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UDGIVNE AF

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Bd. 136 · Nr. 8

NEW SPECIES OF
HIEROCHLOË, *CALAMAGROSTIS*,
AND *BRAYA*

BY

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WITH 10 FIGURES IN THE TEXT
AND 3 PLATES

KØBENHAVN
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The present paper records some scattered results of studies carried out in close co-operation with Prof. C. A. JØRGENSEN, Ph. D., and Prof. M. WESTERGAARD, Ph. D., aiming at presenting a chromosome table for the Greenland plants (JØRGENSEN et al. 1954). As a member of the team, the present writer dealt with the taxonomical questions. The combined cytological and taxonomical studies revealed that some formerly neglected or not fully understood unities were worthy of specific rank; three of these are described below.

The Greenland representatives of the genera *Braya* and *Calamagrostis* were subjected to more comprehensive studies, the results of which will be published in some forthcoming papers. Hence no distributional maps for the new species belonging to these genera are given in the present paper.

I wish to express my gratitude to Messrs. JØRGENSEN and WESTERGAARD for having allowed me to utilise their cytological results. Likewise, I tender my cordial thanks to Dr. M. P. PORSILD, who has kindly undertaken the translation of the diagnoses into Latin.

The maps showing the distribution of *Hierochloë alpina* and *H. orthantha* were prepared on the basis of the material of the Copenhagen Herbarium supplemented with material from the Botanical Museums at Oslo and Stockholm. I wish to thank the Directors of these museums for the loan of herbarium material.

***Hierochloë orthantha* nov. sp.**

Gramen perenne, dissolute caespitosum vel breviter repens, rhizomatousum. Culmi 25—35 cm alti, erecti, foliis unicis vel raro binis viridibus, longe-vaginatiss, laminis ciliolatis, 8—25 mm longis, ad basin 2—5 mm latis. Ligula 1—1.5 mm longa, rotundata, dense pubescens, marginibus fimbriatis ciliolatis. Innovationum folia linearia, 10—15 cm longa, ca. 2 mm lata, vaginis intense purpureis nitentibus. Panicula longe exserta, 3—5 cm longa, subcontracta, ramis laevibus solitariis vel in paribus, 2—6 spiculis pedicellatis munitis. Glumae hyalinae, purpureae, nitentes, subaequales, 6.5—7.5 mm longae, lemmata staminata ad 0.5—1.5 mm superantes, acuminatae et ad apicem modice divergentes, trinerviae, nervo medio

distincto, nervis lateralibus evanescentibus. Lemmata florum masculorum indurata, obscure quinque-nervia, brunnescentia, micantia, punctata, apicem versus et ad margines valde hispida, supra insertionem aristae bifurcata. Lemmatis primi arista erecta, 2—3 mm longa, 1 mm sub acumen inserta. Arista secundi lemmatis 4—5 mm longa, erecta, vel basi parum contorta, 1.5—2.5 mm infra apicem inserta. Pili calli setiformes, ca. 1 mm longi. Palea florum masculorum lemma subaequans, apice bifida, carina superne sparse hirsuta. Lemma floris bisexualis ca. 5 mm longum, apicem versus sparse hirsutum, ceterum glabrum, acutum, trinervium nervis lateralibus exiguis, arista setiformis, 0.2 mm longa ad apicem verum inserta; palea lemma aequans, hyalina, carinata, acutiuscula, carina setis paucis munita vel glabra. Antherae 2.0—2.5 mm longae, tenues; pollen irregulare aut omnino absens. Caryopses maturae 3.0 mm longae, appendice rostriformi excepta.

A perennial, very loosely caespitose or shortly creeping, rhizomatose grass. Culm 25—35 cm tall, erect, bearing only one long-sheathing fresh leaf (rarely two); blade ciliolate 8—25 mm long, 3—5 mm wide at the base. Ligule 1—1.5 mm long, rounded, densely pubescent, the margin fimbriate-ciliolate. Leaf-blades of innovations linear, 10—15 cm long, ca. 2 mm wide, sheaths intense-purple, shining. Panicle long-exserted, 3—5 cm long, somewhat contracted, the branches glabrous, solitary or in pairs, bearing 2—6 pedicellate spikelets. Glumes hyaline, purple, shining, subequal, 6.5—7.5 mm long, exceeding the staminate lemmas by 0.5—1.5 mm, acuminate, and slightly diverging at apex, three-nerved, the mid-nerve distinct, the lateral nerves weak and evanescent. Lemmas of male florets indurate, obscurely five-nerved, brownish, shining, punctate, strongly bristle-hairy toward the apex and the margins, bifid above the insertion of the awn. Awn of the first lemma straight, 2—3 mm long, inserted ca. 1 mm below the apex, awn of the second lemma 4—5 mm long, straight or inconsiderably twisted at the base, inserted 1.5—2.5 mm below the apex. Callus hairs bristly, ca. 1 mm long. Palea of the male florets about as long as the lemma, bifid at the apex, the keel sparsely bristle-hairy above. Lemma of the bisexual floret ca. 5 mm long, sparsely bristle-hairy towards the apex, otherwise glabrous, acute, three-nerved, the side-nerves very faint, awn bristle-like, 0.2 mm long, inserted at the very apex; palea as long as the lemma, hyaline, carinate, acutish, with a few bristle-hairs on the keel, or glabrous. Anthers 2.0—2.5 mm long, thin; pollen irregular or entirely absent. Mature caryopses 3.0 mm long, exclusive of the beak-like appendix.

Type: South Greenland, Kragtût in Tunugdliarfik. July 8, 1947, leg. TH. SØRENSEN (no. 124). (Herb. Copenhagen).

Distribution: South Greenland (cf. fig. 5). Subarctic eastern N. America.

Illustrations: Fl. dan. tab. 1508; Hitchcock, Man. Gr. U. S. ed. 2, fig. 793 (p. 547); this paper figs. 1—2.

Hierochloë orthantha comprises part of the material which has hitherto been regarded as *Hierochloë alpina* (Sw.) ROEM. et SCHULT. (ROEMER & SCHULTES 1817, p. 515). *Hierochloë alpina* was based on

Holcus alpinus SWARTZ (in WILLDENOW Sp. pl. 4,2 (1805) p. 937). As to the occurrence of *Holcus alpinus*, SWARTZ states: "Habitat in alpibus Lapponiae". Hence the Scandinavian material, with which that from northern Greenland agrees in all essentials, should be regarded as the true *Hierochloë alpina*. *Hierochloë orthantha* is closely related to *Hierochloë alpina*, for which reason it has escaped recognition so far although it has good differential characters. As early as 1816 it was so excellently figured in the Flora Danica (tab. 1508) that there can be no doubt as to its identity. The drawing is very instructive, for the most striking characters of the plant as compared with the real *Hierochloë alpina* are clearly shown: In the first place, the straight awns inserted near the apex of the male lemmas; secondly, the elongated rhizome.

