

OHIO MOSSES, POLYTRICHIALES*

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Among the students of Ohio mosses, most of whose work was done a number of years ago, may be mentioned William S. Sullivant, Leo Lesquereux, H. C. Beardslee, W. C. Werner, A. P. Morgan, Miss H. J. Biddlecome, W. A. Kellerman and Edo Claassen. The last named has made a rather extensive study of the mosses of northern Ohio. About 250 species of mosses have heretofore been reported from Ohio and there may be many more not yet reported. This is exclusive of the Sphagnums. Otto E. Jennings has made an extensive study of the mosses of western Pennsylvania and his work is of great value in a study of the Ohio mosses, as many of the species listed in his publications are found also in Ohio. So far as the writer knows, no special or complete study of the Ohio mosses has been made. The present paper is a preliminary study of the order Polytrichiales. The nomenclature used agrees with the law of priority and where characteristics could not be verified from the specimens themselves, only those have been used which are noted by all authors as being fixed. For identification both the gametophyte and the sporophyte have been used as the keys have been constructed so that identification could be made with the use of only a hand lens. To make the identification from the gametophytes alone sections and a compound microscope would be necessary. The distribution indicated for each species is based on specimens in the Ohio State Herbarium unless otherwise indicated.

At the suggestion of Professor John H. Schaffner, under whom this work was carried on, the terms perigonium and perigonial scales are used for both the archegonial and antheridial branches.

POLYTRICHIALES.

Mostly unisexual mosses, acrocarpous, ours mostly little or not at all branched, rising either directly from the protomecium or from a subterranean rhizome-like stalk. Sporangium with a definite columella.

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Peristome teeth solid, single, or double, or rarely absent. Always present in our species. Teeth are developed from two layers of the sporangium, and consist of entire cells; not transversely barred; or if developed from the thickened parts of the cell walls, then the sporangium is decidedly dorsiventral.

Synopsis of the Order.

- I. Peristome of 4-6 teeth; sporangium erect, actinomorphic; small mosses. (Tetraphidaceæ). *Tetraphis*. (1) *pellucida*.
- II. Peristome of numerous teeth; sporangium actinomorphic or zygomorphic.
 - A. Sporangium actinomorphic; gametophytes large. (Polytrichaceæ).
 1. Calyptra smooth. *Catharinaea* (2) *crispa*, (3) *angustata*, (4) *papillosa*, (5) *plurilamellata*, (6) *undulata*.
 2. Calyptra hairy.
 - a. Sporangium cylindrical. *Pogonatum*. (7) *pennsylvanicum*.
 - b. Sporangium angled. *Polytrichum*. (8) *ohioensis*, (9) *gracile*, (10) *commune*, (11) *juniperinum*, (12) *alpestre*, (13) *piliferum*.
 - B. Sporangium zygomorphic, gametophytes small. (Buxbaumiaceæ).
 1. Sporangium only slightly zygomorphic, nearly sessile; scales present. *Diphyscum*. (14) *foliosum*.
 2. Sporangium decidedly flattened and dorsiventrally differentiated; with a short seta; scales disappearing entirely. *Buxbaumia*. (15) *aphylla*.

Key to the Families of Polytrichales.

1. Peristome teeth 4-6, sporangium actinomorphic; small mosses. Tetraphidaceæ.
1. Peristome teeth 32-64, sporangium actinomorphic or zygomorphic. 2.
2. Sporangium actinomorphic; large mosses. Polytrichaceæ.
2. Sporangium zygomorphic; gametophyte very small. Buxbaumiaceæ.

TETRAPHIDACEÆ.

Gametophytes small and gregarious, forming dense mats. Scales ovate or lanceolate, smooth, margins entire, costa extending nearly to the tip. Peristome of four solid teeth formed from all the tissue enclosed within the operculum. Sporangium cylindrical, smooth, erect; hypophysis tapering, no stomata.

1. *Tetraphis* Hedw. (Georgia Ehrh.)

Gametophytes slender, brownish, branched, stalks 3-angled, gemmæ borne at tip of branches in a cup formed of four or five broad scales.

1. *Tetraphis pellucida* (L.) Hedw. (*Georgia pellucida* Rabenhorst). Gametophytes forming yellowish-green tufts, brownish below, one-half to one inch tall, branches of two kinds, those bearing stalked gemmæ and the fertile branches which occasionally bear two sporophytes. Seta straight, slender, brown, one-half to three-fourths inch long; sporangium slender, erect; calyptra covering the upper one-third. Spores mature in late summer, but the capsules persist through the winter. Found on decaying wood, or in swamps on soil rich in organic matter.

This is the only common moss having the 4 peristome teeth. Specimens from Fairfield, Champaign, and Lawrence Counties. Reported from Cuyahoga, Portage, and Summit.

POLYTRICHACEAE.

Large mosses growing mostly on the soil, cespitose; branches simple or branched, from a rhizome. Upper scales large, clasping, lanceolate or ligulate, with the ventral surface bearing few to numerous lamellæ one cell in thickness and several cells high. Lower scales much smaller and not lamellate. Antheridia borne in a large discoid cup at the tip of a branch which may later renew its growth. Seta long; sporangium erect, later becoming inclined or pendulous. Peristome teeth numerous, short, attached by their tips to the expanded top of the columnella. Calyptra cucullate.

