

Wet carpets, lawns, and mud bottoms in poor to medium fens, in mire-wide and mire-edge habitats; low to high elevations; Alta., B.C., Man., Nfld. and Labr. (Nfld.), N.W.T., Ont., Que., Yukon; Alaska, Idaho, Mich., Minn., Mont., N.Y., Wash., Wyo.; Eurasia.

Sporophytes are rare in *Sphagnum annulatum*. Of the more wet-growing species, both *S. cuspidatum* and *S. viride* are typically much more green or yellow and have stem leaves with acute apices. *Sphagnum jensenii* is usually larger and has straight capitulum branches as opposed to the more curved branches of *S. annulatum*. *Sphagnum majus* normally has a denser and more rounded capitulum. Field experience in both Alaska and Scandinavia, where both species occur, does not support the view of H. A. Crum (1997) that *S. annulatum* and *S. jensenii* are simply ends of a continuum. Both species are usually readily separable in the field and look quite different in mixed populations. In North America at least *S. annulatum* is also considerably more widespread.

24. *Sphagnum atlanticum* R. E. Andrus, Bryologist 110: 274, figs. 2007 [E]



Plants robust and weak-stemmed; green, golden brown to dark brown; capitulum often flat-topped and with a visible terminal bud; flaccid and plumose in submerged forms to more compact in emergent or stranded forms. **Stems** green to brown; superficial cortex of 1–2 layers of

moderately thick-walled and poorly differentiated cells. **Stem leaves** triangular, large, less than 1.7 mm, mostly appressed to stem, apex weakly apiculate to narrowly obtuse; hyaline cells e fibrillose and seldom to often septate at base and sides. **Branches** unranked, long and tapering, leaves greatly elongate at distal end. **Branch fascicles** with 2 spreading and 2 pendent branches. **Branch stem** green, cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate to lanceolate in aquatic forms, ovate to ovate-lanceolate in emergent forms, greater than 2.5 mm, often falcate-secund, especially in submerged forms, weakly undulate and recurved when dry; margin entire, hyaline cells on convex surface with 0–1 pores per cell, concave surface with round wall thinnings in the cell apices and angles; chlorophyllous cells narrowly triangular in transverse section and well-enclosed on the concave surface. **Sexual condition** dioicous. **Sporophytes** not seen.

Forming loose carpets in pools in weakly minerotrophic fens; low elevations; N.B., Nfld. and Labr.

(Nfld.), N.S.; Conn., Del., Maine, Md., Mass., N.H., N.J., N.Y., N.C., Pa., R.I., Vt., Va.

Sporophytes of *Sphagnum atlanticum* are rare. The other large North American Atlantic coastal plain species of sect. *Cuspidata*, *S. torreyanum*, is typically more yellow, has a more rounded capitulum, and has straight rather than subsecund branch leaves.

25. *Sphagnum balticum* (Russow) C. E. O. Jensen in Botaniske Forening København, Festschrift, 100. 1890



Sphagnum recurvum subsp. *balticum*
Russow, Sitzungber. Naturf.-Ges.
Univ. Dorpat 9: 99. 1890

Plants small to moderate-sized, soft and ± weak-stemmed; brownish green, yellow-green, yellowish to golden brown, capitulum typically flat and 5-radiate. **Stems** pale green to

brown, branch bases sometimes reddish; superficial cortex of 2–3 layers of moderately thin-walled and differentiated cells. **Stem leaves** 0.8–1.1 mm, triangular-lingulate to lingulate, concave, spreading, apex broadly obtuse, hyaline cells fibrillose in apical region. **Branches** slender and tapering, often 5-ranked and decurved, leaves somewhat elongated at distal end. **Branch fascicles** with 2 spreading and mostly 1 pendent branch. **Branch stem** green, cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate, 1–1.7 mm, straight, slightly undulate and spreading; margin entire, hyaline cells on convex surface with 1–5 pores in cell ends and free near apex, on concave surface with round wall thinnings in cell ends and angles; chlorophyllous cells triangular in transverse section and well-enclosed on concave surface. **Sexual condition** dioicous. **Spores** 25–33 μm; smooth to finely papillose on both surfaces; proximal laesura approximately 0.5 spore radius.

Abundant in hollows and floating mats in raised bogs and poor fens; low to high elevations; Greenland; Alta., B.C., Man., N.W.T., Nunavut, Ont., Que., Yukon; Alaska, Colo.; Eurasia.

