Studies in Indiana Bryophytes XIII

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Eight additional species and varieties of mosses have been found to occur in Indiana since the publication of Studies in Indiana Bryophytes XII, Proc. Ind. Acad. Sci. **69**: 123-127. 1960, and Mosses of Indiana, in 1957.

With the two mentioned exceptions, specimens of the collections cited occur in the Herbarium of DePauw University.

The total number of known species of mosses in Indiana is presently 227, varieties 37, and forms 9, representing 97 genera and 27 families.

The author is indebted to the Graduate Council of DePauw University for a grant in aid of research.

Fissidentaceae

Fissidens obtusifolius Wils. var. *apiculatus* Grout (Fig. 1). Plants small, up to 1 cm. high, pale green or glaucous-green, leaves distichous, 4-12 pairs, oblong-lingulate to oblong, the upper about 1.4 x 0.35 mm., costa often percurrent into the apiculus, apices narrowly obtuse, usually apiculate, margins entire, occasionally flexuose, on margin of vaginant lamina of upper leaves a faint border of a few inconspicuous elongated cells occasionally present; cells of leaves generally smooth, irregularly rounded-hexagonal, hexagonal, rectangular, quadrate, median cells 6.8-10.2μ wide, 8.5-11.9μ long, 1-1.4:1.

Habitat: On moist St. Louis limestone.

Indiana distribution: Putnam County, Vermillion Falls, 6 mis. northwest of Greencastle. Aug. 23, 1958. Welch **17915**, as *F. ravenelii* Sull.; determined Aug. 4, 1960 by Howard Crum as *F. obtusifolius* var. *apiculatus*.

Encalyptaceae. Extinguisher Mosses

Plants 0.5-5 cm. high, in tufts; stems 3-5-angled; leaves crisped or not greatly changed when dry, spreading when moist, lingulate to spatulate, more or less concave, often cucullate, upper ½ or ⅔ opaque, densely papillose, apices broadly rounded to subacuminate, obtuse, acute, mucronate, or hair pointed, costa slightly to not at all excurrent, margins plane or revolute, entire or erose dentate by projecting papillae; upper median cells more or less isodiametric, quadrate, hexagonal, or irregular, slightly thickened, 8-30μ in diameter, lower cells rectangular to rhombic, basal cells larger, oblong, up to 90μ long, the longitudinal walls usually thin, end walls usually reddish, often thickened, smooth or with projecting end walls, occasionally basal cells strongly papillose, basal marginal cells linear, with thick walls; brood bodies present in many plants, in axils or on bases of leaves, reddish brown, usually oblong to filamentous, multiseptate; calyptra large, candle-extinguisher-like, covering capsule or nearly so, cylindric, long beaked, erose, lanceolate, or fringed at base;

