

## Studies in Indiana Bryophytes III

WINONA H. WELCH, DePauw University

The mosses used in this study are Indiana collections in herbaria in the following institutions: Indiana University, Butler University, DePauw University, Field Museum of Natural History, University of Illinois, and University of Chicago; and the personal herbaria of the following: Charles C. Deam, J. P. Naylor, and the author. The collections presented to the author by Charles C. Deam, R. M. Kriebel, William D. Gray, Earl L. Harger, Jr., R. V. Drexler, and Dorothy Parker have contributed considerably to the range of distribution.

The nomenclature is that of A. J. Grout, *The Moss Flora of North America North of Mexico* 1:148-192. 1938; 193-246. 1939.

The distribution of each species is based largely upon Indiana specimens examined by the author and is shown by the list of counties in which collected. The asterisk preceding the name of a county indicates that the species has been reported from that locality according to published records but not studied by the author.

The asterisk following the name of a species or a variety is an indication that, according to available literature, this is the first published record for Indiana.

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### POTTIACEAE

(*Tortulaceae* of Mosses with Hand-lens and Microscope, A. J. Grout, 1903.)

Plants small to large (2 mm. to 10 cm. high); usually in sods or tufts; leaves strongly costate; upper leaf cells usually small, thick-walled, and more or less papillose, the basal leaf cells usually thin-walled and hyaline; capsules usually peristomate, but also cleistocarpous and gymnostomous, immersed to exserted on a long seta; peristome when present consists of 16 or 32 teeth, papillose, sometimes filiform, entire or cleft, sometimes to base, straight or twisted, often united at base into a tube.

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|--|---|
| 1. Leaves narrowly lanceolate to oblong, wider below than above,<br>( <i>Trichostomeae</i> )             | 2 |
| Leaves broadly ovate or oblong, lingulate or spatulate, wider above than<br>below, ( <i>Pottiaceae</i> ) | 8 |
| 2. Plants up to 10 mm. high  | 3 |
| Plants up to 10 cm. high but usually shorter   | 5 |

- 3. Plants up to approximately 5 mm. high; leaves strongly crisped when dry; leaf margins strongly involute..... 4  
Plants up to 10 mm. high; leaves not crisped when dry but  $\pm$  contorted and appressed; leaf margins plane..... *Gymnostomum calcareum*
- 4. Plants dull-green; leaves keeled; capsules immersed..... *Astomum*  
Plants yellowish-green; leaves not keeled; capsules exerted on seta 3-7 mm. long..... *Weisia*
- 5. Leaves curled-crispate when dry; bases whitish and glossy; costa excurrent in a mucro..... *Tortella*  
Leaves  $\pm$  contorted when dry but usually not curled-crispate..... 6
- 6. Leaves appressed and  $\pm$  contorted when dry..... 7  
Leaves not appressed when dry, keeled, lanceolate-acuminate, acute; upper leaf cells distinct..... *Gymnostomum recurvirostrum*
- 7. Apices generally obtuse; costa excurrent as a short yellow mucro.....  
..... *Barbula unguiculata*  
Apices acute or subacute; costa disappears in the apex..... *Barbula fallax*
- 8. Plants bulbiform, subglobose, approximately 2 mm. high when mature.....  
..... *Acaulon rufescens*  
Plants not bulbiform..... 9
- 9. Leaves with costa densely spinose-papillose on back and excurrent into a sharply-serrated awn 1-3 mm. long..... *Tortula ruralis*  
Leaves not as above..... 10
- 10. Plants 1-3 mm. high; leaves acute, older ones with an evident band of 2-3 rows of lighter colored and less densely papillose cells.....  
..... *Desmatodon*  
Plants up to 5 mm. high; leaves not bordered as above..... 11
- 11. Plants 1-2 mm. high; leaves ovate to oblong-lanceolate, acuminate; costa long excurrent, often colorless at apex; capsules  $\pm$  immersed *Phascum*  
Plants usually 3-5 mm. high, sometimes up to 1 cm.; leaves lanceolate to  $\pm$  spatulate, acuminate to acute; costa usually excurrent into a stout, yellowish to brown awn; capsules exerted on setae 2-6.5 mm. long..... *Pottia*

