

with leaves unranked to 5-ranked, leaves not much elongated at distal branch tip. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch leaves** ovate, 1.1–1.3 mm long, stiff, weakly undulate and slightly recurved when dry; hyaline cells in mid region quite short and broad, 3.3–2.5:1, in basal 1/2 of leaf on convex surface often with 1 large pore apically and/or up to 6 free pores, in apical region often with pseudopores along the cell margins; on concave surface with large round wall-thinnings in the cell ends and angles (these sometimes faint or absent); chlorophyllose cells triangular in transverse section and typically well-enclosed on concave surface. **Sexuality** unknown.

Lawns and hollows, typically in sedgey weakly minerotrophic fens; low to moderate elevations; Alaska.

34. *Sphagnum lenense* Pohle, Trudy Glavn. Bot. Sada 33: 14. 1915



Sphagnum lindbergii var. *microphyllum* Warnstorf, Hedwigia 32: 16. 1893

Plants compact, short-branched and small; strongly reddish to golden brown, glossy when dry; flat-topped capitulum with moderately differentiated terminal bud. **Stems** dark brown; superficial cortex of 3–4 layers of enlarged thin-walled cells.

Stem leaves lingulate, small, equal to or less than 0.8 mm, appressed to stem; apex with strong lacerate split in the middle; hyaline cells e fibrillose, aporse, and nonseptate. **Branches** strongly 5-ranked, short and blunt, not much elongated at distal end. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch stems** green, with cortex enlarged with retort cells. **Branch leaves** ovate; usually less than 1.5 mm; stiff and slightly reflexed, straight to slightly subsecund; margins entire; hyaline cells moderately long and narrow (6–8:1), convex surface with one small round pore per cell at apex and numerous pseudopores on the margin, concave surface with large round wall thinnings in the cell angles and ends; chlorophyllous cells triangular in transverse section, with apex reaching concave surface. **Sexual condition** unknown. **Spores** not seen.

Common forming hummocks and carpets in a variety of weakly minerotrophic to ombrotrophic mires including *Eriophorum* tussock fens, dwarf shrub fens, polygon peatlands, string mires and raised bogs; low to moderate elevations; Greenland; Nfld. and Labr. (Nfld.), N.W.T., Nunavut, Que., Yukon; Alaska; Eurasia.

Sporophytes are rare in *Sphagnum lenense*. This species is easily distinguished from the similar *S. lindbergii* by its compact growth form and reddish brown color. *Sphagnum lenense* also is a hummock former in the tundra whereas *S. lindbergii* forms carpets.

35. *Sphagnum lindbergii* Schimper, Öfvers. Kongl. Vetensk.-Akad. Förh. 14: 126. 1857



Plants moderate-sized to large, moderately densely branched; green to brown, often bluish tinged and/or shiny when dry; capitulum flattopped with a conspicuous terminal bud. **Stems** dark brown; superficial cortex of 2–4 layers of enlarged, thin-walled cells. **Stem leaves** lingulate-

spatulate, large, 1.3–1.6 mm; appressed to stem; apex very broad and lacerate; hyaline cells e fibrillose and aporse, often septate. **Branches** strongly 5-ranked and straight. **Branch fascicles** with 2 spreading and 2 pendent branches, leaves not much elongated at distal end. **Branch stems** green, with cortex enlarged with retort cells. **Branch leaves** ovate-lanceolate, 1.5–3 mm; straight to slightly subsecund; imbricate to somewhat reflexed and not undulate; margins entire; hyaline cells long and narrow, length to width ca. 10:1 on convex surface with 1 or more small pores in the cell ends and angles and often with numerous pseudopores along the margins, on concave surface with large round wall thinnings on the cell ends and angles; chlorophyllous cells triangular to trapezoidal in transverse section, apex often exposed on concave surface. **Sexual condition** monoicous or dioicous. **Spores** 22–34 µm; both surfaces smooth, apparent ridged border on proximal surface; proximal laesura more than 0.5 spore radius.

Widespread forming carpets in ombrotrophic to weakly minerotrophic boreal mires; low to high elevations; Greenland; Alta., B.C., Man., Nfld. and Labr. (Nfld.), N.W.T., N.S., Nunavut, Ont., Que., Yukon; Alaska, Colo., N.H., N.Y., Wash.; Eurasia.

Sporophytes are uncommon. *Sphagnum lindbergii* is normally easily distinguished from other carpet-forming species of sect. *Cuspidata* by its large, strongly lacerate stem leaf and dark brown to black stem. Sexual condition is taken from from L. I. Savicz-Lubitzkaya and Z. N. Smirnova (1968).

