

1977

Saxicolous Bryophytes of Coles and Clark Counties

Terri M. Simon

Eastern Illinois University

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SAXICOLOUS BRYOPHYTES OF

COLES AND CLARK COUNTIES

(TITLE)

BY

Terri M. Simon

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
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1977

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
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<u>Scapania nemorosa</u> (L.) Dum.	196-199
<u>Trichocolea tomentella</u> (Ehrh.) Dum.	148-150

INTRODUCTION AND HISTORY

Saxicolous bryophytes compromise some 62 different species in Coles and Clark counties. The sandstone outcrop areas along the Embarrass River, at Rock's Park, Wolf Den Canyon and Rocky Branch Preserve are especially rich in saxicolous species.

Coles and Clark counties are located in the Till Plains Section of the Central Lowland Province. More than 90% of the State of Illinois lies within this province. The Tills Plains Section of the Central Lowland Province is characterized by nearly flat to gently undulating glacial terrain lacking strong end morraines and having few lacustrine plains. It extends over many thousands of square miles through Ohio, Indiana, and Illinois, and is dominantly a depositional topography, although some of the Tills Plains was a cumulative process and the product of at least three glaciations. Each glaciation helped in some degree to obliterate the pre-existing, stream-carved topography, more by a filling up of the valleys than by a cutting down of the hills.

At the edge of the Illinoian and Wisconsin glaciation lie Coles and Clark counties. The Illinoian drift plain, covering most of the southern half of Illinois, is generally characterized as having an altitude of 550 to 700 feet above sea level. The topography in the northeastern part of Clark county is quite rugged due to cutting of 50 to 80 feet below the upland by Big Creek and the smaller tributaries of the Wabash River. At some places in the eastern part of Clark county, streams have been superimposed on the buried bedrock

beneath the glacial drift such as Rocky Branch Preserve and Wolf Den Canyon.

Rocky Branch Preserve is located about four miles from Clarksville in Clark county. The area is characterized by sandstone bluffs bordering a small creek, and is situated in a mainly Beech-Maple forest (Fagus grandifolia L., Acer spp.) with Oak (Quercus spp.) with Ironwood (Carpinus caroliniana) also present.

Wolf Den Canyon is located about three miles east of the Martinsville Fairgrounds. The canyon is characteristic of the gorges in the area in that the walls rarely exceed 45 feet in height and are composed of Pennsylvanian Sandstone Rock. This canyon is situated in a mainly Oak-Hickory forest (Quercus spp., Carya spp.) with Sugar Maple (Acer saccharum Marsh.) and American Beech (Fagus grandifolia L.) also present. The forest keeps most of the canyon in dense shade and allows little evaporation. Within this canyon exists a region rich in saxicolous mosses and liverworts.

The purpose of this paper is to describe and illustrate the saxicolous mosses and liverworts of East-Central Illinois.

REVIEW OF LITERATURE

A review of the literature reveals that no thorough studies of the saxicolous bryophyte vegetation of East-Central Illinois (comprising Coles and Clark counties) have been reported. However, some research has been done on Illinois mosses and liverworts, although the volume is not great. The first to attempt any county bryological studies were Wolf and Hall (1878). Their work was concentrated in Menard and Fulton counties, but included the southern counties of Union, Johnson, and Jackson. They listed 153 mosses and 45 liverworts. The paper also included several species of lichens found growing in the counties under consideration.

Nine years later, Brendel (1887) did a study of the vegetation of Peoria county in which he included a checklist of 87 mosses and 27 liverworts. Forty-three years after Brendel's work, Hague (1930) produced a very comprehensive state-wide study of Illinois mosses. She reported 265 species in which she included the counties of Peoria, Fulton, Kane, Cook, McHenry, Lake, Carroll, Menard, LaSalle, Will, Kankakee, Marion, DuPage, Sangamon, Champaign, Wabash, Stark, Henderson, Union, Johnson, Ogle, Randolph, Rock Island, Hancock, Schuyler, and Winnabago. Her records did not include Coles and Clark counties. Hague (1934) again reported 71 Musci from several southern counties: Saline, Pope, Johnson, Union, Williamson, and Hardin Counties. The same year, Galligan (1934) listed 35 mosses and 5 liverworts she collected in a bryological survey of Macon county.

In 1940, Richards reported 33 mosses and 18 liverworts collected in a survey of Starved Rock State Park, LaSalle county. In a study of Clark county, Vaughn (1941) listed 14 hepatics and 74 Musci. A few years later, Arzeni (1947) reported 42 liverworts and 130 mosses collected in a study of Coles and Clark counties. Hatcher (1952) reported 30 liverworts and 63 mosses from Jackson, Union, and Pope counties in Southern Illinois. Morrow (1952) listed 17 common Musci of McDonough county.

A lapse of 16 years followed Morrow's work before Skorepa (1968) reported 58 species of liverworts from Southern Illinois including Jackson, Pope, Union, Gallatin, Johnson, Randolph, and Saline counties. In 1975, Spessard and Arzeni reported 71 species of mosses and 15 species of liverworts in a study of Shelby county. No other work has been done to date related to county or state-wide studies in Illinois mosses and liverworts.

MATERIALS AND METHODS

The mosses and liverworts were collected from East-Central Illinois (comprising Coles and Clark counties). The material represents bryophytes from four distinct rock habitats so explicated in the descriptions. These are: (1) Moist shaded sandstone bluffs; (2) Vertical sandstone walls; (3) Sandstone walls or boulders exposed to direct sunlight; (4) Wet rocks in or along streams, brooks or creeks. Most species were collected on moist shaded sandstone bluffs, which also provide a habitat for several species of ferns, lichens, and small flowering plants.

The author's determination of all specimens have been corroborated by Dr. Charles B. Arzeni. The mosses and liverworts collected were stored in standard bryological packets containing the following data: scientific name and authority for each species, whether freuting or sterile, the county and state in which the specimen was collected, habitat information, the collector's name, the determiner's name (if different), the data collected, and the collection number. The specimens were deposited in the author's collection with duplicates placed in the Stover Herbarium, Eastern Illinois University. Taxonomic keys used in the determination of species were by Grout (1929-1940), (1903), Frye & Clarke (1937-1947), Conard (1956), Welch (1957), and Crum (1973).

Description of the gross external morphology as well as microscopic morphology were made for each species. The descriptions included: the general habit of the plant under study, the leaf arrangement on the stem, the branching pattern, the overall size of the plant, the leaf morphology,

and aerolation plus cell size. Sporophyte characteristics which were considered included seta characters such as size and color; capsule color, shape, and size; operculum shape; the peristome characteristics, color, and number of teeth; and the spore size, color, and morphology. Measurements of all microscopic characteristics were made with a calibrated ocular micrometer.

Original illustrations have been prepared for each species. The descriptions of all mosses are arranged phylogenetically as given by Grout (1940). The descriptions of all liverworts are arranged as given by Evans (1940).

FAMILY: TETRAPHIDACEAE

Tetraphis pellucida Hedw.

Plants in dense to loose, yellowish-green tufts and sods; protonema of a green scale, not filamentous; stems erect, simple or branches, 8-15 mm. long, densely radiculose at base; barren shoots frequently with terminal gemmiferous cups, about 1 mm. in diameter, formed of 4-5 broadly cordate, obovate, or reniform leaves, truncate to apiculate, containing many-celled, lenticular, stalked gemmae; upper leaves larger than the minute basal blades, close, ovate to ovate-lanceolate, up to 3 mm. long, 0.5-0.75 mm. wide, slightly concave, lower leaves 1-2 mm. long; costa wide, ending below apex; apices mostly acute, margins plane, entire; median cells of leaves almost isodiametric, rounded-hexagonal, 8-20 μ in diameter, incrassate.

