

## The genus *Bryum* (Musci) in Maine.

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*Bryum* is a genus of small, erect mosses nearly always found on soil or humus. The plants often have a rosette growth form with the upper leaves larger and better developed than the lower leaves. Typically the leaves are bordered by linear cells, have large rhomboidal to oblong-rhomboidal laminal cells, and percurrent to excurrent costae. Their capsules are usually pendent, more or less pyriform, and have well-developed, often perfect, double peristomes. *Bryum* has a large number of species and is taxonomically difficult due to its small size, generally nondescript, often technical characters, and the tendency of leaves taken from different parts of single plants to have dissimilar morphologies. Groups of seemingly related species can sometimes be recognized, but as noted by Andrews (1940) a clear division into subgenera or sections is not indicated. Characters that are important in the taxonomy of *Bryum* are found in its leaf cells (upper leaf cell length vs. width; thickness of cell walls; basal leaf cell size and shape), costa length, leaf margins (degree of recurving, border development), sexuality, leaf decurrencies, capsule shape, and endostome form.

*Bryum* can be confused with *Pohlia* which has narrower, oblong-lanceolate, elimbate leaves with long, narrow leaf cells, and percurrent costae. Unfortunately character state variability in *Bryum* is such that it includes all of these features. However, while some *Bryum* species may exhibit one or more of the above features, only *Pohlia* species have them all.

*Bryum* Hedw. Sp. Musc. Frond. 178. 1801.

Plants small to robust dense or loose tufts, simple or forked. Leaves erect, erect-spreading, or spreading wet, oblong, oblong-lanceolate, oblong-ovate, obovate, ovate, ovate-lanceolate or elliptic, often decurrent, obtuse, acute or acuminate, concave; margins plane, erect, or recurved, entire or serrate near apex; cells smooth, thin- or thick-walled, quadrate to long-rectangular below, oblong, hexagonal, rhomboid elongate- rhomboid or fusiform above; costa strong,

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subpercurrent to excurrent. Setae elongate, straight or flexuose. Capsules subcylindrical, clavate, pyriform, subglobose or ovoid, nodding to pendent, symmetric or curved, smooth, neck well developed; opercula conic-apiculate; annulus large, compound, deciduous; stomata superficial; peristome double, exostome teeth 16, lanceolate, yellow to brown, papillose; endostome yellowish-hyaline, lightly papillose, basal membrane well-developed, segments keeled, narrowly or broadly perforate, cilia 2-3, nodose or appendiculate, rudimentary or absent. Calyptrae cucullate, smooth, naked. Spores spherical, smooth or papillose.

Key to the species of *Bryum* in Maine

1. Leaves shrunken and shriveled when dry, long decurrent, cells lax, thin-walled ..... 11. *B. weigelii*
1. Leaves firm, not shriveled when dry, decurrencies present or absent, cells firm, thick- or thin-walled ..... 2
  2. Leaves rounded-obtuse ..... 7. *B. muehlenbeckii*
  2. Leaves acute to acuminate ..... 3
3. Plants whitish to pale-green and silvery ..... 2. *B. argenteum*
3. Plants green, yellow, brown or red ..... 4
  4. Plants with brown, papillose propagulae in leaf axils ..... 5
  4. Plants without propagulae in leaf axils ..... 6
5. Leaf cells lax, thin-walled, margins weakly recurved below, plane above, costa variable, often ending below apex; brown, globose rhizoidal gemmae sometimes present ..... 4. *B. capillare*
5. Leaf cells firm, thick-walled, margins tightly recurved throughout, costa percurrent to excurrent; rhizoidal gemmae absent ..... 10. *B. pseudotriquetrum*
6. Leaf cells lax, thin-walled and bulging, variable in size, cells more than and less than 3:1 often side by side, border weakly developed ..... 7
6. Leaf cells firm, thin- or thick-walled not noticeably bulging, most cells either more than or less than 3:1, border well-developed ..... 8

7. Basal leaf cells long-rectangular, costa percurrent to short excurrent; capsule neck long, well differentiated neck . . . . . 8. *B. pallens*
7. Basal leaf cells quadrate, costa variable, ending below apex, percurrent or short excurrent; capsule neck short, weakly differentiated . . . . . 4. *B. capillare*
8. Most upper leaf cells 3:1 or less . . . . . 9
8. Most upper leaf cells greater than 3:1 . . . . . 10
9. Leaves decurrent, costa percurrent to short excurrent . . . . .  
 . . . . . 10. *B. pseudotriquetrum*
9. Leaves not decurrent, costa short to long excurrent . . . . . 9. *B. pallescens*
10. Plants synoicous . . . . . 11
10. Plants dioicous . . . . . 12
11. Peristome with a short, deep orange-red fundus, yellow-brown above; cilia 1-3, rudimentary . . . . . 1. *B. amblyodon*
11. Peristome yellow-brown throughout; cilia 2-3, appendiculate . . . . . 6. *B. lisae* var. *cuspidatum*
12. Leaves 2-3 mm long, basal leaf cells elongate; capsules brown . . . . . 3. *B. caespiticium*
12. Leaves 1.7-2.0 mm long, basal leaf cells quadrate; capsules purple-red . . . . . 5. *B. dichotomum*

1. *Bryum amblyodon* C. Müll., Linnaea 42: 293. 1879.

*Bryum stenotrichum* C. Müll., Flora 70: 219. 1887.

Plants small, green, densely tufted, at times rosulate above, to 20 mm high; with reddish-brown, smooth or papillose rhizoids. Leaves 2-3 mm long, erect-patent dry, ovate-lanceolate below, oblong-lanceolate above, acuminate; margins revolute throughout, border broad, moderately developed; costa short or long excurrent; upper cells 40-60  $\mu\text{m}$  x 3-4  $\mu\text{m}$ , oblong-rhomboidal, becoming fusiform in apex, firm-walled, basal cells 80-110  $\mu\text{m}$  x 16-24  $\mu\text{m}$ , long-rectangular, firm-walled, at times pitted, reddish at base. Synoicous. Setae 10-20 mm long, red, flexuose dry. Capsules 2-3.5 mm long, elongate-pyriform, neck well-developed, pendent, light-brown; opercula 0.5 mm long, conic-apiculate; exostome teeth yellow-brown with short, dark red fundus, evenly papillose on dorsal surface, endostome light-yellow, basal membrane high,

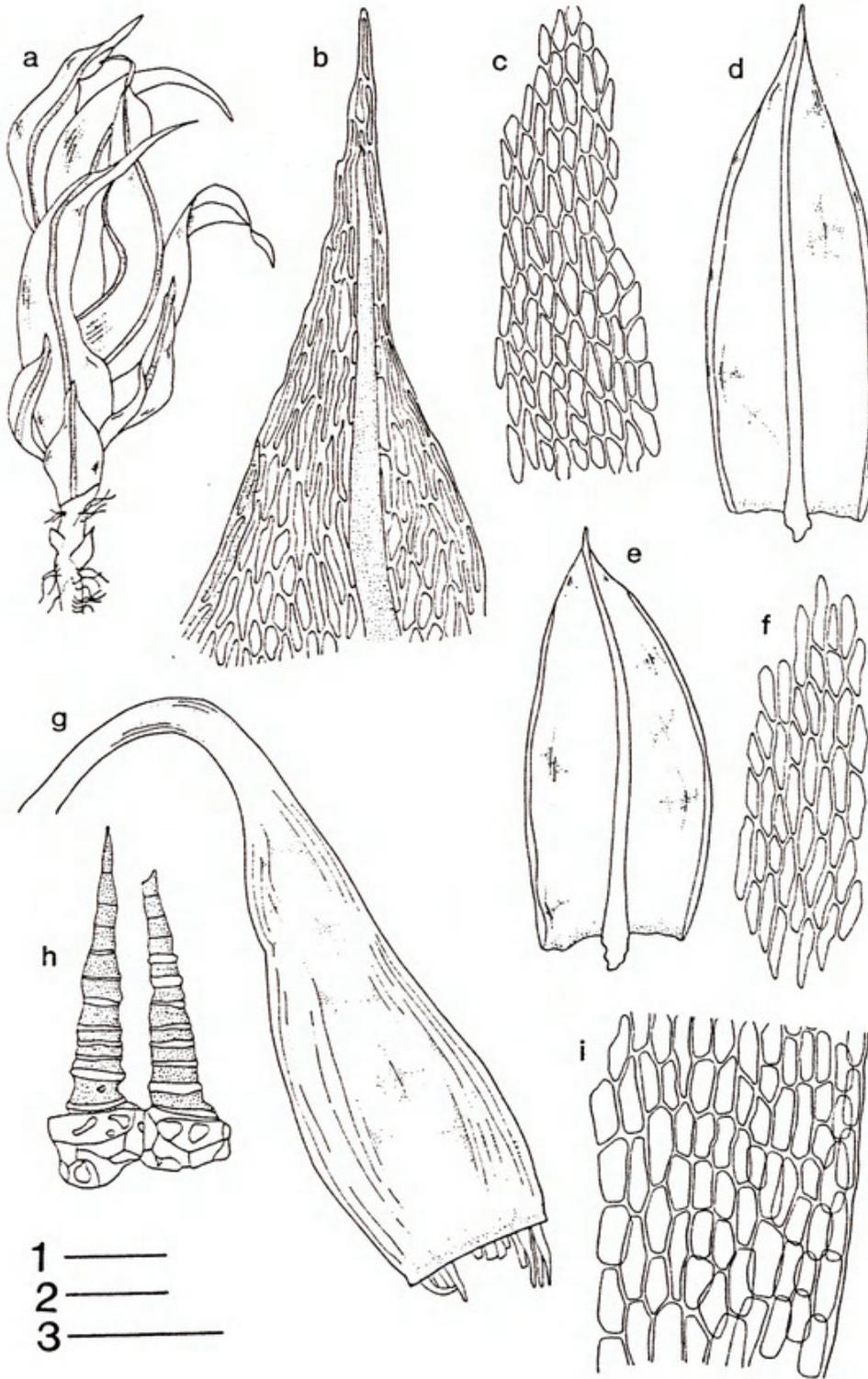


Figure 1. *Bryum amblyodon*. a. Habit. b. Leaf apex. c. Upper leaf cells. d & e. Leaves. f. Median leaf cells. g. Capsule. h. Exostome teeth, inner (ventral) surface. i. Basal leaf cells. Scales in mm: Bar 1 = 0.1 (b,c,f,h,i); Bar 2 = 0.5 (d,e,g); Bar 3 = 0.5 (a).

processes well-developed, broadly perforate, lightly papillose, cilia 1-3, rudimentary. Calyptrae falling early, cucullate, 2-4 mm long. Spores 22-32  $\mu\text{m}$ , smooth to granulate.