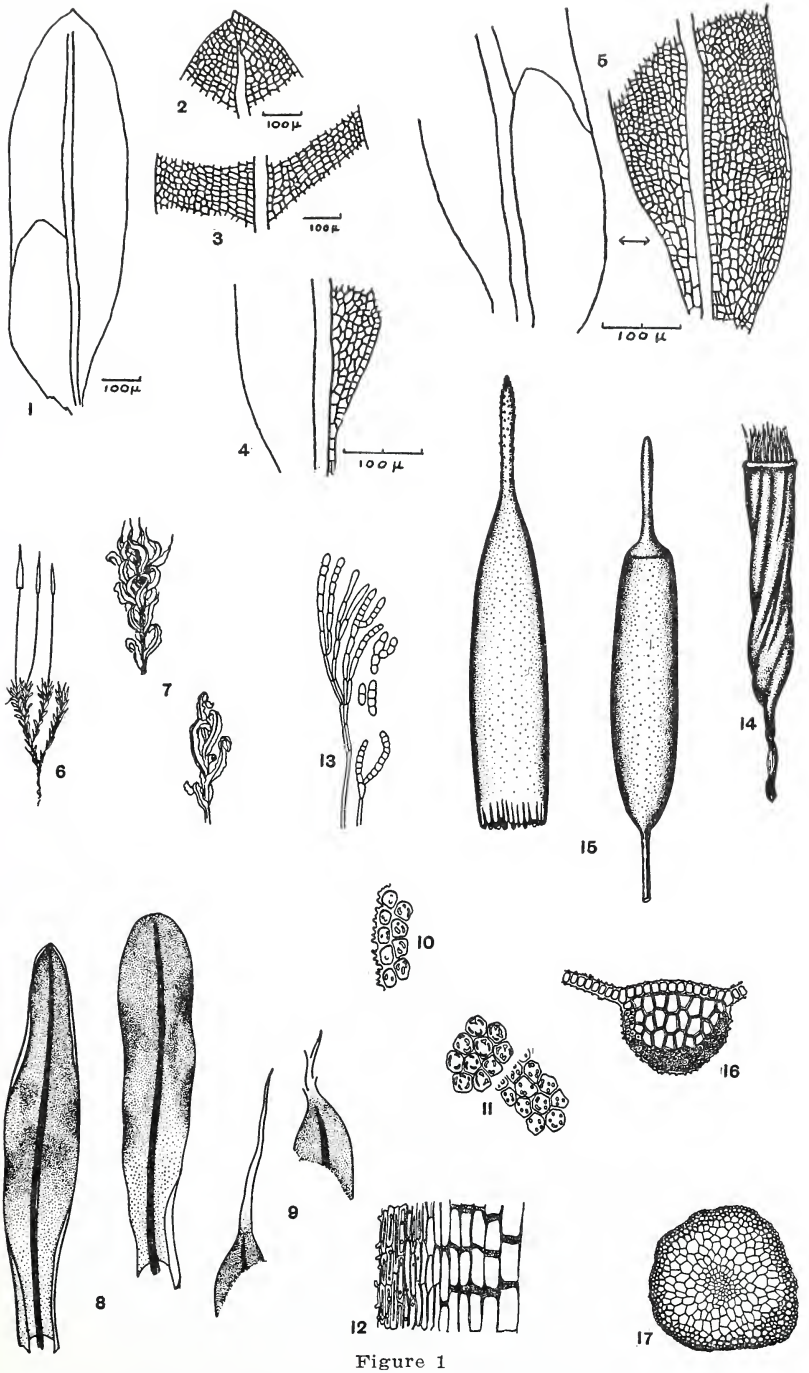

Figure 1

Figure 1. *Fissidens obtusifolius* var. *apiculatus* (drawn from Welch no. 17915). 1. Cauline leaf. 2-5. Apical, median, and basal leaf-cells, respectively. *Encalypta procera* (from Grout, MFNA **1**: *pl. 72*; all enlarged except habit). 6. Habit sketch. 7. Portion of plants, dry habit. 8. Leaves. 9. Leaf apices. 10. Upper marginal cells. 11. Upper median cells, with two types of papillae. 12. Basal cells, marginal and median. 13. Brood bodies. 14. Dry capsule. 15. Moist capsule and calyptra. 16. Cross section of costa. 17. Cross section of stem.

seta short, erect, 0.5-3 cm. long; capsules erect, cylindric, 2.5-5 mm. long, neck short, mouth bordered by 2 to many rows of colored, shorter, and thick-walled cells; annulus present; operculum long-beaked from a conical base; peristome none to 16 well-developed teeth; spores large.

Encalypta Schreb.

The only genus has the characteristics of the family.

