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FURTHER STUDIES IN *BRAYA HUMILIS*
AND ALLIED SPECIES

BY

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WITH 8 FIGURES IN THE TEXT
AND 4 PLATES

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1. INTRODUCTION

Recent works by ABBE 1948, BÖCHER 1950, ROLLINS 1953, SØRENSEN 1954, and PORSILD 1955 have highly added to the interest of the question of the correct valuation of the taxa which have previously been referred to *Braya humilis* (C. A. Meyer) Robinson. In my previous work I termed this group the *Torularia humilis* complex, but I am willing to comply with ROLLINS (1953) in referring these plants to the genus *Braya*. I find it difficult, as SØRENSEN does it, to refer some of the taxa to *Braya*, others to another genus (*Torularia* or a special genus not yet named). In my opinion the distinguishing characters are not so important that it should be necessary to work with two genera. On the other hand, it must be admitted that genera within the *Cruciferae* are often distinguished by rather subtle differences.

In my previous paper (1950) it is said that the time is not ripe for a monographical treatment. We must first have more studies of the chromosome numbers of plants from both Asia and America. It is true that ROLLINS (1953) and JØRGENSEN, SØRENSEN & WESTERGAARD (according to SØRENSEN 1954) have contributed materially to the exploration of the group by adding new chromosome numbers from America and Northeast Greenland, but we still lack sufficient information about the Asiatic material, which in many respects resembles the greater part of the East Greenland material as well as certain sheets from arctic North America. A complete clarification of the systematic problems must still wait until the Asiatic material has been investigated cytotaxonomically; but on the other hand, on the basis of the present material we are able to take a good step farther.

The following treatment is built on studies on the material from the complex which is found in the museums in Copenhagen (C) and Stockholm (S) supplemented by three sheets from Gray Herbarium (G) and a photograph of the type of *Torularia humilis* in the Leningrad museum. I offer my best thanks to the museums in questions for their courtesy in lending me this material.

All drawings are made by the writer. He is indebted to Mr. TYGE CHRISTENSEN, M. sc., for latinizing the diagnoses and to Mr. K. HOLMEN, M. sc., for material from Northeast Greenland.

2. CYTOLOGY

In Table 1 the chromosome numbers known today for the *Braya humilis* complex are listed. (The systematic terms refer to the treatment in the following sections).

Table 1.

Taxon	Origin	Author	n	2 n
<i>Braya novae-angliae</i> var. <i>interior</i> , f. <i>capitata</i>	Two stations at the head of Søndre Strømfjord, West Greenland	BÖCHER & LARSEN 1950, the present paper, fig. 1c	28	56
<i>Braya humilis</i> ssp. <i>arctica</i>	Stations in Northeast Greenland	JØRGENSEN, SØRENSEN & WESTERGAARD according to SØRENSEN 1954	..	42
<i>Braya linearis</i> × <i>humilis</i> (?)	Revet in Northeast Greenland	The present paper, fig. 1a	..	42
<i>Braya intermedia</i>	Stations in Northeast Greenland	JØRGENSEN, SØRENSEN & WESTERGAARD according to SØRENSEN 1954	..	70
— —	Two stations in Northeast Greenland	The present paper, fig. 1b	35	70
<i>Braya humilis</i> coll.	Alaska, material collected by Drury, No. 3298	ROLLINS 1953	..	40
<i>Braya humilis</i> ssp. <i>ventosa</i> ; see p. 9	Colorado	ROLLINS 1953	..	64

The new chromosome countings were made on root tips from pot-grown plants (fig. 1a-b), in the first division of meiosis (fig. 1c) and in the first pollen mitosis.

The course of the meiosis was examined in the West Greenland plant, *B. novae-angliae* var. *interior*, which has been cultivated in the Botanical Garden of Copenhagen for a number of years. The 28 bivalent

chromosomes were highly different in size, corresponding to the great differences in length which were previously found in root-tip mitoses (BÖCHER & LARSEN 1950, fig. 34). The course of the meiosis was almost completely regular. Only in a single one among many cells in Anaphase I a lagging configuration was seen, presumably a quadrivalent. In Metaphase II the two plates in one case were connected by a bridge, and an extremely small acentric fragment was visible. The telophase was normal and pollen was uniform, dwarf pollen being observed extremely rarely. Pollen mitoses had $n =$ about 28.

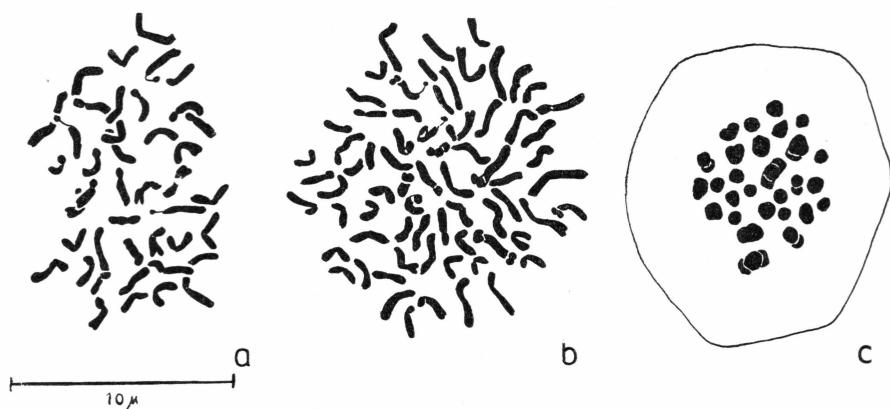


Fig. 1. a. Mitosis from root tip of the presumed hybrid *Braya linearis* \times *humilis* ($2n = 42$).— b. Mitosis from root tip of *B. intermedia* ($2n = 70$).— c. First metaphase plate of meiosis in *B. novae-angliae* var. *interior* from Greenland ($n = 28$). Scale 10μ .

Material of *B. intermedia* was fixed in Northeast Greenland by K. HOLMEN and kindly submitted to me, unexamined. Unfortunately it was not possible to follow the course of the meiosis, but an examination of the pollen substantiated, first, that the pollen had reduced chromosome numbers ($n =$ about 35), secondly, that it was much more irregular than in *B. novae-angliae*. Dwarf pollen and double pollen grains were frequent, amongst others double grains consisting of one large grain and a dwarfish one. Old pollen grains were trinuclear with two male cells. A couple of embryo sacs were quite normal and in a binuclear embryo sac about 35 chromosomes were observed. Thus there is no sign of diplospory here; cf. suggestions to apomixis made by ROLLINS *loc. cit.* The cytological irregularities revealed by the pollen investigations are in good agreement with the reduced seed fertility of *Braya intermedia* (see further p. 28 and fig. 4c).

The number $2n = 56$ may be fitted into a chromosome number series with 7 as basic number as well as into a series with 8, and both

series seem to occur in the group of species (Table 1) as well as the genus *Braya* and the tribe *Brayinae* (see BÖCHER & LARSEN p. 21). Whereas a polyploid series within a species is not always accompanied by appreciable morphological differences which justify a division into several independent species, two different series of numbers will no doubt rarely occur without it proving to be justifiable to subdivide the species. Therefore it is presumably very justifiable, as ROLLINS does it, to consider *B. humilis* ssp. *ventosa* with $2n = 64$ a subspecies; but perhaps it will prove still more correct to segregate it as a particular species. The difference found between the chromosome numbers in West and East Greenland material supports the view advanced by SØRENSEN that we have here to do with two species and not two subspecies of *B. humilis*.

3. THE WEST GREENLAND MATERIAL

In his work (1954) SØRENSEN calls attention to the fact that RYDBERG (1907) was the first to segregate a characteristic long-styled form as a particular species: *Pilosella novae-angliae*. This species should differ from *Braya humilis* in the scarcer pubescence, the smaller flowers, the more slender pod, and the longer style, which is about 1 mm long. Later RYDBERG's species, which originated from the Willoughby Mountains in Vermont, was by FERNALD (1918) reduced to being a variety of *Braya humilis*, and finally by the same author (1937) identified with the var. *leiocarpa* set up by TRAUTVETTER (1877). Obviously FERNALD laid the main stress on the scant pubescence and did not attach any importance to the length of the style, in which character the Vermont plant hardly resembles the Siberian var. *leiocarpa*.

SØRENSEN maintains that the differential characters indicated by RYDBERG likewise apply to the West Greenland plant, for which he proposes the name of *Braya novae-angliae* (Rydb.) Th. Sør. comb. nov. SØRENSEN obviously had not had any opportunity of studying material from Vermont; otherwise he would have noticed that it differs from the West Greenland material in several respects. Not only are the West Greenland plants more strongly pubescent, but they are also much coarser, especially as regards styles and stigmata. However, the difference is not so great that the Vermont plant and the West Greenland plant cannot be referred to the same species; but each of them must be considered a particular variety, as already hinted at by ABBE, even though he only dares to call his types geographical races.