On calcareous soil and cement along coast. In Maine known from Hancock (*Norton MAINE*), Knox (*Norton MAINE*), Lincoln (*Allen 10207 MO*), Sagadahoc (*Norton MAINE*), and Washington (*Norton MAINE*) counties.

This species is better known in eastern North America as *B. stenotrichum* C. Müll. or *B. inclinatum* (Sw.) Sturm., an arctic to subarctic species previously reported from Maine by Andrews (1940). Ochi (1980) synonymized these names with *Bryum amblyodon*, an antipodal species. *Bryum amblyodon* is a calciphile and in Maine it is restricted to the sea coast where it is sometimes found on concrete sidewalks.

This species belongs to the bordered, long-celled group of *Bryum*, otherwise its nondescript gametophytes are nearly impossible to distinguish from *B. lisae* var. *cuspidatum* or *B. caespiticium*. It differs from both species in having rudimentary endostomial cilia and a short, dark-red fundus at the base of the exostome teeth. This fundus represents extra peristomal deposition and divisions in the primary peristomal layer. A much better developed fundus occurs in *B. algovicum* which has chambered exostome teeth that adhere to the base of the endostome.

## 2. *Bryum argenteum* Hedw., Sp. Musc. Frond. 181. 1801.

Plants small, silvery-green, in loose tufts, 3-10 mm high; rhizoids papillose, not matted. Leaves 0.5-1.3 mm long, imbricate, with recurved apices dry, imbricate wet, concave, broadly ovate, apiculate to filiform-acuminate; margins plane or recurved below, unistratose, not bordered, not decurrent; costa slender, ending below the apex, percurrent or excurrent; upper cells rhomboidal to rectangular, hyaline, firm-walled, basal cells sub-quadrate to short-rectangular, green, thick-walled. Asexual reproduction by short, compact, deciduous branches. Dioicous. Setae 8-15 mm long, brown to red. Capsules 1-2 mm long, oblong-cylindric, pendent, light brown becoming red with age, exothecial cells below the mouth strongly differentiated in 10 or more rows; opercula 0.5 mm long conic-apiculate, annulus compound and revoluble; exostome teeth light brown, papillose, 350  $\mu\text{m}$  high, endostome yellowish to hyaline, 320  $\mu\text{m}$  high, basal membrane high, processes broad, perforate, lightly papillose, cilia 2-3,

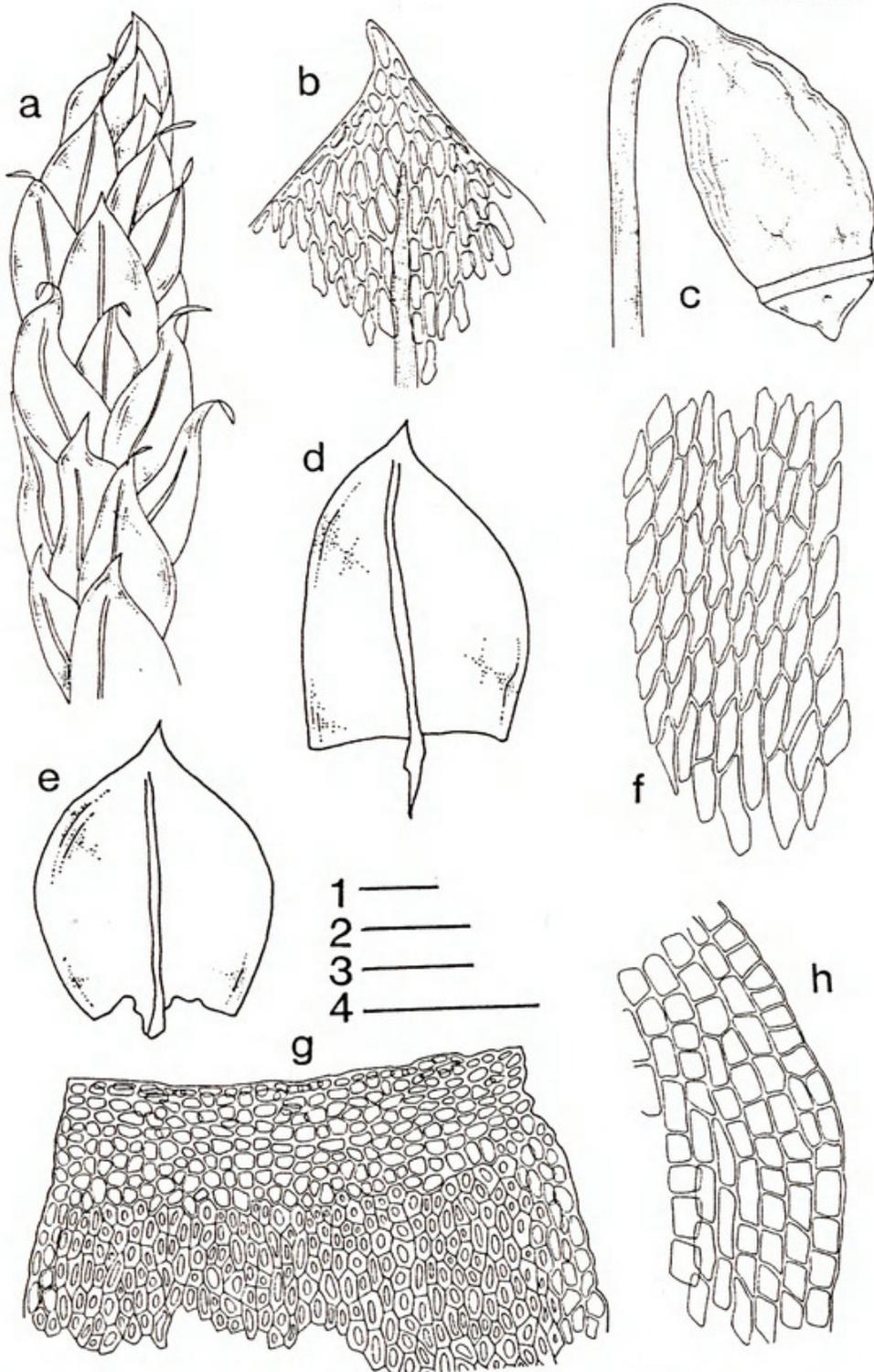


Figure 2. *Bryum argenteum*. a. Habit. b. Leaf apex. c. Capsule and opercum. d & e. Leaves. f. Median leaf cells. g. Capsule mouth. h. Basal leaf cells. Scales in mm: Bar 1 = 0.05 (f,h); Bar 2 = 0.1 (g); Bar 3 = 0.5 (b,c.); Bar 3 = 0.25 (d & e); Bar 4 = 0.5 (a).

perforate, lightly papillose, cilia 2-3, appendiculate. Calyptrae falling early, 1.2-1.5 mm long, cucullate, long-cylindrical. Spores 10-15  $\mu\text{m}$ , smooth to faintly papillose.

Commonly found in weedy, disturbed places. On soil in dry and exposed areas or along paths in woods, crevices of rocks, boulders, and concrete sidewalks, logs, bricks, and roofs. In Maine known from Androscoggin (*Allen 14690* MO), Cumberland (*Blake* (MAINE), Knox (*Lowe* (MAINE), Lincoln (*Allen 10211* MO), Penobscot (*Merrill* (MAINE), Piscataquis (*Lowe* (MAINE), Sagadahoc (*Allen 14609* MO), and York (*Allen 13047* MO) counties. Also reported but not yet verified from Hancock (*Schnoberger & Wynne 1941*), Kennebec and Oxford (*Parlin 1939*), Waldo (*Parlin 1924*), and Washington (*Spencer 1993*) counties.

A common, weedy species, *B. argenteum* is an attractive silvery-green moss often associated with disturbed, anthropogenic habitats. Its silver color is due to the absence of chlorophyll in the upper parts of the leaves. It has a perfect peristome, strongly differentiated exothecial cells at the capsule mouth and short, julaceous stems that grow in dense, tight mats. Andrews (1940) considered this species unrelated to any other North America *Bryum*, but *B. dichotomum* appears similar in its leaf shape, quadrate basal leaf cells and purple-red capsules. That species, however, lacks a silver color and strongly differentiated exothecial cells.

### 3. *Bryum caespiticium* Hedw., Sp. Musc. Frond. 180. 1801.

Plants small to medium sized, yellowish-green, in dense tufts, rosulate above, 5-15 mm high; densely tomentose below, rhizoids papillose-roughened. Leaves 2-3 mm long, erect to erect-patent dry, ovate-lanceolate, acuminate; margins revolute to near the apex, indistinctly border; costa strong, long excurrent, serrulate; upper cells rhomboidal to fusiform, firm-walled, 40-60  $\mu\text{m}$  x 8-12  $\mu\text{m}$ , basal cells long-rectangular, firm-walled, 40-80  $\mu\text{m}$  x 16  $\mu\text{m}$ . Dioicous. Setae 20-40 mm long, red. Capsules 2.0-3.5 mm long, clavate to elongate-ovoid, constricted at neck, pendent; opercula conic, 0.5 mm long; exostome teeth yellow to yellow-brown, lightly papillose, endostome Pale yellow to hyaline, lightly papillose, basal membrane to 1/2 of exostome teeth length, processes long, broadly perforate, cilia 2-3, appendiculate. Calyptra not seen. Spores 12-16  $\mu\text{m}$ , smooth.