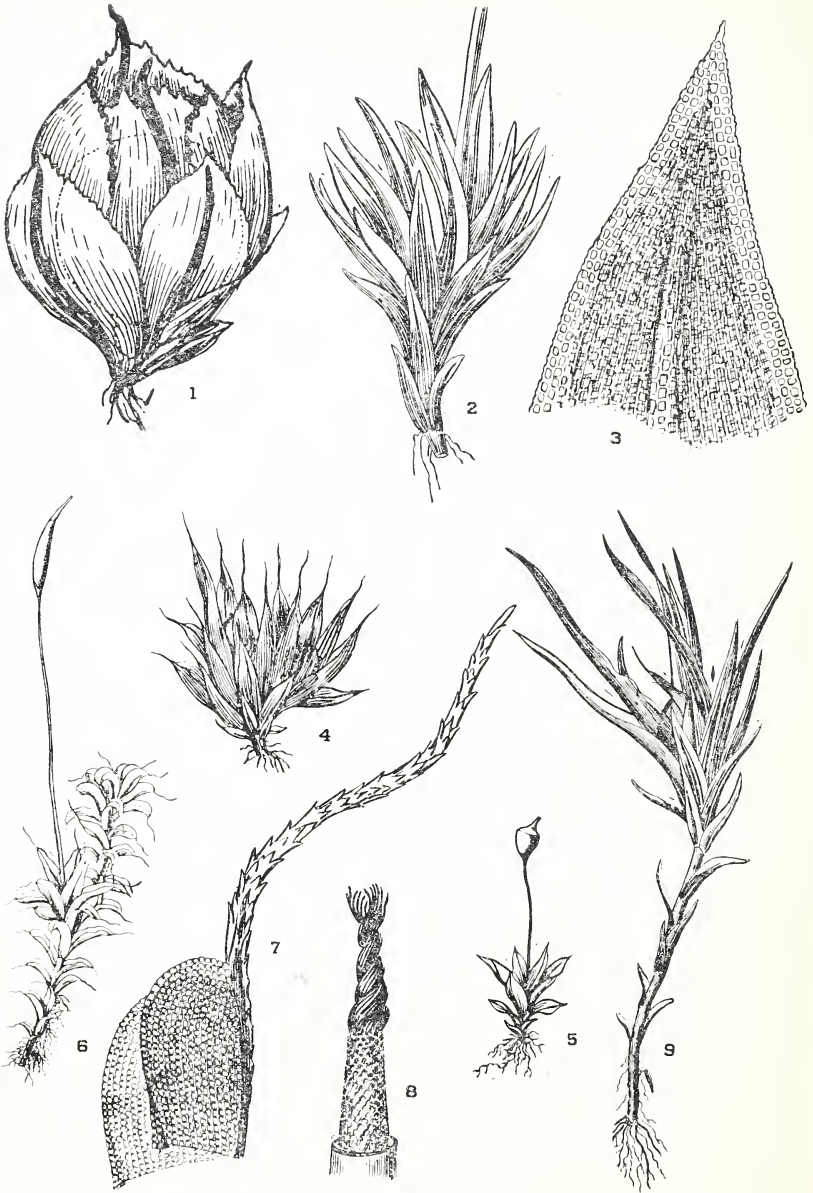
POTTIEAE

Acaulon

**A. rufescens** Jaeg.\* (Fig. 1.) Plants minute, up to 2 mm. high when mature, bulbiform, subglobose; leaves not papillose, lower minute, upper much larger, very concave, boat-shaped, enclosing the capsule, costa  $\pm$  percurrent to excurrent into a squarrose-recurved apiculus; capsule immersed,  $\pm$  spherical or with a minute apiculus; mature spores 40-50 $\mu$  in diameter, smooth, maturing in winter to early spring. On bare, moist soil; Putnam County.

Desmatodon

**D. Porteri** James. (Figs. 2, 3.) Plants small, gametophytes 1-3 mm. high; leaves up to 2 mm. long, oblong-lanceolate to ovate-lanceolate, acute; leaf margins entire, those of older leaves with evident border of 2-3 rows of lighter colored and less densely papillose cells; costa stout, almost percurrent; seta 7-10 mm. long; capsule cylindrical, urn about 2 mm. long; annulus persistent, large, and conspicuous; peristome papillose, teeth irregularly divided into two or three forks, these sometimes united; spores smooth, about 8 $\mu$  in diameter, mature in early spring. On limestone rocks; Decatur, Gibson, Jefferson, Jennings, Lawrence, Martin, Monroe, Owen, Parke, Perry, Putnam, Sullivan, and Warren Counties.



