

19. *Sphagnum tundrae* Flatberg, Lindbergia 19: 3, figs. 1–3. 1994 [E]



Plants small to moderately robust, green to yellow green, with a brownish tinge in hummocks; forms mats and cushions. Stems yellowish green with some brown bands; 2–3 layers of superficial cells. Stem leaves shorter than branch leaves, 0.8–1.6 mm, lingulate, hyaline cells non-septate

above and commonly 1-septate below. Branches short and blunt, branch leaves imbricate. Branch fascicles typically with 2 spreading and 2 hanging branches.

Branch stems with single layer of cortical cells. Branch leaves 0.9–2 mm, ovate, with conspicuously truncate apex, hyaline cells bulging on both surfaces, with 1–4 large circular to elliptic pores per cell on convex surface and 4–7 elliptic pores per cell on concave surface, internal commissural walls faintly papillose, chlorophyll cells elliptical to elliptical-ovate with the broadest part typically some distance from convex surface. Sexual condition unknown.

Forms mats and cushions in weakly minerotrophic arctic mires; low elevations; Yukon; Alaska; Europe.

*Sphagnum tundrae* can be separated from other species in sect. *Squarrosa* most readily by its truncate branch leaves.

1e. SPHAGNUM sect. ISOCLADUS (Lindberg) Braithwaite, Sphagnac. Europe, 30, 87. 1878 [E]

*Isocladus* Lindberg, Öfvers. Kongl. Vetensk.-Akad. Förh. 19: 133. 1862

Plants coarse and robust; usually found floating, submerged or stranded; capitulum not apparent, leaves crowded into a tuft; deep green throughout or dark reddish brown to blackish brown with yellowish branch tips when wet and shiny pale green to straw colored or brown when dry. Stems green to brownish, superficial cortex of 2–3 layers of inflated, thin-walled, efibrillose, non-ornamented, aporose cells. Stem leaves much smaller than branch leaves, broadly triangular with a rounded apex, border entire, hyaline cells rhomboid, efibrillose and non-ornamented; convex surface aporose; concave surface with 0–5 round or oblong pores with either 1 central pore or pores in a single row. Branches more or less monomorphic. Branch fascicles with 2–3 branches. Branch stems green, surrounded by 1–3 layers of enlarged, thin-walled, efibrillose, non-ornamented, mostly aporose cells. Branch leaves lanceolate, linear-lanceolate to ovate-lingulate, apex tubular and involute or flat and rounded, with numerous small pores (8–60 per cell) on the convex surface in 1–3 irregular rows, nearly aporose on the concave surface; chlorophyllous cells rectangular in transverse section and equally exposed on both surfaces. Sexual condition dioicous. Capsule with few pseudostomata or pseudostomata absent. Spores 25–35 µm; smooth to finely papillose on proximal and distal surfaces, conspicuous bifurcated Y-mark sculpture on distal surface; proximal laesura less than 0.5 spore radius.

Species 2 (2 in the flora): North America.

- 1. Branch leaves with 20–40 pores, each less than 0.25 width of cell, mostly in 2 rows, branch leaves ovate-ligulate with a broad, rounded, truncate apex . . . . . 20. *Sphagnum cribrosum*
- 1. Branch leaves with 8–12 pores, each more than 0.25 width of cell, mostly in 1 row, branch leaves lanceolate to linear-lanceolate with a narrow tubular apex . . . . . 21. *Sphagnum macrophyllum*

20. *Sphagnum cribrosum* Lindberg, Eur. Hvitmoss., 74. 1882 [E]



*Sphagnum floridanum* (Austin) Cardot; *S. macrophyllum* var. *floridanum* Austin

**Plants** green, light brown to brown. **Branch leaves** ovate-ligulate, apex broad, rounded, and truncate, hyaline cells with 20–40 small (less than 0.25 cell diameter) in mostly 2 rows.

Floating or stranded at margins of shallow acidic lakes and ponds; low elevations; Fla., Ga., Md., N.C., S.C.