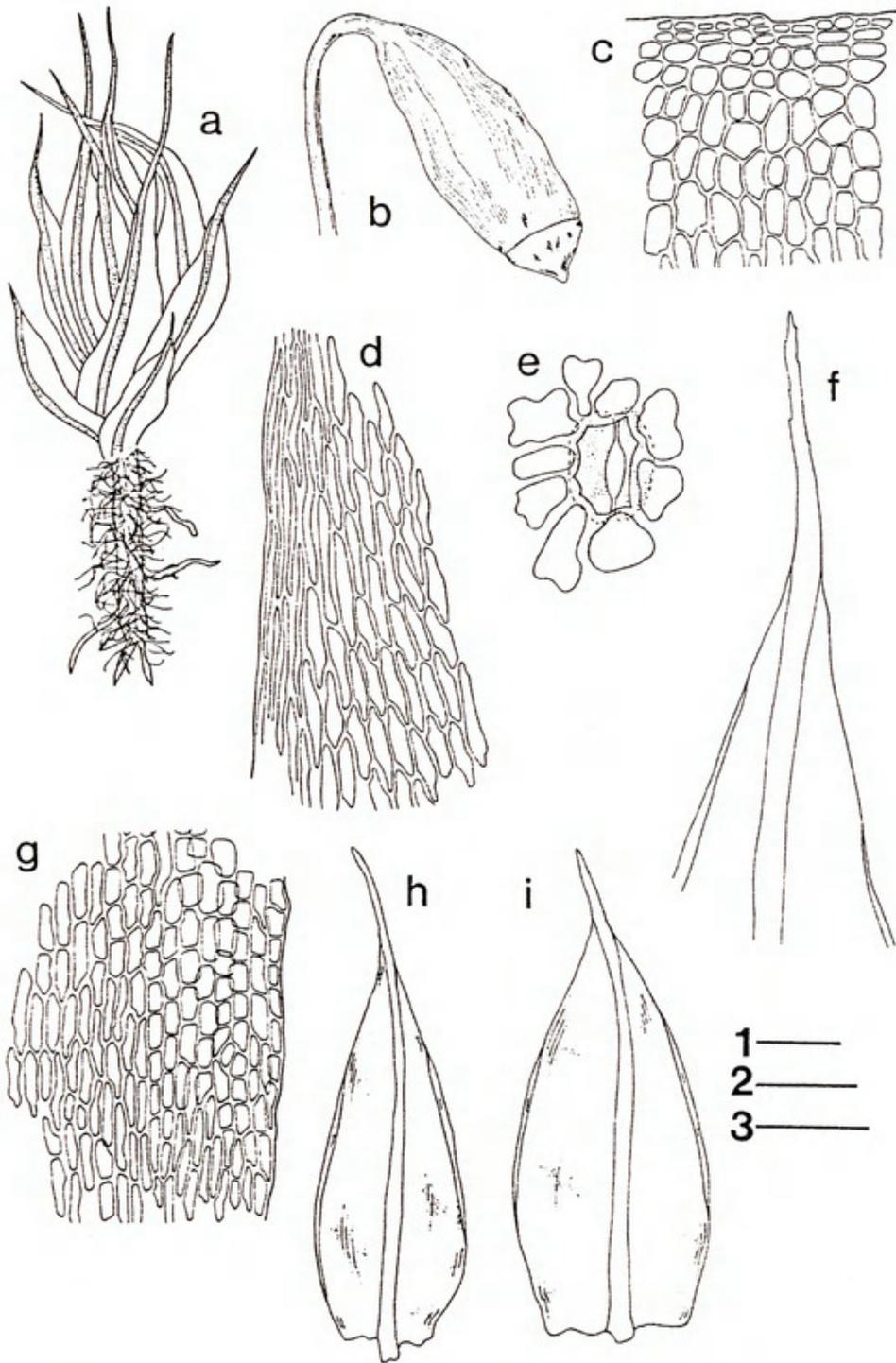


Figure 3. *Bryum caespiticum*. a. Habit. b. Capsule and operculum. c. Capsule mouth. d. Upper leaf cells. e. Stomata. f. Leaf apex. g. Basal leaf cells at alar region. h & i. Leaves. Scales in mm: Bar 1 = 0.05 (d); Bar 2 = 0.05 (e); Bar 2 = 0.1 (c,g); Bar 2 = 0.2 (f); Bar 2 = 0.5 (h & i); Bar 2 = 1.0 (b); Bar 3 = 1.0 (a).

On bare soil, sometimes in full and direct sunlight. In Maine known from Androscoggin (*Lowe MAINE*), Cumberland (*Lowe MAINE*); Oxford (*Lowe MAINE*), Piscataquis (*Merrill 165 MAINE, MO*), and Sagadahoc (*Allen 14589 MO*) counties. Reported by not yet verified from Hancock (Patterson 1930), Kennebec (Parlin 1923, 1939, Pitman 1928), Washington (Parlin 1923), and Waldo (Parlin 1923) counties.

*Bryum caespiticium* has strongly recurved leaf margins, a long-excurrent costa, moderately developed leaf limbidia, and a perfect peristome. Its leaf cells are firm-walled throughout, long-rectangular at base and fusiform above. *Bryum pallescens* differs in having shorter upper leaf cells, short excurrent costae, and quadrate to short-rectangular basal leaf cells. *Bryum lisae* var. *cuspidatum* is very similar, it differs from *B caespiticium* differs only in being synoicous.

#### 4. *Bryum capillare* Hedw. Sp. Musc. Frond. 182. 1801.

Plants small, dark-green above, reddish-brown below, tufted, rosulate above, 6-10 mm high; densely tomentose. Leaves 1.5-3.0 mm long, contorted or twisted dry, erect-spreading moist, from a narrow base obovate to elliptic, abruptly cuspidate or awned; margins plane to weakly recurved, serrulate above, border hyaline or pale-brown, weakly to moderately developed of 1-2(-3) rows of cells; costa variably developed, strong at base, ending below the apex, percurrent or excurrent; upper cells broadly hexagonal to rhomboidal, lax and thin-walled, 36-52  $\mu\text{m}$  x 16-24  $\mu\text{m}$ , basal cells quadrate to short-rectangular, lax, 48-60  $\mu\text{m}$  x 24-28  $\mu\text{m}$ . Brown, filiform, roughened propagulae often clustered in leaf axils, rhizoidal propagulae occasionally present. Dioicous. Setae 10-30 mm long, reddish-brown. Capsules 2.5-4 mm long, clavate, horizontal to inclined; opercula conic-apiculate; exostome teeth yellow-brown, papillose, endostome yellowish-hyaline, basal membrane to 1/2 of exostome teeth length, processes broadly perforated, lightly papillose, cilia 1-4, appendiculate. Spores 8-15  $\mu\text{m}$ , lightly roughened.

On rock, soil or humus, also on bark of trees and decayed wood. In Maine known from Cumberland (*Preston MAINE*), Kennebec (*Allen 15714 MO*), Oxford (*Parlin 8127 MO*), Washington (*McCleary MO*), and York (*Lowe MAINE*) counties. Reported by not yet verified from Hancock (Patterson 1930, Greenwood 1927), and Waldo (Parlin 1929) counties. A report of the species from Somerset county (Allen 1991) is based upon a specimen of *Pohlia*.

