen. The botanical exploration of the country by professional botanists started at the beginning of the nineteenth century with the travels of Wormskjold in the years 1812—14. His work was continued and much extended by Jens Vahl, who spent most of the years between 1828 and 1836 in Greenland, in part as a member of the Graah Expedition. He covered the whole of the west coast as far North as Upernavik and the southeastern coast. Their results were published in *Flora Danica*, mainly by Hornemann. Additional collections in this period are due to the Moravian Brethren, and to the German scientist Giesecke, but their plants have remained unpublished until recent times (M. P. Porsild, 1935). Further collections were made by Rink, Berggren, Th. Fries, and others, and their material together with the previous collections form the basis on which the classical "*Conspectus Florae Groenlandicae*" was worked out by J. Lange (1880, with 2 additions 1887 and 1892, the latter by Rosenvinge). In the two additions many plants collected by Warming and Holm were included. Lange's paper is to the present day the only synoptical work on the Greenland Flora.

From the beginning of this century many expeditions have brought plants from Greenland, some of which were published by the collectors, others in a number of papers by Ostenfeld, who summarized our knowledge of the Greenland Flora and discussed its origin in his paper of 1926. During the same period the ecology and biology of the arctic plants were studied by WARMING and HOLM and by ROSENVINGE, the first of these authors being the sponsor of the series "Structure and Biology of Arctic Flowering Plants", to which many botanists have contributed. The series was published in "Meddelelser om Grønland", vols. 36 and 37, during the years between 1888 and 1921.

In 1906 a permanent biological station was established at Godhavn on Disko Island. This place was for many years (1906—46) managed by M. P. PORSILD, who has contributed much to the exploration of the flora of West Greenland, assisted by his sons A. E. PORSILD and THORBJØRN PORSILD.

Further lists of West Greenland plants are those of JOHS. GRØNTVED (1937), POLUNIN (1938, 1943). TH. SØRENSEN (1943), and BÖCHER (1952 a).

Due to the difficult travelling conditions the exploration of the East Greenland flora is a chapter of its own. The first contribution was made by BUCHENAU and FOCKE (1874) and by N. HARTZ (1895), the latter studying the Flora of Scoresbysund. The plants collected by the Swedish expeditions under the leadership of NATHORST were published by DUSÉN (1901). From the beginning of this century dates the "Danmark Expedition", 1906—08, whose plants were treated by LUNDAGER and OSTENFELD (1910). Other plant lists from East Greenland are those of KRUUSE (1905—06) and HARTZ and KRUUSE (1911). By far the greatest scientific expedition to eastern Greenland is the "Danish Three Years' Expedition" 1931—34, headed by LAUGE KOCH, in which several botanists (SEIDENFADEN, GELTING, and TH. SØRENSEN) took part. Their results were summarized in the paper by TH. SØRENSEN (1945). — Further contributions to the flora of the east coast are due to the Norvegians VAAGE (1932), DEVOLD and SCHOLANDER (1933), to the Danish geologist R. BÖGVAD, whose plants were published by SEIDENFADEN (1933), and to the Danish botanist BÖCHER (1938 b).

The flora of North Greenland from Thule in the West to Peary Land in the East has mainly been explored by the "Thule Expeditions" of KNUD RASMUSSEN. The botanical results of these, among which the collections made by the Swedish botanist THORILD WULFF are the most comprehensive, were published by OSTENFELD (1923 b).

Very extensive and valuable collections of plants from Peary Land were made by K. HOLMEN as a member of the Peary Land Expedition of EIGIL KNUTH in the years 1948—51. (HOLMEN, 1957).

In recent times most botanists paying visits to Greenland have had cytological interests and have made fixations of root-tips or flower buds to a greater or smaller extent. Most students have concentrated on special families or genera, e. g. *Empetrum* (HAGERUP, 1927); *Bicornes* (HAGERUP, 1928, 1933, 1940, 1941 b), *Deschampsia* (HAGERUP, 1939); *Draba* (HEILBORN, 1927, 1941); *Carex* (HEILBORN, 1924, 1928, 1939); *Ranunculus* (BÖCHER, 1938 a), *Campanula* (BÖCHER, 1936); *Saxifraga* (HARMSEN, 1939, BÖCHER, 1941); Orchids (HARMSEN, 1943), while others, as far as possible, have made all the plants of a certain region the object of study: BÖCHER, 1938 c (Cape Dalton, East Greenland), BÖCHER and LARSEN, 1950 (Sdr. Strømfjord and Ivigtut) and HOLMEN, 1952 (Peary Land).

Along with the exploration of the Greenland flora other arctic countries have been studied by botanists, the result having been a number of synoptical works covering different parts of the circumpolar area. The arctic and subarctic parts of Scandinavia are well-known botanically (HOLMBERG, 1926, 1931, LINDMAN, 1926, HYLANDER, 1953—, BLYTT and DAHL, 1906, NORDHAGEN, 1940, LID, 1952); HIITONEN, 1933, and HJELT's *Conspectus Florae Fennicae* (1888—1926) should be consulted for Finland; arctic Asia has been studied by a number of botanists, the results now being summarized in KOMAROV, *Flora URSS* (1934—). The regions on both sides of the Bering Strait, which from a plant-geographical point of view are of great importance, have been treated by HULTÉN in a series of publications (1937—30, Kamtchatka; 1937a, Aleutian Islands; 1941—50, Alaska-Yukon).

The huge arctic parts of North America has been covered botanically by the synoptical works of A. E. PORSILD (1939, 1943, 1955) and POLUNIN (1940).

The flora of Iceland has been treated by JOHS. GRØNTVED (1942) and by Á. LÖVE (1945), and that of Spitsbergen by ANDERSSON and HESSELMAN (1900), ASPLUND (1918), SCHOLANDER (1934), DAHL (1937), and HADAČ (1944).

The cytological work carried out on arctic plants outside Greenland is almost exclusively restricted to northern Scandinavia, Iceland, and Spitsbergen. The Scandinavian numbers, to which many have contributed, are summarized in the well-known chromosome list of Á. and D. LÖVE (1948), in which also the chromosome numbers of Icelandic plants are embodied. Our knowledge of the cytology of the Spitsbergen flora is due to FLOVIK (1938, 1940, 1942).

III. Material and Methods.

The cytological material which forms the basis of our contributions to the knowledge of the chromosome numbers of Greenland plants, originates from East Greenland as well as from West Greenland.

The fixations from East Greenland were made by TH. SØRENSEN during the years 1931—35, during his participation in the "Danish Three Years' Expedition". The major part of the collection is from Clavering Island, about 74° l. N.

In order to bring together a similar material from the West coast of Greenland, the flora of which contains many species not found on the east coast, C. A. JØRGENSEN and TH. SØRENSEN, assisted by G. GUÐJÓNSSON and INGER JUEL, made a collecting trip to that part of the country in the summer of 1947. The places in which the main part of the material was taken, are Bluie West 1 (BW 1), the air base near the head of the Tunugdliarfik Fjord in southern Greenland, app. 61° l. N., and Kutsiaq and Sarfarfik on the north coast of the peninsula Nugssuaq, Umanak district, app. 71° l. N.

The number of fixations made by TH. SØRENSEN amounts to about 700, representing app. 160 species and a few hybrids. Special attention was paid to polymorphic genera such as *Draba* (120 samples), *Poa* (73) and *Potentilla* (54). The fixations are mostly of flower buds, which were checked in acetocarmine for meiotic divisions. The approximate dates at which meiosis takes place in different species are found in Th. Sørensen's paper of 1941. The final fixation was made in Nawashin's fluid after a short pre-treatment in Carnoy's fixative.

The material from West Greenland consists of about 550 samples, covering app. 275 species. On this occasion root-tips were preferably used. The fixative was Levitsky's fluid. Again a comparatively large number of the samples are of critical genera.

Small additional collections were made by C. A. Jørgensen in Southern Greenland in the summer of 1948 and by M. Westergaard at Wollaston Foreland and Clavering Island, in 1949, on a visit to the east coast as a member of the Danish Peary Land Expedition.

In most cases the plant from which the fixation was made, is preserved as a herbarium specimen, making it possible for ourselves and others to check the preliminary determination.

The further steps in the preparation of the material are as follows: In Greenland the fixations were transferred to 70 % alcohol; after the return to Denmark embedding in paraffin wax was carried out and microtome sections made. The slides were mostly stained in Feulgen's fuchsine, often followed by Newton's Gentian-violet.

Many of the slides of the East Greenland material were made already during the years 1936—37 by Jul. Grøntved, M. Sc., and later taken over by us for study. In much the same way the West Greenland fixations were handled by Sai Chiu Van, M. Sc., during the years 1948—49.

IV. A Revised List of the Greenland Flowering Plants, with Cyto-Taxonomical Comments.

The present chapter is an enumeration of the flowering plants of Greenland. The starting-point of our taxonomical evaluation of the flora is J. Lange's *Conspectus Florae Groenlandicae* I—III, and the list presented here aims at being a modern counterpart of this work. The taxonomical principles used by us are of course much the same as those of earlier authors, but the list differs from most others of a similar scope by the principal importance we have assigned to the cytological data in the judging of many difficult taxonomical problems.

In the case of such species in which the present nomenclature differs from that of Lange, we have not followed the usual practice of giving as reference the author of the new name. It will in our opinion be of much more value to those who may make use of the list in the future, to be introduced to some later paper, in which a fuller discussion of taxonomical and other problems is found.

The synonym or synonyms formerly used in the botanical literature of Greenland is generally added in brackets. On many occasions additional notes explaining our decisions on taxonomical, cytological, and other problems will be found in the text.

The text also includes in short the present-day information on the chromosome number and cytological life-history of the Greenland flowering plants. But in contradistinction to the list in Chapter V, in which the chromosome numbers are given irrespective of the origin of the material on which the count was made, only the numbers based on plants of Greenland origin determined by ourselves or by other authors are included here.

The list comprises 437 species which according to our judgment deserve that rank, and which we consider indigenous to Greenland. The adventitious species of obviously recent introduction are omitted. (On these, see M. P. Porsild, 1932, and A. E. Porsild, 1945).

Cupressaceae.

1. **Juniperus communis** L. var. **montana** Ait. — Hultén, 1927: 70. (Lange I: 182, *J. alpina* Clus.).

The chromosome number of the var. *montana* was determined of leaf-buds of a plant from BW 1, SW Greenland and found to be 2n = 22. This is in accordance with the number reported from elsewhere (Scandinavia, Iceland) by Á. and D. Löve (1948) and with the number given for the main species by Sax and Sax (1933).

Typhaceae.

2. **Sparganium hyperboreum** Læst. — Lange I: 116.

The diploid number 2n = 30 of this species was counted on root-tips of material from Egedesminde, NW Greenland. The chromosomes are small, rod-shaped, and two pairs carry small satellites (fig. 1). The same number is reported by Á. and D. Löve (1948) on Scandinavian plants.

3. **Sparganium angustifolium** Michx. — Hylander, 1945: 64. (Lange III: 709, *S. minimum* Fr., cf. Böcher, 1938b: 200).

Zosteraceae.

4. **Zostera marina** L. — Lange I: 117, var. *angustifolia* Lge.

The possibility is at hand that the Greenland plants may belong to *Z. Hornemanniana* Tutin (Tutin, 1936: 227).

Potamogetonaceae.

5. **Potamogeton filiformis** Pers. — HYLANDER, 1953: 98 (LANGE I: 117, *P. marinus* L.).

The somatic number was found to be 2n = 78 on root-tip mitoses of plants from BW 1, SW Greenland. The chromosomes are small and short, 4 pairs being satellited (fig. 2). PALMGREN (1939) reports 2n = appr. 78 on Swedish plants.

6. **Potamogeton groenlandicus** Hagstr. — HAGSTRÖM, 1916: 127, see also M. P. PORSILD, 1946: 18. (LANGE I: 117, *P. pusillus* L. For records of *P. mucronatus* Schr. and *P. obtusifolius* M. et K. from Greenland, see PORSILD *loc. cit.*: 25).

The diploid number of this species was found to be 2n = 26 on root-tips of material collected at Egedesminde, NW Greenland (fig. 3). The fixation was not satisfactory so that no details of the chromosome morphology could be worked out. The number is the same as that known for *P. pusillus* and its allies.

7. **Potamogeton alpinus** Balb. ssp. **tenuifolius** (Raf.) Hult. — HULTÉN, 1937: 65. (LANGE I: 116, *P. rufescens* Schrad., cf. OSTENFELD, 1902: 19).

The chromosome number of this American subspecies is 2n = 52 (Á. LÖVE, 1954) the same number as in the European main species (PALMGREN, 1939).

8. **Potamogeton natans** L. — POLUNIN, 1938: 90, 1943: 358.

9. **Potamogeton gramineus** L. — OSTENFELD, 1902: 19. (LANGE I: 117, *P. heterophyllus* Schreb.).

Juncaginaceae.

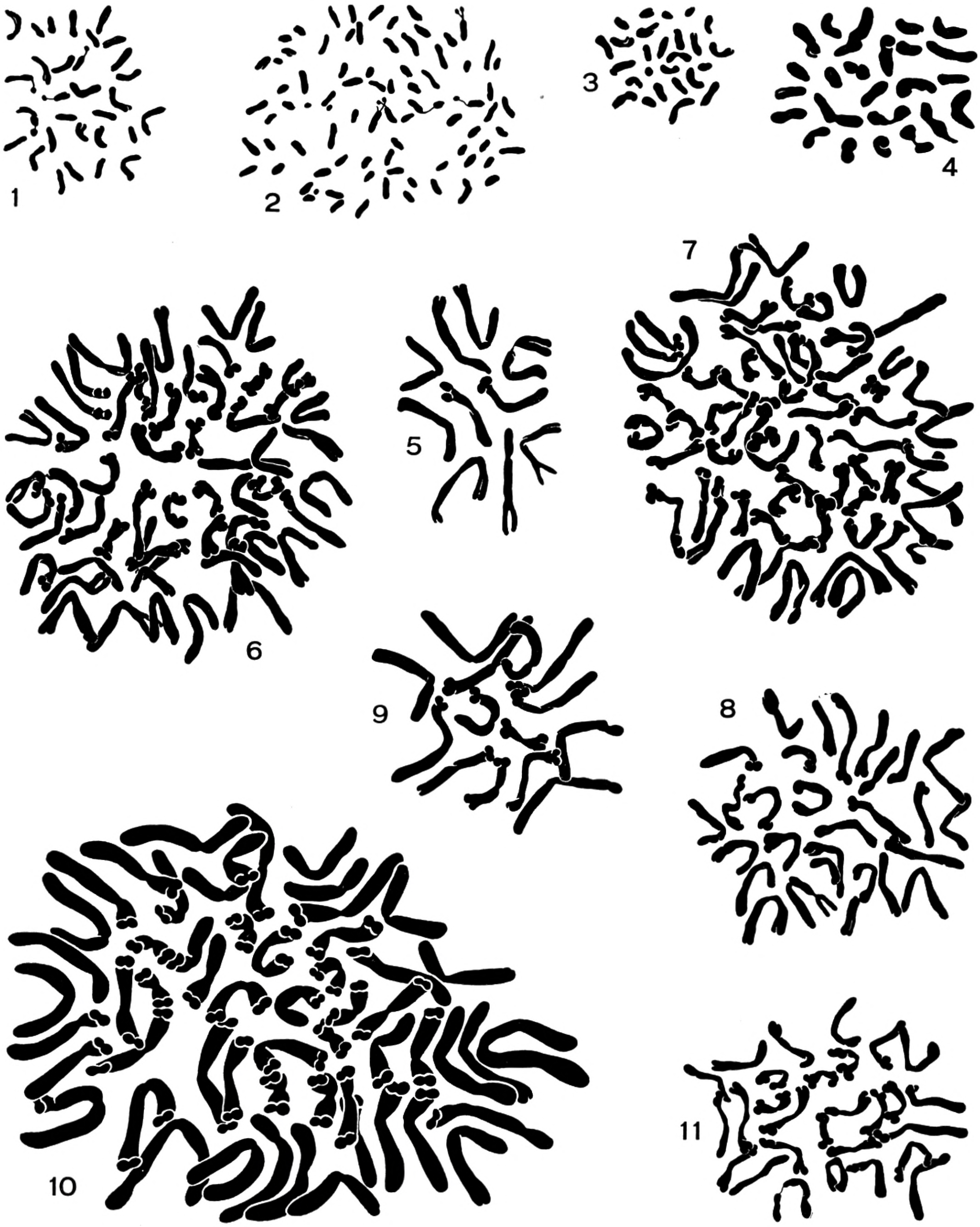
10. **Triglochin palustre** L. — LANGE I: 121.

Root-tip mitoses of a plant of this species collected at BW 1, SW Greenland, showed 2n = 24 (fig. 4). It will be noted that two of the chromosomes have a very marked median constriction, which in some cells may cause the number to appear higher than 24. The number is in agreement with that found elsewhere.

Gramineae.

Anthoxanthum alpinum Á. et D. Löve — Á. and D. LÖVE, 1948: 105. (LANGE I: 157, *A. odoratum* L.). See also KNABEN, 1950: 132; TUTIN, 1950: 224, and HYLANDER, 1953: 346.

The chromosome number of this species has been determined on Greenland material by us and by BÖCHER and LARSEN (1950). We found in root-tip mitoses



Figs. 1—11. All figures are root-tip mitoses.
Fig. 1, *Sparganium hyperboreum*, 2n = 30. Fig. 2, *Potamogeton filiformis*, 2n = 78. Fig. 3, *Potamogeton groenlandicus*, 2n = 26. Fig. 4, *Triglochin palustre*, 2n = 24. Fig. 5, *Anthoxanthum alpinum*, 2n = 10. Fig. 6, *Hierochloë alpina*, 2n = 56. Fig. 7, *Hierochloë orthantha*, 2n = 63. Fig. 8, *Phleum commutatum*, 2n = 28. Fig. 9, *Alopecurus aequalis*, 2n = 14. Fig. 10, *Arctagrostis latifolia*, 2n = 56. Fig. 11, *Agrostis canina* ssp. *montana* 2n = 28. (Figs. 1—5 × 4000, Figs. 6—11 × 3000).

of a plant from BW 1 in SW Greenland 2n = 10 (fig. 5). The chromosomes are of the usual gramineous type, one pair having a very definite secondary constriction in the longer arm.

In Greenland thus only the diploid type of the collective species is known to occur. Östergren (1942), Böcher and Larsen (1950), and Tutin (1950) have demonstrated the existence of tetraploid types alongside with the diploid ones. On this basis Á. and D. Löve (*loc. cit.*) have proposed a subdivision of the original species into two: *A. odoratum* L. emend. Á. et D. Löve with 2n = 20 and *A. alpinum* Á et D. Löve with 2n = 10.

The diagnoses given by these authors of the two species are very deficient, being only a recapitulation of the statements of Östergren. The intricate problem of the correct name of the diploid species has been discussed at length by G. Knaben (1950: 132).

In contradistinction to the lowland *A. odoratum* the arctic and mountainous diploid type has a geographically disjunct occurrence (arctic regions, Switzerland, Transsylvania, and Corsica). We are inclined to the view that some of these plants represent different species or subspecies.

12. **Hierochloë odorata** (L.) P. B. — Johs. Grøntved, 1937: 253, Polunin, 1943: 345.

13. **Hierochloë alpina** (Sw.) R. et S. — Lange I: 157, *H. alpina* pro parte, cf. Th. Sørensen, 1954: 6.

Material of the species in the strict sense in which it is taken here, has been collected both in NW Greenland and NE Greenland. The NW Greenland fixation is from the peninsula of Nugssuaq and consists of root-tips, that from NE Greenland of flower buds from Clavering Island. In both cases 2n = 56 was found (fig. 6). The PMCs on the whole behave regularly, but in some cells a tetrasome was present and the anaphase separation was somewhat irregular. The pollen, studied on herbarium plants, is normal. Counts from Spitsbergen have given the same number (Flovik, 1938).

14. **Hierochloë orthantha** Th. S. — Th. Sørensen, 1954: 3. (Lange I: 157, *H. alpina* pro parte).

In Southern Greenland we encountered a deviating type of *Hierochloë*, hitherto included in *H. alpina*. Root-tips of a plant from BW 1 were counted and showed 2n = 63 (fig. 7). As the type on closer examination proved to be distinct from *H. alpina* in a number of characters, it deserves specific rank, and has been described as such by Th. Sørensen in the paper cited above. The two species differ in their geographical distribution, *H. alpina s. str.* having a wide range of occurrence, whereas *H. orthantha* is restricted to Southern Greenland and Eastern North-America.

As was to be expected, the pollen of *H. orthantha* due to its nonoploid chromosome number is highly defective. Seed formation takes place regardless of the male sterility, and it is therefore most likely that the species reproduces apomictically.

15. **Phleum commutatum** Gaud. — NORDENSKIÖLD, 1945 (LANGE I: 155, *Ph. alpinum* L.).

Chromosome counts were made on root-tips of two plants from BW 1, one growing at sea-level, the other at an altitude of app. 500 m. Both had 2n = 28 (fig. 8). Several of the chromosomes have secondary constrictions. BÖCHER and LARSEN (1950) likewise report the chromosome number to be 2n = 28 on material from SW Greenland. NORDENSKIÖLD (1945) in her paper found the widely distributed *Ph. commutatum* to have 2n = 28 and the true *Ph. alpinum* L. to be diploid, having 2n = 14. It should be noted, however, that MICHALSKI (1955) counted 2n = 14 in plants from Mt. Tatra, Poland, referred to *Ph. commutatum*, not to *Ph. alpinum*.

16. **Alopecurus alpinus** Sm. — LANGE I: 156.

From the literature it is known that this species has a high and, as it seems, somewhat varying chromosome number (FLOVIK, 1938, JOHNSON, 1941). Like these authors we have been unable to determine the number with full certainty. In root-tips of a plant from Nugssuaq Peninsula, NW Greenland, app. 2n = 112 was found, and in PMCs of a plant from Clavering Island, NE Greenland, n = ± 56 could be stated in Anaphase I. The same number is recorded by HOLMEN (1952) from Peary Land. On the whole meiosis proceeds regularly, although occasionally a few multivalents and univalents are seen. The irregularities observed by us are far less common than those described by FLOVIK (1938: 274—77).

The species varies much, especially in the length of the awn and the shape of the glumes, but no attempt to correlate this variation with cytological studies has been made so far.

It is a noteworthy fact that the antarctic species, *A. antarcticus* Vahl, likewise is highly polyploid (JOHNSON, 1941).

17. **Alopecurus aequalis** Sobol. — FERNALD, 1930: 221. (LANGE I: 156, *A. geniculatus* L., LANGE III: 727, *A. fulvus* Sm., cf. GELERT in OSTENFELD, 1902: 100).

Slides of root-tip mitoses of a plant from BW 1, SW Greenland, showed 2n = 14 chromosomes (fig. 9). The number agrees with the count made by JOHNSON (1941) on Swedish material.

18. **Arctagrostis latifolia** (R. Br.) Griseb. — GELERT in OSTENFELD, 1902: 107. (LANGE I: 166, *Colpodium latifolium* R. Br.).

This polymorphic species, which by PETROV (see KOMAROV II: 168, 1934) has been subdivided into a number of separate species, has been counted by us from NW as well as from NE Greenland. In root-tip mitoses of plants from the Nugssuaq Peninsula, and in PMC-meiosis of two plants from Clavering Island, the chromosome number proved to be $2n = 56$ (fig. 10) and $n = 28$, respectively. The same chromosome number was found by HOLMEN (1952) in several collections from Peary Land (North Greenland). Hence all plants so far studied from Greenland agree as to this number. Outside Greenland the only count is due to FLOVIK (1938), who in Spitsbergen material found $2n = 62$.

We have studied the pollen variation in the plants kept in the Botanical Museum of Copenhagen, and also in Dr. FLOVIK's material, which he has kindly sent us. There is great variation in pollen fertility, ranging from plants with quite normal pollen to plants with completely abortive pollen grains and empty anthers. The last is true of Dr. FLOVIK's plants, as would also be expected from their odd chromosome number. Apparently some correlation between pollen quality and morphological differences exists and in addition the different morphological types seem to differ in geographical distribution. Undoubtedly it would be possible to subdivide the species into a number of types. We have, however, refrained from such an attempt, partly because the variation, as far as Greenland is concerned, is not correlated with chromosome differences, and partly because we have been unable to compare our types with the Russian species establish by PETROV (*loc. cit.*).

19. **Agrostis stolonifera** L. — HYLANDER, 1945: 75. (LANGE I: 158, *A. alba* L.). Cf. M. P. PORSILD, 1932: 46.

20. **Agrostis gigantea** Roth — POLUNIN, 1938: 90, 1943: 359.

21. **Agrostis tenuis** Sibth. — POLUNIN, 1938: 90, 1943: 360.

22. **Agrostis canina** L. ssp. **montana** Hartm. — HYLANDER, 1953: 223. (LANGE I: 158, *A. canina* L.).

Three Greenland specimens, collected at BW 1, of which one is awnless, all had the somatic chromosome number $2n = 28$ (fig. 11). This figure has also been reported from Germany by WULFF (1937b).

For comparison we have also investigated the rather well defined ssp. *fascicularis* (Curt.) Hyl. = ssp. *canina* Hubbard, (cf. JONES, 1956a), which occurs in boggy localities in northern Europe. In a specimen from Lyngby bog near Copenhagen we found $2n = 14$. This number is the same as that published by SOKOLOVSKAJA (1938), BJÖRKMAN (1951), and JONES (1952, 1956). Plants on the two chromosome levels differ morphologically, and a subdivision of the species according to these criteria seems well-founded. A critical treatment of the collective species is being made by the Swedish botanist BJÖRKMAN, to whom our material has been handed over. See BJÖRKMAN 1954, cf. JONES, 1956.

23. **Agrostis borealis** Hartm. — GELERT in OSTENFELD, 1902: 109. (LANGE I: 157, *A. rubra* L.).

In this species chromosome counts on Greenland material have been carried out by us and by Böcher and Larsen (1950). Our material is from BW 1, that of Böcher and Larsen from Ivigtut. In both cases the root-tip mitoses showed 2n = 56 (fig. 12). The same number has been reported by Sokolovskaja (1938) and by Björkman (1951).

24. **Calamagrostis neglecta** (Ehrh.) G., M. et Sch. — Hylander, 1953: 317. (Lange II: 296, *C. stricta* Hartm.).

A plant from BW 1 in the Tunugdliarfik Fiord, SW Greenland, growing on a slope near an old Norse ruin was found to have 2n = 28 in root-tip mitoses (fig. 13). All of the chromosomes have two arms, the constrictions being either median or submedian. Some chromosomes in addition have secondary constrictions. Nygren (1946) reports the same number on material from Sweden.

25. **Calamagrostis groenlandica** (Schrank) Kunth — (Lange I: 161, *C. stricta* (Timm) var. *borealis* Laest).

As already suggested by Lange (*loc. cit.*) the arctic plant under consideration here is not identical with the Laestadian *C. borealis* of Scandinavia. We hold the view that its proper name is *C. groenlandica*, established by Schrank 1818: 8 as *Arundo g.*, and transferred to *Calamagrostis* by Kunth 1833: 239. (Cf. Roshevicz in Komarov II 1934: 216).

Counts of root-tip mitoses of a plant from Holsteinborg in NW Greenland showed 2n = 28, the same number as reported by Böcher and Larsen (1950) from Sdr. Strømfjord, and by Flovik (1938) for plants from Spitsbergen.

26. **Calamagrostis lapponica** (Wbg.) Hartm. var. **groenlandica** Lge. — Lange II: 296.

The chromosome number 2n = 42 of the Greenland variety is known from a count by Böcher and Larsen (1950), who collected their material in Søndre Strømfjord in the Holsteinborg district of NW Greenland. This number is in agreement with the lowest number in the series recorded by Nygren (1946) on material of the main species from Lappland in North Sweden. Although only one plant of the Greenland variety has been counted, we find it reasonable to assume that most if not all Greenland specimens have the number 2n = 42, in contradistinction to the Lappland material of the main species, in which the great majority of the plants has a number exceeding 100 chromosomes (Nygren reports the following chromosome numbers 2n = 42 (2 plants), 49 (1 plant), 91 (1 plant), 98 (4 plants), 105 (16 plants) and 112 (29 plants)).

The cytological and embryological details given by Nygren (1946) prove beyond doubt that most biotypes of *C. lapponica* reproduce apomictically, regardless of their chromosome number.

Herbarium material of var. *groenlandica* shows highly defective pollen and although nothing is at present known as to its mode of reproduction, it may be inferred that it is apomictic just as the Scandinavian plants.

27. **Calamagrostis hyperborea** Lge. — Lange I: 160.

Root-tip mitoses of a plant from BW 1 in SW Greenland showed a very high chromosome number, which could be approximately determined only. The plate shown in fig. 14 has ± 100 chromosomes. The nearest euploid number would be 98.

The plant counted by us is identical with the type specimen of Lange's *C. hyperborea,* collected by Jens Vahl at Igaliko in August 1828 and kept in the Botanical Museum, Copenhagen. In figuring his species in the *Flora Danica,* tab. 2942, Lange, in our opinion, has committed an error. The habit figure represents Jens Vahl's specimen, but the figures of the flower details (c, d, e) are from another individual belonging to *C. groenlandica.* It is not identical with *C. inexpansa* A. Gray (cf. Polunin, 1943: 361).

Examination of herbarium material of *C. hyperborea* showed its pollen to be defective and shrivelled, and in all probability the species is apomictic.

28. **Calamagrostis canadensis** (Michx.) P. B. var. **scabra** (Presl) Hitchc. — Hitchcock, 1934: 135. (Lange I: 159, *C. phragmitoides* Hartm., cf. Gelert in Ostenfeld 1902: 106, *C. Langsdorffii* (Link) Trin.).

Our material of this species is from BW 1, SW Greenland. In root-tips of a plant three mitoses gave the numbers 51, 52, 52 (fig. 15). Due to the fixation not being quite satisfactory, we cannot state the number exactly, but feel convinced that it does not reach 56. This number is given by Böcher and Larsen (1950) for material from Ivigtut and by Nygren (1946) for plants of unknown origin.

The main species has been counted by Nygren (*loc. cit.*) and by Stebbins (personal communication) on material from Canada and Western U.S.A., respectively. They both found $2n = 56$.

Nygren (*loc. cit.*) is of opinion that the species includes sexual as well as apomictic biotypes. (See also Nygren, 1954b).

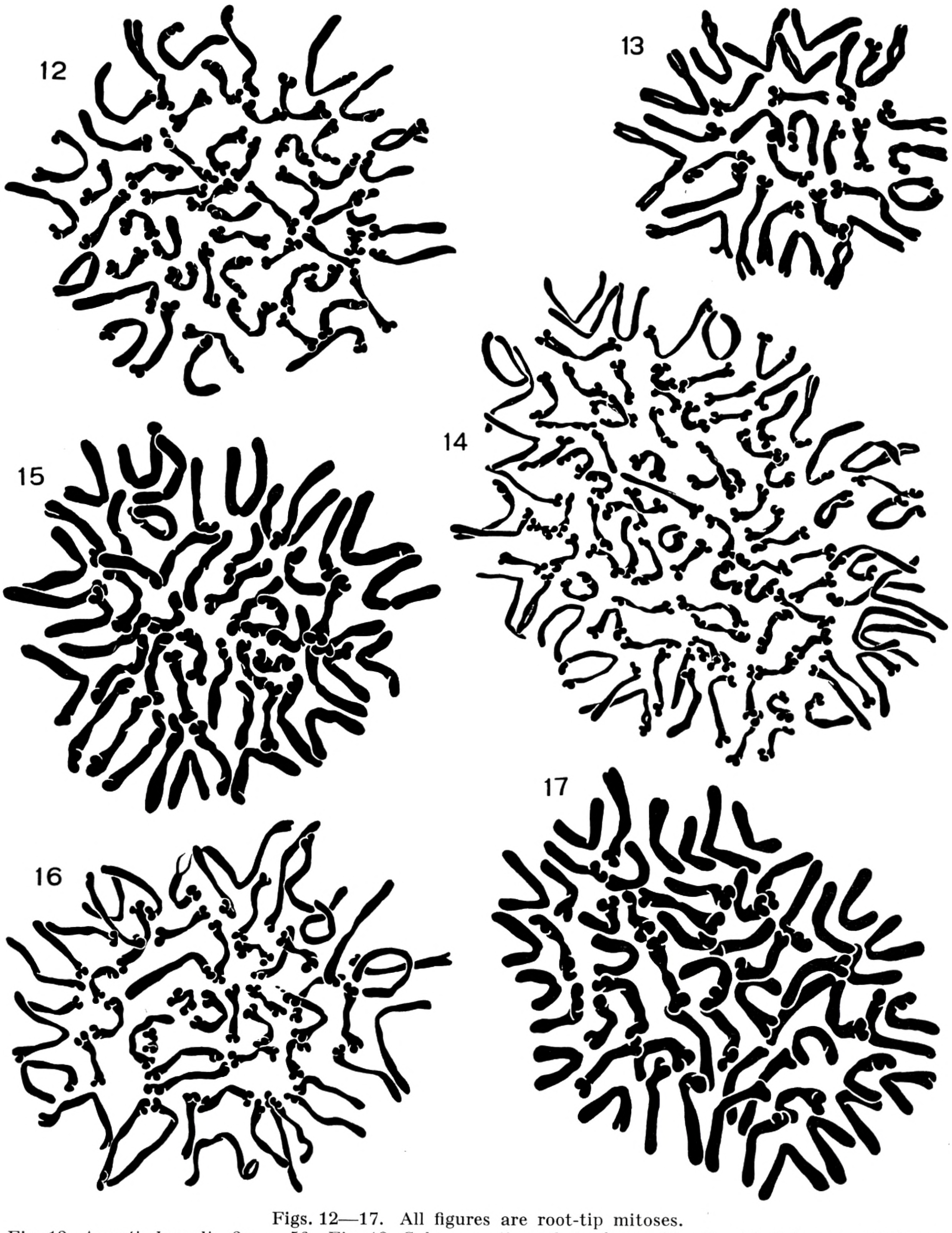
A number of specimens of the Greenland plant from Herb. Copenhagen all showed non-dehiscent anthers and almost complete lack of pollen; we may therefore assume that normal sexual reproduction does not take place.

29. **Calamagrostis Poluninii** Th. S. — Th. Sørensen, 1954: 11. (Lange I: 160, *C. purpurascens* R. Br. pro min. parte).

This new species, the herbarium material of which has hitherto for the major part been referred to *C. purpurascens,* is so far known only from South Greenland. Root-tip mitoses of two plants from BW 1 have $2n = 56$ (fig. 16). The pollen is highly defective.

30. **Calamagrostis purpurascens** R. Br. — Lange I: 160, pro maj. parte, cf. Sørensen, 1954.

The chromosome number of a plant from the Nugssuaq Peninsula in NW



Figs. 12—17. All figures are root-tip mitoses.

Fig. 12, *Agrostis borealis*, 2n = 56. Fig. 13, *Calamagrostis neglecta*, 2n = 28. Fig. 14, *Calamagrostis hyperborea*, 2n = ca. 100 (the drawing shows 101 chromosomes). Fig. 15, *Calamagrostis canadensis* var. *scabra*, 2n = about 52 (the drawing shows 51 chromosomes). Fig. 16, *Calamagrostis Poluninii*, 2n = 56. Fig. 17, *Calamagrostis purpurascens*, 2n = 58. (All figures × 3000).

Greenland was found by us to be $2n = 58$ in a root-tip mitosis (fig. 17). Other investigators have studied the species cytologically and report $2n = 56$ (Böcher and Larsen, 1950) on material from Søndre Strømfjord, and $2n = \pm 56$ (Stebbins, pers. communication) on plants from the Sierra Nevada mountains in California. Nygren (1954a) has found the range of chromosome numbers of American populations to be $2n = 40—57$.

Microscopical examination of the material of this species, mainly from Greenland, kept in the Botanical Museum, Copenhagen, showed the anthers of most specimens to be more or less defective. There is thus some evidence of apomictic reproduction in this plant, a concept also held by Nygren (*loc. cit.*).

31. **Deschampsia alpina** (L.) R. et S. — Lange I: 163. *Aira* (*Deschampsia*) *alpina* L.

This widespread, viviparous species, which is closely related to *D. caespitosa* (L.) P. B., is interesting from a cytological point of view. In Spitsbergen plants Flovik (1938) found in three biotypes the diploid numbers 39, 41, and 49. Hagerup (1939) examined a plant from Norway and gives $2n = 56$. We have re-examined Hagerup's slides and are able to confirm the number, but two of the chromosomes are small ones of the accessory type (B-chromosomes). Recently Nygren (1949a) has added counts of Swedish and Norwegian plants, in which the somatic numbers 26, 48, and 52 were found, cf. also Wycherley 1953.

From Greenland this species has been studied by Böcher and Larsen (1950), who found $2n = 52$ (material from Ivigtut), and by ourselves. In a plant from BW 1 the root-tips showed $2n = 49 + 2$ accessory chromosomes (fig. 18). The chromosome complement is characterized by the existence of a number of chromosomes with almost terminal constrictions. The centromeric region is often achromatic, and several chromosomes have secondary constrictions, as has previously been observed by Flovik (1938).

There has been some confusion as to the basic number in *D. alpina* and *D. caespitosa*, due to the erroneous number of $n = 14$ given by Hagerup (1939) for *D. caespitosa*. Hagerup's slides, re-examined by us, show beyond doubt $n = 13$, a number which is in agreement with that given by Lawrence (1945) for American biotypes. It may thus be inferred that 13 is also the basic number for *D. alpina*.

32. **Deschampsia brevifolia** R. Br. — Fernald, 1934: 90. (Lange I: 163, *Aira* (*Deschampsia*) *brevifolia* R. Br. See also Ostenfeld, 1923a: 167).

Hagerup (1938) has investigated plants of this species from Clavering Island (NE Greenland) and gives the chromosome number as $2n = 28$ ($n = 14$). We have re-examined Hagerup's slides, and found the statement to be incorrect. In pollen-mitoses 13 chromosomes are distinctly seen (fig. 19), one of which, however, has a very long constriction. Apparently this chromosome has been taken to represent two by Hagerup. Meiosis is almost regular, but in some cells a few univalents, and sometimes also a trisome may be observed. We have examined the pollen quality of the plants kept in the Botanical Museum of Copenhagen, and found that in most plants the anthers contain completely normal pollen. Only in some plants the pollen varies somewhat in size and quality. In order to check the chromosome number we have fixed new material from Wollaston Foreland, NE Greenland, and found the somatic number in root-tip mitoses to be 26. (See also HOLMEN (1952) from Peary Land). Hence, both *D. alpina*, *D. brevifolia*, and *D. pumila* have the basic number of 13, whereas *D. flexuosa* and other species belong to a 7-series.

33. **Deschampsia pumila** (Ledeb.) Ostf. — OSTENFELD, 1923a: 109.

The validity of the above name is still under discussion. OSTENFELD (*loc. cit.*) realised the existence of a well-defined *Deschampsia* type in Greenland, and found its characters to agree with a plant figured by TRINIUS (*Species Graminum icon. et descr.*, Vol. III (1836) tab. 256, Fig. c), a plant which by LEDEBOUR in the *Flora Rossica* was given the name of *D. brevifolia* var. *pumila*. The plant depicted by TRINIUS was collected in Kamtchatka, and as already pointed out by HULTÉN (1927: 108), his figure does not match the Greenland plants very well. According to POLUNIN (1940: 56), the Greenland type called *D. pumila* by OSTENFELD is, however, confined to Greenland and arctic NE America, and the question as to its taxonomical identity is still open.

The available cytological facts about *D. pumila* are as difficult to interpret as is its proper name. BÖCHER and LARSEN (1950) found the number of $2n = 39$, a straight triploid number, in a plant collected in the Nugssuaq Peninsula, NW Greenland. However, in a plant from Godthaab, SW Greenland, we counted the number as approximately $2n = 36$ (fig. 20). We are unable to give this number with full certainty, but we feel convinced that it is not so high as 39. In East Greenland, on the other hand, a different situation is found, since all plants counted so far proved to be diploid with $2n = 26$. This is true of three plants from Wollaston Foreland and for a plant from Clavering Island. The Clavering plant was erroneously counted by HAGERUP (1938) to have $n = 14$, but we have re-examined his slides and the true number is $n = 13$.

All Greenland plants, whether from the western or the eastern coast, are morphologically similar, and all of them have irregular, mostly abortive pollen.

The chromosome number of appr. 39 met with in the plants from West Greenland could easily be explained by assuming *D. pumila* to be a hybrid between *D. brevifolia* and the viviparous *D. alpina*. The latter occasionally produces anthers with pollen. A hybrid origin of *D. pumila* has, as a matter of fact, already been suggested by POLUNIN (*loc. cit.*). Such a hypothesis, however, will not suffice to explain the origin of the diploid, morphologically similar plants from East Greenland, which furthermore occur in a region in which one of the supposed parents, *D. alpina*, is at present completely absent. Until further studies have been made, these puzzling problems must be left unsolved.

34. **D. flexuosa** (L.) Trin. — Hylander, 1953: 301 (Lange I: 162, *Aira flexuosa* L.).

The chromosome number of this species has been determined by several authors, who all report 2n = 28. Material from SW Greenland was counted by Böcher and Larsen (1950) and by ourselves from Ivigtut and BW 1, respectively.

35. **Vahlodea atropurpurea** (Wbg.) Fr. — Lange I: 162.

The beautiful mitoses in root-tips of a plant from BW 1, SW Greenland, show 2n = 14. All the chromosomes have median or submedian constrictions and on one pair a large satellite is separated from the mother-chromosome by an achromatic region (fig. 21). In Scandinavian material Nygren (in Á. and D. Löve, 1948) likewise found 2n = 14.

36. **Trisetum spicatum** (L.) Richt. — Mansfeld, 1938c: 226. (Lange I: 164, *T. subspicatum* (L.) Beauv.).

Flower buds of plants from Clavering Island, NE Greenland, contained all stages of meiosis in the PMCs. In the great majority of cases 14 bivalents were observed and meiosis proceeded regularly. In plants from Peary Land, Holmen (1952) found the same number. This is in accordance with Flovik (1938) and with Á. and D. Löve (1948). In a few cells a tetrasome was present, but frequencies of polyvalents to the extent reported by Flovik were never observed by us.

Recently Böcher and Larsen (1950) have reported two different numbers from West Greenland, viz. 2n = 28 in plants from Søndre Strømfjord and 2n = 42 from Ivigtut. According to their observations the two chromosome types differ morphologically to such a degree that they deserve closer taxonomical investigation.

37. **Danthonia spicata** (L.) P. B. — Polunin, 1938: 90, 1943: 366.

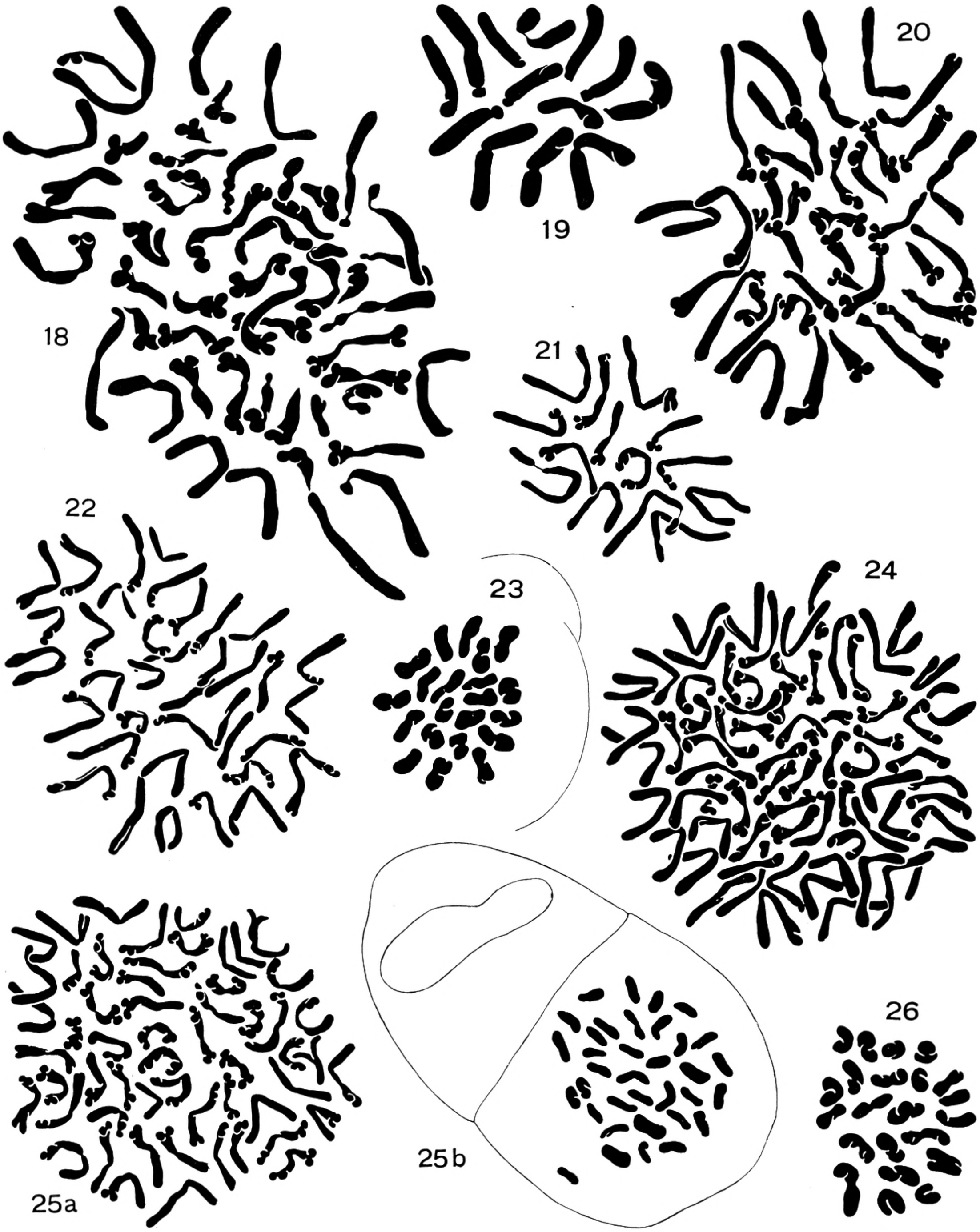
38[1]. **Poa pratensis** L. ssp. **eupratensis** Hiit. — Hylander, 1945: 77. (Lange I: 176, *P. pratensis* L. pro parte).

Only a single chromosome count of the non-viviparous Greenland types of the present subspecies is available: Böcher and Larsen (1950) report 2n ± 95 in material from Søndre Strømfjord, NW Greenland. Åkerberg (1942) and Nygren (1950, 1954) in their very thorough investigations of the Swedish *Poa pratensis* complex have summarized all the available cytological data.

39. **Poa pratensis** L. ssp. **alpigena** (Fr.) Hiit. — Hylander, 1945: 77 (Lange I: 176, *Poa pratensis* L. pro parte).

Of the many forms of this subspecies occurring in Greenland, so far only the

[1] Several highly polymorphic species of the genus *Poa* occur in Greenland. They deserve a similar thorough investigation as has been undertaken by Swedish cyto-taxonomists for the Scandinavian types. We have material for such an investigation, but as it is outside the scope of the present survey to enter into such details, we have postponed the treatment of the material to a later occasion.



Figs. 18—26. The figures 18, 20—22, 24—25a are root-tip mitoses, fig. 19 is a pollen mitosis, and figs. 25b and 26 are PMC's, 1st and 2nd metaphase.

Fig. 18, *Deschampsia alpina*, 2n = 49 + 2 fragments. Fig. 19, *Deschampsia brevifolia*, n = 13. Fig. 20, *Deschampsia pumila*, 2n = 36. Fig. 21, *Vahlodea atropurpurea*, 2n = 14. Fig. 22, *Poa pratensis* ssp. *alpigena* var. *colpodea*, 2n = 35 + 4 fragments. Fig. 23, *Poa abbreviata*, n = 21. Fig. 24, *Poa Hartzii*, 2n = 70. Fig. 25a, *Poa glauca*, 2n = 56. Fig. 25b, *Poa glauca*, n = 35. Fig. 26, *Dupontia psilosantha*, n = 22. (Figs. 18—25 × 3000, fig. 26 × 4000).

viviparous var. *colpodea* (Th. Fr.) Schol. (SCHOLANDER, 1934:89) has been cytologically treated. In material from Clavering Island, NE Greenland, root-tip mitoses showed $2n = 35 + 4$ small, extra chromosomes (fig. 22). In plants from Peary Land, HOLMEN (1952) reports $2n = 35$, no fragments being present. A viviparous type from Spitsbergen referred to the same variety, is reported to have $2n = 51 + 5$ fragments (FLOVIK 1938). A summary of the chromosome numbers of Scandinavian and American plants has been given by NYGREN (1950a, 1954b).

40. **Poa arctica** R. Br. coll. — OSTENFELD, 1923a: 172. (LANGE I: 175, 178, *P. filipes* Lge. + *P. flexuosa* Wbg.). See also NANNFELDT, 1934.

In Greenland the ssp. *caespitans* (Simm.) Nannf., which is characterized by having defective pollen, is widespread on both the eastern and the western coast (NANNFELDT, 1940). In a plant from Peary Land, HOLMEN (1952, fig. 40) found $n = 28$. All the Scandinavian plants of this subspecies have likewise $2n = 56$ (NYGREN, 1950, 1954b). Other types of the collective species with a less caespitose habit of growth, and with good pollen, occur, too, but they have not so far been subjected to a closer study.

41. **Poa alpina** L. coll. — LANGE I: 176.

Besides normally fructifying plants also viviparous strains occur (cf. SEIDENFADEN and SØRENSEN, 1937: 179; SCHWARZENBACH, 1953, 1956; WYCHERLEY, 1953).

Chromosome numbers of *P. alpina* (fructifying plants) from Greenland are due to BÖCHER (1938b, c), BÖCHER and LARSEN (1950), and MÜNTZING (1950). In the first case the number of $2n = 33$ is given for a plant from SE Greenland, in the second $2n = 28$ was found in a plant from Sdr. Strømfjord in NW Greenland, whereas Müntzing counted three plants, two of which had $2n = 42$—43 and one had ± 46. For other chromosome numbers see MÜNTZING (1940, 1948, 1954), NYGREN (1950a, 1955), and SKALINSKA (1951).

42. **Poa abbreviata** R. Br. — LANGE I: 172.

Meiosis was studied on a plant from Clavering Island, NE Greenland. 21 gemini are formed regularly, and no disturbances were observed (fig. 23). $2n = 42$ was likewise found on root-tip mitoses of a plant from the Nugssuaq Peninsula, NW Greenland. The same number is reported by HOLMEN (1952) from Peary Land, North Greenland.

FLOVIK (1938) gives the chromosome number as $2n = 76$ for Spitsbergen plants. We have had an opportunity to see Dr. FLOVIK's material and we find that among the plants labelled *P. abbreviata* there were some specimens of *P. arctica*. Since the number $2n = 76$ fits well with some of the *Poa arctica* chromosome numbers reported by NANNFELDT, we are inclined to infer that FLOVIK's counting refers to this species and not to *P. abbreviata*.

43. **Poa Hartzii** Gdgr. — Th. Sørensen, 1933: 145. (Lange III: 733—734, *P. abbreviata* R. Br. forma *arenaria* Rosenv.).

This interesting species (see Nannfeldt, 1935: 25), which has not hitherto been subjected to a cytological study, was counted by us on material from Clavering Island, NE Greenland, and on material from Nugssuaq Peninsula, NW Greenland. Root-tip mitoses from the latter locality showed its chromosome number to be $2n = 70$ (fig. 24). Holmen (1952) with reservation gives $2n = 63—70$ in Peary Land plants. On Clavering Island flower buds were fixed, and the anthers showed the meiosis to be very irregular. Some of the M_I-plates indicate an almost total asynapsis, whereas in others a rather high number of bivalents were present. The chromosome number could not be established with complete certainty, but in two M_{II}-plates from the same cell, approximately 70 chromosomes could be counted.

The chromosome number found by us does not strengthen the view of Nannfeldt and others of a hybrid status of *P. Hartzii*. In some years the seed production in Greenland localities is good and the seeds germinate well; from this fact an apomictic reproduction may perhaps be inferred.

44. **Poa glauca** Vahl coll. — Lange I: 172, including *P. nemoralis* L. var. *glaucantha* Blytt (p. 174), cf. Polunin, 1943: 363, and *P. laxiuscula* (Blytt) Lge. (p. 174).

Two collections, one from Clavering Island, NE Greenland, the other from Nugssuaq Peninsula, NW Greenland, were studied by us. Root-tip mitoses of the West Greenland plant had $2n = 56$ (fig. 25a), whereas PMC meiosis of the East Greenland material showed $n = 35$, meiosis proceeding on the whole in a regular way (fig. 25b). Böcher and Larsen (1950) in plants from Søndre Strømfjord, NW Greenland, counted $2n = 63$. Holmen (1952) reports $2n = 56$ from Peary Land.

Outside Greenland the following chromosome numbers are known: 70—72 in Spitsbergen (Flovik 1938), PMC meiosis showing more irregularities than was found in the Greenland material; 63 in Iceland (Á. and D. Löve, 1948); 42, 47, 50, 56, 60, 65, and 70 in Sweden (Åkerberg, 1942, Kiellander ex Á. and D. Löve, 1944). Flovik (1938: 315) assumes the species to be apomictic (cf. Nygren, 1954).

Poa laxiuscula (Blytt) Lge. was entered by Lange in the flora of Greenland on the basis of a plant collected by Th. Fries in 1871 at Holsteinborg and figured by him in the *Flora Danica*, tab. 2946.[1] Another collection from the same locality was made by Warming and Holm in 1884.

We have ourselves, in 1947—48, collected similar plants at Nugssuaq, NW Greenland, and on the mountain of Akuliaruserssuaq, South Greenland. From the very last-named locality Polunin (1943: 363) reports *Poa flexuosa* Sm. We were therefore inclined to think that also our plants as well as Lange's *P. laxiuscula* should be referred to *Poa flexuosa* Sm. The old plants together with our new finds were sent

[1] This specimen still exists in the Botanical Museum of Copenhagen. A comparison of the plant with the plate in the *Flora Danica* has convinced us that only the habit figure refers to the specimen in question, the flower details (figs. d, e, f) being of another *Poa* species.

to the Swedish specialist on this group, Professor J. A. NANNFELDT, who kindly informed us that although the Greenland plants differ considerably from Scandinavian *P. glauca* types, they should be referred to this species. The same is in all probability the case with POLUNIN's plant, since it grew in the same place in Southern Greenland as ours. Consequently we exclude *P. flexuosa* from the flora of Greenland.

45. **Poa nemoralis** L. coll. — LANGE I: 174 excl. var. *glaucantha* Blytt (cf. POLUNIN, 1943: 363).

The only chromosome determination from Greenland is due to BÖCHER and LARSEN (1950), who in root-tips of plants from Grønnedal in Arsukfjord, SW Greenland, found 2n = 42. This agrees with the number reported for Icelandic material by Á. and D. LÖVE (1948).

In Scandinavia the species exhibits a whole series of chromosome numbers, 2n ranging from 28 to 56, the numbers being partly aneuploid (cf. NYGREN, 1954b).

46. **Poa annua** L. — LANGE I: 172. Cf. M. P. PORSILD, 1932: 46.

This species of world-wide distribution was collected by us at Godthaab, SW Greenland. The root-tips had 2n = 28, the same number as reported by other authors. Its spontaneous occurrence in Greenland may be questioned.

47. **Dupontia psilosantha** Rupr. — LANGE I: 165.

Material of flower buds from Clavering Island, NE Greenland, showed PMC-meiosis beautifully. The haploid number is 22 (fig. 26). Meiosis proceeds regularly, and the chromosomes show considerable variation in size, corresponding to the situation found by FLOVIK (1938) in his examinations of root-tip mitoses of Spitsbergen plants.

Contrary to SCHOLANDER (1934), FLOVIK (1938), and HULTÉN (1942) we consider *D. psilosantha* to be specifically different from *D. Fisheri*, basing our opinion partly on morphological and geographical grounds, partly on the difference in chromosome number, *D. Fisheri* having n = 44 (FLOVIK 1938).

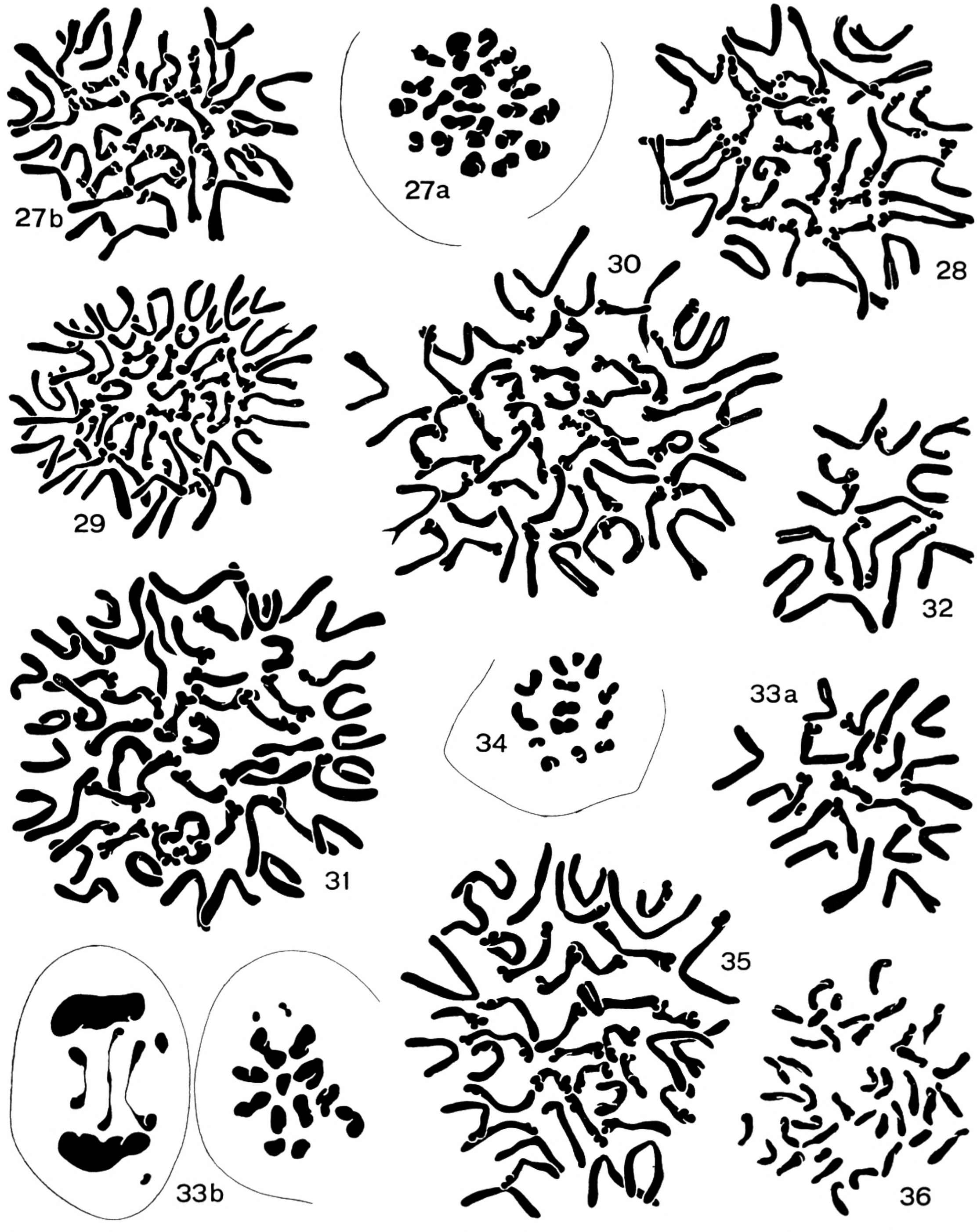
48. **Dupontia Fisheri** R. Br. — SCHOLANDER 1934: 69.

This rare species is at present known from NW Greenland (Svartenhuk and Thule, the specimens seen by us) and from NE Greenland (SCHOLANDER *loc. cit.*).

The chromosome number of *D. Fisheri* from Spitsbergen is stated by FLOVIK (1938) to be 2n = 88.