Besides having different branch leaf porosity, *Sphagnum cribrosum* is usually distinguishable from the closely related *S. macrophyllum* by its paler brown color and distinctly broader and more truncate branch leaves. “Wave forms” of both *S. cribrosum* and *S. macrophyllum*, seemingly developed in response to growing in shallow water where wave action is common, can have very odd

phenotypes that may look more like *Fontinalis* than *Sphagnum*.

21. *Sphagnum macrophyllum* Bridel, Bryol. Univ. 1: 10. 1826 [E]



*Isocladius macrophyllus* (Bridel) Lindberg; *Sphagnum macrophyllum* var. *burinense* W. S. G. Maas

**Plants** brown, dark brown to nearly black. **Branch leaves** lanceolate to linear-lanceolate, apex narrow and tubular, hyaline cells with 8–12 moderate-sized (more than 0.25 cell diameter) in mostly one row.

Floating or stranded at margins of shallow lakes and ponds, rarely in seeps where probably constantly wet; low to moderate elevations; Nfld. and Labr. (Nfld.), N.S.; Ala., Ark., Del., Fla., Ga., La., Md., Miss., N.J., N.Y., N.C., S.C., Tenn., Tex., Va.

1f. SPHAGNUM sect. CUSPIDATA Lindberg, Öfvers. Kongl. Vetensk.-Akad. Förh. 19: 134. 1862

*Sphagnum* sect. *Mollusca* A. Casares-Gil

**Plants** varying from lax, free-floating forms to compact terrestrial forms, usually with distinct capitulum; green, whitish, pale, yellow-green to light brownish, rarely dark-colored. **Stems** green, brown, dark brown to occasionally pinkish in parts, superficial cortex of 0–4 layers of efibrillose, non-ornamented, enlarged, thin-walled cells, cells in outer layer aporose. **Stem leaves** usually smaller than branch leaves, triangular to lingulate, apex apiculate, acute, broad, or erose and split, border narrow or broad at base; hyaline cells non-ornamented, usually efibrillose (in proximal portion) to often fibrillose in distal portion of leaf, aporose or with few pores and septate to nonseptate. **Branches** dimorphic, pendent branches more slender and delicate than spreading branches. **Branch fascicles** with 2–3 spreading to 1–3 pendent branches. **Branch stems** green to pinkish, surrounded by 1 layer of efibrillose, non-ornamented, enlarged, thin-walled cells, with solitary uniporose retort cells (or in groups) with short necks, other aporose cells rectangular. **Branch leaves** usually longer than stem leaves, ovate to lanceolate; margins entire or in a few cases serrulate; apex involute and smooth; hyaline cells non-ornamented, fibrillose (in one case efibrillose), convex surface porose or with a few to numerous pores or pseudopores, concave surface aporose or with pores or pore-like wall thinnings; chlorophyllous cells triangular to trapezoidal in transverse section, more broadly exposed on convex surface, end walls not thickened. **Sexual condition** mostly dioicous or occasionally monoicous. **Capsule** less than 2 mm, with few pseudostomata. **Spores** usually more than 30 µm, rarely with raised surface sculpture on distal surface; proximal laesura typically less than or equal to 0.5 spore radius.

Species ca. 55 (29 in the flora): worldwide except Antarctica.