A satisfactory systematic placing of the West Greenland plant presupposes a closer investigation of the North American material. Fortunately it was possible to get an opportunity to see all the "races" which ABBE distinguishes. My studies of this material have convinced me that ABBE had an excellent eye for the essential differences and that his races correspond to definite taxa. However, the differences seem to me to be so great that the races deserve getting systematic names. It is always difficult to decide whether minor units within species should be considered subspecies or varieties. In this case the differences are not

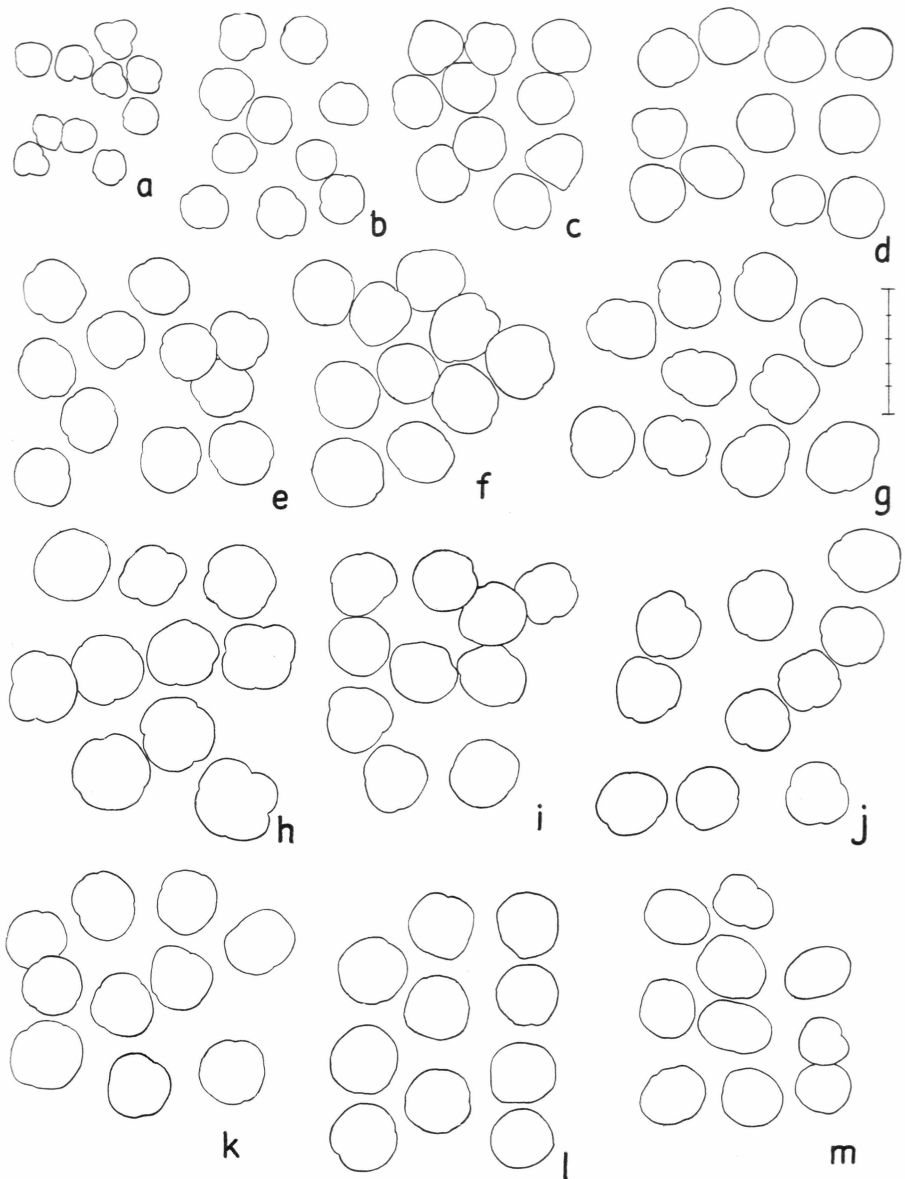


Fig. 2. Pollen size in 13 samples of different species belonging to the *Braya humilis* group. — a. Irkutsk; b. Russ. orient. Ledebour; c. Kara Su, Pamir (all ssp. *humilis*); d. the Mackenzie river, foot of Bear Rock (“*B. richardsonii*”); e-f. Jordanhill and the Granatelv (ssp. *arctica*); g. Ella Ø, Kap Oswald (*B. intermedia*); h. Churchill (*B. novae-angliae* var. *interior*); i. Table Mt., Newfoundland (*B. novae-angliae* ssp. *abbei*); j. Søndre Strømfjord (*B. novae-angliae* var. *interior* f. *capitata*); k. The same place, cultivated material; l. var. *novae-angliae* from Willoughby Mts.; m. Unnamed dwarf race from Emerald Lake, Selkirk. — Scale: 50 μ divided into 5 parts on 10 μ .

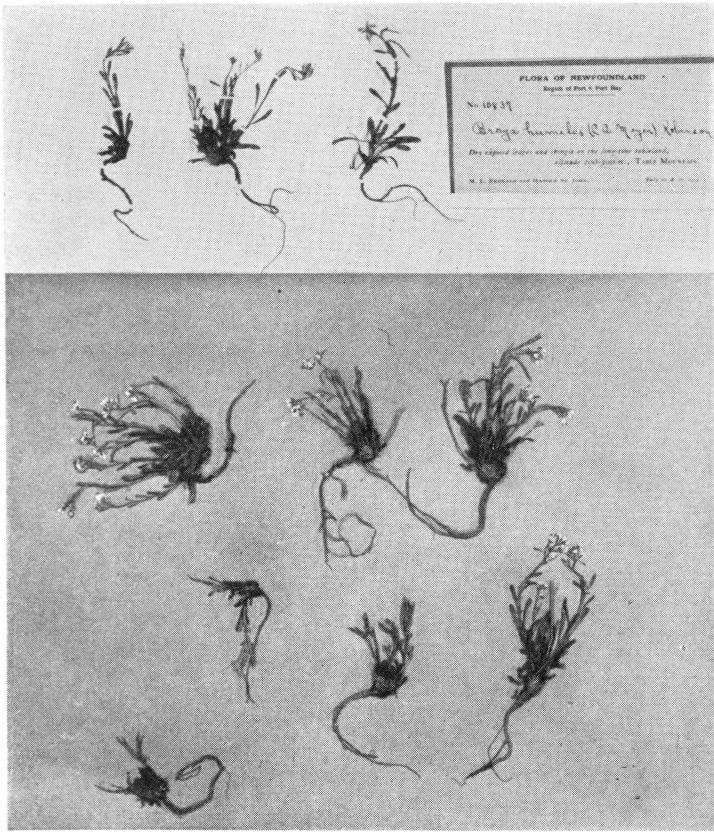


Fig. 3. *Braya novae-angliae* ssp. *abbei* (*B. humilis* race No. 4, ABBE 1948). Type collection from Table Mountain, Newfoundland. M. L. Fernald & Harold St. John 18—17 July 1914, see diagnosis on p. 21.

particularly great, so it is natural to operate with varieties. In one case, however, the differences seem to be so small that it would seem more appropriate to talk about a form, and in another case—ABBE's Race 4 from Newfoundland—the distance from the other units is so great that we should no doubt consider this plant a subspecies.

Referring to the systematic survey on pp. 18—21 I thus find it reasonable to set up the tender Newfoundland plant (fig. 3) as a new subspecies, which I term *abbei* after Dr. ERNST ABBE, who was the first to describe it in detail. Unfortunately I have not seen material of the *B. humilis* ssp. *ventosa* from Colorado described by ROLLINS, but ROLLINS mentions that it is most closely related to the Newfoundland plant. Thus there is a possibility that the latter may be conceived as a variety of ssp. *ventosa*, but the pollen size corresponds to that of *B. novae-angliae* (longest diameter 25—30 μ ; see fig. 2i), while the pollen of the 64-

chromosomed ssp. *ventosa* according to ROLLINS has a longest diameter of about 37 μ . Therefore it is probably most correct to consider the Newfoundland plant an independent subspecies attached to *B. novae-angliae*. I cannot, of course, decide whether such an attachment should also be ascribed to ssp. *ventosa*. Perhaps it should be considered a species.

The other races mentioned by ABBE may all come under *Braya novae-angliae* ssp. *novae-angliae*, which in the survey on p. 18 it is proposed to extend so that all long- and narrow-styled forms with more or less capitate, not or slightly bilobate stigmata are included. The almost glabrous, very narrow-styled Vermont type will be var. *novae-angliae*, the Anticosti Island type with its short pedicels and mostly pinnately lobate or clearly dentate leaves, it is suggested to term var. *laurentiana*, while it is suggested to term the other races from the inland and the continental area at Søndre Strømfjord in West Greenland var. *interior*. The last-mentioned type varies not a little, and it seems evident that the Greenland population differs in several respects from most Canadian forms, sufficiently to make it allowable to term it a special form, which because of the pronounced inspissation of the stigma may suitably be termed f. *capitata*.

Braya novae-angliae has an interesting distribution, which may be characterized as subarctic-continental. Ssp. *abbei*, var. *novae-angliae* and var. *laurentiana* approach very closely to the Atlantic area. Ssp. *interior* will get a wide distribution from Alberta and Ontario in the south to Great Bear Lake and Søndre Strømfjord in the north; according to A. E. PORSILD 1955 still farther into the Mackenzie, Yukon areas, and possibly Alaska. This distribution is not, however, continuous. As a calciphilous species it is absent within the Canadian oligotrophic area (the Laurentian shield). Both ABBE 1948, BÖCHER 1950, and ROLLINS 1953 discuss the geographically highly isolated populations of the *B. humilis* complex. There are many features suggestive of a preglacial species the area of which has been broken up by the Glacial Ages and the part populations of which have been capable of developing into different taxa. The highly isolated occurrence in West Greenland (BÖCHER 1950, fig. 10), as viewed together with many similar isolations, may be interpreted as the result of survival during the last Glacial Age, but there is also a possibility which I have discussed with Dr. JOHS. IVERSEN, that var. *interior* and others with a similar distribution in the Post-glacial Age after the last Glacial Age had a more continuous distribution, which later was split up because of the soil development unprofitable to the species. It is remarkable that in an area of Archean rock like the region around Søndre Strømfjord there are today a great many basic soils, a fact which is connected with the special continental ice-margin climate there (BÖCHER 1949, 1954). In the Postglacial Age there

may therefore have been similar conditions also in many places in Canada, even within the Laurentian shield.