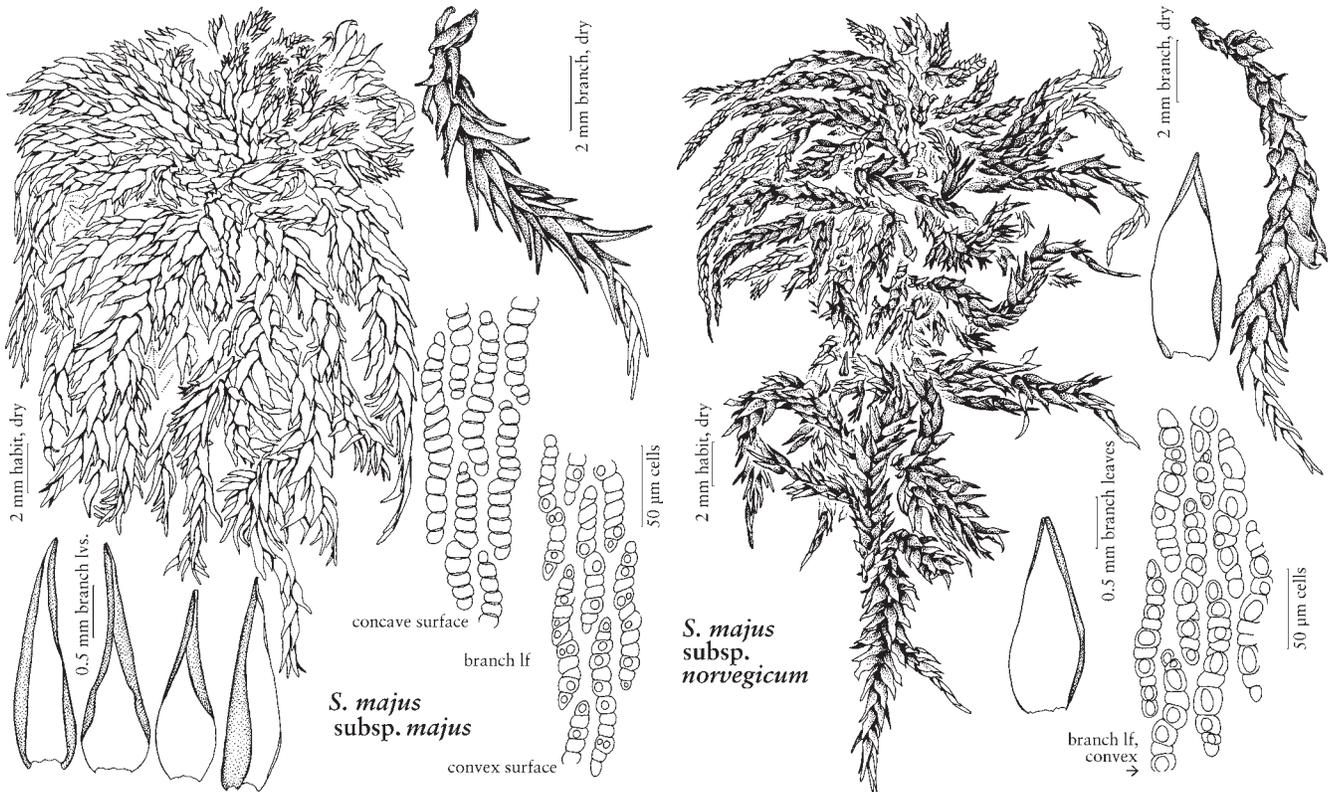
36. *Sphagnum majus* (Russow) C. E.O. Jensen in Botaniske Forening København, Festskrift, 106. 1890

[F]



Sphagnum cuspidatum var. *majus* Russow, Arch. Naturk. Liv- Ehst-Kurlands, Ser. 2, Biol. Naturk. 7: 136. 1865

Plants moderate-sized to robust, fairly weak-stemmed, lax in submersed forms, ± sprawling in emergent forms; golden brown to dark brown; capitulum weakly 5-radiate, branches straight to strongly laterally curved.