Encalypta procera Bruch (Fig. 1). Plants in dense tufts, 1-5 cm. high; stems branched, reddish radiculose below, triangular in cross section; central strand distinct in most plants; leaves suberect to erect-spreading to recurved, subcrispate when dry or only slightly changed, ovate-oblong to spatulate, concave to almost flat, 4-5 mm. long, often clasping at base, costa stout, red with age, papillose throughout or partially smooth, percurrent or ending below apex; apices plane or cucullate, broadly rounded and obtuse or mucronate to long piliferous, hair usually hyaline, smooth or dentate; upper median cells of leaves quadrate, hexagonal, or irregular, often in rows, 14-20μ in diameter, papillae coarse, simple, forked, or lunate, marginal cells with projecting papillae, basal cells oblong, 16-22μ wide, 40-72μ long, hyaline, walls usually red, transverse walls heavily thickened, marginal basal cells linear, thick-walled, smooth or papillose, an area of basal cells extending obliquely up the margin, frequently forming a distinct contrast with green cells above; brood bodies frequently abundant, especially in sterile plants, arising as rhizoid-like outgrowths which branch dichotomously forming dense red clusters, the tips ultimately forming the 2- to 8-celled brood bodies; calyptra large, covering capsule, cylindric, beaked, 6-10 mm. long, base pale, fringed; seta 1.2 cm. long, red at base and at base of urn; capsules cylindric, red at mouth and base, 3.3-6 mm. long, often spirally furrowed when dry, mouth bordered by 2-3 rows of smaller quadrate, red cells, neck short; operculum long rostrate, often 2 mm. long, commonly falling with calyptra; annulus large, double; peristome teeth 16, red, papillose, narrowly lanceolate or linear, 1.2 mm. long, segments and cilia about the same length as the teeth or shorter; spores smooth to granular, 16-18μ in diameter.

Habitat: On wet or damp soil and in rock crevices.

Indiana distribution: Porter and Lake County line, on ground, Lake Michigan sand dune. April 4, 1948. Herbert Habeeb **1521.**[1]

Pottiaceae

Tortula papillosa Wils. (Fig. 2). Plants dark green, greenish brown or brownish when dry, usually in small dense tufts; stems short, commonly up to 5 mm., occasionally up to 10 mm. high; leaves incurved at apex and imbricated when dry, widely spreading when moist, broadly obovate or oblong to spatulate, up to 2 mm. long and 1 mm. wide, very concave, costa very conspicuous, thick, strongly spinose- to stellate-papillose on lower surface, bearing propagula or gemmae on upper

1. Howard Crum discovered this Indiana record in the Herbarium of the New York Botanical Garden and reported it to the author. The writer examined the collection in the Cryptogamic Herbarium of the Chicago Natural History Museum.