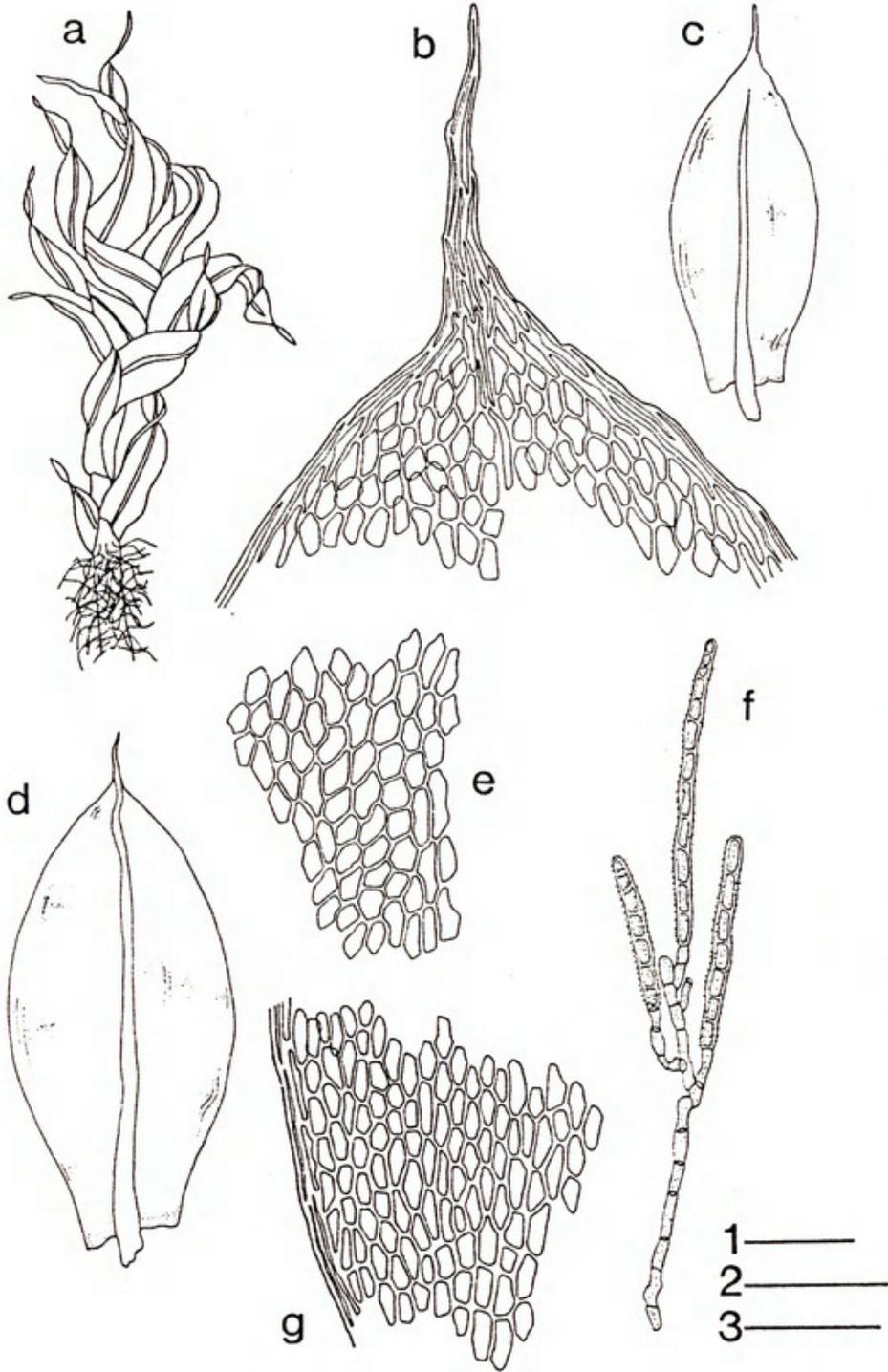


Figure 4. *Bryum capillare*. a. Habit. b. Leaf apex. c & d. Leaf. e. Median leaf cells. f. Filamentous propagulae. g. Basal leaf cells. Scales in mm: Bar 1 = 0.1 (b,e); Bar 1 = 0.2 (f); Bar 1 = 0.5 (c & d); Bar 2 = 0.2 (g); Bar 3 = 0.8 (a).

*Bryum capillare* is a soft looking moss with leaves that are contorted to spirally twisted leaves when dry. It has more or less plane leaf margins, a weakly developed border that nevertheless extends into the apex, and lax, thin-walled, generally short leaf cells. The costa is extremely variability in this species and often a single plant can have some leaves with subpercurrent, percurrent, or excurrent costae. *Bryum capillare* often has abundant reddish-brown, filiform propagulae in its upper leaf axils. *Bryum pseudotriquetrum*, the only other Maine *Bryum* with axillary propagulae, is a larger plant with firm-walled leaf cells and strongly recurved, dark red leaf margins.

*Bryum pallens* and *B. capillare* have lax leaf cells that vary considerably in size, the former differs in having consistently excurrent costae, long-rectangular basal leaf cells, and capsules with strongly differentiated necks.

Syed (1973) treated the *B. capillare*-complex in detail, with particular emphasis on axillary propagulae and rhizoidal tuber characters. Most Maine material of *Bryum capillare* sensu lato appears to represent *B. flaccidum* Brid. a species with papillose axillary propagulae, dark brown rhizoidal tubers, and a costa that is broad below but narrow at apex. However, there are some collections that appear identical to the above material but lack axillary propagulae and/or rhizoidal tubers. Crum and Anderson (1981) give a key to Syed's *capillare*-segregates from eastern North America.

5. *Bryum dichotomum* Hedw., Sp. Musc. Frond. 183. 1801.

*Bryum atropurpureum* Bruch & Schimp. in B.S.G., Bryol. Eur. 4: 143. 1839.

*Bryum bicolor* Dicks., Pl. Crypt. Brit., fasc. 4, p. 16. 1801.

Plants small, yellow-green in loose tufts to 5 mm high; rhizoids dense at base. Leaves 1-1.7 mm long, erect-imbricate, firm dry, erect-spreading wet, ovate to ovate-lanceolate, acuminate; margins recurved, entire, indistinctly bordered; costa percurrent to short excurrent; upper cells elongate-rhomboidal, thick-walled, 28-60  $\mu\text{m}$  x 8-12  $\mu\text{m}$ , basal cells quadrate to short-rectangular, firm-walled, 16-28  $\mu\text{m}$  x 16  $\mu\text{m}$ . Dioicous. Setae 5-10 mm long, red or purple. Capsules 1-3 mm long, purple-red, obovate to oblong-cylindrical, pendent; annulus compound; opercula 0.5 mm long, conic apiculate; exostome teeth yellow-brown, papillose, endostome yellowish-hyaline, basal membrane to 1/2 of exostome teeth length,

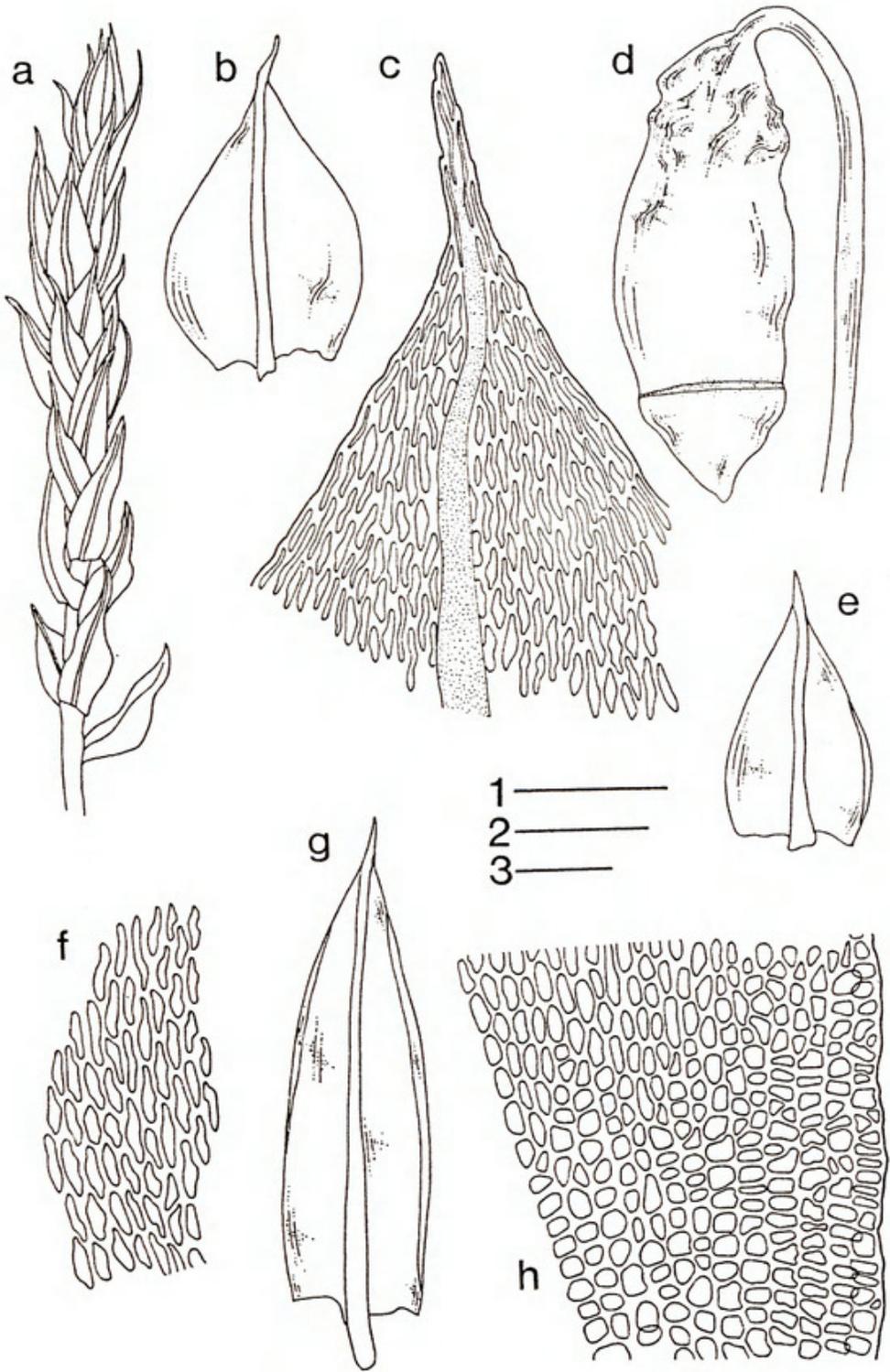


Figure 5. *Bryum dichotomum*. a. Habit. b,e,g. Leaves. c. Leaf apex. d. Capsule and operculum. f. Median leaf cells. h. Basal leaf cells. Scales in mm: Bar 1 = 0.1 (f,h); Bar 1 = 0.5 (b,e,g); Bar 2 = 0.1 (c); Bar 2 = 0.5 (d); Bar 3 = 1.0 (a).

processes well developed, broadly perforate, lightly papillose, cilia 2-4, nodose to weakly appendiculate. Spores 8-12  $\mu\text{m}$ , lightly roughened.

On bare soil. In Maine known from York (*Carlson & Lowe* MAINE) county.

*Bryum dichotomum*, better known in eastern North America as *B. bicolor*, is a small *Bryum* with short broad leaves, and purple-red capsules. Its leaf cells, firm-walled throughout, are long above but short-rectangular to quadrate below. *Bryum argenteum* has a similar size and leaf shape as well as quadrate, firm-walled basal leaf cells. It differs in its silvery color and in having 10 or more rows of differentiated exothecial cells at the capsule mouth.

6. *Bryum lisaе* De Not. var. *cuspidatum* (Bruch & Schimp. in B.S.G.) Marg., *Lindbergia* 1: 125. 1973.

*Bryum bimum* var. *cuspidatum* Bruch & Schimp. in B.S.G., *Bryol. Eur.* 4: 120. 1839. *Bryum cuspidatum* (Bruch & Schimp. in B.S.G.) Schimp. *Syn. Musc. Eur.*, ed. 2: 430. 1876, *non* (Hedw.) Crome.

*B. creberrimum* Tayl., *London J. Bot.* 5: 54. 1846.