Cultivation experiments with *B. novae-angliae*. The Greenland race (f. *capitata*) was cultivated in Copenhagen from two stations at the head of Søndre Strømfjord. The material originated from seeds (cf. fig. 7 in BÖCHER 1950). The plants grew to be 9—13 cm tall, lower than many of the plants collected in Greenland, but otherwise their appearance was quite typical: the characters of the silique (fig. 5c-d) and of the rosette leaves and the reddish colour were retained in culture. The race has been sown in three different years and in all cases it did not flower in the first year of cultivation, whereas the flowering was rich in the second year, after which the plants died. However, it appears from herbarium material from Greenland that the species at least there may flower in two successive summers. Undoubtedly the f. *capitata* is very frequently pauciennial. Basal flowers were never observed as in *B. intermedia* and *B. humilis* ssp. *arctica*. A culture of the former from Ella Ø during the first season just succeeded in forming such flowers from the base (cf. SØRENSEN 1941, fig. 11), but then the following year shot up with a lengthened inflorescence. Both this culture and KH 197 from Ella Ø had very ciliate basal leaf stalks, but the basal leaves in contrast to those of *B. novae-angliae* became much more dentate or sinuate-lobate, thus approaching to *B. humilis*.

4. THE NORTHEAST GREENLAND MATERIAL

In my paper of 1950 this was referred by me to a special subspecies *arctica* of *B. humilis*. Later SØRENSEN (1954) has called attention to the fact that in East Greenland there is another species, *B. intermedia*, which as regards several characters is intermediate between *B. humilis* and *B. linearis*, but which also has certain characters that approach it to *B. purpurascens*. Its deviating and high chromosome number, $2n = 70$, shows that it is out of the question that it should be a simple hybrid of the two species.

As appears from Table 1, I have been able to corroborate the number $2n = 70$ in material from Ella Ø collected by K. HOLMEN. In culture tender plants often occur with basal flowers and with a tendency towards perennity (a few plants have lived for four years). The cultivated plants resembled the sheets in the herbarium which are available and which all show a comparatively tender plant.

Another material collected by K. HOLMEN at Revet (20.8.49) had $2n = 42$, i. e. the same chromosome number as *B. humilis* and *linearis*, the latter also having this number (BÖCHER & LARSEN 1950 in material from West Greenland, JØRGENSEN, SØRENSEN & WESTERGAARD according to SØRENSEN 1954 in material from East Greenland). This material came from plants which were neither typical *B. linearis* nor typical East Greenland *B. humilis*, but resembled the latter most (see description p. 26 and Plate 2). The cultivated plants died before coming into flower, but the rosettes looked like those of *B. intermedia*. The seed fertility of the starting material was reduced. Each valve of the siliques often contained one to three abortive or shrunken seeds, and the amount of germinating seeds was low in proportion to the quantity sown. It is still somewhat doubtful whether the plants in question actually represent the hybrid *B. linearis* × *humilis*, but we are faced with a plant which might be a starting point at the development of *B. intermedia*. The characters of the silique and style are indicative of this (fig. 7 d-e, p-s). The siliques in *B. linearis* in typical material from West Greenland, where no crossing with *B. humilis* is possible, are at most 12 mm in length (very rarely 14 mm) with a short thin style and usually collected

in a head-like inflorescence. However, from East Greenland collections are available apart from those of HOLMEN's from Revet which point towards introgression in *B. linearis* of genes from *B. humilis*. Especially interesting in that respect is one of TH. SØRENSEN's collections from Ella Ø (No. 3578), in which the inflorescence is lengthened and the siliques up to 17 mm in length, only slightly torulose. Three of the plants in his No. 3556 a as well are hardly pure *B. linearis*, but have presumably silique-lengthening properties from *B. humilis*, the siliques often reaching a length of 15 mm.

If a hybrid between *B. linearis* and *humilis* with $2n = 42$ forms an unreduced gamete and this is fertilized by a reduced gamete of *B. purpurascens* ($2n = 56$, according to HOLMEN 1952, p. 14), the result may be a plant with $2n = 70$, i. e. the number of *B. intermedia*. Just in that species the seed fertility is still poorer than in the presumed *B. linearis-humilis* hybrid, a circumstance which might tally with the fact that simple amphidiploidy at the formation of *B. intermedia* is out of the question.

If *B. intermedia* is a triple hybrid, plants may also be imagined to occur as intermediate between *B. linearis* and *B. purpurascens* (and between *B. humilis* and *B. purpurascens*). But in the case of combinations in the form of hybrids between these species, the pairing between the 49 chromosomes will give difficulties. It is not, however, inconceivable that an unreduced gamete with 42 chromosomes of *B. linearis* or *B. humilis* accidentally might be united with a normal *B. purpurascens* gamete and form a hybrid with $2n = 70$, which was fertile as the conditions of pairing in an amphidiploid of this kind might be assumed to be rather favourable. This is, of course, speculation, but it is a fact that there are morphologically intermediate forms between *B. linearis* and *B. purpurascens* where these plants meet, e. g. in West Greenland, where such plants have been collected by M. P. PORSILD in the area somewhat north of lat. 71° N. This material may according to Professor TH. SØRENSEN's determinations in the Botanical Museum in Copenhagen be referred to the controversial species *B. glabella* Richards (fig. 8f, g), which according to GELTING (1934, p. 58) and ABBE (1948 p. 9) falls in the *B. purpurascens* complex more nearly than it does in the *B. linearis* group. The characters of the silique decidedly point towards long-styled forms of *B. purpurascens* (fig. 8d); thus also the large seeds (up to 15 mm in length); while the habit reminds of *B. linearis*. Very similar to this material is a collection from East Greenland (Kap Oswald, Th. Sørensen No. 3577d), which by the collector has been determined as a hybrid into which *B. purpurascens* enters. This material as well might perhaps be referred to *B. glabella* (see fig. 8e).

In this connexion mention may also be made of another very critical material from Great Bear Lake (A. E. & R. T. Porsild 5177, C and S). Of this material I have seen 11 fruit-bearing, 5—9 cm tall plants, mostly with one to a few stems. A. E. PORSILD (1955) refers it to ssp. *arctica* of *B. humilis*, but in several respects they resemble *B. intermedia*. Some plants with narrow siliques up to 15 mm in length resemble *B. linearis* somewhat, while others with short, broad siliques with clearly biseriate seeds and an upwards tapering style approach to *B. purpurascens*. The often bilobate stigma (fig. 7n-o) resembles that of certain races of *B. purpurascens* (fig. 8b) or *B. humilis* ssp. *arctica*, and the lengthened inflorescence reminds of *B. humilis*. Perhaps it is a fertile hybrid between *B. humilis* and *B. purpurascens* likewise with $2n = 70$.

All this indicates that *B. humilis* is rather closely related to *B. linearis* and other *Braya* species. Very weighty arguments are therefore needed if *B. humilis* should be referred to a special genus (subsidiarily *Torularia*). The characters perigynous (*Braya*) and epigynous (*Torularia*), to which SØRENSEN rightly attaches importance, are probably the only usable basis of a distinction between the genera, as *B. novae-angliae* may have at least just as thin leaves as *B. humilis*. The latter, however, varies as regards the expansion of the torus, and the perigyny in the *Braya* species is not always equally distinct, to which should be added that the above-mentioned intermediary forms between *B. humilis* and *linearis* are intermediary also as regards the torus form (see fig. 7). In my judgment it is not, therefore, necessary or practical to distinguish between two genera, which does not, however, weaken the value of the torus characters. It seems most natural to refer forms which were hitherto referred to the same species, to the same genus. An important argument in favour of this is the position of the seeds in the siliques. *Torularia* has always been distinguished from *Braya* by the former having uniseriate, the latter biseriate seeds attributed to it. SØRENSEN does not attach any importance to this distinction, as he maintains that both *B. linearis*, *B. intermedia*, and *B. humilis* ("Torularia") have uniseriate seeds. But this is only in part correct. *B. novae-angliae* has quite uniseriate seeds, fig. 4a (and thus on this point is the best *Torularia*), *B. linearis* has often subbiseriate seeds and the same highly applies to *B. intermedia* (fig. 4c). In *B. humilis* ssp. *arctica* the seeds are often placed somewhat zig-zag, thus approaching to the subbiseriate position, and in the presumed hybrid *B. linearis* × *humilis* this is very distinct (fig. 4b).

It may be asked from where *B. novae-angliae* and *B. humilis* have got the character of having uniseriate seeds. Perhaps it has made its appearance by crossing at an early stage between a *Braya* and a genus

within the *Sisymbrieae* with uniseriate seeds. Considering our experiences from *Nasturtium* this would not at all be inconceivable. HOWARD & MANTON (1946) suppose that the allotetraploid species *Nasturtium uniseriatum* has one genome from the genus *Cardamine*, which has uniseriate seeds, and another from *Nasturtium*, which generally has biseriate seeds.