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Stems green to pale brown, superficial cortex only weakly differentiated. **Stem leaves** triangular-lingulate, 0.8–1.4 mm, spreading to appressed; apex acute to narrowly obtuse, hyaline cells nonseptate and fibrillose near apex. **Branches** unranked or weakly 5-ranked, straight to strongly curved, leaves moderately elongated at distal end. **Branch fascicles** with 2 spreading and 1–2 pendent branches. **Branch stems** green but sometimes reddish at proximal end, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate to narrowly ovate-lanceolate, 1.8–3.4 mm; straight to strongly subsecund; weakly undulate and recurved when dry; margins entire; hyaline cells on convex surface with 1–2 free pores per fibril interval, concave surface aporse or rarely with a few wall thinnings in cell ends and angles; chlorophyllous cells trapezoidal in transverse section and narrowly exposed on concave surface. **Sexual condition** dioicous. **Spores** 33–40 µm.

Subspecies 2 (2 in the flora): North America, Eurasia.

SELECTED REFERENCE Flatberg, K. I. 1987. Taxonomy of *Sphagnum majus* (Russ.) C. Jens. Kongel. Norske Vidensk. Selsk. Skr. (Trondheim) 2: 1–42.

1. Branch leaf hyaline cells on convex leaf surface with 1–2 pores per fibril interval, these usually less than $\frac{1}{3}$ the cell diameter 36a. *Sphagnum majus* subsp. *majus*
1. Branch leaf hyaline cells on convex leaf surface with 1 pore per fibril interval, these more than $\frac{1}{3}$ the cell diameter 36b. *Sphagnum majus* subsp. *norvegicum*

36a. *Sphagnum majus* (Russow) C. E. O. Jensen subsp. majus [E]



Sphagnum dusenii Russow & Warnstorf

Plants golden brown to dark brown; branches strongly laterally curved. **Stem leaves** 0.8–1.3 mm, usually appressed. **Branch leaves** 2–2.8 mm, straight to usually strongly subsecund; hyaline cells on convex surface often with 2

pores per fibril interval, pores usually less than $\frac{1}{3}$ cell diameter. **Spores** 33–38 µm; both surfaces roughly verrucate scabrate; proximal laesura less than 0.5 spore radius.

Forming wet carpets but habitat unclear due to recent taxonomic separation from subsp. *norvegicum*; in North America, subsp. *majus* seems to occur in ombrotrophic

to poor fen habitats, often on floating mats, mixed with *S. cuspidatum* in eastern North America; low to moderate elevations; B.C., Nfld. and Labr. (Nfld.), N.S., Ont., Que.; Alaska, Conn., Maine, Mass., Mich., Minn., N.H., N.J., Pa., Vt., Wis.; Eurasia.

Sporophytes of subsp. *majus* are rare. In the field it is typically darker brown than subsp. *norvegicum*, while its capitulum is denser and less stellate appearing than in the latter. See also discussion under 23. *Sphagnum annulatum*.

36b. *Sphagnum majus* subsp. *norvegicum* K. I.

Flatberg, Kongel. Norske Vidensk. Selsk. Skr. (Trondheim) 2: 1. 1987 [E]



Plants green, yellow-green, brownish green to golden brown; branches straight to slightly curved. **Stem leaves** 1–1.4 mm, often spreading. **Branch leaves** 1.8–3.4 mm, straight to slightly subsecund; hyaline cells on convex surface with mostly 1 pore per fibril interval, pores more than 1/3

cell diameter. **Spores** 33–40 µm; distal surface finely and densely granulate.

Habitat unclear due to recent taxonomic separation from subsp. *majus*; in North America, subsp. *norvegicum* seems to occur in weakly minerotrophic habitats such as poor sedge fens, lake edges, and floating mats; low to moderate elevations; Alta., B.C., Nfld. and Labr. (Nfld.), N.W.T., N.S., Ont., Que., Sask., Yukon; Alaska, Conn., Maine, Mass., Mich., Minn., N.H., N.J., N.Y., Pa., Wis.; Eurasia?

Sporophytes of subsp. *norvegicum* are uncommon. See discussion under 23. *Sphagnum annulatum*. Spore features are taken from from Flatberg's description.

37. *Sphagnum mcqueenii* R. E. Andrus, Sida 22: 959, figs. 1–6. 2006 [E]



Plants robust and weak-stemmed; yellow to light brown; capitulum flat-topped and with ± conspicuous terminal bud. **Stems** light green; superficial cortex of 1–2 layers of moderately differentiated thin-walled cells. **Stem leaves** equilateral triangular, 0.8–1.1 mm; often spreading; apex more

or less obtuse; leaves often spreading; hyaline cells usually septate and often fibrillose in proximal half of leaf. **Branches** unranked, ± straight, leaves moderately elongated at distal end. **Branch fascicles** with 2 spreading and 1–2 pendent branches. **Branch stems** green, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate, less than 2.2 mm, straight;

undulate and sharply recurved when dry; margins entire; hyaline cells on convex surface with 0–1 apical pores and often with pseudopores, concave surface with 12 round wall thinnings in cell angles and sometimes along commissures; chlorophyllous cells triangular in transverse section, just enclosed on the concave surface and broadly exposed on the convex surface. **Sexual condition** unknown. **Spores** not seen.