A close comparison of the two species reveals a number of distinctions which may be shown schematically as follows:

Hierochloë alpina s. str.

Glumes	ca. 6 mm long, bluntly acute, not extending beyond the staminate lemmas.
Lemmas of staminate florets	5—6 mm, hispid with prickly hairs at back and on the flanks, bristle-hairy toward the apex and the margins; hairs of the marginal veil \pm patent, somewhat curled and tousled in a dried condition. Awn of the second staminate lemma inserted below the middle, commonly near the base, geniculate, strongly twisted.
Paleas of staminate florets	commonly bifid about half their length, the keel rather strongly hairy toward the apex.
Callus hairs of staminate florets	commonly 0.5 mm.
Lemma of bisexual floret	5-nerved, the side-nerves faint, but usually visible; awn distinct, inserted 0.5—1 mm below the bidentate apex.
Palea of bisexual floret	keel distinctly hairy toward the apex.
Anthers	2—2.5 mm long, polliniferous; pollen regular.
Caryopses (excl. beak, measuring ca. 1 mm)	ca. 2.5 mm long.
Height of culms	commonly 20—30 cm.
Inflorescence	commonly 2—4 cm long, subracemose; branches 2 from the lower node, bearing 1—2, rarely 3—4, spikelets.
Habit of growth	densely caespitose.
Chromosome number	$2n = 56$.

Hierochloë orthantha.

Glumes	ca. 7 mm long, acuminate, extending ca. 1—2 mm. beyond the staminate lemmas.
Lemmas of staminate florets	6—7 mm, rough with punctiform hairs at back and on the flanks, bristly hairy toward the apex and the margins; hairs of the marginal veil appressed, straight, forwardly directed in a dried condition. Awn of the second staminate lemma inserted above the middle, straight, not, or very slightly, twisted at base.
Paleas of staminate florets	commonly bifid at apex only, the keel sparsely hairy toward the apex.
Callus hairs of staminate florets	commonly 1.0 mm.
Lemma of bisexual floret	commonly 3-nerved, the side-nerves very faint, sometimes lacking; awn bristle-like, inserted at the entire apex.
Palea of bisexual floret	keel with a few hairs toward the apex, or quite glabrous.
Anthers	2—3 mm long, highly varying, shorter when empty, longer when containing pollen; pollen, if present, irregular.
Caryopses (excl. beak, measuring ca. 1 mm)	ca. 3.0 mm long.
Height of culms	commonly 30—40 cm.
Inflorescence	commonly 3—5 cm long, compound; branches from the lower node 1 or 2, the solitary branch, or the stronger one of the pair, bearing 3—4, more rarely 2 or 5, spikelets.
Habit of growth	loosely caespitose or shortly creeping.
Chromosome number	$2n = 63$.

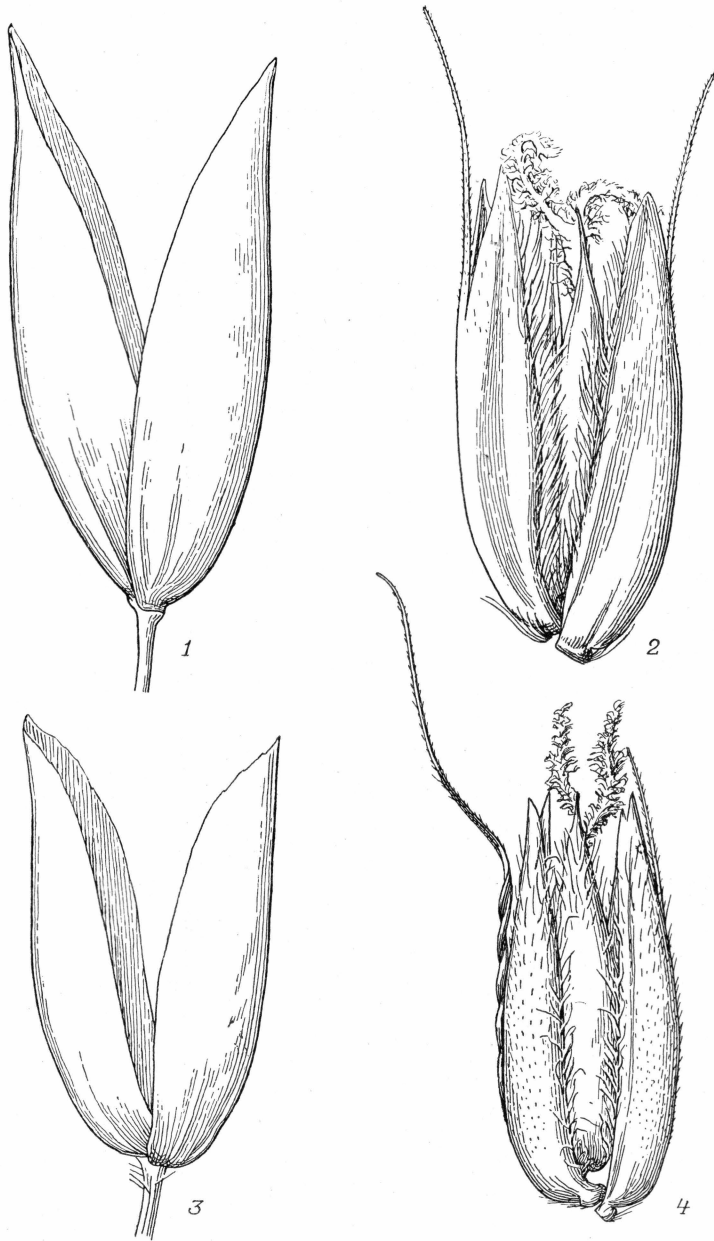
Hierochloë orthantha, as to its general appearance, must be considered a uniform species. Nevertheless, the useful technical character of the insertion of the awn of the second male lemma is subject to some variation. The awn is sometimes inserted somewhat lower than in the type described, and if so, it will be slightly twisted at the base. But even in extreme cases it is inserted above the middle of the lemma. Also the length of the anthers varies considerably according to the content of pollen. Even if pollen is actually present, the grains are of unequal size and in part abortive and empty. Seed formation takes place regardless of male sterility, and thus apomixis is indicated.

As regards the variability of *Hierochloë alpina s. str.* the following statements may be added: The species is rather uniform throughout its circumpolar area except for the Alaskan material. I have only been able to examine some few specimens from there. The Alaskan type seems to deviate from the remainder by having an obtusish awnless lemma of the bisexual floret and a less twisted awn of the second male floret, which characters lend to it some resemblance to *H. orthantha*. The growth-form, rhizomatous or not so, could not be observed. At any rate the Alaskan plant does not belong to *H. orthantha*. Further investigations based on a more comprehensive material will possibly reveal it to be a distinct unit.