All figures (with the exception of Fig. 21, which is original), are copied, with permission, from A. J. Grout, *Mosses with Hand-lens and Microscope* (M.H.M.), and *Moss Flora of North America North of Mexico* (M.F.). (The figures in parentheses refer to these books.) *Acuulon rufescens* (M.F., pl. 91). Fig. 1. Gametophyte and sporophyte, x 25. *Desmatodon Porteri* (M.H.M., fig. 79). Fig. 2. Gametophyte, enlarged. Fig. 3. Apex of old leaf, showing characteristic border cells, enlarged. *Phascum cuspidatum*, var. *americanum* (M.H.M., Fig. 68,

## Phascum

*P. cuspidatum* [Schreb.] Hedw.\* var. *americanum* Ren. & Card.\* (Fig. 4.) Gametophytes usually 1-2 mm. high; upper leaves ovate to oblong-lanceolate, acuminate, keeled, about 2 mm. long, upper cells hexagonal, rhomboidal, or subquadrate, finely papillose; costa long excurrent; capsules ovoid-globose, about 1 mm. long, immersed or nearly so, cleistocarpous; spores 24-35 $\mu$  in diameter, mature in spring. On bare soil of banks, old fields, and pastures; Delaware and Putnam Counties.

## Pottia

*P. truncatà* (Hedw.) Fùrnrohr. (Fig. 5.) Gametophytes usually 3-5 mm. high, sometimes up to 10 mm.; upper leaves lanceolate to spatulate, 1-2.5 mm. long, acuminate to acute; upper leaf cells smooth to very slightly papillose on lower surface; costa strong, yellowish to reddish brown, commonly excurrent into a smooth, stout, yellowish to brown awn; urn gymnostomous, obovate with operculum attached, truncate and wide-mouthed after operculum falls, up to 1 mm. long and 0.8 mm. in diameter, neck short and  $\pm$  indistinct, annulus persistent; seta 2-6.5 mm. long, reddish-yellow; spores reddish-brown to brown, finely papillose, 23-30 $\mu$  in diameter, mature from late autumn to spring. On moist soil in grasslands and along streams, and on stone walls; Monroe, Putnam, and \*Tippecanoe Counties.

## Tortula

*T. ruralis* (Hedw.) Smith.\* (Figs. 6-8.) Plants 2-8 cm. high; leaves  $\pm$  twisted when dry and squarrose-recurved when moist, 3-7 mm. long including awn, obtuse, truncate, or emarginate at apex, keeled; costa red or brown, densely spinose-papillose on the back, excurrent into a long (1-3 mm.), serrate awn; upper leaf cells densely papillose; seta red, 1-3 cm. long; capsule long-cylindric, urn 3-5 mm. long; annulus persistent; peristome with a checkerboard-like basal tube, teeth papillose, twisted at least twice; spores brownish, slightly granulose, 10-14 $\mu$  in diameter, maturing in spring. On soil and rock, frequently calcareous substrata; Porter County.