Autoicous; inflorescence apical; seta erect, yellowish to reddish or brown, 6-14 mm. long, twisted when dry; capsule reddish, erect to ascending; operculum acutely conical, about 1 mm. long; urn green when young, bright reddish brown when mature, symmetrical, rarely subarcuate, narrowly cylindrical, 2-3 mm. long, persistent; annulus none; peristome single, reddish to brownish, teeth 4, linear-triangular, 0.5-0.9 mm. long, thick; spores 10-13 μ in diameter, slightly papillose; calyptra whitish, conical solid and rough at apex, lacerate below, enclosing the entire capsule.

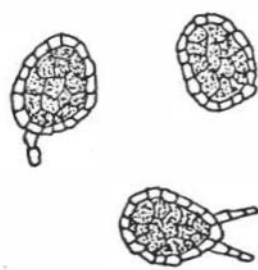
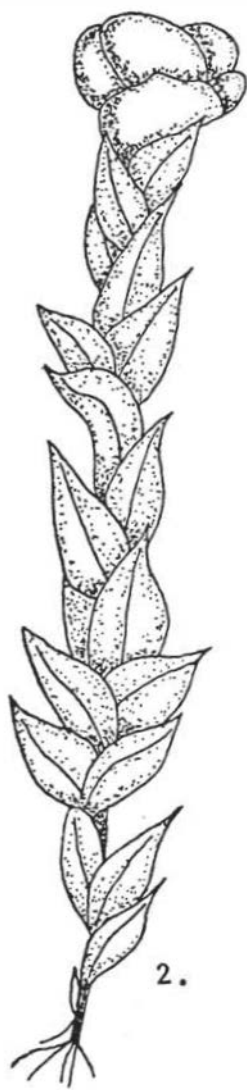
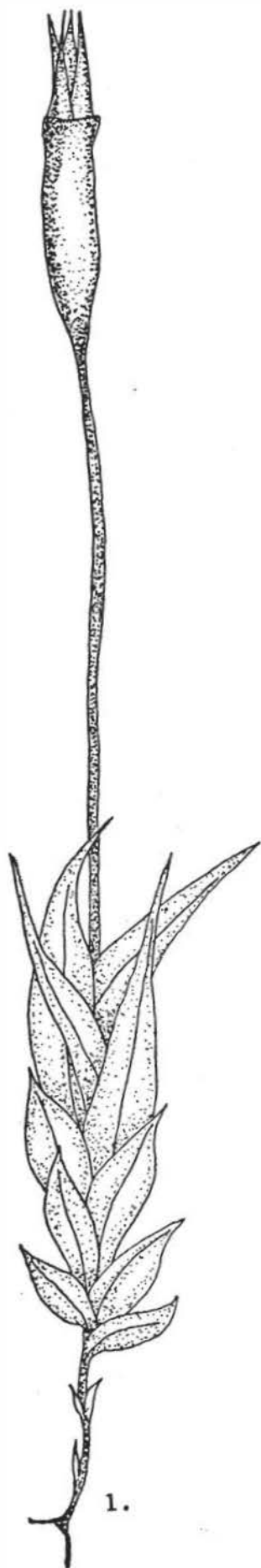
Comments:

Tetraphis pellucida Hedw. often grows on moist, porous sandstone

banks or on humus covering the rock, but may also be found on wet, rotten, decorticated wood. Gemmae are often present. The genus name means bearing or producing four, referring to the four peristome teeth, and thus the common name Four-toothed Moss for this plant.

Tetraphis pellucida Hedw.

1. Habit of fruiting plant, 3 X
2. Habit of sterile plant, 3 X
3. Gemmae, 10 X



FAMILY: POLYTRICHACEAE

Atrichum angustatum (Brid.) B.S.G.

Plants medium-sized, in clusters or tufts, dark olive-green, reddish-brown with age; stems erect, 10-20 (rarely 45) mm. high; leaves of stems minute below, the size increasing above, undulate, especially when dry, linear-lanceolate, 3.5-7 mm. long, 0.6-0.75 mm. wide, toothed at back in oblique rows corresponding to the undulations; apices acute; costa subpurcurrent, toothed at back above, lamellae on upper surface 5-6, rarely 9, wavy, 5-14 cells high, composing 1/4-1/2 the width of the upper 1/3 of the leaf; margins with mostly double teeth, serrate along upper 1/2-1/3; upper cells of leaves 9-19 μ wide, incrassate, irregularly isodiametric, sometimes longer than wide, smooth, subpapillose, or papillose, varying in different leaves on same plant and in various parts of same leaf.

Dioicous; perichaetial leaves scarcely differentiated; setae erect, castaneous, 10-30 mm. long, occasionally in pairs; capsule castaneous, almost erect; operculum 2-3 mm. long, approximately 1/2 length of urn; urn narrowly cylindrical, straight or nearly so, 2.7-6.5 mm. long, 0.5-0.8 mm. in diameter; annulus none; peristome single, teeth 32; spores 9-14 μ in diameter, pale green to reddish yellow; calyptra cucullate, slenderly rostrate, 4-7 mm. long, toothed to short-bristled at apex.

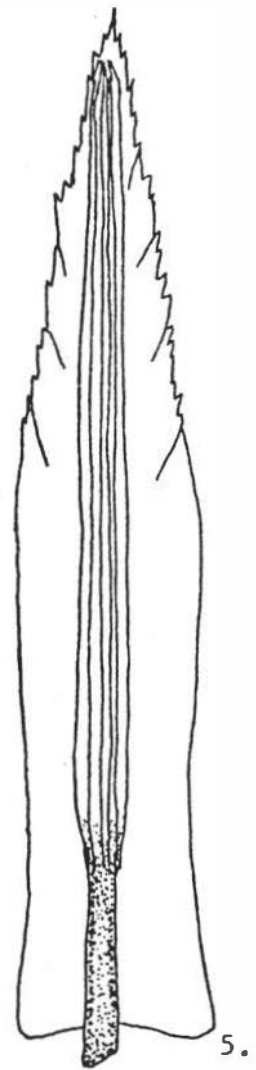
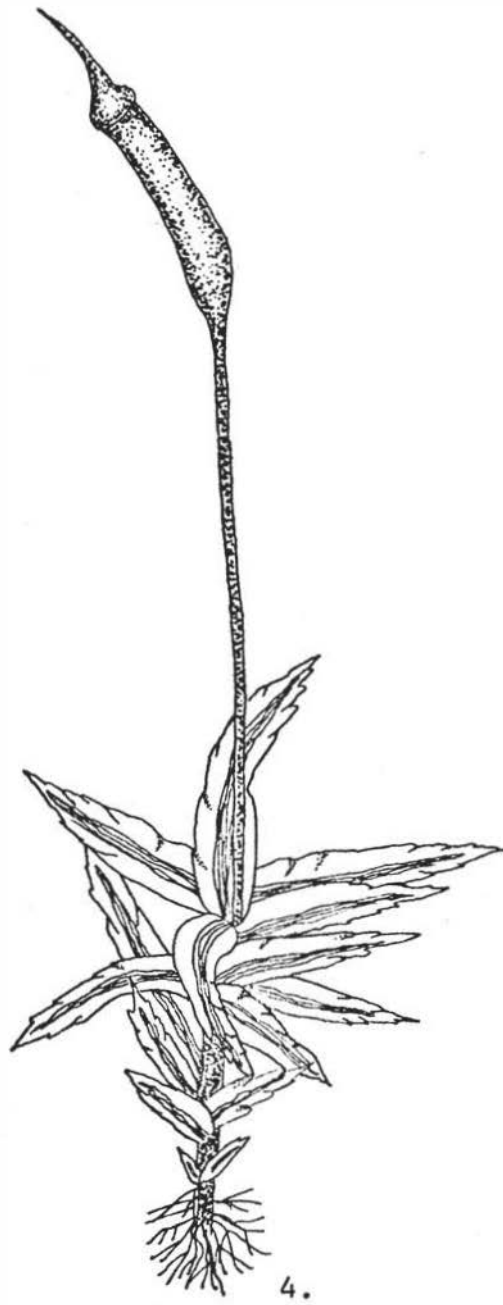
Comments:

Atrichum angustatum (Brid.) B.S.G. grows on moist, shaded

sandstone bluffs and on soil covering the rock. The genus name refers to the absence of hairs on the calyptra, in marked contrast to the usual condition in the family.