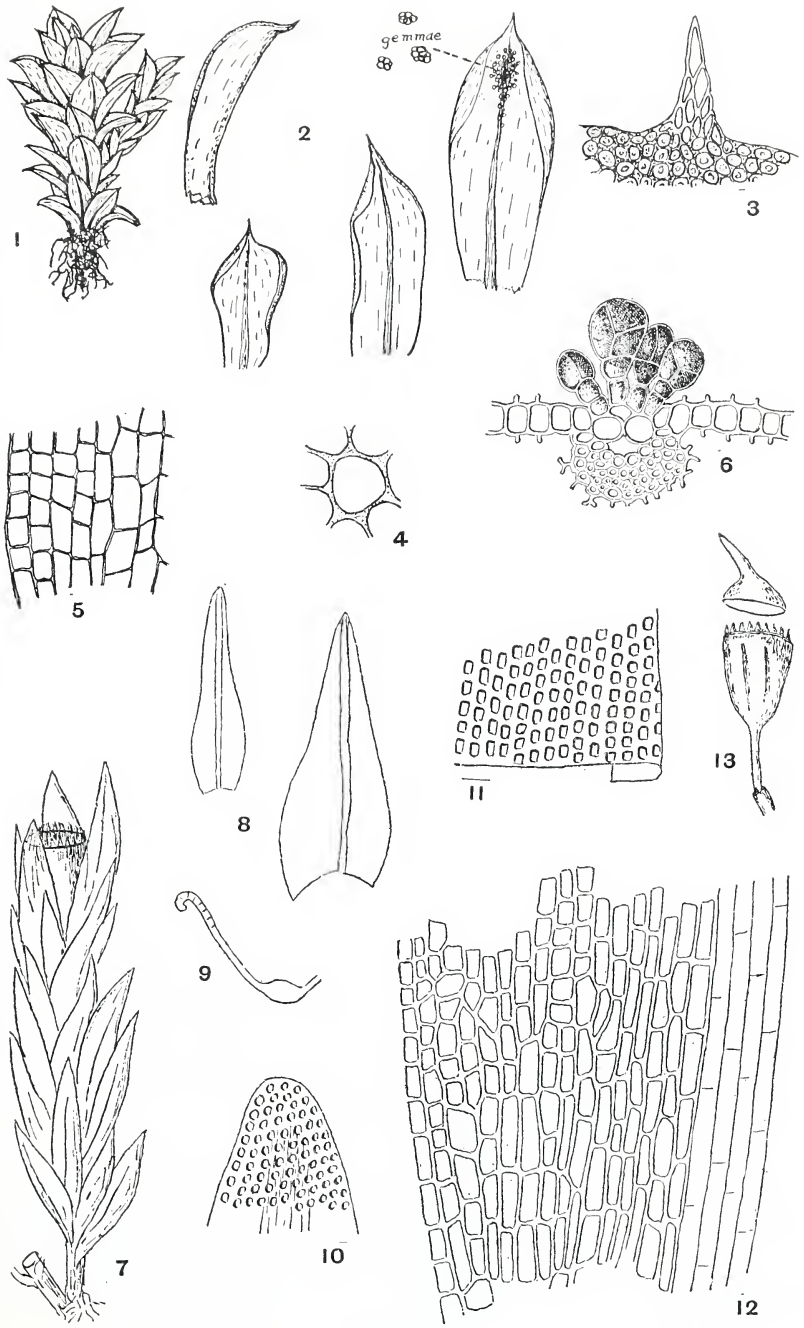

Figure 2

Figure 2. *Tortula papillosa* [1-5, enlarged, from Jennings, Man. Moss., *pl. 62*; 6, enlarged, from Grout, MHM, *fig. 79b* (after Limpricht)]. 1. Plant. 2. Cauline leaves. 3. Leaf apex. 4. Median cell. 5. Lower marginal cells. 6. Cross section of leaf through costa, showing papillae and brood bodies. *Grimmia apocarpa* var. *dupretii* (from Grout, MFNA **2:** *pl. 10* and from Thériot, Bryol. **10:** *pl. 8,* as *G. dupretii;* enlarged). 7. Plant. 8. Leaves. 9. Cross section of leaf, margin revolute. 10-12. Apical, median, and basal leaf-cells, respectively. 13. Urn and operculum, dry.

surface in upper part, especially in young leaves, excurrent into a mucro or short smooth hyaline awn, in cross section showing 2 median guide cells, approximately 4 large ventral cells, and a dorsal group of stereids; apices truncate, rounded, or retuse, obtuse or subacute; margins involute above when dry, plane or involute when moist, entire; upper leaf cells pellucid, rounded quadrate to polygonal, 20-25μ in diameter, more or less collenchymatous, smooth or nearly so on upper surface, papillose or spinose-papillose on lower surface, basal leaf cells rectangular, hyaline toward costa; propagula or gemmae suboval to oval, multicellular, composed of 2-5 clustered roundish green cells, bright or yellowish green, short pedicellate, very numerous on younger leaves, 50-80μ in diameter. According to W. C. Steere in Grout, MFNA 1: 239, 1939, the sporophyte is unknown in the northern hemisphere. H. N. Dixon, in The Students' Handbook of British Mosses, p. 205, 1924, states that the fruit has been found in Australia, only. G. O. K. Sainsbury, in A Handbook of the New Zealand Mosses, p. 184, 1955, states that the fruit is known only from Australia. On p. 184, Sainsbury includes with his description of *T. papillosa* the characteristics and measurements of the sporophytes of plants from Castlemaine, Victoria, Australia. Sainsbury, referring to Correns, Vermehrung der Laubmoose, adds the statement that the gemmae are produced not only from the nerve but also from some of the cells of the lamina.

Habitat: On trunks of living tree (elms, ash, willow), rarely on rock.

Indiana distribution: Randolph County, on bark of ash tree in the lawn of Robert Holliday, 6 miles north of Modoc or 3 miles south of Farmland, on Highway 1. June 16, 1962. Winona H. Welch **20221, 20222.** Collections are deposited in the Herbarium of DePauw University.