Habitat poorly understood, but known from floating mats in poor fen habitats; low to moderate elevations; Nfld. and Labr. (Nfld.); Maine, N.H., Pa., Vt.

Sporophytes of *Sphagnum mcqueenii* are unknown. *Sphagnum torreyanum* and *S. atlanticum* both have longer, narrower, and less sharply recurved branch leaves than does *S. mcqueenii*. Both *S. cuspidatum* and *S. viride* have acute stem leaves as compared to the obtuse stem leaves of this species. *Sphagnum pulchrum* has 5-ranked branch leaves and apiculate stem leaves, which contrast strongly with the unranked branch leaves and obtuse stem leaves of this species.

38. *Sphagnum mendocinum* Sullivant, Icon. Musc., suppl.: 12. 1874 [E]



Sphagnum mendocinum var. *gracilescens*; *S. mendocinum* var. *recurvum* Röhl; *S. mendocinum* var. *robustum* Warnstorf

Plants moderately robust and lax; terminal bud somewhat enlarged; yellow-green to light brownish green. **Stems** yellow-green; superficial cortex of 1–2 layers of

moderately enlarged cells. **Stem leaves** broadly oblong-triangular, 1.2–1.5 mm; mostly appressed to stem; apex obtuse; hyaline cells narrow, usually nonseptate, eifibrillose and aporse on convex surface near apex, on concave surface usually eifibrillose with irregular pores along commissures in distal portion of leaf. **Branches** with loosely imbricate leaves; often 5-ranked; leaves little to somewhat elongated at distal end. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch stems** green, with cortical cells in 1 layer with conspicuous necks. **Branch leaves** ovate, ovate-lanceolate to lanceolate; 2–3.5 mm; flat and undulate at margins and recurved at apex when dry; straight; margins entire; hyaline cells on concave surface with very numerous, small ringed or unringed pores along the commissures, 5–12 in distal portion of leaf and 20–27 in proximal portion, convex surface with 5–15 pores per cell in distal portion of leaf and 14–21 in proximal portion, pores usually without a ring; chlorophyllous cells triangular to trapezoidal in transverse section and exposed slightly on concave surface. **Sexual condition** dioicous. **Spores** ca. 30 µm; very slightly roughened.

Submerged or floating in weakly minerotrophic wet depressions of alder swamps, coniferous swamps, *Spiraea* thickets, sedge fens, raised bogs, and drainage ditches in mires; low to moderate elevations; B.C.; Alaska, Calif., Idaho, Mont., Oreg., Wash.

Sporophytes of *Sphagnum mendocinum* are uncommon. Although the unique branch leaf porosity makes it unmistakable microscopically, it may be confused with other species in the field. It is unusual ecologically in that it seems to overlap both the carpet- and lawn-forming habits—in other words it seems intermediate between *S. recurvum* and *S. cuspidatum*, in the broad sense. Among the species that it overlaps floristically, it is more robust and darker colored than *S. pacificum*. The latter also has an apiculate stem leaf compared to the more or less obtuse stem leaves of *S. mendocinum*. The more wet-growing *S. majus* var. *majus* and *S. majus* var. *norvegicum*, with which it slightly overlaps in habitat, have branch leaves that are strongly elongated at the distal branch ends whereas those of *S. mendocinum* are not. See also discussion under 40. *S. obtusum*. Sexual condition and spore characters are taken from from H. A. Crum (1984).

39. *Sphagnum mississippiense* R. E. Andrus, Mem. New York Bot. Gard. 45: 237. 1987 (as *mississippiensis*) [E]



Plants small, short and weak-stemmed, compact and sprawling in thin mats, green to pale yellow. **Stems** green, superficial cortex of thin-walled but not much enlarged or differentiated. **Stem leaves** elongate-triangular, 1.3–1.5 mm; often spreading; apex obtuse; hyaline cells mostly e fibrillose and

1-septate in proximal half and lateral portions of leaves. **Branches** unranked, often blunt and with leaves moderately elongated at distal end. **Branch fascicles** with 2–3 spreading and 0–2 pendent branches. **Branch stems** green, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate to broadly ovate at branch base and becoming ovate-lanceolate at branch tip; 1.2–1.5 mm; undulate when dry, margins serrulate; hyaline cells of convex surface with 0–5 pores or pseudopores at cell apex, concave surface with faint round wall thinnings in cell angles, but may be absent, chlorophyllous cells trapezoidal in transverse section, exposed more broadly on convex surface. **Sexual condition** probably dioicous. **Spores** not seen.