49. **Puccinellia angustata** (R. Br.) Rand et Redf. — TH. SØRENSEN, 1953: 28. (LANGE I: 171, *Glyceria angustata* (R. Br.) Fr.).

The chromosome number of this species was determined in two collections. In material from Clavering Island, NE Greenland, meiosis in PMCs was found. The divisions proceed regularly, and the chromosome number of n = 21 could be estab-



Figs. 27—36. Figs. 27b, 28—33a, 35 and 36 are root-tip mitoses, figs. 27a, 33b and 34 are PMC's 1st metaphase and 1st anaphase.
Fig. 27a, *Puccinellia angustata*, n = 21. Fig. 27b, *Puccinellia angustata*, 2n = 42. Fig. 28, *Puccinellia coarctata*, 2n = 42. Fig. 29, *Puccinellia groenlandica*, 2n = 56. Fig. 30, *Puccinellia vaginata*, 2n = 56. Fig. 31, *Puccinellia Rosenkrantzii*, 2n = 56. Fig. 32, *Puccinellia Langeana*, 2n = 14. Fig. 33a, *Puccinellia phryganodes*, 2n = 21. Fig. 33b, *Puccinellia phryganodes*, PMC, 1st metaphase and 1st anaphase. Fig. 34, *Phippsia algida*, n = 14. Fig. 35, *Arctophila fulva*, 2n = 42. Fig. 36, *Pleuropogon Sabinei*, 2n = 40. (Figs. 27—35 × 3000, fig. 36 × 4000).

lished in many cells (fig. 27 a). Four plants from the Nugssuaq Peninsula, NW Greenland, the root-tips of which were fixed, all showed 2n = 42 (fig. 27 b). The somatic chromosomes are of the usual grass-type, two-armed, with median or submedian constrictions. HOLMEN (1952) reports the same numbers in plants from Peary Land.

Outside Greenland *P. angustata* has been studied by FLOVIK (1938) from Spitsbergen. He reports the same number, and describes the chromosome morphology in detail, with special reference to the secondary constrictions. In our slides of Greenland plants such constrictions are only visible to a very slight degree or not at all.

50. **Puccinellia coarctata** Fern. et Weatherby — TH. SØRENSEN, 1953: 42. (Lange I: 167, *Glyceria Borreri* Bab. + (p. 168) *Glyceria maritima* L. var. *virescens* Lge.).

Root-tip mitoses of a plant from BW 1, SW Greenland, and of another from Egedesminde, NW Greenland, both had the chromosome number 2n = 42 (fig. 28). As far as can be seen, the chromosome morphology is the same as in the preceding species.

51. **Puccinellia laurentiana** Fern. et Weatherby — TH. SØRENSEN, 1953: 40.

52. **Puccinellia groenlandica** Th. S. — TH. SØRENSEN, 1953: 37 (LANGE 1: 169, *Glyceria arctica* Hook.).

Of this species only one individual from Holsteinborg in NW Greenland has been counted. Its root-tip mitoses had 2n = 56 (fig. 29).

53. **Puccinellia Porsildii** Th. S. — TH. SØRENSEN, 1953: 35.

54. **Puccinellia vaginata** (Lge.) Fern. et Weatherby — TH. SØRENSEN, 1953: 46. (LANGE I: 168, *Glyceria vaginata* Lge.).

Of this rather varying species three chromosome counts are available, the plants all being collected at the northern coast of the Nugssuaq Peninsula, NW Greenland. All three plants have the diploid number 2n = 56 (fig. 30).

55. **Puccinellia deschampsioides** Th. S. — TH. SØRENSEN, 1953: 31.

Again in this species the diploid chromosome number is 2n = 56. We have counted root-tips of a plant from Sarfarfik, Nugssuaq Peninsula, and BÖCHER and LARSEN (1950) have examined two plants from Søndre Strømfjord.

56. **Puccinellia Rosenkrantzii** Th. S. — TH. SØRENSEN, 1953: 33.

This new and interesting species, found in NW Greenland in the interior parts of the peninsula Nugssuaq by Professor A. ROSENKRANTZ, and which grows exclusively near the mud volcanoes, was brought to Denmark by the botanist KNUD JAKOBSEN, who kindly placed the plants at our disposal. It proved to have the diploid chromosome number 2n = 56 (fig. 31), thus being in conformity with the preceding species in this respect, and also, as far as can be worked out, having the same chromosome morphology.

57. **Puccinellia Andersonii** Swallen — Th. Sørensen, 1953: 26.

For this species Holmen (1952) in material from Peary Land, NE Greenland, reports the chromosome number 2n = 56.

58. **Puccinellia Langeana** (Berl.) Th. S. — Th. Sørensen, 1953: 20. (Lange II: 300, *Glyceria Langeana* Berl.).

This well-defined species differs from the other Greenland *Puccinellia* by its low chromosome number. The root-tip mitoses of a plant from Godhavn, Disko Island, NW Greenland, showed 2n = 14, the species thus being at the diploid level (fig. 32).

59. **Puccinellia maritima** (Huds.) Parl. — Th. Sørensen, 1953: 61. (Lange I: 168, *Glyceria maritima* (Gort.) Wahlb. with the exclusion of var. *virescens* Lge.).

Greenland plants are morphologically very close to or even identical with the Icelandic types, and like these have 2n = 56 (Greenland material from Narssak, SW Greenland, fixations of Icelandic plants given us by Mr. Alfr. Andersen).

In Sweden 2n = 56 is also found (Bernström ex Á. and D. Löve, 1948), and the same number was counted by us in plants from Denmark. From Germany, England, and Portugal higher chromosome numbers are reported. (Tischler, 1937; Maude, 1939, Castro and Fontes, 1946). — Church (1949) reports 2n = 42 and 56 for American plants referred to this species. According to Sørensen (1953: 88—89) the American specimen with 2n = 56 belongs to the *coarctata*-group. Of the other nothing can be said before the plants have been subjected to a critical re-examination.

60. **Puccinellia phryganodes** (Trin.) Scribn. et Merr. — Th. Sørensen, 1953: 53. (Lange I: 170, *Glyceria vilfoidea* (And.) Th. Fr.).

Plants counted from Holsteinborg, NW Greenland, from Narssak and Kagdlimiut, on the South coast, and from Wollaston Foreland, NE Greenland (4 specimens) were all triploid with 2n = 21 (fig. 33a). Meiosis has been studied in PMCs of a plant from Clavering Island, NE Greenland, and proved to be very irregular (fig. 33b). Both univalents, bivalents, and trivalents are seen in Metaphase I, and lagging chromosomes, sometimes also chromatin bridges, are present in Anaphase I. In addition a varying number of tiny chromatin bodies occur in most cells in the different stages of meiosis. These fragments were never observed in somatic cells. The meiotic irregularities make counting very difficult and the number of n = 10, on the authority of S. and W. given by Á. and D. Löve (1948) is no longer valid. Similar irregularities have been observed by Flovik (1938) in plants from Spitsbergen, despite the fact that his plants were tetraploid with 2n = 28. In plants from Northern Norway, Nygren (personal communication) has likewise counted 2n = 28.

Puccinellia phryganodes flowers only rarely, and has never been found with seeds, but it propagates very effectively by means of runners. The triploid number found in Greenland as well as the meiotic picture points to a hybrid origin of this type, but the occurrence of tribasic as well as tetrabasic karyotypes within the species, both with highly irregular meiosis, raise problems which still await explanation.

61. **Colpodium Vahlianum** (Liebm.) Nevski — Nevski in Komarov II: 436; see also Th. Sørensen, 1953: 18. (Lange I: 171, *Glyceria Vahliana* (Liebm.) Th. Fr. and Lange II: 299—300 incl. *Glyceria Kjellmani* Lge.).

Meiosis in PMCs was studied in material from Clavering Island, NE Greenland. Our observations are in accordance with the description given by Flovik (1938) for Spitsbergen plants. In both cases n = 7 was found. Holmen (1952) is in accordance with this as far as Peary Land plants are concerned.

62. **Phippsia algida** (Sol.) R. Br. — Gelert in Ostenfeld, 1902: 101. (Lange I: 166, *Catabrosa algida* Fr.).

Excellent material of PMCs showing different stages of the meiotic divisions is at hand from Clavering Island, NE Greenland. The chromosome number is n = 14 (fig. 34). Holmen (1952) found the same number in Peary Land. The Greenland plants thus being, as far as the number is concerned, in full conformity with the material from Scandinavia (Nannfeldt, 1937, Knaben, 1950) and from Spitsbergen (Flovik, 1938).

63. **Catabrosa aquatica** (L.) P. B. — Lange I: 166.

64. **Arctophila fulva** (Trin.) Ands. — Gelert in Ostenfeld, 1902: 118. (Lange I: 167, *Arctophila effusa* Lge.).

Material of this species for chromosome counting was collected at Godthaab, SW Greenland. In root-tip divisions 2n = 42 was found (fig. 35). The same number is given for Spitsbergen and Scandinavian plants by Flovik (1938) and by Nygren (ex Á. and D. Löve, 1948).

65. **Pleuropogon Sabinei** R. Br. — Lange II: 297.

This high arctic species, which taxonomically takes up a very isolated position, was studied cytologically for the first time on material from Wollaston Foreland, NE Greenland. We found 2n = 40 (fig. 36). Holmen (1952) counted the same number in plants from Peary Land, the extreme North of Greenland. The chromosomes are much smaller and differ morphologically from the usual grass-type in being short and rod-shaped, with mostly subterminal constrictions.

The chromosomes of *P. Sabinei* are much like those of the *Glyceria* species, and partly for this reason we consider its basic number to be 10 as in this genus, and not 5.

Besides *P. Sabinei* the genus *Pleuropogon* contains some western American species. In these Church (in Myers, 1947) has counted 2n = 16—32 which numbers show no relation to that found in *P. Sabinei*. Stebbins (personal communication) informs us that the difference in chromosome number has led him to undertake a comparison of *P. Sabinei* with American species. He finds that these differ so much from the high-arctic species, that they probably should be referred to a separate genus.

66. **Festuca baffinensis** Pol. — Holmen, 1952: 26. See also Polunin, 1941: 91. (Lange I: 179, *F. ovata* L. ssp. *borealis* Lge. pro parte. Sørensen, 1933: 137, *F. ovina* var. *brevifolia* (R. Br.) Hart).

This species which has not previously been recorded from Greenland, was identified by Holmen (*loc. cit.*) from Peary Land and by us from Clavering Island, NE Greenland, and from the Nugssuaq Peninsula, NW Greenland. In all cases the chromosome number was found to be 2n = 28, counted in the East Greenland material in a pollen mitosis (fig. 37), in West Greenland plants in root-tip mitoses. In the pollen mitosis two satellited chromosomes are clearly seen.

By its chromosome number *F. baffinensis* differs from *F. brachyphylla*, in which so far 2n = 42 has been found. An exception to this is the number of 2n = 28 for *F. ovina* L. var. *brevifolia* (R. Br.) Hart published by Flovik (1938: 293) for Spitsbergen plants. In order to clear up this discrepancy we have asked Dr. Flovik for his herbarium specimens, and by inspecting them we found that his 2n = 28 plants really were *F. brachyphylla*. The explanation may be that *F. brachyphylla* in certain parts of its area comprises 4n as well as 2n types. However, since both *F. baffinensis* and *F. brachyphylla* were present on the additional sheets of Dr. Flovik, we may perhaps also point to the possibility that a mistake may have been made, by which the number of 2n = 28 has been referred to the wrong plant.

67. **Festuca hyperborea** K. Holmen — Holmen, 1952: 28 (Lange I: 179, *F. ovata* L. pro parte, Th. Sørensen, 1933: 137, *F. ovina* L. var. *supina* (Schur) Hackel).

In the type specimen from Peary Land, 2n = 28 is given by Holmen (*loc. cit.*).

68. **Festuca brachyphylla** Schultes — Scholander, 1934: 69. (Lange I: 179, *F. ovata* L. pro parte, cf. Holmen, 1952: 26 and 28).

Of this species which is very common in Greenland, we have made chromosome counts on material from the following localities: Clavering Island (1 plant) and Wollaston Foreland (2 plants) in NE Greenland, and BW 1 (1 plant) in SW Greenland. In all four plants 2n = 42 was found. Fig. 38 shows a metaphase I-plate of a PMC-division of the Clavering plant. Holmen (*loc. cit.*) reports the same number in plants from Ella Island and Zackenberg, likewise NE Greenland.

69. **Festuca vivipara** (L.) Sm. — Hylander, 1953: 235 (Lange I: 179, *F. ovata* L. var. *vivipara* (Sm.) pro parte: NE Greenland specimens; see also Seidenfaden and Sørensen, 1937: 93).

A typical specimen from Wollaston Foreland, NE Greenland, of which root-tips were fixed, showed 2n = 49 (fig. 39). From Spitsbergen Flovik (1938) reports the same number, and from Scandinavia the same author as well as Turesson (1930,

1931) has found the somatic numbers 21, 28, and 42. SKALINSKA (1950) counted 2n = 28 and 35 in plants from the Mt. Tatra region in Poland.

70. **Festuca vivipara** (L.) Sm. var. **hirsuta** (Lge.) Schol. — DEVOLD and SCHOLANDER, 1933: 140, (LANGE I: 179, *F. ovata* L. var. *vivipara* p. p.: (SW and SE Greenland spec.) and var. *hirsuta* Lge. + *F. duriuscula* L. var. *hirsuta* Lge.).

Three plants from BW 1, SW Greenland all had the same chromosome number, viz. 2n = 28, counted on root-tip mitoses (fig. 40). Material of two plants from Ivigtut, SW Greenland, described by BÖCHER and LARSEN (1950) likewise showed 2n = 28.

The *hirsuta* variety of this species in all probability represents a distinct species, as judged from its morphology and chromosome number. We agree with POLUNIN (1943: 365, footnote) that it is not identical with the Newfoundland *Festuca prolifera* (Piper) Fern. (FERNALD, 1933: 133), which comes closer to *F. rubra* than our Greenland plant.

It should be considered whether the Scandinavian types with 2n = 28 which in the chromosome list of Á. and D. LÖVE (1948) are referred to *F. vivipara*, actually belong here.

71. **Festuca rubra** L. coll. — LANGE I: 180, including *F. duriuscula* L. with the exclusion of var. *hirsuta* Lge.

Plants referred to this species by BÖCHER and LARSEN (1950), but not being typical of it, were found by them to have 2n = 42. The plants are from Søndre Strømfjord, NW Greenland. Many investigators (see Á. and D. LÖVE, 1945a) have studied this polymorphic species, and the following numbers are known: 2n = 14, 28, 42, 56, and 70.

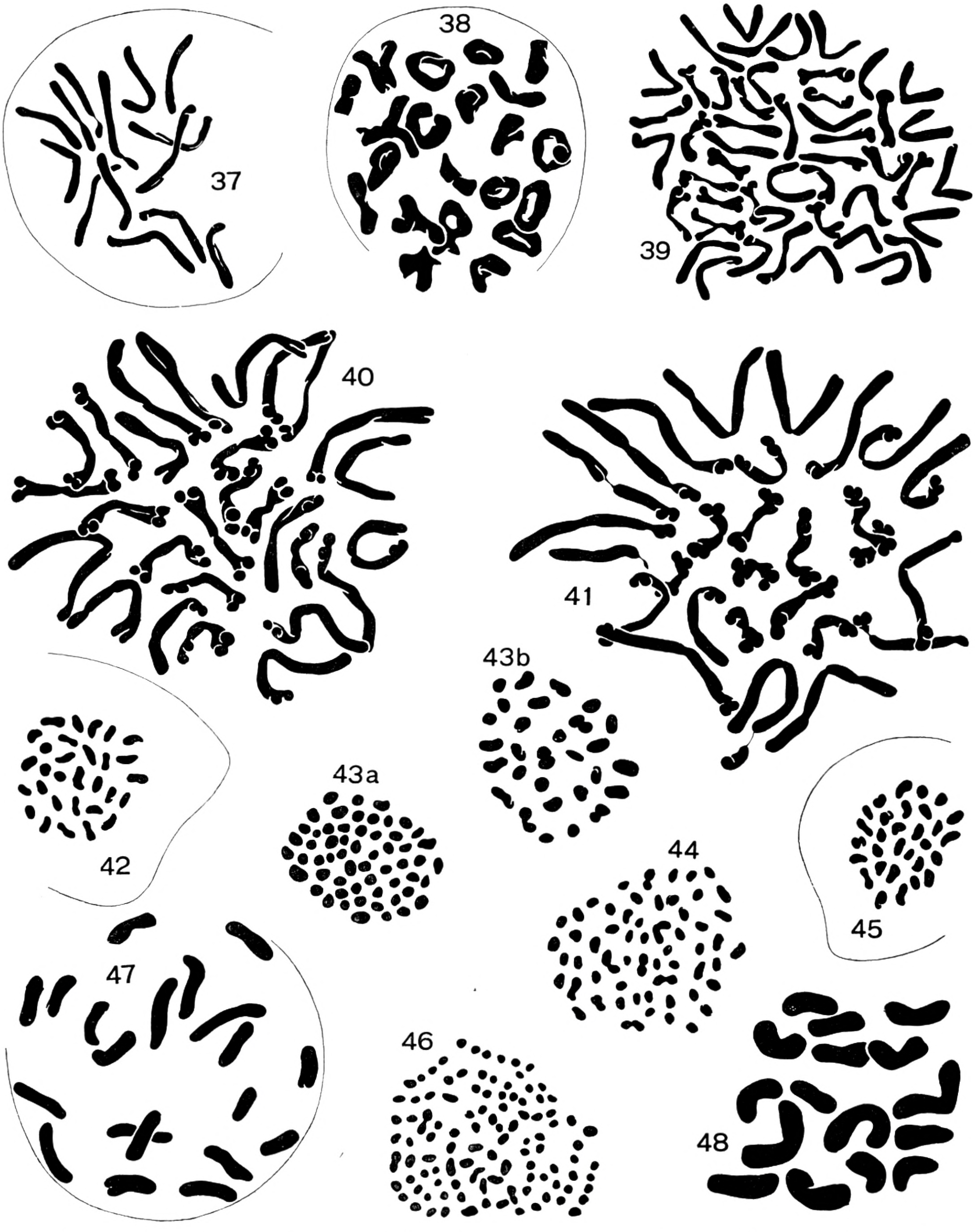
It has long been known that hairy types of *F. rubra* formerly referred to var. *arenaria* Osb. occur in Northern Greenland. (LANGE I: 180). They differ from the Scandinavian plants of this name and should probably be referred to *F. cryophila* V. Krecz. et Bobr. (HADAČ, 1944: 18). As no chromosome counts are available and as transitional types leading to the glabrous form of Southern Greenland are at hand, we at present find it safest not to inquire into this question.

72. **Nardus stricta** L. — LANGE I: 154.

73. **Roegneria violacea** (Hornem.) Melderis — MELDERIS, 1950: 159. (LANGE I: 155, *Agropyrum violaceum* (Hornem.) Lge. pro parte).

This species was counted from two Greenland localities, by us from BW 1, SW Greenland, and by BÖCHER and LARSEN (1950) from Søndre Strømfjord, NW Greenland. In both cases 2n = 28 was found in root-tip mitoses.

74. **Roegneria Doniana** (White) Melderis var. **virescens** (Lge.) Melderis — MELDERIS, 1950: 159. (LANGE I: 155, *Agropyrum violaceum* (Hornem.) Lge. var. *virescens* Lge.).



Figs. 37—48. Fig. 37 is a pollen mitoses; figs. 39—41, 43a, 44, 46—48 are root-tip mitoses, figs. 38, 42, 43b, and 45 are PMC's, 1st metaphase.

Fig. 37, *Festuca baffinensis*, n = 14. Fig. 38, *Festuca brachyphylla*, n = 21. Fig. 39, *Festuca vivipara*, 2n = 49. Fig. 40, *Festuca vivipara* var. *hirsuta*, 2n = 28. Fig. 41, *Elymus mollis*, 2n = 28. Fig. 42, *Eriophorum callitrix*, n = 30. Fig. 43a, *Eriophorum Scheuchzeri*, 2n = 58. Fig. 43b, *Eriophorum Scheuchzeri*, n = 29. Fig. 44, *Eriophorum angustifolium*, 2n = 58. Fig. 45, *Eriophorum triste*, n = 30. Fig. 46, *Scirpus caespitosus* ssp. *austriacus*, 2n = 104. Fig. 47, *Heleocharis acicularis*, 2n = 20. Fig. 48, *Heleocharis palustris*, 2n = 16. (Figs. 37—47 × 3000, fig. 48 × 4000).

Plants collected by us and by Böcher and Larsen (1950) at BW 1, SW Greenland, had 2n = 28, like the preceding species.

75. **Roegneria borealis** (Turcz.) Nevski var. **hyperarctica** (Pol.) Melderis — Melderis, 1950: 161 (Lange I: 155, *Agropyrum violaceum* (Hornem.) Lge. pro parte).

In material from the Nugssuaq Peninsula, NW Greenland, Böcher and Larsen (1950) found 2n = 28. Á. and D. Löve, 1945a found the same number in Swedish plants (which they referred to *Agropyron latiglume* (Scribn. et Sm.) Rydb.).

76. **Elymus mollis** Trin. — Hitchcock, 1950: 251. (Lange I: 154, *E. arenarius* L. var. *villosus* E. Mey.). See also Á. Löve, 1950: 31.

Plants from two very distant localities in West Greenland, viz. Ivigtut in the south and Nugssuaq Peninsula in the north have been investigated, the former by Böcher and Larsen (1950), the latter by ourselves. In both cases 2n = 28 was found (fig. 41). The same number is reported by Böcher and Larsen for material from Montreal Bot. Gardens, and by Stebbins (in Myers, 1947) from NW America.

The European *E. arenarius* L. has the chromosome number 2n = 56 (counted from Sweden (Östergren, 1940), from Denmark (Gudjónsson in Grøntved, 1946: 411, Böcher and Larsen, 1950), and from Bulgaria (Böcher and Larsen, *loc. cit.*). For this reason we agree with those authors who on morphological grounds consider these two types to be of specific rank. It should be added here, that Á. Löve, after the publication of his paper (*loc. cit.*) has made additional cytological studies of Icelandic plants and found both numbers, 2n = 28 and 2n = 56, to be present (cf. Hylander, 1953: 370).

Cyperaceae.

77. **Eriophorum callitrix** Cham. — Seidenfaden and Sørensen, 1933.

Of this species material for meiosis in PMCs was collected on Clavering Island, NE Greenland. Meiosis is regular and the chromosomes, all of which are small and short, arrange themselves in beautiful M_I-plates, in which n = 30 can be definitely counted (fig. 42).

78. **Eriophorum Scheuchzeri** Hoppe — Lange I: 129 incl. *E. vaginatum* L.; cf. Simmons, 1904: 473.

The chromosome number was counted both in root-tip mitosis and in PMCs from Clavering Island, NE Greenland. The somatic cells have 2n = 58 (fig. 43a), the chromosomes being of somewhat different size. Most of them are short and almost spherical, but 12 or 14 are larger and rod-shaped. In the PMCs the M_I correspondingly has 29 bivalents, some of which are slightly larger than the others (fig. 43b). Compared to the mitotic chromosomes the meiotic ones are remarkably small. Plants from Peary Land, North Greenland, according to Holmen (1952) have the same number. 2n = 58 is also reported by Flovik (1942) from Spitsbergen.

79. **Eriophorum angustifolium** Honck. — LANGE I: 130 pro parte (excl. var. *triste* Th. Fr., cf. SØRENSEN, 1933: 127).

Root-tip mitoses of two collections were studied, one from Godthaab (SW Greenland), the other from Godhavn on the Disko Island in NW Greenland. In both cases $2n = 58$ was found (fig. 44). The chromosomes seem to be very similar to those of the preceding species in regard to size and morphology.

The number counted by us in Greenland plants agrees with that reported by HÅKONSSON (1928) from Sweden and with plants of Danish origin studied by us.

80. **Eriophorum triste** (Th. Fr.) Hadač et Löve — Á. LÖVE, 1950: 34. (LANGE I: 130, *E. angustifolium* pro parte, cf. SØRENSEN, 1933: 127).

This species, which morphologically is closely related to the preceding one, of which it was hitherto considered a variety, nevertheless differs from it in chromosome number. The difference is, however, the smallest possible, the diploid number of *E. triste* being 60. This number was counted by us in material both from NE and NW Greenland (Clavering Island, Nugssuaq Peninsula and Qutdligssat). An M_I-plate of a plant from Clavering Island is shown in fig. 45, in which 30 bivalents regularly spaced can be seen. In plants from Peary Land, North Greenland, HOLMEN (1952) reports the same number.

FLOVIK (1942) was the first to determine the chromosome number of $2n = 60$ for *E. triste* in plants from Spitsbergen. In his paper the plant is referred to as *E. polystachium* L., but a revision made by TH. SØRENSEN revealed it and all other herbarium specimens from Spitsbergen to belong to *E. triste*. In a recent paper by Á. LÖVE (1950) the occurrence of *E. triste* in a single locality in NW Iceland is reported, the correctness of the determination being checked by him by a chromosome count of $2n = 60$.

In NE Greenland hybrids of *E. triste* and *E. Scheuchzeri* occur (SØRENSEN, 1933). We have counted $2n = 59$ in such hybrids from Clavering Island.

81. **Scirpus quinqueflorus** F. X. Hartmann — F. X. HARTMANN, 1767: 85 (LANGE III: 716, *S. pauciflorus* Lightf.; see also SCHWARZ, 1949: 89, Á. LÖVE, 1954a: 218).

82. **Scirpus caespitosus** L. ssp. **austriacus** (Pallas) Brodd. — HULTÉN, 1942: 291. (LANGE I: 129: *S. caespitosus* L.).

The material of this species, collected at BW 1 in SW Greenland in root-tip mitoses showed approximately 104 very tiny, spherical chromosomes (fig. 46). SCHEERER (1940) reports $2n = 104$ in German plants.

The chromosome number of ssp. *germanicus* (Pallas) Brodd., which has a more southern distribution, is not known.

83. **Heleocharis acicularis** L. — OSTENFELD, 1902: 42. (LANGE I: 128, *Scirpus parvulus* R. et S.).

Specimens from the Nugssuaq Peninsula (NW Greenland) have been studied. The root-tip mitoses, of which one is shown in fig. 47, have 2n = 20. The chromosomes are rather large and have median to submedian constrictions. The same number has been found by us in Danish material from Hjortekær, North Zealand, and it has previously been reported by TANAKA (1937). These three determinations from geographically widely separated localities suggest that the species is caryologically monotypic.

The plants of American origin examined by HICKS (1929) and having 2n = 30—38 and 50—58, in our opinion do not belong to *H. acicularis*, the dwarfy species and possible hybrids between them being morphologically very similar.

84. **Heleocharis uniglumis** (Lk.) Schult. — FERNALD and BRACKETT, 1929: 71, *H. u.* var. *typica*. (LANGE III: 716, *H. palustris* (L.) R. Br.; LINDBERG, 1902: 12, *Scirpus* (*Heleocharis*) *uniglumis* Lk. pro parte: ROSENVINGE's collection).

85. **Heleocharis palustris** (L.) R. et S. — LANGE I: 128. See also POLUNIN, 1943: 367.

Of this species, which was first identified in Greenland by POLUNIN, material from BW 1, SW Greenland, was examined by us. Only a few root-tip mitoses were present, but from these the chromosome number 2n = 16 was unquestionably established (fig. 48).

E. M. WALTERS (1949) found the same number in British plants, which he referred to as a separate subspecies: Ssp. *microcarpa* Walters. The Greenland plants, however, are not identical with the subspecies *microcarpa* but they match the northernmost specimens of the American *H. Smallii* Britton sensu Svenson (SVENSON, 1947: 64; see also SVENSON, 1939: 63 and 98, FERNALD and BRACKETT, 1929).

Besides the chromosome number 2n = 16 the following numbers have been counted in *H. palustris*: 2n = 38 (HÅKONSSON, 1929, Swedish material; WALTERS, 1949, British plants). In Danish material of the *H. palustris-uniglumis* complex, counted by Mrs. SAUNTE (unp.), the following numbers are found: 16, 38, 40, 42, 44, 46, 48. In addition LEWITZKY (1940) counted 2n = 10 in Russian plants referred to *H. palustris*. Apparently the taxonomical as well as the cytological pattern of this species is still much complicated and we have therefore decided to leave the question open whether it should be subdivided into a number of separate species (as suggested by Á. LÖVE, 1951 : 270) or into a number of subspecies as suggested by WALTERS (*loc. cit.*).

86. **Kobresia myosuroides** (Vill.) Fiori et Paol. — HYLANDER, 1945: 93, (LANGE I: 130, *Elyna Bellardi* All.).

The material investigated by us was collected at BW 1 (SW Greenland). As in other cyperaceous plants the counting of the chromosomes meets with difficulties, due to unsatisfactory fixation and to the very small chromosomes. As far as we have been able to make out, 2n is 56, but may be as much as 2 chromosomes higher or lower than that number. HEILBORN (1939) arrived at a similar result, whereas BÖCHER (1938c) without reservation reported 2n = 52. HOLMEN (1952) in root-tips of plants from Peary Land, North Greenland, arrived at 2n = 60—66. The different figures, in our opinion, do not justify the supposition of the existence of chromosome races in this species.

87. **Kobresia simpliciuscula** (Wbg.) Mack. — HYLANDER, 1945: 93. (LANGE I: 130, *K. caricina* Willd.).

Fixations of this species were made in Greenland on the East as well as on the West coast. The East Greenland material (Clavering Island) of PMCs in meiosis shows n = app. 37 (fig. 49), the NW Greenland root-tips (from Egedesminde) correspondingly 2n = 70—75 (74). As seen in fig. 49, the meiosis is normal.

88. **Carex parallela** (Læst.) Sommerf. — HARTZ, 1895: 344.

Spikes of male plants of this dioecious species were fixed on Clavering Island (NE Greenland). Many beautiful meiotic stages are present in the slides, but here only a few first metaphase plates are drawn (fig. 50). A simple counting of the number of elements in the M_I-cells shows 21 to be present in some cells and 22 in others. When these two types are compared it is found that the difference is due to the fact that in the 21-cells all elements represent paired chromosomes, 20 being normal bivalents and the last one heteromorphic. As far as can be seen, it is composed of three chromosomes, two of which are large and equally shaped, and a very small third one. In the 22-cells, on the other hand, 21 bivalents plus one small univalent, corresponding to the small element of the above-mentioned heteromorphic structure, are present. This explains the observation preliminarily published by SØRENSEN and WESTERGAARD in Á. and D. LÖVE (1948) of n = 22 as the supposed chromosome number of *C. parallela*. FLOVIK (1940) gives 2n = 44 in root-tips, without, however, giving a drawing or reporting on the sex of his plant.

The facts mentioned above suggest that the somatic number of the male plants is 2n = 43, and that the heteromorphic configuration is an expression of the sex-determining mechanism of this dioecious species. The identification of the sex-chromosomes must, however, await detailed investigations of the somatic number of both sexes, and a study of meiosis in the female plants.

89. **Carex gynocrates** Wormsk. — LANGE I: 131.

Of this species only root-tip material (from Nugssuaq Peninsula, NW Greenland) was at hand. The mitoses, one of which is shown in fig. 51, have 2n = 48, the number being established with full certainty.

90. **Carex scirpoidea** Michx. — LANGE I: 132.

The material of this species at our disposal consists of root-tips from male and female plants from the Nugssuaq Peninsula in NW Greenland and of spikes of male plants from Clavering Island, NE Greenland.

Root-tip mitoses from a male and a female plant, respectively, are drawn in fig. 52a and b. The chromosome number is 62 in both. Due to the small size of the chromosomes it is not possible to decide whether there is a difference between the two sexes.

In the PMCs, however, the presence of a heteromorphic pair is beyond doubt (fig. 52c). We feel convinced that the heteromorphic pair is composed of an X- and a Y-chromosome, but the identification of these is not possible. In most first metaphase plates 31 bivalents are clearly present, but in some cells 30 bivalents plus two small univalents (which do not represent the heteromorphic sex bivalent) are seen (fig. 52d). A plate of the latter type formed the basis of the estimate of 2n = 64 by Sørensen and Westergaard (see Á. and D. Löve, 1948). Similar irregularities may also account for Heilborn's (1939) report of n = 34 in this species.

91. **Carex microglochin** Wbg. — Lange I: 133.

92. **Carex nardina** Fr. — Lange I: 131. (On *C. Hepburnii* Boot, see Sieden-faden and Sørensen, 1937: 163).

The material examined by us includes root-tips of plants from BW 1, SW Greenland, and male parts of spikes of plants from Clavering Island, NE Greenland. In the latter material PMC-meiosis is present, but the cells were not well fixed and the number of n = 35 recorded by Sørensen and Westergaard in Á. and D. Löve, 1948 is wrong. The mitoses of the above-mentioned collection have 2n = 68 (fig. 53). This is no doubt the correct number of this species, as was also found by Holmen (1952) in Peary Land.

93. **Carex capitata** L. — H. Smith, 1940: 199. (See also Böcher, 1950: 4).

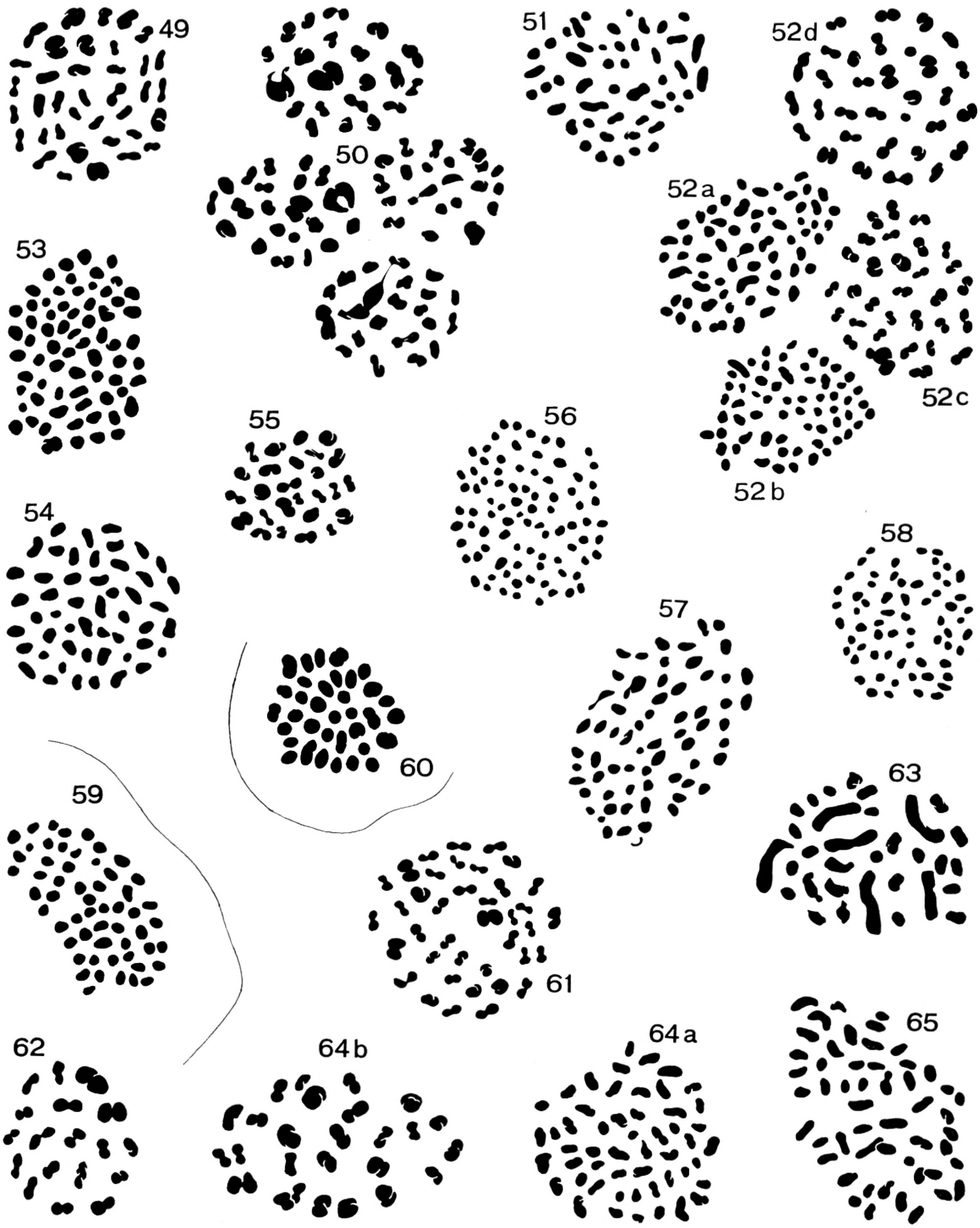
94. **Carex arctogena** H. Sm. — H. Smith, 1940: 198. (Lange I: 132, *C. capitata* L., cf. Böcher, 1950: 4).

The somatic number of this plant was counted on root-tip material of two specimens, one from Lichtenau Fiord in SW Greenland, the other from Egedesminde in NW Greenland. In both cases the chromosome number of 2n = 50 was found beyond any doubt (fig. 54). This is the same number as that reported by Heilborn (1928) for *C. capitata*, but whether his count refers to *C. arctogena* or to *C. capitata* cannot be decided.

95. **Carex rupestris** All. — Lange I: 133.

Slides of spikes with meiosis in the PMCs of plants from Clavering Island (NE Greenland) as well as of root-tips of plants from the Nugssuaq Peninsula in NW Greenland have been studied.

The meiosis is very regular and counting could be made with full certainty, the haploid number being n = 26 (fig. 55). The root-tip mitoses were less satisfactory



Figs. 49—65. Figs. 51, 52a, b, 53, 54, 56—59, 63, 64a, and 65 are root-tip mitoses, figs. 49, 50, 52c, d, 55, 60—62, 64b are PMC's, 1st metaphase.

Fig. 49, *Kobresia simpliciuscula*, n = 37. Fig. 50, *Carex parallela*, n = 21 or 21 + 1. Fig. 51, *Carex gynocrates*, 2n = 48. Fig. 52a, b, *Carex scirpoidea*, 2n = 62. Fig. 52c, d, *Carex scirpoidea*, n = 31. Fig. 53, *Carex nardina*, 2n = 68. Fig. 54, *Carex arctogena*, 2n = 50. Fig. 55, *Carex rupestris*, n = 26. Fig. 56, *Carex Macloviana*, 2n = 86. Fig. 57, *Carex ursina*, 2n = 64. Fig. 58, *Carex amblyorhyncha*, 2n = 64. Fig. 59, *Carex curta*, 2n = 56. Fig. 60, *Carex Bigelowii*, n = 35. Fig. 61, *Carex subspathacea*, n = 39. Fig. 62, *Carex supina* ssp. *spaniocarpa*, n = 18. Fig. 63, *Carex panicea*, 2n = 32. Fig. 64a, *Carex rariflora*, 2n = 52. Fig. 64b, *Carex rariflora*, n = 26. Fig. 65, *Carex stylosa*, 2n = 52. (All figures × 4000).

and in the same plant the numbers 50, 51, and 52 were estimated. These finds are not in agreement with the number reported by HEILBORN (1924) and FLOVIK (1942), the former giving n = 25 in Norwegian material, the latter 2n = 50 in Spitsbergen plants. HOLMEN (1952) counted 2n = about 50 in plants from Peary Land, North Greenland.

From the above facts it might be assumed that two, in chromosome number different races exist within this wide-spread species. But as herbarium specimens from Greenland and Spitsbergen are identical in all essential characters, we think it premature to accept such an hypothesis.

96. **Carex maritima** Gunn. — HYLANDER, 1945: 94. (LANGE I: 133 and 134, *C. incurva* Lightf. and *C. duriuscula* C. A. Mey., cf. SEIDENFADEN and SØRENSEN, 1937: 162).

According to HOLMEN (1952) the chromosome number of Peary Land plants is 2n = 60, the same number as that reported by FLOVIK (1943) from Spitsbergen. KNUD JAKOBSEN (unpubl.) has recently found the same number in plants from NW Greenland (Nugssuaq).

97. **Carex Macloviana** D'URV. — OSTENFELD, 1902: 54. (LANGE I: 134 *C. festiva* Dewey).

The somatic chromosome number was counted on root-tips of a plant from BW 1 (SW Greenland). The mitoses show 2n = 86, the chromosomes all being small, spherical, and of equal size (fig. 56). This number is the same as that given by HEILBORN (1939) for Swedish material, but differs from the figure 2n = appr. 82 given by BÖCHER (1938c). We think it most likely that also his plant really had 86 chromosomes.

98. **Carex praticola** Rydb. — MACKENZIE, 1931: 140. (LANGE I: 135, *C. pratensis* Drejer).

99. **Carex Lachenalii** Schk. — MANSFELD, 1938c: 215, cf. also HYLANDER, 1945: 93, sub *Kobresia simpliciuscula*. (LANGE I: 135, *C. lagopina* Wbg.).

100. **Carex glareosa** Wbg. — LANGE I: 137. We include *C. marina* Dewey, cf. FERNALD, 1906: 47, *C. g.* var. *amphigena* Fern.; see also SEIDENFADEN and SØRENSEN, 1937: 162.

KNUD JAKOBSEN has counted 2 n = 66 in plants from Svartenhuk, NW Greenland (personal communication). The number agrees with FLOVIK's count of Spitsbergen plants (FLOVIK, 1942).

101. **Carex ursina** Dewey — LANGE I: 132.

The diploid number of this rare and interesting species is found to be 64, counted in root-tips of two plants from the Nugssuaq Peninsula, NW Greenland (fig. 57). The chromosomes are small and subspherical, varying somewhat in size. The number agrees with FLOVIK's (1942) count from Spitsbergen.

102. **Carex amblyorhyncha** Krecz. — BÖCHER, 1952b: 25. (SEIDENFADEN and SØRENSEN, 1937: 167, *C. pseudolagopina* Th. S.).

In plants from Nugssuaq Peninsula, NW Greenland, a few root-tip mitoses of a single plant showed 2n = 64 (fig. 58), the same number as that present in *C. Lachenalii,* for which species it was mistaken until lately.

According to BÖCHER (*loc. cit.*) this circumpolar species is represented in Greenland by two types, *C. amblyorhyncha* ssp. *amblyorhyncha* T. W. Böcher, with an American-Eastern Asiatic distribution and *C. amblyorhyncha* ssp. *pseudolagopina* (Th. S.) T. W. Böcher, which has a high arctic distribution. The chromosome number given above refers to the latter subspecies.

Unfortunately neither the other subspecies nor the related *C. Heleonastes* Ehrh. have been studied cytologically.

103. **Carex Mackenziei** Krecz. — POLUNIN, 1938: 90, 1943: 370. (JOHS. GRØNTVED, 1937: 253, *C. norvegica* Willd.).

104. **Carex brunnescens** (Pers.) Poir. — OSTENFELD, 1902: 56. (LANGE I: 136, *C. vitilis* Fr.).

As far as could be worked out, the root-tip mitoses of the Greenland material, collected at BW 1, has 2n = 56, the same number as that reported from Scandinavia by LEVAN (see Á. and D. LÖVE, 1948) and from N. America by WAHL (1940).

105. **Carex curta** Good. — TUTIN in CLAPHAM *et al.*, 1952: 1405; cf. also *loc. cit.*: 1390. (LANGE I: 136, *C. canescens* L.). — *C. helvola* Blytt (LANGE II: 288) = *C. curta* × *C. Lachenalii.*

Plants of this species were fixed at Godthaab, SW Greenland. The root-tips were unusually well fixed and the chromosome number of 2n = 56 was counted with full certainty (fig. 59). Scandinavian plants have the same number according to HEILBORN (1924) and to LEVAN (in Á and D. LÖVE, 1948).

106. **Carex nigra** (L.) Reichard — FERNALD, 1942: 300. (LANGE I: 144, *C. vulgaris* Fr.).

Root-tip counts of plants from BW 1 (SW Greenland) show the diploid number to be either 82 or 84, the latter number being in agreement with n = 42 reported by HEILBORN (1924) on Swedish material.

107. **Carex Bigelowii** Torr. coll. — POLUNIN, 1940: 129. (LANGE I: 141, 142, 145, *C. Drejeriana* Lge., *C. anguillata* Drej., *C. hyperborea* Drej., and *C. rigida* Good.; LANGE II: 290—292, *C. Warmingii* Holm, *C. Fyllae* Holm, and *C. limula* Fr.). — *C. groen-*

landica Lge. (LANGE I: 144) = *C. Bigelowii* × *C. nigra*. *C. haematolepis* Drej. (LANGE I: 143) = *C. Bigelowii* × *C. Lyngbyei*.

Of this widespread and variable species we have fixations of male spikes from Clavering Island, NE Greenland. Plenty of PMC-meiotic divisions were present, enabling the haploid number to be counted accurately as n = 35 (fig. 60). The chromosomes are small and contracted. The above number is in conformity with HEILBORN (1924) and BÖCHER (1938c) on material from Sweden and the Faeroes, respectively. In West Greenland we have made a large number of fixations of plants of this and the following species in order to find out whether they are cytologically uniform or not. — This material has not yet been worked out.

108. **Carex stans** Drej. — LANGE I: 147, including *C. elytroides* Fr. sensu Lange, and *C. Epigeios* Læst. sensu Lange (LANGE II: 292). The right name of this species may be *Carex concolor* R. Br., cf. POLUNIN, 1940: 130.

A highly variable species in which, however, so far only one chromosome number has been demonstrated. In root-tip mitoses in plants from Nugssuaq Peninsula (NW Greenland) 2n = 76 was present. The same number was found by HOLMEN (1952) in material from Peary Land, North Greenland.

The chromosome number of 2n = 76 for *C. stans* separates this species definitely from *C. aquatilis* Wbg., of which it is often considered a variety. *C. aquatilis* has 2n = 84 (LEVAN in Á. and D. LÖVE, 1948).

109. **Carex subspathacea** Wormsk. — LANGE I: 140.

Male spikes of plants from Clavering Island were studied cytologically. The first metaphase in the PMCs display the haploid number beautifully, 39 bivalents being present. The bivalents differ somewhat in size, four of them being much larger than the others, two exceeding all the others (fig. 61). The very small bivalents have a highly conspicuous double structure, and sometimes the partners lie so far apart that they may be mistaken for separate bivalents. Such cells account for the erroneous number of n = 40, preliminarily submitted to the chromosome list of Á. and D. LÖVE (1948) by SØRENSEN and WESTERGAARD.

110. **Carex salina** Wbg. — HYLANDER, 1945: 98. M. P. PORSILD, 1930: 13. (LANGE I: 141, *C. reducta* Drej., and LANGE III: 722, *C. Drejeriana* Lge. forma *cuspidata* Rosenv.).

111. **Carex Lyngbyei** Hornem. — MACKENZIE, 1935: 415. (LANGE I: 143, *C. cryptocarpa* C. A. Mey.).

112. **Carex deflexa** Hornem. — LANGE III: 724. (LANGE I: 151, *C. pilulifera* L. var. *deflexa* Drej.).

The root-tips of this species were fixed at BW 1 (SW Greenland). The fixation was not satisfactory and the divisions are scarce. Estimations as to the chromosome number were attempted on late prophases. We think it safe to state that it is not lower than 20 and not higher than 24. In *C. pilulifera* L., the closest relative of the species, HEILBORN (1924) reports 2n = 18.

113. **Carex supina** Wbg. ssp. **spaniocarpa** (Steud.) Hult. — HULTÉN, 1942: 365. (LANGE I: 151, *C. supina* Wbg.).

Pollen mother cells of material fixed on Clavering Island, NE Greenland, displayed meiotic divisions in which n = 18 was counted with full certainty (fig. 62). No meitotic irregularities were observed.

114. **Carex panicea** L. — LANGE I: 149.

In root-tip mitoses of a plant from the Lichtenau Fiord in SW Greenland 2n = 32 was easily counted. Six of the chromosomes are much larger than the others (fig. 63). The number and morphology of the chromosomes of this material seem to be identical to that of Scandinavian plants counted by various authors.

115. **Carex vaginata** Tausch. — MANSFELD, 1938c: 219. (GELTING, 1934: 174, *C. sparsiflora* (Wbg.) Steud.; see also SEIDENFADEN and SØRENSEN, 1937: 163).

116. **Carex rariflora** (Wbg.) Sm. — LANGE I: 150.

Both root-tip mitoses and meiotic divisions were studied. The root-tips are of plants from BW 1 (SW Greenland), whereas the male spikes were fixed on Clavering Island (NE Greenland). The chromosome number is 2n = 52, n = 26 (fig. 64a and b). The number of 2n = 50 preliminarily reported by SØRENSEN and WESTERGAARD in Á. and D. LÖVE (1948) for the Clavering material is incorrect. Á. and D. LÖVE, *loc. cit.*, give the diploid number as 2n = 54, but considering the monotypic character of the species we are inclined to think that also this number is erroneous.

117. **Carex paupercula** Michx. — MACKENZIE, 1935: 351. (POLUNIN, 1938: 90, 1943: 372, *C. magellanica* Lam.).

118. **Carex Buxbaumii** Wbg. sensu Hyl. — HYLANDER, 1945: 101. (LANGE III: 721; see also CAJANDER, 1935: 11, *C. polygama* Schk. ssp. *subulata* (Schum.) A. Caj.).

CAJANDER (*loc. cit.*: 96 et seq.) thought that ssp. *subulata* does not occur in Greenland. However, Greenland plants were later referred to this subspecies by CAJANDER himself and are found in the herbarium of the Botanical Museum of Copenhagen.

119. **Carex stylosa** C. A. Mey. — LANGE III: 723. (LANGE I: 150, *C. nigritella* Drej.).

The diploid chromosome number was counted in root-tip mitoses of plants from the Lichtenau Fiord in SW Greenland and found to be 52 without any ambiguity (fig. 65).

120. **Carex holostoma** Drej. — Lange I: 139.

The root-tips of this plant, which were fixed at Egedesminde, NW Greenland, had many mitoses. The best of these gave the chromosome number of $2n = 60$ (fig. 66).

121. **Carex norvegica** Retz. emend. Kalela — Kalela, 1944: 12. (Lange I: 138, *C. alpina* Sw. pro parte).

This species, which is part of the collective *C. alpina* Sw., had $2n = 56$, the slides being made from root-tips of plants from BW 1, SW Greenland (fig. 67).

122. **Carex norvegica** Retz. ssp. **inserrulata** Kalela — Kalela, 1944: 25. (Lange I: 138, *C. alpina* Sw. pro parte).

Of this subspecies we have material of spikes from Clavering Island (NE Greenland) and of root-tips from BW 1, (SW Greenland). The mitoses (fig. 68) were good enough to establish $2n = 56$ with certainty, and the same number was counted in somatic cells from ovular tissue of the East Greenland material. Heilborn (1924) reports the same number in Norwegian plants.

Carex angarae Steud., a third member of the *C. alpina* complex, was reported by Kalela (1944: 2) to occur in Greenland. In our opinion this is not so, the plant in question being nothing but a large individual of ssp. *inserrulata*. For *C. angarae* Á. and D. Löve (1948) give $2n = 54$ in plants from Sweden.

123. **Carex rufina** Drej. — Lange I: 138. Cf. also M. P. Porsild, 1946a: 26.

In root-tips of plants fixed near Godthaab, SW Greenland the chromosome number was found to be 86. This number is strikingly different from $2n = 60$ for Scandinavian plants counted by Levan (in Á. and D. Löve, 1948).

We believe that either Levan or we got the fixation wrongly labelled, so that until further notice it is open to discussion which of these numbers is the correct one.

124. **Carex bicolor** All. — Lange I: 138.

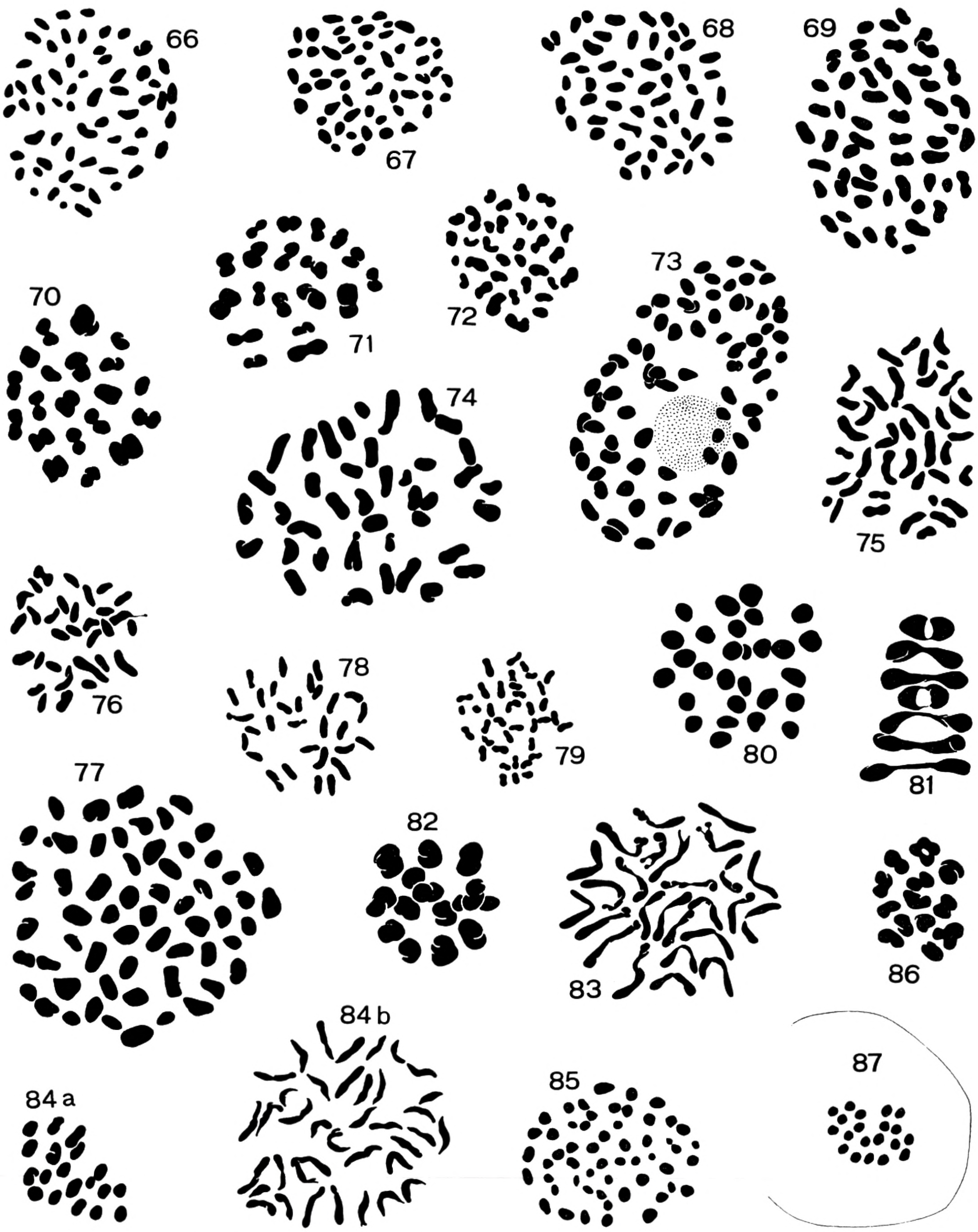
The somatic mitoses of the root-tips fixed at Egedesminde in NW Greenland were not of first-rate quality and the chromosome number is open to some doubt. The nearest estimate we have reached is $2n = 52$. Due to the uncertainty of the counting we have not followed our usual practise of publishing a drawing of a species which is unknown cytologically.

125. **Carex atrata** L. — Lange I: 139.

Good mitoses, in which $2n = 54$ could be counted with full accuracy, were present in root-tips of plants collected at BW 1 (fig. 69). We are in agreement with Heilborn (1924) as to this number.

126. **Carex misandra** R. Br. — Lange I: 139.

Beautiful meiotic divisions were present in male spikes of this species from Clavering Island, NE Greenland. Fig. 70 shows a first metaphase plate with $n = 20$,



Figs. 66—87. Figs. 66—69, 72—79, 83, and 84b are root-tip mitoses; figs. 70, 71, 80—82, and 84a, 85 and 86 are PMC's, 1st metaphase, fig. 87 2nd anaphase.

Fig. 66, *Carex holostoma*, 2n = 60. Fig. 67, *Carex norvegica* s. str., 2n = 56. Fig. 68, *Carex norvegica* ssp. *inserrulata*, 2n = 56. Fig. 69, *Carex atrata*, 2n = 54. Fig. 70, *Carex misandra*, n = 20. Fig. 71, *Carex atrofusca*, n = 19. Fig. 72, *Carex glacialis*, 2n = 34. Fig. 73, *Juncus arcticus*, 2n = about 80. Fig. 74, *Juncus alpinus* ssp. *nodulosus* var. *alpestris*, 2n = 40. Fig. 75, *Juncus subtilis*, 2n = 40. Fig. 76, *Juncus ranarius*, 2n = 30. Fig. 77, *Juncus castaneus*, 2n = 60. Fig. 78, *Juncus trifidus*, 2n = 30. Fig. 79, *Salix Uva-ursi*, 2n = 38. Fig. 80, *Betula aff. tortuosa*, n = 28. Fig. 81, *Oxyria digyna*, n = 7. Fig. 82, *Koenigia islandica*, n = 14. Fig. 83, *Stellaria humifusa*, 2n = 26. Fig. 84a, *Cerastium Cerastoides*, n = 19. Fig. 84b, *Cerastium Cerastoides*, 2n = 38. Fig. 85, *Cerastium alpinum*, n = 54. Fig. 86, *Minuartia rubella*, n = 13. Fig. 87, *Arenaria pseudofrigida*, n = 20. (Figs. 66—75, 77, 78, 80—86 × 4000, figs. 76, 79, and 87 × 3000).

in which the considerable variation in size of the bivalents is clearly seen. HOLMEN (1952) found plants from Peary Land to have the same number. Spitsbergen plants counted by FLOVIK (1942) also have this number.

127. **Carex atrofusca** Schk. — MANSFELD, 1938c: 219. For the earliest Greenland finds see SIMMONS, 1904: 473, *C. ustulata* Wbg.

Of this very spectacular *Carex* species we have collected material for the study of PMC-meiotic divisions on Clavering Island in NE Greenland and root-tips from Nugssuaq, NW Greenland. The pollen mother cells are well fixed and in many cells n = 19 could be established with full certainty (fig. 71).

The root-tip mitoses, on the other hand, are very badly fixed, and no certainty as to the exact number could be obtained. This is true not only of the slides of the Greenland plants, but also of those of LEVAN of Scandinavian material, which we have had on loan for examination. Some cells in his slides point to 2n = 36, others to 2n = 38, corresponding to the gametic number of 19. As far as the root-tips of the NW Greenland plants are concerned, we are much in the same situation, some cells giving 36, others 38, and a few 40 as the best estimate. We are inclined to think that the diploid number is 2n = 38 for all plants of this species, and not 36 as given by HEILBORN (1924) and by LEVAN (see Á. and D. LÖVE, 1948), nor 40 as preliminarily reported by SØRENSEN and WESTERGAARD (in Á. and D. LÖVE, 1948).

128. **Carex viridula** Michx. — MACKENZIE, 1935: 303, see also WIINSTEDT, 1948: 201. (LANGE I: 149, *C. Oederi* Retz.).

The Greenland material formerly passing as *C. Oederi* belongs to the American *C. viridula* Michx., easily recognized by its evenly tapering broad and flat beak with the denticulate teeth converging at the apex (cf. WIINSTEDT *loc. cit.*). The root-tips of our Greenland material from BW 1 proved to be unsatisfactory and exact chromosome counts could not be made. The best estimate is 2n being not less than 67, and very likely the true number is 70, just as in the Swedish *C. Oederi* plants counted by HEILBORN (1924). We do not agree with DAVIES, 1953, concerning the occurrence of *C. demissa* Hornem. in Greenland. For other counts of the collective species see DAVIES, 1955.

129. **Carex glacialis** Mack. — MACKENZIE, 1935: 221. (LANGE I: 151, *C. pedata* Wbg.).

Many mitoses were present in root-tips of plants fixed on the Nugssuaq Peninsula in NW Greenland. The chromosome number is 2n = 34; the chromosomes show some variation in size, similar to the situation found in other *Carex* species with low numbers (fig. 72).

