Studies in Indiana Bryophytes V

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The mosses used in this study are Indiana collections in herbaria in the following institutions: Indiana U., Butler U., DePauw U., U. of Illinois, Earlham College, Field Museum of Natural History, and the New York Botanical Garden.

The nomenclature is that of A. J. Grout, The Moss Flora of North America North of Mexico 2:67-89 and 145-180 (1935).

The asterisk preceding the name of a county indicates that the species has been collected in that locality according to published records but has not been studied by the author. The asterisk following the name of a species is an indication that, according to available literature, this is the first published record for Indiana.

The distribution range of each species has been extended by the author's collections which were made by the financial assistance of an Indiana Academy of Science research grant through the American Association for the Advancement of Science and by the aid of a research grant from the Graduate Council of DePauw University.

EPHEMERACEAE

Plants minutes, up to 2 mm. high, almost stemless, growing on moist, bare soil; protonema persistent and much branched; plants consist mainly of bud-like clusters of leaves and subglobose nearly sessile capsules; peristome none; spores large, globular to kidney-shaped, roughened; calyptra small and usually persistent.

1. Leaf margins slightly serrulate; capsule with rudimentary operculum ..... *Nanomitrium*
   Leaf margins spinose-serrate above; capsule without operculum, opening irregularly ..... *Ephemerum*

Ephemerum

E. serratum (Hedw.) Hampe.* (Figs. 1-2.) Leaves lanceolate, ecostate, upper margins spinose-serrate, up to 1.4 mm. long; calyptra reaching middle of capsule; capsules glossy, reddish-brown, subglobose, short-apiculate, without operculum, cleistocarpous, with stomata; spores 50-70μ in diameter, warty, maturing from winter to spring. Putnam County.

E. crassinervium Hampe, collected by J. P. Naylor in Putnam County, was reported by T. G. Yuncker in Proc. Ind. Acad. Sci. **30**:234. 1920. I determine the plants to be *E. serratum.*

Nanomitrium

N. Austinii (Sull.) Lindb.* (Figs. 3-4.) Leaves ligulate-lanceolate, ecostate, slightly serrulate, up to 1 mm. long; calyptra minute; capsules

without stomata, operculum rudimentary; spores 24-30μ in diameter, finely roughened, maturing from late autumn to early spring. Putnam County.

FUNARIACEAE

Plants usually annual, growing on soil which is bare or only sparsely covered with other plants; upper leaves commonly closely clustered and erect to erect-spreading; costa strong; leaf cells parenchymatous.

1. Capsules immersed ..... *Aphanorhegma*
   Capsules not immersed 2
2. Capsules strongly unsymmetric and curved; peristome double .... (Cord Moss) *Funaria* .. 3
   Capsules symmetric, erect and urn-shaped; peristome lacking .... (Urn Moss) *Physcomitrium*
3. Leaves long acuminate; costa frequently excurrent; spores 20-25μ in diameter, finely roughened when mature ..... *Funaria flavicans*
   Leaves short acuminate; costa usually percurrent; spores 14-17μ in diameter, very smooth when mature ..... *Funaria hygrometrica*

