

**Luzula piperi (Cov.) M. E. Jones,
an overlooked woodrush in western North America
and eastern Asia**

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Luzula piperi has been described by COVILLE from Okanogan Co., Washington, in PIPER (1906, pp. 185—186) under the name: *Juncoides piperi*. JONES (1910) referred it to the genus *Luzula*. KURTZ (1895) has described it by name *L. spadicea* DC. var. *wahlenbergii* (Rupr.) Buchenau f. *americana* F. Kurz. Several authors in their papers concerning flora of western North America have later considered *L. piperi* to be synonymous to *L. wahlenbergii* Rupr., which is somewhat similar (cf. treatments in JONES 1936, HULTÉN 1943, 1960, 1962, EASTHAM 1947, DAVIS 1952, MOSS 1959, PECK 1961, WIGGINS and THOMAS 1962, etc.). Only in some papers dealing with the southwestern United States has *L. piperi* been retained as a species (ABRAMS 1940). In distribution maps these two taxa have often been combined (cf. PORSILD 1957, HULTÉN 1962), but RAUP (1947) has left out the known dots of *L. piperi* in British Columbia and Washington from the map of *L. wahlenbergii*. In Kamchatka, where the species is found in Asia, HULTÉN (1927), according to determinations of G. SAMUELSSON, and KOMAROV (1927) have kept it as *L. wahlenbergii*, but KRECHETOVICH and GONCHAROV (1935) mentioned *L. wahlenbergii* with a question mark from that area.

The differences between *L. piperi* and *L. wahlenbergii* are clear; more difficult is distinguishing *L. piperi* from some races of the very variable *L. parviflora* (Ehrh.) Desv. In herbaria *L. piperi* has been determined as *L. wahlenbergii*, sometimes also *L. parviflora*. In Table 1 some of the differential characters of the three species in question are compared. The data for *L. wahlenbergii* and *L. parviflora* are based on material from northwestern North America and northeastern Asia rather than on all populations of these species.