Unlike *Sphagnum angustifolium* and *S. annulatum*, *S. balticum* has stem leaves exerted at right angles to the stem. It also has fewer and weaker hanging branches than does *S. angustifolium*, which make the stem itself often visible and the stem leaves easier to see. *Sphagnum balticum* also lacks the paired pendent branch buds between the capitulum rays as seen in *S. angustifolium*.

In *Sphagnum kenaiense* there are sometimes spreading stem leaves but this species has 2 hanging branches per fascicle.

26. *Sphagnum brevifolium* (Lindberg) J. Röhl, Bot. Centralbl. 39: 340. 1889



Sphagnum cuspidatum var. *brevifolium* Lindberg in R. Braithwaite, Sphagnac. Europe, 84. 1878

Plants small and slender to moderate-sized, soft, not very compact; pale yellow, yellowish brown to brown; capitulum flat to somewhat convex, not 5-radiate to somewhat 5-radiate. **Stems** pale yellow to pale green, sometimes with reddish portions, superficial cortex of 2–3 layers of clearly differentiated cells. **Stem leaves** triangular to lingulate-triangular, apex apiculate, acute and sometimes slightly obtuse, spreading or sometimes appressed; hyaline cells nonseptate and often fibrillose at leaf apex. **Branches** straight to distinctly curved, leaves unranked to 5-ranked, leaves not greatly elongate at branch distal end. **Branch fascicles** with 2 spreading and 1–2 pendent branches. **Branch stems** with cortex enlarged with conspicuous retort cells, sometimes reddish at proximal end. **Branch leaves** ovate to ovate-lanceolate, greater than 1.2 mm, often subsecund, slightly undulate and slightly recurved when dry; margin entire; hyaline cells on convex surface with 1 pore per cell in apical end, on concave surface with round wall thinnings in the cell ends and angles; chlorophyllous cells equilateral to isosceles-triangular, well-enclosed on the concave surface. **Sexual condition** dioicous. **Spores** not seen.

Ecology not presently understood due to past confusion with other species; low to moderate elevations; Nfld. and Labr. (Nfld.), Que.; Alaska, Maine, Md., Mich., Minn., N.H., N.Y., Vt.; Europe.

Details of the distribution of *Sphagnum brevifolium* are unclear because of confusion with *S. fallax* and *S. isoviitae*. This seems to be a species of poor to medium fens, where it occurs in depressions and floating mats; it does not appear to form extensive fast-growing mats as do *S. fallax*, *S. isoviitae*, and *S. pacificum*. *Sphagnum brevifolium* is one of five species in the *S. recurvum* complex with apiculate stem leaves. On the Pacific coast it seemingly co-occurs only with *S. pacificum*, from which it differs in having branch leaves less sharply recurved and more strongly 5-ranked. In eastern North America it is quite uncommon but can occur with both *S. fallax* and *S. isoviitae* of *S. recurvum*, in the broad sense. *Sphagnum fallax* has more sharply recurved branch leaves. *Sphagnum splendens* has a distinct shiny look. The much more common *S. isoviitae* has a distinctly flatter capitulum, narrower branch leaves and wider stem leaves. In fact, the relatively broad branch leaves of *S.*

brevifolium sometimes can give it the appearance of a slender *S. pulchrum*, but the latter has much more strongly 5-ranked branch leaves and lacks paired pendent branch buds. See also discussion under 22. *S. angustifolium*.

27. *Sphagnum cuspidatum* Hoffman, Deutchl. Fl. 2: 22. 1796



Sphagnum cuspidatum var. *plumosum* Nees & Hornschuch; *S. faxonii* Warnstorf; *S. virginianum* Warnstorf