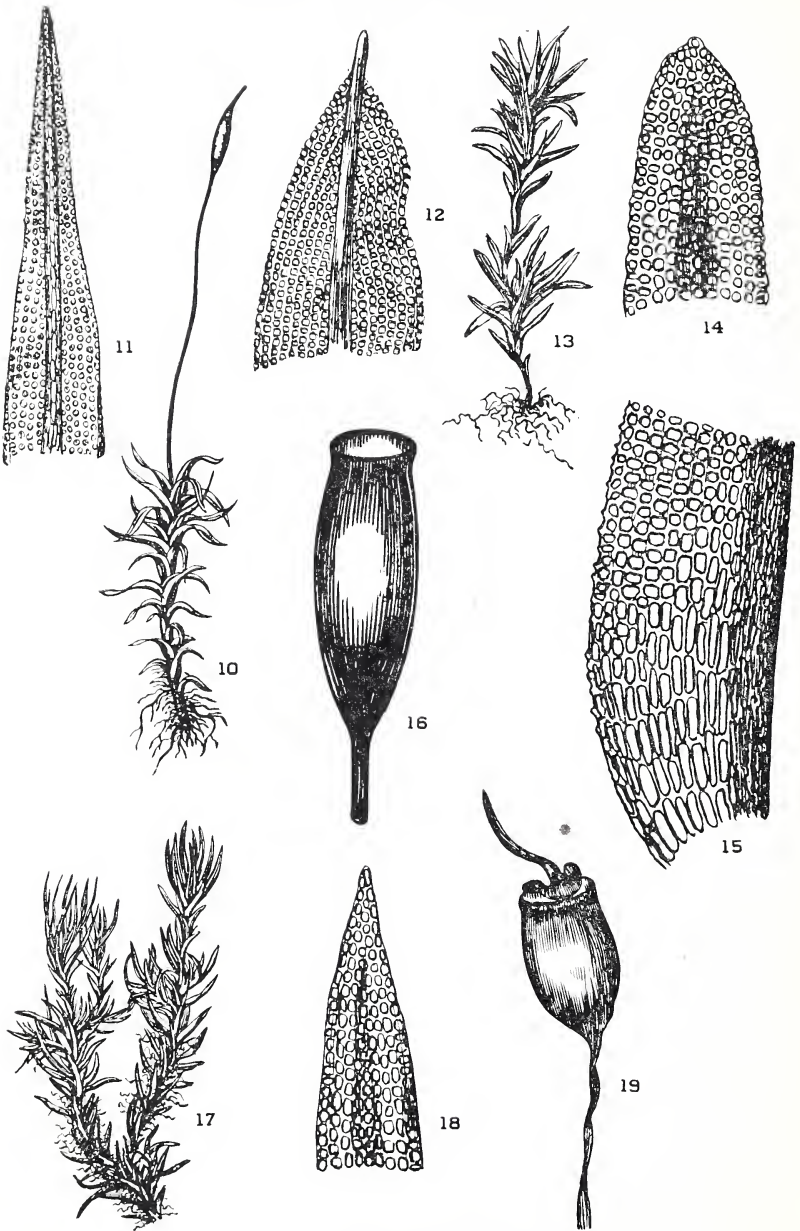
## TRICHOSTOMEAE

## Astomum

*A. Muhlenbergianum* (Sw.) Grout.\* (Fig. 9.) Plants approximately 5 mm. high; leaves strongly crisped when dry, spreading when moist, larger ones up to 3 mm. long, strongly involute to subtubular above; costa strong, excurrent into a short mucro; upper leaf cells quadrate or

as var. *piliferum*). Fig. 4. Gametophyte and sporophytes, enlarged. *Pottia truncatà* (M.H.M., pl. 33). Fig. 5. Gametophyte and sporophyte, enlarged. *Tortula ruralis* (M.H.M., pl. 35). Fig. 6. Gametophyte and sporophyte, enlarged. Fig. 7. Apex of leaf and serrate excurrent costa, enlarged. Fig. 8. Tessellate peristome, enlarged. *Astomum Muhlenbergianum* (M.F., pl. 77). Fig. 9. Gametophyte and sporophyte, enlarged.





*Barbula fallax* (M.H.M., pl. 29). Fig. 10. Gametophyte and sporophyte, enlarged. Fig. 11. Leaf apex, enlarged. *Barbula unguiculata* (M.H.M., Fig. 72). Fig. 12. Leaf apex, enlarged. *Gymnostomum calcareum* (M.H.M., pl. 26). Fig. 13. Gametophyte, enlarged. Fig. 14. Leaf apex, enlarged. Fig. 15. Portion of leaf base, showing rectangular cells along midrib, enlarged. Fig. 16. Urn, enlarged. *Gymnostomum recurvirostrum* (M.H.M., pl. 24). Fig. 17. Gametophyte, enlarged. Fig. 18. Leaf apex, enlarged. Fig. 19. Capsule, enlarged.

hexagonal, densely papillose; seta much shorter than the capsule; capsule elongate-spherical, about 0.4 mm. in diameter, apiculate; spores 20-30 $\mu$  in diameter, strongly papillose, mature in early spring. On soil in old fields and in moist grassy spots; Putnam County.

### Barbula

1. Leaves  $\pm$  obtuse at apex, costa usually excurrent as a pellucid mucro  
 ..... *B. unguiculata*  
 Leaves  $\pm$  acute at apex, costa disappearing in apex, never mucronate *B. fallax*

**B. Fallax** Hedw. (Figs. 10, 11.) Plants 1-3 cm. high; leaves appressed, closely imbricated and slightly twisted when dry, wide-spreading to recurved when moist, lanceolate, 1.5-2.5 mm. long, gradually tapering to a  $\pm$  acute apex, keeled; margins revolute to above the middle; costa strong, disappearing in the apex; upper leaf cells obscure, densely papillose; seta red, 1-1.5 cm. long; capsule elongate-ovoid to subcylindric; peristome long and much twisted; spores smooth, mature from late autumn to early spring. On moist bare soil, rocks, and walls, frequently on calcareous substrata; Monroe and \*Wayne Counties.