Grimmiaceae

Grimmia apocarpa Hedw. var. *dupretii* (Thér.) Sayre[2] (Fig. 2). Plants short, dark green, in dense tufts; stems up to 5 mm. long; leaves ovate-lanceolate or lanceolate, carinate, 1-1.3 mm. long, costa strong, narrow at base, wider above, percurrent, apices of upper leaves short-acuminate or acute, muticous throughout, margins revolute, entire, upper cells of leaves rounded quadrate, 6-8μ in diameter, walls hyaline; calyptra mitrate; seta 0.6 mm. long; capsule immersed, ellipsoid; spores smooth, 12-15μ in diameter, mature in summer.

Habitat: On various rocks.

Indiana distribution: Putnam County, Vermillion Falls, near Greencastle. Aug. 23, 1958. H. A. Miller **5598, 5604**; Hoosier Highlands. Aug. 24, 1958. H. A. Miller **5648.** Each of these collections is a mixture of *Grimmia apocarpa* var. *alpicola* and var. *dupretii*, as determined by Geneva Sayre, Aug. 20, 1960. Miller's collections are at Miami University.

Funariaceae

Pyramidula tetragona (Brid.) Brid. (Fig. 3). Plants small, cespitose; stems about 1 mm. high; upper leaves 1-1.5 mm. long, suberect,