This number is in accordance with that given by KNABEN (1950) in plants from Norway.

130. **Carex capillaris** L. — Lange I: 148. For smaller units, see Böcher, 1952a: 51.

The material counted by us is from BW 1 in SW Greenland. The root-tips were badly fixed, and only an estimate of the chromosome number could be made, giving a figure slightly above 50. Most probably 54 is the real number as previously reported by Heilborn (1924) and by Levan (Á. and D. Löve, 1948).

131. **Carex rostrata** Stokes — Ostenfeld, 1902: 93; cf. also Nelmes, 1942: 105. (Lange I: 152, *C. ampullacea* Good.).

132. **Carex saxatilis** L. — Mackenzie, 1935: 449. (Lange I: 152—153, *C. pulla* Good., *C. vesicaria* L., *C. rotundata* Wbg.; see Seidenfaden and Sørensen, 1937: 83).

Meiotic divisions were present in abundance in material of male spikes of plants from Clavering Island, NE Greenland. As the fixation proved to be satisfactory, the chromosome number of n = 40 could be counted with full certainty. This number is in agreement with the countings of Heilborn (1924) for Swedish plants and of Flovik (1942) for plants from Spitsbergen.

Juncaceae.

133. **Juncus arcticus** Willd. — Lange I: 124.

Counts from root-tips of this and of most other *Juncus* species are made with great difficulty as the fixation of the metaphase chromosomes is usually very bad. The late prophases are mostly better fixed, but the large number of small chromosomes makes it difficult to reach a definite estimate in most cases.

In the present species root-tip prophases of a plant from BW 1, SW Greenland, showed about 80 chromosomes (fig. 73). Holmen (unpublished) has found the same number in plants from Sdr. Strømfjord, NW Greenland.

This chromosome number disagrees to a marked degree with that found in Swedish material by Á. and D. Löve (1945b), who give 2n = app. 100, the number claimed to be not lower than 95 and not higher than 105.

134. **Juncus balticus** Willd. — Ostenfeld, 1902: 23. (See Polunin, 1943: 376; Hylander, 1953:178, *J. arcticus* ssp. *intermedius* Hyl.).

135. **Juncus filiformis** L. — Lange I: 124.

J. filiformis is of frequent occurrence in Southern Greenland. Root-tips fixed at BW 1 gave no opportunity for an exact count, but a fairly safe estimate of 2n = about 80 could be made. This is in agreement with Wulff (1938) for German material. The same number is given by Á. and D. Löve (1945b) without any reservation from counts of Swedish plants.

In spite of what might be expected in a uniform species like *J. filiformis*, Vaarama (in Á. and D. Löve, 1948) reports the finding of 2n = 40 in Finnish material. Dr. Vaarama has been kind enough to send us a specimen of his stock, and it seems in all respects to be identical with the Greenland type. At present we are unable to solve this puzzling problem.

136. **Juncus alpinus** Vill. ssp. **nodulosus** (Wbg.) Lindm. var. **alpestris** (Hartm.) Hyl. — Hylander, 1945: 107. (Lange I: 124, *J. alpinus* Vill.).

The collective species *J. alpinus* has always been very difficult to deal with, and very likely a proper subdivision will not be possible until cytologists and taxonomists join in a broad attempt to solve the problem.

As far as Greenland is concerned, only one type exists (cf. Lindquist, 1932), contrary to what is — by a misunderstanding — said by Böcher (1938) and by Lindquist (1940). The Greenland type is considered by Polunin (1943) to be *J. rariflorus* Hartm., which name according to Hylander (*loc. cit.*) should be replaced by *nodulosus* Wbg. We are inclined to refer the Greenland plant to *J. alpestris* Hartm., although possibly it may not be quite identical with the alpine Scandinavian plant for which the name was apparently first proposed. In view of the very intricate nomenclature of this group we follow Hylander (*loc. cit*), who made *alpestris* a variety subordinate to ssp. *nodulosus*. Curiously enough, later on he (Hylander, 1953: 182) has found *alpestris* not even worthy of varietal rank.

Somatic mitoses from root-tips and from staminal tissue of two plants from BW 1 (SW Greenland) both had 2n = 40; one of the plates is shown in fig. 74. This number is only half of that reported for Scandinavian plants of ssp. *nodulosus* by Vaarama and by Á. and D. Löve (in Á. and D. Löve, 1948).

In another subspecies of *J. alpinus*, ssp. *arthrophyllus* (Brenn.) Hyl. (Hylander, 1953), Á. and D. Löve (1945b) report 2n = 40 for Swedish material. The *alpestris* variety of the ssp. *nodulosus* thus in its chromosome number joins this subspecies. Preliminarily we are inclined to think that the raising of the *alpestris* variety to a subspecies, ranking with the other two, will best fit the above facts. But detailed morphological studies of plants whose chromosome number are known, still have to be made in order to clear up things definitely.

137. **Juncus subtilis** C. A. Mey. — Fernald, 1934a: 92. See also Böcher, 1938: 246. (Lange III: 714, *J. supinus* Mönch).

Fixations of root-tips were made at Godthaab, SW Greenland. Good metaphases are present, in which 2n = 40 could be counted with certainty (fig. 75). As usual in *Juncus* the chromosomes are small and short, but nevertheless show some variation, 4 being decidedly shorter than the others.

138. **Juncus squarrosus** L. — Lange I: 124.

139. **Juncus Gerardi** Lois. —

This is the first report of the species from Greenland. A few specimens were collected at Kaersuarssuk, Tunugdliarfik Fiord in SW Greenland, by C. A. JØRGENSEN in 1948.

140. **Juncus ranarius** Perr. et Song. — BÖCHER, 1952a: 58. (LANGE I: 125, *J. bufonius* L.). Cf. M. P. PORSILD, 1932: 52, and SEIDENFADEN and SØRENSEN, 1937: 165.

This species was formerly included in the collective species of *J. bufonius*. Both species are, however, even in their present delimitation, highly polymorphic, and just as in the case of *J. alpinus* a detailed cyto-taxonomic study is needed to put things right.

J. ranarius from BW 1, SW Greenland has 2n = 30, counted in root-tips (fig. 76). We were highly surprised to find this number, since WULFF (1937a) gives 2n = app. 120 for plants from Germany. On the first occasion possible we had fixations of Danish plants made (from Selsø, Zealand) and these in accordance with the Greenland specimens showed 2n = 30.

On the other hand *J. bufonius* s. str. has been counted by Á. and D. LÖVE (1948), their material being collected at Östersund, Sweden. They report 2n = about 120. We are therefore inclined to suppose that WULFF's *ranarius* plants were really *J. bufonius*.

In the same paper (1937a) WULFF has dealt with *J. bufonius* and with much reservation gives its diploid number as about 60, half of that the other. Other numbers, however, exist in the species, as we in Danish plants from another locality in Zealand, Sortemose, counted 2n = 80 in root-tip mitoses.

141. **Juncus castaneus** Sm. — LANGE I: 123.

The material of this species consisted of root-tips of plants from Wollaston Foreland, NE Greenland. The slides were sufficiently good to allow a safe count of the chromosome number to be made, 2n being 60 (fig. 77). The Greenland plants thus as regards their chromosome number deviate from the Scandinavian ones, for which Á. and D. LÖVE (1948) report 2n = 40. This difference, if substantiated by a recounting, is in our opinion to be taken as indicative of a specific difference between the two provenances of plants.

142. **Juncus triglumis** L. — HULTÉN, 1943: 431. (LANGE I: 123. See also DEVOLD and SCHOLANDER, 1933: 110).

Flower heads of this species were fixed for PMC divisions on Clavering Island, NE Greenland. The material proved very difficult to handle, the staining being unsatisfactory. A fairly good estimate was, however, reached, the haploid number being in all probability 65, certainly higher than 63 and not exceeding 67. HOLMEN (1952) reports that in his material from Peary Land, North Greenland, the best counts of

PMCs give n = app. 67, and that the same number is present in plants from Iceland and Switzerland.

This number is very different from that of 2n = 50 counted in Swedish plants by Á. and D. Löve (1945b). Thus the Greenland plants, which by taxonomists have been referred to *J. albescens* (Lge.) Fernald (1933: 236), a species which we do not consider well founded, have the same chromosome number as plants from the Alps. For this reason we do not think it likely that both numbers, 2n = 50 and 2n = app. 130, exist within *J. triglumis*. The specimens counted by Á. and D. Löve in our opinion probably belong to another species.

143. **Juncus biglumis** L. — Lange I: 122.

Holmen (1952) from fixations of flower-buds from Peary Land has beautiful slides of PMCs, in which n = 60 could be stated with full certainty.

144. **Juncus trifidus** L. — Lange I: 123.

In material of root-tips from BW 1 in SW Greenland, 2n = 30 (fig. 78) was counted with finality. This determination is in accordance with that of Á. and D. Löve (1945b) on Swedish material.

145. **Luzula parviflora** (Ehrh.) Desv. — Lange I: 125.

The somatic chromosomes, counted in root-tips of a plant from BW 1, SW Greenland, are similar in size. One pair has a conspicuous trabant, which also shows beautifully on the nucleolus of the resting nucleus. A very minute trabant seems to be present also on a second pair of chromosomes, but of that we are not quite certain.

The diploid number amounts to 2n = 24. This is in agreement with Böcher and Larsen (1950) and with the counts from other countries, for which Nordenskiöld (1953) should be consulted. Considering the wealth of figures in that paper we have defrayed from publishing drawings from our slides.

146. **Luzula Wahlenbergii** Rupr. — Holmen and Mathiesen, 1953: 233.

This species was found for the first time in Greenland in 1947 at Wollaston Foreland, NE Greenland (Holmen and Mathiesen, *loc. cit.*). These authors also found the chromosome number to be 2n = 24. Nordenskiöld (1951) found the same number in plants from Abisko (North Sweden), whereas Á. and D. Löve (1945b) reported 2n = 36 in plants, which were likewise collected in the Abisko region. We agree with Nordenskiöld that it is highly improbable that both numbers should occur in this species.

147. **Luzula arcuata** (Wbg.) Sw. — Hylander, 1945: 108; 1953: 185. (Lange I: 126—127, comprising *L. arcuata* (Wbg.) Hook. and *L. confusa* Lindeb.).

The cytological situation in this species is a confused one: The number 2n = 36 has been found in a number of cases, viz. in plants from Nugssuaq Peninsula, NW Greenland, by ourselves, by Böcher and Larsen (1950), and by Knud Jakobsen (unpublished), from Angmagssalik by Böcher and Larsen (*loc. cit.*) and Nordenskiöld (1951), and from Peary Land (Holmen, 1952). Outside Greenland this also seems to be the most common number (see Knaben, 1950, Nordenskiöld, 1951).

The number 2n = 42 has been reported by Nordenskiöld (*loc. cit.*) in plants from Lappland, growing together with plants having 36 chromosomes.

Higher numbers are also recorded. Thus Knaben (1950) on Knutshö, Central Norway, found plants with 2n = 48, again growing mixed with the 36-chromosome type, and Holmen (*loc. cit.*) mentions 2n = 44—48 in plants collected at Zackenberg, NE Greenland.

All these counts were made on root-tip mitoses, and although the fixation of these often is not very satisfactory, the numbers must be considered well-founded.

Fixations of flower buds for meiotic divisions were available to us from Clavering Island, NE Greenland. A detailed study of good slides from this material has been made and it was found that M_I has a varying number of chromosome configurations, ranging from 18 to 24. In cells with the lowest number, polyvalent associations may be present, in those with higher numbers small chromosomes, possibly univalent, are seen.

The taxonomical situation is likewise confused, and only further studies, involving a detailed description of the plants, a determination of their chromosome number, meiotic behaviour, and fertility, may disentangle the problems.

148. **Luzula arctica** Blytt — Lange I: 127.

Of this species we have material of flower buds from Clavering Island, NE Greenland. The meiotic divisions beautifully display the haploid number to be n = 12.

This is in accordance with the findings of Holmen (1952) and K. Jakobsen (unpublished) on material from Peary Land and Olrik Fiord (North Greenland), and of Nordenskiöld (1949, 1950) and Knaben (1950) on Scandinavian plants from Lappland, Sweden, and from Kongsvoll, Norway, respectively.

149. **Luzula frigida** (Buchen.) Sam. — M. P. Porsild, 1920: 63. (Lange I: *L. multiflora* Lej. pro parte, cf. Böcher, 1950: 11 et seq., *L. multiflora* ssp. *frigida* (Buchen.) Krecz.).

Root-tips of a typical plant fixed at Holsteinborg, NW Greenland, showed 2n = 36 in the mitotic divisions. This is in agreement with Hagerup 1941 (material from West Greenland) and with Böcher and Larsen, 1950, and Böcher, 1950 (plants from the Nugssuaq Peninsula, leg. Knud Jakobsen, and from the environment of Ivigtut, in which material plants of var. *contracta* Sam. were included). Outside Greenland chromosome counts have been made on Swedish plants (Nordenskiöld, 1949, 1951, Á. and D. Löve, 1945b), giving the same number.

In his paper on the flora of the Julianehaab district of SW Greenland, Polunin (1943: 378) records the find of *L. sudetica* (Willd.) DC. (*L. frigida* of recent authors) in that area. We do not find this justified, because plants from there do not agree with specimens from Central Europe.

150. **Luzula multiflora** (Retz.) Lej. — LANGE I: 125, *L. multiflora* p. p., cf. BÖCHER, 1950: 11 et seq., *L. multiflora* (Retz.) Lej., s. str.

151. **Luzula groenlandica** T. W. Böcher — BÖCHER, 1950: 18.

This new species, in the establishment of which knowledge of its chromosome number was the most guiding fact, was found by BÖCHER and LARSEN (1950) to have 2n = 24 (material from Sdr. Strømfjord, NW Greenland and from Ungawa, Canada). NORDENSKIÖLD (1951) confirms this number in plants from Ontario, Canada.

152. **Luzula spicata** (L.) DC. — LANGE I: 128.

The haploid number of this species was determined from PMCs of material from Clavering Island, NE Greenland. It was found to be n = 12, the same number as reported by BÖCHER (1938) from Angmagssalik, SE Greenland. The same number is also present in plants from U.S.A., Scandinavia, and the Alps, but in the last-mentioned region also the numbers 2n = 12 and 2n = 14 have been found by NORDENSKIÖLD (1951).

Liliaceae.

153. **Tofieldia coccinea** Richards. — LANGE III: 712.

Of plants growing at Kuk, Nugssuaq Peninsula, NW Greenland, root-tips were fixed and gave full evidence of 2n = 30.

154. **Tofieldia pusilla** (Michx.) Pers. — HYLANDER, 1945: 111. (LANGE I: 122, *T. borealis* Wbg.).

We have counted root-tips of this species, collected on the Nugssuaq Peninsula near the locality of *T. coccinea*, and again found 2n to be 30. The same number has been recorded by MILLER (1930) in plants of unknown origin.

155. **Streptopus amplexifolius** (L.) DC. — LANGE I: 121.

Iridaceae.

156. **Sisyrinchium montanum** Greene — FERNALD, 1946: 159. (IVERSEN, 1938: 113, *S. angustifolium* Mill.).

The chromosome number of this plant is 2n = 32, counted in specimens found by BÖCHER at the head of Sdr. Strømfjord, NW Greenland (BÖCHER and LARSEN, 1950). FERNALD (*loc. cit.*) refers the Greenland plant to var. *crebrum* Fern.

Orchidaceae.

157. **Orchis rotundifolia** Banks — GLEASON, 1952 I: 458; cf. also OSTENFELD, 1902: 37. (LANGE I: 119, *Platanthera rotundifolia* Lindl.).

158. **Leucorchis straminea** (Fern.) Á. Löve — Á. Löve 1950: 36; see also Fernald, 1926: 174. (Lange I: 118, *Habenaria albida* R. Br.).

This arctic species, formerly known by the name of *Habenaria albida* R. Br. is well separated from *Leucorchis albida* (L.) E. Mey.

The chromosome number was determined by Harmsen (1943) on material from Disko Island, NW Greenland, and by Holmen (Ivigtut, SW Greenland, the latter not yet having published his data). Both investigators report n = 21. Á. and D. Löve (1944) give the same number from Iceland.

159. **Platanthera hyperborea** (L.) Lindl. — Lange I: 118.

Harmsen (1943) also succeeded in getting material for counting this species, which like the preceding one was collected on Disko Island. But here, the haploid number proved to be n = 42.

This number also was present in plants from Iceland (Harmsen *loc. cit.*), whereas Humphrey (1934) for a plant of this name from Minnesota, U.S.A., gives n = 21.

160. **Listera cordata** (L.) R. Br. — Lange I: 120.

161. **Corallorhiza trifida** Chât. — Mansfeld, 1938a: 154; Fernald, 1946: 193 et seq. (Lange I: 120, *C. innata* R. Br.).

In flower buds collected at Ivigtut, SW Greenland, plenty of pollen-mitoses happened to be present. They definitely proved the haploid number to be 21. This is the same chromosome number as that reported for the species by Hagerup (1941) in material from Denmark.

Salicaceae.

162. **Salix herbacea** L. — Lange I: 107.

163. **Salix Uva-ursi** Pursh — M. P. Porsild, 1920: 65, see also Floderus, 1923: 108. (Lange I: 108, *S. Myrsinites* L. var. *parvifolia* And.).

The Greenland plants of *S. Uva-ursi* from BW 1, SW Greenland, have in their root-tip mitoses 38 small chromosomes, all of the same size (fig. 79).

As seen from the above reference to Lange, *S. Uva-ursi* was earlier considered a variety of *S. Myrsinites* L., a Eurasian species. In this species a very odd cytological situation exists: First Marklund (see Holmberg, 1931: 33) reported 2n = 152, a very high number to be counted without reservation. Later Wilkinson (1944) counted 2n = 38 and 2n = 190, a still higher number. The latter number was counted on plants from Norway. The above facts make it very likely that the 38-chromosome plants counted by Wilkinson actually belong to *S. Uva-ursi.* Unfortunately Wilkinson did not state the origin of the 38-chromosome plants.

164. **Salix arctica** Pallas — Lange II: 279 (Lange I: 108, *S. groenlandica* (And.) Lundstr. pro parte. See also Floderus, 1923: 130).

Holmen (1952) counted 2n = 76 in Peary Land specimens.

165. **Salix arctophila** Cock. — Hultén, 1943: 513; see also Floderus, 1923: 158, *S. chloroclados*. (Lange I: 108, *S. groenlandica* (And.) Lundstr. p.p.).

The root-tips of this species, fixed at BW 1, SW Greenland, were in a bad condition and contained few divisions. Only a rough estimate of the chromosome number could be made on prophases, giving 2n not lower than 70 and not higher than 80. As all *Salix* species hitherto counted have euploid numbers, 76 is the most probable figure.

166. **Salix cordifolia** Pursh — Schneider, 1918: 343. (Lange I: 110, *S. glauca* L. pro parte). Including var. *callicarpaea* (Trautv.) Fern., in Fernald, 1926: 184.

167. **Salix glauca** L. — Lange I: 110, *S. glauca* L. pro parte (and *S. lanata* L., cf. also Lange III: 704).

The intricate problem of the proper name and status of the South Greenland "*Salix glauca*" is left open here. We only want to add that the Greenland plants are very close to Scandinavian *S. glauca* var. *stipulifera* (Flod.), and that *S. cordifolia* var. *intonsa* Fern. (Fernald, 1926: 185) in all probability covers the Greenland plant and should be separated from *S. cordifolia*. The status of *S. anamesa* Schneid. (Schneider, 1918: 348) is quite uncertain (see Fernald *loc. cit.*, p. 186).

Betulaceae.

168. **Betula glandulosa** Michx. — Lange I: 113.

Of this American species, in Greenland restricted to the southernmost part, root-tips were fixed at BW 1. The number was found to be 2n = 28, the same number as previously known in the following species.

169. **Betula nana** L. — Lange I: 112.

The root-tips of *B. nana*, in which we counted 2n = 28, the same number as reported from Spitsbergen (Flovik, 1940) and from Sweden (Á. and D. Löve, 1945a), were fixed on the peninsula Nugssuaq, NW Greenland.

170. **Betula** aff. **tortuosa** Ledeb. — Lange I: 113—114, *B. intermedia* Thom. and *B. odorata* Bechst. var. *tortuosa* Rgl.; see also M. P. Porsild, 1932: 55 *et seq.*

The birches of southern Greenland growing into trees and tall shrubs are related to the birches of the Scandinavian mountains, classified as *B. tortuosa*. Just as these the Greenland birches are highly polymorphic, but the range of variation in the two regions differs markedly. Some 30 specimens of different types from different localities in SW Greenland have been counted, n being in all of them 28 (fig. 80). No doubt these birches form an interbreeding population. Scandinavian *B. tortuosa* and *B. pubescens* both have the same chromosome number (see Á. and D. Löve, 1948).

B. alpestris Fr. in Lange I: 113 mainly represents hybrids between the above arborescent birch and *B. glandulosa* Michx.

171. **Alnus crispa** (Ait.) Pursh — Hultén, 1944: 586. (Lange I: 111, *A. ovata* (Schr.) var. *repens* (Wormskj.) Lge.).

Polygonaceae.

172. **Rumex domesticus** Hartm. — Lange I: 106. Cf. M. P. Porsild, 1932: 59.

173. **Rumex Acetosa** L. — Lange I: 106. (See also Hylander, 1945: 131; Á. and D. Löve, 1948, Appendix I: 107. Cf. M. P. Porsild, 1932: 60).

The Greenland material of this species has not been subjected to any detailed taxonomical study, but we do not feel tempted to follow the various suggestions of Á. Löve as to the proper classification of the many types. According to Á. Löve (1944) the ssp. *alpestris* (Scop.) Löve and ssp. *pratensis* (Wallr.) Blytt et Dahl both occur in Greenland.

We have studied root-tip mitoses of a female plant, not determined to subspecies, collected at BW 1, SW Greenland, and found the diploid number to be $2n = 14$. This number is common to all the types within the species hitherto counted (Ono, 1928; Á. Löve, 1942).

174. **Rumex Acetosella** L. s. str. — Á. Löve, 1944: 3; see also Á. and D. Löve, 1948, Appendix I: 108 (Lange I: 106, *R. Acetosella* pro parte). Cf. M. P. Porsild, 1932: 11 on introduced types.

R. Acetosella is a common plant in the southern parts of Greenland. Plants were collected and fixations of root-tips made of ♂ and ♀ plants at BW 1 in SW Greenland and at "Revet" on the mainland, west of Clavering Island in NE Greenland. In the plants from both localities $2n = 42$ was found, in agreement with the number previously given by Á. Löve (1944).

175. **Rumex tenuifolius** (Wallr.) Á. Löve — Á. Löve, 1941: 99 and 1944: 3. (Lange I: 106, *R. Acetosella* L. pro parte).

176. **Rumex graminifolius** Lamb. — Á. Löve, 1944: 3.

177. **Oxyria digyna** (L.) Hill — Lange I: 105.

O. digyna is widespread in the arctic regions and on high mountains farther south. Many investigators have counted this species, which is easily accessible and has a low chromosome number. All agree to $2n = 14$. Flower buds from Clavering

Island, NE Greenland, showing n = 7 were counted by us (fig. 81). Other Greenland records are due to HARMSEN (unpublished, SW Greenland), BÖCHER and LARSEN, 1950 (Godthaab, SW Greenland, and Nugssuaq Peninsula, NW Greenland), HOLMEN, 1952 (Peary Land, North Greenland). Outside Greenland countings have been made by FLOVIK, 1940 (Spitsbergen), Á. and D. LÖVE, 1948 (Iceland), BÖCHER and LARSEN, 1950 (Canada, Kola Peninsula) KNABEN, 1950 (Norway), and LARSEN, 1954 (European Alps).

178. **Koenigia islandica** L. — LANGE I: 104.

Of this annual species flower buds develop through the summer and meiotic stages in the PMCs are easily found. The present illustration (fig. 82) refers to plants from Clavering Island, NE Greenland, and shows the haploid number of 14, the bivalents being almost alike in size and shape. This is in conformity with the result of HAGERUP (1926) obtained on plants from West Greenland and from the Faroes. Also HOLMEN (1952) has dealt with this species and counted 42 chromosomes in endosperm mitoses in material from Peary Land.

179. **Polygonum aviculare** L. s. l. — LANGE I: 105 (var. *borealis* Lge.). Cf. M. P. PORSILD, 1932: 12 and 28.

180. **Polygonum viviparum** L. — LANGE I: 105.

HOLMEN (1952) has attempted the difficult task of counting the chromosome number of this plant and arrives at 2n = app. 100, apparently the same number as in Spitsbergen plants according to FLOVIK (1940). For other counts see the chromosome list p. 120.

Chenopodiaceae.

181. **Atriplex** cf. **glabriuscula** Edmondst. — HYLANDER, 1945: 142. (LANGE III: 702, *A. Babingtonii* Woods. Cf. M. P. PORSILD, 1932: 64, *A.* sp. (*longipes*?)).

Only young specimens which do not allow a definite determination are available.

Portulacaceae.

182. **Montia fontana** L. ssp. **fontana** Walters — WALTERS 1953: 4. (LANGE I: 32, *M. rivularis* Gmel.).

The specimens from Greenland in the Copenhagen Arctic Herbarium belong to this subspecies. Seedlings for chromosome counts were raised in Denmark from seeds collected by J. GRØNTVED at Eqaluit, SW Greenland. In these plants the diploid number is 20.

Through the kindness of Dr. O. HAGERUP we have had occasion to study his slides, made many years ago, on which his statement of n = 9 for *M. minor*, *M.*

rivularis, and *M. lamprosperma* from Denmark is based. At present it is not possible to decide whether the haploid number is 9 or 10, but in our opinion it may just as well be the latter as the former. This also holds true of HAGERUP's material of *M. rivularis* from Greenland, which is from the same locality as our seedlings. SCHEERER (1939, 1940) reports 2n = 18 in *M. minor* and 2n = 20 in *M. rivularis*.

Caryophyllaceae.

183. **Stellaria media** (L.) Vill. coll. — LANGE I: 27. Cf. M. P. PORSILD, 1932: 13 and 63.

184. **Stellaria calycantha** (Ledeb.) Bong. — HULTÉN, 1944: 648. (LANGE I: 28, *S. borealis* Big., and *S. uliginosa* Murr.; cf. SIMMONS, 1904: 471).

185. **Stellaria longipes** Goldie s. str. — HULTÉN, 1943a: 256. See also BÖCHER, 1951a: 403. (LANGE I: 29, *S. longipes* Goldie pro parte).

The former collective species *S. longipes* Goldie has recently been divided into a number of elementary species by HULTÉN (1943), to whom also the identification of part of the Greenland material is due.

Plants belonging to *S. longipes* Goldie s. str., growing at Qutdligssat, Disko Island, NW Greenland, were fixed, and the root-tips examined. 2n = 104 was found, the number being counted without ambiguity.

A survey of the Greenland species of the *longipes* group has recently been made by BÖCHER (*loc. cit.*). In BÖCHER and LARSEN (1950) and in BÖCHER (*loc. cit.*) plants with 2n = 52, collected by Dr. MARIE HAMMER at Churchill, N. Canada, are referred to the present species. Until a definite statement has been made of the identity of the Greenland and the Canadian material in all details, we feel inclined to presume that the 52-chromosome plants should be referred to a different species. See also BÖCHER, 1952a: 20.

186. **Stellaria monantha** Hult. — HULTÉN, 1943a: 267. (LANGE I: 29, *S. longipes* Goldie pro parte. See also BÖCHER, 1951a: 405).

Two collections of this species, one of two plants from BW 1, SW Greenland, the other from Qutdligssat, Disko Island, NW Greenland, have been studied cytologically by us. All the three plants had 2n = 104 in their root-tip mitoses, the number being stated with fair certainty.

Our finds are in accordance with BÖCHER and LARSEN (1950), who in plants from Sdr. Strømfjord, NW Greenland, also found 2n = 104.

187. **Stellaria crassipes** Hult. — HULTÉN, 1943a: 263. (LANGE I: 29, *S. longipes* Goldie pro parte. See also BÖCHER, 1951a: 408).

188. **Stellaria ciliatosepala** Trautv. — Hultén, 1943a: 258. (Lange I: 29, *S. longipes* Goldie pro parte. See also Böcher, 1951a: 412).

Root-tips of a plant from Clavering Island, NE Greenland, beautifully showed the diploid number of this species to be 2n = 91.

This number is an odd multiple of 13, the basic number of the group, and the species must therefore be of hybrid origin. Its sexual reproduction is very scarce, if any, since only female plants seem to exist. It propagates mostly by runners and shoots breaking loose from the stems.

Of the two supposed parents, one has to be found among the species with 104 chromosomes, and for the other the chromosome number will have to be 78, a number not hitherto counted within the *longipes* complex. It may be one of the following species of which the chromosome number is still unknown.

189. **Stellaria laeta** Richards. — Hultén, 1943a: 265. (Lange I: 29, *S. longipes* Goldie pro parte. See also Böcher, 1951a: 413).

190. **Stellaria Laxmanni** Fisch. — Hultén, 1943a: 261. (Böcher, 1951a: 414). The record of this species from Greenland is due to Böcher (*loc. cit.*).

191. **Stellaria humifusa** Rottb. — Lange I: 28.

Both root-tips and flower buds of this species have been examined, the former from the Nugssuaq Peninsula, NW Greenland, the latter from Clavering Island, NE Greenland. The collections agree as to chromosome number and morphology. The root-tip mitoses show 2n = 26, the chromosomes being small and of almost equal size and with median constrictions (fig. 83); the PMCs show the haploid number of 13, the bivalents being small and subspherical. Flovik (1940) has the same number from Spitsbergen.

192. **Cerastium Cerastoides** (L.) Britt. — Hylander, 1945: 147. (Lange I: 30, *C. trigynum* Vill.).

Only one collection of our own has been available for study. It consists of flower buds fixed at Scoresbysund, NE Greenland. The slides of these buds made it possible to settle the haploid number as well as the diploid. The haploid number of 19, in size somewhat different, chromosomes, was counted in a PMC first metaphase (fig. 84a). The number could be stated with finality.

In the nucellar somatic tissue many mitoses were present and some of these allowed 2n = 38 to be counted beyond doubt (fig. 84b). The chromosomes vary somewhat in length and all have median constrictions. The number and morphology of the chromosomes of *C. Cerastoides* given above are in full accordance with the findings of Favarger and Söllner (1949) and Söllner (1954) in material from the Alps, as well as with plants from SW Greenland studied by Böcher and Larsen (1950).

The NE Greenland material referred to above was previously studied by Westergaard, who in Á. and D. Löve (1948) gave the number as n = 20. This statement is no longer valid, and the same is in our opinion the case with the earlier similar count of Böcher (1938 c).

Plants from Nugssuaq Peninsula, NW Greenland, studied by Böcher and Larsen (1950) and by ourselves, do not seem to fit the 38 number. As the material of root-tips is scarce and the fixation not very good, no definite statement of the exact number could be made. It is certainly lower than 38, and the best plates show 36 chromosomes, of which two are smaller than the others. It is therefore interesting to note that Mattick (in Tischler, 1950) gives the number of *C. Cerastoides* from Austria as 2n = 36. Hence there seems to be some indication that 38 and 36 chromosome races of this species exist both in Greenland and in Central Europe. This interpretation is not, however, accepted by Söllner (1954).

The same situation is apparently present in *C. arvense* L. coll., for which species Brett (1952) records the numbers 38 and 36—72. See, however, Söllner (*loc. cit.*).

193. **Cerastium arvense** L. coll. — Lange II: 245.

194. **Cerastium alpinum** L. coll. — Lange I: 31, including *C. arcticum* Lge. (*loc. cit.*), so far as Greenland specimens are concerned.[1] — As to *C. hyperboreum* Tolm. (Tolmatchew 1930: 6), see Gelting, 1934: 37.

In this collective species with 9 as the basic number, several high multiples are known. The number most safely established by us in Greenland is n = 54, counted on M_I and A_I of PMCs of plants from Clavering Island, NE Greenland (fig. 85). Fairly good counts of root-tip mitoses were made on plants from other parts of Greenland, although the fixations are not always very satisfactory. The numbers found are 2n = 72 and 108. In addition to these, 2n = 54 has been reported by Böcher and Larsen (1950).

A pooling of all the evidence of chromosome numbers of *C. alpinum* in Greenland gives the following picture: Starting in North and NE Greenland we have 2n = 108 (Peary Land, Holmen (1952), Clavering Island (see above)). From the SE coast nothing is known, but from SW Greenland 5 determinations are at hand, of which one is due to Böcher and Larsen (*loc. cit.*) and four have been made by ourselves. In all cases 2n is 72. From NW Greenland (Holsteinborg, Sdr. Strømfjord, and the Disko Bay area) 9 countings are at hand, of which one shows 2n = 54 (Böcher and Larsen, 1950), five have given 2n = 72, and three plants have 2n = 108. Corresponding to the variation in chromosome number in the Disko area, the plants show much morphological variation, to which no doubt hybrids between the different chromosome types contribute. Plants having chromosome numbers more or less

[1] *Cerastium arcticum* Lange is figured by him in the *Flora Danica*, tab. 2963. The plate includes four plants, which, as is evident from growth-habit, and shape of leaves and sepals, belong to two different species. Lange's description fits best with figs. 3 and 4, the latter being stated to originate from Iceland. It is apparently identical with *C. Edmondstonii* Murb. et Ostf. The other two plants, figs. 1 and 2, which are from Greenland, probably belong to Tolmatchew's *C. hyperboreum*, which we for the present include in *C. alpinum* coll. (See also A. E. Porsild, 1955: 107). For these reasons the discussion of the status of *C. arcticum* by Polunin (1954) and Brett (1954) is irrelevant.

intermediate between 54 and 72 and between 72 and 108 have been encountered, but an exact establishment of the actual number was not possible.

From outside Greenland the following determinations have been reported: 2n = 72, Á. and D. Löve, 1945 a (Plants from Abisko, North Sweden) and Brett, 1950 (Plants from Scotland). Besides, Brett, 1952, 1953, 1955 on British material reports 2n = 72, 108, and app. 144. Recently Söllner (1954) counted 2n = 72 in plants from Norway, Canada, Sweden, Scotland, the Alps, and the Pyrenees, whereas 2n = 108 was counted on another sample from Canada, and in *C. Edmondstonii* from the Shetland Islands (see also Brett, 1955).

Evidently the polymorphism and variation in chromosome number in this species is much the same as that in the *Stellaria longipes* group, and a similar subdivision has been attempted (Hultén, 1956).

195. **Cerastium Regelii** Ostf. — J. Vaage, 1932: 26. See also Gelting, 1934: 39. (Dusén, 1901: 22, *C. Edmonstonii* (Wats.) Murb. et Ostf.).

C. Regelii has been collected for chromosome counting by Holmen (1952) in Peary Land, North Greenland. The number is n = 36, which is in accordance with that reported by Flovik (1940) for material from Spitsbergen.

196. **Cerastium fontanum** Baumg. ssp. **scandicum** Gartner — Gartner, 1939: 68. (Lange I: 30, *C. vulgatum* L. ssp. *alpestre* Hartm.).

197. **Cerastium holosteoides** Fr. emend. Hyl. — Hylander, 1945: 150. (Lange II: 245, *C. vulgatum* L., see also Gartner, 1939: 68). Cf. M. P. Porsild, 1932: 62.

198. **Sagina nodosa** (L.) Fenzl — Lange I: 23. Cf. M. P. Porsild, 1932: 61.

199. **Sagina caespitosa** (J. Vahl) Lge. — Lange I: 22.

200. **Sagina intermedia** Fenzl — Hylander, 1945: 152. (Lange I: 22, *S. nivalis* (Lindbl.) Fr.).

201. **Sagina saginoides** (L.) Karst. — Hylander, 1945: 152. (Lange I: 21, *S. Linnaei* Presl).

202. **Sagina procumbens** L. — Lange I: 21. Cf. M. P. Porsild, 1932: 61.

203. **Honckenya peploides** (L.) Ehrh. — Ostenfeld, 1920: 265. (Lange I: 26, *Halianthus peploides* (L.) Fr. var. *diffusa* Hornem.).

The chromosome number of this species has been counted to 2n = 48 (Rohweder, 1939, German material), 2n = 64 (Rohweder, *loc. cit.*, likewise German plants), and 2n = 66 (Flovik, 1940, Spitsbergen plants). Malling (1957) has recently nvestigated plants from several countries, including Greenland (Disko Island), Alaska, Denmark, and Germany (including Dr. ROHWEDER's original localities). All these plants had $2n = 68$, which in all probability is the true and only number in this species. We therefore disagree with Á. LÖVE (1950) in his proposal of raising the arctic var. *diffusa* to specific rank.

204. **Minuartia rubella** (Wbg.) Hiern — OSTENFELD, 1923a: 175. (LANGE I: 24, *Alsine verna* Bartl.).

Young flowering shoots of this species, fixed on Clavering Island, NE Greenland, gave good slides in which $n = 13$ (fig. 86) could be counted with full certainty in the PMCs. Meiosis is normal. Its nearest relative, *M. verna* (L.) Hiern from the Alps, has, according to ROHWEDER (1939) $2n = 78$. (See, however, MATTICK in TISCHLER, 1950, who gives n = app. 12 for *M. verna* from this region).

205. **Minuartia stricta** (Sw.) Hiern — OSTENFELD, 1920: 226. (LANGE I: 25, *Alsine stricta* (Sw.) Wbg.).

Flower buds of this plant, also fixed on Clavering Island, were too old for meiotic divisions, but in a dividing EMC the haploid number could be determined to be 13. The number is given here with some slight reservation as the cell was cut by the microtome knife, and the chromosomes are distributed in two consecutive sections.

206. **Minuartia biflora** (L.) Sch. et Thell. — OSTENFELD, 1920: 226. (LANGE I: 23, *Alsine biflora* (L.) Wbg.).

207. **Minuartia Rossii** (R. Br.) Graebn. — OSTENFELD, 1920: 225. (OSTENFELD & LUNDAGER 1910: 18, *Alsine Rossii* (R. Br.) Fenzl). — *M. Rolfii* Nannf.; NANNFELDT, 1954: 161 not to be followed, cf. A. E. PORSILD, 1955: 110, footnote.

According to SIMMONS, 1904: 470, TAYLOR's record of the plant from West Greenland (LANGE I: 25, cf. also LANGE III: 664) refers to *M. rubella*. However, *M. Rossii* was found by us on the west coast at Nugssuaq in 1947, hence the species occurs both in East and West Greenland.

208. **Minuartia groenlandica** (Retz.) Ostf. — OSTENFELD, 1920: 226. (LANGE I: 26, *Alsine groenlandica* (Retz.) Fenzl).

209. **Arenaria humifusa** Wbg. — NORDHAGEN, 1935: 24. (LANGE I: 27, *A. ciliata* L. *β humifusa* (Wbg.) Lge. p.p.: the West Greenland specimens).

210. **Arenaria pseudofrigida** (Ostf. & Dahl) Juz. — JUZEPCZUK in KOMAROV VI: 537, 1936. (LANGE I: 27, *A. ciliata* L. *β humifusa* (Wbg.) Lge. p.p.: the East Greenland plants. See also OSTENFELD & DAHL, 1917: 217 and NORDHAGEN, 1935: 46).

Meiotic divisions were present in PMCs of flower buds collected on Clavering Island, NE Greenland. Fig. 87 shows a second anaphase with $n = 20$ beyond any doubt. The same number has been found by HORN (personal communication)[1] in Norwegian material.

Arenaria norvegica Gunn., counted by the same investigator, has 2n = 80 (personal communication).

211. **Viscaria alpina** (L.) G. Don — LANGE I: 19.

Curiously enough this conspicuous and widespread species has not hitherto been counted from the arctic regions. Plants grown in Denmark from seeds collected by us at Godhavn, Disko Island, NW Greenland, have 2n = 24, the chromosomes being rather large, with median constrictions and of almost equal size (fig. 88).

ROHWEDER (1939) also finds 2n = 24 for *V. alpina*, and recently FAVARGER (1946) counted the same number in plants from the Alps.

212. **Silene acaulis** L. — LANGE I: 19.

In PMCs of plants from Clavering Island, NE Greenland, the chromosome number n = 12 was counted with full certainty (fig. 89). This number has been given by other investigators for material from widespread localities; Spitsbergen (FLOVIK, 1940), North Sweden (D. LÖVE, 1942) and Austria (MATTICK in TISCHLER, 1950). See also TISCHLER, 1950 for further references to countings where the origin of the material has not been stated.

213. **Melandrium apetalum** (L.) Fenzl ssp. **arcticum** (Fr.) Hult. — HULTÉN, 1944: 700. (LANGE I: 19, *M. apetalum*).

Fixations were made on Clavering Island, NE Greenland. Meiotic divisions were present in PMCs and in many cells n = 12 (fig. 90) could easily be counted. HOLMEN (1952) found the same number in plants from Peary Land, North Greenland.

The main species has the same chromosome number as the arctic subspecies, countings being due to D. LÖVE (1942) and to NYGREN (1949b) on Scandinavian plants, and to BLACKBURN (1924).

214. **Melandrium affine** J. Vahl — OSTENFELD, 1920: 227; TOLMATCHEW, 1932: 257, *M. affine* J. Vahl s. str.; SCHISCHKIN in KOMAROV VI: 719, *M. affine* J. Vahl. (LANGE I: 20, *M. involucratum* Cham. et Schldl. *β affine* Rohrb. See also FERNALD, 1932: 21, *Lychnis furcata* (Raf.) Fern.; HYLANDER, 1945: 159, *M. furcatum* (Raf.) Hyl., is in our opinion not to be followed, cf. also comments by BOIVIN, 1951: 7). The intricate nomenclature of the species is fully elucidated by A. E. PORSILD, 1943: 33.

M. affine has been counted from two Greenland localities. We have material from Clavering Island, NE Greenland, in which the PMCs clearly have n = 24 (fig. 91). BÖCHER and LARSEN (1950) report the same number for plants from the Nugssuaq Peninsula, collected by KNUD JAKOBSEN.

[1] The reference to Dr. HORN's paper in Á. & D. LÖVE, 1948 is not correct, the counts have not yet been published according to personal communication from Dr. HORN of February 1957.

Scandinavian material of *M. angustiflorum* (Rupr.) Walp., which species was formerly included in *M. affine* s. l. has the same chromosome number (NYGREN, 1949b, see also BLACKBURN, 1924).

215. **Melandrium triflorum** (R. Br.) J. Vahl — LANGE I: 20. (Recently BOIVIN (1951: 6) proposed the synonym *Lychnis Sorensenis*).

We have had access to material of flower buds fixed on Clavering Island, NE Greenland. Many anthers had meiotic division stages, but in spite of this it was not possible to count the chromosome number definitely, as most of the divisions were more or less irregular, apparently due to bad condition of the plants during fixation. The larger buds had normal tetrades and in the younger cells e.g. the diakinetic stages looked quite normal. The best estimates of the haploid number gave figures between 30 and 40, and nothing is against the supposition that our plants in accordance with those of BÖCHER and LARSEN (1950) and of BLACKBURN (1929) have 2n = 72. The plants of BÖCHER and LARSEN were collected at Sdr. Strømfjord, NW Greenland. Recently HOLMEN (1952) has counted n = 36 in plants fixed at Brønlundsfjord, Peary Land in North Greenland. The hypothesis of this species being an amphidiploid of *M. apetalum* and *M. affine* is under investigation by NYGREN (1951).

Ranunculaceae.

216. **Thalictrum alpinum** L. — LANGE I: 53.

The count made by us in root-tips of plants from BW 1, SW Greenland, coincides with those of all previous authors, the number being 2n = 14. (BÖCHER, 1938, Disko Island, NW Greenland, Á. and D. LÖVE, 1944, Iceland; for others, see TISCHLER 1950).

217. **Anemone Richardsonii** Hook. — LANGE I: 53.

218. **Ranunculus confervoides** (Fr.) Fr. — LANGE I: 54 (cf. also HYLANDER, 1945: 170).

Five collections of the Greenland representatives of the Water Crowfoot, here tentatively included under the name of *R. confervoides*, have been cytologically studied by us: In three plants from Clavering Island, NE Greenland, in one plant from BW 1, SW Greenland, and in one from Egedesminde, NW Greenland, somatic chromosome counts all gave the same number, viz. 2n = 32. This number was also found by BÖCHER and LARSEN (1950) in a plant from Sarqaq Valley, NW Greenland, collected by KNUD JAKOBSEN. From outside Greenland, 2n = 32 has recently been reported on material of Alpine origin by MATTICK (TISCHLER, 1950). Hence 2n = 32 is the only number counted in *R. confervoides*, the number of 2n = 16, quoted in Á. and D. LÖVE, 1948, and TISCHLER, 1950, on the authority of SØRENSEN and WESTERGAARD being no longer valid.

The Greenland plants here united under the above name are not uniform. The NE Greenland and part of the West Greenland material belong to *Batrachium eradicatum* (Laest.) Fr. s. str. (cf. Komarov VII (1937), p. 339). Part of the West Greenland and especially the South Greenland plants may be referred to *B. divaricatum* (Schrank) Schur *sensu* Kreczetovich in Komarov VII (1937), p. 340. See also M. P. Porsild, 1920: 77.

However, according to Drew (1936: 33) the latter species should be incorporated in *R. trichophyllus* Chaix, in which species Langlet (1927) has counted the chromosome number of 2n = 16, i. e. half that of *R. confervoides*. Unfortunately the origin of Langlet's material has not been reported.

Since it is not always possible to keep the two Greenland types apart morphologically (cf. also Polunin, 1943: 385), and since the chromosome variation in *R. trichophyllus* is not sufficiently known, we have decided to include all the different Greenland types in *R. confervoides*.

219. **Ranunculus glacialis** L. — Lange I: 54.

To the many counts of this species from Greenland, Iceland, and the Alps, we are able to add one more from Greenland, on material collected on Clavering Island, NE Greenland. As the anthers had no PMCs in meiotic divisions, the number was determined in somatic tissue, 2n = 16 being found. This is in accordance with Böcher 1938c (material from Cape Dalton, NE Greenland), Langlet, 1932, and K. Larsen, 1954 (Switzerland), Á. and D. Löve, 1945a (Iceland), Mattick, 1949, ex Tischler, 1950 (Austria) and Skalinska, 1950 (Poland). In Á. and D. Löve (1948) Sørensen and Westergaard are incorrectly quoted as responsible for the chromosome number of 2n = 32 in this species.

220. **Ranunculus lapponicus** L. — Lange I: 57.

The Greenland counts of this species are due to Böcher (1938) and to Böcher and Larsen (1950), the material in both cases being collected in NW Greenland, the first from Disko Island, the second from Nugssuaq Peninsula. In both cases n = 8 was found, as formerly reported by Langlet (1932) and Flovik (1940), the latter in Spitsbergen plants. The quotation by Á. and D. Löve (1948) of Sørensen and Westergaard as authors for a count of this species is incorrect. We have never had any material of it.

221. **Ranunculus hyperboreus** Rottb. — Lange I: 55.

Many counts of this species have been made. We have ourselves material from Clavering Island of meiotic divisions in PMCs, showing n = 16, a figure which is in accordance with all other authors: Böcher, 1938c (Cape Daussy, East Greenland, and Disko Island, NW Greenland), Böcher and Larsen, 1950 (Nugssuaq Peninsula, plants collected by Knud Jakobsen), Holmen, 1952 (Peary Land, North Greenland), and Flovik, 1940 (Spitsbergen plants).

222. **Ranunculus pygmaeus** Wbg. — LANGE I: 55.

Material of this species from Clavering Island, NE Greenland was counted by us. The PMC meiotic divisions were regular and had n = 8. The same number has been reported by all other authors: BÖCHER, 1938 c (J. C. Jacobsens Fjord, East Greenland), LANGLET, 1932; FLOVIK, 1936, 1940 (Spitsbergen material), and MATTICK, 1949 ex TISCHLER, 1950 (Austria).

The well-defined variety of *R. pygmaeus*, var. *Langeana* Nath. (see LANGE II: 254 and M. P. PORSILD, 1930: 42) has been studied cytologically by us on material from Qutdligssat, NW Greenland. The root-tips have 2n = 16, the same number as the main type.

223. **Ranunculus Sabinei** R. Br. — SIMMONS, 1909: 76. (See also LANGE I: 55).

224. **Ranunculus nivalis** L. — LANGE I: 56.

Of this species, which is morphologically close to *R. sulphureus* Soland., we have counted the chromosomes of three plants from Greenland (Qutdligssat, Disko Island, NW Greenland, and Wollaston Foreland, NE Greenland), all of which in their root-tip mitoses showed 2n = 48. This agrees with the Spitsbergen count of FLOVIK (1936), whereas LANGLET (1936) on Scandinavian material, GREGORY (1941), and NYGREN (ex Á. and D. LÖVE, 1948) have found plants with 2n = 56. In addition NYGREN (*loc. cit.*) reports the find of the numbers 2n = 40 and 48 in Scandinavian plants. The numbers 40 and 56 are odd members of the polyploid series, suggesting either a hybrid origin of these plants or apomictic reproduction.

225. **Ranunculus sulphureus** Soland. — HYLANDER, 1945: 171. (LANGE I: 56, *R. altaicus* Laxm.).

The plants investigated by us, collected on Clavering Island, NE Greenland, had a rather regular meiosis, most PMCs containing 48 bivalents. The same number has been found by LANGLET, 1936, FLOVIK, 1940 (Spitsbergen), NYGREN in Á. and D. LÖVE, 1948 (Scandinavia), and HOLMEN (1952) in plants growing in Peary Land, North Greenland (n = app. 48).

BÖCHER (1938 a) studied material collected at Cape Dalton, East Greenland, and found n = ca. 28, but as he himself points out that the fixations were probably mixed up with buds of *R. nivalis*, we leave this statement out of consideration.

226. **Ranunculus pedatifidus** Sm. coll. — FERNALD, 1943 a: 93. (LANGE I: 57, *R. affinis* R. Br.).

Definite records of the chromosome number of this species are the recent ones by BÖCHER and LARSEN (1950), who give 2n = 48 for plants from Sdr. Strømfjord, NW Greenland, and by HOLMEN (1952), who found 2n = 32 in plants from Peary Land. BÖCHER and LARSEN have also studied the meiotic divisions in the PMCs and found many irregularities of the same type as in *R. auricomus* to be present. We also find very irregular behaviour of the meiotic chromosomes in material from Clavering Island, for which reason no definite count could be made. BÖCHER and LARSEN are inclined to consider the irregularities as suggestive of apomictic reproduction since plenty of germinable seeds are produced.

HOLMEN (1952) calls attention to the interesting fact that the plants of BÖCHER and LARSEN agree well with *R. pedatifidus* var. *leiocarpus* (Trautv.) Fern., whereas his own differ from these in some characters.

In the present situation two possibilities seem to exist: that the collective species will resolve itself into two distinct species with the chromosome numbers $2n = 32$ and $2n = 48$, or that a swarm of apomictic microspecies exist of which those mentioned above are two representatives.

227. **Ranunculus auricomus** L. coll. — SØRENSEN, 1933: 53. (HARTZ, 1895: 332; *R. affinis* R. Br. (*R. auricomus* L.)).

Of this polymorphic, widely distributed species, of which several biotypes are known to be apomictic (HÄFLIGER, 1943, RUTISHAUSER, 1953/54, ROUSI, 1956), morphologically slightly different forms occur in Greenland, as judged from the Copenhagen Herbarium and the paper of BÖCHER, 1938b: 88. The most conspicuous of these is var. *glabrata* Lynge.

The chromosome number was counted by BÖCHER (*loc. cit.*) to be $2n = 16$ (material from Cape Daussy, East Greenland). This is the lowest number reported for the collective species. Scandinavian plants have $2n = 32$, 40, and 48 (ROUSI, 1956, cf. GREGORY, 1941; see also TISCHLER, 1950). Alpine types have $2n = 16$, 32, 40, 48 according to HÄFLIGER (*loc. cit*) and RUTISHAUSER (*loc. cit.*). The alpine diploids have sexual reproduction, according to RUTISHAUSER. A study of the embryosac formation of the Greenland diploids would be most interesting.

228. **Ranunculus acris** L. coll. — LANGE I: 58.

Five counts are available for Greenland material of this species. Root-tips of plants from BW 1 and from Upernaviarssuk, SW Greenland, counted by us had $2n = 14$, and the same number was reported by BÖCHER and LARSEN (1950) for three collections from SW Greenland (Ivigtut, Grønnedal, Julianehaab). $2n = 14$ was also found by Á. and D. LÖVE (1945a) in plants of var. *pumilus* Wbg. from Swedish Lappland, whereas NYGREN (in Á. and D. LÖVE, 1948), LANGLET (1932), and GREGORY (1941) report $2n = 28$. See also TISCHLER, 1950. In addition NYGREN (*loc. cit.*) had plants with $2n = 56$.

Very likely a cyto-taxonomic analysis will result in the separation of a number of well-founded species or subspecies within this collective group.

229. **Ranunculus reptans** L. — LANGE I: 57.

Again in this species chromosome counts have been made by BÖCHER and by ourselves. BÖCHER (1938a) studied material from Disko Island, NW Greenland and found normal meiotic divisions with 16 bivalents. The root-tip mitoses investigated by us, of plants from BW 1, SW Greenland, correspondingly showed 2n = 32. The Greenland counts are thus in agreement with those of more southern origin, LANGLET (1937), and GREGORY (1941) all giving 2n = 32.

230. **Ranunculus Cymbalaria** Pursh — LANGE I: 55.

Material from Sdr. Strømfjord, NW Greenland, studied by BÖCHER and LARSEN (1950) had 2n = 16, the same number as reported by LANGLET (1927) and by LARTER (1932). See also GREGORY, 1941.

231. **Coptis trifolia** (L.) Salisb. — LANGE I: 58. (See also HULTÉN, 1944: 715).

Papaveraceae.

232. **Papaver radicatum** Rottb. coll. — SIMMONS, 1906: 99. (LANGE I: 52, *P. nudicaule* L. See NORDHAGEN, 1931: 1; GELTING, 1934: 85; HULTÉN, 1945: 805).

Plants from many different parts of Greenland, covering the east as well as the west coast, have been examined, most of them on material fixed in cultures grown at Lyngby, Denmark, from original seeds. All plants with the exception of two collections made by K. HOLMEN in the summer of 1950 on Brønlundsfjord, Peary Land, North Greenland, have 2n = 56. The two Peary Land samples had 2n = 70 and 2n = 84, respectively. The last number is so far unique in the genus. The number of 2n = 70 quoted in Á. and D. LÖVE 1948 on the authority of WESTERGAARD, is due to an incorrect estimate of the number present in the slide.

Outside Greenland 2n = 56 is known from *P. Laestadianum* Nordh. and *P. lapponicum* (A. Tolm.) Nordh. occurring in northern Scandinavia, whereas the central Scandinavian group has 2n = 70, the same being the case with the Spitsbergen plants and plants from Iceland and the Faeroes (for references see HORN, 1938, FABERGÉ, 1944, Á. and D. LÖVE, 1948, NYGREN in Á. and D. LÖVE, 1948).

The cyto-genetics of the *Scapiflora* group of poppies is under investigation by GUNVOR KNABEN and by C. A. JØRGENSEN.

Cruciferae.

233. **Capsella Bursa-pastoris** (L.) Med. — MANSFELD, 1938b: 304. (LANGE I: 45. *C. Bursa pastoris* (L.) Moench. Cf. M. P. PORSILD, 1932: 66).

234. **Cochlearia groenlandica** L. — LANGE I: 34—36, (including *C. fenestrata* R. Br.).

Plants from a number of localities, ranging from Peary Land in the North (HOLMEN, 1952) to South and West Greenland have been examined (SAUNTE, 1955).

They all proved to have 2n = 14, the same figure as that reported from Spitsbergen by FLOVIK (1940). *C. oblongifolia* DC. counted from Japan by MATSUURA & SUTO (1935), and the endemic alpine species *C. scotica* Druce counted from Scotland (MAUDE, 1939) have also the diploid number (2n = 14). These plants thus differ from more southern types of the *C. officinalis* complex, in which 2n = 24, 36, and 48 have been recorded (SAUNTE, 1955). Plants with 24 chromosomes correspond to *C. officinalis* ssp. *eu-officinalis* (L.) Asch. & Graebn., whereas the 48-chromosome types represent ssp. *anglica* (L.) Asch. & Graebn.

In all probability the 14-chromosome arctic *Cochlearia* include a number of different types (cf. HULTÉN, 1945: 816). However, until the other circumpolar arctic types have been counted (*C. arctica* Schlecht. and *C. lenensis* Adams from Siberia, and *C. fenestrata* R. Br. and *C. sessiliflora* Rollins from North America) it is premature to discuss the relationship of the arctic *Cochlearia* (cf. SAUNTE, *loc. cit.*).

235. **Subularia aquatica** L. — LANGE II: 250.

236. **Draba incana** L. — EKMAN, 1953: 348. (LANGE I: 44 pro maj. parte).

This species has been studied by BÖCHER and LARSEN (1950), who in material from Grønnedal, SW Greenland, found 2n = 32, the same number as previously reported by HEILBORN (1927) for Scandinavian material. Danish plants studied by us have the same number.

237. **Draba lanceolata** Royle — FERNALD, 1934b: 357. (LANGE I: 44, *D. incana* L. pro min. parte; EKMAN, 1935:350, *D. Thomasii* Koch; BÖCHER, 1952a: 28, *D. lanceolata* Royle).

The Greenland specimens kept in the Botanical Museum of Copenhagen under the name of *D. stylaris* Gay (*D. Thomasii* Koch) are not identical with European specimens of *D. stylaris*, but agree with North American plants determined by FERNALD (*loc. cit.*) as *D. lanceolata*.

238. **Draba sibirica** (Pall.) Thell. — EKMAN, 1931: 482. (DUSÉN, 1901a: 23, 1901b: 73, *D. repens* Bieb.).

239. **Draba aurea** Vahl — LANGE I: 39. EKMAN, 1934: 75.

240. **Draba norvegica** Gunn. — HYLANDER, 1945: 182. (LANGE I: 41, *D. corymbosa* R. Br. pro maj. parte; EKMAN, 1941: 136, *D. rupestris* R. Br.).

The chromosome number of plants from Greenland counted by HEILBORN (1937) is 2n = 48.

241. **Draba hirta** L. — LANGE I: 42 incl. ssp. *rupestris* Hartm. See also HYLANDER, 1945: 183. (EKMAN, 1930: 285, *D. daurica* DC.).