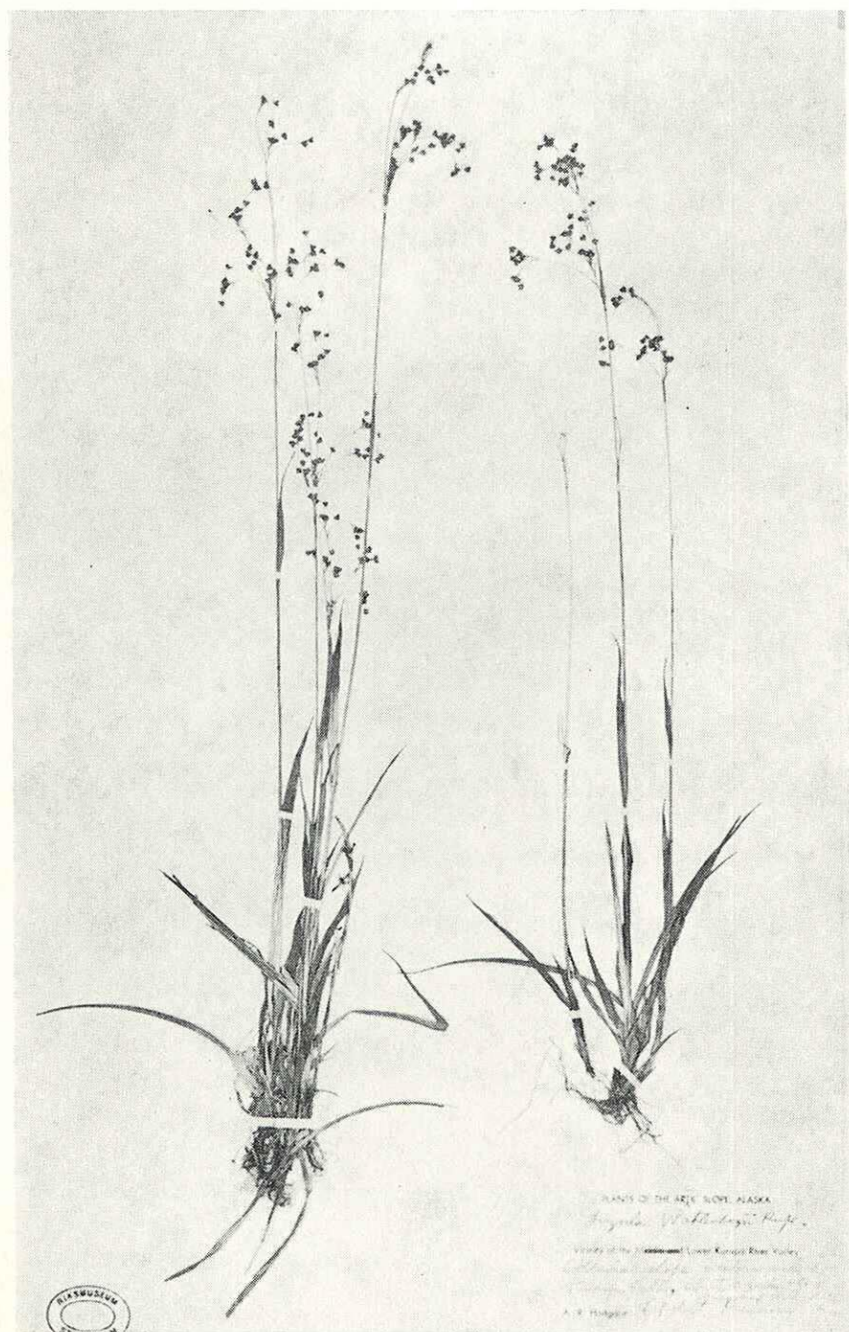


Fig. 1. *Luzula wahlenbergii* Rupr. (U.S.A., Alaska, Arctic Slope, western side of Kurupa Valley, about 10 miles above junction of Colville River, A. R. Hoagdon and R. Predewan, S). Photo S. Holmström.



Fig. 2. *L. piperi* (Cov.) M. E. Jones (U.S.A., Alaska, Windham Bay, 1905 J. N. Culbertson 4935, S). Photo S. Holmström.

Table 1. A comparison of some differences in *Luzula wahlenbergii*, *L. piperi* and *L. parviflora* s. lat.

	<i>L. wahlenbergii</i>	<i>L. piperi</i>	<i>L. parviflora</i> s. lat.
Height	20—30 (35) cm	(20) 30—35 cm	30—50 cm
Base	strongly tufted, often slightly tinged with red	slightly tufted, not tinged with red	often slightly tufted, tinged with red
Leaves	thin, shining, green, lanceolate, acuminate	thick, firm, dull, bluish green, linear, acuminate	thin, dull or shining, green or sometimes bluish green, lanceolate
Basal leaves	numerous, 2.5—3 (5) mm wide, 5—10 cm long	few, 3—4 mm wide, 6—10 cm long	numerous, 5—8 mm wide, 10—17 cm long
Cauline leaves	1—2, the lowest one 2—4 mm wide 3.5—5 cm long	2—3, the lowest one 4—6 mm wide, 4—7 cm long	3—5, the lowest one 5—7 mm wide, 8—15 cm long
The lowest bract	0.4—1.0 cm	1.5—2.5 cm	(1.5) 2—3.5 cm
Inflorescence	poor in flowers (from 10 to 20—30), partly nodding	rich in flowers (from 30 up to 60—80), nodding	number of flowers very variable, nodding
Flowers	2—2.5 mm anthers long compared with filaments	2—3 mm anthers long compared with filaments	1.5—2 (2.5) mm anthers short or long compared with filaments
Floral bracts	strongly ciliate, dark brown	strongly ciliate, dark reddish brown	lacerate or ciliate, green or pale brown, or sometimes dark
Capsule	dark brown, acute, slightly longer than the perianth	dark brown, acute, slightly longer than the perianth	pale or dark brown, obtuse or acute, shorter or longer than the perianth
Seeds	dark reddish-brown, with many slender fibres at micropylar end, seeds remain in open capsules for a long time and the specimens in herbaria are rich in seeds	yellowish brown, with a few slender fibres at micropylar end, seeds leave open capsules easily and in herbaria specimens are often poor in seeds	dark reddish brown, with many slender fibres at micropylar end, seeds remain in open capsules as in <i>L. wahlenbergii</i>