Plants small to medium, green to yellowish-green, tufted, rosulate above, 15-20 mm high; rhizoids sparse. Leaves 2-3 mm long, erect-contorted dry, erect-spreading wet, ovate-lanceolate, long-acuminate; margins recurved to near the apex, border weakly developed; costa long excurrent; upper cells rhomboidal, 40-50  $\mu\text{m}$  x 12  $\mu\text{m}$ , firm-walled, basal cells rectangular, 50-80  $\mu\text{m}$  x 16  $\mu\text{m}$ , thin-walled, lax. Synoicous. Setae 10-40 mm long, flexuose, reddish. Capsules 2-4 mm long, clavate, constricted at neck, horizontal, inclined or pendent; opercula 0.5 mm long, conic-apiculate; exostome teeth yellow-brown, finely papillose, endostome basal membrane yellowish-hyaline, to 1/2 of exostome teeth length, processes long, broadly perforated, lightly papillose to smooth, cilia 3-4, appendiculate. Calyptrae not seen. Spores 12-16  $\mu\text{m}$ , lightly papillose.

On sandy soil in woods, rotting wood, or on boulders in and along streams. In Maine known from Androscoggin (*Allen 14712* MO), Aroostook (*Norton & Copeland* MAINE), Cumberland (*Hodgkins* MAINE), Hancock (*Merrill*

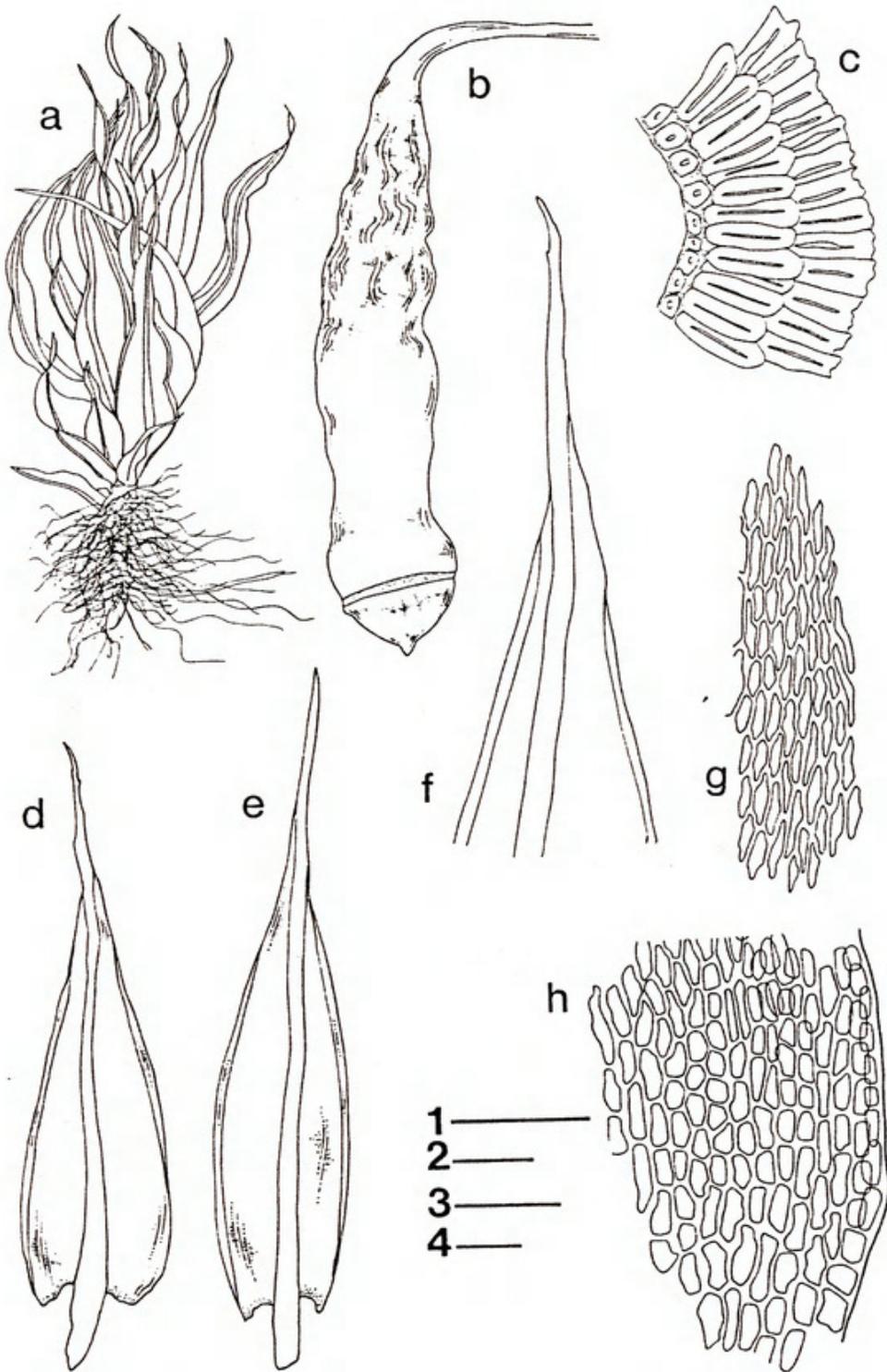


Figure 6. *Bryum lisaе* var. *cuspidatum*. a. Habit. b. Capsule and operculum. c. Part of revolvable annulus. d & e. Leaves. f. Leaf apex. g. Upper leaf cells. h. Basal leaf cells. Scales in mm: Bar 1 = 0.1 (g,h); Bar 1 = 0.5 (d,e); Bar 2 = 0.05 (c); Bar 2 = 0.5 (b); Bar 3 = 0.2 (f); Bar 4 = 0.7 (a).

MAINE), Knox (*Norton & Fanning* MAINE), Oxford (*Holmes 5* MO), Piscataquis (*Smith* MAINE), Sagadahoc (*Allen 14584* MO), Washington (*Norton* MAINE), and York (*Lowe* MAINE) counties. Reported by not yet verified from Waldo county (*Parlin 1924*).

*Bryum lisae* var. *cuspidatum* has broadly ovate-lanceolate leaves with strongly recurved, sometimes dark red, margins. It has noticeably excurrent costae, long-rhomboidal upper leaf cells and elongate basal leaf cells. It is synoicous and so fruits abundantly, it has bright red setae, thick, pendent capsules, and a perfect peristome. *Bryum caespiticum* differs from *B. lisae* var. *cuspidatum* only in its dioicous sexual condition.

7. *Bryum muehlenbeckii* Bruch & Schimp. in B.S.G., Bryol. Eur. 4: fasc. 32, 1846.

Plants medium to large, reddish-green to reddish-brown, densely tufted, to 45 mm high; rhizoids sparse. Leaves 2-3 mm long, erect-imbricate dry, erect to erect-spreading wet, oblong-ovate, concave, rounded-obtuse to bluntly acute, at times cucullate; margins plane, or erect to weakly reflexed below, border weakly differentiated; costa strong, thick at base, percurrent to subpercurrent; upper cells rhomboidal to elongate, 30-70  $\mu\text{m}$  x 8-10  $\mu\text{m}$ , thin or thick-walled, basal cells long-rectangular, 46-90  $\mu\text{m}$  x 14  $\mu\text{m}$ , thick-walled, cells at alar regions deep red, enlarged, bulging, quadrate to short-rectangular, 20-36  $\mu\text{m}$  x 16  $\mu\text{m}$ . Dioicous. Setae 20 mm long, red. Capsules to 3 mm long, obovate-pyriform, pendent; opercula 0.5 mm long, concave-apiculate; exostome teeth brownish-yellow, with a short, dark red fundus, papillose, endostome yellow-brown, basal membrane to 1/2 of exostome teeth length, processes slender, narrowly perforate, papillose, cilia 2-3, appendiculate. Spores 15-18  $\mu\text{m}$ , lightly papillose.

On rocks in or along streams. In Maine known from Hancock (*Allen 3696* MO) county. *Parlin* (1939) reported this species from Oxford county, but the collection on which the report was based is *Bryum pseudotriquetrum*.

*Bryum muehlenbeckii* is an aquatic or semi-aquatic moss with a deep reddish color and broadly acute to obtuse leaf apices. Its leaves have short, dark red, enlarged and bulging alar cells that often extend below the leaf insertions. The species is very similar to *B. miniatum* Lesq. which is supposedly a larger moss with longer, thicker walled leaf cells, and less recurved leaf margins. The two