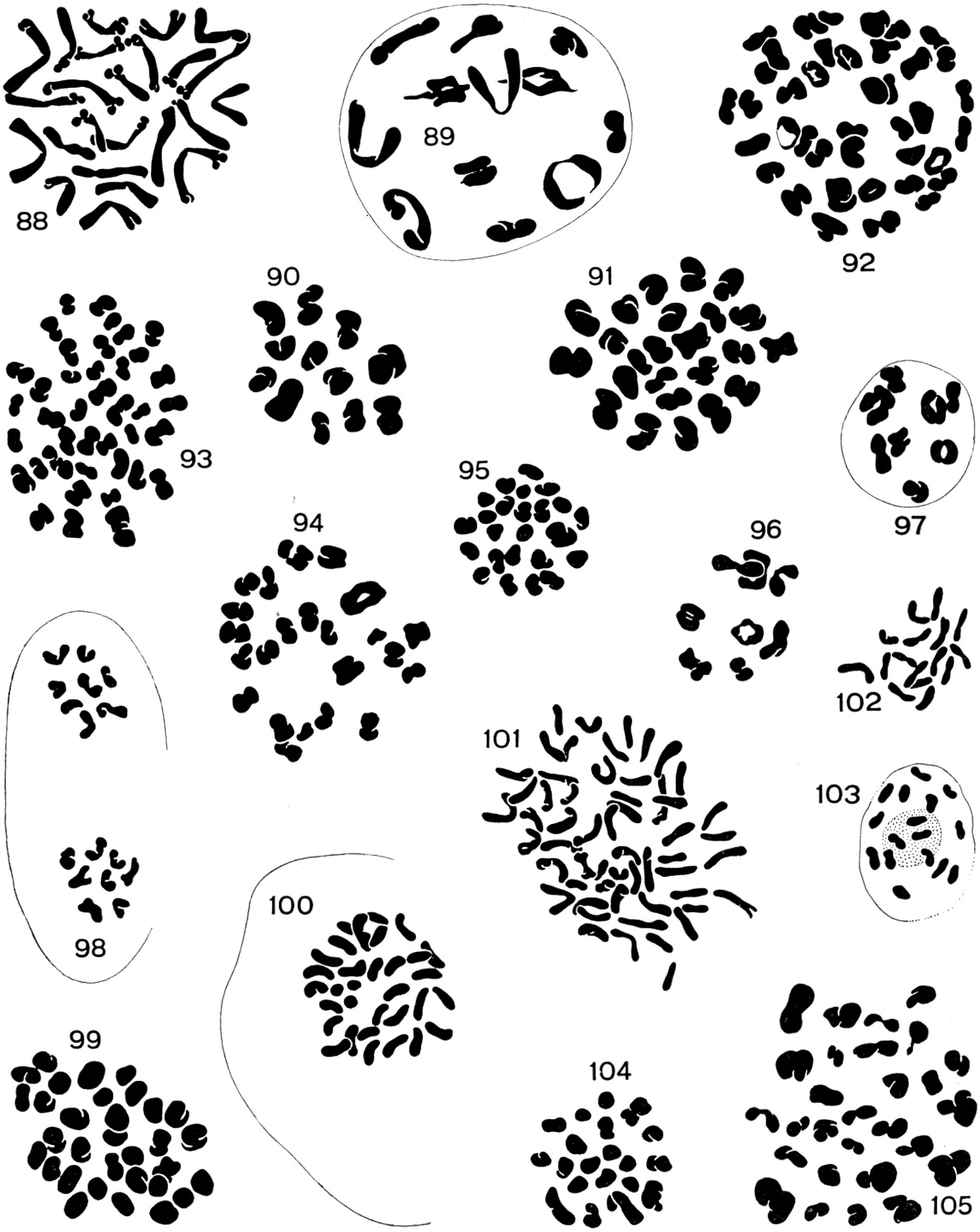


Fig. 88—105. Figs. 88, 101, and 102 are root-tip mitoses, fig. 103 late prophase; figs. 89—99, 104, and 105 are PMC's, 1st metaphase except fig. 89 (diakinesis), and fig. 98 (2nd metaphase); fig. 100 is a pollen mitosis. Fig. 88, *Viscaria alpina*, 2n = 24. Fig. 89, *Silene acaulis*, n = 12. Fig. 90, *Melandrium apetalum*, n = 12. Fig. 91, *Melandrium affine*, n = 24. Fig. 92, *Draba hirta*, n = 40. Fig. 93, *Draba cinerea*, n = 40. Fig. 94, *Draba ovibovina*, n = 24. Fig. 95, *Draba lactea*, n = 24. Fig. 96, *Draba fladnizensis*, n = 8. Fig. 97, *Draba nivalis*, n = 8. Fig. 98, *Draba subcapitata*, n = 8. Fig. 99, *Draba alpina*, n = 32. *Fig.* 100, *Draba oblongata*, n = 32. Fig. 101, *Cardamine pratensis*, 2n = 56. Fig. 102, *Halimolobus mollis*, 2n = 16. Fig. 103, *Rorippa islandica*, 2n = 16. Fig. 104, *Torularia humilis*, n = 21. Fig. 105, *Braya purpurascens*, n = 28. (All figures × 4000).

Most collections of this species agree as to chromosome number, 2n being 64. This number was first recorded by HEILBORN (1927) in plants from two Greenland localities (Atanikerdluk and Umanak) and again by the same author in 1941, from Godhavn. This count agrees with the number found by BÖCHER and LARSEN (1950) in three collections from Sdr. Strømfjord, NW Greenland, and by HOLMEN (unpublished) from Zackenberg, Wollaston Foreland. Outside Greenland 2n = 64 was counted by HEILBORN (1927) in material from Kirkevare in Swedish Lappland.

But 64 is not the only number counted in plants referred to *D. hirta*. Thus HEILBORN (1927) in plants collected at Godhavn, NW Greenland, found 2n = 80, and we have ourselves in plants from Clavering Island, NE Greenland, been able to count n = 40 in Metaphase I plates (fig. 92). In the limited sense in which *D. hirta* is taken here, we do not, of course, consider it likely that two different numbers actually exist within it. It is not, however, possible, until more material is collected, to settle this discrepancy between chromosome number and taxonomical demarcation, and we must at present leave the problem open.

242. **Draba groenlandica** E. Ekman — EKMAN, 1929: 486. (LANGE I: 41, 43, *D. corymbosa* R. Br. and *D. arctica* J. Vahl pro min. parte).

Plants of the present species of Greenland origin were counted by HEILBORN (1941) and by HOLMEN (1952) and had 2n = 64.

243. **Draba cinerea** Adams. — EKMAN, 1930: 486. (LANGE I: 43, *D. arctica* J. Vahl).

This species, which it is sometimes difficult to distinguish from the following three species, was counted by us in material from Clavering Island, NE Greenland, the number found being n = 40 (fig. 93). This is in agreement with the counts from Spitsbergen by HEILBORN, 1927, and by FLOVIK, 1940.

In contradistinction to the finds mentioned above is a series of counts reported by HEILBORN, 1941. In this paper he gives n = 24 for two collections from Greenland, one of them being from Umanak, and for a collection from Lake Ladoga, East Finland. Here again further studies are needed to make the taxonomical situation agree with the cytological facts.

244. **Draba arctogena** E. Ekman — EKMAN, 1941: 135. (See also EKMAN, 1929: 489, *D. groenlandica* Ekman var. *arctogena*).

Our knowledge of the chromosome number of this species is due to HEILBORN (1941) and to HOLMEN (1952), who both give n = 24 in plants from Greenland.

245. **Draba ovibovina** E. Ekman — EKMAN, 1941: 135. (See also EKMAN, 1929: 492, *D. Ostenfeldii* Ekman var. *ovibovina*).

In material collected on Clavering Island, NE Greenland, of this species, which was originally by E. EKMAN considered a variety of the following, n = 24 was found (fig. 94).

246. **Draba Ostenfeldii** E. Ekman — Ekman, 1929: 491.

247. **Draba lactea** Adams — Ekman, 1932: 433. (Lange I: 40, *D. Wahlenbergii* Hartm. pro parte).

Meiotic divisions were present in PMCs of plants fixed on Clavering Island, NE Greenland. The chromosome number is n = 24, the bivalents being highly contracted (fig. 95).

248. **Draba fladnizensis** Wulfen — Ekman, 1932: 431. (Lange I: 40, *D. Wahlenbergii* Hartm. pro parte).

In two collections of this species from Clavering Island, meiotic divisions were found, both with n = 8 (fig. 96). The chromosomes show some variation in size, but due to their highly condensed shape an idiogrammatic analysis is not possible. Root-tip mitoses are required for this purpose. According to Heilborn (1927) material from Norway has the same number.

249. **Draba nivalis** Liljebl. — Lange I: 39; Ekman, 1933b: 339.

Here again the material used by us for chromosome counting originates from Clavering Island in NE Greenland, and the PMCs in the diakinesis showed n = 8 as in the former species (fig. 97). Hybrids between this and the preceding species are not uncommon. They are almost sterile in spite of the fact that the parents have the same chromosome number.

250. **Draba subcapitata** Simm. — Simmons, 1906: 87. (Lange II: 248, *D. altaica* (Ledeb.) Bge.; Dusén, 1901a: 26, *D. Martinsiana* J. Gay; Ekman, 1934: 66 and 1941: 135, *D. subcapitata* Simm. and *D. altaica* (Ledeb.) Bge.; see Gelting, 1934: 81; compare also Tolmatchew in Komarov VIII (1939): 423.

Two samples of *D. subcapitata* from Clavering Island, NE Greenland, counted by us, and a third from Peary Land, collected and counted by Holmen (1952), all had n = 8 (fig. 98). The M_{II}-plates figured exhibit the chromosome morphology better than M_{I}-plates of the preceding species, showing 4 larger and 4 slightly smaller chromosomes.

251. **Draba alpina** L. — Ekman, 1931 :479. (Lange I: 37, *D. alpina* L. pro parte).

We have studied two collections of *Draba alpina* L. s. str. from Clavering Island, NE Greenland, and in both cases n = 32 was found (fig. 99). Very slight irregularities were observed in the PMCs in one of the samples. This number is in agreement with that of Heilborn (1927) for Norwegian plants from Dovre.

Flovik (1940) and Heilborn (1941) in plants from Spitsbergen and from Sweden, respectively, report 2n = 80. In our opinion these plants cannot be *D. alpina* in the strict sense, but must belong to an other species included in this collective group.

252. **Draba Bellii** Holm — Ekman, 1931: 469; 1941: 135. (Lange I: 37, *D. alpina* L. pro parte).

253. **Draba macrocarpa** Adams — Tolmatchew, 1923: 223. See also Ekman, 1931: 474; 1941: 136.

Holmen (1952) has studied this plant and records 2n to be not less than 120, probably 128.

In the light of this very high number it would be of more than usual interest to know the chromosome number of its closest relative, *D. Bellii.*

254. **Draba Gredinii** E. Ekman — Ekman, 1933a: 102, 1941: 135.

255. **Draba micropetala** Hook. — Ekman, 1931: 466 (excl. *D. oblongata* R. Br.), 1941: 136. (Dusén, 1901a: 25, *D. leptopetala* Th. Fr.; Ostenfeld, 1923a: 178, *D. Adamsii* Ledeb. pro parte).

256. **Draba oblongata** R. Br. — Ekman, 1931: 465, 1941: 136. (Ostenfeld, 1923a: 178, *D. Adamsii* Ledeb. pro parte).

Flower buds of this species fixed on Clavering Island, NE Greenland, were too old for meiotic divisions, but a few pollen mitoses were found. They show the haploid number of n = 32 (fig. 100).

257. **Draba crassifolia** Graham — Lange I: 38. Ekman, 1933a: 97.

The only count is due to Heilborn (1941), who reports 2n = 40 in plants from East Greenland, submitted to him by Mrs. E. Ekman.

258. **Cardamine pratensis** L. coll. — Lange I: 48.

Cardamine pratensis is a rather unique species from a cytological point of view, many different chromosome numbers being reported in plants which hardly seem to be morphologically differentiated.

Lövkvist (1947), in plants mainly collected in South Sweden, found the following chromosome numbers: 2n = 30, 56, 58 (rare), 60, 64, 68, 72, 76, and 84 (rare). Earlier Manton (1932) had reported 2n = 32 and 64. The last number is also found in Spitsbergen (Flovik, 1940). Banach (1950) has found the numbers 2n = 30, 32, 38, 44, 50, 58, 64, 68, 72, 76, and 78 in Polish plants. In plants of Central European origin recently studied by Guinochet (1947) and Mattick (in Tischler, 1950) lower chromosome numbers seem to occur, viz. 2n = 16, 28.

Hussein (1955) has recently made an extensive examination of British plants, and found only two numbers to occur, viz. 2n = 30 and 2n = 56, although previous authors had counted both 2n = 32 and 2n = 64 in plants of British origin (cf. Manton, 1932). The 30-chromosome type (19 counts) is almost restricted to the Southern, unglaciated part of the country, whereas the 56-chromosome type (94 counts) has a much wider distribution. It is very puzzling, indeed, that Hussein's careful study of the British flora revealed two types only, in contrast to the karyotypic polymorphism found in Poland and Sweden.

Lövkvist (1956) refers all Greenland plants to *C. Nymani* Gand. According to Table 3 in Lövkvist's paper, all plants belonging to this species have chromosome numbers higher than 2n = 60. (60, 62, 63, 64 (most common), 68, 72, 74, 75, 80, 90). All the counts refer to plants from Northern Scandinavia; no counts of Greenland plants were made.

In plants from Egedesminde, NW Greenland, with purely white flowers, we have counted 2n = 56 (fig. 101), and Harmsen (unpublished) found the chromosome number to be 2n = 60 in plants from Disko (also NW Greenland). Since the chromosome number of 2n = 56 is outside the range of chromosome variation found in *C. Nymani*, but is found in several other members of the collective species described by Lövkvist, we cannot without reservation accept his statement that all Greenland plants belong to *C. Nymani*, and for the present we find it safer to maintain the collective concept of the Greenland *C. pratensis*.

259. **Cardamine bellidifolia** L. — Lange I: 47.

This well characterized and uniform species has been counted by us on material from Clavering Island, NE Greenland. The somatic cells in the ovary tissue showed 2n = 16, which number has also been given by Holmen (1952) from Peary Land.

260. **Arabis alpina** L. — Lange I: 48.

A. alpina has been counted by various authors. We have ourselves several samples from different places in SW and NW Greenland, including the glabrous variety, and in all cases 2n = 16 was found. The same number was counted by Böcher (1938c) in plants from SE Greenland, and by Böcher and Larsen (1950) in plants from Nugssuaq, NW Greenland. Rollins (1941) reports the same number for material from the West American mountains. Material from the Alps, however, includes 16 as well as 32 chromosome types according to Mattick (in Tischler, 1950).

261. **Arabis arenicola** (Richards.) Gelert — Gelert 1898: 287. (Lange I: 51, *Sisymbrium humifusum* J. Vahl; Lange III: 673, *Arabis humifusa* (J. Vahl) Wats.).

262. **Arabis Holboellii** Hornem. coll. — Lange I: 49. See also Böcher, 1951b.

Greenland material of this species from various localities in East and West Greenland has been studied by Böcher (1947), Böcher and Larsen (1950), and by Böcher (1951, 1954). Both diploid plants with 2n = 14 and triploids with 2n = 21 occur, often within the same area. Böcher (1951) puts the species down as an amphi-apomict, in which both sexual and apomictic reproduction takes place. According to Böcher, 1954, the triploids should be named *A. Holboellii* var. *Holboellii*, whereas the diploids are represented by *A. Holboellii* var. *tenuis* T.W.B. including forma *glabra* T.W.B. (see also Rollins, 1941).

Rollins (*loc. cit.*) in his monographic treatment of the North American representatives of the species records the occurrence of types with 2n = 14, 28, and 42 chromosomes.

263. **Halimolobus mollis** (Hook.) Rollins — ROLLINS, 1941: 480. (LANGE I: 50, *Arabis Hookeri* Lge.).

In root-tips of plants fixed at Kutsiaq, Nugssuaq Peninsula, NW Greenland, the diploid number of 2n = 16 was counted. The chromosomes are almost equal in shape and size (fig. 102).

264. **Rorippa islandica** (Oeder) Borb. coll. — HYLANDER, 1945: 187. (LANGE I: 47, *Nasturtium palustre* (L.) R. Br.).

Two chromosome numbers are known in this collective species. Plants grown in Denmark from seeds collected at Eqaluit, SW Greenland, have 2n = 16 (fig. 103), in accordance with a count reported by JARETZKY (1932). In other areas 2n = 32 is found (SCHEERER, 1939, and HOWARD, 1947). We are able to add to this last number with counts of plants from Zealand, Denmark, in which 2n = 32 is also present. A closer morphological analysis of the two karyotypes will undoubtedly result in a subdivision of the collective species.

265. **Erysimum Pallasii** (Pursh) Fern. — FERNALD, 1925c: 171. (LANGE I: 47, *Hesperis Pallasii* (Pursh) Torr. et Gray).

Of this interesting plant only an estimate of the chromosome number is available. HOLMEN (1952) counted 2n = app. 28 in root-tip mitoses.

266. **Eutrema Edwardsii** R. Br. — LANGE I: 46.

Plants from three Greenland localities have been counted. From the NW-coast area fixations were made in two places by Mr. KNUD JAKOBSEN on the Nugssuaq Peninsula, and in slides made from these BÖCHER and LARSEN (1960) report 2n = 28. The third Greenland collection is from Peary Land, North Greenland, and also there 2n = 28 was found (HOLMEN, 1952).

This number deviates from that reported by SOKOLOVSKAJA and STRELKOVA (1941), who in plants from the Kolguev Island, Arctic Russia, found 2n = 42.

267. **Torularia humilis** (C. A. Mey.) O. E. Schulz — TH. SØRENSEN, 1954: 18. (SEIDENFADEN, 1930: 380, *Braya humilis* (C. A. Mey.) Robins.; BÖCHER, 1950: 29. *T. humilis* ssp. *arctica* T.W. Böcher).

This species, originally described from Siberia, is in Greenland restricted to the East coast. It has been counted by us from Clavering Island, NE Greenland. The PMCs present in the material show definitely n = 21 (fig. 104). The chromosomes within the complement differ much in size and are very highly contracted, the two partners of the bivalents often being well separated. In some cells a nucleolus-fragment may be seen in the Metaphase I plates.

268. **Braya Thorild-Wulffii** Ostf. — Ostenfeld, 1923a: 176.

This species has a high-arctic distribution and the lowest chromosome number hitherto known within the genus. In material from Peary Land, North Greenland, Holmen (1952) counted n = 14 on PMCs and the diploid number of 2n = 28 was found by K. Jakobsen, unpubl., on West Greenland plants (Nugssuaq). The species is thus cytologically well separated from *B. purpurascens*, and for this and other reasons we do not consider the idea of Schulz (1924: 364) and A. E. Porsild (1943: 46) of the merging of the two species into one as tenable. See in this connection Seidenfaden and Sørensen (1937: 36), and Sørensen (1941: 104).

269. **Braya purpurascens** (R. Br.) Bge. — Lange I: 46. (Lange II: 250, Lange III: 672, *B. glabella* Richards.).

The slides of this species studied by us were made of material from Clavering Island, NE Greenland. Only a few PMCs in meiotic stages were present. The slides were first studied by Westergaard, who due to the very conspicuous constrictions in some of the larger bivalents thought the haploid number to be n = 32. This preliminary count was unfortunately published in the list of Á. and D. Löve (1948). A thorough revision of the slides has, however, made it clear that the correct number is n = 28 (fig. 105) and the former statement is thus not valid. Holmen (1952) also gives n = 28 from Peary Land.

In the same paper Á. and D. Löve record the find of this species in Iceland, and curiously enough in the chromosome list they give for the Islandic plants just the same erroneous number as that submitted to them by Sørensen and Westergaard.

270. **Braya glabella** Richards.

We have been unable to form a definite opinion as to Greenland occurrences of this species, which have caused much discussion. The name has been used erroneously to cover *B. purpurascens* (Lange II: 250, III: 672) as well as *B. linearis* (Gelting, 1934: 57, Sørensen, 1933: 39). A careful comparison of the Greenland and Scandinavian specimens with Richardson's elaborate description of *B. glabella* (1823: 743) does not, in our opinion, support the conclusions of A. E. Porsild (1943: 44), that Richardson had before him a plant belonging to *B. linearis* Rouy. We are rather inclined to agree with Polunin (1940: 249) that the species is closely related to *B. purpurascens*, but the decision as to the taxonomic rank to be ascribed to it should be postponed until cytological data are available.

Two West Greenland specimens kept in the Copenhagen Herbarium (both from Ingnerit Fjord, 71°3′ lat. N., and 71°7′ lat. N., collected by M. P. and R. T. Porsild, July 12—13, 1939) are in our opinion identical with *B. glabella* Richards. One of these specimens is referred to *B. pilosa* Hook. by A. E. Porsild (*loc. cit.*), although with some reservation. However, a comparison of these specimens with a plant of *B. pilosa*, collected in the type locality by the Franklin Expedition, shows that the plants certainly do not belong to *B. pilosa*.

271. **Braya linearis** Rouy — O. E. Schulz, 1924: 229. (Hartz, 1895: 329, *B. alpina* Sternb. et Hoppe).

The plants from Greenland classed under this name are very close to, but hardly identical with Scandinavian specimens, on which the species was founded by Rouy.

We have had occasion to investigate several samples of fixed material of this species from Ella Island, NE Greenland. Many excellent M_I-plates are present in the PMCs, all showing n = 21 (fig. 106). This number is in accordance with Böcher and Larsen (1950) for two collections from Sdr. Strømfjord, NW Greenland. The chromosome number of Scandinavian plants from Jotunheimen in Norway is the same (G. Knaben, pers. comm.).

The number of 2n = 64 for Greenland plants of *B. linearis*, published in Á. and D. Löve (1948) on the authority of Westergaard, is erroneous, and was brought about because the material in question was contaminated with flower buds not belonging to *B. linearis*.

272. **Braya intermedia** Th. S. — Th. Sørensen, 1954: 15.

As to the general appearance this hitherto not recognized species takes up an intermediate position between *B. linearis* and *Torularia humilis*. Due to this fact it has caused much confusion to taxonomists (see e. g. Gelting, 1934: 57 *et seq.*, Sørensen, 1933: 39).

The chromosome number of n = 35, different from that of the other Greenland species of the genus, marks it out as a well-established species. The counting was made on flower buds fixed on Ella Island, NE Greenland (fig. 107).

273. **Braya Novae-Angliae** (Rydb.) Th. S. — Th. Sørensen, 1954: 22. (Lange II: 252, *Sisymbrium humile* C. A. Mey.).

As pointed out by Th. Sørensen (*loc. cit.*), the West Greenland *Braya* from Sdr. Strømfjord which by Schulz, 1924, and by Böcher, 1950, are referred to *Torularia humilis* conform to the description of the American plant described by Rydberg (1907) as *Pilosella Novae-Angliae*. (For synonyms see Fernald, 1950: 712). Consequently the chromosome count of 2n = 56 by Böcher and Larsen (1950) on the material from Sdr. Strømfjord, which is referred to *Torularia humilis*, belongs here.

274. **Lesquerella arctica** (Wormskj.) Wats. — Lange III: 669. (Lange I: 34, *Vesicaria arctica* R. Br.).

The haploid chromosome number of n = 30 was counted in M_I of PMCs of plants collected on Clavering Island, NE Greenland (fig. 108). The chromosomes are almost equal in size and well spaced, giving very clear plates. The same number, 2n = 60, has been reported by Böcher and Larsen (1950) for plants from Sdr. Strømfjord, NW Greenland, and by Holmen (1952) from Peary Land.

According to Rollins (1939) both 5 and 6 are basic numbers in this genus. As *L. arctica* is most closely related to the American group of species with $x = 5$, it is most appropriate to regard it as being a duodecaploid.

Crassulaceae.

275. **Sedum Rosea** (L.) Scop. — Mansfeld, 1939: 286. (Lange I: 66, *S. Rhodiola* DC.).

The cytology of this species is well-known from Levan's paper (1933), in which $2n = 22$ with heteromorphic sex chromosomes in the male is reported. We have found the same number in root-tip mitoses of a plant from Clavering Island, NE Greenland.

In the interesting paper by Uhl (1952) the occurrence in North America of two cytologically different groups of plants with the basically different numbers of $n = 11$ and $n = 18$ is reported. The plants with $n = 11$ has a northeastern distribution, those with $n = 18$ being more widespread, probably occurring across the continent. A taxonomical investigation by Professor R. T. Clausen of Cornell University is under way.

276. **Sedum villosum** L. — Lange I: 67.

The haploid number of $n = 15$ was counted on material from Kobbermineø, Greenland. Knaben (1950) found the same number in plants from Norway.

277. **Sedum annuum** L. — Lange I: 67.

Material of root-tips of plants grown in Denmark from seeds collected at Tasiusak, SW Greenland contained plenty of mitoses showing $2n = 22$ (fig. 109).

Plants from the environs of Stockholm, Sweden, collected in 1949 have the same number, which is also reported from Austria by Böcher (1938c).

278. **Sedum acre** L. — Kruuse 1906: 245.

Saxifragaceae.

279. **Parnassia Kotzebuei** Cham. et Schldl. — Lange I: 33.

The first and only count of this species is due to Knud Jakobsen, who recently found $2n = 18$ in plants from the Sarqaq Valley on the Nugssuaq Peninsula, NW Greenland (personal communication).

280. **Saxifraga Aizoon** Jacq. coll. — Lange I: 65.

Plants of this species were collected at Safarfik, Nugssuaq Peninsula, NW Greenland, and grown at Lyngby, Denmark. Root-tip slides, in which many mitoses were present, showed the diploid number to be $2n = 28$ (fig. 110). The chromosomes are long and slender and of almost equal size. From Iceland Á. and D. Löve (1951) report the same number. Material collected in the Austrian Alps agree as to chromosome number with the Greenland and Icelandic plants (Mattick ex Tischler, 1950).

Butters (1944) has made a comparative study of the American and European representatives of the species. He finds that the American plants differ from the European ones in some small but consistent characters, and proposes the varietal name *neogœa* for them. The Greenland and Icelandic plants belong to this variety, which by Á. and D. Löve (*loc. cit.*) is raised to subspecific rank.

281. **Saxifraga oppositifolia** L. — Lange I: 66.

The chromosome number of *S. oppositifolia* has been determined many times on Greenland material. First by Böcher (1941) in plants from Clavering Island, NE Greenland (2n = 26) and next by ourselves, again on Clavering material as well as in plants from Nugssuaq Peninsula, NW Greenland, and from BW 1, SW Greenland. In all cases 2n = 26 was found. Thus also Holmen (1952) from Peary Land, North Greenland.

The only case in which a different number was encountered is in a collection from Zackenberg on Wollaston Foreland, NE Greenland. Of the two plants counted, one had 2n = 26, the other 2n = 39, thus being a triploid.

Flovik (1940) in material from Spitsbergen reports 2n = 52, the tetraploid number. We feel convinced that tetraploids also occur in NE Greenland and by crossing with the diploids form the triploids growing at Zackenberg. Outside Greenland the diploid race is known to occur in Norway (Skovsted, 1934), and in Switzerland (Larsen, 1954). Lately we have counted 2n = 26 in plants collected at Sassenfjord, Spitsbergen, by Mr. Sv. E. Olsen.

The diploid and the tetraploid karyotypes will on a closer morphological study no doubt be found to be taxonomically distinct. It is not unlikely that the f. *reptans* and f. *pulvinata* of Anderson and Hesselmann correspond to the two chromosome types, but a definite opinion cannot be formed at present, and we find it premature, as proposed by Á. and D. Löve (1951), to bring *S. pulvinata* Small into the discussion as nothing is known as to its chromosome number.

282. **Saxifraga Nathorsti** (Dusén) Hayek — Hayek, 1905: 661. (Dusén, 1901 a: 35, *S. oppositifolia* var. *Nathorsti* Dusén. See further Sørensen, 1933: 77, and Böcher, 1941).

The chromosome number of this interesting plant was first counted by Böcher (1941), who gives 2n = 52. We have been able to confirm this number in three plants from "Revet", at the head of Tyrolerfjord, NE Greenland. In the same locality two plants having the triploid number of 2n = 39 were found. They were morphologically almost typical, but must be supposed to be of hybrid origin, *S. oppositifolia* being the other parent.

S. Nathorsti takes up an intermediate position between *S. aizoides* and *S. oppositifolia*, and several botanists have suggested it being a hybrid between these two species. This view was opposed by Hayek (1905) and Sørensen (1933), the latter pointing to the fact that it is fertile with regular meiosis of the PMCs. These facts are, however, in accordance with the conception of *S. Nathorsti* as an amphidiploid hybrid of the two said parent species, a hypothesis advanced by Böcher (1941).

283. **Saxifraga stellaris** L. — Lange I: 60, with the exclusion of var. *comosa* Poir.

284. **Saxifraga foliolosa** R. Br. — Hylander, 1945: 193. (Lange I: 60, *S. stellaris* L. var. *comosa* Poir.).

Most investigators of this species agree as to its chromosome number being 2n = 56 (Böcher, 1938, plants from Lappland, North Sweden; Flovik, 1940, Spitsbergen material; Á. and D. Löve, 1951, Icelandic plants; and Mattick ex Tischler, 1950; see also Arwidsson, 1938). We have counted the same number in somatic cells of ovular tissue in a plant from Clavering Island, NE Greenland (fig. 111). This is twice the chromosome number of the closely related sexual species *S. stellaris*.

In the careful and well illustrated embryological study of this species made by Harmsen (1939) on material from Disko Island, NW Greenland, a different number is given. In mitoses in young embryos and in the endosperm divisions 64 and 96 chromosomes, respectively, were found. The correctness of Harmsen's figures seems beyond doubt, and for the time being we must accept the situation of having two different numbers in this species.

It is worth noting that *S. foliolosa* has never been found with ripe seeds in Greenland and in Scandinavia. It thus spreads exclusively by the numerous bulbils present in the inflorescence.

285. **Saxifraga hieraciifolia** W. et K. — Lange I: 59.

The chromosome number is among the highest known in the genus. We have studied meiosis in PMCs of plants from Clavering Island, NE Greenland, but been unable to reach a definite result, although meiosis proceeds in a regular way. The haploid number is somewhere between 55 and 60, and we feel convinced that the Greenland plants as to their chromosome number agree with the Spitsbergen ones, counted by Flovik to have 2n = 112. The count of Sokolovskaja and Strelkova (1938) giving 2n = app. 80, probably refers to another species.

286. **Saxifraga nivalis** L. — Lange I: 59, with the exclusion of *β. tenuior* Wbg.

All investigators of arctic material of this species agree on its chromosome number being 2n = 60: Flovik (1940) Spitsbergen plants; Böcher and Larsen (1950), material from Sdr. Strømfjord, NW Greenland; Holmen (1952) material from Peary Land; Á. and D. Löve (1951), Iceland; and ourselves, Clavering Island, NE Greenland. At meiosis the chromosomes pair regularly and show rather conspicuous size differences, some of the bivalents being very large. (Fig. 112).

In his paper on chromosome numbers in *Saxifragaceae*, Skovsted (1934) gives 2n = 56 for the present species, a number which we are not inclined to consider valid.

287. **Saxifraga tenuis** (Wbg.) H. Sm. — Hylander, 1945: 193. (Lange I: 60, *S. nivalis β tenuior* Wbg.).

Meiotic divisions in PMCs of plants from Clavering Island, NE Greenland, beautifully showed n = 10 (fig. 113), the haploid complement being composed of 2 large, 4 medium, and 4 small bivalents. All investigators agree as to this number (Böcher, 1938c, plants from North Sweden; Flovik, 1940, Spitsbergen; Á. and D. Löve, 1944, North Sweden; Á. and D. Löve, 1951, Iceland; Holmen, 1952, Peary Land).

The great difference in chromosome number between this species and *S. nivalis* place them much further apart than was recognized by earlier taxonomists, who considered them only varietally different.

288. **Saxifraga tricuspidata** Rottb. — Lange I: 63.

Chromosome counts of this species have been carried out by Harmsen (unpublished), who informs us that some years ago he found 2n = 26 in material from Disko Island, NW Greenland. Later the species has been reported on by Böcher and Larsen (1950), who give the same number for plants from Sdr. Strømfjord, NW Greenland.

289. **Saxifraga aizoides** L. — Lange I: 64.

All investigators (Skovsted, 1934, plants from Norway; Mattick in Tischler, 1950, plants from the Austrian Alps, Böcher, 1941, NE Greenland; Á. and D. Löve, 1951, Iceland; and ourselves, material from NE Greenland) agree as to the chromosome number of *S. aizoides*, 2n = 26. Some details of the chromosome morphology are given in Böcher's paper.

290. **Saxifraga Hirculus** L. — Lange I: 64.

The arctic plants of this species are small and stunted as compared with e. g. the Danish ones. Their chromosome number is the same, n = 16 (fig. 114). The plants counted by us were collected on Clavering Island, NE Greenland, and are of the same type as those from Spitsbergen and Iceland, for which Flovik (1940) and Á. and D. Löve (1951) report the same number.

Sokolovskaja and Strelkova (1938) counted 2n = 28 in plants from Caucasia, which in our opinion probably are different from the arctic representatives.

291. **Saxifraga flagellaris** Willd. ssp. **platysepala** (Trautv.) A. E. Porsild — A. E. Porsild, 1954: 295. (Lange I: 65, *S. flagellaris* Willd. var. *setigera* (Pursh) Engl.).

Plants of this species have been counted in Greenland by Holmen (1952), who in material fixed in Peary Land, North Greenland, found n = 16 in PMCs in diakinesis. This number agrees with that reported by Flovik (1940) on Spitsbergen plants belonging to the same subspecies.

292. **Saxifraga cernua** L. — Lange I: 61.

The chromosome number of this widespread and common arctic-alpine species has not yet been counted with certainty in spite of the efforts of several investigators.

Skovsted (1934) gives 2n = app. 66 for Norwegian plants, and Chiarugi (ex Á. and D. Löve, 1948) reports 2n = 50 in material the origin of which is not known. Á. and D. Löve (1951) counted 2n = app. 64 in Icelandic plants. In PMCs of plants from Clavering Island we have reached an estimate of n = 30—35, finding it also impossible to settle the number definitely.

293. **Saxifraga hyperborea** R. Br. — (Lange I: 62, *S. rivularis* L. *β hyperborea* (R. Br.) Engl.).

S. hyperborea has only half the chromosome number of the following species, *S. rivularis*, 2n being 26 (fig. 116). This number was counted by us in root-tip mitoses of plants from Holsteinborg and from Kutsiaq on the Nugssuaq Peninsula, both places in NW Greenland. Counts have also been made in plants from Zackenberg, Wollaston Foreland, NE Greenland, and from Peary Land by Holmen (1952), all giving 2n = 26. Outside Greenland, Flovik (1940) found the same number in Spitsbergen plants. These authors refer their plants to *S. rivularis*.

S. hyperborea, established by Robert Brown (1823: 16), was later on generally considered of varietal rank only, but in the light of the present cytological evidence as well as on morphological grounds we consider it worthy of specific rank. Corresponding to the difference in chromosome number the two species differ in the size of pollen, *S. rivularis* having grains of a diameter of 27—31 μ, *S. hyperborea* of a diameter of 22—26 μ.

Both species are of good fertility. The few intermediate and seedless plants found in the herbaria are undoubtedly triploid hybrids, to judge from their highly irregular and abortive pollen grains.

Both species have a circumpolar distribution. *S. hyperborea* is probably the most continental species, since *S. rivularis* is the only one found in the real Atlantic area (i.e. SE Greenland, Iceland, the Faeroes, Scotland, and Scandinavia).

It should be noted that the var. *purpurascens* Lge. (Lange I: 62) covers purple-coloured and red-flowered specimens of both species, maybe most frequently of *S. hyperborea*.

294. **Saxifraga rivularis** L. — Lange I: 61, with the exclusion of *β hyperborea* (R. Br.) Engl.

The chromosome number of *S. rivularis* L. in the restricted sense is 2n = 52. Counts are available from Clavering Island, NE Greenland (fig. 115), showing M_I-plates with n = 26. Á. and D. Löve (1951) agree with this number on the basis of Icelandic plants. Previously Böcher (1938) reported 2n = 56 for East Greenland material, a count the correctness of which we doubt.

As was first made out by Robert Brown (1823) *S. rivularis* L. is distinguished from *S. hyperborea* R. Br., the preceding species, by several characteristics (see also Th. Sørensen, 1941: 134), of which the presence of runners in the former, their absence in the latter, is the most conspicuous.

295. **Saxifraga caespitosa** L. — Engler and Irmscher, 1916: 358. (Lange I: 62, *S. decipiens* Ehrh.).

In Greenland this polymorphic species is represented by ssp. *eucaespitosa* Engl. et Irmsch., and by ssp. *decipiens* (Ehrh.) Engl. et Irmsch., the latter being restricted to the southernmost part of the country. Chromosome counts have been made by various authors, and in all cases the same number, 2n = 80, has been found:

Counts of ssp. *eucaespitosa*: Harmsen (unpubl.), Disko Island; Holmen (1952), Peary Land; the present authors, Nugssuaq Peninsula.

Counts of ssp. *decipiens*: Böcher and Larsen (1950), Kitsigsut, SW Greenland, under the name of *S. groenlandica* L.

Flovik (1940) was the first to establish the number of 2n = 80 in this species, his material being of Spitsbergen origin. Á. and D. Löve (1951) are in agreement as to Icelandic plants.

S. rosacea Moench sensu Webb, a plant which Á. and D. Löve (*loc. cit.*), in our opinion erroneously, identify with *S. caespitosa* ssp. *decipiens* (Ehrh.) Engl. et Irmsch., does not occur in Greenland. Webb's description and figures (Webb, 1950: 185) of *S. rosacea* show it to be different from Greenland specimens of ssp. *decipiens*, and according to Á. and D. Löve (*loc. cit.*) and to Webb (*loc. cit.*) its chromosome number is 2n = 64.

296. **Chrysosplenium tetrandrum** (N. Lund) Th. Fr. — Th. Fries, 1858: 193. (J. Grøntved, 1931: 442, *C. alternifolium* L.).

Rosaceae.

297. **Rubus Chamaemorus** L. — Lange I: 2.

Only a few Greenland localities are known for this species. Plants from the Kuk Islands at the mouth of the Godthaab Fiord were brought to Denmark by Mr. Bang Christensen and grown there. The root-tip slides of these plants had 2n = 56, the same number as given by all previous authors. (See Á. and D. Löve, 1948).

298. **Rubus saxatilis** L. — Lange I: 2.

299. **Potentilla palustris** (L.) Scop. — Lange I: 3.

A widely distributed species divided into morphologically different geographical races, some of which are known to differ in chromosome number. The Greenland plants from Narssarsuaq, SW Greenland, studied by us, have 2n = 42 (fig. 117), a number hitherto only known from Pamir (Sokolovskaja and Strelkova, 1935). The same authors report 2n = 64 from the same region. In Northern Europe (Scandinavia and Northern Germany) the plants all seem to have 2n = 28, a number found by Wulff (1937) and by Ehrenberg (1945).

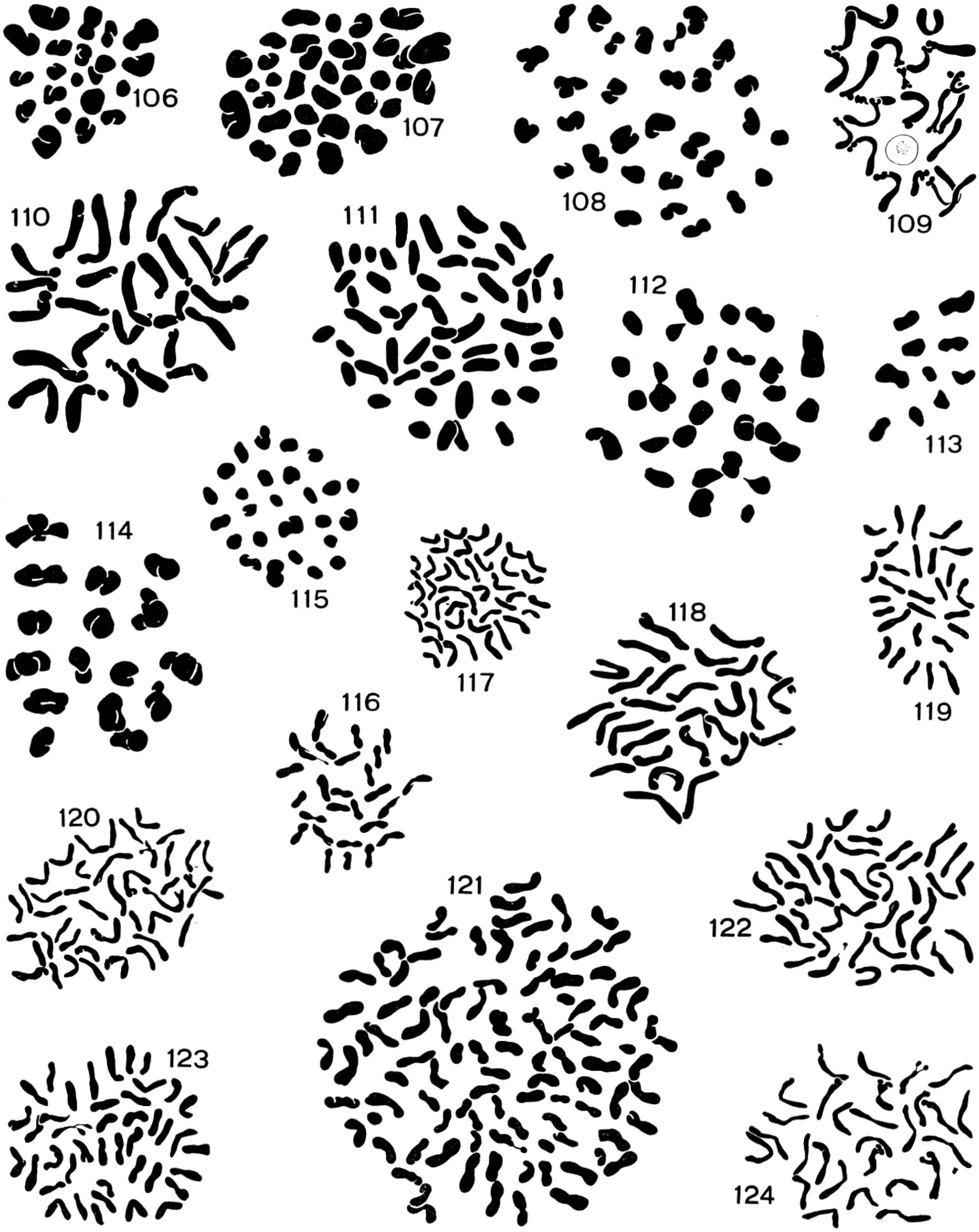


Fig. 106—124. Figs. 109—111, 116—124 are somatic mitoses; figs. 106—108, 112—115 are PMCs, 1st metaphase. Fig. 106, *Braya linearis*, n = 21. Fig. 107, *Braya intermedia*, n = 35. Fig. 108, *Lesquerella arctica*, n = 30. Fig. 109, *Sedum annuum*, 2n = 22. Fig. 110, *Saxifraga Aizoon*, 2n = 28. Fig. 111, *Saxifraga foliolosa*, 2n = 56. Fig. 112, *Saxifraga nivalis*, n = 30. Fig. 113, *Saxifraga tenuis*, n = 10. Fig. 114, *Saxifraga Hirculus*, n = 16. Fig. 115, *Saxifraga rivularis*, n = 26. Fig. 116, *Saxifraga hyperborea*, 2n = 52. Fig. 117, *Potentilla palustris*, 2n = 42. Fig. 118, *Potentilla tridentata*, 2n = 28. Fig. 119, *Potentilla pulchella*, 2n = 28. Fig. 120, *Potentilla Vahliana*, 2n = 42. Fig. 121, *Potentilla Ranunculus*, 2n = 98. Fig. 122, *Potentilla emarginata*, 2n = 42. Fig. 123, *Potentilla Crantzii*, 2n = 42. Fig. 124, *Potentilla Egedii*, 2n = 28. (Figs. 107—116, 118—124 × 4000, figs. 106 and 117 × 3000).

Evidently, a thorough cyto-taxonomical analysis of the complex would result in a subdivision of *P. palustris* into a number of separate species or subspecies.

300. **Potentilla tridentata** Soland. — Lange I: 10.

Root-tip mitoses of plants from BW 1, SW Greenland were found to have 2n = 28 (fig. 118), the same number as that reported by Shimotomai (1930).

301. **Potentilla pulchella** R. Br. — Lange I: 4 including *P. Sommerfeltii* Lehm. (cf. Lange III: 634).

We have counted two collections of this species, from places near each other on the Nugssuaq Peninsula, NW Greenland, and Holmen (1952) has studied material from Peary Land, North Greenland. In all three cases 2n = 28 (fig. 119) was found. By comparison with *P. tridentata* the small size of the chromosomes is remarkable.

For Spitsbergen plants Flovik (1940), for Finnish plants Erlandsson (in Á. and D. Löve, 1948), and from Baffin Island, Dansereau and Steiner (1956) report the same number.

302. **Potentilla rubricaulis** Lehm. — Simmons, 1906: 50, 1909: 61; Sørensen, 1933: 64; Hultén, 1945a: 118. (Ostenfeld. 1923a: 182, *P. Pedersenii* (Rydb.) Ostf.).

303. **Potentilla Chamissonis** Hult. — Hultén, 1945a: 140. (Lange I: 8, *P. nivea* L. pro parte).

Böcher and Larsen (1950) have counted two samples from NW Greenland (Eqaluit and Sdr. Strømfjord) and found both collections to have 2n = 56. Müntzing (see Hultén, 1945a) investigated Scandinavian material and found a different number, the root-tips of his plants having 2n = 77. In plants from Baffin Island Dansereau and Steiner (1956) counted 2n = 49.

P. Chamissonis of Hultén thus seems to be a collective species (cf. also Böcher, 1952:30).

304. **Potentilla nivea** L. emend. Hult. — Hultén, 1945a: 129. (Lange I: 8, *P. nivea* L. pro parte).

The only chromosome counts which can be safely referred to *P. nivea* in the Hulténian sense are those of Müntzing, determined on plants from Sweden. (See Hultén, 1945a), and that of Dansereau and Steiner (1956). Both counts showed 2n = 56, the latter authors, however, stating the number with some reservation.

Earlier counts (Erlandsson in Á. and D. Löve, 1942, Swedish material, Shimotomai, 1930, and Sakai, 1934, in which the origin of the material is not stated) are referred to the collective species *P. nivea* L. Erlandsson gives 2n = 56, whereas the Japanese authors counted 2n = 70.

305. **Potentilla nivea** L. ssp. **subquinata** (Lge.) Hult. — Hultén, 1945a: 135. (Lange I: 9).

The two plants from Nugssuaq Peninsula, NW Greenland, counted by Böcher and LARSEN (1950) to 2n = 63 are referred to *P. nivea* s. str., but according to KNUD JAKOBSEN (pers. communication) the plants belong here.

306. **Potentilla Vahliana** Lehm. — LANGE I: 8.

In Greenland this is a very characteristic and uniform species, The root-tips of plants collected at Ikorfat, Nugssuaq Peninsula, NW Greenland, showed the chromosome number to be 2n = 42 (fig. 120), the chromosomes being of the same small and slender type as those of *P. pulchella*. DANSEREAU and STEINER (1956) have recently counted 2n = 49 and 56 in Baffin Island material. Evidently, this species is also a collective one.

307. **Potentilla stipularis** L. — GELTING, 1934: 112.

308. **Potentilla Ranunculus** Lge. — LANGE I: 7.

A highly interesting species, described by LANGE in 1880. The chromosome number is very high, 2n = 98 (fig. 121). The root-tips were treated with Oxychinoline, for which reason the chromosomes in the figure cannot be compared directly to those of the other species. The plant was collected at BW 1, SW Greenland.

Nothing is known as to the mode of reproduction of *P. Ranunculus,* but the possibility of apomixis should be kept in mind. We do not agree with A. E. PORSILD, 1951: 223, that this characteristic plant should be given subspecific rank only (*P. diversifolia* Lehm. ssp. *Ranunculus* (Lge.) A. E. PORSILD).

309. **Potentilla rubella** Th. S. — GELTING, 1934: 106.

Again we disagree with A. E. PORSILD as to the taxonomical rank of this distinct species, and to its close relationship to *P. diversifolia,* and *P. Ranunculus.* (A. E. PORSILD, 1951: 223).

310. **Potentilla emarginata** Pursh — LANGE I: 8. We include in this species *P. hyparctica* Malte (1934b: 177), cf. M. P. PORSILD, 1946a: 10.

2n = 42 was counted in root-tips of plants from Nugssuaq Peninsula, NW Greenland (fig. 122). The chromosomes are of the usual *Potentilla* type. FLOVIK (1940) reports the same number for plants from Spitsbergen. 2n = 42 was also counted from Point Barrow, Alaska, by DANSEREAU and STEINER (1956). Plants from Baffin Island, however, had a different number, viz. 2n = 49. DANSEREAU and STEINER (*loc. cit.*) named their plants *P. hyparctica,* (cf. FERNALD, 1943: 111), in our opinion not to be followed, the *emarginata* name deserving to be declared a *nomen conservandum.*

311. **Potentilla Crantzii** (Cr.) Beck coll. — POLUNIN, 1943: 389. (LANGE I: 6 and 9, *P. maculata* Pourr. + *P. Frieseana* Lge.).

Two collections of this polymorphic species were studied by us, one from BW 1, the other from Nugssuaq, in SW and NW Greenland, respectively. In both cases

2 n = 42 was found (fig. 123). The same number has been reported for Swedish material by MÜNTZING (1931) and by HÅKANSON (1946). Besides the above number MÜNTZING (*loc. cit.*) also found 2 n = 49, which is not surprising, considering the apomictic reproduction of these plants (MÜNTZING, *loc. cit.*; cf. RUTISHAUSER, 1948).

312. **Potentilla Egedii** Wormskj. — HYLANDER, 1945: 204. (LANGE I: 5, *P. anserina* L.).

Material of *P. Egedii* was collected at Holsteinborg, NW Greenland, in which 2 n = 28 could be counted in the root-tips (fig. 124). This number has also been reported for plants from Disko island (var. *groenlandica* (Tratt.) Pol.) by ERLANDSSON (1942).

This author has also studied plants from a number of Scandinavian localities, most of which had 2 n = 28, but a few were found with 2 n = 35 and 2 n = 42. Some of these plants belong to var. *groenlandica*, which differs from the main species mostly by the hairiness of the underside of the leaves.

P. Egedii is an arctic substitute for *P. anserina*, which exhibits a similar variation in chromosome numbers, 2 n = 28 and 2 n = 42 being counted (see TISCHLER, 1950).

313. **Sibbaldia procumbens** L. — LANGE I: 11.

The chromosome number of 2 n = 14 is known for plants of East Greenland origin (BÖCHER, 1938). This figure is in accordance with the number reported by Á. and D. LÖVE (1944) for Swedish material, and LARSEN (1954) for Alpine material (Mont Blanc).

314. **Alchemilla alpina** L. — LANGE I: 11.

315. **Alchemilla vulgaris** L. coll. — LANGE I: 11.

According to SAMUELSSON (1943) the following 4 microspecies occur in Greenland:

1. *A. filicaulis* Buser (Cf. HYLANDER, 1945: 209).
2. *A. vestita* (Buser) Raunk. (Cf. DEVOLD and SCHOLANDER, 1933: 36, *A. minor* Huds., cf. HYLANDER, 1945: 208).
3. *A. Wichurae* (Buser) Stefáns. *A. acutidens* Lindb. fil. of Greenland authors. (Cf. HYLANDER, 1945: 211).
4. *A. glomerulans* Buser incl. *A. alpestris* (KRUUSE, 1906: 222) and *A. pseudomicans* (BÖCHER, 1933: 16).

The only one of these microspecies for which the chromosome number is known is *A. glomerulans*, of which root-tips of a plant from BW 1, SW Greenland, could be shown to have 2 n = 96 (95—97) chromosomes, counted with almost full certainty (fig. 125). The previous count by BÖCHER (1938) of 2 n = app. 64 needs confirmation, in as much as the numbers known for other microspecies all are of the order of 90 to 100. (See Á. and D. LÖVE, 1948).

316. **Sorbus decora** (Sarg.) Schneid. var. **groenlandica** (Schneid.) Jones — Jones, 1939: 5 and 25. (Lange I: 12, *S. americana* Willd.).

Greenland specimens from Ivigtut, SW Greenland, have been counted by K. Holmen (unpublished) and by Böcher and Larsen (1950). They agree as to the number of 2n = 68. The Greenland variety of *S. decora* is thus tetraploid. The American main species has not yet been counted, but its closest relatives in Europe and America, viz. *S. aucuparia* L. and *S. americana* Marsh., both have 2n = 34 (Liljefors, 1934, Sax, 1931).

317. **Dryas octopetala** L. sensu Juzepczuk — Juzepczuk in Komarov X, 1941: 270. (Lange I: 2).

The recent statement of A. E. Porsild (1947) that the East Greenland *Dryas octopetala* of all previous authors should be referred to *D. punctata* Juz. invited a renewed study of the material.

In contradistinction to Porsild we find that most of the East Greenland plants are in reality *D. octopetala*, and most, perhaps all such specimens may be referred to the small-leaved variety var. *minor* Hook., which variety, however, is included in the main species by Juzepczuk (*loc. cit.*).

The cytological data given below, our own as well as those of previous investigators, cannot, it is true, with certainty be referred to a distinct type. Since in East Greenland as also in Spitsbergen (cf. Hadač, 1944: 54) *D. octopetala* var. *minor* Hook. is the common form, the cytological collections in all probability belong to this unit, and not to *D. punctata*.

In flower buds fixed on Clavering Island, NE Greenland, the M_I in the PMCs showed n = 9. The same number is given by Böcher (1938), likewise from East Greenland, and by Flovik (1940) from Spitsbergen (Flovik refers his plants to *D. octopetala*).

The alpine-Scandinavian plant, possibly varietally different, has the same number, according to Á. and D. Löve (1944b).

318. **Dryas octopetala** L. ssp. **punctata** (Juz.) Hult. — Hultén, 1946: 1047. (A. E. Porsild, 1947: 185, *D. punctata* Juz. pro parte).

Due to the recent monograph of A. E. Porsild the occurrence of this type of Siberian affinity in East Greenland has been established. However, in contradistinction to Porsild we have found, upon an examination of the specimens in the Copenhagen herbarium, that it is actually of rather rare occurrence. Since plants with a few glands only and otherwise referable to *D. octopetala* may occasionally be found, we are inclined to follow Hultén in ascribing subspecific rank only to *D. punctata*.

319. **Dryas integrifolia** Vahl. — Lange I: 3. See A. E. Porsild, 1947: 188.

All the West Greenland *Dryas* plants belong to this species.

The chromosome number is the same as that of the preceding species according to Böcher and Larsen (1950), who found 2n = 18 in root-tips of plants from Ivigtut, SW Greenland.

Papilionaceae.

320. **Vicia Cracca** L. — Lange I: 1. See M. P. Porsild, 1932: 67 for the questionable indigeneity to Greenland of this species.

Plants from Tasiusak, South Greenland, had the somatic number of 2n = 28. Two chromosome races have been found in this species viz. 2n = 14 and 2n = 28. (Sveshnikova, 1937; Ryka, 1954). Outside Greenland the tetraploid number has been counted in Swedish plants (Á. and D. Löve, 1948), in Britain (Clapham *et al.*, 1952) and in Denmark (Sorgenfri, Zealand, our own investigations). Ryka (*loc. cit.*) found the 14-chromosome type to be common in South Poland, whereas only one, partly sterile, specimen with 28-chromosomes was found near Cracow. Sveshnikova's diploid type was of Mediterranean origin. Ryka (*loc. cit.*) found only small, anatomical differencies between the diploid and tetraploid Polish plants. A more comprehensive comparison between North and South European plants would probably result in a subdivision of the species.

321. **Lathyrus maritimus** (L.) Bigel. — Lange I: 1. See also Hylander, 1945: 232. Cf. M. P. Porsild, 1932: 67.

All counts of this species recorded in the literature are in agreement, the number being 2n = 14. We have found it in plants from BW 1, SW Greenland.

Geraniaceae.

322. **Geranium silvaticum** L. — Lange II: 240. Cf. M. P. Porsild, 1932: 68.

Polygalaceae.[1]

Callitrichaceae.

323. **Callitriche verna** (L.) Lönnr. — Fassett, 1951: 166. (Lange I: 14 pro parte. See Samuelsson, 1925: 624. See also Schotsman, 1954: 358, *C. palustris* L.; in our opinion not to be followed).

The somatic chromosome number of this species was counted in two specimens from BW 1, SW Greenland, and both had 2n = 20. This is in agreement with the number given by Jørgensen (1923) for plants of Danish origin.

[1] *Polygala serpyllifolia* Hose — Devold & Scholander, 1933: 55 (*P. serpyllaceum* Weihe). As the reported find of this species in Eastern Greenland is outside its known geographical distribution, and as it refers to a single specimen only, we have excluded it from our list, the more so as the collectors themselves indirectly express some doubt as to the origin of the specimen.

324. **Callitriche anceps** Fern. — FASSETT, 1951: 187; cf. also SAMUELSSON, 1925: 621, footnote, POLUNIN, 1943: 391. (LANGE I: 14, *C. verna* (L.) Lönnr. pro parte, *C. hamulata* Kütz. pro parte; LANGE II: 238, including *C. polymorpha* Lönnr.).

325. **Callitriche hamulata** Kütz. — FASSETT, 1951: 185. (LANGE I: 14 pro parte. See SAMUELSSON, 1925: 628, and POLUNIN, 1943: 391).

According to FASSETT (*loc. cit.*) this species is completely lacking on the American continents.

326. **Callitriche hermaphroditica** L. — FASSETT, 1951: 215. (M. P. PORSILD, 1920: 107, *C. autumnalis* L. See also SAMUELSSON, 1925: 610).

Droseraceae.

327. **Drosera rotundifolia** L. — LANGE III: 667.

Violaceae.

328. **Viola Labradorica** Schrank — BRITTON and BROWN, 1947, II: 561. (LANGE I: 33, *V. Muehlenbergiana β minor* Hook.). See also GLEASON, 1952: 565.

329. **Viola canina** L. ssp. **montana** (L.) Fr. — LANGE I: 34, *V. canina* L. var. *montana* (L.). As regards nomenclature see also POLUNIN, 1943: 391 and HYLANDER, 1945: 332.

The Greenland plants differ slightly from the Scandinavian ones; they are generally much dwarfed and often procumbent, and their stipules are rather narrow. By these characters they may approach the main species. Probably this is the reason why WARBURG (CLAPHAM *et al.*, 1952: 246) refers the Greenland plant to ssp. *canina* and not to ssp. *montana*. In our opinion the whole of the Greenland material should be classed with the latter rather vaguely delimited subspecies.

330. **Viola palustris** L. — LANGE I: 33.

The somatic number is 48, counted in root-tips of plants from BW 1, SW Greenland. The same number was reported for Danish material by CLAUSEN (1931).

331. **Viola Selkirkii** Pursh — LANGE III: 668.

Onagraceae.

332. **Epilobium palustre** L. — LANGE I: 15, including *E. lineare* Mühlenb., cf. LANGE II: 239.

333. **Epilobium arcticum** Sam. — SAMUELSSON, 1922: 260. (DUSÉN, 1901 a: 16. *E. anagallidifolium* Lam.).

334. **Epilobium anagallidifolium** Lam. — LANGE III: 659. (LANGE I: 14, *E. alpinum* L.).

Counted by BÖCHER and LARSEN (1950) in plants from Kangamiut, SW Greenland, 2n being 36. BÖCHER (1938) gives the same number in Swedish plants, whereas MATTICK (in TISCHLER, 1950) reports the interesting find of 2n = 18 in material from the Austrian Alps.

335. **Epilobium lactiflorum** Hausskn. — LANGE II: 238.

BÖCHER and LARSEN (1950) give 2n = 36 for plants from Grønnedal, SW Greenland.

336. **Epilobium Hornemanni** Rchb. — KRUUSE, 1906: 225, cf. also BÖCHER, 1938c: 145. (LANGE I: 15, *E. alsinefolium* Vill., LANGE II: 239, *E. alsinefolium* ssp. *Hornemanni* (Rchb.)).

This species has not been counted in Greenland. The count of 2n = 36 by BÖCHER, 1938c, was on Swedish material. The statement of Greenland origin is due to a misprint (personal communication by the author).

337. **Chamaenerion angustifolium** (L.) Scop. — LANGE I: 16.

The Greenland material is varietally distinct from that of more southern countries and belongs to var. *intermedia* Wormsk; cf. also FERNALD, 1918: 5.

The chromosome number of 2n = 36 was found by BÖCHER and LARSEN (1950) in plants from Grønnedal, SW Greenland. All other counts of this species have revealed the same number.

338. **Chamaenerion latifolium** (L.) Sweet — LANGE I: 16.

Several reports of the chromosome number of this species are found in the literature: BÖCHER (1938c, Cape Dalton, NE Greenland), BÖCHER and LARSEN (1950, Sdr. Strømfjord, NW Greenland), HARMSEN (in Á. and D. LÖVE, 1948, Disko Island), and Á. and D. LÖVE (1948, Icelandic plants). All these authors agree as to the chromosome number being 2n = 72.

We have studied PMC meiotic divisions in plants from Clavering Island and found the chromosome distribution to be somewhat irregular, and the pollen grains to vary in size. The disturbances are no doubt due to environmental conditions, since different anthers of the same plant show widely different behaviour.

Haloragaceae.

339. **Myriophyllum exalbescens** Fern. — FERNALD, 1919a: 120. (LANGE II: 237, *M. spicatum* L.).

The recent chromosome counts of Á. LÖVE (1954a), who finds 2n = 14 in *M. exalbescens* and 2n = 28 in *M. spicatum*, support the view of FERNALD (*loc. cit.*) that the two types are specifically different, in contradistinction to PATTEN (1954).

340. **Myriophyllum alterniflorum** L. — LANGE I: 13.