1. Stem leaves lacerate across all or part of apex.
  2. Stem leaves lingulate-spatulate, lacerate across broad apex and partially down the sides  
..... 35. *Sphagnum lindbergii*
  2. Stem leaves lingulate to triangular-lingulate, lacerate or notched in middle of apex only.
    3. Stem leaves lingulate; branch leaves not sharply recurved when dry and typically strongly 5-ranked; plants strongly brown-pigmented, small and compact . . . . 34. *Sphagnum lenense*
    3. Stem leaves triangular-lingulate; branch leaves sharply recurved when dry and rarely 5-ranked; plants typically green, large and not especially compact . . . . . 44. *Sphagnum riparium*
1. Stem leaves erose to entire at apex.
  4. Branch leaf hyaline cells e fibrillose . . . . . 46. *Sphagnum splendens*
  4. Branch leaf hyaline cells fibrillose.
    5. Branch leaf hyaline cells with 5 or more free pores per cell in proximal portion of convex surface.
      6. Branch leaf hyaline cells lacking pores or wall thinnings on concave surface  
..... 36. *Sphagnum majus*
      6. Branch leaf hyaline cells with pores or wall thinnings on concave surface.
        7. Branch leaf hyaline cells with round wall thinnings in the cell angles and apices on the concave surface.
          8. Stem leaves fibrillose at apex; stem leaves spreading at right angles; common species of northern peatlands . . . . . 25. *Sphagnum balticum* (in part)
          8. Stem leaves normally e fibrillose and appressed but sometimes spreading.
            9. Branch leaves ovate, stem cortex well-differentiated but not enlarged . . . . . 33. *Sphagnum kenaiense* (in part)
            9. Branch leaves ovate-lanceolate, stem cortex undifferentiated  
..... 45. *Sphagnum rubroflexuosum*
        7. Branch leaf hyaline cells with pores or wall thinnings free from the cell margins on the concave surface.
          10. Stem leaves lingulate to triangular-lingulate and with a more or less erose apex; branch leaf pores faint (visible only with heavy staining)  
..... 40. *Sphagnum obtusum*
          10. Stem leaves triangular and with an obtuse, entire apex; branch leaf pores obvious.
            11. Branch leaf hyaline cells with numerous free pores on convex surface in distal region, branch leaf hyaline cells relatively short and wide in proximal portion . . . . . 23. *Sphagnum annulatum*
            11. Branch leaf hyaline cells with numerous pseudopores along commissures on convex surface in distal region; branch leaf hyaline cells relatively long and narrow in proximal portion . . . . . 32. *Sphagnum jensenii*
  5. Branch leaf hyaline cells with less than 5 free pores per cell in proximal portion of convex surface.
    12. Branch leaves with numerous pores along the commissures on both surfaces, round wall thinnings in cell angles and apices not present on concave surface  
..... 38. *Sphagnum mendocinum*
    12. Branch leaves with few or no pores along the commissures on either surface; round wall thinnings present in cell angles and apices on concave surface.
      13. Stem leaves lingulate to ovate-lingulate and with incurved distal margins.
        14. Branch leaves ovate to ovate-lanceolate, moderately concave, slightly undulate and recurved, often 5-ranked . . . . . 25. *Sphagnum balticum* (in part)
        14. Branch leaves ovate, strongly concave, neither undulate nor recurved, not 5-ranked . . . . . 47. *Sphagnum tenellum*
  13. Stem leaves various but not as above.
    15. Branch leaves with serrulate margins.
      16. Branch leaves with broad, rounded apex . . . . . 29. *Sphagnum fitzgeraldii*
      16. Branch leaves with pointed involute apex.