All things considered, I must conclude that it is most justifiable and practical to extend the genus *Braya* so that it can partly contain

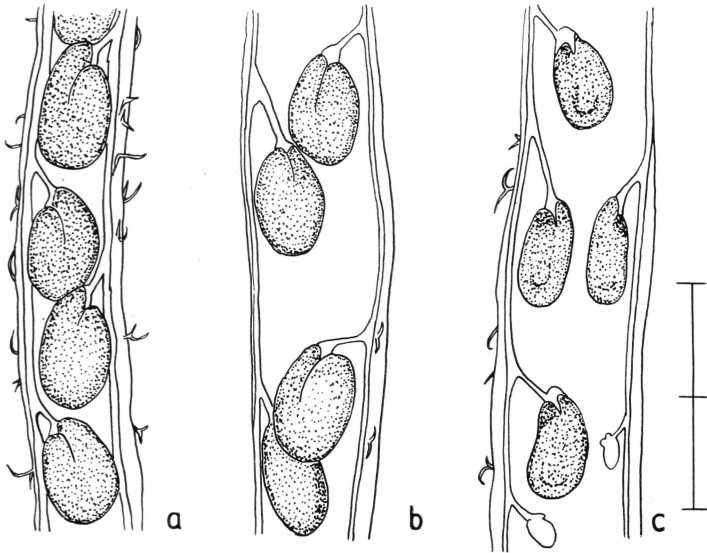


Fig. 4. Position of seeds in the middle part of siliques of a. *Braya novae-angliae* var. *interior* from Søndre Strømfjord; b. The presumed hybrid *B. linearis* × *humilis* from Revet in Northeast Greenland; c. *B. intermedia* from Ella Ø in Northeast Greenland. Scale: 2 mm.

species with purely uniseriate seeds (*B. novae-angliae*), partly species with epigynous flowers (*B. humilis*).

SØRENSEN (1954) is of opinion that there is no reason to maintain a ssp. *arctica*, as he does not find sufficient differences between the Northeast Greenland and the Asiatic material, which i. a. includes the type of *B. humilis*. I cannot share this view, as I am still of opinion that the Asiatic *B. humilis* is much tenderer, suggesting a lower chromosome number, an idea which has recently been supported by ROLLINS *loc. cit.* p. 112, who in material from Southwestern Kansu found pollen with a longest diameter of 26.7μ , while pollen of ssp. *arctica* measured about 31.6μ . I have examined pollen in material from Asia (Russ. orient. Ledebour. Herb. Hornemann, C), which probably is very similar to the type of *B. humilis*, and found pollen with a longest diameter of

17—23 μ . Even much smaller pollen was found in material from Irkutsk (C), viz. with a diameter of 13—16 μ , while the pollen in plants from Pamir (C) measured 21—23 μ . Two samples of ssp. *arctica* both had larger pollen, viz. 22—28 μ (Jordanhill) and 23—30 μ (Granatelv); cf. fig. 2a-f.

It is no small number of macroscopical characters which distinguishes the typical *B. humilis* from Asia from ssp. *arctica*. Most important are the differences in size in flowers, siliques, styles, and pedicels, to which should be added the stigma, which never, in the Asiatic material, is expanded to two large lobes, while this is often the case in ssp. *arctica*. SØRENSEN writes that the stigmata of the Clavering Ø plants are moderately bilobate-capitate; but it would be more adequate to state that they are pronouncedly bilobate-capitate, while in other material, e. g. the type specimen from Ymers Ø, they are moderately capitate (fig. 6a) or not capitate (fig. 8b in BÖCHER 1950).

For these reasons I think that the ssp. *arctica* should be retained. Besides, it is clearly geographically separated from the Asiatic form cycle and according to A. E. PORSILD (1955) is distributed from North Greenland by way of the Arctic archipelago to the Mackenzie river delta, from where I have seen material collected in the North of Richards Island (A. E. & R. T. Porsild No. 2235), about which I may corroborate that it must belong to ssp. *arctica*: cf. fig. 7k-l.

A study of the type material of *B. humilis*, which originates from Central Asia, is of course of importance for the judgment of ssp. *arctica*. A photograph of it is seen in Plate I. On the sheet on the right there is a drawing of the silique taken from LEDEBOUR (1830, Plate 47). The style is rather short and expands a little into a stigma which is not bilobate. The photograph shows that this is a general feature. All the five collections from Asia in the museum of Copenhagen have correspondingly short styles and no capitate-bilobate stigma. Furthermore, they have all of them smaller flowers than the East Greenland plants.

A. E. PORSILD (1955) also discusses *Braya richardsonii* (Rydb.) Fern., which by O. E. SCHULTZ (1924) is not appreciated as an independent species. According to RYDBERG (1907) it is amongst other things distinguished by dense and very short pubescence and by the fact that the stems are decumbent at the base. I have seen a specimen from Kluane Lake in Yukon which has been referred to this type by M. P. and R. T. PORSILD, and I must admit that it is no doubt a question of an independent taxon. Because of the short style and coarse structure it is best referred to ssp. *arctica* either as a variety under the latter, but rather as a parallel subspecies. Other collections, in habit and as regards pollen and pubescence, are not essentially different from certain Asiatic forms of the typical *B. humilis*; but the stalks of the basal leaves

are densely set with undivided marginal hairs, which is not the case of typical *B. humilis* or of *ssp. arctica*, which are both without such hairs or have only small numbers of them.

Finally there is reason to mention a plant which O. E. SCHULZ (1934, p. 330) terms *Torularia humilis* prol. *venusta* Schulz. It was found in Yunnan in China on rocky banks at an altitude of 3400 m. As in the case of *ssp. ventosa* Rollins it is a question of a low mountain plant 3—7 cm in height; but its flowers are very large with 3 mm long sepals and 6—7 mm long petals. Unfortunately the diagnosis does not include any statement about the siliques or the style. Therefore it is not possible to judge the affinities of this plant. As the material is Asiatic, there is, however, a greater possibility that it should be referred to *B. humilis* than that it should be referred to *B. novae-angliae*.

5. SYNOPSIS

Below is found a more detailed description with emendations of the taxa discussed above, and diagnoses of all new taxa. Furthermore, an enumeration of the plants examined.

1. *Braya novae-angliae* (Rydb.) Th. Sør.

5—25 (30) cm high, branched from the base with erect branches. Rosette leaves narrow, oblong spatulate, entire or remotely dentate, more rarely pinnately lobate, slightly pubescent to glabrous with scattered marginal hairs on the stalks. The whole plant often intensely reddish, more rarely purely green. Sepals 2—3 mm, petals 3—4 (5) mm. Siliques mostly straight and torulose, up to 25 mm in length and 0.6—1 mm thick. Pedicels of lowermost fruits 2—7 mm long, 0.4—0.5 mm broad. Torus clearly expanded. Valves of the silique with 1(—3) nerve(s), ending above in a narrowly rounded-off tip. The silique evenly tapering towards the style, which is long and rather thin (0.8—1.3 mm long, 0.2—0.4 mm thick) and ends in a more or less capitate stigma, which is not or only slightly bilobate. Chromosome number (var. *interior* f. *capitata*) $2n = 56$. Widely distributed although scattered in the sub-arctic area of North America and in the lowlands around Søndre Strømfjord, West Greenland. For the type see var. *novae-angliae*.

1A. ssp. *novae-angliae*. Often more than 10 cm tall; with a thin style and more or less capitate stigma.

- a. var. *novae-angliae* (Syn.: *B. humilis* var. *leiocarpa* (Trautv.) Fern., see FERNALD in *Rhodora* 39, 1937). Green, gracile, 8—12(—18) cm tall with almost completely glabrous siliques, which are only 0.7—0.8 mm thick, the styles very thin (0.2—0.25 mm thick), stigma capitate, 0.4—0.6 mm broad. Pedicels of lowermost fruit 3—4(—7) mm. Basal leaves oblong spatulate-linear with few (mostly only two) teeth. Vermont, Willoughby Mts. Type: Willoughby Mountain, July 1887 Edwin Faxon, according to RYDBERG 1907, p. 159 (note), preserved in the Columbia University