Mats in seasonally wet depressions in coastal plain; low elevations; La., Miss., N.J.

Sporophytes of *Sphagnum mississippiense* are unknown. The combination of broad branch leaves and

obtuse stem leaves will distinguish it from *S. cuspidatum* and *S. viride*. The much commoner and more wide-ranging *S. trinitense*, although also having serrulate branch leaves, has much narrower branch leaves that are more elongate at the branch tips, becoming quite lanceolate as compared with the ovate-lanceolate branch leaves that *S. mississippiense* exhibits at its branch tips.

40. *Sphagnum obtusum* Warnstorf, Bot. Zeitung (Berlin) 35: 478. 1877 [E]

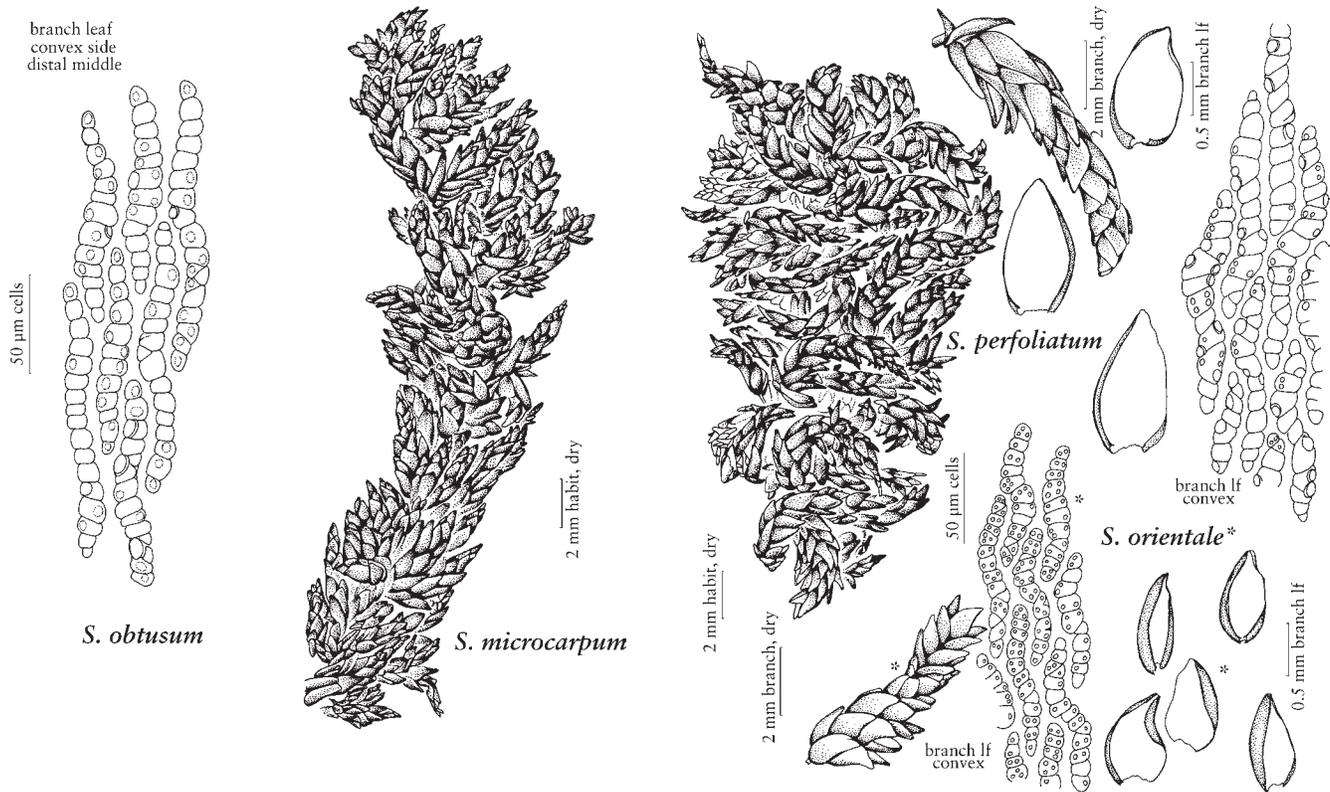


Plants moderate to robust, weak-stemmed, yellow, yellowish brown to golden brown; capitulum varying from rounded, not 5-radiate and twisted to flat 5-radiate and straight branched. **Stem** pale green to pale brown; superficial cortex of weakly to moderately differentiated. **Stem**