17. Branch leaves ovate to broadly ovate; spreading branches short, little tapered to distal end . . . . . 39. *Sphagnum mississippiense*
17. Branch leaves ovate-lanceolate to lanceolate; spreading branches long, tapered to distal end . . . . . 49. *Sphagnum trinitense*
- [15. Shifted to left margin.—Ed.]
15. Branch leaves entire along margins.
18. Stem leaves lingulate to triangular-lingulate with more or less erose apex.
19. Branch leaves sharply recurved when dry; stem leaves efrillose at apex . . . . . 43. *Sphagnum recurvum*
19. Branch leaves slightly recurved when dry; stem leaves efrillose or fibrillose at apex.
20. Stem leaves spreading, fibrillose distally . . . . . 25. *Sphagnum balticum* (in part)
20. Stem leaves appressed, efrillose distally.
21. Branch leaves ovate-lanceolate, stem cortex undifferentiated . . . . . 30. *Sphagnum flexuosum*
21. Branch leaves ovate, stem cortex well-differentiated but not enlarged . . . . . 33. *Sphagnum kenaiense* (in part)
18. Stem leaves triangular to triangular-lingulate, acute to obtuse but rarely erose.
22. Stem leaves less than 0.8 mm, triangular . . . . . 22. *Sphagnum angustifolium*
22. Stem leaves 0.8 mm or more (if shorter, then apiculate), triangular to triangular-lingulate.
23. Branch leaves typically broadly ovate with an abruptly involute apex . . . . . 42. *Sphagnum pulchrum*
23. Branch leaves ovate-lanceolate to lanceolate with a tapered involute apex.
24. Stem leaves apiculate; young pendent branches in pairs between rays of the capitulum; carpet forming species with branch leaves not greatly elongated at distal branch end.
25. Branch leaves strongly recurved when dry.
26. Branch leaf chlorophyll cells slightly enclosed on or just reaching concave surface; stem cortex with moderately enlarged and thick-walled cells . . . . . 28. *Sphagnum fallax*
26. Branch leaf chlorophyll cells wall-enclosed on concave surface; stem cortex with strongly enlarged thin-walled cells . . . . . 41. *Sphagnum pacificum*
25. Branch leaves weakly recurved when dry.
27. Branch leaves relatively broad, with length to width ratio ca. 2.8; stem leaves relatively narrow, with length to width ratio ca. 1:1.22; branch leaves unranked or only weakly 5-ranked . . . . . 26. *Sphagnum brevifolium*
27. Branch leaves relatively narrow, with length to width ratio ca. 3.2; stem leaves relatively broad, with length to width ratio 1:1.14; branch leaves typically strongly 5-ranked . . . . . 31. *Sphagnum isoviitae*
24. Stem leaves obtuse to apiculate; young pendent branches not in pairs between the branches of the capitulum; aquatic species with branch leaves substantially elongated at distal branch end.
28. Branch leaf chlorophyll cells very well-enclosed on concave surface.
29. Branch leaf chlorophyll cells in transverse section well-enclosed and reaching only ca.  $\frac{1}{2}$  the distance to the concave surface; branch leaves often falcate-secund . . . . . 24. *Sphagnum atlanticum*
29. Branch leaf chlorophyll cells slightly enclosed and reaching about  $\frac{3}{4}$  the distance to the concave surface; branch leaves typically straight . . . . . 48. *Sphagnum torreyanum*
28. Branch leaf chlorophyll cells slightly enclosed or reaching concave surface.
30. Stem leaves obtuse, spreading and with septate hyaline cells in the proximal mid region . . . . . 37. *Sphagnum mcqueenii*
30. Stem leaves acute to apiculate, appressed and with non-septate hyaline cells in proximal mid region.

[31. Shifted to left margin.—Ed.]

31. Branch leaves relatively narrow, length to width equal or greater than 3.6:1, hyaline cells in distal region convex surface 8–15:1; capitulum often twisted ..... 27. *Sphagnum cuspidatum*  
 31. Branch leaves relatively broad, length to width less than 3.6:1, hyaline cells in distal region convex surface 4–8:1; capitulum with straight branches ..... 50. *Sphagnum viride*

22. ***Sphagnum angustifolium*** (Warnstorf) C. E. O.  
 Jensen, Bih. Svenska Vetensk.-Akad. Handl. 16(9): 46.  
 1891



*Sphagnum recurvum* var.  
*angustifolium* Warnstorf, Nyt. Mag.  
 Naturvidensk. 31: 213. 1888;  
*S. amblyphyllum* var. *parvifolium*  
 (Sendtner) Warnstorf; *S. flexuosum*  
 var. *tenu* (H. Klinggraff) Pilous;  
*S. parvifolium* (Warnstorf)  
 Warnstorf; *S. recurvum* var.  
*parvifolium* Warnstorf; *S. recurvum*  
 var. *tenu* H. Klinggraff