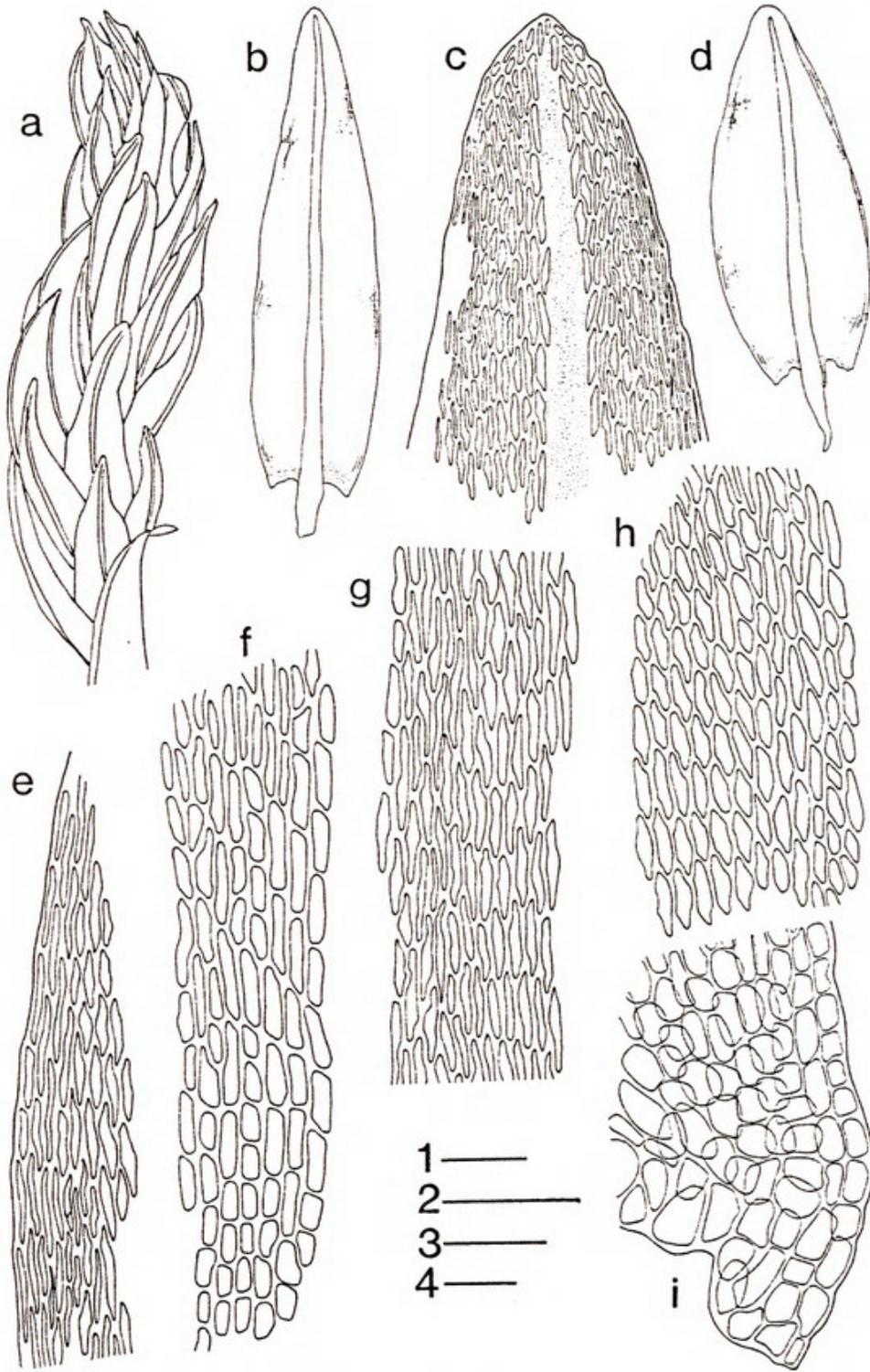


Figure 7. *Bryum muehlenbeckii*. a. Habit. b & d. Leaves. c. Leaf apex. e. Marginal leaf cells. f. Basal leaf cells. g & h. Median leaf cells from different leaves. i. Alar cells. Scales in mm: Bar 1 = 0.05 (i); Bar 2 = 0.1 (e-h); Bar 3 = 0.1 (c); Bar 3 = 0.5 (b,d); Bar 4 = 1.0 (a).

species are doubtfully distinct since they exhibit intergrading variation in all of these features. The single collection from Maine has the leaf size and weakly recurved leaf margins of *B. miniatum*, but astonishingly variable leaf cells. On a single stem some leaves have cells that match those of *B. miniatum* while other leaves have the cells of *B. muehlenbeckii*. *Bryum alpinum* differs from *B. muehlenbeckii* in having leaf margins recurved nearly to the apex and very long leaf cells (7:1).

8. *Bryum pallens* Sw. Monthly Rev. 34: 538. 1801.

Plants small, green to yellowish-green, densely or loosely tufted, rosulate, 5-30(-50) mm high, stems red; rhizoids sparse. Leaves 2-3 mm long, erect-twisted or erect-spirally contorted dry, erect-spreading wet, oblong to oblong-lanceolate, acute or gradually acuminate, decurrent; reflexed to near the apex, border strongly developed; costa reddish at base, yellow above, shortly excurrent; upper cells irregularly rhomboidal to elongate-rhomboidal, thin-walled, 30-50  $\mu\text{m}$ , basal cells long-rectangular, lax and thin-walled, 40-90  $\mu\text{m}$ . Dioicous. Setae red, 10-50 mm long. Capsules yellow-brown, 2.5-4 mm long, elongate-pyriform, with strongly differentiated neck, subpendant; opercula conic-apiculate; exostome teeth yellow, finely but densely papillose, endostome hyaline, basal membrane to 1/2 of exostome teeth length, processes long, narrowly perforated, smooth to lightly papillose, cilia 2, appendiculate. Spores 18-24  $\mu\text{m}$ , lightly papillose.

On rocks and humus along stream or lake margins, and on rocks in streams. In Maine known from Androscoggin (*Allen 14729* MO), Aroostook (*Lowe MAINE*), Knox (*Norton MAINE*), Oxford (*Allen 10072*), and Somerset (*Allen 9287B*) counties. Reported but not yet verified from Hancock (*Patterson 1930*) and Piscataquis (*Hermann 1970*) counties.

The cilia in *B. pallens* can apparently vary from fully developed to almost lacking. The collections from Maine have well-developed cilia and so come out with difficulty in keys to *Bryum* (*Andrews 1940*, *Crum and Anderson 1981*) that rely primarily on the rudimentary character state. In *B. pallens* the capsules have long, constricted necks, the leaf cells are lax, and the leaf border is strongly differentiated. *Bryum capillare* differs in having quadrate to short-rectangular basal leaf cells and a variably developed costa that often ends below the apex. *Bryum pallescens* is an autoicous species with firm-walled leaf cells, short-rectangular to quadrate basal leaf cells, and non-decurrent leaves.

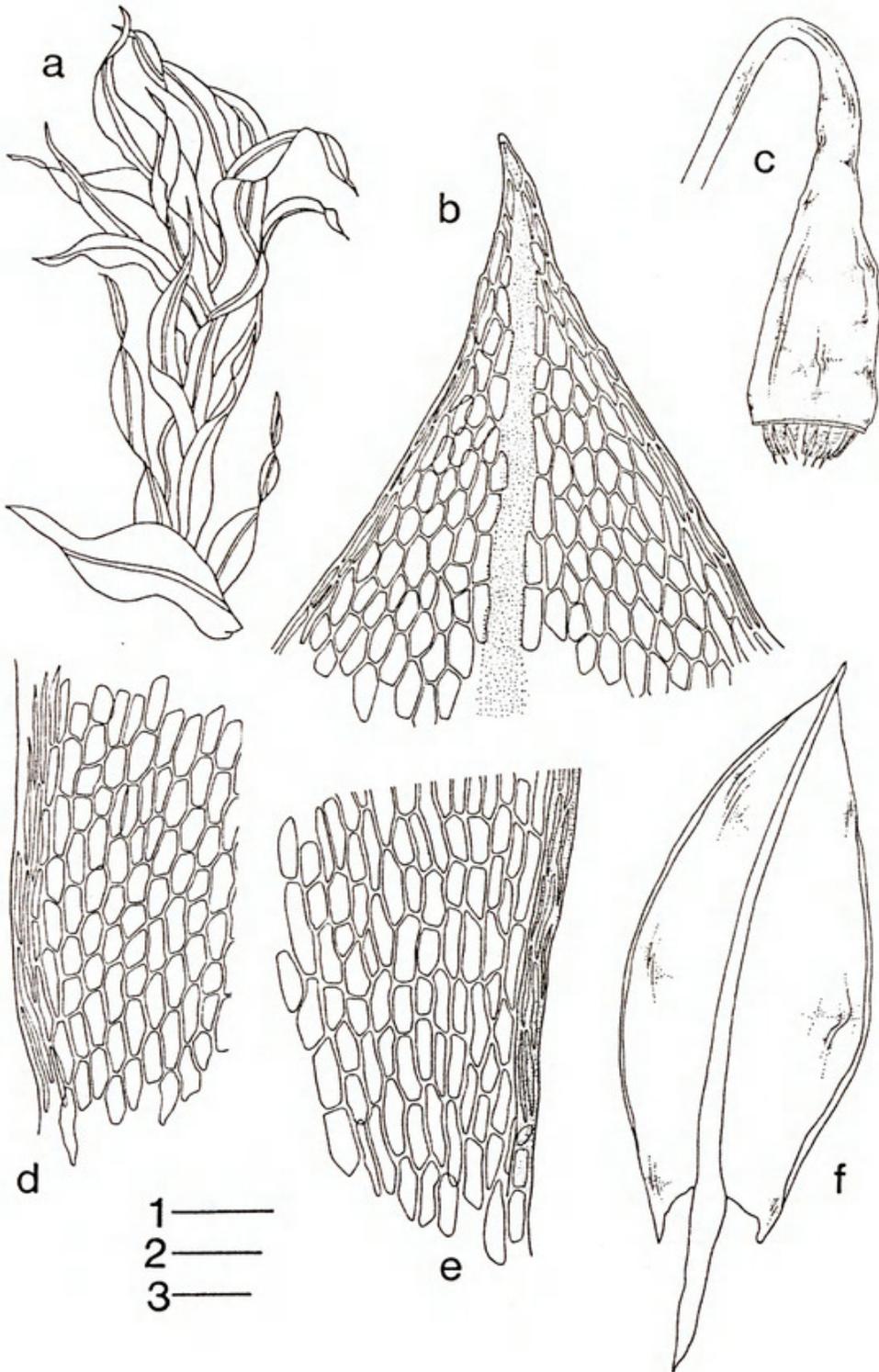


Figure 8. *Bryum pallens*. a. Habit. b. Leaf apex. c. Capsule. d. Median leaf cells and margin. e. Basal leaf cells and margin. f. Leaf. Scales in mm: Bar 1 = 0.1 (b,d,e); Bar 1 = 0.5 (c); Bar 2 = 1.0 (a); Bar 3 = 0.5 (f).

Since Swartz provided an indirect reference to a previously published description of *Bryum pallens* the species epithet is attributed him rather than Bridel (see Anderson et al. 1990) under Article 32.4 of the International Code of Botanical Nomenclature (Greuter 1994).

9. *Bryum pallescens* Schleich. ex Schwaegr., Suppl. Sp. Musc. Frond. Suppl. 1(2): 107. 1816.