Anatomical differences are also found in the epidermis and in cross sections of the leaves of *L. piperi* and *L. wahlenbergii* (Table 2, Fig. 3). According to the 10 specimens (see the lists of localities) sectioned, the leaves of *L. piperi* seem to be thicker and richer in mechanical tissue. The girders are more numerous, the walls of epidermis cells lignified, the inner bundle sheaths thicker, etc. The latter features are also present in an individual apparently grown in a shady habitat. The epidermis cells of *L. piperi* are smaller with thinner walls and wavier cell contours than those of *L. wahlenbergii* (Fig. 4). *L. wahlenbergii*, also an European specimen, was examined (Finland: Enontekiö, Saana, 1910 J. W. Montell, H) and was stated to be essentially indetical with the North American ones.

The leaf anatomy of *L. parviflora* has been studied by BUCHENAU (1906) and EBINGER (1963). According to the mechanical tissue (BUCHENAU op.c.) and the waviness of the marginal walls of the epidemis cells and their size (EBINGER op.c.), the leaves of *L. parviflora* seem to be intermediate between *L. piperi* and *L. wahlenbergii*.

Table 2. A comparison of some anatomical features in the leaves of *Luzula piperi* and *L. wahlenbergii*.

	<i>L. piperi</i>	<i>L. wahlenbergii</i>
Thickness of leaves	0.25—0.30 mm	0.15—0.20 mm
Thickness of the upper epidermis	30—50 μ	25—40 μ
Combined thickness of the cuticle and the outer wall of the upper epidermis cells	5—8 μ	2 μ
Thickness of the lower epidermis	9—20 μ	13—27 μ
Combined thickness of the cuticle and the outer wall of the lower epidermis cells	5 μ	2 μ

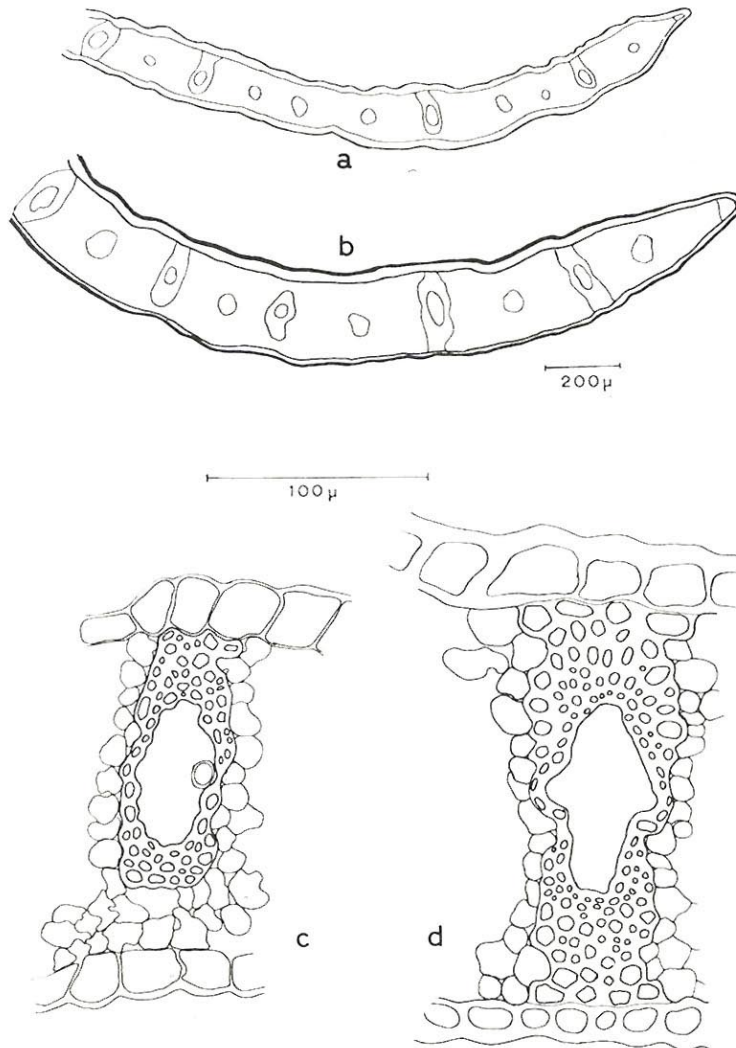


Fig. 3 The cross sections and the vascular bundles of the leaves of *Luzula wahlenbergii* Rupr. (a, c; Canada, NWT, Southampton, 1959 E. Hultén) and *L. piperi* (Cov.) M. E. Jones (b, d; W. J. Eyerdam 608).