**B. unguiculata** Hedw. (Fig. 12.) Plants usually less than 2 cm. high; leaves appressed and variously contorted when dry, erect-spreading and recurved to  $\pm$  squarrose when moist, oblong to tongue-shaped, apex generally obtuse; costa strong, very papillose on the back, excurrent as a short, yellow mucro; margins recurved in lower half, plane above; upper leaf cells quadrate or rounded, densely papillose, obscure; seta 0.5-2.5 cm. long, deep red; capsule cylindric; the 16 peristome teeth papillose, twisted in at least two complete spiral turns, divided into 32 filiform divisions, spores  $\pm$  smooth, 9-12 $\mu$  in diameter, mature from winter to early spring. On moist soil in fields, old paths, roadside banks, stones, and walls, frequently on calcareous substrata; Cass, Decatur, Henry, Jasper, Jefferson, Jennings, Knox, Lake, Lawrence, Marion, Martin, Monroe, Parke, Perry, Posey, Putnam, Sullivan, Tippecanoe, Warren, and \*Wayne Counties.

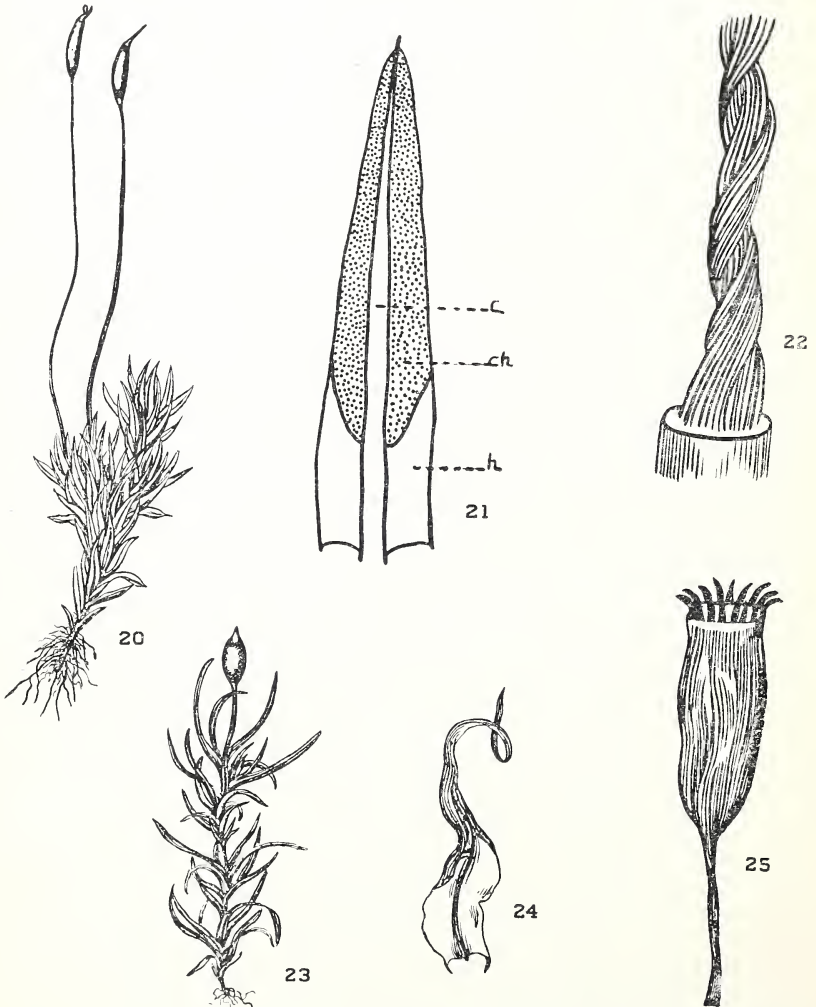
### Gymnostomum

1. Gametophytes up to 10 mm. high; leaf margins plane; upper leaf cells densely papillose and obscure; basal cells smooth, pellucid, those near the costa rectangular, others  $\pm$  quadrate; seta 3-5 mm. long; spores 8-10 $\mu$  in diameter. .... *G. calcareum*  
 Gametophytes up to 10 cm. in length but usually shorter; leaves keeled, with one or both margins recurved below; upper leaf cells distinct; basal cells elongate-rectangular; seta 8-10 mm. long; spores 15-22 $\mu$  in diameter. .... *G. recurvirostrum*