The area of distribution of *H. orthantha* comprises the southernmost outlying part of the range of *H. alpina s. l.* of previous authors, namely South Greenland, northward to 63°30' N. lat. on the east coast and to ca. 65° N. lat. on the west coast, and, as far as can be demonstrated on the basis of material kept in the Copenhagen Museum, the east coast of Labrador except the Torngat Region (northernmost locality Hebron, ca. 58° N.); further, Newfoundland, Gaspé Peninsula, and the mountains of New England, viz. White Mountains (New Hampshire) and Adirondack Mountains (New York) ca. 44° N. lat. An enumeration of examined specimens from areas outside Greenland is given below.

As far as can be demonstrated by the present investigation, the area of *H. orthantha* and that of *H. alpina s. str.* only overlap to an astonishingly inconsiderable extent. In East Greenland as well as in West Greenland the two species are found together only within about one degree of latitude (cf. accompanying maps, figs. 5—6). In Labrador, judging by the available herbarium material, the two species meet immediately south of the Torngat Area. Plants from Torngat and from several places within the Canadian Archipelago are, all of them, *H. alpina s. str.*

From the available data about the ranges of the two related species *H. orthantha* may be pointed out as a subarctic-alpine species, adapted



Figs. 1—2. *Hierochloë orthantha*, glumes and florets (type). $\times 10$.

Figs. 3—4. *Hierochloë alpina*, glumes and florets (W. Greenland, Rødeelv pr. Godhavn, leg. J. GRÖNTVED 21.VII.1932, nr. 47). $\times 10$. del. INGEBORG FREDERIKSEN.

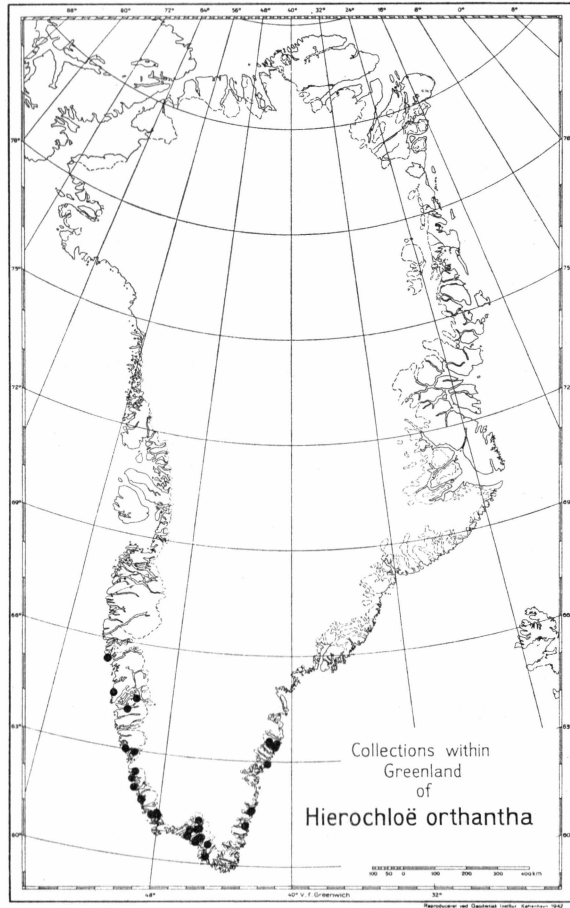


Fig. 5. Greenland range of *Hierochloë orthantha*.

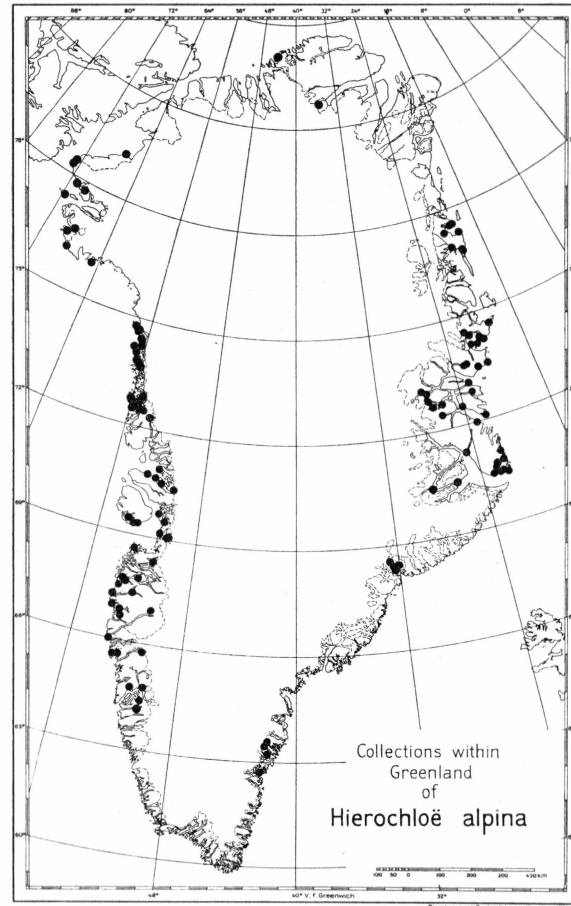


Fig. 6. Greenland range of *Hierochloë alpina*.

to comparatively oceanic climates while the high-arctic *H. alpina* clearly prefers a dry continental climate.

Hierochloë orthantha: Specimens examined from areas outside Greenland.

New York:

Whiteface Mountain, near Lake Placid. Summit of the mountain, mostly in moss.

A. S. HITCHCOCK, Aug. 17, 1917 (Amer. Gr. Nat. Herb. no. 438).

Mt. Marcy. S. B. BUCKLEY (Distrib. by the Shaw School of Botany).

Mt. Marcy. June 14, 1930. Com. C. HEIMBURGER.

New Hampshire:

Mount Washington. On rocks along Huntington Ravine Trail below the timber line.

A. S. HITCHCOCK, Aug. 28, 1917 (Amer. Gr. Nat. Herb. no. 437).

Eastern Quebec:

Gaspé County: Mt. Albert. Abundant above 950 metres, on damp rocks and mossy banks. J. F. COLLINS and M. L. FERNALD, Aug. 10, 1905 (no. 18).

Newfoundland:

Valley of Exploits River: Hodge's Hill. Granite ledges at summit (alt. 670 m).

M. L. FERNALD and K. M. WIEGAND, July 13, 1911 (no. 4527).

Straits of Belle Isle: Quirpon Island. Turfy and rocky slopes of Cape Dégrat. M. L.

FERNALD and BAYARD LONG, Aug. 7, 1925 (no. 27518).

Labrador:

Tikkerasuk. C. S. SEWALL, June 1928 (Rawson-MacMillan Expedition, 1927—28, no. 55).