Atrichum angustatum (Brid.) B.S.G.

- 4. Habit, 2 X
- 5. Leaf, 12 X



FAMILY: POLYTRICHACEAE

Pogonatum pensilvanicum (Hedw.) Par.

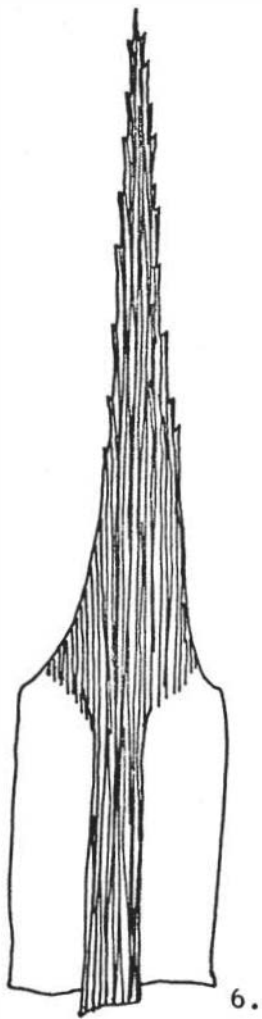
Plants in clusters, growing from an abundant, persistent protonema; stems erect, very short, 1-2 mm. high, with rhizoids at base; lower leaves bract-like, upper few, erect when dry, ascending when moist, lanceolate-subulate from a sheath-like base, 3-4 mm. long, 0.28 mm. wide; costa percurrent, with 10-15 lamellae along upper surface, 4-6 cells high; apices long acuminate, serrulate; margins plane to erect, entire below, serrate in upper half; cells of blades at 3/4 up quadrate, rectangular, rounded or oval, 10-20 μ in longest diameter; Dioicous; seta erect, 1-2.5 cm. long, yellowish to reddish; capsule erect to slightly inclined, yellowish to reddish; operculum briefly conic, 1/6-1/5 as long as urn, the beak about 0.4 mm. long, slightly curved; urn cylindric, symmetrical, about 4 mm. long, 0.8 mm. wide, minutely mammilose with bulging cells, hypophysis separated by a slight constriction; annulus none; peristome single, teeth 32, about 200 μ long, 50-70 μ wide; spores 8-12 μ in diameter yellowish-brown, smooth; calyptra cucullate, extending well below capsule, light yellow or gray, densely hairy.

Comments:

Pogonatum pensilvanicum (Hedw.) Par. prefers to grow on a moist clay-like substratum, but often is found growing as scattered individuals from an abundant persistent protonema on sandstone rock along stream banks.

Pogonatum pensilvanicum (Hedw.) Par.

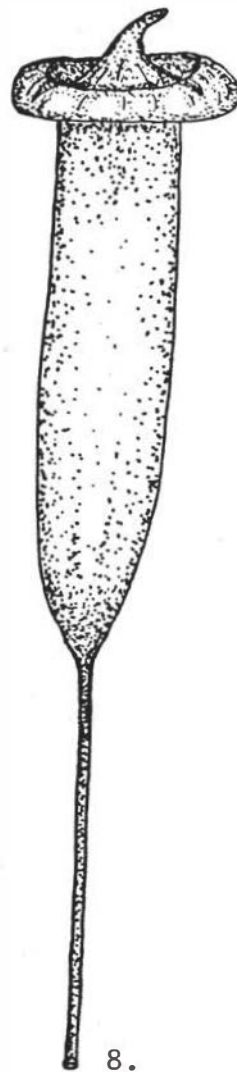
- 6. Leaf, 40 X
- 7. Habit, 8 X
- 8. Dried capsule, 30 X



6.



7.



8.

FAMILY: POLYTRICHACEAE

Polytrichum commune Hedw.

Robust, dark-green or brownish plants in loose or fairly dense tufts 4-45 cm. high; stems erect, chestnut-brown; leaves small below, gradually larger above, erect or somewhat spreading at least at the tips and rolled when dry, spreading to recurved when moist, 6-10 mm. long, lanceolate to linear-lanceolate from a sheathing base about 2-3 mm. long; apices acuminate, serrate; margins plane or erect, sharply serrate nearly to the sheath; costa excurrent, toothed at back; lamellae 21-55, covering nearly all the leaf above the shoulders, 4-9 cells high, the terminal or marginal cells slightly wider; cells of unistratose border of blade quadrate to transversely rectangular or elliptic; cells in middle of sheathing base linear.

Dioicous; perichaetial leaves long and narrow, about 9-15 mm. long, with costa long-excurrent; seta erect, 50-99 mm. long, reddish brown; capsule 3-5 mm. long, red-brown; operculum low conic, beak about 1 mm. long, straight or slightly curved; urn almost cuboidal, sharply 4-angled, deeply constricted above a distinct apophysis; annulus none; stomata with 2 guard cells, in the constriction between urn and apophysis; peristome single, teeth 64, reddish; spores 8-10 μ in diameter, smooth, yellowish; calyptra densely hairy, yellow or brownish, entirely covering the capsule.