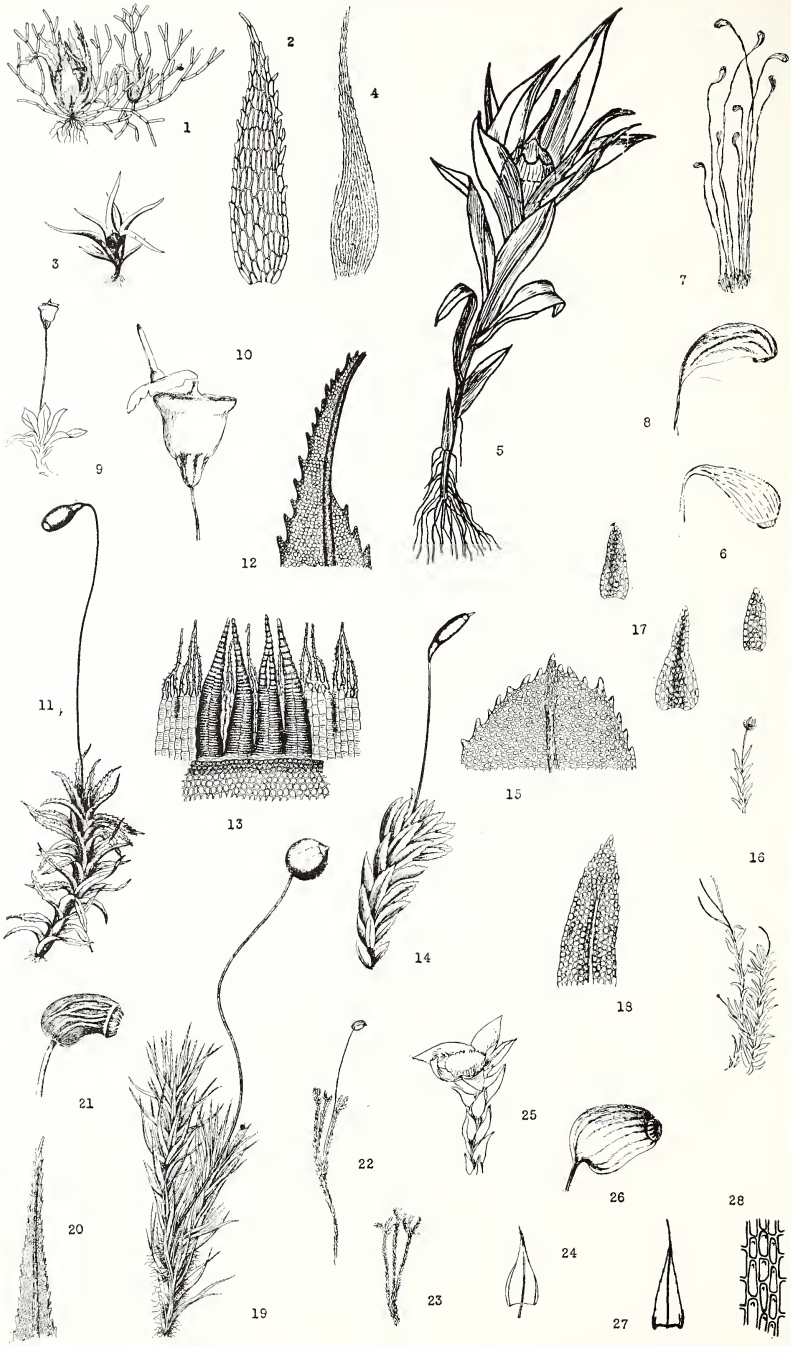
Aphanorhegma

A. serratum (Hook. & Wils.) Sull. (Fig. 5.) Plants up to 5 mm. high, growing on damp, clayey soil; upper leaves oblong-lanceolate to oblong-obovate, acute to acuminate, upper margins serrulate; costa ending in or just below the apex; capsule immersed, spherical, light brown when ripe, opening equatorially along a clearly marked line of dehiscence, wall cells distinctly collenchymatous; operculum half spherical, obtusely apiculate; calyptra campanulate-mitrate, 4-6 lobed, covering upper half of operculum; spores 22-30μ in diameter, papillose-spinose, mature in autumn. Monroe and Putnam Counties.

Funaria

F. flavicans Mx. (Fig. 6.) Plants similar in appearance to *F. hygrometrica*; upper leaves slenderly acuminate by excurrent costa; capsule globose-pyriform, urn is much less furrowed, mouth less oblique, and capsules shorter and less unsymmetric than in *F. hygrometrica*; spores 20-25μ in diameter, finely roughened, mature from spring to summer. Clark, Jefferson, Lake, Monroe, and Putnam Counties.

F. hygrometrica Hedw. (Figs. 7-8.) Plants loosely gregarious, light green, 3-10 mm. high; young upper leaves closely imbricated into a bulb-like tuft; costa stout, ending just below apex to very shortly excurrent; calyptra inflated-cucullate, rostrate; capsule subpyriform, urn very unsymmetric and arcuate, deeply sulcate when dry, mouth so oblique that it is often nearly parallel with the axis of the urn; spores 14-17μ in diameter, very smooth, mature from spring to summer. Carroll, Cass, Clark, Crawford, Dearborn, Delaware, Dubois, Elkhart, *Hamilton, Huntington, Jasper, Jefferson, Kosciusko, Lagrange, Lake, Lawrence, Madison, Marshall, Monroe, Montgomery, Newton, Noble, Parke, Porter, Putnam, Shelby, Steuben, Wayne, Wells, White, and Whitley Counties.