Nain. C. S. SEWALL, June—July 1928 (Rawson-MacMillan Subarct. Exp. no. 94).

Anatolak. C. S. SEWALL, June—Aug. 1928 (Rawson-MacMillan Subarct. Exp. no. 433).

Hebron. A. P. COLEMAN, July 23, 1915 (Univ. of Toronto Herb. no. 95).

***Calamagrostis Poluninii* nov. sp.**

Gramen perenne rhizomatosum. Culmi in fasciculis parvis vel etiam solitarii, 40—55 cm alti, erecti, graciles, laeves, inferiore tertia parte tantum foliati. Vaginae basilares emortuae griseae, opacae. Folia culmi bina, vaginis laevibus, saepe rubescentibus; laminis 4—8 cm longis, ad basin 2.5—3.5 mm latis, gradatim angustioribus, firmis, involutis, profunde sulcatis et dense pubescentibus pilis brevissimis rectis in paginis superioribus, in inferioribus scaberulis; ligula 4—8 mm longa, acuta, dense pubescens. Laminae foliariae innovationum usque ad 25 cm longae. Panicula condensata spiciformis, 5—8 cm longa, ca. 1 cm crassa, rubro-purpurea, pruinosa, axis primaria glabra, rami et pedicelli dense hirsuti, rami breves, quaterni ex eodem nodo spiculis binis usque ad octonis muniti. Spiculae 5—6 mm longae, glumae subaequales, ovato-lanceolatae, dense punctato-pilosae, lemma

scaberulosum, 4.5—5.0 mm longum, apicem bifurcatum versus hyalinum, nervi laterales forte colorati in pares duo dentium apicalium obtusorum et ciliolatorum evanescentes; arista vigorosa geniculata, supra basin ca. 1 mm inserta, ad 4 mm longa, vexillum longior quam contorta pars basalis, saepe inter glumes lateraliter protrudens. Palea lemma aequans aut saepe longior, obtusa aut obtuso-acuta, ad apicem eroso-ciliolata. Pili calli veli medii 1.0—1.5 mm longi, ei comarum lateralium 2.0—2.5 mm longi; rhachilla apiculata, 1.5—2.0 mm longa, pilis inclusis 3.5 mm longa. Antherae 2.3—2.5 mm longae, tenues, sine polline. Caryopses 2.1—2.2 mm longae.

Perennial, rhizomatous grass. Culms in small tufts or even solitary, 40—55 cm tall, erect, slender, smooth, leaf-bearing only in their lower third. Old withered basal sheaths greyish, opaque. Two fresh culm-leaves, with smooth, often reddish tinged sheaths; blades 4—8 cm long, 2.5—3.5 mm wide at the base, evenly tapering, firm, rolled, deeply furrowed and densely pubescent with very short straight hairs above, scaberulous below; ligule 4—8 mm long, acute, densely pubescent. Leaf-blades of innovations up to 25 cm long. Panicle condensed, spike-like, 5—8 cm long, ca. 1 cm thick, reddish purple, pruinose; main axis glabrous, branches and pedicels densely rough-hairy; branches short, ca. 4 from each node, bearing 2—8 densely crowded, pedicelled spikelets. Spikelets 5—6 mm long, glumes subequal, ovate-lanceolate, densely point-hairy, lemma scaberulous, 4.5—5.0 mm long, hyaline towards the bifid apex, the strongly coloured side-nerves vanishing into two pairs of blunt, ciliolate apical teeth; awn vigorous, geniculate, inserted ca. 1 mm above the base, ca. 4 mm long, the vexillum longer than the twisted basal part, commonly protruding sideways from between the glumes. Palea as long as the lemma or commonly longer, obtuse or bluntly acute, erose-ciliolate at apex. Callus hairs of the median veil 1.0—1.5 mm long, those of the lateral tufts 2.0—2.5 mm long. Rachilla pointed, 1.5—2.0 mm long, incl. hairs ca. 3.5 mm long. Anthers 2.3—2.5 mm long, thin, without pollen. Grains 2.1—2.2 mm long.

Type: South Greenland, Kiagtût in Tunugdliarfik. Growing in dry, coarse sand. July 15, 1947, leg. TH. SØRENSEN (no. 188). (Herb. Copenhagen).

Distribution: South Greenland, northward to ca. 64° N. lat.

Illustrations: Pl. 1; figs. 7—8.

Additional specimens in the Copenhagen Botanical Museum:

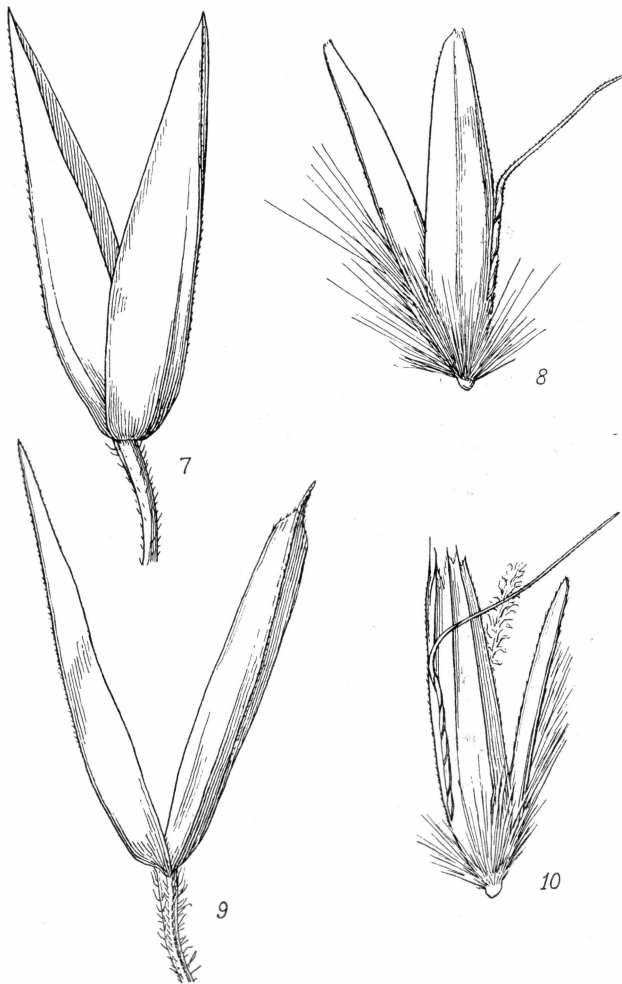
Julianehaab District:

Kiagtût, Tunugdliarfik fjord, 30.VII.1876 A. KØRNERUP, 10.VIII.1925 A. E. & M. P. PORSILD, 1.VII.1947 TH. SØRENSEN no. 18; Qagssiarssuk, Igaliko Fjord, 5.VIII.1925 A. E. & M. P. PORSILD.