Plants medium sized, green to yellow-green, in loose or dense tufts, 1-3 cm high; rhizoids dense below. Leaves 1.5-3 mm long, spirally twisted dry, erect-spreading moist, ovate to ovate-lanceolate, long acuminate, not decurrent; margins revolute nearly to the apex, border well developed; costa long excurrent; upper cells oblong-hexagonal, firm-walled, 28-50  $\mu\text{m}$  x 14-24  $\mu\text{m}$ , basal cells short-rectangular to quadrate especially near the margins, firm-walled, 30-40  $\mu\text{m}$  x 15-18  $\mu\text{m}$ . Autoicous or synoicous. Setae 20-40 mm long, red-brown. Capsules 3-4 mm long, clavate, constricted at neck pendent; opercula conic-apiculate, 0.5 mm long; exostome teeth brown to yellowish-brown, papillose, endostome hyaline to yellowish, basal membrane to 1/2 of exostome teeth length, processes broadly perforated, smooth to lightly papillose, cilia 2-3, nodose or appendiculate. Spores 18-36  $\mu\text{m}$ , papillose.

In moist places on soil, over rocks, and in rock crevices. In Maine known from Oxford (*Parlin 11697* NY), and Washington (*Norton* MAINE) counties. Reported but not yet verified from Piscataquis county (Kennedy and Collins 1901).

*Bryum pallescens* has broad leaves with strongly revolute leaf margins, short leaf cells, and a long excurrent costa. It is generally autoicous with male and female inflorescences at the ends of separate branches, but occasionally it is synoicous. *Bryum pseudotriquetrum* differs from it in having decurrent leaves, a short excurrent costa and generally synoicous inflorescences. *Bryum pallens* is a dioicous species with decurrent leaves, laxer, thin-walled leaf cells, and long rectangular basal cells. This species is sometimes confused with *B. lisa* var *cuspidatum*, but that species is consistently synoicous, has upper leaf cells greater than 3:1 and smaller (14-16  $\mu\text{m}$ ), finely papillose spores.

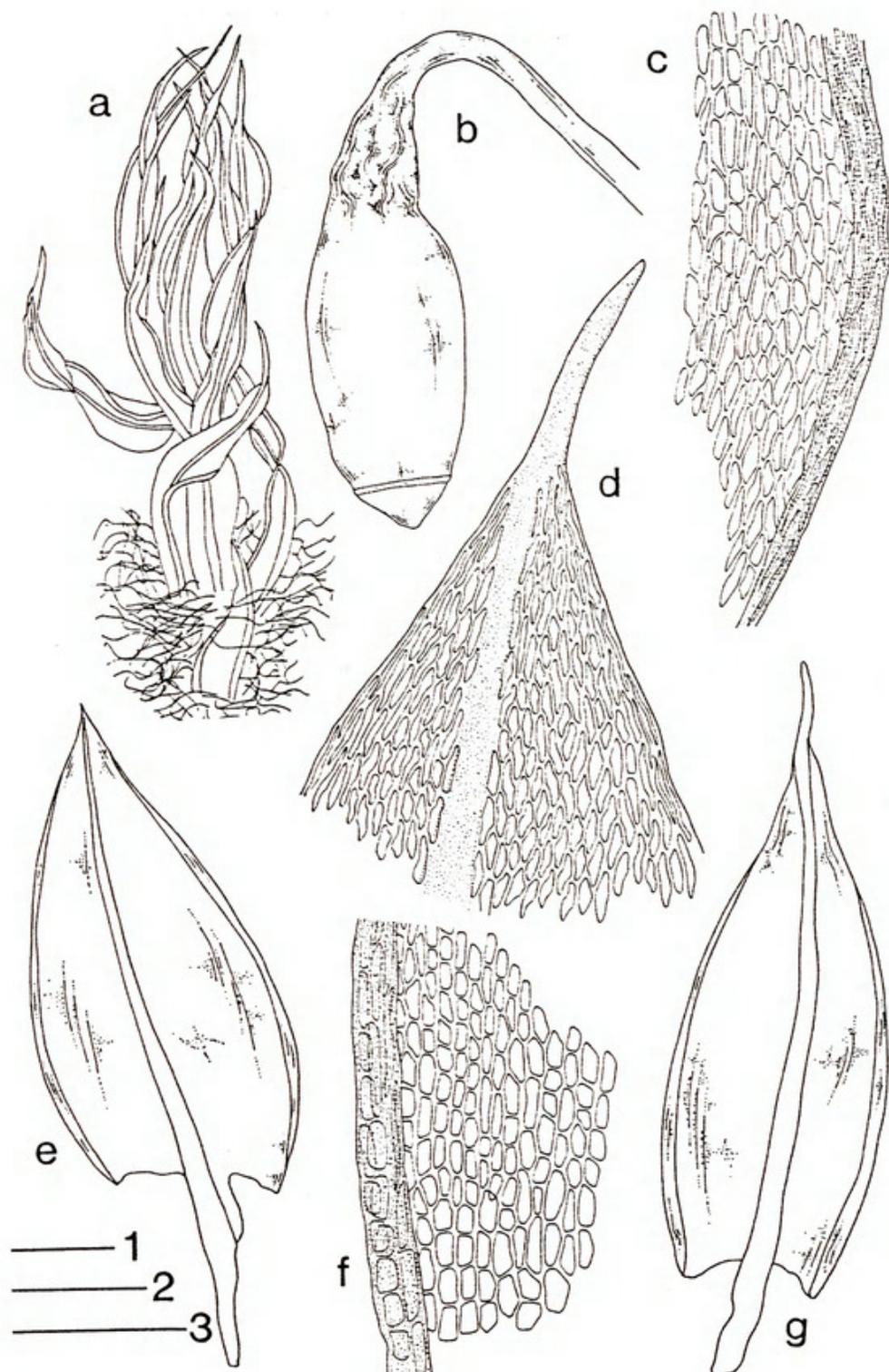


Figure 9. *Bryum pallescens*. a. Habit. b. Capsule and operculum. c. Median leaf cells and margin. d. Leaf apex. e. & g. Leaves. f. Basal leaf cells and margin. Scales in mm: Bar 1 = 0.1 (c,d,f); Bar 1 = 0.5 (b); Bar 2 = 0.5 (e,g); Bar 3 = 1.0 (a).

10. *Bryum pseudotriquetrum* (Hedw.) Gaertn., Mey Scherb., Oekon.-Techn. Fl. Wetterau, 3(2): 102. 1802. *Mnium pseudotriquetrum* Hedw., Sp. Musc. Frond. 190. 1801.

*Mnium bimum* Brid., Muscol. Rec. 3: 93. 1803. *Bryum bimum* (Brid.) Turn. Musc. Hib. 127. 1804.

Plants large, dark-green, reddish or yellowish green, densely tufted, 10-30 mm high; reddish-brown rhizoids densely matted below. Leaves 2-3.5 mm long, erect-spreading to spreading, twisted and contorted dry, erect-spreading wet, oblong-lanceolate to ovate-lanceolate, acute to gradually acuminate, distinctly decurrent; margins tightly recurved often to near the apex, border well-developed, often red; costa, percurrent to short excurrent; upper cells hexagonal to hexagonal-rhomboidal, firm-walled, 20-46  $\mu\text{m}$  x 10-20  $\mu\text{m}$ , basal cells quadrate to rectangular, firm-walled, porose-pitted. Plants at times with filamentous, brown brood bodies in upper leaf axils. Synoicous or dioicous. Setae 20-40 mm long, reddish, becoming brown with age. Capsules 2.5-4 mm long, cylindrical to clavate, horizontal, inclined or pendent; opercula conic-apiculate, 0.5-0.8 mm long; exostome brownish-yellow to pale-yellow, papillose, endostome yellowish-hyaline, basal membrane to 1/2 of exostome teeth length, processes long, perforations broad, lightly papillose, cilia 2-3, appendiculate. Spores 12-20, lightly papillose.

On humus in moist seepy areas, drainage ditches and in crevices of cliffs. In Maine known from Androscoggin (*Allen 14674*), Aroostook (*Lowe MAINE*), Cumberland (*Norton MAINE*), Hancock (*Rand MAINE*), Kennebec (*Carlson MAINE*), Oxford (*Parlin 11662 NY*), Penobscot (*Merrill 125 MO*), and Washington (*Holmes 135*) counties. Reported but not yet verified from Piscataquis (*Kennedy & Collins 1901*) and Waldo (*Parlin 1924, 1939*) counties.

*Bryum pseudotriquetrum* is a large *Bryum* with distinctly decurrent leaves, strongly recurved, often dark-red margins, short, firm-walled leaf cells, and a percurrent or short-excurrent costa. *Bryum capillare* and *B. pallens* differ from it in having lax, bulging leaf cells, while *B. pallescens* differs in having long excurrent costae and non-decurrent leaves. *Bryum lisae*. var. *cuspidatum* and *B. caespiticum* are somewhat smaller mosses with longer upper leaf cells and long-excurrent costae.