In root-tips of plants from BW 1, SW Greenland, many mitoses showed the chromosome number to be 2n = 14 (fig. 126), the same number as that reported by SCHEERER (1939).

Hippuridaceae.

341. **Hippuris vulgaris** L. — LANGE I: 13.

Meiotic divisions in PMCs of plants from Clavering Island, NE Greenland, were studied by us. The haploid number is 16, clearly exhibited in the anaphases (fig. 127). In the first metaphase a sort of secondary association, due to some unknown cause, is often seen. Some of the bivalents are joined to configurations of higher valency, giving the impression of a lower number, sometimes even of 8.

WINGE (1917) found the same chromosome number in plants of Danish origin.

Cornaceae.

342. **Cornus suecica** L. — LANGE I: 67, pro parte, cf. OLSEN, 1914: 127.

Mitoses in the root-tips of plants from SW Greenland show the chromosome number of 2n = 22, the same number as reported by WULFF (1939) for German plants.

343. **Cornus canadensis** L. — OLSEN, 1914: 127. (LANGE I: 67, *C. suecica* L. pro parte).

Umbelliferae.

344. **Angelica Archangelica** L. ssp. **norvegica** (Rupr.) Nordh. — HYLANDER, 1945: 251. (LANGE I: 68, *Archangelica officinalis* Hoffm.).

The chromosome number was found to be 2n = 22, in plants from BW 1, SW Greenland. The Scandinavian plants of this subspecies have the same number (Á. and D. LÖVE 1948, VAARAMA ex Á. and D. LÖVE, 1948), and so also has spp. *litoralis* (Fr.) Thell., counted by WANSCHER (1931), by VAARAMA, and by Á. and D. LÖVE (in Á. and D. LÖVE, 1948).

In American manuals *Coelopleurum lucidum* (L.) Fern. is often stated to occur in Greenland. This is not correct, the Greenland plants in question being the present species.

345. **Ligusticum scoticum** L. — LANGE I: 68, *Haloscias scoticum* Fr.

Plants from Igaliko, SW Greenland, were found to have 2n = 22, the same number as that reported by WANSCHER (1932) for Danish plants.

Pirolaceae.

346. **Pirola minor** L. — Lange I: 85.

347. **Pirola grandiflora** Rad. — Lange I: 84, including *P. rotundifolia* L. var. *arenaria* Koch. See M. P. Porsild, 1920: 117, and Malte, 1934b: 182.

Both Hagerup (1928) and Harmsen (unpublished) report the chromosome number of this species to be 2n = 46. Their material is from West Greenland.

348. **Ramischia secunda** (L.) Garcke ssp. **obtusata** (Turcz.) H. Andr. — Andres, 1923: 219. (Lange I: 85, *Pirola secunda* L. var. *borealis* Lge.).

Ericaceae.

349. **Ledum groenlandicum** Oeder — Lange I: 89.

Hagerup (1941b) gives 2n = 26 on West Greenland material.

350. **Ledum palustre** L. ssp. **decumbens** (Ait.) Hult. — Hultén, 1930: 8. (Lange I: 89, *L. palustre* L.).

Hagerup (1941b) counted 2n = 52 in plants from West Greenland. The chromosome number of the main species, which it would be important to know for taxonomical reasons, is not yet known.

351. **Rhododendron lapponicum** (L.) Wbg. — Lange I: 88.

Again our knowledge as to the chromosome number is due to Hagerup's investigations (1941b). He found 2n = 26 in material from NE Greenland.

352. **Loiseleuria procumbens** (L.) Desv. — Lange I: 88.

Hagerup (1928) gives 2n = 24 in material from SW Greenland and from Iceland. Mattick (in Tischler, 1950) found the same number in plants of Alpine origin.

353. **Phyllodoce coerulea** (L.) Bab. — Lange I: 86.

Hagerup (1928) was the first to study this species cytologically. He found it difficult to settle the question of its chromosome number because the bivalents in the PMCs have a marked tendency to fuse together. He felt convinced, however, that the haploid number was 6, although in the diakinesis and the M_{II}-plates figured by him a higher number is present. Wanscher (1934) and Böcher (1938c) have reexamined Hagerup's slides and find n = 12 to be the correct number. We agree in this view.

354. **Cassiope tetragona** (L.) D. Don — Lange I: 87.

2n = 26 was counted by Hagerup (1941b) in material from Clavering Island, NE Greenland. This number has been confirmed by us in Hagerup's slides as well as in aceto-carmine smears of plants from Nugssuaq, NW Greenland.

355. **Harrimanella hypnoides** (L.) Coville — Coville, 1901: 575. (Lange I: 87, *Cassiope hypnoides* (L.) D. Don).

The material collected by ourselves in West Greenland was fixed too late in the summer to be of any use. Thanks to the kindness of Dr. Hagerup, we have had his slides of this species for examination. The statement in Hagerup's paper (1941 b), is not very definite; however we found a few PMCs in which it was possible to settle definitely the chromosome number, n being 16 (fig. 128).

This number places the species rather remotely from the preceding one, and partly for this reason we have followed Coville in placing it in a separate genus.

356. **Andromeda glaucophylla** Link — M. P. Porsild, 1930: 35. (Lange I: 87, *A. Polifolia* L. pro parte).

357. **Andromeda Polifolia** L. — Lange I: 87, pro parte, cf. M. P. Porsild, 1930: 35.

358. **Arctostaphylos Uva-ursi** (L.) Spreng. — Lange I: 86.

359. **Arctostaphylos alpina** (L.) Spreng. — Lange I: 86.

n = 13 was counted in PMCs (fig. 129) of material from Clavering Island, NE Greenland. The chromosome number of this species is thus only half that of the preceding one, in which Hagerup (1928) counted n = 26.

360. **Vaccinium Vitis-idaea** L. ssp. **minus** (Lodd.) Hult. — Hultén, 1937: 268. (Lange I: 90, *V. Vitis-idaea* L. var. *pumilum* Hornem.).

361. **Vaccinium uliginosum** L. — Lange I: 90, excl. ssp. *microphyllum* Lge.

362. **Vaccinium uliginosum** L. ssp. **microphyllum** Lge. — Lange I: 91.

Hagerup (1933) reported n = 12 in PMCs of plants from West Greenland at 66° lat. N. and from East Greenland at 73° lat. N. We have confirmed this number in root-tips of plants from Nugssuaq Peninsula, NW Greenland.

Hagerup (*loc. cit.*) also counted n = 24 for the main species on material from Denmark. Unfortunately, plants of the main species which occur in the southern parts of Greenland, have not been subjected to a cytological study, and it is still an open question whether they agree in chromosome number with the Danish type or not.

363. **Oxycoccus quadripetalus** Gilib. var. **microphyllus** (Lge.) Porsild — M. P. Porsild, 1930: 38. (Lange I: 90, *O. palustris* Pers.; Lange II: 267, *O. palustris* Pers. f. *microphylla* Lge.).

The collective species is interesting from a cytotaxonomical point of view in containing a number of different polyploid karyotypes (2n = 24, 48, and 72), as reported by HAGERUP, 1940; NEWCOMER, 1941; CAMP, 1944; DARROW, CAMP, FISCHER, and DERMEN, 1944. HAGERUP (*loc. cit.*) has found the chromosome number of var. *microphyllus* to be 2n = 48 in plants from West Greenland.

Empetraceae.

364. **Empetrum hermaphroditum** (Lge.) Hagerup — HAGERUP, 1927: 7. (LANGE I: 18, *E. nigrum* L. forma *hermaphrodita* Lge.).

HAGERUP (*loc. cit.*) gives the chromosome number of this species as 2n = 52, his material being collected in West Greenland. ARWIDSSON (1943) reports the same number for Scandinavian plants. WESTERGAARD (1940: 105) has commented on the sex-chromosome interpretation of HAGERUP.

The closely related dioecious species *E. nigrum* L. has half the chromosome number of *E. hermaphroditum* (HAGERUP, 1927, see also Á. and D. LÖVE, 1948).

Diapensiaceae.

365. **Diapensia lapponica** L. — LANGE I: 83.

HAGERUP (1928) reports 2n = 12 on plants from West Greenland. We have confirmed this number on material from Clavering Island, NE Greenland. See also BALDWIN, 1939, ex Á. and D. LÖVE, 1948.

Primulaceae.

366. **Primula stricta** Hornem. — LANGE I: 70; LANGE II: 260, excluding var. *groenlandica* Warm.; LANGE III: 683, *P. farinosa* L. var. *mistassinica* (Mich.) Pax, excluding var. *groenlandica* Warm.

367. **Primula egaliksensis** Wormskj. — LANGE I: 71; LANGE II: 260, including *P. stricta* var. *groenlandica* Warm. See FERNALD, 1928: 98.

This species is in Greenland represented by two races, the white-flowered, which is the one on which WORMSKJOLD's diagnosis was founded, and a lilac-coloured one of a more northern distribution (the var. *groenlandica* Warm. f. *violacea* Fern., FERNALD, 1928:98). Root-tip mitoses of plants from Igaliko, grown at Lyngby, Denmark, showed 2n = 36 (fig. 130).

P. egaliksensis is a typical member of the subsection *Eu-Farinosae*, just as is *P. stricta*. The species in this section, which deserve a closer taxonomical study, form a beautiful polyploid series, the numbers 2n = 18, 36, 54, 72, and 126 (*P. stricta*) being at present known (BRUUN, 1930, 1932, ERNST, 1953).

368. **Androsace septentrionalis** L. — POLUNIN, 1940: 320, footnote.

Plumbaginaceae.

369. **Armeria maritima** (Mill.) Willd. — HYLANDER, 1945: 257. (IVERSEN, 1940: 27, *A. vulgaris* Willd.).

370. **Armeria scabra** Pallas ssp. **sibirica** (Turcz.) Hyl. — HYLANDER, 1945: 257. (LANGE I: 70, *A. sibirica* Turcz.). See also IVERSEN, 1940: 18, *A. scabra* Willd. ssp. *labradorica* Wallr.) Ivers.

We have been able to confirm HAGERUP's count of 2n = 18 (HAGERUP in IVERSEN, 1940: 33) for this species, our material being collected on Clavering Island.

Gentianaceae.

371. **Gentiana nivalis** L. — LANGE I: 82.

372. **Gentianella detonsa** (Rottb.) G. Don — Cf. HYLANDER, 1945: 48. (LANGE I: 82, *Gentiana serrata* Gunn.). For varieties see M. P. PORSILD, 1935: 43.

373. **Gentianella aurea** (L.) H. Sm. — HYLANDER, 1945: 259. (LANGE I: 82, *Gentiana aurea* L.).

374. **Gentianella tenella** (Rottb.) H. Sm. — HYLANDER, 1945: 259. (LANGE II: 265, *Gentiana tenella* Rottb. See also ROUSSEAU et RAYMOND, 1952: 76).

375. **Gentianella Amarella** (L.) H. Sm. — HYLANDER, 1945: 259. (POLUNIN, 1938: 2, *Gentiana amarella* L. var. *uliginosa* Wbg., POLUNIN, 1943: 396, *Gentiana amarella* L.).

376. **Lomatogonium rotatum** (L.) Fr. — FERNALD, 1919b: 194. (LANGE I: 82, *Pleurogyne rotata* (L.) Griseb.).

Menyanthaceae.

377. **Menyanthes trifoliata** L. — LANGE I: 83.

Two Greenland counts are available, one due to HOLMEN (unpublished), the other to ourselves on plants from Lichtenau, SW Greenland. In both cases 2n = 54 was found, as in all other counts of this plant.

Polemoniaceae.

378. **Polemonium boreale** Adams — HULTÉN, 1948: 1324. (LANGE I: 80, *P. humile* Willd.).

Boraginaceae.

379. **Mertensia maritima** (L.) S. F. Gray — Hultén, 1949: 1358. (Lange I: 80, *Stenhammaria maritima* (L.) Rchb.).

Labiatae.

380. **Thymus arcticus** (Dur.) Ronniger — Ronniger, 1924: 331. See also M. P. Porsild, 1935: 38, Jalas, 1947: 23 and 1948: 418. (Lange I: 81, *T. Serpyllum* L. var. *prostrata* Hornem.).

We have not followed Jalas (1948) and Warburg (Clapham *et al.*, 1952: 942) in using *T. Drucei* Ronn. as name for this species.

T. Drucei was coined by Ronniger to design a local British race of the species, and the fact that it is placed three pages ahead of *T. arcticus* in Ronniger's paper, does not in our opinion justify its legality over the older name. Such a change of names was certainly not intended by Ronniger.

Specimens from SW Greenland (Tasiusak in the Tasermiut Fjord and Grønnedal near Ivigtut) were grown in Denmark, and their root-tips showed $2n = 54$, all the chromosomes being small and of almost equal size. The same chromosome number has been found by Jalas (1948) in plants from Norway and Iceland. The late G. Gudjónsson, M. Sc., also counted $2n = 54$ in Icelandic material (unpublished).

The two Scandinavian subspecies of *T. Serpyllum* (L.) Mill., viz. *tanaénsis* (Hyl.) Jal. and *angustifolius* (Pers.) Vollm. both have $2n = 24$ (see Jalas, 1948).

Scrophulariaceae.

381. **Limosella aquatica** L. — Lange I: 72.

Plants from BW 1, SW Greenland, of which root-tips were fixed, have $2n = 40$ (fig. 131). The chromosomes are small and pointed and of almost equal size.

The same number is given for this species by Vachell and Blackburn (1939) and by Á. and D. Löve (1944). The British authors record $2n = 20$ for the closely related *L. subulata* Ives.

382. **Veronica fruticans** Jacq. — Pennell, 1921: 13. (Lange I: 73, *V. saxatilis* L. fil.).

Known from Greenland by countings of Harmsen (unpublished) on material from Disko Island, NW Greenland, to have $2n = 16$, the same number as reported by other authors on material from outside Greenland.

383. **Veronica alpina** L. — Lange I: 72 pro parte, excl. *β villosa* Lge., cf. Pennell, 1921: 14.

Of this common species counts have been made by Böcher (1938), Cape Dalton, NE Greenland, Böcher and Larsen (1950, material from Nugssuaq Peninsula, collected by Knud Jakobsen) and by ourselves (Holsteinborg, NW Greenland). All plants have 2n = 18. All counts from outside Greenland show the same number.

Besides the main type the var. *australis* Wbg. occurs in Greenland (Böcher, 1938c: 176, *V. pumila* All. emend. Penn., see Hylander, 1945: 280). Larsen (1954) counted 2n = 18 in plants from the European Alps, the same number as found in the main species.

384. **Veronica Wormskjoldii** R. et S. — Pennell, 1921: 15. (Lange I: 73, *V. alpina* L. *β villosa* Lge.).

In two collections, one from BW 1, SW Greenland, the other from Holsteinborg, NW Greenland, we found the chromosome number to be 2n = 36, twice that of *V. alpina*. Counts have also been reported by Böcher and Larsen (1950), who give the same number in plants from Ivigtut, SW Greenland.

385. **Euphrasia officinalis** L. coll. — Lange I: 79.

Several microspecies occur in Greenland. Of these only *E. frigida* Pugsl. has been named, but Pugsley (see Böcher, 1938: 171) reports several other types to be present in the Greenland Herbarium of the Botanical Museum in Copenhagen. See also Polunin, 1943: 397.

Recently Callen (1952) has dealt with the nomenclatorial problems, and replaces the *frigida* name of Pugsley by *E. arctica* Lge. (cf. also Fernald, 1933: 301). Of the varieties established by Callen, var. *arctica* and var. *obtusata* occur in Greenland.

We have counted the chromosome number of *E. arctica* var. *obtusata* in plants from Clavering Island, NE Greenland. The meiotic divisions are regular and have n = 22 (fig. 132).

The collective species is known to include diploid (2n = 22) and tetraploid (n = 44) biotypes (v. Witsch, 1932, Reese, 1951).

386. **Rhinanthus minor** L. coll. — Hylander, 1945: 293. (Lange I: 78, *R. minor* Ehrh.). See also M. P. Porsild, 1930: 22 and 1932: 69.

This collective species is in Greenland represented by *R. groenlandicus* Chab., *R. borealis* Sterneck, *R. minor* L. s. str., and maybe one or two other, yet unnamed types.

One count only has been made. It is due to K. Holmen (unpublished), who in plants from SW Greenland (microspecies unknown) found 2n = 14 + 8 fragments, which — as far as the chromosome pattern is concerned — is consistent with the finding of Fagerlind (1936) in *R. major*. *R. minor* is known to have 2n = 14 from places outside Greenland (v. Witsch, 1932, Mattick, 1949, in Tischler, 1950, Á. Löve, 1950).

387. **Bartsia alpina** L. — Lange I: 78.

The chromosome situation in this species is as follows: Outside Greenland counts have been made by v. Witsch (1932), Doulat (1946), Mattick (1949, ex Tischler, 1950), and Favarger, 1953, who report the numbers 2n = 12, 24, and 36.

From Greenland only one counting has been attempted (Böcher and Larsen, 1950). They grew seedlings from seeds collected on Nugssuaq Peninsula, and in fixations made from these 2n = 28 is reported. The authors say that only one plate was sufficiently clear to allow a definite count to be made. They feel convinced, however, that all the other plates studied had a number exceeding 24. Further investigations are needed.

388. **Pedicularis groenlandica** Retz. — Lange I: 73, cf. M. P. Porsild, 1946b:96.

389. **Pedicularis lapponica** L. — Lange I: 74.

Harmsen (unpublished) gives 2n = 16, counted in PMCs of material from Disko, NW Greenland. The same number has been reported by Á. and D. Löve (1945a) from Sweden.

390. **Pedicularis arctica** R. Br. — Simmons, 1906: 31, 1909: 53, see also Ostenfeld, 1925: 21.

391. **Pedicularis lanata** Cham. et Schldl. — Lange I: 76.

392. **Pedicularis hirsuta** L. — Lange I: 76, including *P. Kanei* Durand and *P. sudetica* Willd. See Simmons, 1904: 471—72.

The haploid chromosome number of this species was determined on PMCs of material from Clavering Island, NE Greenland. Meiosis is regular, n = 8. The same number has been reported from NW Greenland (Harmsen, unpublished) and from Peary Land by Holmen (1952).

393. **Pedicularis labradorica** Wirsing — Merrill, 1938: 292. (Lange I: 74, *P. euphrasioides* Steph.).

394. **Pedicularis flammea** L. — Lange I: 75.

The chromosome number of n = 8 was counted in PMCs of material from Clavering Island, NE Greenland. The same number was found by Harmsen (unpublished, plants from Disko). Scandinavian plants counted by Á. and D. Löve (1948) likewise had 2n = 16.

395. **Pedicularis capitata** Adams — Lange I: 78.

Lentibulariaceae.

396. **Pinguicula vulgaris** L. — Lange I: 71.

Root-tips of plants from BW 1, SW Greenland, although not very satisfactory, leave no doubt that the chromosome number is slightly higher than 60, probably 64, just as in other counts of the species (Á. and D. Löve, 1948, Doulat, 1947).

The related *P. alpina* L. is known to have half this number (see authors above).

397. **Utricularia intermedia** Hayne — M. P. Porsild, 1920: 144 and 1935: 28.

398. **Utricularia ochroleuca** R. Hartm. — M. P. Porsild, 1935: 26.

399. **Utricularia minor** L. — Lange I: 72. Cf. M. P. Porsild, 1935: 26.

Plantaginaceae.

400. **Plantago maritima** L. coll. — Hylander, 1945: 295. (Lange I: 68, 69, *P. maritima* L. + *P. borealis* Lge.).

The chromosome number of Greenland plants of *P. maritima* was first counted by McCullagh (see Gregor, 1939) on material from Disko Island, NW Greenland. She found 2n = 12. The same number is present in plants from SW Greenland (Lichtenau Fjord) counted by us.

All counts of *P. maritima* s. l. from Northern Europe and North America agree as to the chromosome number 2n = 12 (Gregor *loc. cit.*; see also Tischler, 1950). The statement in Á. and D. Löve (1948) of 2n = 24 being present in Icelandic plants, cited on the authority of McCullagh (1934) is due to a misquotation. The tetraploid number is confined to the alpine species *P. alpina* L.

As the chromosome number of the various *P. maritima* types is the same, and as there is a transitional series of types connecting the boreal and arctic types of the species, we do not find it appropriate to keep *P. borealis* Lge. apart. As the taxonomical relationship of the European and American types is still open to discussion, we have chosen to follow Hylander, (1945: 295), leaving the *P. juncoides* problem aside. (See M. P. Porsild, 1920: 145, Fernald, 1925b: 93, and Gregor, 1939: 297).

Rubiaceae.

401. **Galium boreale** L. — Johs. Grøntved, 1954: 98.

According to Grøntved (*loc. cit.*) his Greenland specimens may be referred to var. *typicum* Beck. It would be interesting to know the chromosome number of these specimens. Recently Á. and D. Löve (1954) have shown that the American-Asiatic species are hexaploids (2n = 66) and should be referred to *G. septentrionale* R. et S., whereas *G. boreale* L. of European origin is tetraploid (2n = 44).

402. **Galium Brandegei** A. Gray — M. P. Porsild, 1930: 24. (Lange I: 92, *G. palustre* L. var. *minus* Lge.).

A chromosome count of this species was made by us in plants from BW 1, SW Greenland. The chromosome of the root-tip mitoses are long and slender, but well separated, and the number, 2n = 24, could be stated with full certainty (fig. 133).

In the related *G. palustre*, the same number is found in certain types, but this collective species contains a series of different chromosome numbers (FAGERLIND, 1934, 1937, HANCOCK, 1942, see also TISCHLER, 1950).

403. **Galium triflorum** Michx. — LANGE I: 91.

Caprifoliaceae.

404. **Linnaea borealis** L. ssp. **americana** (Forb.) Hult. — HULTÉN, 1930: 142. (LANGE II: 269, *L. borealis* L.).

We have no counts of this plant from Greenland, but want to point to the fact that Canadian plants of this subspecies counted by HAGERUP (1944) have the same chromosome number as the European main species, viz. 2n = 32 (EHRENBERG, 1945, VAARAMA in Á. and D. LÖVE, 1948).

Campanulaceae.

405. **Campanula rotundifolia** L. coll. — LANGE I: 93, including *C. groenlandica* Berl. (LANGE II: 269; cf. LANGE III: 694).

Of this collective species several biotypes differing in habit of growth and number of the flowers occur in Greenland. Chromosome counts of the dwarfish var. *uniflora* Lge. showed this plant to be diploid with 2n = 34, whereas the erect, taller growing var. *arctica* Lge., with one or a few flowers, is tetraploid, with 2n = 68 (BÖCHER, 1936, 1938c). More recently BÖCHER and LARSEN (1950) have dealt with this species again and found that there does not seem to be any relation between chromosome number and the growth type and number of flowers on the stalks; hence, the var. *uniflora* Lge. should be only a dwarfish modification. It should be noted that diploid types have also been found in the Alps (GUINOCHET, 1942).

We feel convinced that a more comprehensive investigation will bring out separating characters between the two Greenland karyotypes, as has been possible in the case of the Alpine types (GUINOCHET *loc. cit.*).

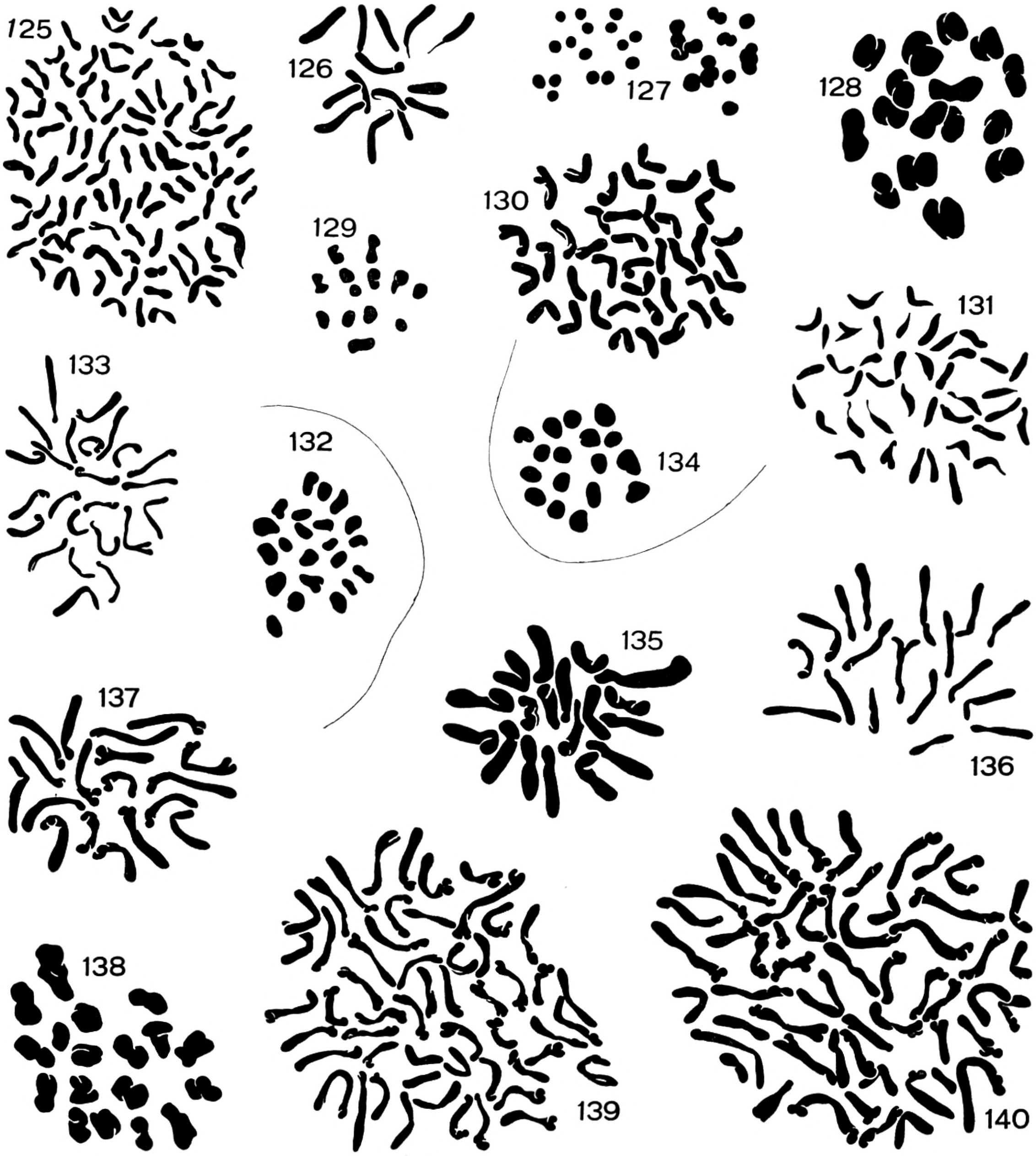
406. **Campanula uniflora** L. — LANGE I: 92.

In material from Clavering Island, NE Greenland of this very characteristic species meiotic divisions in the PMCs were plentiful. They proceed regularly and show n = 17 (fig. 134).

Compositae.

407. **Erigeron boreale** (Vierh.) Simmons — SIMMONS, 1913: 127, M. P. PORSILD, 1920: 149. (LANGE I: 101, *E. alpinus* L. pro parte).

Plants from BW 1, SW Greenland showed 2n = 18 in root-tip mitoses (fig. 135).



Figs. 125—140. Figs. 125, 126, 130, 131, 133, 135—137, 139, and 140 are root-tip mitoses, figs. 128, 129, 132 and 138 are PMCs 1st metaphase. Fig. 127 is a first anaphase.

Fig. 125, *Alchemilla glomerulans*, 2n = 96. Fig. 126, *Myriophyllum alterniflorum*, 2n = 14. Fig. 127, *Hippuris vulgaris*, n = 16. Fig. 128, *Harrimanella hypnoides*, n = 16. Fig. 129, *Arctostaphylos alpina*, n = 13. Fig. 130, *Primula egaliksensis*, 2n = 36. Fig. 131, *Limosella aquatica*, 2n = 40. Fig. 132, *Euphrasia arctica* v. *obtusa*, n = 22. Fig. 133, *Galium Brandegei*, 2n = 24. Fig. 134, *Campanula uniflora*, n = 17. Fig. 135, *Erigeron boreale*, 2n = 18. Fig. 136, *Erigeron uniflorum*, 2n = 18. Fig. 137, *Erigeron eriocephalum*, 2n = 18. Fig. 138, *Erigeron unalaschkense*, n = 18. Fig. 139, *Erigeron compositum*, 2n = 54. Fig. 140, *Antennaria Hansii*, 2n = 56. (Figs. 125—128, 131—140 × 4000, figs. 129 and 130 × 3000).

This number is the same as that given by Böcher and Larsen (1950) for plants from Ivigtut, likewise SW Greenland.

Chiarugi (1927) also gives 2n = 18 for this species, as does Á. Löve (1950) for Icelandic plants.

We do not agree with Cronquist (1947) about the classification of the Greenland types. Greenland populations include trimorphic as well as dimorphic types, a fact which in our opinion invalidates the establishment of *E. alpiniformis* Cronquist.

408. **Erigeron uniflorum** L. — Lange I: 101, with the exclusion of var. *pulchellus* Fr., see below.

Our material of this species was collected on Clavering Island, NE Greenland. As no meiotic divisions were present, the chromosome count was made in the somatic tissue and 2n = 18 was found (fig. 136). This is the same as that recorded by Böcher and Larsen (1950) for plants from Ivigtut.

In Icelandic material Á. Löve (1950) likewise counted 2n = 18.

409. **Erigeron eriocephalum** J. Vahl — Lange I: 102.

Root-tips were fixed of plants growing at Kutsiaq, on the Nugssuaq Peninsula, NW Greenland, and proved to have 2n = 18 (fig. 137), the chromosomes being very much like those of the preceding species. The same number has been reported for Icelandic plants (Á. Löve, 1950), and from Sweden (Holmberg, 1919).

410. **Erigeron unalaschkense** (DC.) Vierh. — Vierhapper, 1906: 492. M. P. Porsild, 1920: 148. (Lange I: 102, *E. uniflorus* L. var. *pulchellus* Fr.).

The material of this species at our disposal was fixed on Clavering Island, NE Greenland. Many PMCs in meiotic stages were present in the slides, and n = 18 could be easily counted (fig. 138). As is seen from the chromosome plates pictured, meiosis is regular with typical bivalent formation.

Flovik (1940) reported 2n = 36 from Spitsbergen, and so did Holmgren (1919) for plants from North Sweden, and Á. Löve (1950) for Icelandic plants.

411. **Erigeron compositum** Pursh — Lange I: 101.

Plants from both East and West Greenland were studied. The East Greenland material from Clavering Island consisted of young heads with meiotic divisions in PMCs, but in these the irregular behaviour of the chromosomes made counting difficult, and only an estimate of n = app. 27 could be reached. The root-tips of West Greenland plants from Nugssuaq Peninsula, however, made a definite count possible, 54 chromosomes being present (fig. 139).

Holmen (1952) in his material from Peary Land found n = 27, irregularities being present, whereas Böcher and Larsen (1950) in plants from Sdr. Strømfjord, NW Greenland, report 2n = 63. In Canadian plants these authors counted 2n = 54.

Apomictic reproduction is known to occur in several species of *Erigeron*, and along with these *E. compositum* should in all probability be classed.

412. **Antennaria dioeca** (L.) Gaertn. coll. — LANGE I: 100, *A. dioica* (L.) var. *hyperborea* Don.

An examination of the plants in the Botanical Museum, Copenhagen, has convinced us that a continuous series of types, connecting this species with the following one, exists in the arctic region. It might be the most logical attitude to give up the two Linnean species, but we have refrained from such an attempt and chosen to put an arbitrary border-line between them, referring the microspecies with broad, scarious phyllaries to *A. dioeca*, those with narrow, not scarious phyllaries to *A. alpina*. Within each of these "species", sexual as well as apomictic types occur.

1. *Antennaria Hansii* Kerner — M. P. PORSILD, 1946: 3. (M. P. PORSILD, 1915: 274, *A. groenlandica* Porsild).

   Root-tips of plants from BW 1, SW Greenland, proved the somatic number to be 2n = 56 (fig. 140).

   In contrast to the typical *A. dioeca*, which is sexual with 2n = 28, and has an abundance of male plants, *A. Hansii* is apomictic, and male plants are not known (M. P. PORSILD, 1946).
2. *Antennaria affinis* Fern. — FERNALD, 1931: 222. See also POLUNIN, 1943: 401.

   In plants collected at BW 1, SW Greenland, the chromosome number was counted in root-tip mitoses. 2n was found to be 56. Also this microspecies is apomictic.
3. *Antennaria intermedia* (Rosenv.) Porsild — M. P. PORSILD, 1915: 278. (LANGE III: 698, *A. alpina* var. *intermedia* Rosenv.).

   The chromosome number of this apomictically reproducing species was determined by BERGMAN, 1935. His plants from Greenland were grown in Hort. Bergianus, Stockholm. The number is stated to be 2n = about 80, which statement probably represents 84.

413. **A. alpina** (L.). Gaertn. coll. — LANGE I: 100.

Most of the *A. alpina* microspecies have apomictic reproduction. In some of the microspecies, however, male and female individuals are known to occur with about equal frequency (e.g. the Alaskan *A. monocephala* DC.). In these it is natural to suggest the seed production to be sexual.

The following microspecies are known from Greenland:

1. *Antennaria angustata* Greene — GREENE, 1893: 284; MALTE, 1934: 115. In this species is included *A. Hudsonica* Malte (MALTE, *loc. cit.*: 116), which according to POLUNIN (1940: 347) is identical with *A. angustata*. See also below: *A. glabrata*.
2. *Antennaria brevistyla* Fern. — FERNALD, 1931: 223.
3. *Antennaria canescens* (Lge.) Malte — MALTE, 1934a: 109; cf. also POLUNIN, 1940: 349.

   Root-tips of this microspecies were fixed at Holsteinborg and at Ikorfat (Nugssuaq) in NW Greenland. Both plants had the same number, viz. 2n = 56.

4. *Antennaria Ekmaniana* A. E. Porsild — A. E. Porsild, 1943: 69. (*A. labradorica* Nutt. of Greenland authors following Fernald, 1931: 223).

Plants of *A. Ekmaniana* were fixed at Ikorfat, NW Greenland, and the slides proved good enough to state definitely the chromosome number of 2n = 84 (fig. 141).

5. *Antennaria glabrata* (J. Vahl) Greene — Greene, 1898: 285; Malte, 1934a: 116. (M. P. Porsild, 1915: 273, *A. glabrata* (J. Vahl) Porsild pro parte).

A. glabrata is very closely related to *A. angustata* Greene. Logically it should be considered a local glabrate or glabrescent variant of the wide-spread *A. angustata*. It seems to be restricted to West Greenland, though possibly reaching northern Labrador (cf. Fernald, 1914: 130).

Apparently A. E. Porsild intends to incorporate it into *A. angustata* since on his distribution map of the latter species (1950, Map 6) a few localities are inserted (Godhavn, Holsteinborg) from where only the glabrate form is known to occur.

Böcher and Larsen (1950) give the chromosome number of 2n = 63 in a plant from Sarqaq, NW Greenland, collected by Knud Jakobsen. However, an inspection of the plants has convinced us that they belong to the following microspecies, to which the count therefore should be referred.

6. *Antennaria Porsildii* E. Ekman — Ekman 1927: 51.

Nygren (1950b: 483) has recently investigated Scandinavian plants of this microspecies, and found the diploid chromosome number to be 2n = 63. The same number was counted on Greenland material by Böcher and Larsen (1950), their plant being erroneously referred to *A. glabrata* (see the preceding microspecies). For this reason the discussion of the relationship of *A. glabrata* and *A. Porsildii* in Nygren (1950b) rests on false premises.

7. *Antennaria sp.* (aff. *A. compacta* Malte).

A few specimens from South Greenland cannot be referred to any of the microspecies enumerated. Possibly the plant listed by Polunin (1938: 2, 1943: 401) as *A. compacta* Malte also belongs here. According to A. E. Porsild (1950: 12) *A. compacta* is a western plant, which is absent from the eastern Canadian Arctic and Greenland.

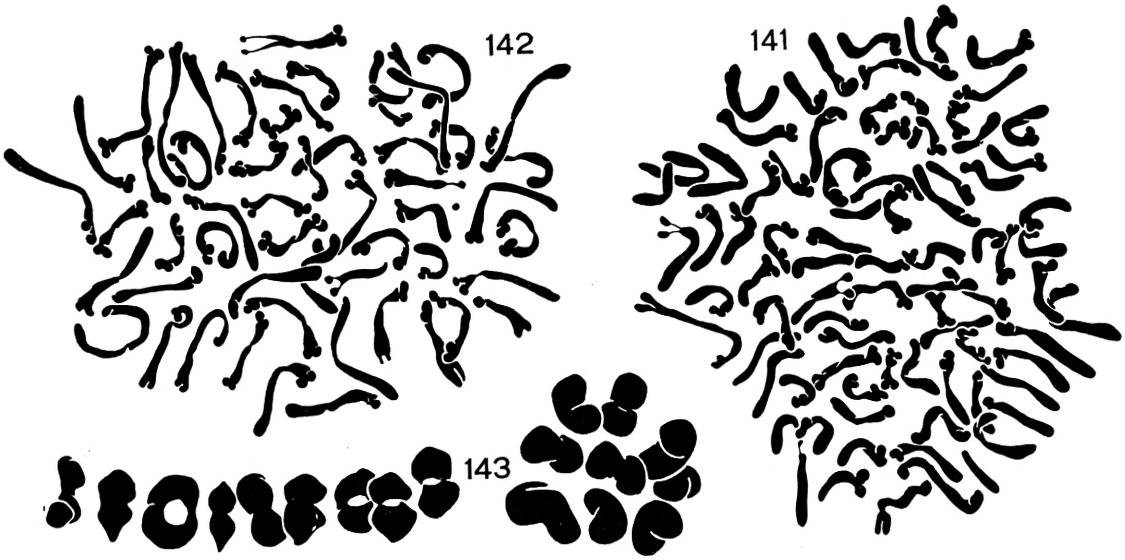
Our undescribed type also occurs in Iceland.

414. **Gnaphalium supinum** L. — Lange I: 99.

In flower buds of this species, fixed at BW 1, SW Greenland, pollen-mitoses were present; the haploid number is n = 14. This is the same as that reported by Rutland (1941) and Á. and D. Löve (1948), the latter on Scandinavian material.

415. **Gnaphalium norvegicum** Gunn. — Lange I: 99.

In root-tips of a plant from BW 1 in SW Greenland we could only reach the approximate chromosome number, 2n being between 54 and 57. Swedish material (Á. and D. Löve, 1948) give 2n = 56 straightaway.



Figs. 141—143. Fig. 141 and 142 are root-tip mitoses, fig. 143 PMCs 1st metaphase. Fig. 141, *Antennaria Ekmaniana*, 2n = 84. Fig. 142, *Achillea Millefolium*, 2n = 54. Fig. 143, *Matricaria ambigua*, n = 9. (All figures × 4000).

416. **Gnaphalium uliginosum** L. — Lange I: 98. Cf. M. P. Porsild, 1932: 75.

417. **Achillea Millefolium** L. coll. — M. P. Porsild, 1946: 36. (Lange I: 102).

Root-tips of plants from BW 1, SW Greenland, grown in Denmark, were fixed and gave excellent slides in which 2n = 54 could be counted with full certainty (fig. 142).

Within the collective species several different chromosome numbers are known, viz. 2n = 36, 54, and 72 (Clausen, Keck, and Hiesey, 1946, Lawrence, 1947).

418. **Matricaria ambigua** (Ledeb.) Kryl. — M. P. Porsild, 1932: 72. (Lange I: 103, *M. inodora* L. var. *phaeocephala* Rupr.).

Hagerup (1941 a) has dealt with this species cytologically. He found n = 9 in PMCs of plants from Clavering Island, NE Greenland. In new slides of the same material we found beautiful meiotic stages with the same number (fig. 143).

The closely related *M. maritima* L. has the same number according to Hüser (1930), Hagerup (1941, Danish material), Rottgardt (in Tischler, 1950) and Vaarama (1953), whereas in *M. inodora* L., 2n = 36 is reported by Rottgardt (*loc. cit.*) and by Vaarama (*loc. cit.*).

419. **Artemisia borealis** Pall. — Lange I: 98.

The chromosome number is known for Greenland plants only. First Erlandsson (1938) gave 2n = 18, and this number was later confirmed by Böcher and Larsen

(1950, Sdr. Strømfjord) and by the present authors in plants from Nugssuaq, NW Greenland. Erlandsson (*loc. cit.*) found the Scandinavian ssp. *bottnica* (Lundstr.) Hult. to be tetraploid with 2n = 36.

420. **Arnica alpina** (L.) Olin — Boivin, 1948:209. (Lange I:103, *A. alpina* Murr.).

Flower buds of heads collected on Clavering Island, NE Greenland were studied by us. Meiosis in the PMCs show many irregularities, and do not allow a definite chromosome count to be made. It is, however, certain that the diploid number is not lower than 50 and not higher than 60. Böcher and Larsen (1950) counted 2n = 76 in plants from Sdr. Strømfjord, NW Greenland, and it thus seems beyond doubt that at least two different karyotypes exist in Greenland. Afzelius (1936) in his paper on apomixis in *A. alpina* gives 2n = 60, and Flovik (1940) in plants from Spitsbergen records 2n = 56.

The difference between the two last-mentioned counts is no doubt imaginary, and probably due to the fact that a good fixation of the chromosomes is difficult to obtain. In *A. montana* L., the number is 2n = 38 (Favarger, 1953). Afzelius (1924) records 2n to be 36 or 40 in this species, but we feel convinced that the number is 38, having ourselves found the same number as Favarger in Danish material.

The suggestion of Böcher and Larsen (*loc. cit.*) of 19 being the basic number, which places *A. montana* as a diploid and the two races of *A. alpina* as triploid and tetraploid, in our opinion offers the best explanation of the above facts. It might be mentioned in this connection that American *Arnica* species have x = 5 (cf. Nygren, 1954 b).

The occurrence of tetraploids within the species raises the problem whether the apomictic reproduction found by Afzelius (*loc. cit.*, cf. Nygren, 1954b) in the Scandinavian triploids, is universal. An examination of the pollen quality shows that the Scandinavian and most of the East Greenland plants have no or little pollen of highly defective quality. All West Greenland plants and a few from East Greenland have pollen in quantity which is on the whole normal in size and shape, suggesting that these plants, which are probably on the tetraploid level, have sexual reproduction.

As to the shape of the leaves, involucres, and ray flowers, a considerable variation is present. Local races seem to occur in Greenland, some of which approach the Scandinavian type very much. For this reason we cannot agree with Maguire (1942: 153) in referring the Greenland plants to a separate subspecies with the Vahlian name *angustifolia*. (Cf. also Boivin, *loc. cit.*).

421. **Cirsium heterophyllum** (L.) Hill — Grøntved, 1937: 253. (For the nomenclature see Hylander, 1945: 321).

422. **Leontodon autumnalis** L. — Lange I: 93.

Many authors report 2n = 12 for this species (cf. Tischler, 1950). The same number is present in plants from BW 1, SW Greenland, counted by us. Vaarama, however, (in Á. and D. Löve, 1948) reports 2n = 24 in a collection of Scandinavian plants.

Taraxacum.

The Greenland representatives of this polymorphous genus, which includes a sexual as well as several apomictic species, has never been subjected to thorough taxonomical investigation. The collective species of the older literature are of little use for our purpose, and we have therefore based the present classification on the sections of DAHLSTEDT (1921—30), supplemented by the special papers on the microspecies later created.

The Greenland species belonging to sect. *Arctica* Dt. and sect. *Ceratophora* Dt. are comparatively well-defined and may equalize Linnean species so as to be made the units of tabulation. As to the third section, *Spectabilia* Dt., a rather larger number of microspecies, often closely related, are known. The subdivision of the Icelandic *Spectabilia* proposed by M. P. CHRISTIANSEN (1942) has been applied to the Greenland representatives, for the purpose of establishing units of reasonable amplitude, applicable for tabulation.

Sectio *Arctica* Dt. — DAHLSTEDT, 1928: 55.

423. **Taraxacum arcticum** (Trautv.) Dt. — DAHLSTEDT, 1905: 8; (HARTZ, 1895: 338, *T. phymatocarpum* J. Vahl f. *albiflora* Kjellm.).

We have counted 2n = 40 in root-tips in plants from Clavering Island, NE Greenland. HOLMEN (1952) found the same number in Peary Land material. The Greenland counts agree with FLOVIK (1940, Spitsbergen plants) and ERLANDSSON (1939).

424. **Taraxacum hyparcticum** Dt. — DAHLSTEDT, 1905: 17.

425. **Taraxacum phymatocarpum** J. Vahl — LANGE I: 94. Cf. DAHLSTEDT, 1905: 22.

HOLMEN (1952) has counted 2n = 24 in mitoses of plants from Peary Land, North Greenland, and ERLANDSSOM (1939), counted 2n = 40 in plants raised from seeds collected at Disko Island, NW Greenland. We find it highly improbable that both numbers exist in this well-defined species, and as HOLMEN's fixations were made of plants growing in Greenland, we find his statement indisputable.

426. **Taraxacum pumilum** Dt. — DAHLSTEDT, 1905: 29. (OSTENFELD, 1923b: 243).

HOLMEN (1952) made the interesting discovery that this high-arctic species is diploid, with n = 8, and has regular meiosis.

Sectio *Ceratophora* Dt. — DAHLSTEDT, 1928: 34. (LANGE I: 94, *T. officinale* Web. ssp. *ceratophorum* (Ledeb.) DC.).

427. **Taraxacum arctogenum** Dt. — DAHLSTEDT, 1906: 26.

HOLMEN (1952) has found the chromosome number of the present species to be 2n = 32.

428. **Taraxacum lacerum** Greene — HAGLUND, 1943: 339, 1948: 309. (DAHLSTEDT, 1906: 23, *T. groenlandicum* Dt.).

The chromosome number of this species is 2n = 40, counted by us on material fixed at BW 1, SW Greenland.

429. **Taraxacum umbrinum** Dt. — Böcher, 1952a: 43; cf. also Boivin, 1951: 14.

(Species dubia: *Taraxacum leptoceras* Dt. — M. P. Porsild, 1930: 23. Certainly not *T. leptoceras* Dt. *vera*, an endemic of Kamtchatka. Cf. Dahlstedt, 1926: 5).

Sectio *Spectabilia* Dt. — Dahlstedt, 1930: 5. (Lange I: 94, *T. officinale* Web., excluding ssp. *ceratophorum* (Ledeb.) DC.).

430. **Taraxacum** sect. **Crocea** M. P. Chr. — M. P. Christiansen, 1942: 255.

Including:

1. *Taraxacum brachyceras* Dt. — Dahlstedt, 1906: 19 (as regards the taxonomic position of this microspecies, cf. Dahlstedt, 1912: 16, and Gelting, 1934: 141).
2. *Taraxacum croceum* Dt. — Dahlstedt, 1928: 78 (cf. also Dahlstedt, 1912: 15).
3. *Taraxacum devians* Dt. — Böcher, 1938: 198.
4. *Taraxacum pleniflorum* M. P. Chr. — M. P. Christiansen, 1942: 284.
5. *Taraxacum purpuridens* Dt. — Devold and Scholander, 1933: 106.
6. *Taraxacum rhodolepis* Dt. — Devold and Scholander, 1933: 106.

431. **Taraxacum** sect. **Naevosa** M. P. Chr. — M. P. Christiansen, 1942: 303.

Including:

1. *Taraxacum atroglaucum* M. P. Chr. — M. P. Christiansen, 1942: 307. (M. P. Porsild, 1930: 23, *T. pseudonaevosum* Dt. *nomen nudum*).
2. *Taraxacum cyclocentrum* M. P. Chr. — M. P. Christiansen, 1942: 312.
3. *Taraxacum dilutisquameum* M. P. Chr. — M. P. Christiansen, 1942: 312.
4. *Taraxacum firmum* Dt. — Dahlstedt, 1930: 45.
5. *Taraxacum naevosum* Dt. — Dahlstedt, 1903: 45.

432. **Taraxacum** sect. **Macrodonta** M. P. Chr. — M. P. Christiansen, 1942: 318.

Including:

1. *Taraxacum campylodes* Hagl. — Böcher, 1952a: 43.
2. *Taraxacum islandiciforme* Dt. — Polunin, 1943: 402.
3. *Taraxacum latispinulosum* M. P. Chr. — M. P. Christiansen, 1942: 372.

(Species dubia: *Taraxacum maurostylum* Dt. in M. P. Porsild, 1930: 23, may belong to *Spectabilia*, apparently it has never been described).

Hieracium (Archieracium).

The following grouping of the Greenland species is in accordance with Zahn, 1921—22 (cf. also Omang, 1933). The Linnean species (*species principalis collectiva* (Zahn)) are made the units of tabulation, and in addition, the microspecies are enumerated by numerals.

As to the indigenousness, cf. M. P. PORSILD, 1932: 76.

Sectio *Alpina* Fr. — ZAHN, 1921—22: 621.

433. **Hieracium alpinum** L. — ZAHN, *loc. cit.*: 621. (LANGE I: 95).

Including:

1. *Hieracium alpinum* (L.) Zahn — ZAHN, *loc. cit.*: 623.

   BÖCHER and LARSEN (1950) in two samples from SW and SE Greenland (Tigssaluk and Angmagssalik) counted 2n = 27. We have found the same number in a plant from BW 1, SW Greenland.
2. *Hieracium angmagssalikense* Om. — OMANG, 1937: 5.

434. **Hieracium atratum** Fr. — ZAHN, *loc. cit.*: 669. (LANGE I: 96; LANGE II: 271, *H. murorum* L. (pro parte); LANGE III: 696, *H. nigrescens* Willd. ssp. *hyparcticum* Almq.).

Including:

1. *Hieracium hyparcticum* Almq. — ZAHN, *loc. cit.*: 687.

   BÖCHER and LARSEN (1950) and the present authors have counted the somatic number of this species to 2n = 27 in plants from SW Greenland.
2. *Hieracium stelechodes* Om. — OMANG, 1932: 4.

435. **Hieracium lividorubens** Almq. — ZAHN, *loc. cit.*: 688. (LANGE I: 96, *H. murorum* L.; LANGE II: 271, *Hieracium murorum* L. (pro parte); LANGE III: 695, *H. nigrescens* Willd. ssp. *lividorubens* Almq.).

Including only a single named species:

1. *Hieracium lividorubens* Almq. — ZAHN, *loc. cit.*: 689.

   The somatic chromosome number of this species, counted on root-tip mitoses fixed at BW 1, SW Greenland, likewise proved to be on the triploid level with 2n = 27.

Sectio *Prenanthoidea* Koch — ZAHN, 1921—22: 747.

436. **Hieracium plicatum** Ledeb. — ZAHN, *loc. cit.*: 839. (LANGE I: 96—97, *H. vulgatum* Fr., and *H. dovrense* Fr.; LANGE II: 272, *H. dovrense* Fr.; LANGE III: 696, *H. dovrense* Fr. ssp. *groenlandicum* Almq. and ssp. *amitsokense* (Almq.) Dt.).

Including:

1. *Hieracium amitsokense* (Almq.) Dt. — ZAHN, *loc. cit.*: 840.
2. *Hieracium groenlandicum* (A.-T.) Almq. — ZAHN, *loc. cit.*: 839.

   BÖCHER and LARSEN (1950) have counted the chromosome number on plants from Ivigtut, SW Greenland, and found 2n = 27.
3. *Hieracium ivigtutense* (Almq.) Om. — ZAHN, *loc. cit.*: 840.
4. *Hieracium Scholanderi* Om. — OMANG, 1933: 9.
5. *Hieracium Sylowii* Om. — SEIDENFADEN, 1933: 119.

Sectio *Tridentata* Fr. — ZAHN, *loc. cit.* 856.

437. **Hieracium inuloides** Tausch — ZAHN, *loc. cit.*: 895. (LANGE I: 97, *H. auratum* Fr.; LANGE II: 273, *H. prenanthoides* Vill. ssp. *rigorosum* Laest., and *H. strictum* Fr.; LANGE III: 696, *H. strictum* Fr. ssp. *rigorosum* (Laest.) Almq.).

Including:

1. *Hieracium acranthophorum* Om. — OMANG, 1937: 10.
   Root-tip mitoses of a plant from BW 1, SW Greenland, have been counted by us; the somatic chromosome number is 2n = 27.
2. *Hieracium Devoldii* Om. — OMANG, 1933: 13.
3. *Hieracium Eugenii* Om. — OMANG, 1937: 11.
4. *Hieracium musartutense* Om. — OMANG, 1937: 9.
5. *Hieracium nepiocratum* Om. — SEIDENFADEN, 1933: 120.
6. *Hieracium rigorosum* (Laest.) Almq. — ZAHN, *loc. cit.*: 907.
7. *Hieracium stiptocaule* Om. — OMANG, 1937: 6.

V. Table of Chromosome Numbers of Flowering Plants of Greenland.

In the list the chromosome number is given for all the species of which a count has been made, no matter whether material of Greenland origin or not has been used.

In the first column the basic numbers are added in brackets to the generic name. The second column gives the diploid number of the species, those of Greenland origin being printed in heavy type. The third column contains the polyploidy level of the different species, and in the fourth is recorded the country from which the plants subjected to the count originate. In Greenland the following subdivision is used: SW Greenland, from Cape Farewell to Godthaab, including this town and its environment; NW Greenland, the northern part of the west coast to Thule; N Greenland, the north coast from Thule to Peary Land including the latter; SE Greenland, from Cape Farewell to Scoresby Sound; NE Greenland, the northern part of the east coast north of Scoresby Sound to Peary Land.

The last column in the table refers to the authors of the chromosome counts. For the designation of the present authors the abbreviation JSW is used. No attempt has been made to make the references for each individual species complete. Generally the most recent one is given, and we have as far as possible chosen those which are based on material of known geographical origin.

More complete lists for Northern Europe are those of TISCHLER (1950), Á. and D. LÖVE (1948), and CLAPHAM, TUTIN, and WARBURG (1952).