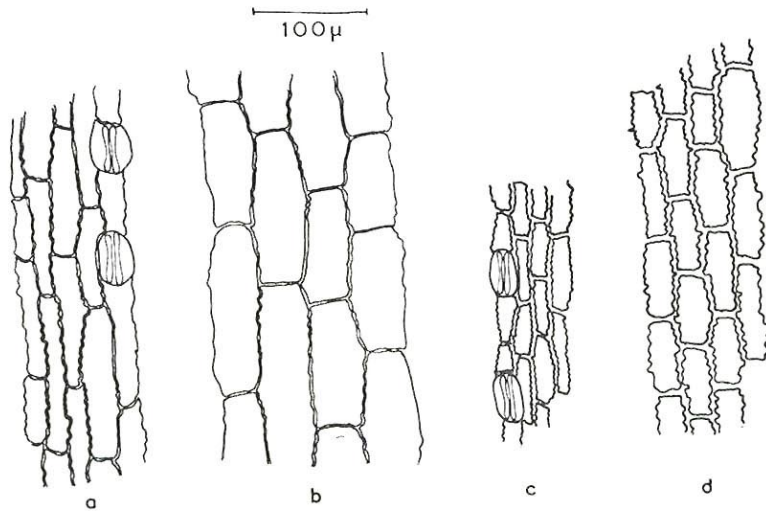


Fig. 4. Epidermis cells of the leaves of *Luzula wahlenbergii* Rupr. and *L. piperi* (Cov.) M. E. Jones: a the lower surface and b the upper surface of *L. wahlenbergii* (H. A. Senn and J. A. Calder 4021), c the lower surface and d the upper surface of *L. piperi* (E. Hultén 2253).

The best characters for identification of *L. piperi* are the bluish-green colour, the form and texture of leaves and the seeds. It is very easy to distinguish it from the race of *L. parviflora* called by HULTÉN (1943, 1962) ssp. *divaricata* (S. Wats.) Hult. (with leaves shiny, perianth light-coloured, capsule obtuse and shorter than the perianth, filaments much longer than anthers, etc.), which race obviously is not identical with *L. divaricata* S. Wats. occurring in the mountains of California, Oregon and Washington. More difficult in northwestern America are those specimens of *L. parviflora* which have dull, sometimes bluish-green leaves, acute capsules, anthers sometimes longer than filaments, etc. Some of these specimens, collected chiefly from southern Alaska and the Yukon *may be* hybrids (cf. HULTÉN 1943, ANDERSON 1959), but they need further study, as does the whole *L. parviflora* group in general.

It is usually easy to distinguish *L. piperi* and *L. wahlenbergii*, but the young specimens may be sometimes difficult. *L. wahlenbergii* is apparently not very variable anywhere within its range. However, the Japanese specimens are different and obviously what SATAKE (cf. OHWI 1961) called *L. parviflora* var. *yezoensis* Satake. The Alaskan collections of *L. wahlenbergii* from Seward Peninsula and around Norton Sound seem to be normally taller than those from the Arctic Slope, Arctic Canada and Fennoscandia. Hybrids between *L. piperi* and *L. wahlenbergii* have not been recorded yet. The ranges of the two species do not overlap according to material available to me, but others (e.g. GJAEREVOLL 1958) reports *L. wahlenbergii* from the Interior of Alaska.

The chromosome number $2n=24$ in *L. wahlenbergii* has been reported from Scandinavia (NORDENSKIÖLD 1951, 1953) and East Greenland (HOLMEN and MATHIESEN 1953). *L. parviflora* has the same number (NORDENSKIÖLD 1951). Apparently no counts of *L. piperi* have been made.