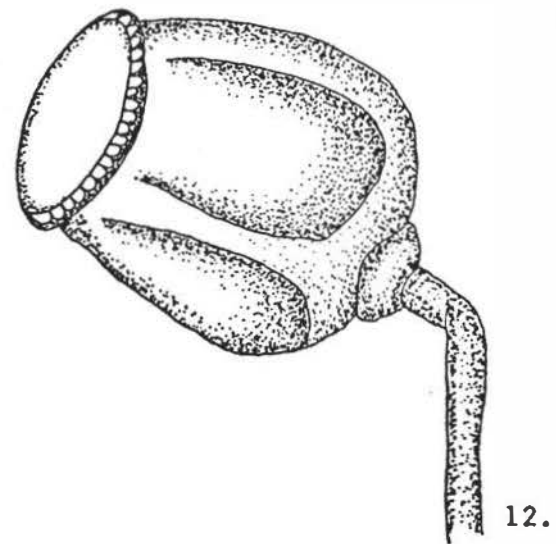
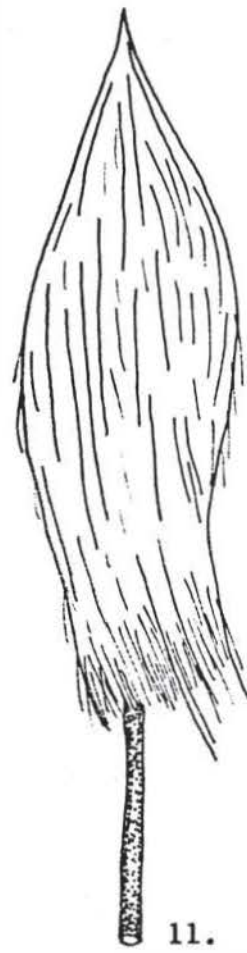
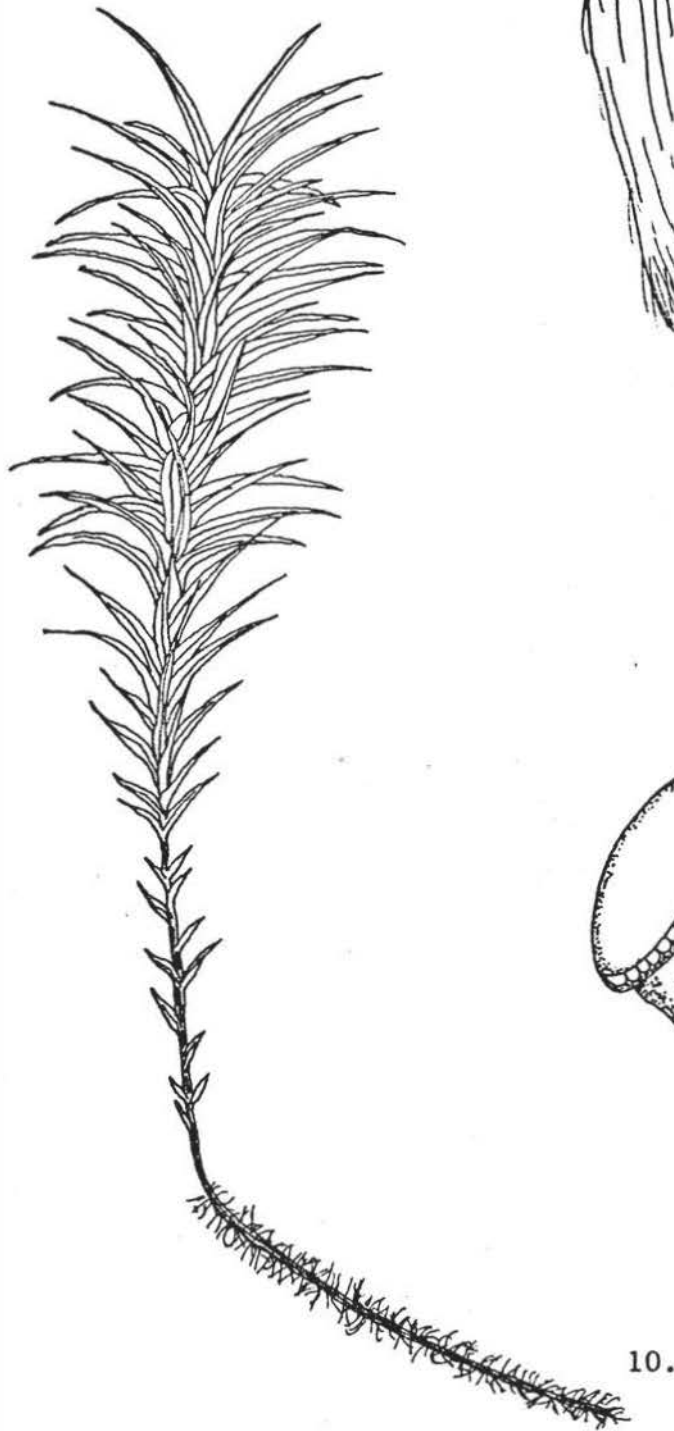
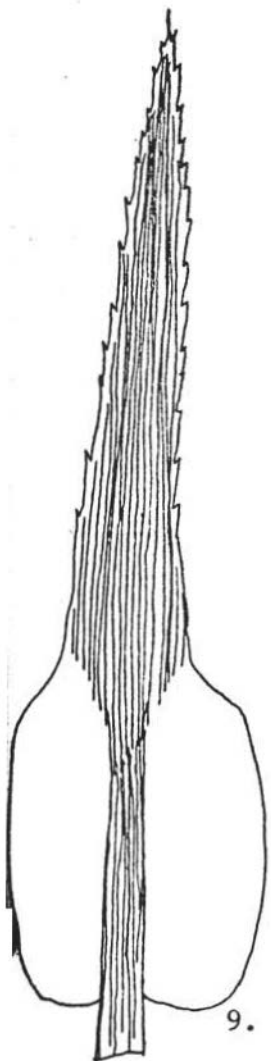
Comments:

Polytrichum commune Hedw. is found growing on moist shaded sandstone banks or on wet soil covering the bank. The generic

name refers to the many hairs covering the calyptra, thus the
common name Hair Cap Moss.

Polytrichum commune Hedw.

- 9. Leaf, 15 X
- 10. Habit, 2 X
- 11. Calyptra, 15 X
- 12. Capsule, 25 X



FAMILY: FISSIDENTACEAE

Fissidens bryoides Hedw.

Small plants 2-7 mm. high; stems erect, reddish; leaves usually 3-5 pairs, 1-2 mm. long, oblong to oblong-lingulate; apices obtuse to gradually or rather abruptly acute, sometimes cuspidate; margins typically bordered by hyaline, linear cells extending to the apex or nearly so; vaginant lamina boat-shaped, flat, about 1/2 length of the leaf, clasping the stem and frequently a portion of adjacent leaf above; dorsal lamina tapered, often ending above the leaf insertion; costa strong, ending slightly below apex, percurrent; median cells irregularly quadrate to rectangular-hexagonal, varying greatly in shape and size, 6-15 μ in diameter.

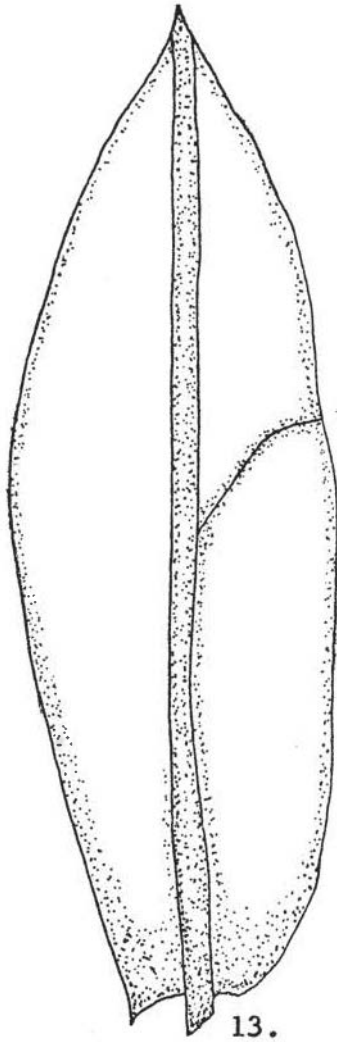
Dioicous; seta erect, 2-6 mm. long, yellowish or reddish; capsule usually erect, symmetric, yellow to yellow-brown; urn oval-oblong, 0.7-9.0 mm. long, often shorter, constricted below mouth when dry; annulus of 1-2 rows of small, persistent cells; peristent cells; peristome single, teeth 16, bifid, papillose below, spirally thickened above, spores 11-21 μ in diameter, pale yellowish red, smooth or nearly so; calyptra small, narrowly conical.

Comments:

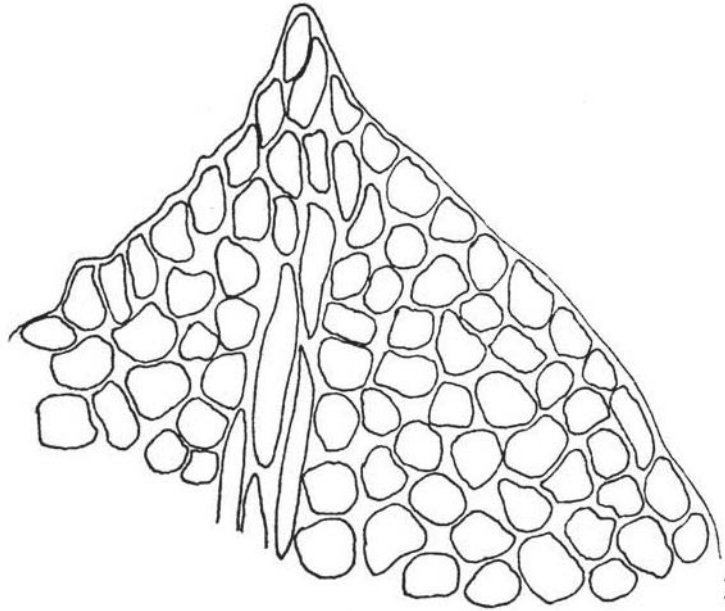
Fissidens bryoides Hedw. is a very minute moss preferring moist shaded or wet rocks in or along streams, brooks, or creeks. The genus name means split tooth, referring to the peristome teeth which are forked.

Fissidens bryoides Hedw.