No.	Species	2 n	Ploidy	Counted from	References
	Gymnospermae				
	Cupressaceae				
	JUNIPERUS (x = 11)				
1	*communis* L. var. *montana* Ait.	**22**	2x	SW-Greenland	JSW
				Scandinavia	Á. and D. Löve, 1948
	Angiospermae				
	Monocotyledones				
	Typhaceae				
	SPARGANIUM (x = 15)				
2	*hyperboreum* Læst.	**30**	2x	NW-Greenland	JSW
				Scandinavia	Á. and D. Löve, 1948
3	*angustifolium* Michx	30	2x	Sweden	Lohammer in Á. and D. Löve, 1948
	Zosteraceae				
	ZOSTERA (x = 6)				
4	*marina* L.	12	2x	Scandinavia, Germany	Wulff, 1937a
				Britain	Clapham *et al.*, 1952
	Potamogetonaceae				
	POTAMOGETON (x = 13)				
5	*filiformis* Pers.	**78**	6x	SW-Greenland	JSW
				Sweden	Palmgren, 1939
6	*groenlandicus* Hagstr.	**26**	2x	NW-Greenland	JSW
7	*alpinus* Balb. ssp. *tenuifolius* (Raf.) Hult.	52	4x	Canada	Á. Löve, 1954
8	*natans* L.	52	4x	Sweden	Palmgren, 1939
9	*gramineus* L.	52	4x	Sweden	Palmgren, 1939
	Juncaginaceae				
	TRIGLOCHIN (x = 6)				
10	*palustre* L.	**24**	4x	SW-Greenland	JSW
				Germany	Wulff, 1939
				Sweden	Á. and D. Löve, 1945a
	Gramineae				
	ANTHOXANTHUM (x = 5)				
11	*alpinum* Á. et D. Löve . .	**10**	2x	SW-Greenland	JSW, Böcher and Larsen, 1950
				Scandinavia	Östergren, 1942, Knaben, 1950
				Kola (USSR)	Böcher and Larsen, 1950

No.	Species	2n	Ploidy	Counted from	References
	Hierochloë (x = 7)				
12	*odorata* (L.) P. B.	28	4x	Scandinavia	Nygren in Á. and D. Löve, 1948
		42	6x	Scandinavia	Vaarama in Á. and D. Löve, 1948
		56	8x	USA	Church in Myers, 1947
13	*alpina* (Sw.) R. et S.	**56**	8x	NW-Greenland	JSW
				Spitsbergen	Flovik, 1938
14	*orthantha* Th. S.	**63**	9x	SW-Greenland	JSW
	Phleum (x = 7)				
15	*commutatum* Gaud.	**28**	4x	SW-Greenland	JSW, Böcher and Larsen, 1950
				Scandinavia	Nordenskiöld, 1945
		14	2x	Tatra, Poland	Michalski, 1955
	Alopecurus (x = 7)				
16	*alpinus* Sm.	**112**	16x	N, NW, and NE-Greenland	JSW, Holmen, 1952
		119–122	17x?	W-Greenland	Johnson, 1941
		112 + 3f	16x	Spitsbergen	Flovik, 1938
		114 + 2f		Spitsbergen	Flovik, 1938
		130 + 1f	18x?	Spitsbergen	Flovik, 1938
17	*aequalis* Sobol.	**14**	2x	SW-Greenland	JSW
				Sweden	Johnson, 1941
	Arctagrostis (x = 7)				
18	*latifolia* (R. Br.) Griseb. .	**56**	8x	N, NW, and NE-Greenland	JSW, Holmen, 1952
		62	?	Spitsbergen	Flovik, 1938
	Agrostis (x = 7)				
19	*stolonifera* L.	28	4x	Scandinavia, etc.	cf. Björkman, 1954
		35	5x	Germany, etc.	cf. Björkman, 1954, Juhl, 1952
		42	6x	Germany	cf. Juhl, 1953
20	*gigantea* Roth	42	6x	Scandinavia	cf. Björkman, 1954,
				Britain	Jones, 1956
21	*tenuis* Sibth.	28	4x	Scandinavia	cf. Björkman, 1954
				Britain	Jones,1956
22	*canina* L. ssp. *montana* Hartm.	**28**	4x	SW-Greenland	JSW
				Scandinavia	cf. Björkman, 1954
				Britain	Jones, 1956
		35	5x	N-Sweden	Björkman, 1954
23	*borealis* Hartm.	**56**	8x	SW-Greenland	JSW, Böcher and Larsen, 1950
				Scandinavia, Canada	Björkman, 1954
				USSR	Sokolovskaja, 1938

No.	Species	2n	Ploidy	Counted from	References
	CALAMAGROSTIS (x = 7)				
24	*neglecta* (Ehrh.) G., M. et Sch.	**28**	4x	SW-Greenland	JSW
				Sweden	Nygren, 1946
25	*groenlandica* (Schrank) Kunth	**28**	4x	NW-Greenland	JSW, Böcher and Larsen, 1950
				Spitsbergen	Flovik, 1938
26	*lapponica* (Wbg.) Hartm. var. *groenlandica* Lge.	**42**	6x	NW-Greenland	Böcher and Larsen, 1950, cf. Nygren, 1946, 1954b, for the main species
27	*hyperborea* Lge.	ca. **100**	14x?	SW-Greenland	JSW
28	*canadensis* (Michx.) P. B. var. *scabra* (Presl) Hitchc.	ca. **52**		SW-Greenland	JSW
		56	8x	SW-Greenland	Böcher and Larsen, 1950, cf. Nygren, 1946, 1954b, for the main species
29	*Poluninii* Th. S.	**56**	8x	SW-Greenland	JSW
30	*purpurascens* R. Br.	**56**	8x	NW-Greenland	Böcher and Larsen, 1950
		59		NW-Greenland	JSW, cf. Nygren, 1954a, for counts outside Greenland (2n = 40—57)
	DESCHAMPSIA (x = 7, 13)				
31	*alpina* (L.) R. et S.	**49**	?	SW-Greenland	JSW
		52	4x	SW-Greenland	Böcher and Larsen, 1950, cf. Nygren, 1949a, 1954, for other counts (2n = 26—54)
32	*brevifolia* R. Br.	**26**	2x	N, and NE-Greenland	JSW, Holmen, 1952, cf. text p. 18 for Hagerup's count (1939)
33	*pumila* (Ledeb.) Ostf.	**26**	2x	NE-Greenland	JSW, cf. text p. 19 for Hagerup's count (1939)
		39	3x	NW-Greenland	Böcher and Larsen, 1950
		36		SW-Greenland	JSW
34	*flexuosa* (L.) Trin.	**28**	4x	SW-Greenland	JSW, Böcher and Larsen, 1950
				Scandinavia	Hagerup, 1938, Á. and D. Löve, 1945a
	VAHLODEA (x = 7)				
35	*atropurpurea* (Wbg.) Fr.	**14**	2x	SW-Greenland	JSW
				Sweden	Nygren in Á. and D. Löve, 1948
	TRISETUM (x = 7)				
36	*spicatum* (L.) Richt.	**28**	4x	N, NE, and NW-Greenland	JSW, Böcher and Larsen, 1950
				Spitsbergen	Flovik, 1938
				Sweden	Á. and D. Löve, 1945a
		42	6x	SW-Greenland	Böcher and Larsen, 1950

No.	Species	2n	Ploidy	Counted from	References
	DANTHONIA (x = 9)				
37	*spicata* (L.) P. B.	36	4x	USA	Stebbins, in Myers, 1947, cf. de Wet, 1954
	POA (x = 7)				
38	*pratensis* L. ssp. *eupratensis* Hiit.	ca. **95**	14x?	NW-Greenland	Böcher and Larsen, 1950, cf. Nygren, 1954, for other counts
39	*pratensis* L. ssp. *alpigena* Hiit. var. *colpodea* (Th. Fr.) Schol.	**35**	5x	N-Greenland	Holmen, 1952
		35+4f		NE-Greenland	JSW, cf. Nygren, 1954, for other counts
40	*arctica* R. Br. coll.	**56**	8x	N-Greenland	Holmen, 1952, cf. Nygren, 1954, for other counts
41	*alpina* L. coll.	**28**	4x	NW-Greenland	Böcher and Larsen, 1950
		33		SE-Greenland	Böcher, 1938c
		42, 43, 46	6x	W-Greenland	Müntzing, 1954, cf. Nygren, 1954, 1955, Müntzing, 1954, Skalinska, 1952b, for other counts
42	*abbreviata* R. Br.	**42**	6x	N, NE, and NW-Greenland	JSW, Holmen, 1952, cf. text p. 22 for Flovik's count (1938)
43	*Hartzii* Gdgr.	**70**	10x	NW-Greenland	JSW, (Holmen, 1952, gives 2n = 63—70 on material from Pearyland)
44	*glauca* Vahl coll.	**56**	8x	N, and NW-Greenland	Holmen, 1952, JSW
		63	9x	NW-Greenland	Böcher and Larsen, 1950
		70	10x	NE-Greenland	JSW, cf. Nygren, 1954b, for other counts
45	*nemoralis* L. coll.	**42**	6x	SW-Greenland	Böcher and Larsen, 1950, cf. Nygren, 1954b, for other counts
46	*annua* L.	**28**	4x	SW-Greenland	JSW
				Sweden	Nannfeldt, 1937, cf. also Tischler, 1950
	DUPONTIA (x = 11)				
47	*psilosantha* Rupr.	**44**	4x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1938
48	*Fisheri* R. Br.	88	8x	Spitsbergen	Flovik, 1938
	PUCCINELLIA (x = 7)				
49	*angustata* (R. Br.) Rand et Redf.	**42**	6x	N, NE, and NW-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1938
50	*coarctata* Fern. et Weatherby	**42**	6x	NW, and SW-Greenland	JSW

No.	Species	2n	Ploidy	Counted from	References
	PUCCINELLIA				
51	*laurentiana* Fern. et Weatherby	56	8x	USA	Church, 1949
52	*groenlandica* Th. S.	**56**	8x	NW-Greenland	JSW
53	*Porsildii* Th. S.	—			
54	*vaginata* (Lge.) Fern. et Weatherby	**56**	8x	NW-Greenland	JSW
55	*deschampsioides* Th. S. ...	**56**	8x	NW-Greenland	JSW, Böcher and Larsen, 1950
56	*Rosenkrantzii* Th. S.	**56**	8x	NW-Greenland	JSW
57	*Andersonii* Swallen......	**56**	8x	N-Greenland	Holmen, 1952
58	*Langeana* (Berl.) Th. S.. .	**14**	2x	NW-Greenland	JSW
59	*maritima* (Huds.) Parl. . .	**56**	8x	SW-Greenland	JSW
				Iceland	JSW
				Scandinavia	Bernström in Á. and D. Löve, 1948; cf. Tischler, 1950 for other counts
60	*phryganodes* (Trin.) Scribn. et Merr.	**21**	3x	NW, SW, and NE-Greenland	JSW
		28	4x	Spitsbergen	Flovik, 1938
				Norway	Nygren, unpubl.
	COLPODIUM (x = 7)				
61	*Vahlianum* (Liebm.) Nevski...............	**14**	2x	N, and NE-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1938
	PHIPPSIA (x = 7)				
62	*algida* (Sol.) R. Br.	**28**	4x	N, and NE-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1938
				Scandinavia	Nannfeldt, 1937, Knaben, 1950
	CATABROSA (x = 10)				
63	*aquatica* (L.) P. B.	20	2x	Denmark	H. Christiansen, unpubl.; cf. Tischler, 1950
	ARCTOPHILA (x = 7)				
64	*fulva* (Trin.) Ands.......	**42**	6x	SW-Greenland	JSW
				Spitsbergen	Flovik, 1938
				Scandinavia	Nygren in Á. and D. Löve, 1948
	PLEUROPOGON (x = 10?)				
65	*Sabinei* R. Br.	**40**	4x	N, and NE-Greenland	Holmen, 1952, JSW
	FESTUCA (x = 7)				
66	*baffinensis* Pol.	**28**	4x	N, NE, and NW-Greenland	Holmen, 1952, JSW
67	*hyperborea* K. Holmen ...	**28**	4x	N-Greenland	Holmen, 1952

No.	Species	2n	Ploidy	Counted from	References
	FESTUCA				
68	*brachyphylla* Schult.	42	6x	N, NE, and SW-Greenland	Holmen, 1952, JSW, cf. text p. 29 for the Spitsbergen count of Flovik (1938)
69	*vivipara* (L.) Sm.	49	7x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1938, cf. Nygren, 1954, for countings outside Greenland
70	*vivipara* (L.) Sm. var. *hirsuta* (Lge.) Schol.	28	4x	SW-Greenland	JSW, Böcher and Larsen, 1950
71	*rubra* L. coll.	42	6x	NW-Greenland	Böcher and Larsen, 1950. For countings outside Greenland, see Tischler, 1950, Juhl, 1953 (2n = 14, 28, 42, 46, 53, 56, 64, 70)
	NARDUS (x = 13)				
72	*stricta* L.	26	2x	USSR?	Avdulov, 1931
	ROEGNERIA (x = 7)				
73	*violacea* (Hornem.) Melderis	28	4x	NW, and SW-Greenland	JSW, Böcher and Larsen, 1950
74	*Doniana* (White) Melderis var. *virescens* (Lge.) Melderis	28	4x	SW-Greenland	JSW, Böcher and Larsen, 1950
75	*borealis* Nevski var. *hyperarctica* (Pol.) Melderis. .	28	4x	NW-Greenland	Böcher and Larsen, 1950
				Scandinavia	Á. and D. Löve, 1945a
	ELYMUS (x = 7)				
76	*mollis* Trin.	28	4x	NW, and SW-Greenland	JSW, Böcher and Larsen, 1950
				N-America	Böcher and Larsen, 1950, Myers, 1947
				Iceland	Á. Löve in Hylander, 1953
				Japan?	Suzuka, 1950
	Cyperaceae				
	ERIOPHORUM (x = ?)				
77	*callitrix* Cham.	60		NE-Greenland	JSW
78	*Scheuchzeri* Hoppe	58		N, and NE-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1942
79	*angustifolium* Honck.	58		NW, and SW-Greenland	JSW
				Sweden	Håkonsson, 1928
				Denmark	JSW
80	*triste* (Th. Fr.) Hadač et Löve	60		N, NE, and NW-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1942
				Iceland	Á. Löve, 1950

No.	Species	2n	Ploidy	Counted from	References
	SCIRPUS (x = ?)				
81	*quinqueflorus* F. X. Hartm.	ca. 136		Denmark	Saunte, unpubl.
		ca. 100		Norway	Knaben, 1950
82	*caespitosus* L. ssp. *austriacus* (Pallas) Brodd. . .	**104**		SW-Greenland	JSW
				Germany	Scheerer, 1940
	HELEOCHARIS (x = ?)				
83	*acicularis* L.	**20**		NW-Greenland	JSW
				Denmark	JSW, cf. text p. 33 for evaluation of Hick's counts (1929)
84	*uniglumis* (Link.) Schult. .	46		Denmark	JSW
				Britain	Clapham *et al.*, 1952, see also no. 85
85	*palustris* (L.) R. et S. . . .	**16**		SW-Greenland	JSW, cf. text p. 34 for additional counts of the *H. palustris-uniglumis* complex (2n = 16, 32, 38, 40, 42, 44, 46, 48, 68, 92). See also Clapham *et al.*, 1952
	KOBRESIA (x = ?)				
86	*myosuroides* (Vill.) Fiori et Paol.	**52—56**		N, and SW-Greenland	Holmen, 1952, JSW
				Iceland	Holmen, 1952, Böcher, 1938 c
				Sweden	Heilborn, 1939
87	*simpliciuscula* (Wbg.) Mack.	**70—75**		NE, and SW-Greenland	JSW
	CAREX (x = ?)				
88	*parallela* (Laest.) Sommerf.	**43** (♂)		NE-Greenland	JSW
		44		Spitsbergen	Flovik, 1942
89	*gynocrates* Wormsk.	**48**		NW-Greenland	JSW
90	*scirpoidea* Michx.	**62** (♀ and ♂)		NE, and NW-Greenland	JSW
		(68)		Spitsbergen	Flovik, 1942, cf. text p. 36
91	*microglochin* Wbg.	ca. 56		Sweden	Levan in Á. and D. Löve, 1948
92	*nardina* Fr.	**68**		N, NE, and SW-Greenland	JSW, Holmen, 1952
93	*capitata* L.	—			cf. text p. 36, no. 94, for evaluation of Heilborn's count (1928)
94	*arctogena* H. Sm.	**50**		NW, and SW-Greenland	JSW
95	*rupestris* All.	**52**		NE-Greenland	JSW
		ca. **50**		N-Greenland	Holmen, 1952
		50		Spitsbergen	Flovik, 1942
				Norway	Heilborn, 1924

No.	Species	2 n	Ploidy	Counted from	References
	CAREX				
96	*maritima* Gunn.	**60**		N, and NW-Greenland	Holmen, 1952, Jakobsen, unpubl.
				Spitsbergen	Flovik, 1942.
97	*Macloviana* D'Urv.......	**86**		SW-Greenland	JSW
				Sweden	Heilborn, 1939
98	*praticola* Rydb..........	—			
99	*Lachenalii* Schk.........	64		Spitsbergen	Flovik, 1942
				Sweden	Heilborn, 1939
100	*glareosa* Wbg.	**66**		NW-Greenland	Jakobsen, unpubl.
				Spitsbergen	Flovik, 1942
101	*ursina* Dewey	**64**		NW-Greenland	JSW
				Spitsbergen	Flovik, 1942
102	*amblyorhyncha* Krecz. ssp. *pseudolagopina* (Th. S.) T. W. B.	**64**		NW-Greenland	JSW
103	*Mackenziei* Krecz.	—			
104	*brunnescens* (Pers.) Poir...	**56**		SW-Greenland	JSW
				Scandinavia	Levan in Á. and D. Löve, 1948
				USA	Wahl, 1940
105	*curta* Good.	**56**		NW-Greenland	JSW
				Scandinavia	Heilborn, 1924, Levan in Á. and D. Löve, 1948
106	*nigra* (L.) Reichard	82 or 84		SW-Greenland	JSW
		84		Sweden	Heilborn, 1924
107	*Bigelowii* Torr. coll......	**70**		NE-Greenland	JSW
				Faeroes	Böcher, 1938 c
				Sweden	Heilborn, 1924
108	*stans* Drej.............	**76**		N, and NW-Greenland	Holmen, 1952, JSW
109	*subspathacea* Wormskj. ..	**78**		NE-Greenland	JSW
110	*salina* Wbg............	—			
111	*Lyngbyei* Hornem.	78		Faeroes	Harling, 1945
112	*deflexa* Hornem.	**20—24**		SW-Greenland	JSW
113	*supina* Wbg. ssp. *spaniocarpa* (Steud.) Hult....	**36**		NE-Greenland	JSW
114	*panicea* L.	**32**		SW-Greenland	JSW
				Scandinavia	Knaben, 1950, cf. Á. and D. Löve, 1948
115	*vaginata* Tausch	32		Scandinavia	Heilborn, 1924, Knaben, 1950
116	*rariflora* (Wbg.) Sm.	**52**		NE, and SW-Greenland	JSW
		54		Iceland	Á. and D. Löve, 1948
117	*paupercula* Michx.	58		?	Heilborn, 1928
118	*Buxbaumii* Wbg.	74		Sweden	Heilborn, 1924
119	*stylosa* C. A. Mey........	**52**		SW-Greenland	JSW
120	*holostoma* Drej.........	**60**		NW-Greenland	JSW

No.	Species	2n	Ploidy	Counted from	References
	CAREX				
121	*norvegica* Retz. emend. Kalela	**56**		SW-Greenland	JSW
				Norway	Heilborn, 1924
122	*norvegica* Retz. ssp. *inserrulata* Kalela	**56**		SW-Greenland	JSW
123	*rufina* Drej.	**(86)**		SW-Greenland	JSW, cf. text p. 42
		(60)		Sweden	Levan in Á. and D. Löve, 1948
124	*bicolor* All.	ca. **52**		NW-Greenland	JSW
125	*atrata* L.	**54**		SW-Greenland	JSW
				?	Heilborn, 1924
126	*misandra* R. Br.	**40**		N, and NE-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1942
127	*atrofusca* Schk.	**38**		NE, and SW-Greenland	JSW (cf. text p. 44 for evaluation of previous counts)
128	*viridula* Michx.	**66**—70		SW-Greenland	JSW
129	*glacialis* Mack.	**34**		NW-Greenland	JSW
				Norway	Knaben, 1950
130	*capillaris* L.	ca. **54**		SW-Greenland	JSW
		54		Sweden	Heilborn, 1924, Levan in Á. and D. Löve, 1948
131	*rostrata* Stokes	ca. 60		Sweden	Ehrenberg, 1945
		76		Sweden	Heilborn, 1924
		80		N-America	Wahl, 1940
132	*saxatilis* L.	**80**		NE-Greenland	JSW
				Spitsbergen	Flovik, 1942,
				Sweden	Heilborn, 1924
	Juncaceae				
	JUNCUS (x = 5)				
133	*arcticus* Willd.	ca. **80**	16x	NW, and SW-Greenland	JSW, Holmen, unpubl.
				Denmark	Christiansen, unpubl.
		ca. 100	20x	Sweden	Á. and D. Löve, 1945b, cf. text p. 45
134	*balticus* Willd.	ca. 80	16x	Denmark	Christiansen, unpubl.
135	*filiformis* L.	ca. **80**	16x	SW-Greenland	JSW
				Sweden	Á. and D. Löve, 1945b
				Germany	Wulff, 1938
		40	8x	Finland	Vaarama in Á. and D. Löve, 1948
136	*alpinus* Vill. ssp. *nodulosus* (Wbg.) Lindm.	**40**	8x	SW-Greenland	JSW
		80	16x	Scandinavia	Vaarama in Á. and D. Löve, 1948. Á. and D. Löve, 1948, cf. text p. 46
137	*subtilis* C. A. Mey.	**40**	8x	SW-Greenland	JSW

No.	Species	2 n	Ploidy	Counted from	References
	JUNCUS				
138	*squarrosus* L.	40	8x	Scandinavia	Á. and D. Löve, 1948, Wulff, 1938
139	*Gerardi* Lois.	80	16x	Germany	Wulff, 1937a
140	*ranarius* Song. et Perr.	**30**	6x	SW-Greenland	JSW
				Denmark	JSW (cf. text p. 47 for evaluation of Wulff's countings (1937a))
141	*castaneus* Sm.	**60**	12x	NE-Greenland	JSW
		40	8x	Scandinavia	Á. and D. Löve, 1948
142	*triglumis* L.	ca. **130**	26x	N, and NW-Greenland	Holmen, unpubl., JSW
				Switzerland	Holmen, unpubl., cf. text p. 47 for evaluation of Á. and D. Löve's counting (1945b)
143	*biglumis* L.	**120**	24x	N-Greenland	Holmen, 1952
144	*trifidus* L.	**30**	6x	SW-Greenland	JSW
				Sweden	Á. and D. Löve, 1945b
	LUZULA (x = 3)				
145	*parviflora* (Ehrh.) Desv.	**24**	8x	SW-Greenland	JSW, Böcher and Larsen, 1950
				Sweden, N-America	Nordenskiöld, 1951
146	*Wahlenbergii* Rupr.	**24**	8x	NE-Greenland	Holmen and Mathiesen, 1953
				N-Sweden	Nordenskiöld, 1951, cf. text p. 48 for evaluation of Á. and D. Löve's count (1945b)
147	*arcuata* (Wbg.) Sw. coll.	**36**	12x	N, NE, NW, SW-Greenland	JSW, Böcher and Larsen, 1950, Jakobsen, unpubl., Holmen, 1952, Nordenskiöld, 1951
				Scandinavia, Canada	Á. and D. Löve, 1948, Knaben, 1950, Nordenskiöld, 1951
		42	14x	N-Sweden	Nordenskiöld, 1951
		48	16x	NE-Greenland	Holmen, 1952, JSW
				Norway	Knaben, 1950
148	*arctica* Blytt	**24**	8x	N, NE, and NW-Greenland	Holmen, 1952, JSW, Jakobsen, unpubl.
				Scandinavia	Knaben, 1950, Nordenskiöld, 1951
149	*frigida* (Buchen.) Sam.	**36**	12x	NW, and SW-Greenland	JSW, Hagerup, 1941a, Böcher and Larsen, 1950
				Scandinavia	Á. and D. Löve, 1945b, Nordenskiöld, 1951
150	*multiflora* (Retz.) Lej.	36	12x	Iceland, Scandinavia, Denmark	Á. and D. Löve, 1945b, Böcher and Larsen, 1950, Hagerup, 1940a, Nordenskiöld 1951; cf. Darlington and Wylie, 1955, for other counts (2n = 12, 24, 30)

No.	Species	2n	Ploidy	Counted from	References
	Luzula				
151	*groenlandica* T.W. Böcher	**24**	8x	NW-Greenland	Böcher and Larsen, 1950
				Canada	B. and L., 1950, Nordenskiöld, 1951
152	*spicata* (L.) DC.	**24**	8x	NE, and SE-Greenland	JSW, Böcher, 1938c
				Sweden, USA	Nordenskiöld, 1951
		12	4x	Austria	Nordenskiöld, 1951
		14		Austria	Nordenskiöld, 1951
	Liliaceae				
	Tofieldia (x = 15)				
153	*coccinea* Richards.	**30**	2x	NW-Greenland	JSW
154	*pusilla* (Michx.) Pers. ...	**30**	2x	NW-Greenland	JSW
				?	Miller, 1930
	Streptopus (x = 8)				
155	*amplexifolius* (L.) DC....	32	4x	?	Sato, 1942
	Iridaceae				
	Sisyrinchium (x = 9)				
156	*montanum* Greene	**32**	4x	NW-Greenland	Böcher and Larsen, 1950
	Orchidaceae				
	Orchis (x = 7)				
157	*rotundifolia* Pursh.......	42	6x	?	Humphrey, 1932
	Leucorchis (x = 7)				
158	*straminea* (Fern.) Á. Löve	**42**	6x	NW, and S-Greenland	Harmsen, 1943, Holmen, unpubl.
				Iceland	Á. and D. Löve, 1944
	Platanthera (x = 7)				
159	*hyperborea* (L.) Lindl. ...	**84**	12x	NW-Greenland	Harmsen, 1943
				Iceland	Harmsen, 1943
		42	6x	USA	Humphrey, 1934
	Listera (x = ?)				
160	*cordata* (L.) R. Br.	38	?	Caucasia	Sokolovskaja and Strelkova, 1940
		42		?	Blackburn, ex. Tischler, 1950
	Corallorhiza (x = 7)				
161	*trifida* Chât.	**42**	6x	SW-Greenland	JSW
				Denmark	Hagerup, 1941a
	Dicotyledones				
	Salicaceae				
	Salix (x = 19, 22)				
162	*herbacea* L.	38	2x	Sweden	Holmberg, 1931
163	*Uva-ursi* Pursh	**38**	2x	SW-Greenland	JSW; cf. text p. 51 for the count of Wilkinson, 1944
164	*arctica* Pallas	**76**	4x	N-Greenland	Holmen, 1952
165	*arctophila* Cock.	ca. **76**	4x	SW-Greenland	JSW

No.	Species	2n	Ploidy	Counted from	References
	SALIX				
166	*cordifolia* Pursh.........	—			
167	*glauca* L.	152	8x	Scandinavia	Holmberg, 1931
		176	8x	?	Wilkinson, 1944
	Betulaceae				
	BETULA (x = 7)				
168	*glandulosa* Michx........	**28**	4x	SW-Greenland	JSW
169	*nana* L.	**28**	4x	NW-Greenland	JSW
				Spitsbergen	Flovik, 1940
				Sweden	Á. and D. Löve, 1944
170	sp. aff. *tortuosa* Ledeb. ..	**56**	8x	SW-Greenland	JSW (cf. text p. 52)
	ALNUS (x = 7)				
171	*crispa* (Ait.) Pursh......	28	4x	USA	Woodworth, 1929
	Polygonaceae				
	RUMEX (x = 7, 10)				
172	*domesticus* Hartm.	60	6x	?	Á. Löve, 1942
		80	8x	Japan	Takenaka, 1941
173	*Acetosa* L.	**14** (♀)	2x	SW-Greenland	JSW
				Scandinavia	Á. Löve, 1942
174	*Acetosella* L. s. str.......	**42**	6x	NE, and SW-Greenland	JSW
				Scandinavia	Á. Löve, 1944
175	*tenuifolius* (Wallr.) Löve..	28	4x	Sweden	Á. Löve, 1944
176	*graminifolius* Lamb......	56	8x	Scandinavia	Á. Löve, 1944
	OXYRIA (x = 7)				
177	*digyna* (L.) Hill	**14**	2x	Greenland	Holmen, 1952, JSW, Harmsen, unpubl., Edman, 1929, Böcher and Larsen, 1950
				Spitsbergen	Flovik, 1940
				Iceland	Á. and D. Löve, 1948
				Norway	Knaben, 1950
				Kola (USSR)	Böcher and Larsen, 1950
				European Alps	Larsen, 1954
	KOENIGIA (x = 7)				
178	*islandica* L.	**28**	4x	N, NE, and SW-Greenland	Hagerup, 1926, JSW, Holmen, 1952
				Faeroes	Hagerup, 1926
	POLYGONUM (x = 10)				
179	*aviculare* L. s. l.	40	4x	Sweden	Anderson in Á. and D. Löve, 1948
		60	6x	Sweden	Anderson in Á. and D. Löve, 1948
180	*viviparum* L.	ca. **100**	10x	N-Greenland	Holmen, 1952
				Spitsbergen	Flovik, 1940. Other counts, see Á. and D. Löve, 1948, Sokolovskaja and Strelkova, 1948, Skalinska, 1949/50 (2n = 83—130)

No.	Species	2n	Ploidy	Counted from	References
	Chenopodiaceae				
	ATRIPLEX (x = 9)				
181	cf. *glabriuscula* Edmonst. (cf. text)	—	—		
	Portulacaceae				
	MONTIA (x = 9, 10)				
182	*fontana* L. ssp. *fontana* Walters	**20**	2x	SW-Greenland	JSW
				Germany	Scheerer, 1940; cf. text p. 54 for Hagerup's count (1941 a)
	Caryophyllaceae				
	STELLARIA (x = 13, (10, 11, 12?))				
183	*media* (L.) Vill. coll.	28, 40, 42, 44	?	Scandinavia, etc.	Peterson, 1936; cf. Darlington and Wylie, 1955
184	*calycantha* (Ledeb.) Bong.	44—48	?	Scandinavia	Peterson, 1936
185	*longipes* Goldie s. str.	**104**	8x	NW-Greenland	JSW
		52	4x	Canada	Böcher and Larsen, 1950; cf. text p. 55
186	*monantha* Hult.	**104**	8x	NW, and SW-Greenland	JSW, Böcher and Larsen, 1950
187	*crassipes* Hult.	ca. 104	8x	Spitsbergen	Flovik, 1940
				Scandinavia	Nygren in Gustafsson, 1947, Knaben, 1950
188	*ciliatosepala* Trautv.	**91**	7x	NE-Greenland	JSW
189	*laeta* Richards.	—			
190	*Laxmanni* Fisch.	—			
191	*humifusa* Rottb.	**26**	2x	NE, and SW-Greenland	JSW, Böcher and Larsen, 1950
				Spitsbergen	Flovik, 1940
	CERASTIUM (x = 9, 19)				
192	*Cerastoides* (L.) Britt.	**36**	4x	NW-Greenland	JSW, Böcher and Larsen, 1950
				Austria	Mattick in Tischler, 1950
		38	2x?	NE, and SW-Greenland	JSW, Böcher and Larsen, 1950
				Switzerland	Söllner, 1954, Brett, 1955
				Britain	Brett, 1955
193	*arvense* L. coll.	36	4x	Canada	Brett, 1955
				European Alps	Larsen, 1954, Söllner, 1954
		72	8x	Europe	cf. Söllner, 1954, Brett, 1955
		38	2x?	Austria	Brett, 1955

No.	Species	2n	Ploidy	Counted from	References
	CERASTIUM				
194	*alpinum* L. coll.	**54**	6x	NW-Greenland	Böcher and Larsen, 1950
		72	8x	NW, and SW-Greenland	JSW, Böcher and Larsen, 1950
		108	12x	N, NW, and NE-Greenland	Holmen, 1952, JSW
		ca. 144	16x	Sweden (Abisko)	Brett, 1955. (For other counts outside Greenland cf. Brett, 1955, Hultén, 1956)
195	*Regelii* Ostf.	**72**	8x	N-Greenland	Holmen, 1952
				Spitsbergen	Flovik, 1940
196	*fontanum* Baumg. ssp. *scandicum* Gartn.	ca. 144	16x	Faeroes	Böcher, 1938c; cf. also Tischler, 1950
197	*holosteoides* Fr. emend. Hyl.	126	14x	Denmark	Hagerup, 1944
		144	16x	Austria, Germany	Mattick in Tischler, 1950
		136–152		Britain	Brett, 1955
				Italy, Portugal	Söllner, 1952
	SAGINA (x = 6, 11)				
198	*nodosa* (L.) Fenzl	20—24	?	?	Wulff, 1937b
		56	?	?	Blackburn in Tischler, 1950
199	*caespitosa* (J. Vahl) Lge. .	88	8x	Norway	Knaben, 1950
		ca. 100	?	Iceland	Á. and D. Löve, 1945a.
200	*intermedia* Fenzl	—			Cf. Á. and D. Löve, 1948
201	*saginoides* (L.) Karst. ...	22	2x	Britain	Blackburn in Á. and D. Löve, 1948
202	*procumbens* L.	22	2x	Germany	Rohweder, 1939; see also Tischler, 1950
	HONCKENYA (x = 17)				
203	*peploides* (L.) Ehrh.	**68**	4x	NW-Greenland	Malling, 1957
				Denmark, Germany, Alaska	Malling, 1957; cf. text p. 58 for evaluation of earlier counts (Rohweder, 1939, Flovik, 1940)
	MINUARTIA (x = 13)				
204	*rubella* (Wbg.) Hiern	**26**	2x	NE-Greenland	JSW
205	*stricta* (Sw.) Hiern	**26**	2x	NE-Greenland	JSW
206	*biflora* (L.) Sch. et Thell.	—			
207	*Rossii* (R. Br.) Graebn. ..	—			
208	*groenlandica* (Retz.) Ostf.	—			
	ARENARIA (x = 10)				
209	*humifusa* Wbg.	40	4x	Norway	Horn, personal communication
210	*pseudofrigida* (Ostf. et Dahl) Juz.	**40**	4x	NE-Greenland	JSW
				Norway	Horn, personal communication

No.	Species	2n	Ploidy	Counted from	References
	VISCARIA (x = 12)				
211	*alpina* (L.) G. Don......	24	2x	NW-Greenland	JSW
				Switzerland	Favarger, 1946
	SILENE (x = 12)				
212	*acaulis* L..............	24	2x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1940
				Sweden	D. Löve, 1942
				Austria	Mattick in Tischler, 1950
	MELANDRIUM (x = 12)				
213	*apetalum* (L.) Fenzl ssp. *arcticum* (Fr.) Hult.	24	2x	N, and NE-Greenland	Holmen, 1952, JSW; cf. text p. 60
214	*affine* J. Vahl...........	48	4x	NE, and NW-Greenland	JSW, Böcher and Larsen, 1950; see also Nygren, 1949b
215	*triflorum* (R. Br.) J. Vahl	72	6x	N, NE, and NW-Greenland	JSW, Holmen, 1952, Böcher and Larsen, 1950, Blackburn, 1929; cf. also Nygren, 1951
	Ranunculaceae				
	THALICTRUM (x = 7)				
216	*alpinum* L.............	14	2x	NW, and SW-Greenland	JSW, Böcher, 1938c, Böcher and Larsen, 1950
				Iceland	Á. and D. Löve, 1944; cf. also Tischler, 1950
	ANEMONE (x = 7, 8)				
217	*Richardsonii* Hook.	—			
	RANUNCULUS (x = 7, 8)				
218	*confervoides* (Fr.) Fr.....	32	4x	NE, NW, and SW-Greenland	Böcher and Larsen, 1950, JSW; see also text p. 61
				Austria	Mattick in Tischler, 1950
219	*glacialis* L.............	16	2x	NE-Greenland	Böcher, 1938c, JSW
				Iceland	Á. and D. Löve, 1944
				European Alps	Langlet, 1932, Mattick in Tischler, 1950, Larsen, 1954
				Poland	Skalinska, 1950
220	*lapponicus* L...........	16	2x	NW-Greenland	Böcher, 1938a, c, Böcher and Larsen, 1950
221	*hyperboreus* Rottb.......	32	4x	N, NE, and NW-Greenland	Böcher, 1938c, Böcher and Larsen, 1950, Holmen, 1952, JSW
				Spitsbergen	Flovik, 1940
222	*pygmaeus* Wbg..........	16	2x	NE, and NW-Greenland	Böcher, 1938c, JSW
				Spitsbergen	Flovik, 1936
				Austria	Mattick in Tischler, 1950
223	*Sabinei* R. Br...........	—			

No.	Species	2n	Ploidy	Counted from	References
	RANUNCULUS				
224	*nivalis* L.	**48**	6x	NE, and NW-Greenland	JSW
				Spitsbergen	Flovik, 1936
				Scandinavia	Nygren in Á. and D. Löve, 1948
		40	5x	Scandinavia	Nygren, *loc. cit.*
		56	7x	Scandinavia	Nygren, *loc. cit.*
225	*sulphureus* Soland.......	**96**	12x	N, and NE-Greenland	JSW, Holmen, 1952
				Spitsbergen	Flovik, 1940
				Scandinavia	Nygren in Á. and D. Löve, 1948
226	*pedatifidus* Sm. coll......	**32**	4x	N-Greenland	Holmen, 1952
		48	6x	NW-Greenland	Böcher and Larsen, 1950
227	*auricomus* L. coll.	**16**	2x	E-Greenland	Böcher, 1938a
				Switzerland	Häfliger, 1943, Rutishauser, 1953/54; cf. Tischler, 1950, Rousi, 1956, Rutishauser, 1953/54 for other counts (2n = 32, 40, 48)
228	*acris* L. coll.	**16**	2x	SW-Greenland	JSW, Böcher and Larsen, 1950
				Scandinavia	Á. and D. Löve, 1945a; cf. Gregory, 1941, Á. and D. Löve, 1948 for other counts (2n = 28, 56)
229	*reptans* L..............	**32**	4x	NW, and SW-Greenland	Böcher, 1938a, JSW
				Scandinavia	Böcher, 1938a, see also Gregory, 1941, Tischler, 1950
230	*Cymbalaria* Pursh.......	**16**	2x	NW-Greenland	Böcher and Larsen, 1950
				Scandinavia	Langlet, 1927; cf. also Gregory, 1941
	COPTIS (x = 9)				
231	*trifolia* (L.) Salisb.......	18	2x	?	Langlet, 1932; cf. Gregory, 1941
	Papaveraceae				
	PAPAVER (x = 7)				
232	*radicatum* Rottb. coll....	**56**	8x	Greenland	Holmen, 1952, Jørgensen, unpubl., Knaben, unpubl.
				Scandinavia	Horn, 1938
		70	10x	Greenland	Jørgensen, unpubl., Knaben, unpubl.
				Scandinavia	Knaben, unpubl.
				Iceland, Faeroes	Horn, 1938
		84	12x	Greenland	Jørgensen, unpubl., Knaben, unpubl.

No.	Species	2n	Ploidy	Counted from	References
	Cruciferae				
	CAPSELLA (x = 8)				
233	*Bursa-pastoris* (L.) Med. .	32	4x	Scandinavia	Vaarama, 1943
	COCHLEARIA (x = 6, 12)				
234	*groenlandica* L.	**14**	2x	Greenland	Cf. Saunte, 1955, also for counts outside Greenland and for counts of *C. officinalis* coll. (2n = 24, 48)
	SUBULARIA (x = ?)				
235	*aquatica* L.	—			
	DRABA (x = 8, 10)				
236	*incana* L.	**32**	4x	SW-Greenland	Böcher and Larsen, 1950
				Scandinavia	Heilborn, 1927
				Denmark	JSW
237	*lanceolata* Royle	—			
238	*sibirica* (Pall.) Thell.	—			
239	*aurea* Vahl	64	8x	?	Böcher, 1938c
240	*norvegica* Gunn.	**48**	6x	W-Greenland	Heilborn, 1927
241	*hirta* L.	**64**	8x	NE, and NW-Greenland	Heilborn, 1927, Böcher and Larsen, 1950, Holmen, unpubl.
				Scandinavia	Heilborn, 1927
		80	10x	NE, and NW-Greenland	Heilborn, 1927, JSW
242	*groenlandica* E. Ekman . .	**64**	8x	N, and W-Greenland	Holmen, 1952, Heilborn, 1941
243	*cinerea* Adams	**48**	6x	NW-Greenland	Heilborn, 1941
				Finland	Heilborn, 1941
		80	10x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1940, Heilborn, 1941
244	*arctogena* E. Ekman	**48**	6x	N-Greenland	Heilborn, 1941, Holmen, 1952
245	*ovibovina* E. Ekman	**48**	6x	NE-Greenland	JSW
246	*Ostenfeldii* E. Ekman	—			
247	*lactea* Adams	**48**	6x	NE-Greenland	JSW
248	*fladnizensis* Wulfen	**16**	2x	NE-Greenland	JSW
				Norway	Heilborn, 1927
249	*nivalis* Liljebl.	**16**	2x	NE-Greenland	JSW
				Norway	Heilborn, 1927
250	*subcapitata* Simm.	**16**	2x	N, and NE-Greenland	JSW, Holmen, 1952
251	*alpina* L.	**64**	8x	NE-Greenland	JSW
				Norway	Heilborn, 1927
		80	10x	Spitsbergen	Flovik, 1940
				Sweden	Heilborn, 1941
252	*Bellii* Holm	—			
253	*macrocarpa* Adams	**ca. 128**	16x	N-Greenland	Holmen, 1952
254	*Gredinii* E. Ekman	—			

No.	Species	2n	Ploidy	Counted from	References
	DRABA				
255	*micropetala* Hook........	—			
256	*oblongata* R. Br.	**64**	8x	NE-Greenland	JSW
257	*crassifolia* Graham	**40**	4x	E-Greenland	Heilborn, 1941
	CARDAMINE (x = 8)				
258	*pratensis* L. coll.........	**56**	?	NW-Greenland	JSW
		60	?	NW-Greenland	Harmsen, unpubl. (For counts outside Greenland, cf. Banach, 1950, Hussein, 1955, Lövkvist, 1956, and text, p. 70)
259	*bellidifolia* L............	**16**	2x	N, and NE-Greenland	Holmen, 1952, JSW
	ARABIS (x = 7, 8)				
260	*alpina* L.	**16**	2x	NW, SW, and SE-Greenland	Böcher, 1938c, Böcher and Larsen, 1950, JSW
				USA	Rollins, 1941,
				Austria	Mattick in Tischler, 1950
		32	4x	Austria	Mattick in Tischler, 1950
261	*arenicola* (Richards.) Gelert	—			
262	*Holboellii* Hornem. coll...	**14**	2x	Greenland	Cf. Böcher, 1951b
				USA	Rollins, 1941
		21	3x	Greenland	Cf. Böcher, 1951b
		28	4x	USA	Rollins, 1941
		42	6x	USA	Rollins, 1941
	HALIMOLOBUS (x = 8)				
263	*mollis* (Hook.) Rollins...	**16**	2x	NW-Greenland	JSW
	RORIPPA (x = 8)				
264	*islandica* (Oeder) Borb. coll.	**16**	2x	SW-Greenland	JSW
				?	Jaretzky, 1932
		32	4x	Britain	Howard, 1947
	ERYSIMUM (x = 7, 8)			Denmark	JSW
265	*Pallasii* (Pursh) Fern....	ca. **28**	4x	N-Greenland	Holmen, 1952
	EUTREMA (x = 7)				
266	*Edwardsii* R. Br.	**28**	4x	N, and NW-Greenland	Holmen, 1952, Böcher and Larsen, 1950
		42	6x	USSR	Sokolovskaja and Strelkova, 1941
	TORULARIA (x = 7)				
267	*humilis* (C. A. Mey.) O. E. Schulz.	**42**	6x	NE-Greenland	JSW
	BRAYA (x = 7)				
268	*Thorild-Wulffii* Ostf.	**28**	4x	N, and NW-Greenland	Holmen, 1952, Jakobsen, unpubl.
269	*purpurascens* (R. Br.) Bge.	**56**	8x	N, and NE-Greenland	Holmen, 1952, JSW; cf. text p. 73

No.	Species	2n	Ploidy	Counted from	References
	BRAYA				
270	*glabella* Richards.	—			
271	*linearis* Rouy	42	6x	NE, and NW-Greenland	JSW, Böcher and Larsen, 1950
				Norway	Knaben, unpubl.
272	*intermedia* Th. S.	70	10x	NE-Greenland	JSW
273	*Novae-Angliae* (Rydb.) Th. S.	56	8x	NW-Greenland	Böcher and Larsen, 1950; cf. text p. 74
	LESQUERELLA (x = 5, 6)				
274	*arctica* (Wormskj.) Wats..	60	12x	N, NE, and NW-Greenland	Holmen, 1952, JSW, Böcher and Larsen, 1950
	Crassulaceae				
	SEDUM (x = 8, 11, 15, 19)				
275	*Rosea* (L.) Scop.........	22	2x	NE-Greenland	JSW
				USA	Uhl, 1952
		38	2x?	USA	Uhl, 1952
276	*villosum* L.............	30	2x	SW-Greenland	JSW
				Norway	Knaben, 1950
277	*annuum* L.	22	2x	SW-Greenland	JSW
				Austria	Böcher, 1938c
278	*acre* L.	16	2x	Britain	Toyohuku, 1935
		48	6x	Sweden	Á. and D. Löve, 1944; cf. Clausen and Uhl, 1944
	Saxifragaceae				
	PARNASSIA (x = 9)				
279	*Kotzebuei* Cham. et Schl..	18	2x	NW-Greenland	Jakobsen, unpubl.
	SAXIFRAGA (x = 7, 8, 10, 13)				
280	*Aizoon* Jacq. coll.	28	4x	NW-Greenland	JSW
				Iceland	Á. and D. Löve, 1951
				Austria	Mattick in Tischler, 1950
281	*oppositifolia* L.	26	2x	N, NE, and SW-Greenland	Böcher, 1941, Holmen, 1952, JSW
				Spitsbergen	JSW
				Iceland	Á. and D. Löve, 1951
				Norway	Skovsted, 1934
				Switzerland	Larsen, 1954
		39	3x	NE-Greenland	JSW
		52	4x	Spitsbergen	Flovik, 1940
282	*Nathorsti* (Dusén) Hayek.	52	4x	NE-Greenland	Böcher, 1941, JSW
283	*stellaris* L.	28	4x	Scandinavia	Skovsted, 1934,
				Faeroes	Böcher, 1938c
				Iceland	Á. and D. Löve, 1948, 1951
				Austria	Mattick in Tischler, 1950

No.	Species	2n	Ploidy	Counted from	References
	Saxifraga				
284	*foliolosa* R. Br.	**56**	8x	NE-Greenland	JSW
				Spitsbergen	Böcher, 1938c, Flovik, 1940
				Iceland	Á. and D. Löve, 1951
				Scandinavia	Á. and D. Löve, 1948,
		64	?	NW-Greenland	Harmsen, 1939
285	*hieraciifolia* W. et K. ...	ca. **112**	14x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1940
		ca. 80	10x	Caucasia	Sokolovskaja and Strelkova, 1938
286	*nivalis* L.	**60**	6x	N, NE, and NW-Greenland	Böcher and Larsen, 1950, JSW, Holmen, 1952
				Spitsbergen	Flovik, 1940
				Iceland	Á. and D. Löve, 1951; cf. text p. 77
287	*tenuis* (Wbg.) H. Sm. ...	**20**	2x	N, and NE-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1940
				Iceland	Á. and D. Löve, 1948, 1951
				Scandinavia	Böcher, 1938c
288	*tricuspidata* Rottb.	**26**	2x	NW-Greenland	Böcher and Larsen, 1950, Harmsen, unpubl.
289	*aizoides* L.	**26**	2x	NE-Greenland	Böcher, 1938c, JSW
				Iceland	Á. and D. Löve, 1951
				Norway	Skovsted, 1934
				European Alps	Mattick in Tischler, 1950
290	*Hirculus* L.	**32**	4x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1940
				Iceland	Á. and D. Löve, 1951
				Denmark	JSW; cf. text p. 78 for Sokolovskaja's and Strelkova's count (2n = 28)
291	*flagellaris* Willd. ssp. *platysepala* (Trautv.) A. E. Porsild	**32**	4x	N-Greenland	Holmen, 1952
				Spitsbergen	Flovik, 1940
292	*cernua* L.	**60—70**	?	NE-Greenland	JSW
		ca. 64	8x?	Iceland	Á. and D. Löve, 1951
				Norway	Skovsted, 1934
		ca. 50	?	?	Chiarugi, 1934
293	*hyperborea* R. Br.	**26**	2x	N, NE, and NW-Greenland	Böcher, 1938, Holmen, 1952, JSW
				Spitsbergen	Flovik, 1940
294	*rivularis* L.	**52**	4x	NE-Greenland	JSW, cf. text p. 79

No.	Species	2 n	Ploidy	Counted from	References
	SAXIFRAGA				
295	*caespitosa* L. coll.	**80**	10x	N, NW, and SW-Greenland	Holmen, 1952, JSW, Böcher and Larsen, 1950, Harmsen, unpubl.
				Spitsbergen	Flovik, 1940
				Iceland	Á. and D. Löve, 1951; cf. also Skovsted, 1934
	CHRYSOSPLENIUM (x = 6)				
296	*tetrandrum* (N. Lund) Th. Fr.	24	4x	Spitsbergen	Flovik, 1940
	Rosaceae				
	RUBUS (x = 7)				
297	*Chamaemorus* L.	**56**	8x	SW-Greenland	JSW
				Scandinavia	Cf. Á. and D. Löve, 1948
298	*saxatilis* L.	28	4x	Scandinavia	Cf. Á. and D. Löve, 1948
	POTENTILLA (x = 7)				
299	*palustris* (L.) Scop.	**42**	6x	SW-Greenland	JSW
				Pamir	Sokolovskaja and Strelkova, 1935
		28	4x	Scandinavia	Ehrenberg, 1945
				Germany	Wulff, 1937b
		64	?	Pamir	Sokolovskaja and Strelkova, 1935
300	*tridentata* Soland	**28**	4x	SW-Greenland	JSW
				?	Shimatomai, 1930
301	*pulchella* R. Br.	**28**	4x	N, and NW-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1940
				Scandinavia	Erlandsson in Á. and D. Löve, 1948
				Baffin Island	Dansereau and Steiner, 1956
302	*rubricaulis* Lehm.	56	8x	Great Bear Lake	Dansereau and Steiner, 1956
303	*Chamissonis* Hult.	**56**	8x	NW-Greenland	Böcher and Larsen, 1950
		49	7x	Baffin Island	Dansereau and Steiner, 1956
		77	11x	Scandinavia	Müntzing in Hultén, 1945
304	*nivea* L. emend. Hult. ..	56	8x	Sweden	Müntzing in Hultén, 1945
				Canada	Dansereau and Steiner, 1956
305	*nivea* L. ssp. *subquinata* (Lge.) Hult.	**63**	9x	NW-Greenland	Böcher and Larsen, 1950; cf. text p. 82
306	*Vahliana* Lehm.	**42**	6x	NW-Greenland	JSW
		49	7x	Baffin Island	Dansereau and Steiner, 1956
		56	8x	Baffin Island	Dansereau and Steiner, 1956
307	*stipularis* L.	—			
308	*Ranunculus* Lge.	**98**	14x	SW-Greenland	JSW
309	*rubella* Th. S.	—			

No.	Species	2n	Ploidy	Counted from	References
	POTENTILLA				
310	*emarginata* Pursh	**42**	6x	NW-Greenland	JSW
				Spitsbergen	Flovik, 1940
				Alaska	Dansereau and Steiner, 1956
		49	7x	Baffin Island	Dansereau and Steiner, 1956
311	*Crantzii* (Cr.) Beck coll...	**42**	6x	NW, and SW-Greenland	JSW
				Scandinavia	Müntzing, 1931, Håkansson, 1946
		49	7x	Scandinavia	Müntzing, 1931
312	*Egedii* Wormskj.........	**28**	4x	NW-Greenland	Erlandsson, 1942, JSW
				Scandinavia	Erlandsson, 1942
		35	5x	Norway	Erlandsson, 1942
		42	6x	Norway	Erlandsson, 1942
	SIBBALDIA (x = 7)				
313	*procumbens* L...........	**14**	2x	E-Greenland	Böcher, 1938c
				Sweden	Á. and D. Löve, 1945a
				European Alps	Larsen, 1954
	ALCHEMILLA (x = 8)				
314	*alpina* L.	ca. 120	15x	Scandinavia	Cf. Á. and D. Löve, 1948
315	*vulgaris* L., including:				
	1. *A. filicaulis* Buser ..	—			
	2. *A. vestita* (Buser) Raunk............	—			
	3. *A. Wichurae* (Buser) Stefáns..........	—			
	4. *A. glomerulans* Buser	ca. **96**	12x	SW-Greenland	JSW; cf. text p. 84
	SORBUS (x = 17)				
316	*decora* (Sarg.) Schneid. var. *groenlandica* (Schneid.) Jones................	**68**	4x	SW-Greenland	Böcher and Larsen, 1950, Holmen, unpubl.
	DRYAS (x = 9)				
317	*octopetala* L. sensu Juzepczuk	**18**	2x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1940
318	*octopetala* L. ssp. *punctata* (Juz.) Hult...........	—			
319	*integrifolia* Vahl	**18**	2x	SW-Greenland	Böcher and Larsen, 1950
	Leguminosae				
	VICIA (x = 7)				
320	*Cracca* L.	**28**	4x	SW-Greenland	JSW
				Sweden	Á. and D. Löve, 1948
				Denmark	JSW
				Britain	Clapham *et al.* 1952
				Poland	Ryka, 1954
		14	2x	Poland, S-Europe	Ryka, 1954, Sveshnikova, 1927

No.	Species	2n	Ploidy	Counted from	References
	LATHYRUS (x = 7)				
321	*maritimus* (L.) Bigel.	**14**	2x	SW-Greenland	JSW
				?	Senn, 1937; cf. Tischler, 1950
	Geraniaceae				
	GERANIUM (x = 7)				
322	*silvaticum* L.	28	4x	Sweden	Á. and D. Löve, 1944
	Callitrichaceae				
	CALLITRICHE (x = 3, 5, 19)				
323	*verna* (L.) Lönnr.	**20**	4x	SW-Greenland	JSW
				Denmark	Jørgensen, 1923
				Holland	Schotsman, 1954
				USSR	Sokolovskaja, 1932
324	*anceps* Fern.	—			
325	*hamulata* Kütz.	38	2x	Denmark	Jørgensen, 1923
				Holland	Schotsman, 1954
326	*hermaphroditica* L.	6	2x	Denmark	Jørgensen, 1923
	Droseraceae				
	DROSERA (x = 10)				
327	*rotundifolia* L.	20	2x	Sweden	Rosenberg, 1909; cf. Tischler, 1950
				Germany	Reese, 1953
	Violaceae				
	VIOLA (x = 6, 10)				
328	*labradorica* Schrank	20	2x	?	Gershoy, 1934
329	*canina* L. ssp. *montana* (L.) Fr.	—			Cf. Tischler, 1950 for counts of *V. canina* coll.
330	*palustris* L.	**48**	8x	SW-Greenland	JSW
				Denmark	Clausen, 1931; cf. also Gershoy, 1932
331	*Selkirkii* Pursh	24	4x	?	Gershoy, 1928
	Onagraceae				
	EPILOBIUM (x = 9)				
332	*palustre* L.	36	4x	Scandinavia	Á. and D. Löve, 1948
				Denmark	Böcher, 1938c
333	*arcticum* Sam.	—			
334	*anagallidifolium* Lam. . . .	**36**	4x	SW-Greenland	Böcher and Larsen, 1950
				Sweden	Böcher, 1938c
		18	2x	Austria	Mattick in Tischler, 1950
335	*lactiflorum* Hausskn.	**36**	4x	SW-Greenland	Böcher and Larsen, 1950
336	*Hornemanni* Rchb.	36	4x	Scandinavia	Böcher, 1938c, Á. and D. Löve, 1948

No.	Species	2n	Ploidy	Counted from	References
	CHAMAENERION (x = 9)				
337	*angustifolium* (L.) Scop. .	**36**	4x	SW-Greenland	Böcher and Larsen, 1950
				Scandinavia	Á. and D. Löve, 1948
338	*latifolium* (L.) Sweet	**72**	8x	NE, and NW-Greenland	Böcher, 1938c, Böcher and Larsen, 1950, Harmsen, unpubl.
				Iceland	Á. and D. Löve, 1948
	Haloragaceae				
	MYRIOPHYLLUM (x = 7)				
339	*exalbescens* Fern	14	2x	Canada	Á. Löve, 1954a
340	*alterniflorum* L.	**14**	2x	SW-Greenland	JSW
				?	Scheerer, 1939
	Hippuridaceae				
	HIPPURIS (x = 8)				
341	*vulgaris* L.	**32**	4x	SW-Greenland	JSW
				Denmark	Winge, 1917
	Cornaceae				
	CORNUS (x = 11)				
342	*suecica* L.	**22**	2x	SW-Greenland	JSW
				Germany	Wulff, 1939
343	*canadensis* L.	44	4x	USA?	Dermen, 1932
	Umbelliferae				
	ANGELICA (x = 11)				
344	*Archangelica* L. ssp. *norvegica* (Rupr.) Nordh. . .	**22**	2x	SW-Greenland	JSW
				Scandinavia	Cf. Á. and D. Löve, 1948
	LIGUSTICUM (x = 11)				
345	*scoticum* L.	**22**	2x	SW-Greenland	JSW; cf. also Wanscher, 1932
	Pirolaceae				
	PIROLA (x = 23)				
346	*minor* L.	46	2x	Denmark	Hagerup, 1928
347	*grandiflora* Rad.	**46**	2x	NW-Greenland	Hagerup, 1928, Harmsen, unpubl.
	RAMISCHIA (x = 19)				
348	*secunda* (L.) Garcke	38	2x	Denmark	Hagerup, 1941b
	Ericaceae				
	LEDUM (x = 13)				
349	*groenlandicum* Oeder	**26**	2x	W-Greenland	Hagerup, 1941b
350	*palustre* L. ssp. *decumbens* (Ait.) Hult.	**52**	4x	W-Greenland	Hagerup, 1941b

No.	Species	2n	Ploidy	Counted from	References
	RHODODENDRON (x = 13)				
351	*lapponicum* (L.) Wbg....	**26**	2x	NE-Greenland	Hagerup, 1928
	LOISELEURIA (x = 12)				
352	*procumbens* (L.) Desv....	**24**	2x	SW-Greenland Iceland Austria	Hagerup, 1928 Hagerup, 1928 Mattick in Tischler, 1950
	PHYLLODOCE (x = 12)				
353	*coerulea* (L.) Bab........	**24**	2x	W-Greenland	Wanscher, 1932, Böcher, 1938c; cf. text p. 90
	CASSIOPE (x = 13)				
354	*tetragona* (L.) D. Don ...	**26**	2x	NE, and NW-Greenland	Hagerup, 1941b, JSW
	HARRIMANELLA (x = 8)				
355	*hypnoides* (L.) Coville ...	**32**	4x	NE-Greenland	JSW; cf. text p. 91
	ANDROMEDA (x = 12)				
356	*glaucophylla* Link	48	4x	?	Hagerup, 1941b
357	*Polifolia* L.	48	4x	?	Hagerup, 1928, Callan, 1941
	ARCTOSTAPHYLOS (x = 13)				
358	*Uva-ursi* (L.) Spreng. ...	52	4x	?	Hagerup, 1928
359	*alpina* (L.) Spreng.	**26**	2x	NE-Greenland	JSW
	VACCINIUM (x = 12)				
360	*Vitis-idaea* L. ssp. *minus* (Lodd.) Hult.	—			Cf. Tischler, 1950 for counts of main species
361	*uliginosum* L.	48	4x	Denmark	Hagerup, 1933
362	*uliginosum* L. ssp. *microphyllum* Lge.........	**24**	2x	NE, NW, SW-Greenland	Hagerup, 1933, JSW
	OXYCOCCUS (x = 12)				
363	*quadripetalus* Gilib. var. *microphyllus* (Lge.) M. P. Porsild	**48**	4x	W-Greenland	Hagerup, 1940; cf. Hagerup *loc. cit.*, and Darrow *et al.*, 1944 for counts of the main species (2n = 24, 48, 72)
	Empetraceae				
	EMPETRUM (x = 13)				
364	*hermaphroditum* (Lge.) Hagerup	**52**	4x	W-Greenland Scandinavia	Hagerup, 1927 Arwidsson, 1943 (counts by Á. Löve)
	Diapensiaceae				
	DIAPENSIA (x = 6)				
365	*lapponica* L.	**12**	2x	NE, and W-Greenland	JSW, Hagerup, 1928; cf. also Baldwin, 1939

No.	Species	2n	Ploidy	Counted from	References
	Primulaceae				
	PRIMULA (x = 9)				
366	*stricta* Hornem.	126	14x	?	Bruun, 1932
367	*egaliksensis* Wormskj.	**36**	4x	SW-Greenland	JSW
	ANDROSACE (x = 10)				
368	*septentrionalis* L.	20	2x	Austria	Mattick in Tischler, 1950; cf. also Dahlgren, 1916
	Plumbaginaceae				
	ARMERIA (x = 9)				
369	*maritima* (Mill.) Willd.	18	2x	Scandinavia Denmark Germany	Á. and D. Löve, 1945a Hagerup in Iversen, 1940 Griesinger, 1937
370	*scabra* Pall. ssp. *sibirica* (Turcz.) Hyl.	**18**	2x	NE, and W-Greenland	JSW, Hagerup in Iversen, 1940
	Gentianaceae				
	GENTIANA (x = 7)				
371	*nivalis* L.	14	2x	Iceland, Norway Switzerland	D. Löve, 1953, Knaben, 1950 Favarger, 1949
	GENTIANELLA (x = 5, 6, 11)				
372	*detonsa* (Rottb.) G. Don.	44	4x	Iceland	D. Löve, 1953
373	*aurea* (L.) H. Sm.	36	6x	Iceland	D. Löve, 1953
374	*tenella* (Rottb.) H. Sm.	10	2x	Iceland, Norway Switzerland	D. Löve, 1953, Knaben, 1950 Favarger, 1949
375	*Amarella* (L.) H. Sm.	36	6x	Iceland	D. Löve, 1953
	LOMATOGONIUM (x = 5)				
376	*rotatum* (L.) Fr.	10	2x	Iceland	D. Löve, 1953
	Menyanthaceae				
	MENYANTHES (x = 9)				
377	*trifoliata* L.	**54**	6x	SW-Greenland Sweden, Austria, USA	JSW, Holmen, unpubl. Palmgren, 1943, Ehrenberg, 1945, Mattick in Tischler, 1950, Rork, 1949
	Polemoniaceae				
	POLEMONIUM (x = 9)				
378	*boreale* Adams.	18	2x	Spitsbergen	Flovik, 1940
	Boraginaceae				
	MERTENSIA (x = 12)				
379	*maritima* (L.) S. F. Gray.	24	2x	Scandinavia	Á. and D. Löve, 1948

No.	Species	2n	Ploidy	Counted from	References
	Labiatae				
	THYMUS (x = 6, 9)				
380	*arcticus* (Dur.) Ronnig. . .	**54**	6x	SW-Greenland	JSW
				Iceland	Guðjónsson, unpubl.
				Scandinavia	Jalas, 1948; cf. Jalas, *loc. cit.*, for count of *T. Serpyllum* (2n = 24)
	Scrophulariaceae				
	LIMOSELLA (x = 10)				
381	*aquatica* L.	**40**	4x	SW-Greenland	JSW
				Sweden, Britain	Cf. Á. and D. Löve, 1948
	VERONICA (x = 8, 9)				
382	*fruticans* Jacq.	**16**	2x	NW-Greenland	Harmsen, unpubl.
				European Alps	Mattick in Tischler, 1950, Larsen, 1954
383	*alpina* L.	**18**	2x	NE, and NW-Greenland	Böcher, 1938c, Böcher and Larsen, 1950, JSW
				Sweden	Á. and D. Löve, 1945a
				European Alps	Favarger, 1949, Mattick in Tischler, 1950, Larsen, 1954
384	*Wormskjoldii* R. et S. . . .	**36**	4x	NW, and SW-Greenland	Böcher and Larsen, 1950, JSW
	EUPHRASIA (x = 11)				
385	*officinalis* L. coll.	**44**	4x	NE-Greenland	JSW (*E. arctica* Lge. var. *obtusa* Callen)
				Germany	Reese, 1952
		22	2x	Germany	Cf. Tischler, 1950 for other counts of the collective species
	RHINANTHUS (x = 7)				
386	*minor* L. coll.	**14+8f**	2x	SW-Greenland	Holmen, unpubl.
				Iceland	Á. Löve, 1950; cf. also Tischler, 1950
	BARTSIA (x = 6)				
387	*alpina* L.	**28?**	?	NW-Greenland	Böcher and Larsen, 1950; cf. text
		12	2x	Austria	Mattick in Tischler, 1950
				France	Favarger, 1953
		24	4x	Austria	Mattick in Tischler, 1950
		36	6x	France	Doulat, 1947
	PEDICULARIS (x = 8)				
388	*groenlandica* Retz.	—			
389	*lapponica* L.	**16**	2x	NW-Greenland	Harmsen, unpubl.
				Sweden	Á. and D. Löve, 1945a
390	*arctica* R. Br.	—			
391	*lanata* Cham. et Schl. . . .	—			

No.	Species	2n	Ploidy	Counted from	References
392	*hirsuta* L.	**16**	2x	N, NE, and NW-Greenland	Holmen, 1952, JSW, Harmsen, unpubl.
393	*labradorica* Wirsing	—			
394	*flammea* L.	**16**	2x	NE, and NW-Greenland	JSW, Harmsen, unpubl.
395	*capitata* Adams	—			
	Lentibulariaceae				
	Pinguicula (x = 8)				
396	*vulgaris* L.	**64**	8x	SW-Greenland	JSW
				Sweden	Á. and D. Löve, 1948
				France	Doulat, 1947
	Utricularia (x = ?)				
397	*intermedia* Hayne	—			
398	*ochroleuca* R. Hartm.	ca. 40	?	Germany	Reese, 1952
399	*minor* L.	36—40	?	Germany	Reese, 1952
	Plantaginaceae				
	Plantago (x = 6)				
400	*maritima* L.	**12**	2x	SW-Greenland	Mc. Cullagh in Gregor, 1939, JSW
	Rubiaceae				
	Galium (x = 11, 12)				
401	*boreale* L.	44	4x	Europe, Asia	Á. and D. Löve, 1954
		66	6x	Asia, N-America	Á. and D. Löve, 1954
402	*Brandegei* A. Gray	**24**	2x	SW-Greenland	JSW
403	*triflorum* Michx.	—			
	Caprifoliaceae				
	Linnaea (x = 8)				
404	*borealis* L. ssp. *americana* (Forb.) Hult.	32	4x	Canada	Hagerup, 1944
	Campanulaceae				
	Campanula (x = 17)				
405	*rotundifolia* L. coll.	**34**	2x	Greenland	Cf. Böcher and Larsen, 1950
				European Alps	Guinochet, 1942
		68	4x	SE-Greenland	Böcher, 1936, 1938c
				European Alps	Guinochet, 1942
				Iceland, Kola (USSR), Denmark, France, Central Europe	Böcher, 1936, 1938c, Böcher and Larsen, 1950, Guinochet, 1942
406	*uniflora* L.	**34**	2x	NE-Greenland	JSW

No.	Species	2n	Ploidy	Counted from	References
	Compositae				
	ERIGERON (x = 9)				
407	*boreale* (Vierh.) Simm....	18	2x	SW-Greenland	JSW, Böcher and Larsen, 1950
				Iceland	Á. Löve, 1950
408	*uniflorum* L.	18	2x	NE, and SW-Greenland	JSW, Böcher and Larsen, 1950
				Iceland	Á. Löve, 1950
				Scandinavia	Holmgren, 1919
409	*eriocephalum* J. Vahl	18	2x	NW-Greenland	JSW
				Iceland	Á. Löve, 1950
410	*unalaschkense* (DC.) Vierh.	36	4x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1940
				Iceland	Á. Löve, 1950
				Sweden	Holmgren, 1919
411	*compositum* Pursh.......	54	6x	NE, and NW-Greenland	Holmen, 1952, JSW, Böcher and Larsen, 1950
				Canada	Böcher and Larsen, 1950
		63	7x	NW-Greenland	Böcher and Larsen, 1950
	ANTENNARIA (x = 7)				
412	*dioeca* (L.) Gaertn. coll., including:				Cf. Bergman, 1935
	1. *A. Hansii* Kerner	56	8x	SW-Greenland	JSW
	2. *A. affinis* Fern.	56	8x	SW-Greenland	JSW
	3. *A. intermedia* (Rosenv.) M. P. Porsild	84	12x	Greenland	Bergman, 1935
413	*alpina* (L.) Gaertn. coll., including:				Cf. Bergman, 1935
	1. *A. angustata* Greene ..	—			
	2. *A. brevistyla* Fern.....	—			
	3. *A. canescens* (Lge.) Malte	56	8x	NW-Greenland	JSW
	4. *A. Ekmaniana* A. E. Porsild	84	12x	NW-Greenland	JSW
	5. *A. glabrata* (J. Vahl) Greene	—			
	6. *A. Porsildii* E. Ekman.	63	9x	NW-Greenland	Böcher and Larsen, 1950
				Sweden	Nygren, 1950b
	GNAPHALIUM (x = 7)				
414	*supinum* L.	28	4x	SW-Greenland	JSW
				Scandinavia	Á. and D. Löve, 1948
415	*norvegicum* Gunn........	56	8x	SW-Greenland	JSW
				Sweden	Á. and D. Löve, 1948
416	*uliginosum* L.	14	2x	Germany	Wulff, 1938
	ACHILLEA (x = 9)				
417	*Millefolium* L. coll.	54	6x	SW-Greenland	JSW
				Scandinavia	Lawrence, 1947; cf. Lawrence, *loc. cit.*, for other counts (2n = 36, 72)

No.	Species	2n	Ploidy	Counted from	References
	MATRICARIA (x = 9)				
418	*ambigua* (Ledeb.) Kryl...	**18**	2x	NE-Greenland	Hagerup, 1941a, JSW
				Scandinavia	Vaarama, 1953
	ARTEMISIA (x = 9)				
419	*borealis* Pall.	**18**	2x	NE, and NW-Greenland	Erlandsson, 1939, JSW, Böcher and Larsen, 1950
	ARNICA (x = 19)				
420	*alpina* (L.) Olin coll.....	ca. **57**	3x	NE-Greenland	JSW
				Spitsbergen	Flovik, 1940
				Scandinavia	Afzelius, 1924; cf. text p. 104
		76	4x	NW-Greenland	Böcher and Larsen, 1950
	CIRSIUM (x = 17)				
421	*heterophyllum* (L.) Hill...	34	2x	Germany	Wulff, 1937b
	LEONTODON (x = 6)				
422	*autumnalis* L.	**12**	2x	SW-Greenland	JSW
				Sweden	Bergman, 1935,
				Denmark	Hagerup, 1941a
		24	4x	Scandinavia	Vaarama in Á. and D. Löve, 1948
	TARAXACUM (x = 8)				
423	*arcticum* (Trautv.) Dt. ..	**40**	5x	N, and NE-Greenland	Holmen, 1952, JSW
				Spitsbergen	Flovik, 1940, Erlandsson, 1939
424	*hyparcticum* Dt.	—			
425	*phymatocarpum* J. Vahl..	**24**	3x	N-Greenland	Holmen, 1952, cf. text p. 105
427	*arctogenum* Dt.	**32**	4x	N-Greenland	Holmen, 1952
428	*lacerum* Greene	**40**	5x	SW-Greenland	JSW
429	*umbrinum* Dt.	—			
430	Sect, *Crocea* M. P. Chr., including:				
	1. *T. brachyceras* Dt.	—			
	2. *T. croceum* Dt.	32	4x	Sweden	Gustafsson, 1935
	3. *T. devians* Dt.	—			
	4. *T. pleniflorum* M. P. Chr.	—			
	5. *T. purpuridens* Dt. ...	—			
	6. *T. rhodolepis* Dt.	—			
431	Sect. *Naevosa* M. P. Chr., including:				
	1. *T. atroglaucum* M. P. Chr.	—			
	2. *T. cyclocentrum* M. P. Chr.	—			
	3. *T. dilutisquameum* M. P. Chr.	—			
	4. *T. firmum* Dt.	—			
	5. *T. naevosum* Dt.	—			

No.	Species	2n	Ploidy	Counted from	References
	TARAXACUM				
432	Sect. *Macrodonta* M.P. Chr., including:				
	1. *T. campylodes* Hagl. . .	—			
	2. *T. islandiciforme* Dt. . .	—			
	3. *T. latispinulosum* M.P. Chr.	—			
	HIERACIUM (x = 9)				
433	*alpinum* L., including:				
	1. *H. alpinum* (L.) Zahn.	**27**	3x	SW, and SE-Greenland	Böcher and Larsen, 1950
	2. *H. angmagssalikense* Om.	—			
434	*atratum* Fr., including:				
	1. *H. hyparcticum* Almq. .	**27**	3x	SW-Greenland	Böcher and Larsen, 1950, JSW
	2. *H. stelechodes* Om.	—			
435	*lividorubens* Almq., including:				
	1. *H. lividorubens* Almq. .	**27**	3x	SW-Greenland	JSW
436	*plicatum* Ledeb., including:				
	1. *H. amitsokense* (Almq.) Dt.	—			
	2. *H. groenlandicum* (A.T.) Almq.	**27**	3x	SW-Greenland	Böcher and Larsen, 1950
	3. *H. ivigtutense* (Almq.) Om.	—			
	4. *H. Scholanderi* Om. . . .	—			
	5. *H. Sylowii* Om.	—			
437	*inuloides* Tausch, including:				
	1. *H. acranthophorum* Om.	**27**	3x	SW-Greenland	JSW
	2. *H. Devoldii* Om.	—			
	3. *H. Eugenii* Om.	—			
	4. *H. musartutense* Om. . .	—			
	5. *H. nepiocratum* Om. . .	—			
	6. *H. rigorosum* (Laest.) Almq.	—			
	7. *H. stiptocaule* Om.	—			

VI. Summarizing Remarks.

As stated in the last paragraph of the introduction to this paper, which was written 5—6 years ago, it was foreseen that the present work should include, or promote, detailed studies of as far as possible all those polymorphous and complex groups of Greenland plants, to the elucidation of which cytological facts could be supposed to be of importance. At the same time it was also planned that a finishing chapter should be worked out, containing a comprehensive discussion of the many and varied aspects of the cytological viewpoint in modern botany, using as the basis the fresh information on the chromosome numbers of Greenland plants brought together here.