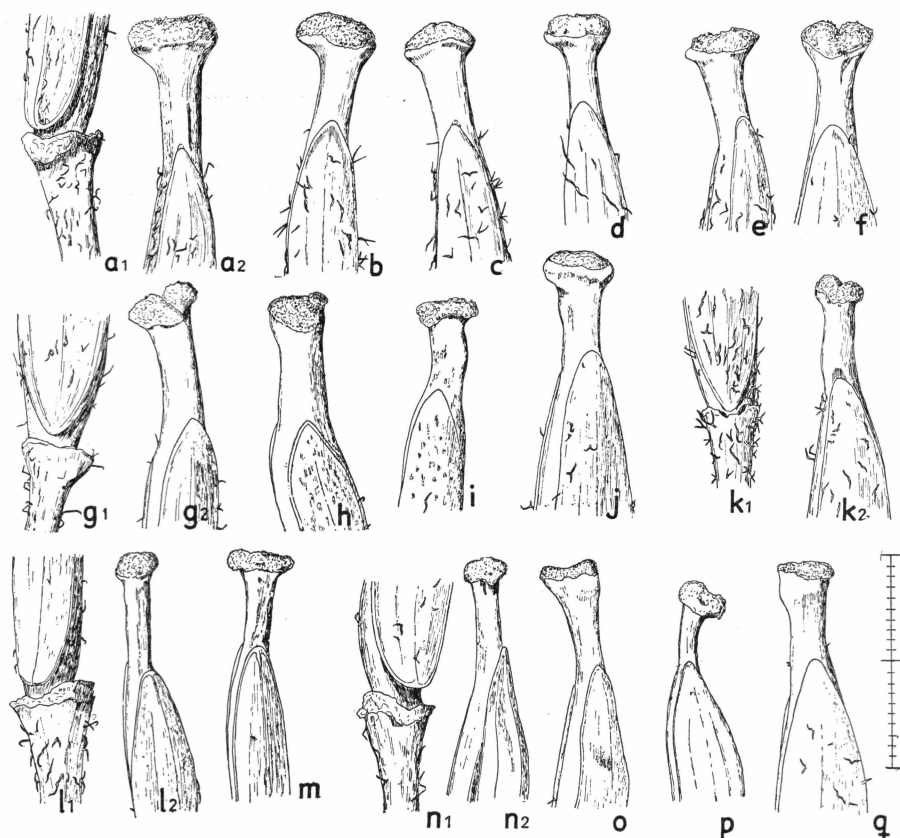


Fig. 5. Lower part of silique with torus and upper part with style and stigma of *Braya novae-angliae*: a-j. var. *interior* (a-f. f. *capitata*), k. and q.: var. *laurentiana*, l-p. var. *novae-angliae*. — a. Vandfaldskløften, Søndre Strømfjord (Böcher 490, type of f. *capitata*); b-e. Loc. 3 Søndre Strømfjord (Böcher 488 (b), 491 (e), Cult. No. 853 (c-d), c. Original material from Greenland, d. Cultivated in Denmark from the same locality); f. Itivdleq, head of the fjord near Itivdlínguaq (M. P. Porsild 1926); g-h. Churchill, Gillett No. 2242 (type of var. *interior*); i. Great Bear Lake (A. E. & R. T. Porsild 5039); j. Alberta, above Lake Louise (Ostenfeld 513); k. the Jupiter river, Anticosti Island (Marie-Victorin & Rolland Germain 24,850, type of var. *laurentiana*); l-m. Willoughby collect. of George G. Kennedy (1892); n-p. Willoughby cliffs (Charles E. Faxon 22.6.1884); q. the Jupiter river, Anticosti Island (Macoun 1883). — Scale: 2 mm divided into tenths.

Herbarium. — Illustrations ABBE 1948, Plate 1088, fig. 1. The present paper Plate 3 and fig. 5, l-p.

Material studied: Willoughby collection of George G. Kennedy 21.6.1892 (G and C); Ledges at Willoughby Lake (I. R. Churchill 5.6.1895, G); Willoughby Cliffs (Charles E. Faxon 22.6.1884, G).

b. var. *laurentiana* n. var. *Saepe rubella*, *validior*, 10—30 cm *alta*, *pedicellis brevibus*. *Folia basalia saepe pinnatiloba vel dentibus*

magnis suboppositis ornata, fere glabra, petiolis tamen saepe margine pilosis. Siliquae modice pubescentes, 0.7—1.0 mm latae; styli 0.3—0.4 mm crassi; stigmata ± capitata, 0.4—0.6 mm lata. Pedicelli fructuum infimorum 2—4 mm longi.

Often reddish, rather coarse, 10—30 cm tall, with short pedicels, the basal leaves often pinnately lobate or with several pairs of large teeth, glabrate, but often with marginal hairs on the stalk. Siliques moderately pubescent, 0.7—1.0 mm broad, style 0.3—0.4 mm thick, stigma more or less capitate, 0.4—0.6 mm broad, pedicels of lowermost fruits 2—4 mm. Anticosti Island in the St. Lawrence estuary. Type: The Jupiter river, Marie-Victorin & Rolland Germain No. 24,850. 1926. — Illustrations ABBE 1948, Plate 1088, fig. 4, the present paper fig. 5, k, q.

Material studied: The Jupiter river (Macoun 1883 (C), Marie-Victorin & Rolland Germain 8.8.1926, S, Rivière Maliote (J. Rousseau 52, 377, S), Rivière du Brick (Marie-Victorin & Rolland-Germain 1927, S).

- c. var. *interior* n. var. *Saepe rubella*, 5—30 cm alta, validior, pedicellis mediae longitudinis. Folia basalia oblonge spatulata, integra vel dentibus perpaucis ornata, fere glabra, petiolis pilos marginales remotissimos gerentibus. Siliquae modice pubescentes, 0.7—1.0 mm latae; styli 0.3—0.4 mm crassi; stigmata 0.5—0.6(—0.8) mm lata, interdum capitata. Pedicelli fructuum infimorum 3—6 mm longi.

Often reddish, 5—30 cm tall, rather coarse, with medium long pedicels, and oblong spatulate, entire or very slightly dentate basal leaves, glabrate with much scattered marginal leaves on the stalk. Siliques moderately pubescent 0.7—1.0 mm broad, style 0.3—0.4 mm broad, stigma 0.5—0.8 mm broad and often capitate. Pedicels of lowermost fruit 3—6 mm long. — Inland at Søndre Strømfjord, West Greenland, Ontario, Manitoba, Alberta, Northwest Territories. — Type: Fort Churchill, Manitoba 27.7.1948 Gillett 2242. — Illustrations ABBE 1948, Plate 1088, figs. 2—3. BÖCHER 1950, fig. 8a and Plate 5. The present paper, fig. 5a-j and Plate 4.

Material studied: Churchill, Manitoba (I. M. Gillett 2242, C and S), Gillam, Churchill district, Manitoba (W. B. Schofield 1950, young plants hardly different from Gillett's plants, C), Alberta, above Lake Louise (C. H. Ostenfeld 513, C), Great Bear Lake, Mouth of the Haldane river 66°49' (A. E. & R. T. Porsild 5039, C).

f. *capitata* n. f. *A f. interiore differt stigmatibus argute capitatis, ad 0.8 mm lato.*

Distinct by the stigma being pronouncedly capitate, up to 0.8 mm broad. Here belongs the West Greenland material. The material from Alberta (Ostenfeld 513) is closely related to f. *capitata*. —

Type: Vandfaldskløften, Søndre Strømfjord. T. W. Böcher No. 490 21.8.1946 (C). — Illustrations Plate 4 and fig. 5a-f.

Material studied: Type material, see above; furthermore the author's own collections, 6 sheets in all (C), from Søndre Strømfjord mentioned in BÖCHER 1950, pp. 28—29 (with remarks on ecology). Itivdlinguaq 66°29' M. P. & A. E. Porsild 4.8.1914, C), Itivdleq 66°29' near Itivdlinguaq (M. P. Porsild 6.7.1926, C). Nákajanga, Umivít (I. A. D. Jensen 5.8.1884, C), the river debouching into the southern arm of Søndre Strømfjord (I. A. D. Jensen 6.8.1884, C), clay flats at the northern arm of Søndre Strømfjord (I. A. D. Jensen 15.8.1884, C).

- 1B. subsp. *abbei* n. subsp. *Tenuis*, 3—6 cm alta, a basi ramosa, ramis, adscendentibus vel erectis. Folia basalia spatulata, ± remote dentata glabra, petiolis pilos marginales remotos gerentibus. Caules foliaque caulina remote piligera. Pedicelli siliquarum inferiorum 1—2 mm longi. Sepala 2.5 mm longa; petala 3—4.5 mm longa, rosea; antherae ca. 0.4 mm longae, filamentis 2.5—3 mm longis suffultae. Siliquae 10—15 mm longae, 0.8—0.9 mm latae, modice pubescentes; valvae ad apicem versus attenuatae, apice rotundatae. Stylus longus (0.6—1.0 mm) et crassus (0.5 mm), ad stigma non bilobo-capitatum versus sensim incrassatus.

Tender, 3—6 cm tall plant branched from the base, with ascending-erect branches and spatulate, more or less distantly dentate, glabrous basal leaves, the petioles of which have scattered marginal hairs. Stems and stem leaves with scattered pubescence. Pedicels of lower siliques 1—2 mm. Sepals 2.5 mm, petals 3—4.5 mm long, pink, filament 2.5—3 mm with an about 0.4 mm long anther. Siliques 10—15 mm long, 0.8—0.9 mm broad, moderately pubescent. Valves of the silique evenly tapering above, finally rounded-off. Style long and broad (0.6—1.0 mm long and 0.5 mm broad) increasing evenly in breadth towards the stigma, which is not capitate-bilobate. — Table Mountain, Newfoundland. — Illustrations ABBE 1948, Plate 1088, figs. 3 and 5. The present paper, figs. 3 and 6g-h. Type: Fernald & St. John No. 10,837, 16.—17.7. 1914, fig. 3.

Material studied: Table Mountain, Newfoundland (M. L. Fernald & H. St. John 10,837, C and G). Furthermore to be found in U.S. National Herb., Philadelphia Acad. of Nat. Sc. Herb., National Herb. of Canada.

- 1C. ssp. *ventosa* Rollins. See discussion on p. 9.

Besides ssp. *ventosa* there are perhaps other low mountain races which may be referred to *B. novae-angliae*, or which belong to a species of their own. I am thinking of material from Selkirk (Emerald Lake, 4300 m altitude; Charles H. Shaw & H. Petersen

1904, S); this material was deviating as regards the form of the pollen grains (see fig. 2 m).

2. *Braya humilis* (C. A. Meyer) B. L. Robinson sensu strictu (Syn.: *Torularia humilis* (C. A. Meyer) O. E. Schultz).