The distribution of *L. wahlenbergii* (Fig. 5) is arctic and oroarctic (alpine) and circumpolar, radiating from northern Beringia (cf. HULTÉN 1937, 1962). *L. piperi* is a northern Pacific, oceanic species (Fig. 5), occurring in the oroarctic zones of the mountains from Oregon and Idaho (ABRAMS 1940, DAVIS 1955) to southeastern Yukon and Alaska and from there through the Aleutian Islands to southern Kamchatka. It belongs very clearly to HULTÉN's (1937) »Western American plants reaching the Bering Sea, radiating from the coastal refugia«. *L. parviflora* s. lat. is circumpolar occurring in western North America and eastern Asia obviously from the middle (oro)boreal zone up to the (oro)hemiarctic zone, and thus it seems very rarely to grow with the preceding species (cf. HULTÉN 1927, KOMAROV 1927, PORSILD 1951, GJAEREVOLL 1958).

The ecology of *L. wahlenbergii* seems to be similar in North America and Fennoscandia; it occurs in arctic and oroarctic, mesic heaths, on hummocks and margins of shallow fens, in snow beds, in bare gravelly places, along trails, etc. Little information is available of habitats of *L. piperi*. PORSILD (1951, p. 131, under the name *L. wahlenbergii*) in southeastern Yukon reported it »in alpine Sphagnum bogs« and I have collected it from a dry rocky soil above the timber-line (HÄMET-AHTI 1965) in eastern central British Columbia. According to specimens examined it seems to keep to the same kind of habitats as *L. wahlenbergii*.

It is still difficult to say, which is the best taxonomic rank for *L. piperi* and *L. wahlenbergii* s. str. If we consider *L. wahlenbergii* s. str. to be a species, also *L. piperi* must be given specific rank. However, it is possible that they both are better to be regarded as subspecies of *L. parviflora*, the taxonomy of which is still imperfectly understood. For instance, the presence or absence of cilia in bracts, used for identification of *L. parviflora* and *L. wahlenbergii* in Northern Europe, does not serve to distinguish them in northwestern America. In material from the latter area I have only seen *L. parviflora* with dominantly lacerate bracts, which already indicates that the Fennoscandian *L. parviflora* ssp. *parviflora* is obviously absent there.

Summary

Luzula piperi (Cov.) M. E. Jones is regarded as a species distinct from *L. wahlenbergii* Rupr. and distributed along the mountain areas from Washington to Kamchatka. However, both of them belong to the still imperfectly known *L. parviflora* (Ehrh.) Desv. complex. The Fennoscandian *L. parviflora*

ssp. *parviflora* seems to be absent from western North America the species being represented by other races there.

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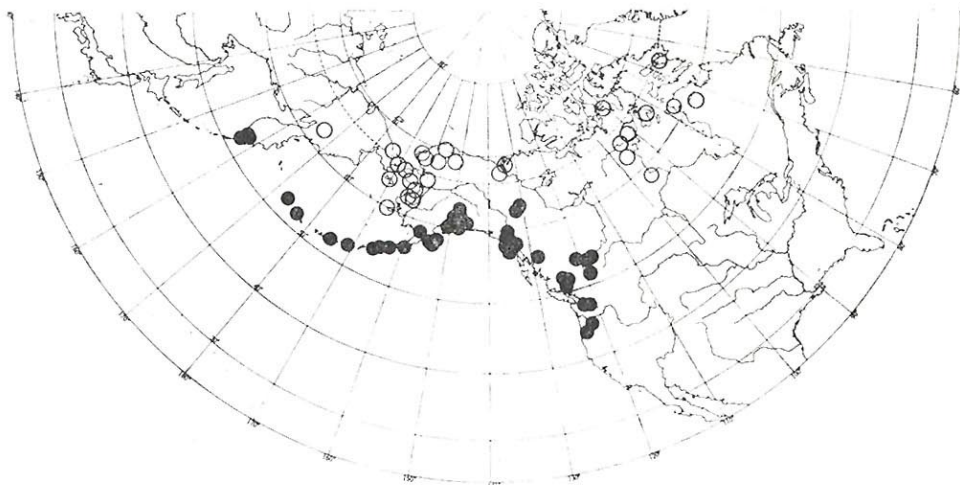


Fig. 5. The distribution of *Luzula wahlenbergii* Rupr. (open rings) and *L. piperi* (Cov.) M. E. Jones (dots) around the North Pacific according to the specimens examined.