In the course of time we have had to realise, however, that it will require many years of future work in addition to that already done to fill the originally intended frame, and that such a long-time effort is beyond our possibilities.

The present team-work has, however, given occasion to several studies of critical groups already published, and others are under way. Thus the paper of TH. SØRENSEN on the Greenland species of *Puccinellia* appeared in 1953, that on *Hierochloë, Calamagrostis,* and *Braya* in 1954, and in 1955 the paper of SAUNTE on *Cochlearia* was published. Supplementary studies on *Calamagrostis* and *Braya* are planned by TH. SØRENSEN, and the studies of C. A. JØRGENSEN on the large material of the Greenland species of *Betula* and of *Papaver radicatum,* still awaits publication.

We may also mention here that we have had much mutual contact with other Danish botanists occupied with studies of Greenland plants, and that BÖCHER, HOLMEN, and JAKOBSEN, while at work on their "Grønlands Flora" have had access to draw upon the manuscript of the present paper.

This concluding chapter is thus far from that originally intended. We have renounced on the general, critical discussion on the polyploidy problem in arctic botany, partly because of lack of time, and partly because we have on closer reflexion found it somewhat premature to attempt such a discussion, considering the scanty information on the chromosome numbers of the North American and the Siberian floras. Besides, the general polyploidy problems of the plant kingdom have lately been discussed by different botanists (MANTON, 1950, STEBBINS, 1950, JENS CLAUSEN, 1951, HESLOP-HARRISON, 1953, and English authors in the "Conference on species studies in the British flora", ed. by LOUSLEY, 1955). We therefore confine ourselves to a few, summarizing remarks.

1. The Number of Species of Flowering Plants in Greenland.

In the species delimitation adopted here, the Greenland flora totals 437 species, namely 1 Gymnosperm, 160 Monocotyledons and 276 Dicotyledons. The Monocotyledons are represented by 10 families, and of these 3 are dominant to an extra-

TABLE 1.

	Number of species	Counted	Counted from Greenland
Gymnosperms			
Cupressaceae	1	1	1
Total...	1	1	1
Monocotyledons (10 families)			
Gramineae	66	65	57
Cyperaceae	56	52	43
Carex	(45)	(42)	(34)
Juncaceae	20	20	16
Other families	18	18	10
Total...	160	155 (97 %)	126 (79 %)
Dicotyledons (40 families)			
Caryophyllaceae	33	27	16
Ranunculaceae	16	14	13
Ranunculus	(13)	(12)	(12)
Cruciferae	42	33	31
Draba	(22)	(17)	(15)
Saxifragaceae	18	18	16
Saxifraga	(16)	(16)	(15)
Rosaceae	23	20	16
Potentilla	(14)	(12)	(10)
Ericaceae	15	14	10
Scrophulariaceae	15	10	10
Compositae	31	27	22
Other families	83	76	41
Total...	276	239 (87 %)	175 (63 %)
Grand total...	437	395 (91 %)	302 (69 %)

ordinary degree, namely *Gramineae* (66 species), *Cyperaceae* (56 species), and *Juncaceae* (20 species). The 7 other families taken together contribute with 18 species only.

Among the grasses *Puccinellia* includes the highest number of species (12) followed by *Poa* (9) and *Calamagrostis* (7). Of the *Cyperaceae* 45 species belong to the genus *Carex*.

The Dicotyledons are distributed on 40 families and again the bulk of species belongs to a few of these. The 8 families: *Caryophyllaceae* (33), *Ranunculaceae* (16), *Cruciferae* (42), *Saxifragaceae* (18), *Rosaceae* (23), *Ericaceae* (15), *Scrophulariaceae* (15), and *Compositae* (31) include as many as 193 species, the remaining 32 families covering only 83 species. The dicotyledonous genera containing the highest number of species are *Ranunculus* (13), *Draba* (22), *Saxifraga* (16), and *Potentilla* (14).

2. Present Status of the Cytological Information on the Greenland Flora.

These data are summarized in Table 1. It appears from the table that approximately 91 per cent of the Greenland species of flowering plants have been studied cytologically. 69 per cent of the chromosome numbers known have been determined from fixations of root-tips or flower buds made in Greenland or from plants of Greenland provenance grown elsewhere. This should be considered a fairly satisfactory state of affairs, considering the difficult accessibility of that country. Only the floras of the Scandinavian countries have been studied cytologically to a similar extent (Á. and D. Löve, 1948, 1949). Fortunately all the dominating families of the Greenland flora are well represented. We know the chromosome number of almost all species of grasses, of *Ranunculus* and *Saxifraga*, and of most *Draba* and *Potentilla* species.

3. Remarks on the Classification with Respect to Polyploidy.

In most cases the classification of the individual species as diploids or polyploids in a numerical sense meets with little difficulty. The basic number (x) is usually the lowest haploid number counted in the genus. In some genera, however, diploids have not yet been found because they are rare or do not exist, and the basic number must then be ascertained indirectly. In *Calamagrostis*, for instance, the lowest number found so far is $2n = 28$, but the basic number is obviously 7 as in related genera. In *Luzula* the basic number was for a long time thought to be 6, until the recent discovery of $2n = 6$ in the Mediterranean *L. purpurea* proved it to be 3. In *Juncus* neither diploids nor tetraploids have so far been found, the lowest number counted being $2n = 30$. However, the fact that these 30-chromosome species have normal sexual reproduction by seeds prove them to be hexaploids, not triploids, thus the basic number of the genus must be 5, not 10.

In one family only, *viz.* the *Cyperaceae*, clear evidence of polyploidy in the strict sense of the term is lacking. Accordingly the species of this family cannot in our opinion be classified according to this principle. In their evolution another mechanism is probably at work. For this reason the safest attitude will be to leave them out of consideration when the various aspects of the polyploidy phenomenon is under discussion. Tischler (1935) and Á. and D. Löve (1943) both list all *Cyperaceae* as polyploids in their statistical analysis of the polyploidy frequencies in various countries. This gives in our opinion a biased picture of the situation.

4. Taxonomical Significance of the Basic Numbers.

In most cases there is only one basic number in a genus. The conformity in number is an indication of a close relationship, differences of a more distant one. In *Honckenya*, *e.g.*, 17 is the basic number, and this fact is a good argument against the suggested inclusion of this plant in the genus *Arenaria*, which has $x = 10$.

In a similar way the basic number of 8 in *Harrimanella hypnoides* places this species rather remotely from *Cassiope* ($x = 13$), and this difference is one of the reasons why we should resort to Coville's opinion that a separate genus should be established for this plant.

In other and less disputable genera two or more different basic numbers are present (see Table 2). In *Pleuropogon* the Greenland species *P. Sabinei* has $2n = 40$, and thus the basic number of 10 as distinct from that of the North American species with $x = 8$ (7). A division of the genus according to the chromosome difference would not, as a matter of fact, be preposterous on morphological grounds, and if this step is taken, the American group of species must be given another generic name, since *P. Sabinei* is the type species of the genus.

Table 2. Genera with different basic number (numbers not represented in Greenland species in brackets).

Genus	Basic numbers
Deschampsia	7, 13
Salix	19, 22
Rumex	7, 10
Stellaria	13, (8, 12, 10? 11?)
Cerastium	9, 19
Sagina	6, 11, (9)
Ranunculus	7, 8
Cochlearia	7, (6)
Draba	8, 10
Arabis	7, 8
Lesquerella	5, (6)
Sedum	8, 11, 15, 19, (9, 17)
Saxifraga	7, 8, 10, 13
Callitriche	3, 5, 19
Viola	6, 10, (9, 11, 13, 17)
Gentiana and *Gentianella*	5, 6, 7, 11, 13
Thymus	9, (6)
Veronica	8, 9, (7, 17)
Galium	8, 11

Sometimes the cytological situation reflects the attitude taken by taxonomists who have already established subgenera corresponding to the chromosome difference. *Rumex, Veronica,* and *Callitriche* may be cited as examples.

In other cases the morphological and cytological variations seem to be more or less uncorrelated, the chromosome evolution having apparently proceeded without giving rise to new characters of much taxonomical value. In the genera *Cochlearia* and *Thymus* the arctic representatives, being themselves collective species, differ in their basic number from other members of the genus. Thus *Cochlearia groenlandica* has $2n = 14$, while in *C. officinalis* the numbers $2n = 24$ and 36 occur. Similarly *Thymus arcticus* has $2n = 54$ and *T. Serpyllum* $2n = 24$. The coexistence of 7 and 13 as basic number in closely related species of *Deschampsia* is a third example, and a very similar case is *Callitriche* with $x = 5$ in some species and $2n = 38$ in *C. hamulata*.

The most complex situation is found in genera like *Sedum, Saxifraga,* and *Gentiana,* which include many different basic numbers.

In *Cerastium Cerastoides* the two numbers $2n = 36$ and 38 were counted in Greenland material, indicating the existence of the basic numbers 9 and 19 within this species, a situation parallel to that found in *C. arvense*. *Sedum Rosea* is a third puzzling example of the coexistence of two different basic numbers (11 and 19) within the Linnaean species.

5. Intra- and Interspecific Polyploidy in Greenland Flowering Plants.

Table 3 lists the Greenland species in which the phenomenon of "intraspecific" polyploidy is met with. The presentation of such a list is really a challenge both to enter into a general discussion of the intricate problem of the relation of chromosome number differences to species delimitation, and next to put the individual cases to a closer test. We shall on the present occasion abstain from both of these tasks and confine ourselves to a few remarks.

In the case of two different chromosome numbers being reported or found in plants of the same Linnaean species, it is wise first to consider the possibility that the fixation was mixed up with root-tips or flower buds of another species. Another possibility is of course incorrect identification of one of the specimens in question. When a renewed examination confirms the case, a thorough morphological examination of the specimens should be made and an elucidation of their geographical distribution be attempted before taxonomical conclusions are actually drawn. If used with cautiousness in this way, chromosome cytology is an exceedingly valuable tool for taxonomists when studying critical polymorphic species, apomictic as well as sexual. It will for instance hardly be possible to make a division into naturally defined species in such complexes as *Cerastium alpinum* and *Stellaria longipes*, or of parts of the genus *Draba* without large-scale chromosome studies.

In most of the cases listed in Table 3 the question is of species in which one of the two or more different counts is a Greenland one, the other from another country. There are also, however, a number of cases of intraspecific polyploidy within the Greenland plants themselves (Nos. 36, 147, 194, 232, 241, 243, 405). This indicates that the number of Greenland flowering plants, here stated to be 437, must be a minimum number, and that in the future some of the present species will become subdivided into two or more.

Table 3 shows that the intraspecific polyploids are not distributed at random among the families and genera. Thus of the 12 *Juncus* species as many as 4 are of this type. The family of *Caryophyllaceae* also carries a heavy load of them, especially the genera *Cerastium* and *Stellaria*. Although the recent taxonomical treatment of *Cerastium alpinum* and *Stellaria longipes* by HULTÉN is an important step towards a natural limitation of the taxa within these collective species, we feel convinced that much cytological work will be needed to reach a final result.

In Table 4, which is a counterpart of Table 3, selected cases have been brought together, in which the pairs of species listed differ with respect to polyploidy, and in which the cytological facts have contributed materially to the taxonomical decision. Some of the species pairs listed here were by LANGE or by other taxonomists included in one species, often in such a way that one of them was considered the typical or main species, the other a variety. The difference in polyploidy places the species of such a pair on an equal footing; it proves their intersterility and puts them into their proper relative position from an evolutionary point of view.

TABLE 3. "Intraspecific polyploidy" among Greenland plants. Sexual species only.

No.	Species	Chromosome number
12	*Hierochloë odorata*	4x, 6x, 8x
15	*Phleum commutatum*	2x, **4x**
16	*Alopecurus alpinus*	**16x**, 18x
19	*Agrostis stolonifera*	4x, 6x
36	*Trisetum spicatum*	**4x**, **6x**
59	*Puccinellia maritima*	6x, **8x**, 10x
71	*Festuca rubra*	2x, 4x, **6x**, 10x and aneuploids
133	*Juncus arcticus*	**16x**, 20x
135	*Juncus filiformis*	8x, **16x**
136	*Juncus alpinus*	**8x**, 16x
141	*Juncus castaneus*	8x, **12x**
147	*Luzula arcuata*	**12x**, 14x, **16x**
150	*Luzula multiflora*	4x, 8x, 10x, 12x
152	*Luzula spicata*	4x, **8x**
159	*Platanthera hyperborea*	6x, **12x**
172	*Rumex domesticus*	6x, 10x
179	*Polygonum aviculare*	4x, 6x
183	*Stellaria media*	2n = 28, 40, 42, 44
185	*Stellaria longipes*	4x, **8x**
193	*Cerastium arvense*	2n = 36, 38, 72
194	*Cerastium alpinum*	**6x**, 8x, **12x**, 16x
196	*Cerastium fontanum*	12x, **16x**
197	*Cerastium holosteoides*	14x, 16x
198	*Sagina nodosa*	2n = 20—24, 56
199	*Sagina caespitosa*	2n = 88, ± 100
232	*Papaver radicatum*	**8x**, **10x**, **12x**
241	*Draba hirta*	**8x**, **10x**
243	*Draba cinerea*	**6x**, **10x**
251	*Draba alpina*	**8x**, 10x
260	*Arabis alpina*	**2x**, 4x
264	*Rorippa islandica*	**2x**, 4x
266	*Eutrema Edwardsii*	**4x**, 6x
275	*Sedum Rosea*	2n = **22**, 38
278	*Sedum acre*	2x, 6x
281	*Saxifraga oppositifolia*	**2x**, 4x
285	*Saxifraga hieraciifolia*	10x, **14x**
299	*Potentilla palustris*	4x, **6x**, 8x
320	*Vicia Cracca*	2x, **4x**
334	*Epilobium anagallidifolium*	2x, **4x**
363	*Oxycoccus quadripetalus*	2x, **4x**, 6x
385	*Euphrasia officinalis*	2x, **4x**
387	*Bartsia alpina*	2x, 4x, 6x
401	*Galium boreale*	4x, 6x
405	*Campanula rotundifolia*	**2x**, **4x**
417	*Achillea millefolium*	4x, **6x**, 8x
422	*Leontodon autumnalis*	**2x**, 4x

Table 4. Selected cases of "Interspecific polyploidy" among species pairs.

No.	Species	References
11	*Anthoxanthum alpinum* (2x) — *odoratum* (4x)	Á. and D. Löve, 1948
15	*Phleum commutatum* (**4x**) — *alpinum* (2x)	Nordenskiöld, 1945
19—20	*Agrostis stolonifera* (**4x**) — *gigantea* (**6x**)	Jones, 1956, cf. Juhl, 1952
22	*Agrostis canina* ssp. *montana* (4x) — ssp. *canina* (2x)	Jones, 1956, Björkman, 1954
47—48	*Dupontia psilosantha* (**4x**) — *Fisheri* (**8x**)	Flovik, 1940, JSW, p. 24
67—68	*Festuca hyperborea* (**4x**) — *brachyphylla* (**6x**)	Holmen, 1952
76	*Elymus mollis* (**4x**) — *arenarius* (8x)	Á. Löve, 1950, JSW, p. 32
140	*Juncus ranarius* (**6x**) — *bufonius* (8x, 16x, 24x)	Böcher, 1952, JSW, p. 47
174—175—**176**	*Rumex Acetosella* (**6x**) — *tenuifolius* (**4x**) — *graminifolius* (**8x**)	Á. Löve, 1944
204	*Minuartia rubella* (**2x**) — *verna* (6x)	JSW, p. 59
218	*Ranunculus confervoides* (**4x**) — *trichophyllus* (2x)	JSW, p. 61
234	*Cochlearia groenlandica* (2n = **14**) — *officinalis* coll. (2n = 24, 48)	Saunte, 1955
271—272	*Braya linearis* (**6x**) — *intermedia* (**10x**)	Sørensen, 1954
281—282	*Saxifraga oppositifolia* (**2x**) — *Nathorsti* (**4x**)	Böcher, 1941
283—**284**	*Saxifraga stellaris* (**4x**) — *foliolosa* (**8x**)	Harmsen, 1939, JSW, p. 77
286—287	*Saxifraga nivalis* (**6x**) — *tenuis* (**2x**)	JSW, p. 77
293—294	*Saxifraga hyperborea* (**2x**) — *rivularis* (**4x**)	JSW, p. 79
316	*Sorbus decora* (**4x**) — *americana* (2x)	JSW, p. 85
361—**362**	*Vaccinium uliginosum* (**4x**) — ssp. *microphyllum* (**2x**)	Hagerup, 1933
364	*Empetrum hermaphroditum* (**4x**) — *nigrum* (2x)	Hagerup, 1927
380	*Thymus arcticus* (2n = **54**) — *Serpyllum* (2n = 24)	Jalas, 1948, JSW, p. 94
383—384	*Veronica alpina* (**2x**) — *Wormskjoldii* (**4x**)	Böcher & Larsen, 1950, JSW, p. 95
401	*Galium boreale* (4x) — *septentrionale* (6x)	Á. & D. Löve, 1954
408, 410	*Erigeron uniflorum* (**2x**) — *unalaschkense* (**4x**)	Á. Löve, 1950, JSW, p. 100
418	*Matricaria ambigua* (**2x**) — *inodora* (4x)	JSW, p. 103, Vaarama, 1953

6. Apomicts in Greenlandic Flowering Plants.

It is often a difficult and tedious task to prove definitely that apomictic reproduction is present in a certain plant species unless apomixis is exclusively effectuated by some sort of vegetative reproduction (vivipary, etc.). Both embryological investigations and castration experiments are necessary to prove agamospermous reproduction. But without resort to the results of such studies, agamospermy may be inferred with a high degree of probability in plants having (1) normal seed setting, but highly defective pollen or (2) normal seed setting and a somatic chromosome number which is either aneuploid or an odd multiple of the basic number.

In the list of apomicts among the Greenland flowering plants in Table 5 are included not only such species in which this mode of reproduction has been definitely proved, but also those in which it can be inferred to be present on the indications mentioned above.

As the literature on apomixis in the flowering plants has been summarized recently by STEBBINS (1941), by GUSTAFSSON (1946—47), and by NYGREN (1954b) we confine ourselves to some new cases which should be added to the lists of these authors.

Hierochloë orthantha (No. 14) has defective pollen, it is nonoploid and has normal seed production. It is therefore very likely that the species is agamospermous, but no embryological or experimental work has been done so far to support this suggestion.

The two species of *Calamagrostis, C. hyperborea* (No. 21) and *C. Poluninii* (No. 29), are included in the list because they have defective pollen combined with normal seed fertility. The other three species, *C. lapponica, C. canadensis,* and *C. purpurascens* are among the many species in which agamospermous reproduction has been demonstrated through the careful embryological and experimental work of NYGREN.

Deschampsia pumila (No. 33) is in our opinion one of the most puzzling Greenland apomicts. It is not viviparious like *D. alpina*, but judging from the highly irregular meiosis in the PMCs and the defective pollen in both diploids and triploids, normal sexual reproduction cannot be possible.

Puccinellia phryganodes (No. 60) presents a similar mystery, but in this species vegetative reproduction is effected by broken-off runners. A further discussion of *D. pumila* and *P. phryganodes* is found in the text, p. 19 and p. 27.

Poa Hartzii (No. 43) has a good seed production, but a very irregular meiosis in the PMCs and no normal pollen. It certainly must be agamospermous, but embryological studies are lacking.

Alltogether 18 out of 66 Greenland grasses thus possess mechanisms for asexual reproduction. Obviously apomixis in these species is often associated with polyploidy, and many of them include biotypes with odd multiples of the basic number or are aneuploids, especially in *Poa*. Intraspecific chromosome variation is also characteristic of many of the apomictic grasses and is probably associated with microspeciation in these. It will be an interesting and profitable task to undertake a cyto-taxonomical investigation of the apomictic grasses of Greenland.

Of the 19 dicotyledonous species, in which apomictic reproduction has either been proved or is probable, we shall only comment on the following:

Stellaria ciliatosepala (No. 188) is in our opinion most likely a hybrid between two other microspecies of the *Stellaria longipes* group. It never produces seed and seems to spread exclusively by detached branchlets and runners.

Ranunculus auricomus (No. 227) is from BÖCHER's preliminary studies of Greenland plants known to have a rather irregular PMC-meiosis, but as the embryo-sac formation has not yet been investigated, some reservation as to its mode of reproduction is necessary. It is known that tetraploids and plants with higher numbers are pseudogamous, whereas the diploid alpine plants recently studied by RUTISHAUSER, 1953/54, are sexual. The status of the Greenland diploids have not yet been settled definitely.

Ranunculus pedatifidus (No. 224) and *R. nivalis* (No. 226) are listed among the

TABLE 5. Apomictic species.

No.	Species	Chromosome number	Mode of reproduction	References
14	*Hierochloë orthantha*	**9 x**	agam.?	JSW, p. 12
26	*Calamagrostis lapponica*	**6 x**	agam.	Nygren, 1954b, JSW, p. 15
21	*Calamagrostis hyperborea*	**14 x**	agam.?	JSW, p. 16
28	*Calamagrostis canadensis* var. *scabra*	**8 x** and aneuploids	agam.	Nygren, 1954b, JSW, p. 16
29	*Calamagrostis Poluninii*	**8 x**	agam.?	JSW, p. 16
30	*Calamagrostis purpurascens*	**8 x** and aneuploids	agam.	Nygren, 1954b, JSW, p. 16
31	*Deschampsia alpina*	2x, 3x, **4 x** and aneuploids	viviparous (and sexual)	Cf. Nygren, 1954b
33	*Deschampsia pumila*	**2 x**, **3 x** and aneuploids	?	JSW, p. 19
38	*Poa pratensis* ssp. *eupratensis*	2n = 41—124 Greenland: ± **95**	agam.	Cf. Nygren, 1954b
39	*Poa pratensis* ssp. *alpigena*	2n = 38—92 Greenland: **35**	agam. and viviparous	Cf. Nygren, 1954b
40	*Poa arctica*	2n = **56**—100	agam.	Cf. Nygren, 1954b
41	*Poa alpina*	2n = 14—57 Greenland: **28, 33, 42, 43, 46**	agam. and viviparous	Cf. Nygren, 1954b
43	*Poa Hartzii*	**10 x**	agam.?	JSW, p. 23
44	*Poa glauca*	2n = 42—70 Greenland: **8 x, 9 x, 10 x**	sexual + agam.?	Cf. Nygren, 1954b
45	*Poa nemoralis*	2n = 28—56 Greenland: **6 x**	sexual + agam.?	Cf. Nygren, 1954b
60	*Puccinellia phryganodes*	**3 x**, 4x	sexual? and vegetative	JSW, p. 27
70	*Festuca vivipara*	3x, 4x, 6x, **7 x**	viviparous	Cf. Nygren, 1954b
	Festuca vivipara var. *hirsuta*	**4 x**	viviparous	JSW, p. 30
186	*Polygonum viviparum*	2n = 83—130 Greenland: app. **100**	viviparous	Holmen, 1952, Skalinska, 1949; cf. Nygren, 1954b
188	*Stellaria ciliatosepala*	**7 x**	vegetative	JSW, p. 56
224	*Ranunculus nivalis*	5x, **6 x**, 7x	?	Nygren in Á. & D. Löve, 1948, JSW, p. 63
226	*Ranunculus pedatifidus*	**4 x**, **6 x**	agam.?	Böcher & Larsen, 1950, JSW, p. 63
(227)	*Ranunculus auricomus*	**2 x**, 4x, 5x, 6x	agam. + sexual	Häfliger, 1943, Rutishauser, 1953/54, Rousi, 1956; see also Böcher, 1938; cf. Nygren, 1954b
262	*Arabis Holboellii*	**2 x**, **3 x**, 4x, 6x	sexual + agam.	Böcher, 1951, cf. Nygren, 1954b
284	*Saxifraga foliolosa*	**8 x** and aneuploids	viviparous	Cf. Nygren, 1954b
292	*Saxifraga cernua*	**8 x** and aneuploids	viviparous	Cf. Nygren, 1954b
303	*Potentilla Chamissonis*	**8 x**, 9x, 11x	agam.?	Böcher & Larsen, 1950, Dansereau & Steiner, 1956, JSW, p. 82
305	*Potentilla nivea* ssp. *subquinata*	**9 x**	agam.	Böcher & Larsen, 1950

TABLE 5 (continued).

No.	Species	Chromosome number	Mode of reproduction	References
306	*Potentilla Vahliana*	**6 x**, 7 x, 8 x	agam.?	JSW, p. 83, Dansereau & Steiner, 1956
310	*Potentilla emarginata*	**6 x**, 7 x	agam.?	JSW, p. 83, Dansereau & Steiner, 1956
311	*Potentilla Crantzii*	**6 x**, 7 x	agam.	JSW, p. 83; cf. Müntzing, 1951
312	*Potentilla Egedii*	**4 x**, 5 x, 6 x	agam.?	Erlandsson, 1942
314	*Alchemilla alpina*	15 x	agam.	Cf. Nygren, 1954 b
315	*Alchemilla vulgaris*	**12 x**	agam.	Cf. Nygren, 1954 b
411	*Erigeron compositum*	**6 x, 7 x**	agam.?	Böcher & Larsen, 1950, JSW, p. 100
412	*Antennaria dioeca*	**8 x, 12 x**	agam. + sexual	Cf. Nygren, 1954 b (sexual species 2 x = 28)
413	*Antennaria alpina*	**8 x, 9 x, 12 x**	agam. + sexual	Cf. Nygren, 1950, 1954 b
420	*Arnica alpina*	**3 x, 4 x**	agam. + sexual?	Böcher & Larsen, 1950, JSW, p. 104; cf. Nygren, 1954 b
423	*Taraxacum arcticum*	**5 x**	agam.	Cf. Nygren, 1954 b
424	*Taraxacum hyparcticum*	?	agam.	Cf. Nygren, 1954 b
425	*Taraxacum phymatocarpum*	**3 x**	agam.	Cf. Nygren, 1954 b
427	*Taraxacum arctogenum*	**4 x**	agam.	Cf. Nygren, 1954 b
428	*Taraxacum lacerum*	**5 x**	agam.	Cf. Nygren, 1954 b
429	*Taraxacum umbrinum*	?	agam.	Cf. Nygren, 1954 b
430	*Taraxacum* sect. *Crocea*	4 x	agam.	Cf. Nygren, 1954 b
431	*Taraxacum* sect. *Naevosa*	?	agam.	Cf. Nygren, 1954 b
432	*Taraxacum* sect. *Macrodonta*	?	agam.	Cf. Nygren, 1954 b
433	*Hieracium alpinum*	**3 x**	agam.	Cf. Nygren, 1954 b
434	*Hieracium atratum*	**3 x**	agam.	Cf. Nygren, 1954 b
435	*Hieracium lividorubens*	**3 x**	agam.	Cf. Nygren, 1954 b
436	*Hieracium plicatum*	**3 x**	agam.	Cf. Nygren, 1954 b
437	*Hieracium inuloides*	**3 x**	agam.	Cf. Nygren, 1954 b

apomicts with some reservation, because cytological data on their reproduction is lacking. However, the evidence for apomixis in these two species is in our opinion stronger than that for the Greenland *R. auricomus*.

The chromosome numbers found in Greenland plants of the 6 species of *Potentilla* included in the list of apomicts are indicative of apomixis only in the case of *P. nivea* ssp. *subquinata*, (No. 305). In the other species, biotypes with odd multiples, however, are found outside Greenland.

Erigeron compositum (No. 411), which shows two different polyplotypes in Greenland, one of them heptaploid, is probably agamospermous like other high polyploid species of this genus.

Arnica alpina (No. 420) presents a complicated problem as to its mode of reproduction. The triploid biotype found by us cannot well exist without being agamospermous, but the tetraploid plants reported on by BÖCHER and LARSEN have a high proportion of good pollen grains and nothing indicative of apomixis is known for them. Special studies are much needed to solve the problems of this interesting species.

7. The Frequency and Distribution of Diploids and Polyploids in the Greenland Flowering Plants.

The distribution of diploids and polyploids among the different families is shown in Table 6. All those sexual species in which only one chromosome number is known, enter straightaway. If two or more different euploid numbers are known, they are all included if they are based on Greenland plants. If in similar cases none of the counts refer to plants of Greenland origin they are omitted from the statistical treatment. In the case of apomictic species, most of which include biotypes with different chromosome numbers, only the lowest of the euploid figures is used.

Of the monocotyledonous families, *Gramineae* and *Juncaceae* are shown separately, the remaining 7 small families being pooled together. The *Cyperaceae* are left out of the statistical summary because they cannot in our opinion be classed as diploids or polyploids. Eight of the dicotyledonous families, *Caryophyllaceae, Ranunculaceae, Cruciferae, Saxifragaceae, Rosaceae, Ericaceae, Scrophulariaceae,* and *Compositae* are represented separately, and the remaining small families are again pooled.

The total percentage of polyploids in the monocotyledonous flora is 84, when the sexual species only are considered, and 86 with the apomictic ones included. — In the Dicotyledons the polyploidy percentage based on the sexual species is 54; with the apomicts included 62. Hence among the Greenland flowering plants as elsewhere, the percentage of polyploids is higher in the Monocotyledons than in the Dicotyledons.

It is worth noting that the lowest proportion of polyploids is found in the "small" families, i.e. those with but few representatives in Greenland. In the Dicotyledons it amounts to 55, as compared with 65 in the large families pooled together.

A similar survey of the polyploidy percentages of the Scandinavian plants has been made by Á. and D. Löve (1943, 1949).

The table of the distribution of the chromosome numbers in the 11 dominating families of flowering plants in Greenland call for the following comments:

(1) **Gramineae.** The Greenland grasses are characterized by a very high incidence of polyploidy, and by a high proportion of apomictic species. The apomicts, most of which belong to *Calamagrostis, Poa, Deschampsia,* and *Festuca,* are all polyploids and many show odd multiples of the basic number. Aneuploidy is a common phenomenon among them. Microspeciation is present in many of the apomicts, but the swarms of microspecies in the apomictic Greenland grasses have not yet been studied satisfactorily. Among the sexual species a few cases of intraspecific po-

lyploidy is known (*Phleum commutatum, Trisetum spicatum, Hierochloë odorata, Festuca rubra*).

(2) **Cyperaceae.** This family shows no evidence of polyploidy, but displays a long range of chromosome numbers from 2n = 20 to 2n = app. 100. Intraspecific chromosome variation is reported in a few cases, but due to the difficulties of counting many species of this family accurately, they may in part be artefacts. In some cases, however, it is proved beyond doubt, that closely related species, even such not formerly separated, differ — sometimes to a very small degree — in chromosome number. As an example the species pair *Eriophorum angustifolium* (2n = 58) and *E. triste* (2n = 60) can be mentioned, and among the *Carices* the closely related *C. stans* (2n = 76) and *C. aquatilis* (2n = 84) as well as *C. norvegica* (2n = 56) and *C. angarae* (2n = 54) are other examples. The chromosome variation found in the genus *Heleocharis*, especially *H. uniglumis* and *H. palustris*, will undoubtedly lead to a better taxonomical demarcation of the taxa within these collective species.

(3) **Juncaceae.** The species of this family are on a very high polyploidy-level. In *Juncus*, diploids and tetraploids have not been found and may be extinct, and hexaploids are rare. The Greenland *Juncus* species are furthermore characterized by a good many cases of intraspecific polyploidy. In spite of the evident polyploid evolution, the morphological variation within this genus is small. It is of interest to note that even the highest polyploids in *Juncus* have retained their sexual reproduction, in contrast to the grasses, among which the high-polyploids are often apomictic.

(4) **Caryophyllaceae.** Polyploidy in the *Caryophyllaceae* is not associated with apomixis. In the genera *Stellaria* and *Cerastium* the situation seems to be almost the same as in the genus *Juncus*, namely that the different polyploidy steps carry only small morphological differences with them. The picture becomes further complicated because some of the polyplotypes seem to hybridize in nature with a rather high frequency. For these reasons a clear-cut demarcation of the species in the orthodox way is hardly possible (cf. Hultén, 1956, regarding *Cerastium alpinum*).

(5) **Ranunculaceae.** Many of the arctic *Ranunculus* species are diploids. Thus the rare Greenland *R. auricomus* is a diploid and in all probability reproduces sexually in contrast to the polyploid, apomictic biotypes of lower latitudes. It should be noted that the highest polyploid species in Greenland, *R. sulphureus* (12x) has a perfectly regular meiosis and shows no evidence of apomixis.

(6) **Cruciferae.** In this family a rather high proportion of polyploids is found, the highest in the dicotyledonous families, the apomicts excluded. In *Draba*, the microspecies partly differ in degree of polyploidy, and thanks to the cyto-taxonomical work of Ekman and Heilborn, the species demarcation in this genus is much more satisfactory than in *Juncus*. *Arabis Holboellii* is unique in having diploid sexual, and triploid, apomictic biotypes in Greenland.

(7) **Saxifragaceae.** A characteristic pattern in this family is the many different basic numbers found in *Saxifraga*, a pattern which does not run parallel to the taxonomical subdivision of the genus. Clear-cut examples of a better taxonomical

Table 6. The distribution of diploids and polyploids

		2x	3x	4x	5x	6x	7x	8x	9x	10x
MONOCOTYLEDONS										
Gramineae	sexual	8	..	18	..	8	..	11	..	..
	apom.	..	2	3	1	2	1	5	1	1
	total	8	2	21	1	10	1	16	1	1
Juncaceae, all sexual	*Juncus*	..	..	..	..	2	..	3	..	..
	Luzula	..	..	..	..	..	..	5	..	..
	total	..	..	..	..	2	..	8	..	..
Monocotyledons, small families	all sexual	6	..	6	..	4	..	..	..	..
Summary	sexual	14	..	24	..	14	..	19	..	..
	apom.	..	2	3	1	2	1	5	1	1
	total	**14**	**2**	**27**	**1**	**16**	**1**	**24**	**1**	**1**
DICOTYLEDONS										
Caryophyllaceae	sexual	8	..	5	..	2	..	6	..	..
	apom.	..	..	..	..	..	1	..	..	..
	total	8	..	5	..	2	1	6	..	..
Ranunculaceae	sexual	8	..	3	..	..	..	..	..	..
	apom.	..	..	1	..	1	..	..	..	..
	total	8	..	4	..	1	..	..	..	..
Cruciferae *Draba*	all sexual	3	..	2	..	5	..	5	..	2
Cruciferae Other genera	sexual	6	..	4	..	2	..	2	..	1
	apom.	..	1	..	..	..	..	..	..	..
	total	9	1	6	..	7	..	7	..	3
Saxifragaceae	sexual	6	..	7	..	1	..	..	..	1
	apom.	..	..	..	..	..	..	2	..	..
	total	6	..	7	..	1	..	2	..	1
Rosaceae	sexual	3	..	4	..	1	..	4	..	..
	apom.	..	..	1	..	3	..	..	1	..
	total	3	..	5	..	4	..	4	1	..
Ericaceae	all sexual	7	..	7	..	..	..	..	..	..
Scrophulariaceae	all sexual	6	..	3	..	..	..	..	..	..
Compositae	sexual	9	..	3	..	1	..	1	..	..
	apom.	..	7	2	2	1	..	2	..	..
	total	9	7	5	2	2	..	3	..	..
Dicotyledons, small families	sexual	33	..	24	..	5	..	7	..	..
	apom.	..	..	..	..	..	..	..	..	1
	total	33	..	24	..	5	..	7	..	1
Dicotyledons, summary	sexual	89	..	62	..	17	..	25	..	4
	apom.	..	8	4	2	5	1	4	1	1
	total	**89**	**8**	**66**	**2**	**22**	**1**	**29**	**1**	**5**

among Greenland families (*Cyperaceae* excluded).

11x	12x	13x	14x	15x	16x	17x	18x	19x	20x	21x	22x	23x	24x	25x	26x	Total
..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	46
..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	18
..	..	..	2	..	1	..	..	..	..	..	..	..	..	..	..	64
..	1	..	..	..	4	..	..	..	..	..	..	..	1	..	1	12
..	3	..	..	..	1	..	..	..	..	..	..	..	..	..	..	9
..	4	..	..	..	5	..	..	..	..	..	..	..	..	..	..	17
..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17
..	5	..	..	..	6	..	..	..	..	..	..	..	1	..	1	84
..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	18
..	**5**	..	**2**	..	**6**	..	..	..	..	..	..	..	**1**	..	**1**	**102**
..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	23
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	24
..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14
..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	18
..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	35
..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	16
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	18
..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	13
..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	7
..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	20
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	28
..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	71
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	72
..	4	..	3	..	2	..	..	..	..	..	..	..	..	..	..	206
..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	28
..	**5**	..	**3**	**1**	**2**	..	..	..	..	..	..	..	..	..	..	**234**

judgment based on cytological information is represented by *Saxifraga nivalis* — *S. tenuis*, and by *S. rivularis* — *S. hyperborea*, often considered varieties, but fully worthy of specific rank, due to the different chromosome numbers. Two of the *Saxifraga* species propagate exclusively by means of bulbils. They are both highly polyploid and include aneuploid types.

(8) **Rosaceae.** This family contains two apomictic genera, viz. *Potentilla* and *Alchemilla*. All the apomicts are polyploids and some have chromosome numbers which are odd multiples of the basic number. The sexual species likewise show a high incidence of polyploidy, and there is full agreement between the cytological data and the species concept, with the exception of *Potentilla palustris*.

(9) **Ericaceae.** It is interesting to note that the cytological evolution in this and the following family in Greenland has not proceeded beyond the tetraploid level. Several species of this family are represented by diploids in the Arctic, against tetraploids in more southern regions. Of the large families in Greenland this is the only one which does not show intraspecific polyploidy.

(10) **Scrophulariaceae.** The only copiously represented genus in Greenland which comprises diploid species only is *Pedicularis*. The family contains two genera, *Euphrasia* and *Rhinanthus*, which include a number of sexual microspecies. The Greenland ones have not yet been analyzed taxonomically.

(11) **Compositae.** Apomictic species are found in 5 genera: *Erigeron, Antennaria, Arnica, Taraxacum,* and *Hieracium*. In *Taraxacum*, a diploid sexual species has been found in the northernmost part of Greenland (Holmen, 1952). All the apomicts with the exception of *Erigeron compositum* are strict polyploids and several show odd multiples of the basic number. In *Antennaria* intraspecific polyploidy occurs, and the same holds true to some extent in *Taraxacum*. Further studies are needed to sort out all the taxa in the two genera. Also *Erigeron compositum* may perhaps be divided into several microspecies, partly differing in polyploidy. It appears from Table 6 that the sexual *Compositae* are preferably diploids (9, against 5 polyploids).

Acknowledgements.

During the course of this investigation many scientists and institutions have offered us valuable help in various ways.

We are greatly indebted to Jul. Grøntved, M. Sc., for having made most of the slides of the East Greenland material, and to Sai Chiu Van, M. Sc., for having similarly handled the West Greenland fixations.

Our Scandinavian colleagues K. Flovik, Ph. D., Tromsö; K. Horn, M. Sc., Oslo; A. Levan, Ph. D., Lund, and Professor J. A. Nannfeldt, Ph. D., Uppsala, have kindly placed herbarium material and slides at our disposal and provided us with much appreciated advice on special problems.

Our Danish colleagues Professor T. W. Böcher, Ph. D.; O. Hagerup, Ph. D.; L. Harmsen, M. Sc.; K. Holmen, M. Sc., and K. Jakobsen, M. Sc., have kindly permitted us to use some of their collections and fixations and to quote some of their unpublished data, for which we owe them high gratitude.

To the leader of the "Danish Three Years Expedition" to East Greenland, Lauge Koch, Ph. D., to the leader of the Danish Peary Land Expedition, Count Eigil Knuth, to Professor A. Rosenkrantz, Ph. D., of the Greenland Geological Survey, and to the former Director of the Danish Arctic Station, Disko, P. Gelting, Ph. D., in whose expeditions we have had the privilige to participate or who have provided us with travelling or housing facilities, we take this opportunity to express our sincerest and most grateful thanks. The Royal Danish Navy and the Ministry of Greenland have rendered us valuable assistance. We address our gratitude to Admiral A. H. Vedel, Ph. D. *h.c.*, and to Secretary of State, Mr. Eske Brun.

The Carlsberg Foundation has granted us generous financial support to cover the expenses for travelling and laboratory work. It is our pleasant duty to thank the Trustees of the Foundation.

Literature.

AFZELIUS, K. 1924. Embryologische und zytologische Studien in Senecio und verwandten Gattungen. Acta Horti Bergiani 8, 123.

ÅKERBERG, E. 1942. Cytogenetic studies in Poa pratensis and its hybrid with Poa alpina. Hereditas 28, 1.

ANDERSSON, N. J. 1852. Skandinaviens Gramineer. Stockholm.

ANDERSSON, G., och HESSELMAN, H. 1900. Bidrag till Kännedomen om Spitsbergens och Beeren Islands Kärlväxtflora. Kungl. Svenska Vet. Akad. Handl. Biol. Skr. 26, Afd. III No. 1.

ANDRES, H. 1923. Studien zur speziellen Systematik der Pirolaceae. IV. Revision der Gattung Ramischia Opiz. Fedde Rep. sp. nov. 19, 209.

ARWIDSSON, TH. 1938. Einige neue Gesichtspunkte zu den Chromosomenzahlenbestimmungen. Svensk bot. Tidskr. 32, 191.

— 1943. Studien über die Gefässpflanzen in den Hochgebirgen der Pite Lappmark. Acta Phytogeogr. Suecica, 17.

ASPLUND, E. 1918. Beiträge zur Kenntnis der Flora des Eisfjordgebietes. Arkiv för Botanik 15, No. 14.

AVDULOV, N. P. 1931. Karyo-systematische Untersuchungen der Gramineen. Bull. Appl. Bot., Genet. Plant Breeding 44, 1.

BALDWIN, J. T. jr. 1939. Chromosomes of the Diapensiaceae. Journ. Heredity 30, 169.

BANACH, E. 1950. Studies in the karyological differentiation of Cardamine pratensis L. in connection with ecology. Bull. de l'Acad. Polonaise des Sc. et des Lettr., Cl. Sc. Math. et Nat. Sér. B. (1), 197.

BERGMAN, B. 1935. Zur Kenntnis der Zytologie der skandinavischen Antennaria-Arten. Hereditas 20, 214.

BJÖRKMAN, S. O. 1951. Chromosome studies in Agrostis. Hereditas 37, 465.

— 1954. Chromosome studies in Agrostis II. Hereditas 40, 254.

BLACKBURN, K. B. 1924. The cytological aspects of the determination of sex in the dioecious forms of Lychnis. The British Journ. Exp. Biology 1, 413.

— 1929. On the occurrence of sex chromosomes in flowering plants with some suggestions as to their origin. Proc. Intern. Congr. Plant Sci. I, 299.

BLYTT, A. 1906. Haandbog i Norges Flora. Kristiania.

BÖCHER, T. W. 1933. Phytogeographical studies of the Greenland Flora. Medd. Grønl. 104, No. 3.

— 1936. Cytological studies on Campanula rotundifolia. Hereditas 22, 269.

— 1938a. Cytological studies in the genus Ranunculus. Dansk Bot. Arkiv 9, No. 4.

— 1938b. Biological distributional types in the flora of Greenland. Medd. Grønl. 106, No. 2.

— 1938c. Zur Zytologie einiger arktischen und borealen Blütenpflanzen. Svensk bot. Tidskr. 32, 346.

Böcher, T. W. 1941. On the origin of Saxifraga Nathorsti (Dusén) v. Hayek. Medd. Grønl. 131, No. 2.
— 1947. Cytological studies of Arabis Holboellii Hornem. Hereditas 33, 573.
— 1950. Contributions to the flora and plant geography of West Greenland II. Medd. Grønl. 147, No. 7.
— 1951a. Studies on the distribution of the units within the collective species of Stellaria longipes. Bot. Tidsskr. 48, 401.
— 1951b. Cytological and embryological studies in the amphi-apomictic Arabis Holboellii complex. Biol. Skr. Dan. Vid. Selsk. 6, No. 7.
— 1952a. Contributions to the flora and plant geography of West Greenland III. Medd. Grønl. 147, No. 9.
— 1952b. A Study of the circumpolar Carex Heleonastes-amblyorhyncha complex. Acta Arctica 5, København.
— 1954. Experimental taxonomical studies in the Arabis Holboellii complex. Svensk bot. Tidskr. 48, 31.
Böcher, T. W. and Larsen, K. 1950. Chromosome numbers of some arctic or boreal flowering plants. Medd. Grønl. 1947, No. 6.
Boivin, B. 1948. Centurie de plantes Canadiennes. Naturaliste Canadien 75, 202.
— 1951. Centurie de plantes Canadiennes II. Canadian Field-Naturalist 65, 1.
Brett, O. E. 1950. Chromosome numbers of Cerastium species. Nature 166, 446.
— 1951. Chromosome numbers of Cerastium species. Nature 168, 793.
— 1953. Cerastium arcticum Lange. Nature 171, 527
— 1954. Cerastium arcticum Lge. Nature, 173, 89.
— 1955. Cyto-taxonomy of the genus Cerastium I. Cytology. New Phytol. 54, 138.
Britton, N. L. and Brown, A. 1947. An illustrated flora of the Northern United States, Canada and the British Possessions. Ed. II. New York.
Britton, N. L. and Rydberg, P. A. 1901. Contributions to the Botany of the Yukon Territory 4. An enumeration of the flowering plants collected by R. S. Williams and J. B. Tarleton. Bull. New York Bot. Gard. 2, 149.
Brown, R. 1823. Chloris Melvilliana. A list of plants collected in Melville Island in the year 1820 by the officers of the voyage of discovery under the orders of Captain Parry. London.
Bruun, H. G. 1930. The cytology of the genus Primula. Svensk bot. Tidskr. 24, 468.
— 1932. Cytological studies in Primula. Symbol. Bot. Upsal. 1.
Buchenau, F. und Focke, W. O. 1874. Gefässpflanzen. Die zweite Deutsche Nordpolarfahrt in den Jahren 1869—1870. Wissenschaftliche Ergebnisse. Leipzig.
Butters, F. K. 1944. The American variety of Saxifraga Aizoon. Rhodora 46, 61.
Cajander, A. 1935. Über die fennoskandischen Formen der Kollektivart Carex polygama Schkuhr. Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo 5, No. 5.
Callan, H. G. 1941. The cytology of Gaulthettya wisleyensis (Marchant) Rehder. A new mode of species formation. Annals of Botany N. S. 5, 579.
Callen, E. O. 1952. Studies in the genus Euphrasia L. III. Euphrasia arctica Lange. Rhodora 54, 145.
Camp, W. H. 1944. A preliminary consideration of the biosystematy of Oxycoccus. Bull. Torr. Bot. Club 71, 426.
Camp, W. H. and Gilly, C. L. 1943. The structure and origin of species. Brittonia 4, 323.
Castro, D. and Fontes, F. 1946. Primeiro contacto citológico com a flora halófila dos salgados de Sacavém. Brotéria 15, 38.
Chiarugi, A. D. 1927. L' evoluzione delle cellule del tappeto e la formazione del periplasmodia in alcune Asteraceae. Nuovo Giorn. Bot. Italiano N. S. 34, 783.
— 1934. Sulla ecologia della Saxifraga cernua L. al limite meridionale dell'area geografica. Nuovo Giorn. Bot. Italiano N. S. 40, 572.

CHRISTIANSEN, M. P. 1942. The Taraxacum-Flora of Iceland. The Botany of Iceland, 3,3, 229 Copenhagen and London.

CHURCH, G. L. 1949. A cytotaxonomic study of Glyceria and Puccinellia. Am. Journ. Bot. 36, 155.

CLAPHAM, A. R., TUTIN, T. G. and WARBURG, E. T. 1952. Flora of the British Isles. Cambridge.

CLAUSEN, J. 1931. Viola canina L., a cytologically irregular species. Hereditas 15, 67.

— 1951. Stages in the evolution of plant species. Ithaca, New York.

CLAUSEN, J., KECK, D. D. and HIESEY, W. M. 1940. Experimental studies on the nature of species I. Carnegie Inst. of Wash. Publ. 520.

CLAUSEN, J., KECK, D. D. and HIESEY, W. M. 1945. Experimental studies on the nature of species II. Carnegie Inst. Wash. Publ. 564.

CLAUSEN,, KECK, D. D. and HIESEY, W. M. 1946. Experimental taxonomy. Ann. Rept. Carnegie Inst. Washington, Div. of Plant Biology 45, 111.

CLAUSEN, R. T. and UHL, C. H. 1944. The taxonomy and cytology of the subgenus Gormania of Sedum. Madroño 7, 161.

COVILLE, F. V. 1901. Harrimanella, a new genus of heathers. Proc. Wash. Nat. Acad. Sci. 3, 569.

CRANE, M. B. and GAIRDNER, A. E. 1923. Species crosses in Cochlearia, with a preliminary account of their cytology. Journ. Gen. 13, 187.

CRONQUIST, A. 1947. Revision of the North American species of Erigeron north of Mexico. Brittonia 6, 121.

DAHL, E. 1937. On the vascular plants of Eastern Svalbard. Skr. om Svalbard og Ishavet 75.

DAHLGREN, K. V. OSSIAN 1916. Zytologische und embryologische Studien über die Reihen Primulales und Plumbaginales. Kungl. Svenska Vet. Akad. Handl. 56, No. 4.

DAHLSTEDT, H. 1905. Studier öfver arktiska Taraxaca. Arkiv för Botanik 4, No. 8.

— 1906. Arktiska och alpina arter inom formgruppen Taraxacum ceratophorum (Led.) DC. Arkiv för Botanik 5, no. 9.

— 1912. Nordsvenska Taraxaca. Arkiv för Botanik 12, No. 2.

— 1921—1930. De svenska arterna av släktet Taraxacum I—VIII. I—II: Acta Florae Sueciae I (1921). III—VII: Kungl. Svenska Vet. Akad. Handl. Ser. 3, 6, No. 3 (1928). VIII: ibid. Ser. 3, 9, No. 2 (1930).

— 1926. Taraxaca from Kamtchatka chiefly collected by E. Hultén in the years 1920—22. Arkiv för Botanik 20 A, No. 1.

DANSEREAU, P. and STEINER, E. E. 1956. Studies in Potentillae of high latitudes and altitudes II. Central Baffin Island Populations. Bull. Torrey Bot. Club. 83, 113.

DARLINGTON, C. D. and WYLIE, A. P. 1955. Chromosome Atlas of Flowering Plants. London.

DARROW, G. M., CAMP, W. H., FISCHER, H. S., and DERMEN, H. 1944. Chromosome numbers in Vaccinium and related groups. Bull. Torrey Bot. Club 71, 498.

DAVIES, E. W. 1953. Notes on Carex flava and its allies IV. Geographic Distribution. Watsonia 3, 80.

— 1955. The cytogenetics of Carex flava and its allies. Watsonia 3, 129.

DERMEN, H. 1932. Cytological studies on Cornus. Journ. Arnold Arb. 13, 410.

DEVOLD, J. and SCHOLANDER, P. F. 1933. Flowering Plants and Ferns of Southeast Greenland. Skr. Svalbard og Ishavet, Oslo 56.

DE WET, J. M. J. 1954. The genus Danthonia in grass phylogeny. Am. Journ. Bot. 41, 204.

DOULAT, E. 1946. Observations caryologiques sur le Bartsia alpina L. C. R. Acad. Sci. Paris 222, 1510.

— 1947. Recherches caryologiques sur quelques Pinguicula. C. R. Acad. Sci. Paris 225, 354.

DREW, W. B. 1936. The North American representatives of Ranunculus, § Batrachium. Rhodora 38, 1.

DUSÉN, P. 1901 a. Zur Kenntnis der Gefässpflanzen Ostgrönlands. Kungl. Svenska Vet. Akad. Handl. 27, Afd. III, No. 3.