**G. calcareum** Nees & Hornsch. (Figs. 13-16.) Gametophytes 1-10 mm. high; leaves  $\pm$  contorted and appressed when dry, scarcely crisped, about 1 mm. long, usually lanceolate with  $\pm$  acute apices; upper leaf cells densely papillose and obscure; basal cells  $\pm$  quadrate except those near the costa rectangular, smooth, and pellucid; costa strong, disappearing below apex; seta 3-5 mm. long; capsule oblong, obovoid, or cylindric, usually  $\pm$  narrowed at mouth when dry and empty; peristome and

annulus lacking; spores 8-10 $\mu$  in diameter, mature in summer. On moist rocks  $\pm$  calcareous; Jefferson, Jennings, Lawrence, Madison, Martin, Montgomery, Owen, Parke, Putnam, Sullivan, and Washington Counties.

*G. recurvirostrum* Hedw. (Figs. 17-19.) Plants in soft, thick sods, bright-green to yellowish-green above, darker and reddish below, up to 10 cm. in length but usually shorter; leaves only slightly contorted when dry,



*Tortella caespitosa* (M.H.M., pl. 32). Fig. 20. Gametophyte and sporophytes, enlarged. Fig. 21. Diagram of leaf to show V-shaped area of hyaline cells, *c*, costa, *ch*, chlorophyllose cells, and *h*, hyaline cells. Fig. 22. Peristome, enlarged. *Weisia viridula* (M.H.M., pl. 23). Fig. 23. Gametophyte and sporophyte, enlarged. Fig. 24. Leaf, showing strongly involute margins, enlarged. Fig. 25. Urn and peristome, enlarged.

erect to erect-spreading when moist, 1-1.5 mm. long, lanceolate, keeled, acute at apex; one or both margins recurved below; upper leaf cells distinct, rounded,  $\pm$  quadrate, or rectangular; costa strong, disappearing below apex; seta 8-10 mm. long; capsule dark red-brown, ovoid to  $\pm$  spherical, about 1 mm. long, widest at mouth when dry and empty; peristome lacking; operculum remains attached to columella after dehiscence; spores 15-22 $\mu$  in diameter; mature in late summer to autumn. On moist cliffs, especially those  $\pm$  calcareous; Fountain, Jefferson, Jennings, Lawrence, Montgomery, Cwen, Parke, Putnam, Sullivan, Washington, and \*Wayne Counties.

### Tortella

*T. caespitosa* (Schwaegr.) Limpr. (Figs. 20-22.) Gametophytes up to 1.3 cm. high; leaves crisped when dry,  $\pm$  spreading when moist,  $\pm$  lanceolate, acuminate to  $\pm$  mucronate at apex, 1.5-4.5 mm. long; costa yellow, usually excurrent in a mucro; upper leaf cells quadrate, papillose, lower leaf cells rectangular, hyaline, extending obliquely higher up the margin than at the costa, terminating in a V-shaped line; seta red at base to pale yellow-green above, about 1.5 cm. long; capsule cylindrical, 1.5-2.5 mm. long; peristome teeth 32, papillose, filiform, twisted two or three times; spores greenish, translucent,  $\pm$  smooth, 7-11 $\mu$  in diameter, mature in spring. In woods, on rock, base of tree trunks, decaying wood, and soil; Cass, Clark, Crawford, Dubois, Harrison, Jackson, Jasper, Jefferson, Jennings, Lake, Lawrence, Madison, Martin, Monroe, Montgomery, Owen, Parke, Perry, Porter, Posey, Putnam, \*Scott, Spencer, Steuben, Washington, and \*Wayne Counties.

### Weisia

*W. viridula* Hedw. (Figs. 23-25.) Gametophytes bright-green to yellowish-green, up to about 5 mm. in height; leaves crispate when dry, erect-spreading when moist, upper about 3 mm. long, lanceolate, acute to acuminate; margins strongly involute above, often plane near the base; costa strong, excurrent into a sharp,  $\pm$  hyaline point; upper leaf cells round to hexagonal, papillose, obscure; seta yellow, 3-7 mm. long; capsule ovoid to oblong-cylindric, brown, often appearing varnished; peristome teeth papillose, short, consisting of 1-10 sections; spores 15-19 $\mu$  in diameter, rather coarsely papillose, mature in spring. On bare soil in fields, excavations, along roadsides, etc.; Carroll, Crawford, Floyd, Harrison, Henry, Jasper, Jefferson, Lake, Lawrence, Marion, Martin, Monroe, Noble, Owen, Parke, Perry, Porter, Putnam, Spencer, Warren, and \*Wayne Counties.