5—20 cm tall, branched from the base with erect (in certain plants ascending) branches. The rosette leaves oblong spatulate or sinuately dentate, densely hairy, with or without simple marginal hairs on the petioles. Sepals hairy, 1.6—2.5 mm, petals 2.8—4(5) mm (up to 7 mm if prol. *venusta* is included as a subspecies). Siliques straight or curved, not or little torulose, up to 20 mm long, mostly only 15 mm, 0.8—1.3 mm broad, glabrescent-pubescent. Pedicels of lowermost siliques 2—5 mm. Torus mostly not or slightly expanded. Valves of the silique broadly rounded-off. The silique tapers rather quickly into a short style (0.2—0.5 mm long, rarely a little longer, 0.3—0.5 mm broad). The stigma may be of the same breadth as the style and not or slightly bilobate or extended into a large bilobate disc which is 0.5—1.1 mm broad. Chromosome number (ssp. *arctica*) $2n = 42$. Asia, North America, North and Northeast Greenland. For the type see ssp. *humilis*.

- 2A. ssp. *humilis* (Syn.: *Sisymbrium humile* Ledeb.). Often rather tender and with small pollen grains. The siliques 0.6—0.8 mm broad and up to 20 mm long. The styles 0.3—0.4 mm broad, 0.4—0.75 mm long, mostly slightly expanded below the stigma, which is undivided or divided into two small lobes, which, however, do not expand so that the stigma becomes capitate. Sepals 1.6—1.8(—2.0) mm long, petals 2.8—3.5 mm, white to pale violet. Pedicels 0.3—0.4(—0.5) mm broad, up to 4 mm long. In Asia, perhaps also in North America. — See type in Plate 1. — Illustrations LEDEBOUR 1830, Plate 147, SCHULZ 1924, fig. 45 M-U, BUSCH 1931, p. 591, the present paper, Plate 1 and fig. 6 a-f. Varies with regard to degree of pubescence and the dentation of the leaves. The material from Tunzham (fig. 6 e-f) deviates by the valves of the silique not being broadly rounded-off, while the material from Pamir (fig. 6 c) deviates by having distinct marginal hairs on the basal leaves. The Irkutsk material has particularly small pollen grains (fig. 2 a).

Material studied: In arenosis ad flum. Irkutsk (Herb. Hornemann, C), Baical (C), e Russ. orient. (Ledeb., Herb. Hornemann, C), In arenosis prope Tunzham (1830, C), In alveo arido ad fl. Kara Su. Pamir Alt. 3800 m (Ove Paulsen 755, 12.7.1898, determ. Lipsky, C).

- 2B. ssp. *arctica* (Böch.) Rollins (Syn.: *Torularia humilis* ssp. *arctica* Böch.). Coarser and with larger pollen grains. 0.8—1.1 mm broad,

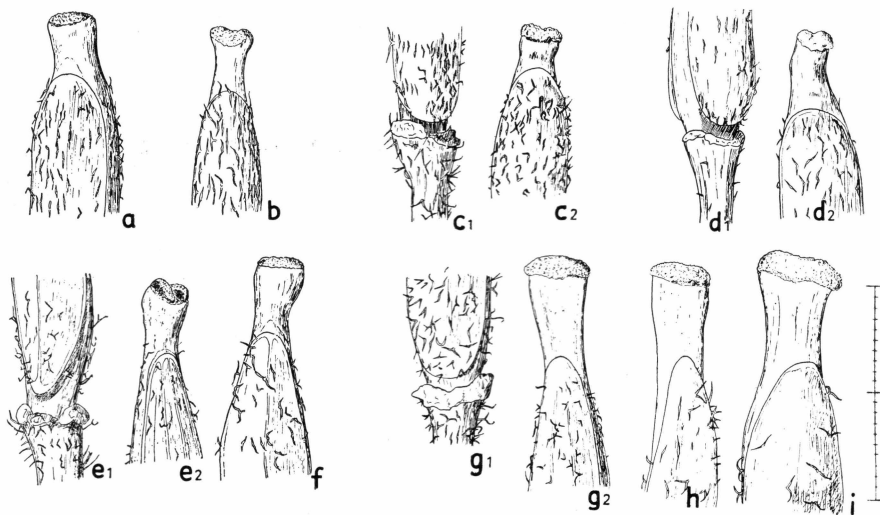


Fig. 6. Lower part of silique with torus and upper part with style and stigma of *Braya humilis* ssp. *humilis* (a-f) and *B. novae-angliae* ssp. *abbei* (g-h). — a. Russ. orient. Ledebour; b. fl. Ircutsk; c. Kara Su, Pamir; d. Baical; e-f. prope Tunzam; g-i. Table Mountain, Newfoundland (Fernald & St. John 10,837; type of ssp. *abbei*). — Scale: 2 mm divided into tenths.

up to 20 mm long siliques, which bear short styles. The styles mostly 0.5 mm broad and 0.3—0.4(—0.6) mm long with a stigma which is undivided or sometimes divided into two broad lobes so that the surface of the stigma becomes up to 1.1 mm broad. Sepals 2—2.5 mm, petals (3—)3.5—4.0(—4.5) mm long, mostly pale mauve-pink. Pedicels 0.5—0.6 mm broad and up to 4 mm long. Seeds uniseriate(-subbiseriate). — North and Northeast Greenland, Arctic North America. — Type: The large plant on Plate 4 in BÖCHER 1950 (the others on the same plate with the exception of the two plants below on the right, which according to SØRENSEN 1954 belong to *B. intermedia*, are also ssp. *arctica*). — Illustrations besides those on the plate mentioned also BÖCHER 1950, fig. 8b, and fig. 7a-c, f-h, k-l in the present paper.

f. biloba n. f. A *f. arctica* differt stigmatē argute bilobo-capitato, 0.7—1.1 mm lato.

Deviates by having pronouncedly bilobate-capitate stigma, 0.7—1.1 mm broad. Clavering Ø and several other places in East Greenland. — Type: Clavering Ø. Th. Sørensen No. 4231 (C), fig. 7b-c.

Material studied: The Northeast Greenland material (C) is mentioned in SØRENSEN (1933) and GELTING (1934), the North Greenland station, legit K. Holmen, is mentioned in more detail in BÖCHER (1950). For material redetermined to *B. intermedia* see SØRENSEN (1954). In all there are 23 sheets

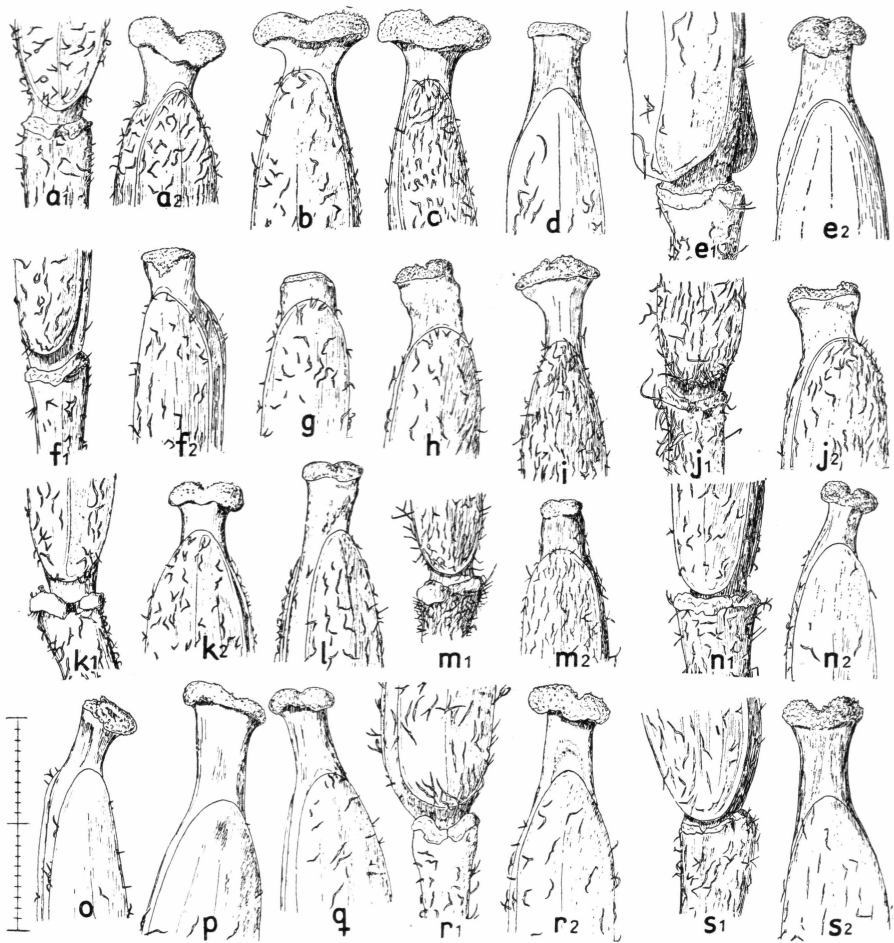


Fig. 7. Lower part of silique with torus and upper part with style and stigma of *Braya humilis* ssp. *arctica* (a-c, f-h, k-l; b-c f. *biloba*), *B. linearis* × *humilis* (d-e), “*B. richardsonii*” (i-j coarse race, which approaches to ssp. *arctica*, m tender race, which approaches to ssp. *humilis*), *B. intermedia* (p-s), and a critical plant which may perhaps be *B. humilis* × *purpurascens* (n-o). — a. Ymers Ø, Duséns Fjord (Tulinus 1933, type of ssp. *arctica*, silique with moderately bilobate-capitate stigma); b. Strindbergs Land (Th. Sørensen No. 3565); c. Clavering Ø (Th. Sørensen No. 4231, type of f. *biloba*); d-e. Revet (K. Holmen 20 August 1949); f. Ulvedal, Ella Ø (Th. Sørensen 3575 a); g. Solitærbugt, Ella Ø (Th. Sørensen 3576 a); h. Ymers Ø, Karl Jakobsens Bugt (Th. Sørensen 3574 b); i-j. Kluane Lake, Yukon (M. P. & R. T. Porsild No. 135); k-l. The Mackenzie river delta (A. E. & R. T. Porsild 2235); m. The Mackenzie river, foot of Bear Rock (A. E. Porsild 16,710); n-o. Great Bear Lake, McTavish Arm (A. E. & R. T. Porsild 5177); p. Ella Ø, Kap Elisabeth (Th. Sørensen 4229); q. Material cultivated in Denmark, origin Ella Ø, East Greenland; r. Ella Ø, Kap Oswald (Th. Sørensen 3577 e); s. Hudson Land (Seidenfaden 196). — Scale: 2 mm divided into tenths.