Plants slender and weak-stemmed, moderate-sized, flaccid and plumose in aquatic forms to more compact in emergent forms, spreading branches often conspicuously falcate, giving capitulum a twisted appearance; green to yellow, often tinged with red, red-brown or brown in capitula. **Stems** green; superficial cortex of 2–3 layers, 2 layers of enlarged thin-walled cells. **Stem leaves** triangular-ovate, more than 1.2 mm, usually appressed; apex acute to apiculate, hyaline cells rarely septate or porose, apical region often fibrillose. **Branches** mostly unranked to weakly 5-ranked, often conspicuously falcate, leaves greatly elongated at distal end. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch stems** green, but often pinkish at the proximal ends, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate to lanceolate, 1.6–5 mm, falcate toward branch tips, when dry often undulate and recurved, rarely weakly serrulate along the margins in submerged forms, leaves from middle of spreading branches with length to width ratio less than or equal to 1:0.28; hyaline cells length to width ratio in apical convex surface region 8:1 or more, convex surface with 0–1 small round pores at apex, concave surface with faint round wall thinnings in cell apices and angles; chlorophyllous cells triangular to trapezoidal in transverse section, broadly exposed on the convex surface and exposed slightly on the concave surface. **Sexual condition** dioicous. **Spores** 29–38 µm; covered with large papillae on both surfaces, appearing pustulate; proximal laesura less than 0.5 spore radius.

Widespread forming wet carpets in ombrotrophic to weakly minerotrophic mires; low to moderate elevations; N.B., Nfld. and Labr. (Nfld.), N.S., Ont., Que.; Ala., Conn., Del., Fla., Ga., Ill., Ind., Kans., Maine, Md., Mass., Mich., Minn., Miss., N.H., N.J., N.Y., N.C., Ohio, Pa., R.I., S.C., Tenn., Vt., Va., W.Va., Wis.; Europe.

Sporophytes are occasional, capsules mature in early to mid summer.

Distinguishing *Sphagnum cuspidatum* from *S. viride* is sometimes difficult, as both occur over a similar geographic range and both grow in wet carpets. *Sphagnum cuspidatum* has narrower branch leaves and usually a distinct red tinge at the branch bases within the capitulum.

28. *Sphagnum fallax* (H. Klinggräff) H. Klinggräff, Vers. Topogr. Fl. Westpreuss., 128. 1880



Sphagnum cuspidatum var. *fallax* H. Klinggräff, Schriften Phys.-Ökon. Ges. Königsberg 13: 7. 1872; *S. apiculatum* H. Lindberg; *S. flexuosum* var. *fallax* (H. Klinggräff) A. J. E. Smith; *S. mucronatum* (Russow) Zickendrath; *S. recurvum* var. *brevifolium* (Braithwaite) Warnstorff; *S. recurvum* var. *fallax*

(H. Klinggräff) H. K. G. Paul; *S. recurvum* subsp. *mucronatum* Russow

Plants moderate-sized, fairly stiff-stemmed; green, brownish green, pale yellow, golden yellow, yellow and brown; capitulum hemispherical and not 5-radiate to somewhat 5-radiate in shade-grown or wet-grown forms. **Stems** pale green to pale brown, superficial cortex of 2 layers of moderately differentiated cells. **Stem leaves** triangular to lingulate-triangular, 0.8–1.2 mm, mostly appressed to the stem, apex acute to apiculate, hyaline cells mostly e fibrillose and nonseptate. **Branches** straight, mostly unranked, but can be 5-ranked in wet-growing forms, leaves little elongated at distal branch ends. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch stems** green but proximal end sometimes red, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate, greater than 1.2 mm, straight, undulate and sharply recurved when dry, margins entire; hyaline cells on convex surface with usually 1 round pore per cell at apical end, on concave side with round wall thinnings in the cell ends and angles; chlorophyllous cells triangular and just reaching or slightly enclosed within the concave surface. **Sexual condition** dioicous. **Spores** 25–31 μm ; proximal surface finely papillose, distal surface pusticulate with bifurcated Y-mark sculpture; proximal laesura less than 0.5 spore radius.

Widespread in poor fen habitats, often as a pioneer species in extensive mats, occasionally in ombrotrophic mires at hummock bases; low to moderate elevations; N.B., Nfld. and Labr. (Nfld.), N.S., Ont., P.E.I., Que.; Conn., Del., Ill., Ind., Maine, Mass., Mich., Minn., N.H., N.J., N.Y., N.C., Ohio, Pa., Tenn., Vt., Va., W.Va.; Europe.

Sporophytes are uncommon, capsules mature early to mid summer.

Sphagnum fallax can be distinguished from the closely related *S. isoviitae* by its sharply recurved branch leaves, as opposed to the leaves of the latter only slightly reflexed at their tips. See also discussion under 26. *S. brevifolium* and 46. *S. splendens*.