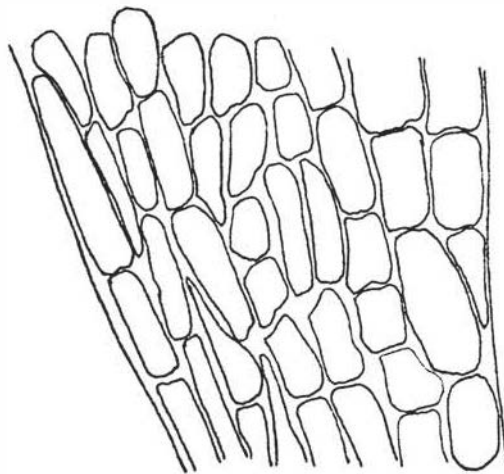
- 13. Leaf, 40 X
- 14. Apical cells, 400 X
- 15. Alar cells, 400 X



13.



14.



15.

FAMILY: DITRICHACEAE

Ceratodon purpureus (Hedw.) Brid

Plants in dense tufts or mats, dark green, yellow-brown or reddish with age; stems erect, 0.5-2.5 cm. high; leaves 1.8-2 mm. long, broadly triangular-ovate, ovate-lanceolate, lanceolate, or linear-lanceolate; costa strong, $1/6$ - $1/4$ width of leaf at base, percurrent to briefly excurrent; apices acute to acuminate; margins strongly reflexed or revolute nearly to apex, irregularly notched or serrulate near the tip; cells 7-9 μ wide, smooth, hexagonal-quadrate.

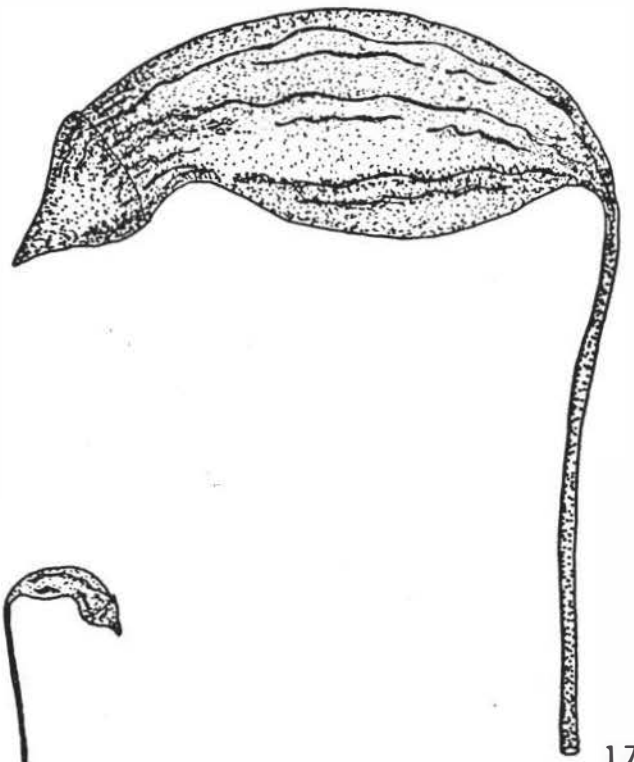
Diocous; perichaetial leaves differentiated, sheathing; seta erect, dark reddish-brown, 1-2.5 cm. long; capsule dark reddish-brown, erect when young, inclined to horizontal when mature; operculum elongate conic, about $1/4$ length of urn, often curved downward, urn ovoid-cylindric to oblong-ovoid, deeply furrowed when dry; annulus distinct, of 2-3 rows of cells; peristome single, teeth 16, dark red below, hyaline above, papillose; spores 11-15 μ in diameter, yellow or greenish-yellow, smooth or nearly so; calyptra cucullate.

Comments:

Ceratodon purpureus (Hedw.) Brid. is often called the Roof Top Moss because of one of its unusual habitats. The generic name refers to the forked peristome teeth which resemble horns of a goat. The species name refers to the purple color of the sporophyte generation which is very distinctive for this moss which may be collected on moist shaded sandstone banks.

Ceratodon purpureus (Hedw.) Brid.

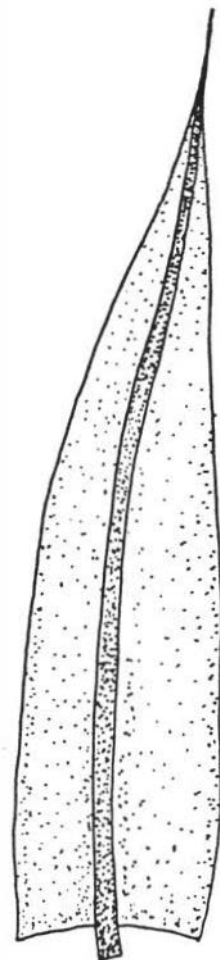
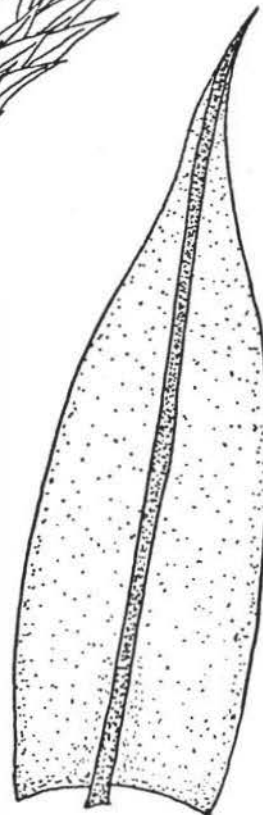
- 16. Habit, 8 X
- 17. Dried capsule, 10 X
- 18. Leaves, 15 X



17.



16.



18.

FAMILY: DITRICHACEAE

Ditrichum pallidum (Hedw.) Hampe

Plants small, caespitose or gregarious, green or yellow-green; stems erect or nearly so, from a prostrate base, short, about 5 mm. long; leaves or stems slightly contorted when dry, erect spreading, occasionally secund, long linear-subulate from a lanceolate or ovate base, 3-5 mm. long, concave below, channelled above; costa strong, long excurrent, serrulate toward apex; margins often distantly serrate in upper part of base; median cells rectangular, thin-walled, smooth, basal cells oblong-hexagonal.

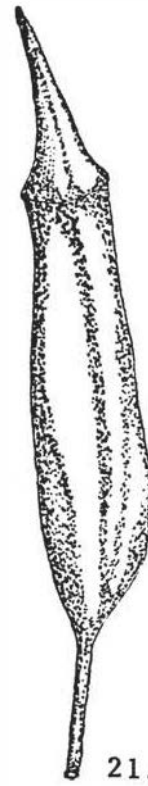
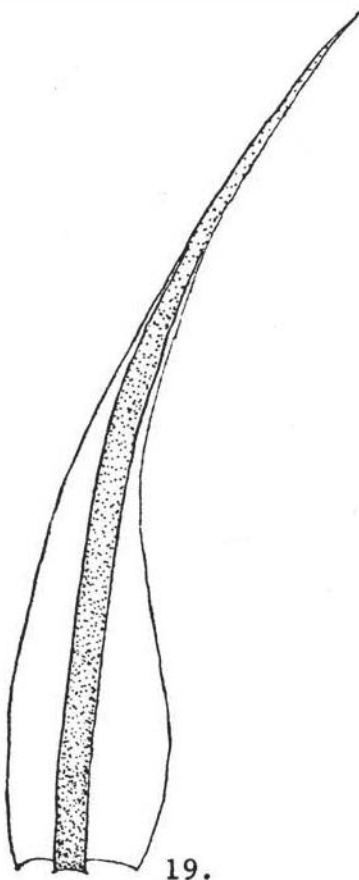
Paroicous; perichaetial leaves sub-clasping; seta erect, bright yellow to orange, slender, 1-4 cm. long; capsule light brown to yellowish or yellowish-red, ascending to inclined or horizontal; operculum conic, obtuse, 0.6-1 mm. long; urn slightly unsymmetric, 1-2.5 mm. long, oblong-ovoid, narrowed near mouth, subarcuate and irregularly furrowed when dry; annulus of 1-3 rows of cells, deciduous; peristome single, reddish, teeth 16, about 0.5 mm. long, split nearly to the base into two nodose divisions, spinose-papillose; spores 14-18 μ in diameter, papillose to coarsely warty, brownish or reddish-pellucid, sphaerical.