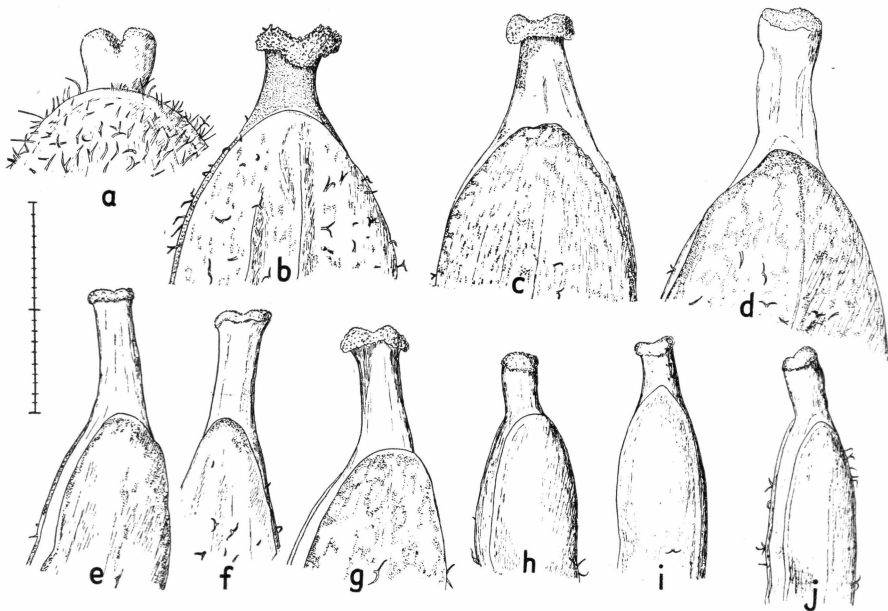


Fig. 8. Upper part of silique with style and stigma of the other species of *Braya* occurring in Greenland. a. *B. thorild wulfii* (Gunnar Anderssons Dal, North Greenland 82°28', 11.7.1917 Thorild Wulff, C); b. Short-styled form of *B. purpurascens* from Ekorgfat (Ikorfat), West Greenland (70°47', 2.8.1888 S. Hansen, C); c. *B. purpurascens* with medium long style from Hurry Inlet, East Greenland (C. Kruse No. 524, 3.8.1900, C); d. Long-styled *B. purpurascens* from Nordfjord, Strindbergs Land, East Greenland, 73°45' (Th. Sørensen No. 3566, C); e. *B. purpurascens* hybrid, perhaps *B. purpurascens* × *linearis* from Kap Oswald, Ella Ø, East Greenland (Th. Sørensen No. 3577 d); f. *B. glabella* (or *B. purpurascens* × *linearis*) from Ingnerit Fjord in West Greenland (71°3', 13.7.1929, M. P. and R. T. Porsild, C); g. The same from Qaumarujuk fjord in West Greenland, 71°07' (M. P. Porsild 27.7.1935, C); h. *B. linearis* from Store Saltø in West Greenland (Böcher 1946 No. 499, C); *B. linearis* from Kap Oswald, Ella Ø, East Greenland (Th. Sørensen No. 3559, C); j. *B. linearis* from Bardø in Norway, 68°45' (29.7.1891, A. Blytt, C). — Scale: 2 mm divided into tenths.

in C, of which material from Ella Ø (Th. Sørensen 3575 a, 3576, 3577 b, and c), Ymers Ø (Th. Sørensen 3574 b, 3560 (apart from one plant), Seidenfaden 401 a), Jordanhill, and Geologfjord (Seidenfaden 797, 799, 364) has no bilobate stigma, which occurs in the others. A particularly pronounced bilobate-capitate stigma is found in material from Clavering Ø (Th. Sørensen No. 4231 (Type of *f. biloba*), 5494, Seidenfaden 84), Ella Ø (Th. Sørensen 3564, 4228), Gauss Halvø (Th. Sørensen 5045), and Strindbergs Land (Th. Sørensen 3565).

North America: The Mackenzie river delta, North of Richards Island 69°30'—40' (A. E. & R. T. Porsild 2235, C and S).

?2C. As mentioned above, *B. richardsonii* (Rydb.) Fern. might perhaps be viewed as a third subspecies. A more detailed unravelment of

this problem, however, ought to be made from American quarters, where they have a richer material of the type mentioned at their disposal. See further the illustrations in fig. 7. Fig. 7i-j belong to a very coarse, many-branched plant with very arched, first decumbent stems. Its styles may be rather long and capitate. The other type, fig. 7m, is much tenderer and reminds of ssp. *humilis* (see especially fig. 6c).

Material studied: South end of Kluane Lake, Yukon, 2500 feet (M. P. & R. T. Porsild 135, C), the Mackenzie river, foot of Bear Rock below Norman. (A. E. Porsild 16,710, C and S), Bear Rock 1300 feet (A. E. & R. T. Porsild 3383, C and S).

?2D. SCHULZ's prol. *venusta* perhaps might be viewed as a fourth subspecies. See on this question p. 17.

3. *Braya linearis* × *humilis* (?).

Perennial, with a vigorous, 0.4—0.6 cm thick tap-root. Numerous branches ascending from the base or erect (in the specimens on Plate 2 about 13—15 cm long). The inflorescence not capitate. Siliques up to 15—20 mm long, 0.9—1.3 mm thick, glabrate, the seeds about 1 mm long, 10—15 in each cell, subbiseriate, often 1—3 abortive-shrunken seeds in each part of the silique. Stigma capitate, sometimes bilobate, style sturdy, 0.6—0.7 mm long and about 0.4—0.5 mm broad. Torus only slightly expanded, chromosome number $2n = 42$. — Illustrations Plate 2 and fig. 7d-e.

Material studied: Revet in Northeast Greenland (K. Holmen 20.8.1949, C). Somewhat similar plants previously collected on Ella Ø (Th. Sørensen No. 3578; see p. 13).

4. *Braya intermedia* Th. Sør.

The characters for this species are carefully indicated by SØRENSEN (1954), who also in his Plates 2—3 shows the habits of the plants. My fig. 7p-s show details of siliques, styles, and stigma. Fig. 4c shows that the seeds may be biseriate, but mostly they are subbiseriate. The species varies amongst other things as regards the expansion of the torus. In this respect it is, if anything, intermediary between *B. novae-angliae* or *B. linearis* and *B. humilis*. Type: Ella Ø, Kap Oswald, Northeast Greenland. Th. Sørensen No. 3556b (C). Illustrations: see above.

Material studied: 10 sheets from Northeast Greenland in C. (See Sørensen 1954, p. 16).

The above-mentioned population from Great Bear Lake (McTavish Arm, A. E. & R. T. Porsild 5177, C and S), which by PORSILD 1955 is referred to ssp. *arctica*, approaches to *B. intermedia* and deserves great attention, being possibly *B. humilis* × *purpurascens*.

6. KEY TO THE SPECIES, SUBSPECIES,
AND VARIETIES MENTIONED IN MORE DETAIL
IN THE PRESENT PAPER

- A. Siliques long and narrow with a long, thin style (up to 25 mm long and 0.7—1 mm broad, style about 1 mm long and 0.2—0.4 mm broad). Seeds uniseriate. Torus clearly expanded.
 - B. Siliques glabrous, style very thin (0.2—0.25 mm)
B. novae-angliae var. *novae-angliae*.
 - B. Siliques with scattered pubescence, style thicker.
 - C. Basal leaves often pinnately lobate or with coarse teeth, pedicels short *B. novae-angliae* var. *laurentiana*.
 - C. Basal leaves entire or with a few teeth, pedicels longer
B. novae-angliae var. *interior*.
- A. Siliques shorter (up to 20 mm long) with broader style.
 - D. Tender, 3—6 cm tall with up to 15 mm long, 0.8—0.9 mm broad siliques with a long, but broad style
B. novae-angliae ssp. *abbei*.
 - D. Up to 20 cm tall with up to 20 mm long siliques. Styles less than 1 mm long, 0.3—0.5 mm thick.
 - E. Styles short and rather thick, siliques 0.6—1.1 mm broad. Seeds uniseriate, torus hardly expanded.
 - F. Small flowers and pollen grains, siliques 0.6—0.8 mm broad, stigma never bilobate. . . *B. humilis* ssp. *humilis*.
 - F. Larger flowers and pollen grains, siliques 0.8—1.1 mm broad, stigma often bilobate. . . *B. humilis* ssp. *arctica*.