29. *Sphagnum fitzgeraldii* Lesquereux & James, Man., 23. 1884 [E]



Sphagnum mobrianum Warnstorff

Plants small and weak-stemmed, flaccid and \pm plumose when submerged to (more frequently) sprawling in thin mats; capitulum \pm compact and with a strong terminal bud; pale green to greenish white. **Stem** pale green; superficial cortex of 1–2 layers of thin-walled and well differentiated cells. **Stem leaves** large, ovate to oblong-ovate, ca. 2 mm, more or less spreading; apex rounded and serrulate; hyaline cells fibrillose and often 1–septate, convex surface generally aporose, concave surface with 1–several round pores per cell in ends and angles. **Branches** unranked to slightly 5-ranked, often short and blunt at distal end. **Branch fascicles** with 1–2 spreading and 0–1 pendent branches. **Branch stems** green, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate to oblong-quadrate, 1.2–2.5 mm, not undulate or recurved when dry, strongly toothed across apex and serrulate on margins; hyaline cells with to 4 small round ringed pores at cell ends on convex surface, small round wall thinnings in the cell ends and angles on the concave surface; chlorophyllous cells trapezoidal in transverse section, more broadly exposed on the convex surface. **Sexual condition** monoicous. **Spores** 38–48 μm ; both surfaces covered with fine to moderately coarse papillae; proximal laesura less than 0.4 spore radius.

Commonly in prostrate mats on damp sand, often in recently burned or cleared areas, also occasionally floating in ditches; low elevations; Ala., Fla., Ga., La., Miss., N.C., S.C., Va.

Sporophytes of *Sphagnum fitzgeraldii* are common, being immersed or exerted. This species is found largely on the Atlantic coastal plain. The wide truncate branch leaves easily distinguish it in most situations. Floating plants are not as quickly identified but can be distinguished from other species of sect. *Cuspidata* by the branch leaves wider than those of similar species.

30. *Sphagnum flexuosum* Dozy & Molkenboer in R. B. van den Bosch et al., Prodr. Fl. Bat. 2(1): 76. 1851



Sphagnum amblyphyllum (Russow) Zickendrath; *S. fallax* var. *flexuosum* (Dozy & Molkenboer) Nyholm; *S. flexuosum* var. *ramosissimum* R. E. Andrus; *S. flexuosum* var. *recurvum* Dozy & Molkenboer; *S. recurvum* subsp. *amblyphyllum* Russow; *S. recurvum* var. *amblyphyllum* (Russow) Warnstorf

Plants small to moderate-sized, slender and soft, lax, moderately weak to moderately stiff-stemmed; green, pale yellowish green, yellowish brown, grayish brown or reddish brown; capitulum typically compact and twisted in the middle like a ball of yarn, spreading branches curved giving a pinwheel appearance. **Stems** pale green to pale brown, rarely with pinkish red patches, superficial cortex of undifferentiated to slightly differentiated cells. **Stem leaves** triangular-lingulate to lingulate, 0.7–1.3 mm, appressed to stem, apex obtuse to broadly obtuse and erose to somewhat lacerate, hyaline cells efihrillose and nonseptate. **Branches** curved, unranked to less commonly (in wet-grown forms) 5-ranked, leaves not much elongate at distal end. **Branch fascicles** with 2(–3) spreading and 2 pendent branches. **Branch stems** green but sometimes reddish at proximal end, with cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate to broadly ovate-lanceolate, 1.5–2.5 mm, strongly undulate and moderately recurved when dry, straight; margin entire; greater than hyaline cells on convex surface with 1–2 pores per cell at cell apex, on concave surface with round wall thinnings in the cell ends and angles; chlorophyllous cells triangular in transverse section and typically just slightly exposed on the concave surface. **Sexual condition** dioicous. **Spores** 23–25 μm ; moderately to coarsely papillose on both surfaces; proximal laesura approximately 0.5 spore radius.

Sporophytes uncommon, capsules mature early to late summer. Forming carpets in poor to medium fens, mostly sedge-fens and mire edge habitat; low to moderate elevations; N.B., Nfld. and Labr. (Nfld.), N.S., Ont., P.E.I., Que.; Conn., Ill., Ind., Maine., Md., Mich., Minn., N.H., N.J., N.Y., N.C., Ohio, Pa., Tenn., Vt., W.Va., Wis.; Europe.