**Plants** small and often slender and soft, lax to compact, moderately stiff-stemmed; green to pale yellow to golden brown to brown; capitulum strongly convex in drier grown forms to strongly 5-radiate and flat in wetter growing forms. **Stems** pale green to pale brown, often with pinkish red patches, cortex undifferentiated. **Stem leaves** equilateral to isosceles-triangular, small, less than 0.8 mm, mostly appressed to stem, apex acute to obtuse, hyaline cells e fibrillose and nonseptate. **Branches** straight to slightly curved, usually 5-ranked; leaves not much longer at distal end than proximal end. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch stems** with cortex enlarged with conspicuous retort cells, often pinkish red at proximal end. **Branch leaves** narrowly ovate-lanceolate, 0.8–1 mm, straight, moderately undulate and recurved in larger and/or wetter grown forms, not undulate and slightly recurved in compact forms from drier sites; margins entire; hyaline cells on convex surface with 1(2–3) pore per cell at apical end of cell, on concave surface with round wall thinnings in cell ends and angles; chlorophyllous cells triangular in transverse section and just enclosed on concave surface. **Sexual condition** dioicous. **Spores** 21–25  $\mu\text{m}$ ; coarsely papillose on proximal and distal surfaces; proximal laesura more than 0.5 spore radius.

Wide range of habitats, from ombrotrophic to rich fens, open mires, sedge fens and muskeg, as carpets, floating mats, low hummocks and hummock sides; low to high elevations; Greenland; Alta., B.C., Man., N.B., Nfld. and Labr. (Nfld.), N.W.T., N.S., Ont., Que., Sask., Yukon; Alaska, Calif., Colo., Idaho, Ill., Ind., Maine, Md., Mass., Mich., Minn., Mo., Mont., N.H., N.J., N.Y., N.C., N.Dak., Ohio, Oreg., Pa., Utah, Vt., Va., Wash., W.Va., Wis., Wyo.; Eurasia.

The sporophytes of *Sphagnum angustifolium* are somewhat common. This species is distinguished from similar ones in sect. *Cuspidata* by the small, triangular, obtuse and appressed stem leaves. It also often has a pink stem, as opposed to the reddish branch bases seen in some other species of the section. *Sphagnum balticum* has stem leaves that are more lingulate-triangular as well as spreading from the stem. *Sphagnum angustifolium* belongs to a subgroup within sect. *Cuspidata* usually referred to as *S. recurvum*, in the broad sense, a group of mostly carpet-forming species that differ from other members of the section in having pairs of pendent branch buds visible between the capitulum rays. The group also includes *S. brevifolium*, *S. fallax*, *S. flexuosum*, *S. pacificum*, *S. recurvum*, *S. rubroflexuosum*, and *S. splendens*.

23. ***Sphagnum annulatum*** Warnstorf, Bot. Centralbl.  
 76: 422. 1898 [F]



*Sphagnum jensenii* var. *annulatum*  
 (Warnstorf) Warnstorf

**Plants** moderate-sized and weak-stemmed; in lawns and floating mats; brownish green, brown, reddish brown to chestnut-brown, often with bluish tint when dry, capitulum 5-radiate and flat-topped. **Stems** pale green to brown; cortex poorly differentiated to undifferentiated. **Stem leaves** lingulate-triangular to triangular-lingulate, equal to or less than 1.2 mm, more or less spreading; apex obtuse; hyaline cells mostly fibrillose and nonseptate. **Branches** straight to distinctly curved, leaves becoming substantially longer at distal end of the branch. **Branch fascicles** with 2 spreading and 1–2 pendent branches. **Branch stems** green, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate, 1.5–2 mm, straight to slightly subsecund, only slightly undulate and recurved if at all; margin entire; hyaline cells on convex surface with numerous small free pores, on concave surface with numerous round free pores, cells relatively short in basal region (similar to mid region); chlorophyllous cells  $\pm$  triangular in transverse section, just reaching concave surface or slightly enclosed. **Sexual condition** dioicous. **Spores** 25–32  $\mu\text{m}$ , finely papillose on both surfaces.