Godthaab District:

Qugssuk sinus, Baals Revier VII.1830 J. VAHL; Umîviarssuk, 22.VI.1932 J. IVERSEN; Kangarsuneq, 18.VIII.1932 J. IVERSEN.

Calamagrostis Poluninii was formerly recorded as *Calamagrostis purpurascens*, to which species it is, no doubt, related. It differs from the latter species mainly by its elongated creeping rhizomes, a more



Figs. 7—8. *Calamagrostis Poluninii*, glumes and floret (type). $\times 10$.

Figs. 9—10. *Calamagrostis purpurascens*, glumes and floret (W. Greenland, Qeqertarsuaq, Nûtåtsiaq, $71^{\circ}33'$ N. lat., leg. M. P. & R. T. PORSILD 16.VIII.1929. $\times 10$.
del. INGEBORG FREDERIKSEN.

slender stature, narrower leaves, less hairy panicle branches, a shorter awn, longer callus hairs, and a longer palea (cf. figs. 7—10).

As to technical characters, it seems to come rather close to the likewise rhizomatous *Calamagrostis Lepageana*, recently described by LOUIS-MARIE (1944, p. 303) from Rimousky County, Quebec. However, *C. Poluninii* differs from *C. Lepageana* in several characters, e. g. by its long acute ligule, larger spikelets, longer palea and callus hairs, shorter awn, and by its coloured, not green, inflorescence.

C. Poluninii may be said to replace *C. purpurascens* within the southern parts of West Greenland. Actually, the areas of the two species

do not overlap, for the southernmost certain locality of *C. purpurascens* is situated in about 66° N. lat., while *C. Poluninii* does not seem to spread beyond ca. 64° N. lat.

Around the B.W.I. Airbase, Tunugdliarfik, Julianehaab District, where I observed the plant here proposed as a new species, it is of common occurrence and may be characterised as the most conspicuous grass in dry sandy wind-swept places. According to Dr. JOHS. IVERSEN (verbal information), who collected the plant in the inner ramifications of Godthaabs fjord in the summer of 1932, it is likewise an important component of dry grassland vegetation there.

In East Greenland the typical *Calamagrostis purpurascens* does not occur south of the Scoresby Sund Region. However, there is a record of *C. purpurascens* from Southeast Greenland, namely that of DEVOLD and SCHOLANDER (1933, p. 136): Akorninarmiut District, Myrodden and Dronning Marias Dal, both localities situated in the inner ramifications of the fjords separating the Island of Skjoldungen from the mainland in about 63°30' N. lat.

By the courtesy of Mr. JOHS. LID, Curator of the Botanical Museum, Oslo, I have had the opportunity to examine these collections. I am inclined to refer them to *C. Poluninii*, rather than to *C. purpurascens*, though not without hesitation. The SE. Greenland plants deviate slightly from the SW. Greenland type of *C. Poluninii*, especially by the main axis of the inflorescence not being quite glabrous, and the palea being a little shorter than the lemma, characters by which they approach the real *C. purpurascens*. On the other hand, the plants are, no doubt, rhizomatous, but the rhizomes may be stouter and shorter than in the typical *C. Poluninii*, though this character is not easy to evaluate correctly on the basis of the herbarium material. The collectors state (l. c.) that it grows in tufts, which may indicate that it tends more to develop a caespitose growth-form than does the typical *C. Poluninii*. However, the presence of rhizomes, the short awn, the comparatively slight pilosity of the panicle branches, the slender stature, and the narrow leaves, are characters by which it deviates from the Greenland type of *C. purpurascens* in a similar way to *C. Poluninii*. I therefore provisionally refer the isolated SE. Greenland population to the latter species, even if it may be varietally different. It must be left to future investigators of the SE. Greenland flora to elucidate the taxonomical status of this somewhat doubtful type.

Some few specimens of *Calamagrostis*, collected by M. P. and A. E. PORSILD in the Ikertôq fjord region (W. Greenland, about 67° N. lat.) within the range of *C. purpurascens*, superficially resemble *C. Poluninii*. It cannot be ascertained whether or not these plants are rhizomatous. They differ from *C. Poluninii* by having a more robust stature, longer

but not diverging panicle branches, more acuminate glumes, a shorter palea, and by the callus hairs being soft and of a tousled appearance, not stiff and bristly as in *C. Poluninii*. In all probability these plants represent the hybrid *C. Langsdorffii* × *C. purpurascens*.

C. Poluninii is, certainly, an apomict, for it fruits even though the anthers do not develop pollen. Its chromosome number is $2n = 56$, the same number as is found in *C. purpurascens* and in several other species of *Calamagrostis* (cf. NYGREN 1946).

I have named the new species in honour of Professor NICHOLAS POLUNIN, Ph. D., who was evidently the first to suspect the identity of the South Greenland "*Calamagrostis purpurascens*" (cf. POLUNIN 1943, p. 361).

***Braya intermedia* nov. sp.**

Herba perennis radicata, mesocormo gracili, dense ramificato, foliorum basibus persistentibus scariosis tunicato. Folia basilaria rosulata spatulata et integra aut, in plantis robustioribus, distantissime sinuato-dentata, 1.5—3 cm longa, 1.5—3.5 mm lata, subcarnosa, sparse pilosa pilis bifurcatis, aut exceptione partim trifurcatis; petiola alata et ciliata pilis crassis, plerumque singulis. Caulis fructifer purpureus, pilis bifurcatis appressis strigosus, vigorosus, erectus, simplex vel rarius basi furcatus, 6—15 cm altus, vulgo foliis 3—7 parvis spatulatis integris, quorum supremum vel folia suprema bina sunt bractea inferiori dimidio parte pedicellorum connatae. Ceterum racemus ebracteatus floribus 5—15, pedicellis apice dilatatis, toro 1 mm lato. Sepala caduca, 2.5—3 mm longa, cucullata, apicem versus pilis paucis crassis simplicibus vel bifurcatis munita. E sepalis duo media 1.0—1.2 mm lata, oblonga, duo lateralia 1.5—1.8 mm lata, ovata, saccata; petala 3.5—4.0 mm longa, obovata, cuneata; eorum laminae roseae ungues obscuriores; stamina 2.0—2.5 et 2.5—3.0 mm longa, antherae parum longiores quam latae, basi cordatae, apicibus subapiculatis; ovarium pilosum, stylo evidenti, stigmata biloba capitata, ovulis 16—32. Racemus fructifer inferiore parte moderatim elongatus, apice densus; pedicelli erecto-patentes, 3—4 mm longi; siliqua linearis aut lanceolato-linearis, 8—15 mm longa, 1.2—1.8 mm lata, parum complanata, solitu recta, ad maturitatem non torulosa; valvulae subconvexae pilosae pilis bifurcatis appressis, inconspicue trinerviae, superiore parte nervis evanescentibus aut anastomosantibus; replum vigorosum in rostrum persistentem crassum 0.8—1.2 mm longum transiens, stigmate discoideo bipartito; dissepimentum totum hyalinum. Semina ovoidea subcomplanata 1.1—1.2 mm longa, 5—8 in eodem loculo.