All figures (with the exception of 5, 27, and 28) are taken with permission from A. J. Grout, Mosses with Hand-lens and Microscope (M.H.M.). Fig. 5 is drawn from Sullivant, Icones Muscorum (Icon. Musc.), pl. 57. Figs. 27 and 28

Physcomitrium

P. turbinatum (Mx.) Brid. (Figs. 9-10.) Plants gregarious, up to 12 mm. high; leaves 3-5 mm. long, oblong-oblanceolate or obovate-lanceolate, acuminate, upper margins serrate; costa ending in or below the apex or occasionally very shortly excurrent; capsule when young and moist globose-pyriform, when dry and empty turbinate and constricted below mouth and spore sac; spores strongly papillose, 27-40μ in diameter, mature in spring. Carroll, Delaware, Elkhart, Hamilton, Hendricks, Henry, Jasper, Jefferson, Knox, Kosciusko, Lake, Lawrence, Madison, Marshall, Monroe, Noble, Owen, Parke, Perry, Porter, Posey, Pulaski, Putnam, Randolph, St. Joseph, Scott, Steuben, *Switzerland, Tippecanoe, Wayne, Wells, and Whitley Counties.

TIMMIACEAE

Plants large, tufted, growing on damp soil, in rock crevices, and at bases of trees; leaves lance-linear, sheathing, costate, toothed above, cells frequently papillose, almost isodiametric in blade, elongate in sheath.

Timmia

T. megapolitana Hedw. (Figs. 11-13.) Plants 3-5 cm. high; leaves lance-linear, crisped when dry, spreading when wet, canaliculate, 5-10 mm. long, 1.0-1.5 mm. wide, sheathing at base, gradually narrowed to apex, costa forming ridge on back of leaf, upper margin strongly serrate with teeth usually composed of several cells, upper leaf cells 10-14μ in diameter, smooth to slightly papillose, rounded and somewhat collenchymatous; dry capsule suberect to horizontal, 1 mm. in diameter, 2.0-3.5 mm. long; peristome double, outer of 16 teeth, inner of 64 cilia with long spinose appendages, at base attached to a high membrane, above commonly grouped in twos or fours; spores 12-18μ in diameter,

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are drawn from A. J. Grout, Moss Flora of North America north of Mexico **2**: pl. 69 G (M. Fl.). (The figures in parentheses refer to these books.) *Ephemerum serratum* (M.H.M., fig. 64), Fig. 1. Gametophyte and sporophyte, enlarged. Fig. 2. Leaf, enlarged. *Nanomitrium Austinii* (M.H.M., fig. 63). Fig. 3. Gametophyte and sporophyte, enlarged. Fig. 4. Leaf, enlarged. *Aphanorhegma serratum* (Icon. Musc. pl. 57, reduced ½). Fig. 5. Gametophyte and sporophyte, enlarged. *Funaria flavicans* (M.H.M., fig. 98). Fig. 6. Urn, about x 5.5. *Funaria hygrometrica* (M.H.M., fig. 97). Fig. 7. Gametophyte and sporophyte, x 1. Fig. 8. Urn, enlarged. *Physcomitrium turbinatum* (M.H.M., fig. 96). Fig. 9. Gametophyte and sporophyte, x 2. Fig. 10. Capsule and calptra, x 7.5 *Timmia megapolitana* (M.H.M., pl. 43). Fig. 11. Gametophyte and sporophyte, enlarged. Fig. 12. Leaf apex, enlarged. Fig. 13. Portion of peristome, enlarged. *Aulacomnium heterostichum* (M.H.M., fig. 100). Fig. 14. Gametophyte and sporophyte, enlarged. Fig. 15. Leaf apex, enlarged. *Aulacomnium palustre* (M.H.M., figs. 101 and 102). Fig. 16. Portion of gametophytes with pseudopodia, naked and with clusters of leaf-like brood bodies at summit, x 2. Fig. 17. Leaf-like brood bodies, enlarged. Fig. 18. Leaf apex, x 1.5. *Bartramia pomiformis* (M.H.M., pl. 44). Fig. 19. Gametophyte and sporophyte, enlarged. Fig. 20. Leaf apex, enlarged. Fig. 21. Mature urn, enlarged. *Philonotis fontana* (M.H.M., fig. 103). Fig. 22. Gametophyte and sporophyte, x 0.5. Fig. 23. Portion of gametophyte showing whorled innovations, x 0.5. Fig. 24. Leaf, x 5. Fig. 25. Male head, x 5. Fig. 26. Urn, x 5. *Philonotis marchica* (M. Fl. **2**: pl. 69 G). Fig. 27. Leaf, x 10. Fig. 28. Leaf cells, x 300.

smooth to slightly papillose, maturing in late spring *Montgomery and Lake Counties.