2. Indiana distribution: Not known.

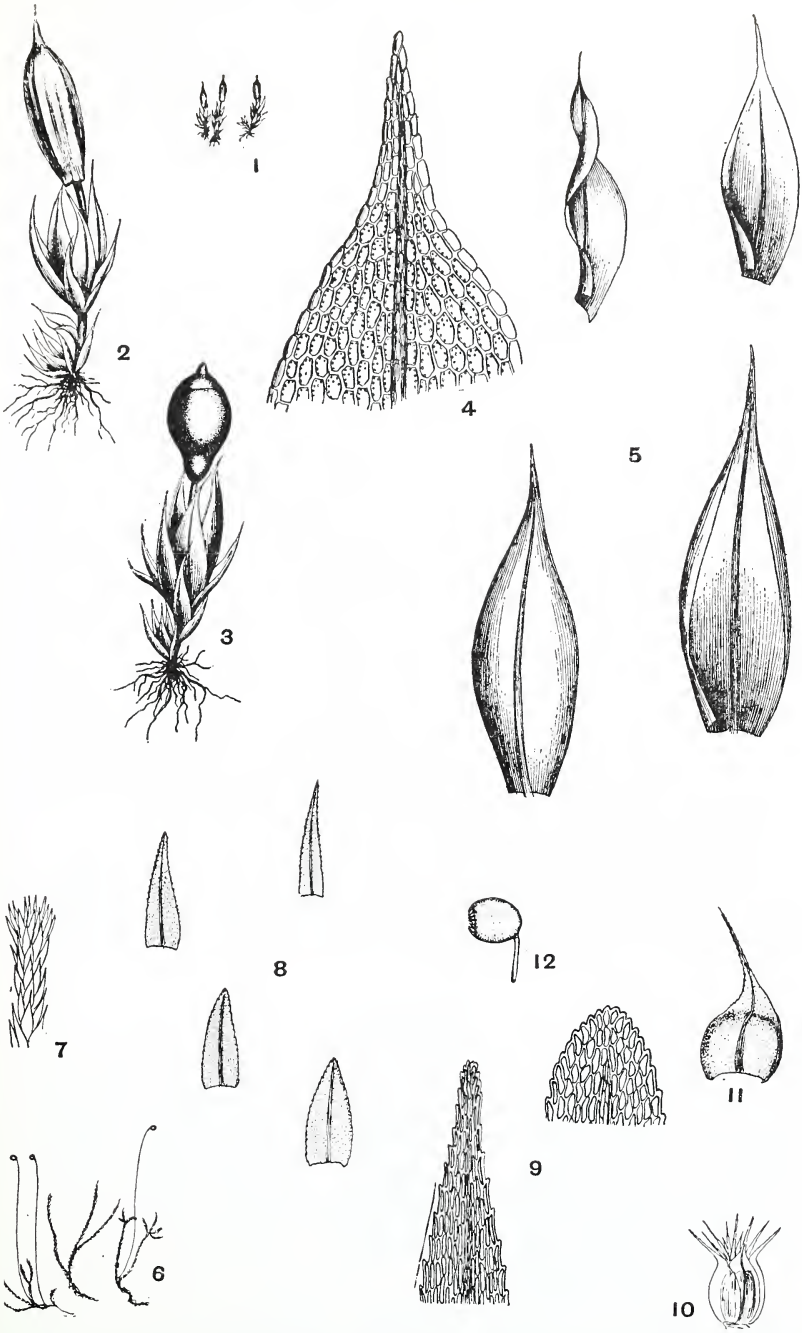

Figure 3

Figure 3. *Pyramidula tetragona* (from Grout, MFNA **2**: *pl. 28;* from Bry. Eur., *pl. 298*; all enlarged except 1 & 6, natural size). 1. Plants, with fruit. 2. Plant, showing 4-angled calyptra. 3. Gametophyte, bearing sporophyte. 4. Apical cells. 5. Leaves. *Philonotis gracillima* (from Grout, MFNA **2**: *pl. 67A*; enlarged). 6. Plants, with fruit. 7. Porton of foliated stem. 8. Leaves. 9. Apices of leaves. 10. Perigonium. 11. Perigonial leaf. 12. Urn, with peristome.

contorted when dry, ovate to oblong-ovate, rather abruptly long-acuminate, concave, costa ending in upper leaf or extending to near the tip of the slender acuminate apex, margins plane, entire; cells of leaves large, the lower about 18μ wide, 36-72μ long, the upper rhombic-hexagonal; calyptra large, 4-angled, split on one side, entirely covering the capsule; seta 1-2 mm. long; capsule erect, emergent or barely exserted, globose pyriform, about length of seta, mouth bordered by about 6 rows of transversely elongated cells; operculum small, mammillate-apiculate; peristome lacking; spores smooth, 45-70μ in diameter, maturing in early spring.

Habitat: On soil and on layer of soil on rock.

Bartramiaceae

Philonotis gracillima Ångstr. (Fig. 3.) Plants small, 1-1.5 cm. high, bright green, tomentose near base; stems not hooked at tips; branches irregularly arranged or in whorls; leaves erect-spreading to spreading, subtriangular, ovate-oblong, or oblong-lanceolate, 0.4-1 mm. long, apices obtuse, margins plane or slightly recurved, dentate, teeth blunt, costa ending below apex; upper cells linear-oblong or rhomboidal, faintly papillose on lower surface, papillae at upper end of cells, basal cells lax and subhyaline or hyaline; dioicous; perigonia gemmiform, often appearing lateral, subtended by 1-5 branches, bracts transparent, 1-1.2 mm. long, sheathing at broad base and abruptly slenderly acuminate at apex, costa narrow, very faint, antheridia and brownish paraphyses visible through bracts; seta 2 cm. long; capsule reddish brown, horizontal or nearly so, ovoid, furrowed upon drying, 1-1.5 mm. long, mouth small, suboblique; peristome complete, teeth lanceolate, acuminate, knobbed at tip; spores reniform, densely papillose, 20-26μ in diameter.

Habitat: On sandstone bluff.

Indiana distribution: Warren County, Little Pine Creek Gorge, near Bridge, about 13 miles southwest of Lafayette. Aug. 27, 1961. Robert R. Ireland, Jr. 5401. Collection deposited in The United States National Herbarium.