- 1. Calyptra smooth.....Catharinea.
- 1. Calyptra hairy. 2.
- 2. Sporangium cylindrical.....Pogonatum.
- 2. Sporangium 4-6 angled.....Polytrichum.

1. *Catharinea* Ehrh. (*Atrichum* Beauv.)

Scales crisped when dry, margins serrate, not sheathing the stalk. Sporangium smooth, cylindrical or oval, more or less curved. Calyptra without hairs, but is spinulose-papillose at the apex. Operculum long-beaked. Peristome teeth 32, with a rust-colored median line.

- 1. Scales oval-oblong; lamellæ 1-4, low and indistinct; sporangia obconical, C. crispa.
- 1. Scales ligulate. 2.
- 2. Sporangia strongly arcuate, cylindrical.....C. undulata.
- 2. Sporangia inclined, oblong.....C. angustata.

1. *Catharinea crispa* James. (*Atrichum crispum* Sull.). Gametophytes form yellowish-green tufts; stalks unbranched, 2-4 inches high; scales distant, oval-oblong or oblong-lanceolate, lamellæ 1-4, low, vanishing toward base of scale, scarcely undulate; lower scales smaller and broader. Often two or three sporophytes grow together. Sporangia only slightly curved, obconical.

Rare. Found in beds and on sides of rocky streams, in sand or among grass. Clinton County.

2. *Catharinea undulata* (L.) Weber and Mohr. (*Bryum undulatum* L., *Atrichum undulatum* Beauv.). Gametophytes in loose, dark green patches, yellowish when in open dry spots. Stalks simple or branched from a much branched rhizome, 1-2 inches tall. Scales very small below, gradually larger above; upper ones ligulate, strongly undulate; lamellæ 2-6, covering one-eighth to one-fourth of the width of the upper part of scale. Sporophytes often two or more from one perigonium; seta reddish-brown, 1-1¼ in. long; sporangium strongly arcuate, cylindrical.

A common moss on shady clay or sandy banks.

3. *Catharinea angustata* (Bridel.) Bridel. (*Polytrichum angustatum* Schw., *Atrichum angustatum*, B. & S.). Loosely cespitose, dull green, one-third to one inch tall. Scales linear-lanceolate, lamellæ and costa

occupying more than one-fourth width of scale; lower scales minute. Seta erect, brown; sporangium brown, linear, cylindrical, slightly curved. On shady banks, often under hemlocks.

Rather general in Ohio.

Jennings has described two new species found in Western Pennsylvania and these are probably found in Ohio. They vary from *C. angustata* only in the number and height of the lamellæ and may be forms of *C. angustata*. They are distinguished as follows:

- C. angustata*—Lamellæ 5-8, 6-8 cells high, covering one-fourth to one-half of upper scale width.
- C. papillōsa* Jenn.—Lamellæ 6-8, 8-14 cells high, covering one-half to two-thirds of upper scale width.
- C. plurilamellata* Jenn.—Lamellæ 7-12, 8-14 cells high, covering two-thirds to three-fifths of upper scale width.

2. *Pogonatum* Beauv.

Gametophytes gregarious, erect, upper scales somewhat clasping. Sporangium erect, cylindrical, without stomata, hypophysis tapering. Calyptra mitrate, densely hirsute and somewhat shaggy, hairs covering the entire sporangium. Peristome teeth, 32.

1. *Pogonatum pennsylvanicum* (Hedw.) Paris. (*Polytrichum pennsylvanicum* Hedw., *Pogonatum brevicaulis* Beauv., *Pogonatum tenue* F. G. Briton, *Polytrichum tenue* Menzies). Gametophytes scattered on a green felt-like protonema, very short, less than one-eighth inch. Scales acuminate, serrulate, lamellate. Seta yellowish or reddish; Calyptra light yellow; operculum beaked. On shady clay banks. Fruits in late autumn.

Specimens from Franklin and Lawrence Counties, and Claassen reports it from Cuyahoga and Lake.

3. *Polytrichum* Dill. Haircap Mosses.

The largest of our mosses, tufted, stiff, green or bluish-green. Scales not sheathing, lamellæ and costa occupying the greater part of the outer part of scales; costa often extending in an awn. Sporangium 4-6-angled, cubic to oblong. Calyptra covered with dense shaggy hairs which extend below base of capsule. Generally 64 peristome teeth.

- 1. Margins of scales broad, entire, and inflexed. 3.
- 1. Margins of scales serrate, not inflexed. 2.
- 2. Hypophysis with constriction above, disk-like; sporangium cubical, with short beak. *P. commune*.
- 2. Hypophysis not constricted above; sporangium longer than broad, *P. ohioensis*.
- 3. Costa ex current, forming a long hyaline awn, rough; plants small and simple, in dry places. *P. piliferum*.
- 3. Costa only slightly or not at all excurrent, red; plants larger. 4.
- 4. Stalks densely tomentose below; sporangium cubic; scales erect. *P. alpestre*.
- 4. Stalks not at all or only slightly tomentose; sporangia oblong; scales spreading. *P. juniperinum*.