AULACOMNIACEAE

Plants in dense or loose tufts; leaves decurrent, costa strong, ending near apex; upper leaf cells thick walled, a single papilla on upper and lower surface; capsules strongly and regularly wrinkled when dry.

Aulacomnium

1. Plants growing on rich moist soil in woods, especially at base of trees; leaves dense, elongate-ovate, erect, not crisped when dry, commonly obtuse and apiculate, up to 3 mm. long, upper margins strongly serrate; plants not bearing gemmae; upper leaf cells rounded or ellipsoidal; spores slightly papillose, 9-12μ in diameter, mature in early summer ..... *A. heterostichum*

   Plants growing in swamps and wet shaded hollows; leaves long-lanceolate, crisped when dry, acute to slenderly acuminate, up to 4 mm. long, margins slightly to distinctly serrulate near apex, revolute below; upper leaf cells angular, sinuose-walled; pseudopodia up to 5 mm. long, naked or with minute ecostate leaf-like brood bodies in a cluster at upper end; spores smooth, 10-12μ in diameter, mature in early summer ..... (Ribbed Bog Moss) *A. palustre*

A. heterostichum (Hedw.) Br. & Sch. (Figs. 14-15.) Allen, Brown, Carroll, Clark, Crawford, Delaware, Fountain, Harrison, Jefferson, Knox, Lake, Lagrange, LaPorte, Lawrence, Monroe, Montgomery, Morgan, Owen, Parke, Perry, Porter, Posey, Putnam, Steuben, Warren, and Wayne Counties.

A. palustre (Web. & Mohr.) Schwaegr. (Figs. 16-18.) Allen, Cass, Delaware, Hamilton, Jasper, Jefferson, Kosciusko, Marshall, Lagrange, Lake, LaPorte, Noble, Parke, Perry, and Porter Counties.

BARTRAMIACEAE

Plants commonly in deep tufts, growing on soil or rocks in moist shaded places; leaves strongly costate to near the apex or long-excurrent, acute, margins usually serrate; capsules globose to ovoid, usually unsymmetric and without a neck, regularly plicate or deeply furrowed when dry; peristome double.

1. Stems frequently with a whorl of branches near the ends; leaves ovate-lanceolate to lanceolate-triangular; costa percurrent to shortly excurrent or spinulose-excurrent; cilia present in inner peristome ..... *Philonotis* .. 2

   Stems branched but not in whorls; leaves elongate-lanceolate to linear-lanceolate, canaliculate, frequently crisped when dry; costa excurrent to a terete, spinulose point; cilia of inner peristome rudimentary or lacking . (Apple Moss) *Bartramia pomiformis*

2. Leaves concave with one or two folds on either side of the costa; margins strongly revolute, doubly serrate; upper leaf cells not conspicuously parallel, papillose at lower end of cell, occasionally at both ends ..... *Philonotis fontana*

Leaves slightly concave with no apparent folds on either side of costa; margins plane or revolute, singly serrate; upper leaf cells parallel, papillose at upper ends ..... *Philonotis marchica*

Bartramia

B. pomiformis Hedw. (Figs. 19-21.) Allen, Brown, Clark, Crawford, Dubois, Fountain, Jasper, Jefferson, Lagrange, Lake, LaPorte, Lawrence, Martin, Monroe, Montgomery, Owen, Parke, Perry, Porter, Putnam, Steuben, Warren, Washington, and Wayne Counties.

Philonotis

P. fontana Brid. (Figs. 22-26.) Elkhart and Lagrange Counties.

P. marchica (Willd.) Brid. (Figs. 27-28.) Jefferson, Monroe, Putnam, and *Wayne Counties.

I consider the specimens of *P. Muhlenbergii* (Schw.) Brid., cited by T. G. Yuncker in Proc. Ind. Acad. Sci. **30**:236. 1920, to be *P. marchica* (Willd.) Brid.