leaves triangular-lingulate, 0.9–1.3 mm; usually appressed; apex obtuse and often erose; hyaline cells e fibrillose and nonseptate. **Branches** tapering or in more robust forms, frequently blunt, straight to arcuate, leaves slightly to moderately elongated at distal end. **Branch fascicles** with 2 spreading and 2 pendent branches. **Branch stems** green, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate to ovate-lanceolate; more than 1.8 mm; straight, stiff, not much undulate and reflexed to recurved; margins entire; hyaline cells on convex surface with a few end pores, but mostly numerous small to very small (often barely visible) pores or wall thinnings free from the commissures, on concave surface similar, but with pores generally fewer and larger; chlorophyllous cells triangular in transverse section, just reaching concave surface or slightly enclosed. **Sexual condition** dioicous. **Spores** 18–27 μm; both surfaces covered with rough, irregular verrucate plates of papillae, bifurcated Y-mark sculpture on distal surface; proximal laesura less than 0.5 spore radius.

Forming carpets in minerotrophic peatlands; low to moderate elevations; Greenland; Alta., B.C., Man., Nfld. and Labr. (Nfld.), N.W.T., Nunavut, Ont., Que., Sask., Yukon; Alaska, Minn.; Eurasia.

Sporophytes are uncommon in *Sphagnum obtusum*. This is a quite phenotypically variable species that warrants further investigation, which may result in taxonomic splitting. The strongly obtuse stem leaf should separate it from any similar species with which it occurs. *Sphagnum mendocinum* looks similar phenotypically but there appears to be no range overlap with *S. obtusum*. The tiny branch leaf pores, which may seem like no more than pinpricks in the cell surface, easily separate *S. obtusum* microscopically from other species of sect. *Cuspidata*.



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41. *Sphagnum pacificum* Flatberg, Bryologist 92: 116, figs. 1–20. 1989 [E]



Plants moderate-sized and fairly strong-stemmed; green, yellow to yellowish brown; capitulum 5-radiate in shade forms to hemispherical in open grown or drier growing forms. **Stems** pale green to pale brown, sometimes with red branch bases; superficial cortex of 2 layers of enlarged,

clearly differentiated and thin-walled cells. **Stem leaves** triangular to lingulate-triangular, 0.8–1.3 mm; typically appressed; apex acute to apiculate; hyaline cells efibrillose and nonseptate to rarely septate. **Branches** straight and somewhat tapered, usually 5-ranked; leaves little elongate at the distal branch end. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch stems** green but often reddish at proximal end, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate to narrowly ovate-lanceolate; (1.1–)1.4–1.8(–3.1) mm; slightly undulate and sharply recurved when dry, somewhat subsecund; margins entire; hyaline cells on convex surface with usually 1 round pore on apical end, on concave surface with wall thinnings in the cell ends and angles; chlorophyllous cells broadly triangular in transverse section and very deeply enclosed on the concave surface.

Sexual condition dioicous. **Spores** 19–25 µm; finely papillose on both surfaces.

Forested and open poor fen habitats, often as a ruderal species in extensive mats; low to moderate elevations; B.C.; Alaska, Oreg., Wash.

Sporophytes in *Sphagnum pacificum* are uncommon. See discussion under 26. *S. brevifolium*. Characters of the spores are taken from Flatberg's description.

42. *Sphagnum pulchrum* (Lindberg) Warnstorf, Bot. Centralbl. 82: 42. 1900



Sphagnum intermedium var. *pulchrum* Lindberg in R.

Braithwaite, Sphagnac. Europe, 81, fig. 25g. 1880

Plants moderate-sized to robust, often quite dense and compact; green, brownish green, golden brown to dark brown; capitulum flat-topped and not especially 5-radiate. **Stems** green to dark brown; superficial cortex of 2 layers of enlarged, moderately differentiated cells. **Stem leaves** triangular to triangular-lingulate, 0.9–1.1 mm; appressed to spreading; apex apiculate, acute or narrowly obtuse, appressed to spreading; hyaline cells nonseptate and efibrillose. **Branches** straight to more