- E. Styles rather short and thick, siliques up to 1.8 mm broad. Seeds subbiseriate. Torus somewhat expanded.
- G. More than 10 seeds in each cell of the silique. Siliques up to 17—20 mm long and 1.3 mm broad. Coarse plants with several stems *B. linearis* × *humilis* (?)
- G. Less than 10 seeds in each cell of the silique. Many seeds undeveloped. Siliques not more than 15 mm long and up to 1.8 mm broad. Tenderer plants with one to few stems *B. intermedia*.
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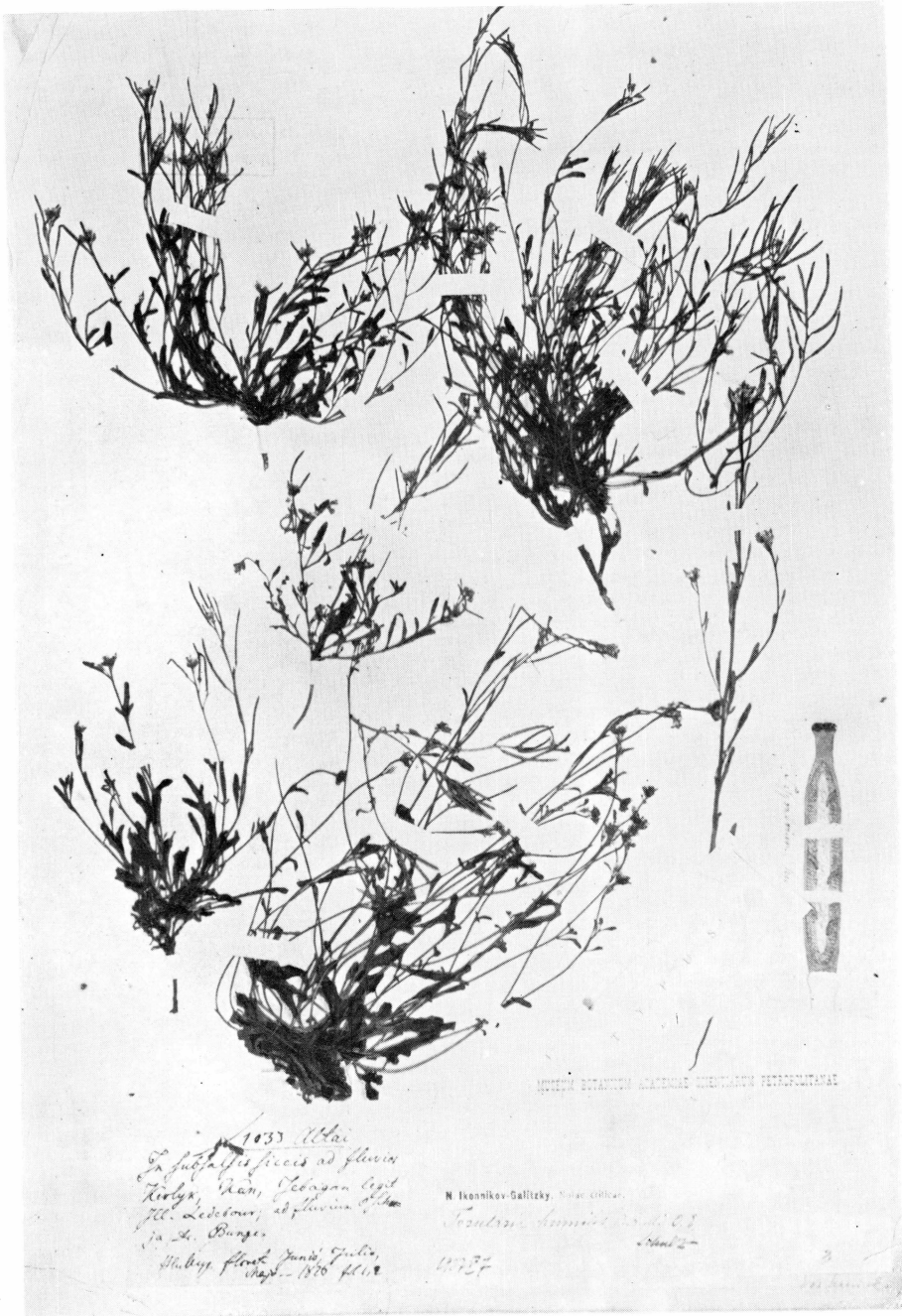
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PLATES

Plate 1.

Braya humilis ssp. *humilis*. Type specimen of *Torularia humilis* O. E. Schulz in Museum Botanicum Academiae Scientiarum Petropolitanae (Leningrad), Bunge No. 1033, Altai 1826.



1033 *Urtica*
fulgens *ficus* ad floris
 Kory, Nam, Cebasan legi
 fl. ad floris, ad floris
 in L. Bunge.
 M. B. floris, floris, floris,
 floris - 1870 fl. 1. 2.

N. Ivanikov-Galitzky, floris, floris.

Taraxacum officinale L.
 floris 2
 1875

HERBARIUM IMPERIALIS ACADEMIAE SCIENTIARUM PETROPOLITANAE

Plate 2.

Material of the presumed hybrid *Braya linearis* × *humilis* from Revet in Northeast Greenland (K. Holmen 20.8.1949).

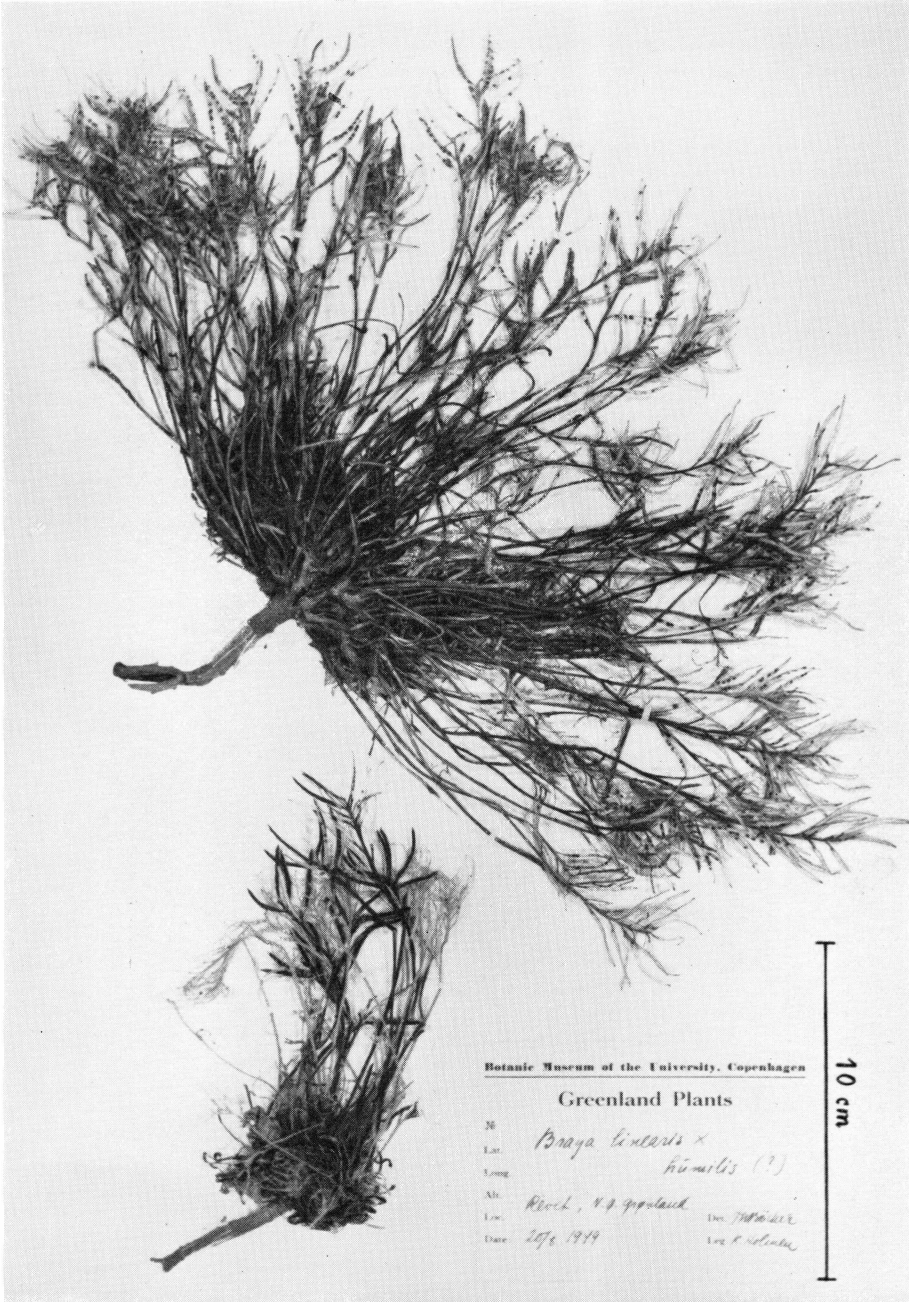


Plate 3.

Braya novae-angliae var. *novae-angliae* (*B. humilis* var. *novae-angliae* (Rydb.) Fern.).
Material from Type locality in Willoughby Mts., Vermont (Willoughby Collection
of George Golding Kennedy, 21.6.1892).



Plate 4.

Braya novae-angliae var. *interior* f. *capitata*. Material from Søndre Strømfjord. Large specimen: Type of f. *capitata* from Vandfaldskløften (Böcher No. 490, 1946), small specimens from Hassells Fjeld (Böcher Nos. 491—492, 1946). Scale: 10 cm.