The specimens examined

(those marked with an asterisk were used for anatomical studies)

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»NW coast of North America«, leg. Tolmie (Det. F. Buchenau 24. 1. 1885: »Eine kleine Form von *Luz. parviflora*, der *Luz. Wahlenbergii* Rupr. sich nähernd«, UPS). — OREGON. Douglas Co., near the summit of Old Bailey Mtn., 1897 F. V. Coville & E. I. Applegate 472*) (S). Mt. Hood, 1886 T. Howell (UPS). — WASHINGTON. Cascade Mts., Stevens Pass Region, 1929 J. M. Grant (S). Mt. Baker, 1800 m, 1915 G. Turesson (UPS). — ALASKA. *Eastern Pacific Coast Dist.*: Sitka, 1932 E. Hultén 8404 (S). Juneau, 1932 E. Hultén 8305 (S). Juneau Ice Field, Taku A nunatak, 1200 m, 1949 R. T. Ward (S). Skagway, 700 m, 1913. S. J. Enander (S). Skagway, 1934 J. P. Anderson 1646a (S). Yakobi I., 480 m, 1957 H. T. Shacklette (S). Windham Bay, 1905 J. N. Culbertson 4935 (S). White Pass, 1922 S. J. Enander (S, UPS). Lynn Canal, »Dejäh«, 1882 A. & A. Krause 476 (UPS). *Central Pacific Coast Dist.*: Port San Juan, Evans I., 1948 W. J. Eyerdam 7175 (S). Orca, 1938 J. L. Nordberg, (S). Talkeetna Mts., 1931 J. P. Anderson (S). Mt. Aljeska 1962 E. Hultén (S). Kenai Peninsula, Sterling Hwy 123, 1961 E. Hultén (S), end of Palmer Creek Road, 1951 W. S. Benninghoff 5506 (S). Chugach Mts, Worthington Glacier, 1961 E. Hultén (S). *Western Pacific Coast Dist.*: Kodiak I., Three Saints Bay, 1931 W. J. Eyerdam 608*) (S). Kodiak group, Raspberry I., Raspberry Strait, Port Vita, 1945 & 1946 W. J. Eyerdam 3948 & 5266

(S), Old Harbour 1931 W. J. Eyerdam 628 (S). King Cove, 1932, W. J. Eyerdam 1454, 1555, 1542, 1588, 1717 (S). *Aleutian Islands Dist.*: Attu 1932 E. Hultén 6133, 6132 (S). Atka, 1932 P. West 101 (S). Carlisle I., 1932 E. Hultén 6606* (S). Atka, 1932 W. J. Eyerdam 1038, 1304 (S). Kiska I., 1932 E. Hultén 6352 (S). Chichagof, 1929 M. Tatewaki (S). False Pass, 1932 W. J. Eyerdam 1850, 2146, 2416 (S). Unalaska, 1932 E. Hultén 7216 (S). Akutan, 1934 I. L. Nordberg 555 (S). *Bering Sea Dist.*: Naknek, 1946 J. L. Nordberg (S). *Alaska Range Dist.*: Maclaren Glacier, 1300 m, 1958 H. T. Shacklette 5589 (S). Sheep Mtn., Glenn Hwy 113, 1948 J. P. Anderson 10702 (S).

CANADA

ALBERTA. Banff Natl. Park, Lake Louise, 1913 C. Skottsberg (UPS). — BRITISH COLUMBIA. Selkirk area, 2400 m, 1904 C. H. Shaw 386 (S), 1800 m, 1904 H. Petersen 392 (S), above Carb. Draw, 2100 m, 1904 R. J. Shaw 307 (S). Itcha Mts., 26 mi. NE of Anahim Lake, 1800 m, 1956 J. A. Calder, J. A. Parmelee & R. L. Taylor 20215 (S). Tenquille Lake area, Crown Mtn., 1800 m, 1960 K. Beamish & F. Vrugtman 60931 (OULU). Copper Dome Mtn, 2000 m, 1960 K. Beamish & F. Vrugtman 60980 (OULU). Lillooet area, Big Dog Mtn., 2000 m K. Beamish & F. Vrugtman 610659 (OULU), Elisabeth Mine, 2000 m, 1961 K. Beamish & F. Vrugtman 610561 (OULU). Tenquille Lake Pass, 1600 m, 1960 K. Beamish & F. Vrugtman 60896 (OULU). Yoho Natl. Park, Field, Mt. Stephen, 1931 A. Cajander & V. Kujala* (H). Wells Gray Prov. Park, Battle Mtn., 1961 L. & T. Ahti 7037* (H). Smithers, Kathlyn Mts., 1931 A. Cajander & V. Kujala (H). — YUKON. Canol Road, Itsi Range, 1944 A. E. Porsild & A. J. Breitung 11382 (S), Upper south fork of MacMillan R. 1200 m, 1944 A. E. Porsild & A. J. Breitung 11335 (S).