Perennial herb with a tap-root and slender, densely branched mesocorm, tunicate with persistent withered scarios leaf-bases. Basal leaves in rosettes, spatulate, entire, or in vigorous plants very distantly sinuate-dentate 1.5—3 cm long,

1.5—3.5 mm wide, subcarnose, sparsely hairy with bifurcate, exceptionally in part trifurcate hairs; the winged petioles ciliate, with coarse, mostly simple, hairs. Fruiting stem purple, strigose with two-branched appressed hairs, stout, erect, simple or rarely furcately branched at the base, 6—15 cm tall, commonly bearing 3—7 small spathulate entire leaves, the uppermost one or two of which are bracts connate to the lower half of the pedicels. Raceme otherwise ebracteate, 5—15-flowered; pedicels of flowers widened at the top, torus about 1 mm across, sepals caducous 2.5—3 mm long cucullate, toward the apex equipped with a few coarse simple and bifurcate hairs, the median pair of sepals 1.0—1.2 mm wide, oblong, the lateral pair 1.5—1.8 mm wide, oval, saccate; petals 3.5—4.0 mm long, obovate, cuneate, the limbs pink, the claws of a darker colour; stamens 2.0—2.5 and 2.5—3.0 mm long, anthers scarcely longer than broad, cordate at base, very bluntly pointed at apex; ovary hairy, style evident, stigma two-lobed capitate, ovules 16—32. Fruiting raceme moderately elongated in the lower part, dense at the top; pedicels erecto-patent 3—4 mm long; silique linear—lanceolate-linear, 8—15 mm long, 1.2—1.8 mm broad, slightly flattened, commonly straight, not torulose when mature; valves hairy with bifurcate appressed hairs, slightly convex, inconspicuously three-nerved, the nerves vanishing or anastomosing in the upper part; replum vigorous, continuing into a durable, stout, 0.8—1.2 mm long beak crowned with the disk-like bipartite stigma; dissemination hyaline throughout. Seeds ovoid, slightly flattened, 1.1—1.2 mm long, 5—8 in each cell.

Type: Northeast Greenland, Ella Ø. Kap Oswald (72°53' N. lat.) 30.VII.1932 leg. TH. SØRENSEN (No. 3556b). (Herb. Copenhagen).

Distribution: NE. Greenland, ca. 72° to ca. 74° N. lat.

Illustrations: Pls. 2—3.

Additional specimens in the Copenhagen Botanical Museum:

Ella Ø, Kap Oswald, 24.VII.1932 TH. SØRENSEN nr. 3562a (cf. pl. 3), nr. 3577e (in part, with *B. linearis*).

Ella Ø, Ulvedal, 22.VII.1932 TH. SØRENSEN nr. 3575c (cf. pl. 3), 29.VII.1933 TH. SØRENSEN nr. 4223 (in part, with *B. linearis*).

Ella Ø, Kap Elisabeth, 1.VIII.1933 TH. SØRENSEN nr. 4229.

Ymers Ø, Karl Jakobsens Bugt, 4.IX.1931 TH. SØRENSEN nr. 3560 (in part, with *Torularia humilis*).

Ymers Ø, Duséns Fjord, Ankerpladsen, 10.VIII.1933 E. TULINIUS nr. 4225.

Hudson Land, west side of the head of Loch Fyne, 3.VIII.1929 G. SEIDENFADEN nr. 196.

Hold with Hope, Kap Stosch, VIII.1932 M. KØIE nr. 4222.

As type a collection was chosen which consists of fruiting plants only, for within the *Cruciferae* the fruiting stage is thought to be the most suitable for a characterisation of the species in broad features. For a complete description flowering plants also must, of course, be considered. As supplementary material for the completion of the diagnosis chiefly nos. 3562a (flowering plants) and 3575c (with flowers and immature pods) were used, both of which, like the type, were collected in the immediate vicinity of the Danish Scientific Station at Kap Oswald, Ella Ø (cf. pl. 3).

As to outer appearance, *Braya intermedia* may simulate an intermediate form between *Braya linearis* (listed as *B. glabella* in Greenland publications of the 1930's) and *Torularia (Braya) humilis*, with which species it generally forms mixed stands. This fact accounts for the view held by the writer (SØRENSEN 1933, p. 39) that the two latter species hybridise freely so that probably "the specific difference is increasingly effaced by continued hybridisation".

The chromosome numbers of the two "pure" species (both of them have $2n = 42$) as compared with that of the intermediary type ($2n = 70$) definitely disproved this hypothesis and invited a renewed investigation of the East Greenland Brayas on a morphological basis. One of the results is the establishment of *Braya intermedia* comprising the confusing "intermediary" plants.

A careful examination of the herbarium material led to the result that *B. intermedia*, all technical characters being duly considered, is not, actually, an intermediate between *Braya linearis* and *Torularia humilis*. It seems rather to combine characters of *Braya purpurascens* with those of the other two species. The rather large proportion of undeveloped ovules always found among the seeds in the mature pods of *B. intermedia* might suggest a hybrid nature of this plant. It may be an amphidiploid hybrid, not yet stabilised.

The known chromosome numbers of the East Greenland species of *Braya* (and *Torularia*) are as follows:

<i>Braya Thorild-Wulfii</i>	$2n = 28$	(HOLMEN 1952, p. 14).
<i>Braya linearis</i>	$2n = 42$	} according to JØRGENSEN and WESTERGAARD
<i>Torularia humilis</i>	$2n = 42$	
<i>Braya purpurascens</i>	$2n = 56$	
<i>Braya intermedia</i>	$2n = 70$	

The chromosome number of $2n = 70$ might be obtained (through chromosome doubling) by a crossing between *B. Thorild-Wulfii* and *B. linearis* or *Torularia humilis*. However, no single of these cytologically possible combinations can be expected to produce a plant like *B. intermedia*, for the very vigorous persisting style, which I consider an important feature of *B. intermedia*, in other East Greenland species is found in *B. purpurascens* only. The other three species pointed out as possible ancestors, have a short style, which on the mature pods is reduced to an inconspicuous, shrunken appendage. Thus the origin of *Braya intermedia* may be said to be obscure.

Since, so far, *Braya intermedia* has been confounded with *Torularia humilis* and *Braya linearis*, a comparative analysis of the three species is presented below. In the comparison only East Greenland material is considered.

Torularia humilis O. E. SCHULZ.