Hypnaceae

Isopterygium elegans (Hook.) Lindb. [*Plagiothecium elegans* (Hook.) Sull.] (Fig. 4.) Plants bright green to dark green, small, glossy, prostrate, in mats; stems 2-3 cm. long, irregularly branching, cortical cells small, thick-walled; branches up to 1 cm. long, sometimes flagellate at ends; foliated stems and branches complanate, appearing distichous; leaves commonly symmetric, oblong-ovate, oblong-lanceolate, or ovate-lanceolate, 1-1.5 mm. long, about 0.35 mm. wide, subconcave, narrowed from about midleaf into slender acumination, base rounded,

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3. Through an oversight, the author missed Grout's reference to the occurrence of this species in Indiana, Moss Flora of North America North of Mexico **2**: 73, 1935, during the preparation of Mosses of Indiana (1957). The writer's attention was called to this omission by Arthur Cridland. Attempts to locate Indiana specimens of this moss in the herbaria of The New York Botanical Garden, Chicago Natural History Museum, Duke University, Missouri Botanical Garden, and DePauw University have been unsuccessful.

Figure 4

Figure 4. *Isopterygium elegans* (from Grout, MHM, *fig. 195*; from Sullivant, Icones Muscorum, Supplement, *pl. 64*; f. from Conard, HKM, *fig. 229*; enlarged.). 2. Portion of foliated branch. 3. Cauline and branch leaves. 4. Apical and basal leaf-cells. 6-7. Perichaetial leaves. 9. Urn and peristome, dry. F. Urn and operculum. *Amblystegium compactum* (from Grout, MFNA **3:** *fig. 172;* from Cheney, in Bot. Gaz. **24:** *pl. 11, fig. 8*; enlarged.). 8a. Leaves. 8b, 8c, 8d, basal, median, and apical cells, respectively.

rather narrow, non-decurrent, costa double, with one fork longer, sometimes extending ⅓ length of leaf, apices frequently extending downwards, margins of blades plane, entire except in the more or less serrulate acumination; in axils of leaves of stems and branches frequent gemmiform branchlets with minute leaves; median cells of normal leaves linear-flexuose, 4-7 x 70-100μ, 20-30:1, alar cells scarcely differentiated from the shorter basal rows; dioicous; seta 12-20 mm. long; capsules inclined to pendent, nearly symmetric, ovoid to oblong-ovoid; urn about 1.5 mm. long; operculum conic-apiculate, obtuse; annulus of large deciduous cells; peristome perfect; spores mature in early spring.

Habitat: In moist shaded crevices of sandstone (non-calcareous rock) and on humus in similar situations.

Indiana distribution: Warren County, Little Pine Creek Gorge near High Bridge, about 13 miles southwest of Lafayette. Aug. 27, 1961. Robert R. Ireland, Jr., 5399. Collection is deposited in The United States National Herbarium.

Amblystegium compactum (C. Müll.) Aust. [Originally, *Hypnum compactum* C. Müll.; in Index Muscorum (1959), *Rhynchostegiella compacta* (C. Müll.) Loesk.] (Fig. 4.) Plants very small, usually in deep tufts, up to 2.5 cm. deep, pale green, yellowish within dense tufts, brittle when dry; stems irregularly branching, radiculose, some radicles minutely scabrous; leaves erect to erect-spreading, often slightly secund, ovate-lanceolate, gradually narrowed to slender acumination, narrowly decurrent, the cauline 0.75-1 mm. long, margins plane, usually finely and sharply denticulate throughout, basal teeth often recurved, frequently double by projecting outer walls of two adjacent cells at their common wall, costa 30-37.5μ wide at base, gradually narrowing into apex, subpercurrent to percurrent, frequently with radicle-like structures or delicate jointed brood-filaments from lower surface or from apex; branch leaves smaller, lanceolate; median leaf cells linear-rhomboidal, 40-60μ long, 4-10:1, alar cells not inflated; usually autoicous; calyptra short, covering operculum; seta 1-3 cm. long; capsule suberect to erect, clavate-oblong, symmetric or nearly so, 1.5-3 mm. long; operculum conic-apiculate; annulus present; peristome complete or incomplete, with cilia short or lacking; spores apparently mature in spring.

Habitat: On moist or wet decayed wood, bases of trees, and rock, especially calcareous stone.

Indiana distribution: Warren County, Little Pine Creek Gorge, near waterfall, at High Bridge, about 13 miles southwest of Lafayette. Aug. 27, 1961. Howard Crum 11658. The collection is in the Herbarium of the National Museum of Canada.