Of species in sect. *Cuspidata* with range and ecology similar to that of *Sphagnum flexuosum*, *S. angustifolium* and *S. recurvum* have rounded stem leaves. In *S. angustifolium* the stem leaves are more triangular and rarely erose while the branch leaves are narrower and

more strongly 5-ranked. *Sphagnum recurvum* also has narrower and more 5-ranked branch leaves than does *S. flexuosum*, as well as a much more strongly differentiated stem cortex. In *S. flexuosum* the branch leaves are only slightly recurved whereas in *S. recurvum* they are sharply recurved.

31. *Sphagnum isoviitae* Flatberg, J. Bryol. 17: 2, figs. 1, 2. 1992

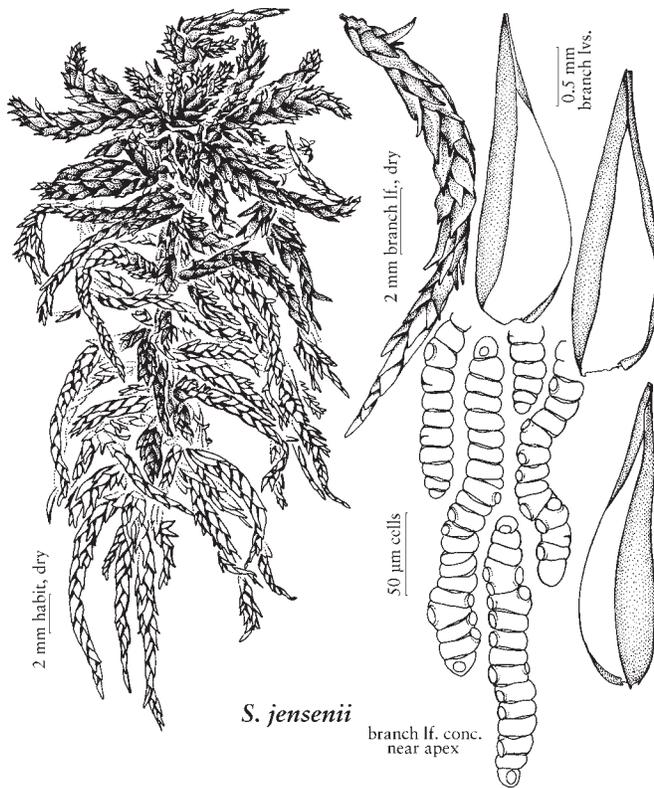
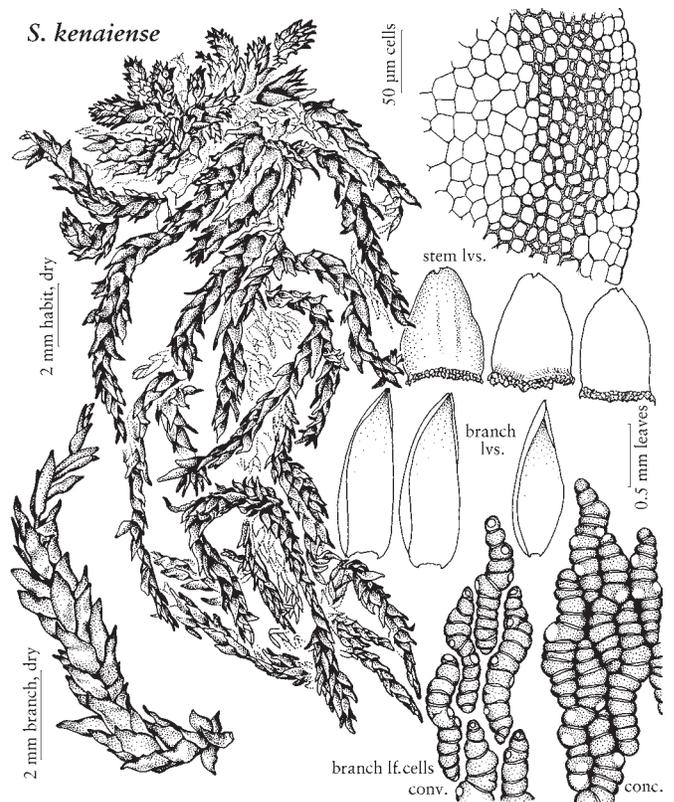