Rosette leaves	oblong or oblong-spathulate, commonly sinuate-dentate, rather thin, densely hairy with simple and 2—3-branched hairs, hardly ciliate at base.
Flowers: lowermost flowers of the raceme	bracteate.
Torus	not widened, 0.5—0.6 mm across.
Sepals	2.5—3.0 mm long, hardly cucullate, hairy throughout, the median ones 0.8—1.1 mm wide, not saccate, the lateral ones 1.2—1.4 mm wide, not or hardly saccate.
Petals	3.5—4.0 mm long, obovate—retuse, white—pale-lilac or pink.
Filaments	the longer exceeding the shorter ones by ca. $\frac{3}{4}$ (up to 1) mm.
Anthers	evidently longer than broad, cordate—obscurely sagittate; connective pointed at apex.
Stem (after flowering)	rather slender, often accumbent, often branched at base; plant not rarely acauline.
Fruiting raceme	strongly elongated.
Siliques	12—20 mm long, 0.8—1.0 mm broad, straight or slightly curved, obtusely quadrangular toward the base, terete toward the apex; slightly torulose, densely hairy with equally branched bifurcate appressed hairs often with intermixed unequally branched ones, the longer arm of which is patent.
Valves	one-nerved, subcarinate, at least toward the base.
Beak	style short, shrunken, and not capitate (sometimes persistent and moderately bilobate-capitate: plants from Clavering Ø).
Seeds	0.9—1.0 mm long, uniseriate, commonly 12—16 in each cell; no, or only a few, undeveloped ovules.
Chromosome number	$2n = 42$.

Braya linearis ROUY.

narrowly spatulate, distantly and rather sharply dentate or entire, carinose, glabrous or nearly so, moderately ciliate at base.

bracteate or, more rarely, ebracteate.

moderately widened, 0.6—0.8 mm across.

2.0—2.5 mm long, slightly cucullate, glabrous or with a few hairs on the hoods, the median ones 1.0—1.2 mm wide, not saccate, the lateral ones 1.2—1.6 mm wide, saccate.

3.0—3.5 mm long, spatulate-obovate, reddish, the claws darker.

the longer exceeding the shorter ones by ca. 0.5 mm.

approximately isodiametrical, reniform; connective not pointed.

vigorous, stiffly erect, not branched; acauline plants not seen.

subumbellate, head-like.

8—15 mm long, 1.0—1.2 mm broad, incurved, terete; evidently torulose, sparsely hairy with bifurcate and simple hairs, or even nearly glabrous.

very obscurely one-nerved, or apparently nerveless, convex.

style short, shrunken, not capitate.

1.0—1.1 mm long, uniseriate, commonly 7—12 in each cell; no, or only a few, undeveloped ovules.

$2n = 42$.

Braya intermedia nov. sp.

spathulate, commonly entire, more rarely distantly sinuate-dentate, subcarinose, moderately hairy with two-branched, rarely with intermixed three-branched hairs, or nearly glabrous, strongly ciliate at base.

bracteate, rarely ebracteate.

distinctly widened, 0.8—1.0 mm across.

2.5—3.0 mm long, distinctly cucullate, coarse-hairy on the hoods, the median ones 1.1—1.3 mm wide, slightly saccate, the lateral ones 1.5—1.8 mm wide, strongly saccate.

3.5—4.0 mm long, obovate, pink, the claws darker.

the longer exceeding the shorter ones by ca. 0.5 mm.

slightly longer than broad, cordate; connective very bluntly pointed at apex.

rather vigorous, erect or accumbent, rarely branched; plant rarely acauline.

elongated, but often subumbellate at the top.

8—15 mm long, 1.2—1.8 mm broad, slightly flattened, straight; not torulose, moderately hairy with equally branched, bifurcate, appressed hairs.

obscurely three-nerved, at least toward the base, the side-nerves faint, vanishing upwards, often forming an obscure network, slightly convex or nearly flat.

style elongated, persistent, very vigorous, bilobate-capitate.

1.1—1.2 mm long, uniseriate, commonly 5—8 in each cell; one-third to half of the ovules remain undeveloped.

$2n = 70$.

It is my duty to make some comments on the nomenclature of the East Greenland *Torularia humilis* in consequence of T. W. BÖCHER's treatise on the Greenland representatives of this species (BÖCHER 1950, p. 24 et seq.). The East Greenland plant was named *Torularia humilis* ssp. *arctica* by BÖCHER. I do not accept this name, in the first place because it is a *nomen confusum* based on a mixture of two different species, and secondly—and this is the essential point of the matter—because, in my opinion, there is no need for a subspecific epithet of the East Greenland *Torularia*.

BÖCHER discusses very briefly the question, still in dispute, of *Torularia* versus *Braya*. In contrast to ABBE (1948), an authority otherwise commonly cited by BÖCHER, he refers the Greenland plants to *Torularia*, not to *Braya*, as did ABBE. He confines himself to the following, rather surprising, comment (l. c., p. 24) "The characters distinguishing *Torularia* are not, it is true, very numerous, and one of them, "semina uniseriata", which was to characterize *Torularia*, does not apply to the Greenland material, which has biseriata seeds". Nevertheless, he chose *Torularia* in preference to *Braya*. However, BÖCHER's statement is wrong. The character "semina uniseriata" does apply to the Greenland material. For this reason the generic name of *Torularia* might well be accepted for the West Greenland as well as for the East Greenland material. But in my opinion the character of the seeds, whether placed in a single or in two rows in each cell, is not essential for a distinction between the two genera, for one-rowed seeds are also found in species which should for other reasons be referred to *Braya*.

I think that *Torularia torulosa* can be taken as the type of the genus *Torularia* (cf. SCHULZ 1924, p. 213 et seq.), and I am inclined to regard the very thick dissepiment of the siliques as generically significant as opposed to *Braya*. If this view is accepted, *Torularia humilis* should be referred to *Braya*. But even this view is hardly satisfactory, for in other characters it deviates from *Braya*, i. a. by its narrow torus, the highly different length of the median and the lateral filaments, the somewhat elongated anthers, distinctly pointed at the apex, and the basal theca-lobes not rarely being bluntly pointed. Some of these characters, for instance the sagittate anthers, only indicated in *Torularia humilis*, are, so to speak, improved in the real *Torulariae*. Actually, *Torularia humilis* does not fit in either with *Braya* or with *Torularia*. The genus *Torularia* of SCHULZ seems to me to comprise generically different elements. However, a removal of *T. humilis* from the genus *Torularia* would certainly involve a transfer of other related species, e. g. *T. Korolkovii*. For the time being, I prefer to follow SCHULZ, though not without reservation. After all, this question does not interfere with that of the foundation of ssp. *arctica*, but, on the other hand, it cannot

simply be neglected, when the nomenclature of *Torularia humilis* is discussed.