Comments:

Ditrichum pallidum (Hedw.) Hampe grows on moist, shaded, or mesic, partially shaded sandstone rock. This species is best recognized by its long, slender, bright yellow setae. The generic name refers to the peristome teeth, each usually consisting of two hair-like divisions.

Ditrichum pallidum (Hedw.) Hampe.

- 19. Leaf, 40 X
- 20. Habit, 10 X
- 21. Capsule, 30 X



FAMILY: DITRICHACEAE

Ditrichum pusillum (Hedw.) E.G. Britton

Plants small, in light green to yellowish-green dense sods, often dark with age; stems erect, 5-10 mm. high, sometimes more; lower leaves of stem lanceolate, about 1 mm. long, the upper slightly contorted when dry, erect to somewhat spreading, lanceolate-subulate from an ovate-lanceolate base, 2-3 mm. long, concave at base, channelled above, costa broad, percurrent to excurrent, apices denticulate, subulate; margins irregularly thickened, somewhat narrowly revolute, serrulate, especially in the apex; median cells of upper leaves rectangular to quadrate, with thick walls, smooth; apical cells sometimes bistratose; basal cells rectangular to hexagonal or linear-rectangular.

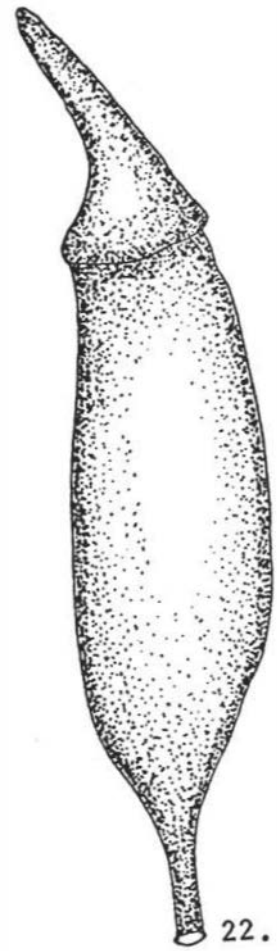
Dioicous; perichaetial leaves slightly sheathing to sheathing at base; seta reddish-brown; 5-15 mm. long, glossy; capsule erect or nearly so, reddish to brown; operculum conic, rostellate, beak more or less oblique, 0.45 mm. long; urn oblong to oblong-cylindric or ovoid, 0.5-1.5 mm. long, smooth, not sulcate, not contracted beneath mouth when dry and empty; annulus of 1 row of large cells; peristome single, reddish, split nearly to the base into two usually free divisions, obliquely stiolate, often papillose, teeth 16; spores 10-18 μ in diameter, smooth, yellowish pellucid; calyptra cucullate, extending to base of capsule.

Comments:

Ditrichum pusillum (Hedw.) E.G. Britton often grows on moist, shaded sandstone banks, or on moist humus covering the rock. The generic name refers to the peristome teeth, each usually consisting of two hair-like divisions.

Ditrichum pusillum (Hedw.) E.G. Britton

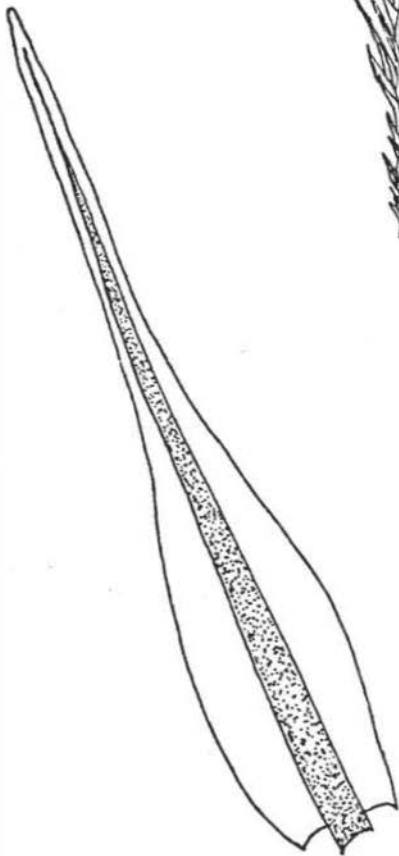
- 22. Capsule, 30 X
- 23. Habit, 10 X
- 24. Leaves, 40 X



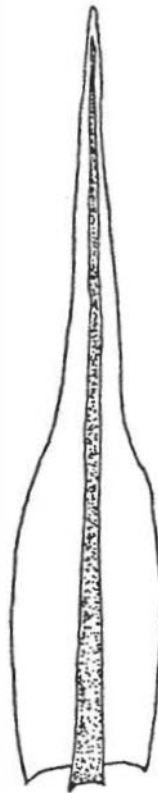
22.



23.



24.



FAMILY: DICRANACEAE

Dicranella heteromalla (Hedw.) Schimp.

Plants small, in yellow to dark-green, rather glossy tufts; stems erect to ascending, 0.5-4 cm. long, frequently branched; leaves numerous, generally falcate-secund, rarely erect, ovate-lanceolate to lanceolate, 2-3 mm. long, gradually narrowed from a lanceolate base to a subula largely filled by the costa, upper half of leaf toothed on lower surface, concave below; costa percurrent to excurrent, broad, about 100 μ wide near the insertion, about 1/5 to 1/3 the width of the leaf base; margins plane, erect, entire below and faintly to sharply denticulate above; cells in 1-3 rows above the middle of the leaf, short-rectangular or rectangular-oblong, 4-7x11-14 μ .

Dioicous; seta erect to curved, 5-15 mm. long, greenish-yellow to pale yellow, sometimes dark red with great age; capsule inclined to horizontal or more often suberect, chestnut-brown to dark brown; operculum 1 mm. long, long-rostrate, beak 1-1.5 mm. long; urn 1-1.5 mm. long, chestnut-brown to dark brown, cylindric, asymmetric, usually deeply furrowed when dry and empty and contracted below the oblique mouth; annulus consisting of 1 row of small, persistent cells; peristome single, 400-450 μ long, divided about 1/2 the way down, papillose, teeth 16, dark red; spores 14-18 μ in diameter, very minutely roughened, yellowish; calyptra cucullate.

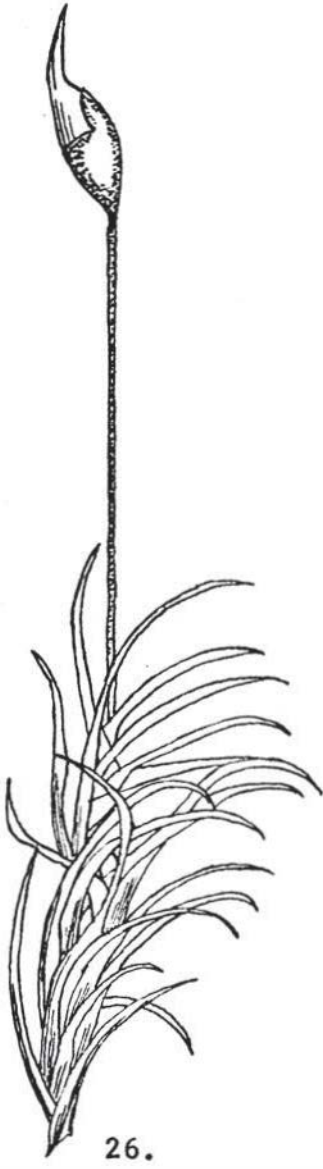
Comments:

Dicranella heteromalla (Hedw.) Schimp. grows on moist, shaded sandstone bluffs, or humus covering the bank. The setaceous leaves and the shapes of the empty capsules, with somewhat oblique furrows, tapering neck, and very oblique mouth, are distinctive.