1. *Polytrichum ohioënsis* Ren. and Cand. Ohio Hair-cap. Loosely cespitose, olive-green, gametophytes erect; 1-6 inches tall; stalks stiff, brown. Upper scales sheathing, spreading when moist, costate, 40-50 lamellæ. Sporophyte erect, seta brown, $1\frac{1}{2}$ - $2\frac{1}{2}$ inches long; sporangium erect when young, becoming inclined when older, elongated, slender; tapering, not constricted above, hypophysis calyptra not covering sporangium; operculum long-beaked. Spores ripe in June. Common; in moist, shady places.

Polytrichum gracile Dicks, is a form very similar to *P. ohioënsis* and doubtless often confused with it. The characteristics of the two as described overlap and are variable. The terminal cell of the lamellæ of *P. gracile* in cross-section is rounded, while that of *P. ohioënsis* is notched.

2. *Polytrichum commune* L. Common Hair-cap. Gametophytes similar to *P. ohioënsis*, but larger, 6-18 inches, our largest moss. Seta $2\frac{1}{2}$ -4 inches long, brown. Sporangium almost cubic; hypophysis distinct, constricted above, operculum with a short beak; calyptra light yellow, extending to below the sporangium. Spores mature in mid-summer. In open fields or woods.

Williams and Licking counties. Claassen reports it from Cuyahoga, Geauga, Lake, and Portage.

3. *Polytrichum juniperinum* Willd. Juniper Hair-cap. Plants scattered, erect, 1-4 inches, light green, slightly tomentose at the base. Scales lanceolate, sheathing, inflexed, entire, spreading when moist, costa excurrent to form a short dentate, red arista; lamellæ 35-40. Seta $1\frac{1}{2}$ - $2\frac{1}{2}$ inches long, red; sporangium tetragonal-oblong, sharply angled, operculum red with a short beak, hypophysis rather indistinct. Spores mature in mid-summer. In dry pastures or open woods.

Rather common.

4. *Polytrichum alpestre* Hoppe. (*Polytrichum strictum* Banks). Resembles *P. juniperinum*, except it grows in dense matted tufts, grayish-white tomentose; slender, terete, up to one foot tall. Scales entire, erect, sheathing; costa protruding to form a red, serrate arista; lamellæ 25-30. Seta $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long; sporangium cubic brown; hypophysis distinct; calyptra covering the capsule; operculum flat. Spores mature in mid-summer. Bogs.

Has not been reported from Ohio, but may be present as Jennings lists it from western Pennsylvania.

5. *Polytrichum piliferum* Schreb. Loosely tufted, light green, somewhat glaucous. Gametophytes simple, erect, 1- $1\frac{1}{2}$ inches tall; scales only on the upper part of the stalk, ascending when moist, lanceolate, entire, margins inflexed, ending in a long, hyaline, white awn.

Seta 1-1½ inches long; sporangium sharply 4-angled, usually horizontal when mature; hypophysis constricted above; operculum with a short beak, stout; capytra covering the sporangium. Spores mature in mid-summer. On dry, sandy soil or rocky ledges.

No specimens, but is reported by Kellerman.

BUXABAUMIACEAE.

Very small mosses with the protonema often persistent. Sporangium zygomorphic, oblique and dorsiventrally asymmetrical, very large in proportion to the remainder of the plant; calyptra very small; peristome of one or two layers, outer teeth, when present, very faintly barred.

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| 1. Scales persistent, exceeding the sporophyte in length; seta almost or quite absent..... | Diphyscum. |
| 1. Scales deciduous; seta distinct..... | Buxbaumia. |

1. *Diphyscum* Mohr.

Low, gregarious perennials with a long, persistent protonema. Scales dense, spreading when moist, ligulate or lanceolate, entire; perigonal scales longer, erect, membranous; costa long aristate. Seta very short; sporangium immersed, mouth very small.

1. *Diphyscum foliosum* (Webr.) Mohr. (*Webera sessilis* Lind., *Buxbaumia foliosa* Weber). Plants form a dense dark green mat; many sterile plants. Seta almost or entirely absent, sporangium light brown, resembling a grain of wheat, apex curved, pointed; inner peristome white, later brown. Found on moist clay banks where there is little or no other vegetation, and usually associated with a white lichen.

Reported by Claassen from Cuyahoga County.

2. *Buxbaumia* Haller.

Antheridial plants microscopic, having a single scale enclosing one stalked antheridium; archegonial plants with only a few minute, deciduous scales, without chlorophyll. Seta rough, stout; sporangium conspicuous, oblique, dorsiventral.

1. *Buxbaumia aphylla* L. Protonema persistent, forming a brownish mat. Seta purplish, about one-half inch long; sporangium glossy, brown, almost horizontal, flattened above. Spores scattered by the splitting of the capsule. Capytra minute; peristome present. On ground or rotten wood. Spores mature in late fall and early spring. Rare.

Perry County. Is also reported from Jacob's Ladder, Fairfield County, by Miss Clara G. Mark.