BÖCHER (l. c. p. 24) refers to "the difficulties which have appeared at the distinction between *T. humilis* and *Braya linearis* in North-West Greenland¹⁾ (SØRENSEN 1933, GELTING 1934)". Considering that BÖCHER undertook to revise the East Greenland material, it seems curious that his only comment on the difficulties of previous authors is an affirmation that the two species in Søndre Strømfjord (West-Greenland) differ greatly. Of what difficulties I alluded to in my 1933-paper, he might have got an idea by studying my East Greenland collections in our Botanical Museum, for, twenty years ago, I clearly labelled several sheets as "*Braya glabella* × *humilis*" (collections made in 1931—32) or "*Braya* sp. *inter humilis et linearis*" (collections made in 1933, at which time I had realised that "*B. glabella*" should be altered to "*B. linearis*").

According to BÖCHER, the most important character of his East Greenland ssp. *arctica* is its short style. However, he observed fairly long styles in a few East Greenland plants, but "such plants are not frequent; they occur in SEIDENFADEN's material from the head of Loch Fyne (3.VIII.1929) and in TULINIUS's collection from Ymers Ø." (l. c. p. 26). I here take the liberty to comment upon this passage: Such plants are fairly frequent, for they belong to the "*Braya* sp. *inter humilis et linearis*", as labelled by me. I now deplore that I have not taken the trouble to re-label SEIDENFADEN's single "intermediate" collection, determined by him as *Braya humilis* (or, possibly, I have overlooked it). For BÖCHER unfortunately pictures it in his pl. 4 (below, right) as one type of *Torularia humilis* ssp. *arctica*. In the case of TULINIUS's collection, determined and labelled by me, I think I have nothing for which to blame myself. The collection comprises two plants, one of which, a short-styled specimen, likewise pictured in BÖCHER's pl. 4, I labelled *Braya humilis*, the other, which is really long-styled, I labelled "*inter humilis et linearis*". I think it has escaped the attention of BÖCHER that the collection comprises not a single, but two specimens, for his remarks on the long styles cannot have reference to the pictured plant.

However, the priority of BÖCHER's demonstration of short-styled and long-styled Greenland "*Torularia humilis*" will probably remain unchallenged. He writes (l. c. p. 24): "Already before I read ABBE's work I had by means of differences in the length of the styles been able to divide the material from East and West Greenland, respectively, into two groups. As ABBE mentions the same difference, this was felt as a strong support of my results." It is far from me to criticise ABBE's judgment. On the contrary. And BÖCHER's conclusion is no doubt sound;

¹⁾ Probably misprint for North-East Greenland.

but I think a carpenter's rule would offer a fully satisfactory guarantee of that indisputable difference.

The problem is no longer to distinguish between the two types but rather how to name them correctly. There seems to be no need of a sub-specific name for a *Torularia humilis* on account of its short style, for in the original diagnosis of *Sisymbrium humile*, LEDEBOUR (1830, p. 16) expressly states that it is short-styled: "*S. [isymbrium] stylo brevi*"¹). Furthermore, if you compare the East Greenland plant with the excellent drawing in LEDEBOUR (l. c. tab. 147), hardly any differences can be observed except that the flowers of the pictured Siberian plant are a trifle smaller and of a pure white colour; the flowers of the Greenland plants are usually pale-lilac. I therefore take the East Greenland plant to be *Torularia humilis* without further qualifications.

It is not the East Greenland plant that is in need of a new name, but the West Greenland one. As clearly stated in ABBE's key to the geographical races of "*Braya humilis*" (ABBE 1948, p. 4), the West Greenland and the East American plants, though in his opinion racially different, forms a unity as compared with the East Greenland race. While it is still a question of controversy to which genus the East Greenland plant should be rightly referred, the West-Greenland—American plants doubtless belong to *Braya* on account of floral characters such as the widened torus and subequal filaments. One East American race (from Willoughby Mountain, Vermont), which according to ABBE's key comes very close to the West Greenland one, was clearly recognised by RYDBERG (1907, p. 158) as a distinct species to be separated from *Braya* (*Sisymbrium, Torularia*) *humilis*. He named it *Pilosella Novae-Angliae*. His comments are as follows (l. c. p. 159): "*Pilosella Novae-Angliae* differs from *Sisymbrium humile* Ledeb. (Icon. Pl. Fl. Ross. 2: 16 pl. 147, 1830) in the more compact habit, the scant pubescence, the smaller flowers, the more slender pod, and the longer style, which is about 1 mm long." All these differential characters likewise hold true for our West Greenland plant, and, therefore, referring to what was pointed out above as to its generic appertaining, I think that its legal name should be: *Braya Novae-Angliae* (Rydb.) nov. comb.

¹) It seems probable that the diagnosis was written by C. A. MEYER, whose exhaustive description of the plant appeared the following year (in LEDEBOUR Fl. Altaica III (1831) pp. 137—38).

POSTSCRIPT

It was not till reading the proofs that I became aware of a treatise recently published by ROLLINS: *Braya* in Colorado (Rhodora 55 (1953), pp. 109—116). It cannot, therefore, be fully discussed here, but I will make some few comments.

From my remarks on *Torularia humilis* it is evident that I fully agree with ROLLINS in referring the material in question from East America and West Greenland to *Braya*. As to the West American representatives of *Braya humilis sensu* ROLLINS, I dare not express any opinion, since no specimens from there are available to me.

The somewhat perigynous flowers, common to all typical Brayas, in my opinion form a most important character which may serve to rationally circumscribe the genus. In addition, the more or less, though generally evident, carnose structure of the leaves should also be evaluated. The specimens of *Torularia humilis* from Siberia as well as those from East Greenland have clearly hypogynous flowers, and their leaves are rather thin as compared with those of the real Brayas.

As will appear from the present paper, I agree with ROLLINS that *Torularia humilis s. str.* should be separated from *Torularia*. Actually, I am inclined to think that *Torularia humilis* together with some few other Siberian species represent a genus of their own. Owing to want of sufficient material I am not able to solve the question definitely. The reason why for the present I refer the East Greenland (and the Siberian) plant to *Torularia*, is that I wish to emphasise that it does not belong to *Braya*, as do the other East and West Greenland species formerly confounded with it.

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PLATES

Plate 1.

Calamagrostis Poluninii (type). $\times 1/2$.



Plate 2.

Braya intermedia (type). $\times 3/4$.



Plate 3.

Braya intermedia.

Above: Ella Ø, Kap Oswald, snow-bed, alt. 40 m, leg. TH. SØRENSEN
24.VII.1932, nr. 3562 a. $\times \frac{3}{4}$.

Below: Ella Ø, Ulvedal, dry Elyna slope, alt. 150 m, leg. TH. SØRENSEN
22.VII.1932, nr. 3575 c. $\times \frac{3}{4}$.