U.S.S.R.

Kamchatka Dist.: Opala vulcan, 620 m, 1921 E. Hultén 2253* (S). Akhomten Bay, 250 m, 1920 E. Hultén 1200 (S), Akhomten Bay, 1920 R. Malaise 1153 (S). Illina vulcan, 600 m, 1922 E. Hultén 4385 (S). Sorelaja vulcan, 800 m, 1922 E. Hultén 3991 (S). Shalsan Pass, 700 m, 1921 E. Hultén 2986 c, 3035 (S).

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ALASKA. *Bering Sea Dist.*: Nunivak I., Nash Harbour, 1938 J. P. Anderson 3878, 3875 (S). Yukon R. Delta, Kotlik, 1926 A. E. & R. T. Porsild 864 (S). Norton Sound, Pastolik, 1926 A. E. & R. T. Porsild 976 (S), St. Michael I., 1894 F. Funston 228 (S). St. Lawrence I., 1879 F. R. Kjellman (S), Cape Tam-nik, 1949 W. S. Benninghoff 3320 (S). *Bering Sea Dist.*: Gambell, 1938 J. P. Anderson 5179 (S). Nome, 1936 G. N. Jones 9015 (S), 1938 J. P. Anderson 3635 (S). Port Clarence, Teller, 1926 A. E. & R. T. Porsild 1425 (S). Buckland River, 26 mi. above delta, 1926 A. E. & R. T. Porsild 1551 (S, H*). Wales, 1938 J. P. Anderson 4933 (S). Brooks Range, De Long Mts., Feniak Lake, 600 m, 1961 K. Holmen & O. Mårtensson 611039 (OULU). Ogotoruk Creek Drainage, 300 m, 1960 L. Viereck & A. Bucknell 4643 (OULU). *Arctic Coast Dist.*: About 12 km SE of Cape Sabine, 1959 S. G. Shetler & K. J. Stone 3267 (S). Meade R. village, 1960 E. Hultén (S). W side of Kurupa Valley about 10 mi. above junction with Colville R., 1952 A. R. Hoagdon & R. Predewan 8873 (S). Umiat, 1948 N. Polunin (S), 1948 L. A. Spetzman 1267 (S), 1960 E. Hultén (S).

CANADA

QUEBEC. Lac Payne, 1948 J. Rousseau 867 (S). Iviguvik, 1938 P. A. Dutilly 6167 (S). — MANITOBA. Lamprey, 1950 D. K. Brown 293 (OULU). — NORTHWEST TERRITORIES.

Keewatin Dist.: Southampton I., Coral Harbour, 1959 E. Hultén* (S). Lake on Tha-anne River, 240 m, 1930 A. E. Porsild 5580 (S). Hikolikdjuak Lake on Kazan River, 1930 A. E. Porsild 5781, 5782 (S). Chesterfield, 1930 A. E. Porsild 6148 (S), 1938 M. Duman 1821 (S). *Franklin Dist.*: Frobisher Bay, 1948 H. A. Senn & J. A. Calder 3878 (UPS), 4021 (S, TUR*). Frobisher Bay, 1959 E. Hultén (S). Pangnirtung, Cumberland Gulf, 1927 M. O. Malte 118581 (S). *Mackenzie Dist.*: Mackenzie R. Delta, North end of Richards I., 1927 A. E. & R. T. Porsild 218b (S). Richardson Mts., Canoe Lake W of Aklavik, 1964 E. Hultén (S).

U.S.S.R.

Magadan Dist.: Pitlekaj, 1879 F. R. Kjellman (S). Uedle, 1881, A. & A. Krause 175 (UPS). *Kamchatka Dist.*: Pal'matkina R., 1932 B. Gorodkov & B. Tikhomirov (S).

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