Plants moderate-sized and moderately weak-stemmed to moderately stiff; green, brownish green to brown; capitulum flat-topped and 5-radiate, terminal bud often visible. **Stems** pale green, rarely with red coloration, superficial cortex of 2 layers of moderately to well differentiated

cells. **Stem leaves** triangular to lingulate-triangular, equal to or more than 0.8 mm, spreading to appressed; apex acute to apiculate, hyaline cells mostly efihrillose and nonseptate. **Branches** \pm straight and somewhat tapered, usually 5-ranked, leaves not greatly elongate at branch distal end. **Branch fascicles** with 2 spreading and 2–3 pendent branches. **Branch stems** green and often reddish at proximal end, with cortex enlarged with conspicuous retort cells. **Branch leaves** narrowly ovate-lanceolate, greater than 1.2 mm, straight, slightly undulate and weakly recurved when dry, margins entire; hyaline cells on convex surface with 1 pore per cell in apical end, on concave surface with round wall thinnings in the cell ends and angles; chlorophyllous cells in transverse section triangular to ovate-triangular and well-enclosed on the concave surface. **Sexual condition** dioicous. **Spores** 24–33 μm ; finely papillose on the superficial surface.

Forming carpets in a wide variety of poor to medium fen habitats of both mire edge and mire wide character, not found in ombrotrophic mires; low to moderate elevations; Alta., Nfld. and Labr. (Nfld.), N.S., Que.; Conn., Ind., Maine, Md., Mass., Mich., Minn., N.H., N.J., N.Y., N.C., Ohio, Pa., Vt., Va., W.Va.; Europe.

Sporophytes are uncommon in *Sphagnum isoviitae*. See discussion under 26. *S. brevifolium* and 28. *S. fallax* for distinction from these similar species. *Sphagnum isoviitae* has no range overlap with *S. pacificum*, the other North American species of the *S. recurvum* complex with apiculate stem leaves; the sharply recurved branch leaves of the latter, however, would separate it easily in any case. Spore features are those given by Flatberg.

*S. jensenii**S. kenaiense*

SPHAGNUM

32. *Sphagnum jensenii* H. Lindberg, Acta Soc. Fauna Fl. Fenn. 18(3): 13. 1899 [E F]



Sphagnum annulatum var. *porosum* (Warnstorf) W. S. G. Maas

Plants moderate-sized to robust, weak-stemmed; pale brown to chestnut brown; capitulum flat-topped and generally 5-radiate, branches straight to somewhat curved, terminal bud often visible.

Stems pale green to brown, superficial cortex of 2 layers of thin-walled and well-differentiated cells. **Stem leaves** triangular, ovate-triangular to triangular-lanceolate, 1–1.3 mm; appressed to spreading; apex obtuse, hyaline cells usually fibrillose near apex. **Branches** straight to somewhat curved, leaves moderately elongate at distal end. **Branch fascicles** with 2 spreading and 1–2 pendent branches. **Branch stems** green, cortex enlarged with conspicuous retort cells. **Branch leaves** ovate-lanceolate; usually more than 2 mm; straight; weakly undulate and slightly recurved when dry, margins entire; hyaline cells on convex surface with numerous small free pores in proximal $\frac{2}{3}$ of leaf and in apical region with numerous pseudopores along commissures, on concave surface with numerous round free pores; cells relatively long and narrow in basal region,

much longer than in mid region; chlorophyllous cells triangular in transverse section and well-enclosed on concave surface. **Sexual condition** dioicous. **Spores** 29–33 µm; both surfaces very smooth; proximal laesura long, more than 0.6 spore radius.

Predominantly in wet carpets in poor to medium fen habitats, mostly in mire-wide vegetation; low to moderate elevations; Alta., B.C., Nfld. and Labr. (Nfld.), N.W.T., Ont., Que., Sask., Yukon; Alaska; Eurasia.

Sporophytes of *Sphagnum jensenii* are uncommon. For more information, see discussion under 23. *S. annulatum*.

33. *Sphagnum kenaiense* R. E. Andrus, Sida 22: 961, figs. 7–13. 2006 [E F]



Plants small and weak-stemmed; grows sprawling in lawns; pale brown to golden brown; capitulum flat-topped and only weakly 5-radiate. **Stems** pale yellow; stem cortex moderately well-differentiated but not much enlarged. **Stem leaves** appressed to stem or somewhat spreading; lingulate, ovate, to triangular; equal to or less than 0.9 mm; apex obtuse and often erose to lacerate. **Branches**