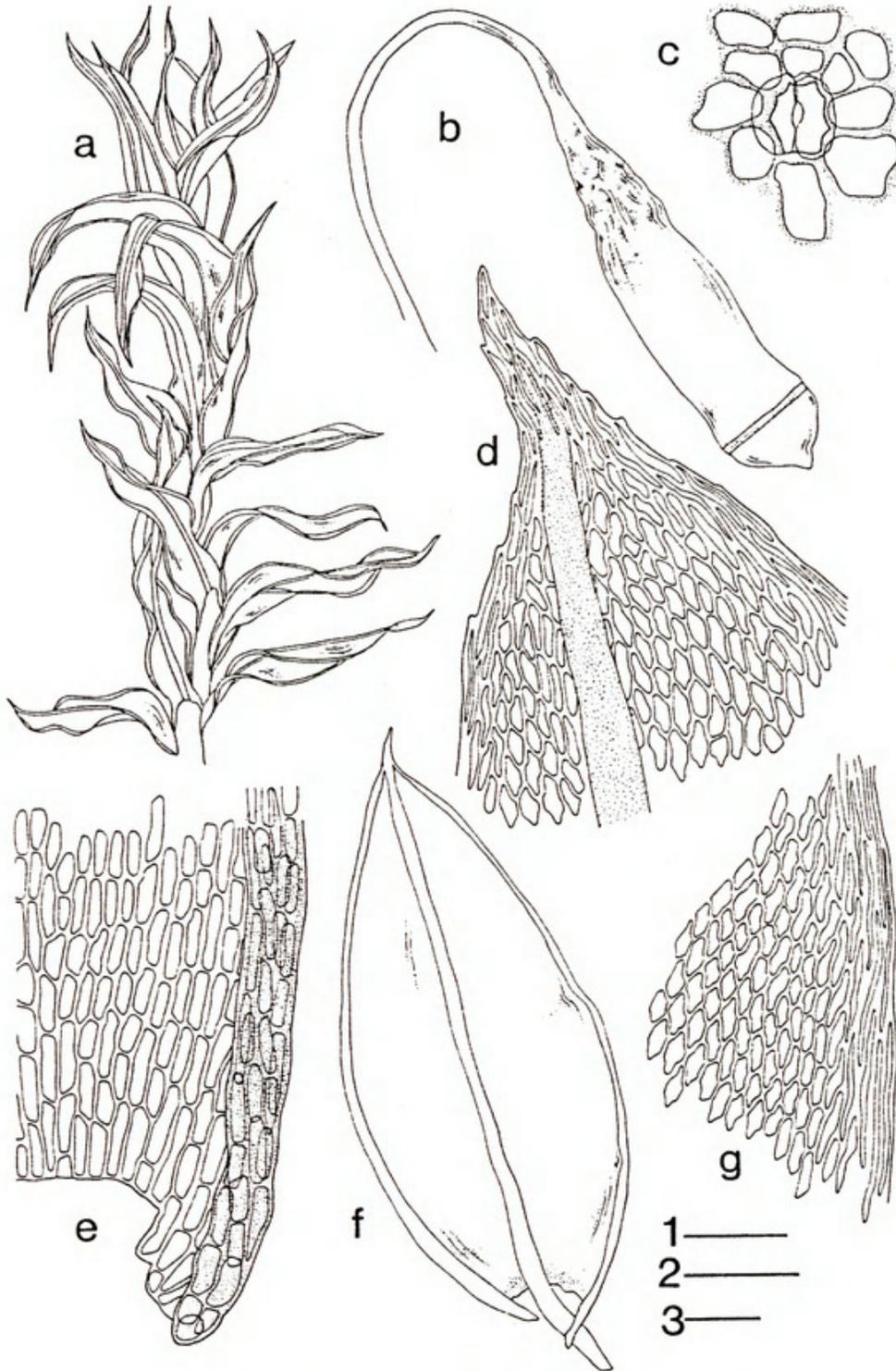


Figure 10. *Bryum pseudotriquetrum*. a. Habit. b. Capsule and operculum. c. Stomata. d. Leaf apex. e. Basal leaf cells and margin. f. Leaf. g. Median leaf cells and margin. Scales in mm: Bar 1 = 0.05 (c); Bar 1 = 0.1 (d,e,g); Bar 1 = 0.5 (f); Bar 2 = 1.0 (b); Bar 3 = 1.0 (a).

11. *Bryum weigelii* Spreng., Mant. Prim. Fl. Halens. Add. p. 55. 1807.

Plants large, pale-green to yellowish-green, in soft, loose tufts, 30-50 mm high; rhizoids sparse. Leaves 2-3 mm long, widely spaced, soft, shriveled and twisted dry, erect-spreading wet, ovate to ovate-lanceolate, long-decurrent, acute to short-acuminate; margins plane or weakly recurved below, border indistinct; subpercurrent to percurrent; upper cells irregularly oblong-hexagonal, lax and thin-walled 30-50  $\mu\text{m}$  x 12-24  $\mu\text{m}$ , basal cells irregularly rectangular, lax and thin-walled, 34-60  $\mu\text{m}$  x 14-24  $\mu\text{m}$ . Dioicous. Setae 35-45 mm long, red. Capsules 3 mm long, pyriform, pendent; opercula conic-apiculate, 0.5 mm long; exostome brownish-yellow, papillose, endostome yellowish-hyaline, basal membrane to 1/2 of exostome teeth length, processes long, perforations broad, lightly papillose, cilia 2-3, appendiculate. Spores 10-14, lightly papillose.

On soil and rock along stream margins, in seepage areas or in springs. In Maine known from Aroostook (*Lowe MAINE*), Cumberland (*Lowe MAINE*), Oxford (*Bacon 391 NY*) and Piscataquis (*Faxon 259 NY*) counties.

*Bryum weigelii* has elongated stems with pale, widely spaced, soft, contorted, very long-decurrent leaves. Despite its widely spaced leaves the leaf decurrencies in this species often extend into the axils of the leaves next below. Its costae are often subpercurrent, its leaf cells lax, thin-walled, and frequently bulging, and its margins are plane and indistinctly bordered. Although no other Maine *Bryum* is comparable to it, as noted by Andrews (1940) "Elongated sterile forms of various other species showing slightly decurrent leaves are often confused with it."

Syed (1973) reported *B. stirtonii* Schimp. from Maine, but the specimen on which the report is based came from Montana ("near Columbia Falls, altitude 4000 ft, May, Aug. 1896, R. S. Williams").

Parlin (1939) reported *Bryum schleicheri* Lam. & DC, a western species otherwise unknown in eastern North America, from Androscoggin county (North Turner, 1928). The specimen on which this report was based has not been seen.

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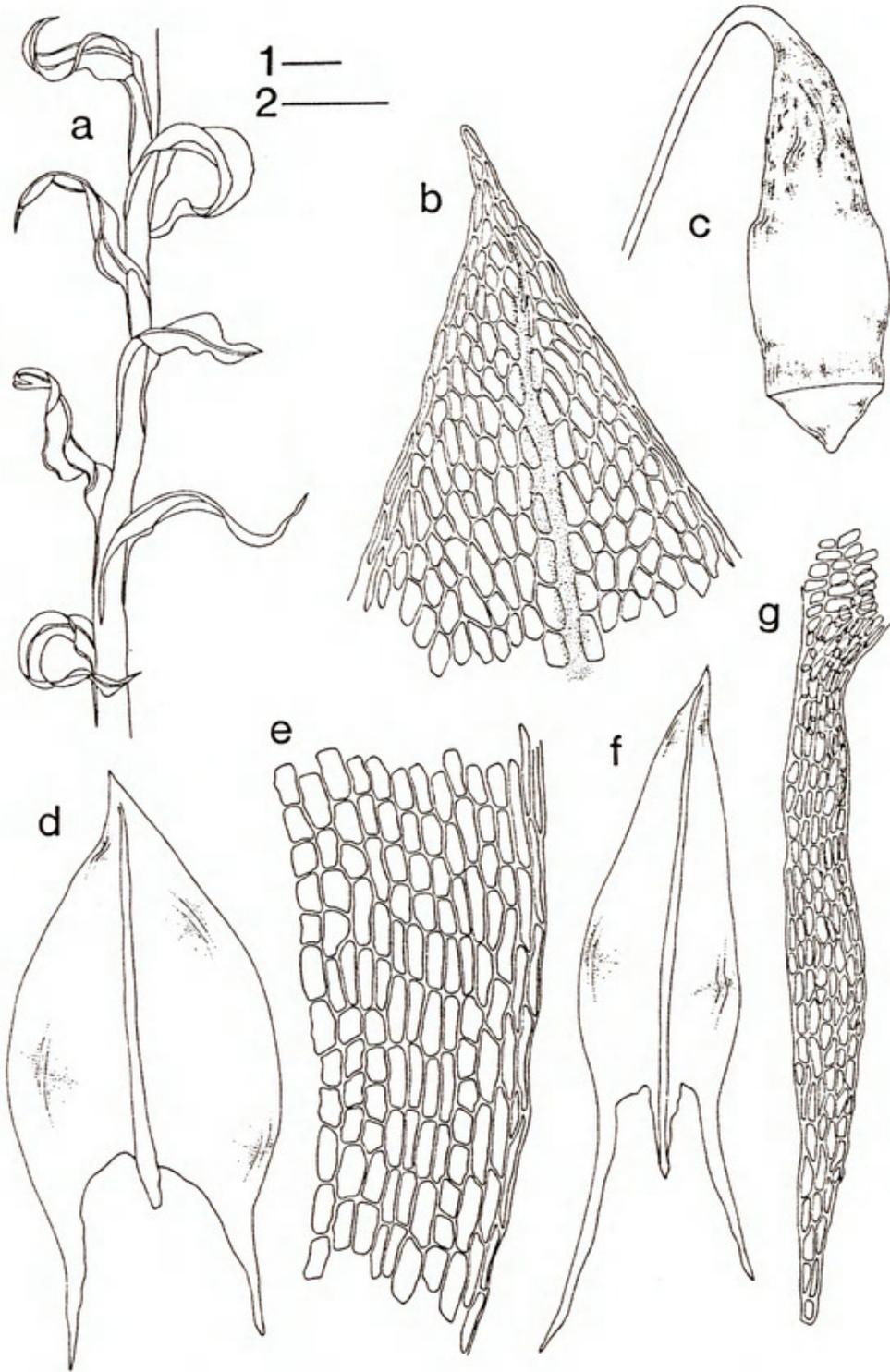


Figure 11. *Bryum weigeli*. a. Habit. b. Leaf apex. c. Capsule and operculum. d & f. Leaves. e. Basal leaf cells and margin. g. Leaf decurrency. Scales in mm: Bar 1 = 0.5 (c); Bar 2 = 0.5 (d,f); Bar 2 = 0.1 (b,e); Bar 2 = 0.2 (g); Bar 2 = 1.0 (a). Species unknown or excluded from Maine.

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