Dusén, P. 1901 b. Några viktigare växtfynd från nordöstra Grönland. Bot. Notiser 1901, 73.
Edman, G. 1929. Zur Entwicklungsgeschichte der Gattung Oxyria Hill, nebst zytologischen, embryologischen und systematischen Bemerkungen über einige andere Polygonaceen. Acta Horti Bergiani 9, 165.
Ehrenberg, L. 1945. Kromosomtalen hos några kärlväxter. Bot. Notiser 1945, 430.
Ekman, E. 1927. Notes on some Greenland Antennariae. Svensk Bot. Tidskr. 21, 47.
— 1929. Studies in the genus Draba I. Svensk bot. Tidskr. 23, 476.
— 1930. Studies in the genus Draba II. Contributions to the Draba flora of Greenland. Svensk bot. Tidskr. 23, 483.
— 1931. Contributions to the Draba flora of Greenland III. Svensk bot. Tidskr. 25, 465.
— 1932. Contributions to the Draba flora of Greenland IV. Svensk bot. Tidskr. 26, 432.
— 1933 a. Contributions to the Draba flora of Greenland V. Svensk bot. Tidskr. 27, 97.
— 1933 b. Contributions to the Draba flora of Greenland VI. Svensk bot. Tidskr. 27, 339.
— 1934. Contributions to the Draba flora of Greenland VII. Svensk bot. Tidskr. 28, 66.
— 1935. Contributions to the Draba flora of Greenland VIII. Svensk bot. Tidskr. 29, 348.
— 1941. Notes on the genus Draba. Svensk bot. Tidskr. 35, 133.
Engler, A. et Irmscher, I. 1916—19. Saxifragaceae — Saxifraga. Pflanzenreich IV, 117.
Erlandsson, S. 1938. The chromosome numbers of three Artemisia forms. Hereditas 25, 27.
— 1939. The chromosome numbers of some Taraxacum species. Bot. Notiser 1939, 261.
— 1942. Cytological studies in Potentilla anserina L. and closely allied Scandinavian species. Hereditas 28, 503.
Fabergé, A. C. 1942. Generics of the Scapiflora section of Papaver I. Journ. Gen. 44, 169.
— 1944. Genetics of the Scapiflora section of Papaver. III. Interspecific hybrids and genetic homology. Journ. Gen. 46, 125.
Fagerlind, F. 1934. Beiträge zur Kenntnis der Zytologie der Rubiaceen. Hereditas 19, 223.
— 1936. Die Chromosomenzahl von Alectorolophus und Saison-Dimorphismus. Hereditas 22, 189.
— 1937. Embryologische, zytologische und bestäubungs-eksperimentelle Studien in der Familie Rubiaceae nebst Bemerkungen über einige Polyploiditätsprobleme. Acta Horti Bergiani 11, No. 9, 195.
Fassett, N. T. 1951. Callitriche in the New World. Rhodora 53, 137.
Favarger, C. 1946. Recherches caryologiques sur la sous-famille des Silénoïdées. Bull. Soc. Bot. Suisse 56, 364.
— 1949. Contribution à l'étude caryologique et biologique des Gentianacées. Bull. Soc. Bot. Suisse 59, 62.
— 1952. Contributions à l'étude caryologique et biologique des Gentianacées. II. Bull. Soc. Bot. Suisse 62, 244.
— 1953. Notes de caryologie alpine II. Bull. Soc. Neuchâteloise des Sc. Nat. 76, 133.
Favarger, C. et Söllner, R. 1949. Nombres chromosomiques et structure du noyau de quelques Cerastium des Alpes. Bull. Soc. Bot. Suisse 59, 87.
Fernald, M. L. 1906. Two variations of Carex glareosa. Rhodora 8, 45.
— 1914. Some Antennarias of northeastern America. Rhodora 16, 129.
— 1918. American variations of Epilobium, section Chamaenerion. Rhodora 20, 1.
— 1919 a. Two new Myriophyllums and a species new to the United States. Rhodora 21, 120.
— 1919 b. Lomatogonium, the correct name for Pleurogyne. Rhodora 21, 193.
— 1924. Juncus triglumis and its American representative. Rhodora 26, 201.
— 1925 a. Persistence of plants in unglaciated areas of boreal America. Mem. Amer. Acad. Arts and Sci. 15, No. 3.
— 1925 b. The maritime plaintains of North America. Rhodora 27, 95.
— 1925 c. Erysium Pallasii (Pursh) nov. comb. Rhodora 27, 171.
— 1926. Two summers of botanizing in New Foundland. Rhodora 28, 174.

FERNALD, M. L. 1928. Primula § Farinosae in America. Rhodora 30, 98.
— 1929. Some relationships of the Flora of the Northern Hemisphere. Proc. Internat. Cong. Plant Sci. 2, 1484.
— 1930. The identity of Alopecurus aequalis. Rhodora 32, 221.
— 1931. Three Antennarias from Greenland. Rhodora 33, 222.
— 1932. Some genera and species of Rafinesque. Rhodora 34, 21.
— 1933. Recent discoveries in the New Foundland Flora. Rhodora 35.
— 1934a. Some critical plants of Greenland. Rhodora 36, 89.
— 1934b. Draba in temperate Northeastern America. Rhodora 36. 241.
— 1942. Critical notes on Carex. Rhodora 44, 281.
— 1943. Two later homonyms. Potentilla hyparctica Malte, var. elatior (Abromeit) comb. nov. Rhodora 45, 111.
— 1945. Notes on eastern American Luzula. Rhodora 47, 265.
— 1946. Identifications and reidentifications of North American plants. Rhodora 48, 137.
— 1950. Gray's Manual of Botany. Eighth ed. New York.
FERNALD, M. L. and BRACKETT, A. E. 1929. The representatives of Eleocharis palustris in North America. Rhodora 31, 57.
FERNALD, M. L. and WEATHERBY, C. A. 1916. The genus Puccinellia in eastern North America. Rhodora, 18, 1.
FLODERUS, B. 1923. Om Grønlands Salices. Medd. Grønl. 63, 65.
FLORAE DANICAE ICONUM 1761—1883. fasc. 1—51, suppl. fasc. 1—3 (1953—1874). Hauniae.
FLOVIK, K. 1936. The somatic chromosomes of certain arctic species of the genus Ranunculus. Soc. Sci. Fennica, Comm. Biol. 5, No. 7, 1.
— 1938. Cytological studies of arctic grasses. Hereditas 24, 265.
— 1940. Chromosome numbers and polyploidy within the flora of Spitsbergen. Hereditas 26, 430.
— 1942. The Chromosome numbers of some species of Carex and Eriophorum. Nytt Magasin for Naturvidensk., Oslo, 83, 77.
FRIES, TH. M. 1858. Iakttagelser rörande några arktiska växter. Bot. Notiser 1858, 189.
GARTNER, H. 1939. Zur systematischen Anordnung einiger Arten der Gattung Cerastium. Fedde Rep. sp. nov. Beih. 113.
GELERT, O. 1898. Notes on arctic plants. Bot. Tidsskr. 21, 287.
GELTING, P. 1934. Studies on the vascular plants of East Greenland between Franz Joseph Fjord and Dove Bay. Medd. Grønl. 101, No. 2.
— 1941. Über pleistozäne Pflanzenrefugien in Grönland. Mitt. Naturforsch. Ges. Schaffhausen 17, 74.
GERSHOY, A. 1928. Studies in North American Violets. I. General considerations. Bull. Vermont Agric. Exp. Sta. 279.
— 1932. Descriptive notes for Viola exhibit. The Nominium and Chamaemelanium Sections. Sixth Internat. Congr. Genet. Ithaca, N. Y., The Lane Press, Burlington, Vt.
— 1934. Studies in North American Violets. III. Chromosome numbers and species characters. Bull. Vermont Agric. Exp. Sta. 367.
GLEASON, H. A. 1952. Illustrated Flora of the Northeastern United States and adjacent Canada. I—III. Lancaster Penna.
GREENE, E. L. 1898. Some northern species of Antennaria. Pittonia 3, 273.
GREGOR, J. W. 1939. Experimental Taxonomy IV. Population differentiation in North American and European sea plantains allied to Plantago maritima L. New Phytol. 38, 293.
GREGORY, W. C. 1941. Phylogenetic and cytological studies in the Ranunculaceae. Trans. Amer. Phil. Soc. N. S. 31, 520.
GRIESINGER, R. 1937. Über hypo- und hyperdiploide Formen von Petunia, Hyoscyamus, Mamium und einige andere Chromosomenzählungen. Ber. Deutsch. Bot. Ges. 55, 556.

Grøntved, J. 1931. Chrysosplenium alternifolium fundet i Grønland. Bot. Tidsskr. 41, 440.
— 1942. The Pteridophyta and Spermatophyta of Iceland. The Botany of Iceland 4, 1. Copenhagen—London.
— 1937. Additions to the Flora of South West Greenland. Bot. Tidsskr. 44, 251.
— 1946. Agropyrum junceum (L.) Beauv. × Elymus arenarius L. Bot. Tidsskr. 46, 407.
— Galium boreale L., new to Greenland. Bot. Tidsskr. 51, 98.
Guinochet, M. 1942. Recherches de taxonomie expérimentale sur la flora des Alpes et de la Région méditerranéenne occidentale. II. Sur quelques formes du Campanula rotundifolia L. sens lat. Bull. Soc. Bot. France 89, 70 and 153.
— 1946. Sur l'existence, dans le Jura central, de races écologiques aneuploïdes et polyploïdes chez Cardamine pratensis L. C. R. Acad. Sc. Paris 222, 1131.
Gustafsson, Å. 1946—1947. Apomixis in Higher Plants I—III. Kungl. Fysiogr. Sällsk. Handl. N. F. 57 No. 3, 58 No. 2, 58 No. 12.
— 1948. Polyploidy, life-form and vegetative reproduction. Hereditas 34, 1.
Hadač, E. 1944. Die Gefässpflanzen des "Sassengebietes" Vestspitsbergen. Norges Svalbard- og Ishavsundersøkelser Skr. 87.
Häfliger, E. 1943. Zytologisch-embryologische Untersuchungen pseudogamer Ranunkeln der Auricomus-Gruppe. Ber. Schweiz. Bot. Ges. 53, 317.
Hagerup, O. 1926. Kønsdelenes Bygning og Udvikling hos Koenigia islandica L. Medd. Grønl. 58, 197.
— Empetrum hermaphroditum (Lge.) Hagerup. Dansk bot. Arkiv 5, No. 2.
— 1928. Morphological and cytological studies of Bicornes. Dansk bot. Arkiv 6, No. 1.
— 1932. Über Polyploidie in Beziehung zu Klima, Ökologie und Phylogenie. Chromosomenzahlen aus Timbuktu. Hereditas 16, 19.
— 1933. Studies on polyploid ecotypes in Vaccinium uliginosum L. Hereditas 18, 122.
— 1938. Studies on the significanse of polyploidy II. Orchis. Hereditas 24, 258.
— 1939. Studies on the significance of polyploidy III. Deschampsia and Aira. Hereditas 25, 185.
— 1940. Studies on the significance of polyploidy IV. Oxycoccus. Hereditas 26, 399.
— 1941a. Nordiske Kromosomtal I. Bot. Tidsskr. 45, 385.
— 1941b. Zytoökologische Bicornes-Studien. Planta 32, 6.
— 1944. Notes on some boreal polyploids. Hereditas 30, 152.
Haglund, G. E. 1943. Taracacum in Arctic Canada (east of 100° W.). Rhodora 45, 337.
— 1948. Further contributions to the knowledge of the Taraxacum flora of Alaska and Yukon. Svensk bot. Tidskr. 42, 297.
Hagström, J. O. 1916. Critical researches on the potamogetons. Kungl. Svenska Vet. Akad. Hand. 55, No. 5.
Håkansson, A. 1928. Die Chromosomen einiger Scirpoideen. Hereditas 10, 277.
— 1929. Über verschiedene Chromosomenzahlen in Scirpus palustris L. Hereditas 13, 53.
— 1946. Untersuchungen über die Embryologie einiger Potentilla-formen. Lunds. Univ. Årsskr. N. F. Avd. 2, Bd. 42, Nr. 5.
Hancock, B. L. 1942. Cytological and ecological notes on some species of Galium L. em. Scop. New Phytol. 41, 70.
Harling, G. 1945. Die Chromosomenzahlen einiger Carex-Arten. Bot. Notiser 1945, 114.
Harmsen, L. 1939. Studies on the embryology and cytology of Saxifraga. Medd. Grønl. 125, No. 4.
— 1943. Studies on the cytology of arctic plants III. Habenaria. Medd. Grønl. 131, No. 10.
Hartmann, F. X. 1767. Primarum linearum institutionum botanicarum clarissimi viri Crantzii. Ed. II. Lipsiae.
Hartung, M. E. 1946. Chromosome numbers in Poa, Agropyron and Elymus. Amer. Journ. Bot. 33, 516.

Hartz, N. 1895. Fanerogamer og Karkryptogamer fra Nordøstgrønland ca. 75°—70° N. Br. og Angmagssalik o. 65°40′ N. Br. Medd. Grønl. 18, 315.

Hartz, N. and Kruuse, C. 1911. The vegetation of Northeast Greenland 69°25′ lat. n.—75° lat. n. Medd. Grønl. 30, 335.

Haskell, G. 1952. Polyploidy, ecology and the British flora. Journ. Ecol. 40, 265.

Hayek, A. von 1905. Monographische Studien über die Gattung Saxifraga I. Denkschr. Kaiserl. Akad. Wiss. Mat. nat. Kl. 77, 661.

Hegi, G. 1906—1931. Illustrierte Flora von Mitteleuropa I—VII. München.

Heilborn, O. 1924. Chromosome numbers and dimensions, species-formation and phylogeny in the genus Carex. Hereditas 5, 129.

— 1927. Chromosome numbers in Draba. Hereditas 9, 59.

— 1928. Chromosome studies in Cyperaceae. Hereditas 11, 182.

— 1939. Chromosome studies in Cyperaceae III—IV. Hereditas 25, 224.

— 1941. Some chromosome numbers in Draba. Svensk bot. Tidskr. 35, 141.

Heiser, Ch. B. jr. and Whitaker, T. W. 1947. Chromosome number and growth habit in Californian weeds. Amer. Journ. Bot. 34, 584.

Heslop-Harrison, J. 1953. New concepts in flowering-plant taxonomy. London.

Hicks, G. C. 1929. Cytological studies in Cyperus, Eleocharis, Dulichium and Eriophorum. Bot. Gazette 88, 132.

Hiitonen, I. 1933. Suomen Kasvio. Helsinki.

Hitchcock, A. S. 1934. New species and changes in nomenclature of grasses of the United States. Am. Journ. Bot. 21, 127.

— 1950. Manual of the Grasses of the United States. 2nd ed. revised by Agnes Chase. U. S. Dept. Agric. Misc. Publ. No. 200.

Hjelt, H. 1888—1926. Conspectus florae fennicae I—VII. Helsingforsiae.

Holm, Th. 1907. New plants from arctic North America. Fedde Rep. sp. nov. 3, 337.

Holmberg, O. R. 1926. Skandinaviens Flora 2. Pteridophyta, Gramineae. Stockholm.

— 1931. Skandinaviens Flora, I b, 1. Salicales. Stockholm.

Holmen, K. 1952. Cytological studies in the flora of Peary Land, North Greenland. Medd. Grønl. 128, No. 5.

— 1957. The vascular plants of Peary Land, North Greenland. Medd. Grønland, 124, No. 9.

Holmen, K. and Mathiesen, H. 1953. Luzula Wahlenbergii in Greenland. Bot. Tidsskr. 49, 233.

Holmgren, J. 1919. Zytologische Studien über die Fortpflanzung bei den Gattungen Erigeron und Eupatorium. Kungl. Svenska Vet. Akad. Handl. 59, No. 7.

Hooker, W. J. 1833—1840. Flora Boreali-Americana I—II. London.

Horn, K. 1938. Chromosome numbers in Scandinavian Papaver species. Afh. Norske Vid. Akad. Oslo I, No. 5.

Howard, H. W. 1947. Chromosome numbers of British species of the genus Roripa Scop. Nature 159, 66.

— 1948. Chromosome number of Cardamine pratensis. Nature 161, 277.

Hultén, E. 1927—1928—1929—1930. Flora of Kamtchatka and the adjacent islands. I—IV. Kungl. Svenska Vet. Akad. Handl. Ser. 3. 5, No. 1—2; 8, No. 1—2.

— 1937a. Flora of the Aleutian Islands. Stockholm 1937.

— 1937b. Outline of the history of arctic and boreal biota during the Quaternary period. Stockholm.

— 1941—1942—1943—1944—1945—1946—1947—1948—1949—1950. Flora of Alaska and Yukon I—X. Kungl. Fysiogr. Sällska. Handl. 52 No. 1, 53 No. 1, 54 No. 1, 55 No. 1, 56 No. 1, 57 No. 1, 58 No. 1, 59 No. 1, 60 No. 1, 61 No. 1.

— 1943a. Stellaria longipes Goldie and its allies. Bot. Notiser 1943, 251.

— 1945a. Studies in the Potentilla nivea group. Bot. Notiser 1945, 127.

Hultén, E. 1949a. On the races in the Scandinavian flora. Svensk bot. Tidskr. 43, 383.
— 1956. The Cerastium alpinum complex, a case of world-wide introgressive hybridization. Svensk bot. Tidskr. 50, 411.
Humphrey, L. M. 1934. The somatic chromosomes of the Cypripedium hirsutum and six species of the genus Habenaria. Amer. Nat. 68, 184.
Hüser, W. 1930. Untersuchungen über die Anatomie und Wasserökologie einiger Ostseepflanzen. Planta 11, 485.
Hussein, F. 1948. Chromosome number of Cardamine pratensis. Nature 161, 1015.
— 1955. Chromosome races in Cardamine pratensis in the British Isles. Watsonia 3, 170.
Hylander, N. 1941. Förteckning över Skandinaviens Växter. I. Kärlväxter. Lund, Sweden.
— 1945. Nomenklatorische und systematische Studien über nordische Gefässpflanzen. Uppsala Univ. Årsskr. 7, 1945.
— 1953. Nordisk Kärlväxtflora I. Uppsala.
Iversen, J. 1938. Et botanisk Vidne om Nordboernes Vinlandsrejser. Naturhist. Tidende, København, 2, 113.
— 1940. Dimorphie und Monomorphie bei Armeria. Biol. Medd. Dan. Vid. Selsk. 15, No. 8.
Jalas, J. 1947. Zur Systematik und Verbreitung der fennoskandischen Formen der Kollektivart Thymus Serpyllum L. em. Fr. Acta Botanica Fennica 39, 1.
— 1948. Chromosome studies in Thymus. I. Somatic chromosome numbers with special reference to the Fennoscandian forms. Hereditas 34, 414.
Jaretzky, R. 1928. Untersuchungen über Chromosomen und Phylogenie bei einigen Cruciferen. Pringsheim Jahrb. Wiss. Bot. 68, 1.
— 1932. Beziehungen zwischen Chromosomenzahl und Systematik bei der Cruciferen. Pringsheim Jahrb. Wiss. Bot. 76, 485.
Johnson, H. 1941. Cytological studies in the genus Alopecurus. Kungl. Fysiogr. Sällsk. Handl. N. F. 52, 1.
Jones, G. N. 1939. A Synopsis of the North American species of Sorbus. Journ. Arnold. Arboret. 20, 1.
Jones, K. 1952. Autotetraploidy in Agrostis canina. Nature 169, 159.
— 1956. Species differentiation in Agrostis. I—III. Journ. Gen. 54, 370.
Jørgensen, C. A. 1923. Studies on the Callitrichaceae. Bot. Tidsskr. 38, 81.
Juhl, H. 1953. An-euploidie und Systematik bei Agrostis stolonifera L. und Festuca rubra L. aus Schleswig-Holstein. Ber. Deutsch. Bot. Ges. 65, 331.
Kalela, A. 1944. Systematische und pflanzengeographische Studien an der Carex-subsektion Alpinae Kalela. Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo 19, 1.
Knaben, G. 1950. Chromosome numbers of Scandinavian arctic-alpine plant species. I. Blyttia 8, 129.
Komarov, V. L. 1934—1955. Flora U.R.S.S. I—XXII. Leningrad.
Kruuse, C. 1905. List of the phanerogams and vascular cryptogams found on the coast 75°—66°20′ lat. N. of East Greenland. Medd. Grønl. 30, 143.
— 1906. List of phanerogams and vascular cryptogams found in the Angmagssalik District. Medd. Grønl. 30, 209.
Kükenthal, G. 1909. Cyperaceae—Caricoideae. Das Pflanzenreich IV, 20, Leipzig.
Kunth, C. S. 1833. Agrostographia synoptica sive enumeratio graminearum omnium hucusque cognitarum. Tom. I. Stuttgardiae et Tubingae.
Lange, J. 1880 (cit. Lange I). Conspectus Florae Groenlandicae. Medd. Grønl. 3.
— 1887 (cit. Lange II). Conspectus Florae Groenlandicae II. Medd. Grønl. 3, XXXVII—L, 233—308.
— 1887. Nomenclator "Florae Danicae". Hauniae, Lipsiae.
— 1892 (cit. Lange III). L. K. Rosenvinge: Andet Tillæg til Grønlands Fanerogamer og Karsporeplanter. Medd. Grønl. 3, 647—749.

LANGLET, O. 1927. Beiträge zur Zytologie der Ranunculazeen. Svensk bot. Tidskr. 21, 1.
— 1932. Über Chromosomenverhältnisse und Systematik der Ranunculaceae. Svensk bot. Tidskr. 26, 381.
LARSEN, K. 1954. Chromosome numbers of some European flowering plants. Bot. Tidsskr. 50, 163.
LARTER, L. N. H. 1932. Chromosome variation and behaviour in Ranunculus L. Journ. Gen. 26, 255.
LAWRENCE, W. E. 1945. Some ecotypic relations of Deschampsia caespitosa. Amer. Journ. Bot. 32, 298.
— 1947. Chromosome numbers in Achillea in relation to geographic distribution. Amer. Journ. Bot. 34, 538.
LEDEBOUR, C. F. 1853. Flora Rossica IV. Stuttgart.
LEHMANN, E. 1941. Polyploidie und Verbreitung der Arten der Gattung Veronica. Pringsheim Jahrb. wiss. Bot. 89, 461.
LEVAN, A. 1933. Über das Geschlechtschromosom in Sedum Rhodiola DC. Bot. Notiser 1933, 195.
LEWITSKY, G. A. 1940. The karyotypes of some pairs of related forms of plants. Journ. bot. de l'U.R.S.S. 25, 295.
LID, J. 1952. Norsk Flora (2nd ed.) Oslo.
LILJEFORS, A. 1934. Über normale und apospore Embryosackentwicklung in der Gattung Sorbus, nebst einigen Bemerkungen über die Chromosomenzahlen. Svensk bot. Tidskr. 28, 290.
LINDBERG, H. 1902. Die nordeuropäischen Formen von Scirpus (Heleocharis) paluster L. Acta Soc. pro Fauna et Flora Fennica 23, No. 7.
LINDMAN, C. A. M. 1926. Svensk Fanerogamflora (2nd ed.) Stockholm.
LINDQUIST, B. 1932. Taxonomical remarks on Juncus alpinus Vill. and some related species. Bot. Notiser 1932, 313.
— 1940. Juncus alpinus var. Marshallii (Pugsl.) Lindq. in Scotland and the race differentiation in the species J. alpinus Vill. Acta Phytogeogr. Suecica 13, 121.
LOSINA-LOSINSKAJA, A. 1939. Subfamily Saxifragoideae. Komarov: Flora U.R.S.S. IX, 135.
LOUSLEY, J. E. 1955. Species studies in the British flora. Ed. by. London.
LÖVE, Á. 1941. Rumex tenuifolius (Wallr.). Löve sp. nov. Bot. Notiser 1941, 99.
— 1942. Cytogenetic studies in Rumex. III. Some notes on the Scandinavian species of the genus. Hereditas 28, 289.
— 1943. Cytogenetic studies on Rumex subgenus Acetosella. Hereditas 30, 1.
— 1944. The dioecious forms of Rumex subgenus Acetosa in Scandinavia. Bot. Notiser 1944, 237.
— 1945. Islenzkar Jurtir. Kaupmannahöfn.
— 1950. Some innovations and nomenclatural suggestions in the Icelandic flora. Bot. Notiser 1950, 24.
— 1951. Taxonomical evaluation of polyploids. Caryologia III, 263.
— 1953. Subarctic polyploidy. Hereditas 39, 113.
— 1954a. Cytotaxonomical remarks on some American species of circumpolar taxa. Svensk bot. Tidskr. 48, 211.
— 1954b. Cytotaxonomical evaluation of corresponding taxa. Vegetatio 5—6, 212.
LÖVE, Á. and LÖVE, D. 1942. Chromosome numbers of Scandinavian plant species. Bot. Notiser 1942, 19.
— — 1943. The significance of differences in the distribution of diploids and polyploids. Hereditas 29, 145.
— — 1945a. Cyto-taxonomical studies on boreal plants III. Arkiv för Bot. 31 A, No. 12.

Löve, Á. and Löve, D. 1945b. Cyto-taxonomical studies on boreal plants II. Arkiv för Bot. 31B, No. 1.
— — 1948. Chromosome numbers of northern plant species. Univ. Inst. Appl. Sci. Dep. Agr. Rep. Ser. B, No. 3. Reykjavík.
— — 1949. The geobotanical significance of polyploidy I. Polyploidy and latitude. Portugaliæ Acta Biologica Ser. A. — R. B. Goldschmidt Vol., 273.
— — 1951. Studies on the origin of the Icelandic Flora II. Saxifragaceae. Svensk bot. Tidskr. 45, 368.
— — 1954. Cytotaxonomical Studies on Northern Bedstraw. Amer. Midl. Nat. 52, 88.
Löve, D. 1942. Some contributions to the cytology of Silenoideae. Svensk bot. Tidskr. 36, 262.
— 1953. Cytotaxonomical remarks on the Gentianaceae. Hereditas 39, 225.
Lövkvist, B. 1947. Chromosome studies in Cardamine. Hereditas 33, 421.
— 1956. The Cardamine pratensis complex. Outlines of its cytogenetics and taxonomy. Symb. Bot. Upsalienses 14, No. 2.
McCullagh, D. 1934. Chromosomes and chromosome morphology in Plantaginaceae I. Genetica 16, 1.
Mackenzie, K. K. 1931—1935. Cariceae. North American Flora 18. Publ. by New York Bot. Gard.
Maguire, B. 1942. Arnica in Alaska and Yukon. Madroño 6, 153.
— 1943. A Monograph of the genus Arnica. Brittonia 4, 386.
Malheiros, N. and Gardée, A. 1947. Contribuições para o estudo citológico do género Lucula Link. Agronomia Lusitana 9, 75.
Malling, H. 1957. The chromosome number of Honckenya peploides (L.) Ehrh., with a note on its mode of sex determination. Hereditas 43, 517.
Malte, M. O. 1934a. Antennaria of arctic America. Rhodora 36, 101.
— 1934b. Critical notes on plants of Arctic America. Rhodora 36, 172.
Mansfeld, R. 1938a. Zur Nomenklatur der europäischen Orchideengattungen. Fedde Rep. sp. nov. 44, 145.
— 1938b. Zur Nomenklatur der Farn- und Blütenpflanzen Deutschlands. Fedde Rep. sp. nov. 44, 285.
— 1938c. Zur Nomenklatur der Farn- und Blütenpflanzen Deutschlands II. Fedde Rep. sp. nov. 45, 193.
— 1939. Zur Nomenklatur der Farn- und Blütenpflanzen Deutschland V. Fedde Rep. sp. nov. 46, 286.
— 1940. Verzeichnis der Farn- und Blütenpflanzen des Deutschen Reiches. Ber. Deutsch. Bot. Ges. 58a.
Manton, I. 1932. Introduction to the general cytology of the Cruciferae. Ann. Bot. 46, 509.
— 1934. The problem of Biscutella laevigata L. Zeitschr. Ind. Abst.- u. Vererbungsl. 67, 41.
— 1937. The problem of Biscutella laevigata L. II. The evidence from meiosis. Ann. Bot. N. S. 1, 439.
— 1950. Problems of Cytology and evolution in the Pteridophyta. Cambridge.
Marsden-Jones, E. M. and Turrill, W. B. 1935. Studies in Ranunculus. III. Further experiments concerning sex in Ranunculus acris. Journ. Gen. 31, 363.
— — 1952. Studies in Ranunculus IV. Additional experiments with Ranunculus bulbosus and R. acris. Journ. Gen. 51, 26.
Mason, H. L. 1950. Taxonomy, systematic botany and biosystematics. Madroño 10, 193.
Matsuuro, H. and Suto, T. 1935. Contributions to the idiogram study in phanerogamous plants I. Journ. Fac. Sc. Hokkaido Univ. 5, 5, 1.
Maude, P. F. 1939. The Merton Catalogue. A list of the chromosome numerals of species of British flowering plants. New Phytol. 38, 1.

MAUDE, P. F. 1940. Chromosome numbers in some British plants. New Phytol. 39, 17.
MELCHERS, G. 1946. Die Ursachen für die bessere Anpassungsfähigkeit der Polyploiden. Zeitsch. f. Naturforsch. 1, 160.
MELDERIS, A. 1950. The short-awned species of the genus Roegneria of Scotland, Iceland and Greenland. Svensk bot. Tidskr. 44, 132.
MERRILL, E. D. 1938. On Houttuyn's overlooked binomials for native or introduced plants in Eastern North America. Rhodora 40, 288.
MICHALSKI, T. 1955. Studia cytologiczno-morfologiczne nad Phleum commutatum z Tatr. Summary: Cyto-morphological study in Phleum commutatum from the Tatra-Mts. Acta Soc. Bot. Poloniae 24, 181.
MILLER, E. W. 1930. A preliminary note on the cytology of the Melanthioideae section of the Liliaceae. Proc. Univ. Durham Philos. Soc. 8, 267.
MÜNTZING, A. 1931. Note on the cytology of some apomictic Potentilla species. Hereditas 15, 166.
— 1932. Apomictic and sexual seed formation in Poa. Hereditas 17, 131.
— 1936. The evolutionary significance of autopolyploidy. Hereditas 21, 263.
— 1940. Further studies on apomixis and sexuality in Poa. Hereditas 26, 115.
— 1948. Accessory chromosomes in Poa alpina. Heredity 2, 49.
— 1954. The cytological basis of polymorphism in Poa alpina. Hereditas 40, 459.
MÜNTZING, A. and MÜNTZING, G. 1941. Some new results concerning apomixis, sexuality, and polymorphism in Potentilla. Bot. Notiser 1941, 237.
MÜNTZING, A. and NYGREN, A. 1955. A new diploid variety of Poa alpina with two accessory chromosomes at meiosis. Hereditas 41, 405.
MYERS, W. M. 1947. Cytology and genetics of forage grasses. Bot. Rev. 13, 369.
NANNFELDT, J. A. 1934. Poa rigens Hartm. versus Poa arctica R. Br. Symb. Bot. Upsalienses 3.
— 1935. Taxonomical and plant-geographical studies in the Poa laxa group. Symb. Bot. Upsalienses 5.
— 1937. On the chromosome number of Phippsia algida (Sol. ap. Phipps) R. Br. Bot. Notiser 1937, 255.
— 1940. On the polymorphy of Poa arctica R. Br. with special reference to its Scandinavian forms. Symb. Bot. Upsalienses 4, No. 4.
— 1954. Some notes on Minuartia stricta (Sw.) Hiern and allied species. Nytt Magasin f. Botanikk 3, 159.
NELMES, E. 1942. Notes on British Caries VI. Journ. Bot. 80, 105.
NEWCOMER, E. H. 1941. Chromosome numbers of some species and varieties of Vaccinium and related genera. Proc. Amer. Soc. hort. Sci. 38, 468.
NORDENSKIÖLD, H. 1945. Cyto-genetic studies in the genus Phleum. Acta Agric. Suecana 1, 1.
— 1949. The somatic chromosomes of some Luzula species. Bot. Notiser 1949, 81.
— 1950. Cyto-taxonomic studies in the genus Luzula. I. Somatic chromosomes and chromosome numbers. Hereditas 37, 325.
NORDHAGEN, R. 1931. Studien über die Skandinavischen Rassen des Papaver radicatum. Bergens Museums Årbok 1931, Naturv. Rk. 2.
— 1933. De senkvartære Klimavekslinger i Nordeuropa og deres Betydning for Kulturforskningen. Oslo.
— 1935. Om Arenaria humifusa Wg. og dens betydning for utforskningen av Skandinavias eldste floraelement. Bergens Museums Årbok 1935, Naturv. R. 1.
— 1940. Norsk Flora. Oslo.
NYGREN, A. 1946. The genesis of some Scandinavian species of Calamagrostis. Hereditas 32, 131.
— 1949a. Studies on vivipary in the genus Deschampsia. Hereditas 35, 27.

Nygren, A. 1949b. Experimental studies in Scandinavian alpine plants I. Ecotypical differentiation in Melandrium angustiflorum (Ruprecht) Walpers. Hereditas 35, 214.
— 1950a. Cytological and embryological studies in arctic Poae. Symb. Bot. Upsalienses 10, 4.
— 1950b. A cytological and embryological study of Antennaria Porsildii. Hereditas 36, 483.
— 1951. Experimental studies in Scandinavian alpine plants II. On the origin of the Greenlandic species, Melandrium triflorum (R. Br.) J. Vahl. Hereditas 37, 373.
— 1954a. Investigations on North American Calamagrostis. Hereditas 40, 377.
— 1954b. Apomixis in the Angiosperms II. Bot. Rev. 20, 577.
— 1955. Further studies in diploid Poa alpina with and without accessory chromosomes at meiosis. Ann. Roy. Agric. Coll., Sweden 21, 179.
Olsen, C. 1914. Cornaceae. Medd. Grønl. 37, 127.
Omang, S. O. F. 1932. Beiträge zur Hieraciumflora Ost-Grönlands. Skr. Svalbard og Ishavet. 46.
— 1933. Übersicht über die Hieraciumflora Ost-Grönlands. Skr. Svalbard og Ishavet 55.
— 1937. Über einige Hieracium-Arten aus Grönland. Medd. Norges Svalbard- og Ishavsundersøkelser 40.
Ono, T. 1928. Further investigations on the cytology of Rumex. Tokyo Bot. Magaz. 42, 524.
Ostenfeld, C. H. 1901. Phanerogamae and Pteridophyta. Bot. of the Faeroes 1, 41.
— 1902. Flora Arctica I. Copenhagen.
— 1920. A list of arctic Caryophyllaceae, with some synonyms. Medd. Grønl. 37, 221.
— 1923a. Critical notes on the taxonomy and nomenclature of some flowering plants from northern Greenland. Medd. Grønl. 64, 163.
— 1923b. The vegetation on the north coast of Greenland based upon the late Dr. Wulff's collections and observations. Medd. Grønl. 64, 223.
— 1925. Flowering plants and ferns from North-Western Greenland collected during the Jubilee Expedition 1920—22. Medd. Grønl. 68, 1.
— 1926. The Flora of Greenland and its origin. Biol. Medd. Dan. Vid. Selsk. 6, No. 3.
Ostenfeld, C. H. and Dahl, O. 1917. De nordiske former av kollektiv-arten Arenaria ciliata L. Nytt Mag. f. Naturvid. 55, 217.
Ostenfeld, C. H. and Lundager, A. 1910. List of vascular plants from North-East Greenland (N. of 76° N. lat.). Medd. Grønl. 43, 1.
Østergren, G. 1942. Chromosome numbers in Anthoxanthum. Hereditas 28, 242.
Palmgren, O. 1939. Cytological studies in Potamogeton. Bot. Notiser 1939, 246.
— 1943. Chromosome numbers in angiospermous plants. Bot. Notiser 1943, 348.
Patten, B. C. jr. 1954. The status of some American species of Myriophyllum as revealed by the discovery of intergrade material between M. exalbescens Fern. and M. spicatum L. in New Jersey. Rhodora 56, 213.
Pennell, F. W. 1921. Veronica in North and South America. Rhodora 23, 1, and 29.
Peterson, D. 1936. Stellaria Studien. Zur Zytologie, Genetik, Ökologie und Systematik der Gattung Stellaria insbesondere der media-Gruppe. Bot. Notiser 1936, 281.
Polunin, N. 1938. Notes on a botanical journey in S. W. Greenland 1937. Kew Bull. 3, 89.
— 1940. Botany of the Canadian Eastern Arctic I. Nat. Mus. Canada Bull. 92, Biol. Ser. 24.
— 1943. Contributions to the flora and phytogeography of South-Western Greenland. Journ. Linn. Soc. Bot. 52, 349.
— 1954. Cerastium arcticum Lge. Nature 173, 89.
Porsild, A. E. 1926. Contributions to the flora of West Greenland at 70°—71°45′ N. lat. Medd. Grønl. 58, 159.
— 1939. Contributions to the flora of Alaska. Rhodora 41, 141.
— 1943. Materials for a flora of the Continental Northwest Territories of Canada. Sargentia 4, 1.

Porsild, A. E. 1945. A Survey of the adventitious flora of Ivigtut in Southwest Greenland. Canad. Field Naturalist 59, 53.
— 1947. The genus Dryas in North America. Canadian Field Naturalist 61, 175.
— 1950. The genus Antennaria in Northwestern Canada. Canadian Field Naturalist 64, 1.
— 1951. Botany of Southeastern Yukon adjacent to the Canol Road. Nat. Mus. Canada Bull. 121.
— 1954. The North American races of Saxifraga flagellaris Willd. Bot. Tidsskr. 51, 292.
— 1955. The vascular plants of the Western Canadian Arctic Archipelago. Nat. Mus. Canada Bull. 135.
Porsild, M. P. 1915. On the genus Antennaria in Greenland. Medd. Grønl. 51, 267.
— 1920. The flora of Disko Island and the adjacent coast of West Greenland. Medd. Grønl. 58, 1.
— 1930. Stray contributions to the Flora of Greenland I—V. Medd. Grønl. 77, 1.
— 1932. Alien plants and apophytes of Greenland. Medd. Grønl. 92, No. 1.
— 1935. Stray contributions to the flora of Greenland VI—XII. Medd. Grønl. 93, No. 3.
— 1946a. Stray contributions to the Flora of Greenland XIII—XVII. Medd. Grønl. 134, No. 4.
— 1946b. Den grønlandske Forekomst af Pedicularis groenlandica Retz. Bot. Tidsskr. 48, 96.
Raup, H. M. 1943. The Willows of the Hudson Bay Region and the Labrador Peninsula. Sargentia 4, 81.
Reese, G. 1952. Ergänzende Mitteilungen über die Chromosomenzahlen mitteleuropäischer Gefässpflanzen I. Ber. Deutsch. Bot. Ges. 64, 240.
— 1953. Ergänzende Mitteilungen über die Chromosomenzahlen mitteleuropäischer Gefässpflanzen II. Ber. Deutsch. Bot. Ges. 66, 66.
Richardson, J. 1823. Botanical Appendix, in J. Franklin: Narrative of a Journey to the Shores of the Polar Sea. Ed. I, London.
Rohweder, H. 1939. Weitere Beiträge zur Systematik und Phylogenie der Caryophyllaceen unter bes. Berücksichtigung der karyologischen Verhältnisse. Beih. Bot. Centralbl. 59B, 1.
Rollins, R. C. 1939. Studies in the genus Lesquerella. Amer. Journ. Bot. 26, 419.
— 1941. Monographic study of Arabis in Western North America. Rhodora 43, 290.
Ronniger, K. 1924. Beiträge zur Kenntnis der Gattung Thymus I. Die britischen Arten und Formen. Fedde Rep. sp. nov. 20, 321.
Rork, C. L. 1949. Cytological studies in the Gentianaceae. Amer. Journ. Bot. 36, 687.
Rosenberg, O. 1909. Cytologische und morphologische studien an Drosera longifolia × rotundifolia. Kungl. Svenska Vet. Akad. Handl. 43 (11) 1.
Rosenvinge, L. K. 1892 (cit. Lange III). Andet Tillæg til Grønlands Fanerogamer og Karsporeplanter. Medd. Grønl. 3, 647.
Rousi, A. 1956. Cytotaxonomy and reproduction in the apomictic Ranunculus auricomus group. Ann. Bot. Soc. Zool.-Bot. Fennica, Vanamo 29, No. 2.
Rousseau, J. et Raymond, M. 1952. Le Gentiana tenella Rottb. dans le Québec arctique. Naturaliste Canadien 79, 76.
Rutishauser, A. 1948. Pseudogamie and Polymorphie in der Gattung Potentilla. Arch. Julius Klaus-Stiftung (Zürich) 23, 267.
— 1953/54. Die Entwicklungserregung des Endosperms bei pseudogamen Ranunculusarten. Mitt. Naturf. Ges. Schaffhausen 25, 1.
— 1954. Entwicklungserregung der Eizelle bei pseudogamen Arten der Gattung Ranunculus. Bull. Schweiz. Akad. Mediz. Wissensch. 10, 491.
Rutland, J. P. 1941. The Merton Catalogue. A List of chromosome numbers of British plants. Suppl. no. 1. New Phytol. 40, 210.
Rydberg, P. A. 1907. The genus Pilosella in North America. Torreya 7, 157.

Ryka, C. 1954. Studia cytologiczne nad Vicia cracca L. i V. tenuifolia Rth. Acta Soc. Bot. Poloniae 23, 321.

Sakai, K. 1934. Studies on the chromosome number in alpine plants I. Jap. Journ. Gen. 9, 226.

Samuelsson, G. 1922. Zwei neue Epilobium-Arten aus der Arktis. Bot. Notiser 1922, 259.

— 1925. Die Callitriche-Arten der Schweiz. Veröffentl. Geobot. Inst. Rübel, Zürich 3. Heft. (Festschrift Carl Schröter) 603.

— 1943. Die Verbreitung der Alchemilla-Arten aus der Vulgaris-Gruppe in Nordeuropa. Acta Phytogeogr. Suecica 16.

Sâto, D. 1942. Karyotype alteration and phylogeny in Liliaceae and allied families. Japan. Journ. Bot. 12.

Saunte, L. H. 1955. Cyto-genetical studies in the Cochlearia officinalis complex. Hereditas 41, 499.

Sax, K. 1931. The origin and relationships of the Pomoideae. Journ. Arnold Arb. 12, 3.

Sax, K. and Sax, H. J. 1933. Chromosome number and morphology in the Conifers. Journ. Arnold Arb. 14, 356.

Scheerer, H. 1939. Chromosomenzahlen aus der Schleswig-Holsteinischen Flora I. Planta 29, 636.

— 1940. Chromosomenzahlen aus der Schleswig-Holsteinischen Flora II. Planta 30, 716.

Schneider, C. 1918. Notes on American Willows II. The species related to Salix glauca L. Bot. Gaz. 66, 318.

Scholander, P. F. 1934. Vascular plants from Northern Svalbard. Skr. Svalbard og Ishavet 62.

Schotsman, H. D. 1954. A taxonomic spectrum of the section Eu-Callitriche in the Netherlands. Acta Bot. Neerlandica 3, 313.

Schrank, F. P. 1818. Aufzählung einiger Pflanzen aus Labrador, mit Anmerkungen. Denkschr. d. Koeniglich-Bayerischen Bot. Ges. zu Regensburg Bd. 1, Abt. 2, 1.

Schulz, O. E. 1924. Cruciferae-Sisymbrieae. Pflanzenreich IV, 105.

Schwarz, O. 1949. Beiträge zur Nomenklatur und Systematik der mitteleuropäischen Flora. Mitt. Thüring. Bot. Ges. 1, 82.

Schwarzenbach, F. H. 1953. Die Abhängigkeit der Bulbillenbildung bei Poa alpina vivipara von Photoperiodismus und Frost. Experientia 9, 96.

— 1956. Die Beeinflussung der Viviparie bei einer grönländischen Rasse von Poa alpina L. durch jahreszeitlichen Licht- und Temperaturwechsel. Ber. Schweiz. Bot. Ges. 66, 204.

Seidenfaden, G. 1930. Botanical investigations during the Danish East Greenland expedition 1929. Medd. Grønl. 74, 367.

— 1933. The vascular plants of South-East Greenland 60°04′ to 64°30′ N. lat. Medd. Grønl. 106, No. 3.

Seidenfaden, G. and Sørensen, Th. 1933. On Eriophorum callitrix Cham. in Greenland. Medd. Grønl. 101, No. 1.

— — 1937. The vascular plants of Northeast Greenland from 74°30′ to 79°00′ N. lat. Medd. Grønl. 101, No. 4.

Senn, H. A. 1938. Experimental data for a revision of the genus Lathyrus. Am. Journ. Bot. 25, 67.

Shimotomai, N. 1930. Chromosomenzahlen und Phylogenie bei der Gattung Potentilla. Journ. Sci. Hiroshima Univ. Ser. B, Div. 2, Vol. 1, 1.

— N. 1933. Zur Karyogenetik der Gattung Chrysanthemum. Journ. Sci. Hiroshima Univ. Ser. B, Div. 2, Vol. 2, 1.

Simmons, H. G. 1904. Notes on some rare and dubious Danish Greenland plants. Medd. Grønl. 26, 469.

— 1906. The vascular plants in the flora of Ellesmereland. Rep. Sec. Norw. Arct. Exp. "Fram" 1898—1902, No. 2.

SIMMONS, H. G. 1909. A revised list of the flowering plants and ferns of North-Western Greenland. Rep. Sec. Norw. Arct. Exp. "Fram" 1898—1902, No. 16.

SKALINSKA, M. 1949—50. Studies in chromosome numbers of Polish Angiosperms. Acta Soc. Bot. Poloniae 20, 45.

— 1952a. Cytological studies in Gentiana species from the Tatra and Pieniny Mts. Bull. de l'Acad. Polonaise des Sci. et des Lettr. Cl. Sc. Math. et Nat. Sér. B (1) (1951) 119.

— 1952b. Cyto-ecological studies in Poa alpina L. var. vivipara L. Bull. de l'Acad. Polonaise des Sc. et des Lettr. Cl. Sc. Math. et Nat. Sér. B (1) (1951) 253.

SKOVSTED, A. 1934. Cytological studies in the tribe Saxifrageae. Dansk Bot. Arkiv 8, No. 5.

SMITH, H. 1940. Carex arctogena nova species. Acta Phytogeogr. Suecica 13, 191.

SOKOLOVSKAJA, A. P. 1937. A caryo-geographical study of the genus Agrostis. Cytologia 8, 452.

SOKOLOVSKAJA, A. P. and STRELKOVA, O. S. 1938. Polyploidy in the high mountain regions of Pamir and Altai. C. R. (Doklady) Acad. Sci. U.S.S.R. 21, 68.

— — 1940. Karyological investigations of the alpine flora on the main Caucasus Range and the problem of geographical distribution of polyploids. C. R. (Doklady) Acad. Sci. U.S.S.R. 29, 415.

— — 1941. Polyploidy and karyological races under conditions in the Arctic. C. R. (Doklady) Acad. Sci. U.S.S.R. 32, 144.

SÖLLNER, R. 1950. Polyploïdie intraspécifique chez Cerastium arvense L. et nombres chromosomiques de quelques autres Cerastium. Experientia 6, 335.

— 1952. Nouvelle contribution à la cytotaxinomie du genre Cerastium. Experientia 8, 104.

— 1954. Recherches cytotaxinomique sur le genre Cerastium. Bull. Soc. Bot. Suisse 64, 221.

SØRENSEN, TH. 1933. The vascular plants of East Greenland from 71°00′ to 73°30′ N. lat. Medd. Grønl. 101, No. 3.

— 1941. Temperature relations and phenology of the Northeast Greenland flowering plants. Medd. Grønl. 125, No. 9.

— 1943. The Flora of Melville Bugt. Medd. Grønl. 124, No. 5.

— 1945. Summary of the botanical investigations in Northeast Greenland. Medd. Grønl. 144, No. 3.

— 1953. A revision of the Greenland species of Puccinellia Parl. with contributions to our knowledge of the arctic Puccinellia flora in general. Medd. Grønl. 136, No. 3.

— 1954. New species of Hierochloë, Calamagrostis, and Braya. Medd. Grønl. 136, No. 8.

STEBBINS, G. L. JR. 1930. A revision of some North American Species of grasses. Rhodora 32, 35.

— 1941. Apomixis in Angiosperms. Bot. Rev. 7, 507.

— 1947a. Types of polyploids, their classification and significance. Advances in Genetics 1, 403.

— 1947b. Evidences on rates of evolution from the distribution of existing and fossil plant species. Ecol. Monogr. 17, 149.

— 1950. Variation and evolution in plants. New York.

STRELKOVA, O. 1937. Polyploidy and geographic-systematic groups in the genus Alopecurus L. Cytologia 8, 468.

SUZUKA, O. 1950. Chromosome numbers in pharmaceutical plants I. Rep. Kihara Inst. Biol. Res. (Seiken Zihô) 4, 57.

SVENSON, H. K. 1929. Monographic studies in the genus Eleocharis. Rhodora 31, 121.

— 1939. Monographic studies in the genus Eleocharis V. Rhodora 41, 43 and 90.

— 1947. The group of Eleocharis palustris in North America. Rhodora 49, 61.

SVESHNIKOVA, I. 1927. Kariologiczeskij oczerk roda Vicia. [Karyological survey of the genus Vicia.] Bull. Appl. Bot. Genet. Plant Breeding 17, 37.

SWALLEN, J. R. 1944. The Alaskan species of Puccinellia. Journn. Wash. Acad. Sci. 34, 16.

Täckholm, G. 1920. On the cytology of the genus Rosa. A preliminary note. Svensk Bot. Tidskr. 14, 300.
— 1922. Zytologische Studien über die Gattung Rosa. Acta Horti Bergiani 7.
Takenaka, Y. 1941. The relation between polyploidy and size of the stoma I. On the plants of the subgenus Lapathum. Bot. Mag. Tokyo 55, 319.
Tanaka, N. 1937. Chromosome studies in Cyperaceae I. Cytologia, Fujii-Jub. Vol., 814.
Tischler, G. 1927. Pflanzliche Chromosomenzahlen. Tabulae Biologicae 4.
— 1935. Die Bedeutung der Polyploidie für die Verbreitung der Angiospermen. Engler Bot. Jahrb. 67, 1.
— 1937. Die Halligenflora der Nordsee im Lichte cytologischer Forschung. Cytologia, Fujii-Jub. Vol., 162.
— 1942. Polyploidie und Artbildung. Naturwiss. 30, 713.
— 1950. Die Chromosomenzahlen der Gefässpflanzen Mitteleuropas. Haag.
Tolmatchew, A. 1923. Sur une nouvelle espèce critique du genre Draba du cycle Draba alpina. Trav. Mus. Bot. Acad. Sci. U.R.S.S. 23, 223.
— 1930. Die Gattung Cerastium in der Flora von Spitzbergen. Skr. Svalbard og Ishavet 34.
— 1932. Contribution à la connaissance des Melandryum, sec. Wahlbergella, de l'Eurasie. Trav. Mus. Bot. Acad. Sci. U.R.S.S. 24, 251.
— 1939. Genus Draba. Komarov: Flora U.R.S.S. VIII, 371.
Toyohuku, T. 1935. Chromosome numbers in Sedum. Jap. Journ. Gen. 11, 316.
Turesson, G. 1930. Studien über Festuca ovina L. II. Chromosomenzahl und Viviparie. Hereditas 13, 177.
— 1931. Studien über Festuca ovina L. III. Weitere Beiträge zur Kenntnis der Chromosomenzahlen viviparer Formen. Hereditas 15, 13.
Tutin, T. G. 1936. New species of Zostera from Britain. Journ. Bot. 74, 227.
— 1950. A note on species pairs in the Gramineae. Watsonia 1, 224.
Uhl, C. H. 1952. Heteroploidy in Sedum Rosea (L.) Scop. Evolution 6, 81.
Vaage, J. 1932. Vascular Plants from Eirik Raudes Land. Skr. Svalbard og Ishavet 48.
Vaarama, A. 1943. Beobachtungen über die Meiose bei einigen Anthropochoren. Hereditas 29, 191.
— 1953. Cytotaxonomic studies on northern Tripleurospermum forms. Proc. 7th Internat. Congr. Stockholm 1950, 279.
Vachell, E. and Blackburn, C. 1939. The Limosella plants of Glamorgan. Journ. Bot. 77, 65.
Vierhapper, F. 1906. Monographie der alpinen Erigeron-Arten Europas. Beih. Bot. Centralbl. 19, Abt. 2, 385.
Wahl, H. A. 1940. Chromosome numbers and meiosis in the genus Carex. Amer. Journ. Bot. 27, 458.
Walters, S. M. 1949. Biological Flora of the British Isles. Eleocharis R. Br. Journ. Ecol. 37, 192.
— 1953. Montia fontana L. Watsonia 3, 1.
Wanscher, J. H. 1931. Studies on the chromosome numbers of the Umbelliferæ. Hereditas 15, 179.
— 1932. Studies on the chromosome numbers of the Umbelliferae. Bot. Tidsskr. 42, 49.
— 1934. Secondary associations in Umbelliferae and Bicornes. New Phytol. 33, 58.
Webb, D. A. 1950. A revision of the dactyloid Saxifrages of North-western Europe. Proc. Royal Irish Acad. 53, Sect. B, No. 12, 207.
Westergaard, M. 1940. Studies on cytology and sex determination in polyploid forms of Melandrium album. Dansk Bot. Arkiv 10, 5.
Wiinstedt, K. 1948. Bidrag til Polymorfien hos den tidligere som Carex Oederi Retz. kendte Art. Bot. Tidsskr. 48, 192.

Wilkinson, J. 1944. The Cytology of Salix in relation to its taxonomy. Ann. Bot. N. S. 8, 269.
Winge, Ø. 1917. The chromosomes, their numbers and general importance. Compt. Rend. Trav. Lab. Carlsberg 13, 131.
Witsch, H. 1932. Chromosomenstudien an mitteleuropäische Rhinantheen. Österr. Bot. Zeitschr. 81, 108.
Woodworth, R. H. 1929. Cytological studies in the Betulaceae II. Corylus and Alnus. Bot. Gaz. 88, 383.
Wulff, H. D. 1937a. Karyologische Untersuchungen an der Halophytenflora Schleswig-Holsteins. Pringsheim Jahrb. Wiss. Bot. 84, 812.
— 1937b. Chromosomenstudien an der schleswig-holsteinischen Angiospermen-Flora I. Ber. Deutsch. Bot. Ges. 55, 262.
— 1938. Chromosomenstudien an der schleswig-holsteinischen Angiospermen-Flora II. Ber. Deutsch. Bot. Ges. 56, 247.
— 1939. Chromosomenstudien an der schleswig-holsteinischen Angiospermen-Flora III. Ber. Deutsch. Bot. Ges. 57, 84.
Wycherley, P. R. 1953. Proliferation of spikelets in British grasses. Watsonia 3, 41.
Zahn, K. H. 1921—22. Compositae-Hieracium. Pflanzenreich IV, 280.

Joint publication from the Laboratory of Genetics of the Royal Veterinary and Agricultural College (C. A. Jørgensen), the Botanical Laboratory of the University of Copenhagen (Th. Sørensen), and the Institute of Genetics of the University of Copenhagen (M. Westergaard).

Indleveret til selskabet den 14. marts 1957.
Færdig fra trykkeriet den 29. januar 1958.

Det Kongelige Danske Videnskabernes Selskab

Biologiske Skrifter

Biol. Skr. Dan. Vid. Selsk.

Bind 6 (kr. 94,00)

kr. ø.

1. ORLA-JENSEN, S., ORLA-JENSEN, ANNA D., and SNOG-KJÆR, AGNETE: Biological Researches on the Silage Process. 1948 2,00
2. LUND, SØREN: The Marine Algæ of Denmark. Contributions to their Natural History. Vol. II. Phæophyceæ. IV. Sphacelariaceæ, Cutleriaceæ, and Dictyotaceæ. 1950. 10,00
3. TUXEN, S. L.: Über den Lebenszyklus und die postembryonale Entwicklung zweier dänischer Proturengattungen. 1949 10,00
4. PAULSEN, OVE: Observations on Dinoflagellates. Edited by Jul. Grøntved. 1949. 9,00
5. THOMSEN, MATHIAS: Weismann's Ring and Related Organs in Larvae of Diptera. 1951. 15,00
6. NIELSEN, ANKER: Contributions to the Metamorphosis and Biology of the Genus Atrichopogon Kieffer (Diptera, Ceratopogonidæ). With Remarks on the Evolution and Taxonomy of the Genus. 1951 16,00
7. BÖCHER, TYGE W.: Cytological and Embryological Studies in the Amphi-Apomictic *Arabis Holboellii* Complex. 1951 9,00
8. DEGERBØL, MAGNUS: Recent Discoveries of Remains of Mammals from Glacial Deposits in Denmark. *Dicerorhinus kirchbergensis* (Jäger), New to the Fauna of Denmark; *Megaloceros giganteus* (Blumenbach) and *Bison priscus* (H. v. Meyer). 1952 5,00
9. CHRISTENSEN, PAUL J. HOLST: The Embryonic Development of *Cochlidion limacodes* Hufn. (Fam. *Cochlididae, Lepidoptera*). A Study on Living Dated Eggs. 1953. 18,00

Bind 7 (kr. 95,00)

1. NYGAARD, GUNNAR: Hydrobiological Studies on some Danish Ponds and Lakes. Part II: The Quotient Hypothesis and some new or little known Phytoplankton Organisms. 1949 40,00
2. CHRISTENSEN, PAUL J. HOLST: Studien über die postembryonale Entwicklung bei *Cochlidion limacodes* Hufn. (Fam. *Cochlididae, Lepidoptera*). 1950 10,00
3. LADEFOGED, KJELD: The Periodicity of Wood Formation. 1952 20,00
4. BÖCHER, TYGE W.: Lichen-Heaths and Plant Successions at Østerby on the Isle of Læsø in the Kattegat. 1952 5,00
5. THOMSEN, MATHIAS: Neurosecretion in some Hymenoptera. 1954 8,00
6. FJERDINGSTAD, E.: The Subfossil Algal Flora of the Lake Bølling Sø and its Limnological Interpretation. 1954 12,00

Bind 8 (kr. 100,00)

1. KØIE, M., and RECHINGER, K. H.: Symbolae Afghanicae. Enumeration and Descriptions of the Plants Collected by L. EDELBERG and M. KØIE on "The 3rd Danish Expedition to Central Asia" and by W. KOELZ, H. F. NEUBAUER, O. H. VOLK, and others in Afghanistan. Vol. I. K. H. RECHINGER: Labiatae. 1954 15,00
2. KØIE, M., and RECHINGER, K. H.: Symbolae Afghanicae. Enumeration and Descriptions of the Plants Collected by L. EDELBERG and M. KØIE on "The 3rd Danish Expedition to Central Asia" and by G. KERSTAN, W. KOELZ, H. F. NEUBAUER, O. H. VOLK, and others in Afghanistan. Vol. II. K. H. RECHINGER: Compositae. 1955 40,00

On direct application to the agent of the Academy: Ejnar Munksgaard, Publishers, 6 Nörregade, Köbenhavn K, a subscription may be taken out to the series of *Biologiske Skrifter*. This subscription is comprising automatically *Biologiske Meddelelser* in 8vo. The *Meddelelser* and the *Skrifter* only differ in size, not at all in the subjects treated. Papers with large formulae, tables, plates etc. will generally be published in the *Skrifter* in 4to. Since it is due to a mere accident, with regard to the subjects treated, if a paper is printed in *Meddelelser* in 8vo or in *Skrifter* in 4to, these two series will be sent together automatically to all subscribers to the biological papers of the Academy.

For subscribers and others who want to receive only the publications concerning a single group of subjects, there is a possibility of special arrangement with the agent of the Academy, in order to acquire the papers published under one or more of the subjects: *Botany, Zoology, General Biology*.

In order to avoid mistakes at registration and quotation the publications will not have any special designation of the group of subjects printed on them; but on the cover of each paper there will be a list of the papers last published within the same group of subjects as that to which the number in question belongs.

The last published numbers of *Biologiske Skrifter* within the group of **Botany** are the following:

Vol. **6**, no. 2, 4, 7. — Vol. **7**, no. 1, 3–4, 6. — Vol. **8**, no. 1–3. — Vol. **9**, no. 3–4.

Printed in Denmark
Bianco Lunos Bogtrykkeri A/S