The generic name meaning "little Dicranum" is derived from some resemblance to that genus in the appearance of the leafy plants, especially in species with secund leaves.

Dicranella heteromalla (Hedw.) Schimp.

- 25. Dried capsule, 34 X
- 26. Habit, 11 X
- 27. Leaf, 34 X



FAMILY: DICRANACEAE

Dicranella varia (Hedw.) Schimp.

Plants in clusters or loose, dull, bright-green or yellowish-green tufts; stems erect to ascending, 5-15 mm. long, branching below; leaves erect-spreading or somewhat falcate-secund, lower leaves about 1 mm. long, upper leaves 1.5-2 mm. long, gradually narrowed from a lanceolate base; costa nearly percurrent to slightly excurrent, composing a large portion or acumen; apices slenderly acute to narrowly obtuse or long acuminate; margins bistratose, irregularly recurved above the basal portion of leaf, entire throughout or sometimes faintly denticulate at tip of leaf; median cells of upper leaves oblong-linear, 4-6 μ wide; alar cells not differentiated or only slightly so.

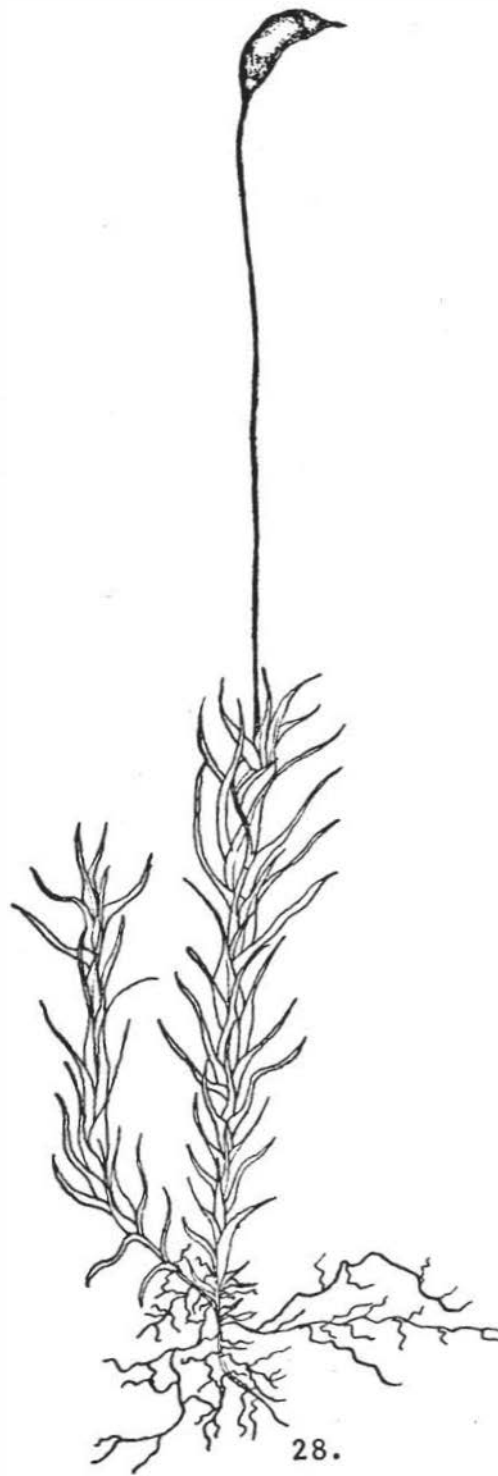
Dioicous; perichaetial leaves similar to upper stem leaves; seta erect, 5-10 or sometimes 16 mm. long, reddish; capsule reddish to light brown, more or less cernuous, 1-1.25 mm. long, operculum 0.5-0.7 mm. long, stoutly restrate; urn ovoid to short-oblong, 0.7-1 mm. long, asymmetric, curved, smooth; annulus none; peristome single, 360-410 μ long, divided about 1/3 down; spores 14-20 μ in diameter, finely papillose, yellowish; calyptra cucullate.

Comments:

Dicranella varia (Hedw.) Schimp. grows on moist, shaded sandstone banks, rocks, bluffs and ledges, and on moist humus covering rocks but often found on rock exposed to direct sunlight. The short, oval and asymmetric capsules with disproportionately large teeth, aid in identification of this moss.

Dicranella varia (Hedw.) Schimp.

28. Habit, 11 X



FAMILY: DICRANACEAE

Dicranum scoparium Hedw.

Plants rather robust, in glossy, yellowish or green or sometimes dull green or brownish tufts; stems erect, 2-8 cm. high, densely tomentose; leaves exceedingly variable, typically falcate secund, but often erect-spreading or sometimes oppressed, 3.5-8 mm. long, narrowly or broadly lanceolate, strongly serrate in the upper 1/3; costa strong, at base 1/4-1/3 width of leaf, ending in apex or briefly excurrent, with 4 rather prominent, serrate lamellae or ridges on lower surface; apices gradually acuminate, narrowly to broadly acute, strongly serrate; leaf cells elongate, the median cells elongate-rectangular to almost linear, porose, the upper cells shorter and less porose, walls irregularly thickened, the alar cells well differentiated, inflated, yellow-brown, not extending quite to the costa.

Dioicous; male plants usually dwarfed, but rarely large and similar to the female plants; perichaetial leaves convolute-sheathing; seta erect, 18-35 mm. long, yellowish to reddish-brown, single; capsule chestnut-brown, inclined; operculum 2.5-3 mm. long, often longer than the urn, long rostrate; urn cylindric, 2-3.5 mm. long, curved, suberect to horizontal, nearly smooth or somewhat furrowed when old, neck distinct, short; annulus none; peristome single, reddish brown, teeth 16, cleft from apices to middle into 2, rarely 3 papillose divisions; spores 14-24 μ in diameter, slightly rough; calyptra cucullate, conic-rostrate, 6-7 mm. long.

Comments:

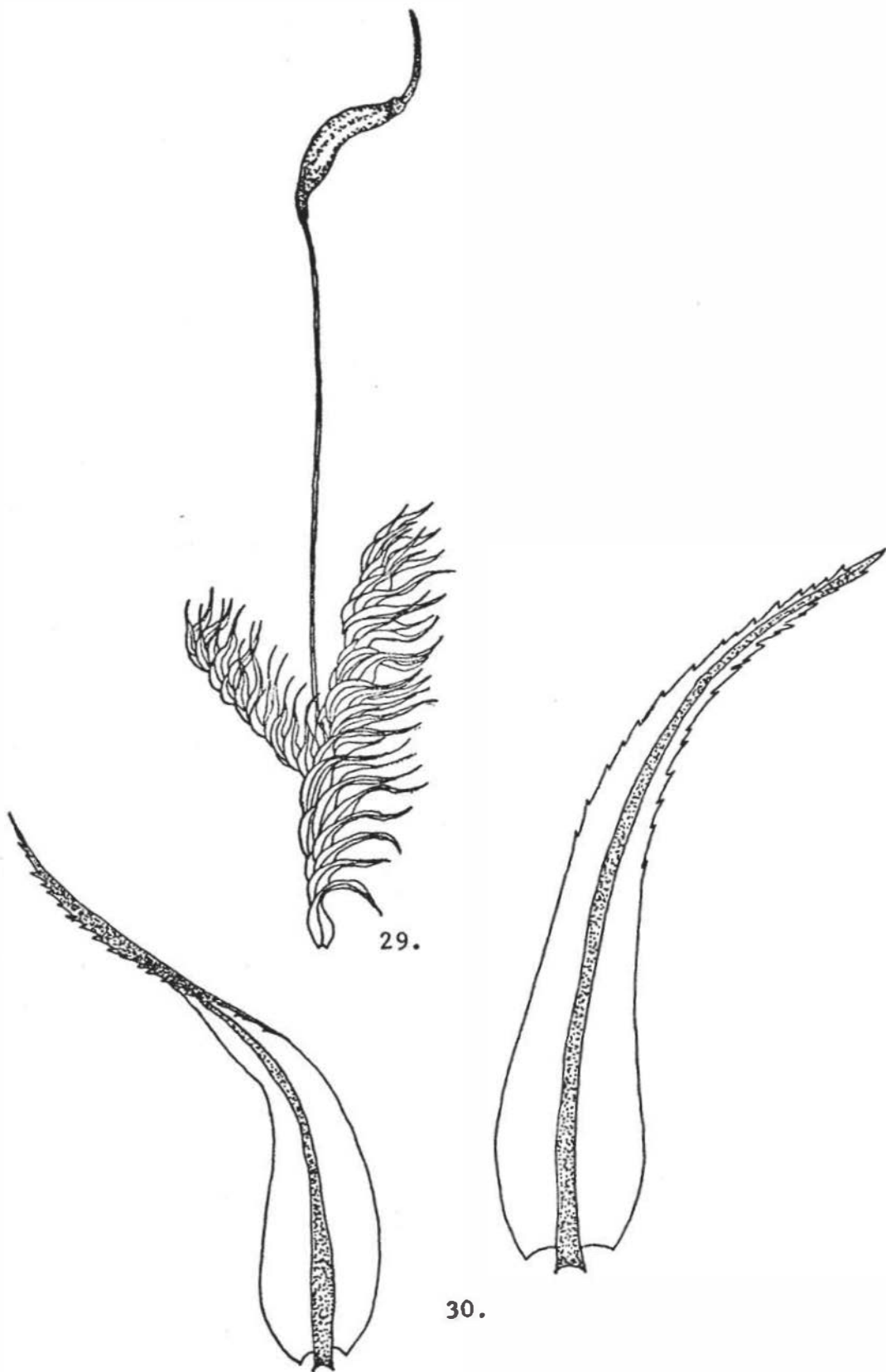
Dicranum scoparium Hedw. is often called the Broom Moss, referring to the secund leaves which give the tufts a swept appearance. The elongate, porose leaf cells and costa with four serrate ridges at back are characteristic features of this species.

The generic name refers to the forked nature of the peristome teeth.

This moss is often found growing with Bartramia pomiformis and Aulacomnium heterostichum on moist, shaded, sandstone banks, and on humus covering the rock.

Dicranum scoparium Hedw.

- 29. Habit, 2 X
- 30. Leaves, 15 X



FAMILY: LEUCOBRYACEAE

Leucobryum glaucum (Hedw.) Schimp.

Plants robust, in dense, whitish, grayish or bluish-green cushions or tufts; stems erect, dichotomously forked, often 2-9 cm. but often much higher and forming very large hummocks; leaves crowded, thick and fleshy, erect-appressed to erect-spreading, 3-8 mm. long, lanceolate or subulate-lanceolate and subtubulose from an oblong-obovate or elliptic base; the lamina very narrow, hyaline and very delicate, essentially restricted to the base; lamina cells long-rectangular to linear, thin-walled; costa in cross section consisting of two kinds of cells, a central chlorocyst layer with 1-3 layers of leucocysts above and below; apices acute or apiculate.

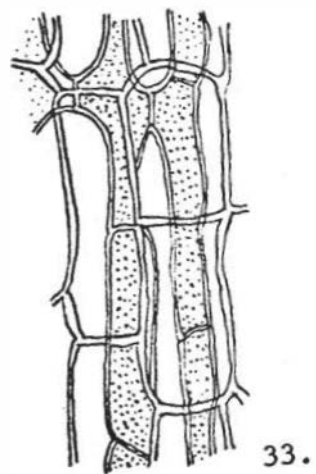
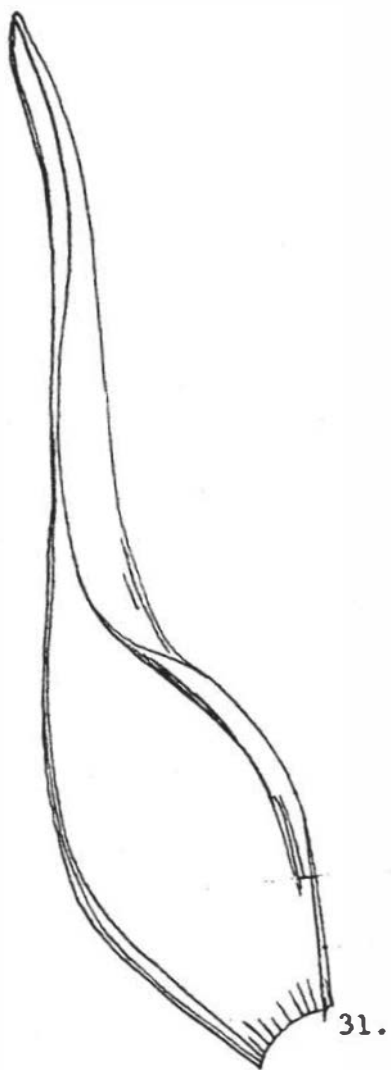
Dioicous; seta erect, 9-17 mm. long, red-brown; capsule inclined, castenaceous; operculum long rostrate from a conical base, 1.5-2 mm. long; urn subarcuate to arcuate when dry, oblong to cylindric, stumose at base, 1.5-2 mm. long; annulus none; peristome single, dark red to reddish-brown, teeth 16, lanceolate, vertically striate and papillose, spores 13-18 μ in diameter, spherical, nearly smooth or very finely papillose; calyptra cucullate, longer than the capsule.

Comments:

Leucobryum glaucum (Hedw.) Schimp. often grows on moist, shaded sandstone bluffs. This moss is often called White Moss or Pincushion Moss, referring to its whitish or glaucous, dense cushion-like tufts that resemble large pincushions. The genus name means white moss.

Leucobryum glaucum (Hedw.) Schimp.

- 31. Leaf, 15 X
- 32. Habit, 1.5 X
- 33. Hyaline (clear) and green
(stippled) cells, 375 X
- 34. Marginal cells, 375 X



FAMILY: POTTIACEAE

Barbula fallax Hedw.

Plants densely and widely caespitose, in dull brownish or reddish green tufts; stems slender, 5-20, rarely 40, mm. high, usually branched; leaves erect, somewhat distant, incurved or contorted when dry, erect-spreading when moist, 1-2 mm. long, lanceolate or ovate-lanceolate, often faintly plicate at base on each side of midrib; costa strong, tapering upward, disappearing in apex of leaf; apices acuminate or acute; margins entire, revolute in lower half or nearly to apex, with 2 stereid bands; upper cells of leaves 7-11 μ in diameter, rounded to rounded-quadrate, oblate, angular, thick-walled, strongly papillose; lower cells pale, smooth, subquadrate to short-rectangular, moderately thick-walled.

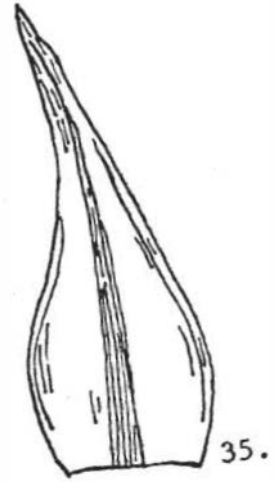
Dioicous; perichaetial leaves convolute-sheathing; seta erect, 8-25 mm. long, red; capsule mostly erect, brownish; operculum long, often as long as urn, conic-subulate; urn elongated, ovoid to subcylindric, nearly symmetric; annulus none; peristome dark red to orange-red, teeth 16, cleft into 32 delicate, long, filiform, papillose divisions, much twisted, from a narrow basal membrane; spores 10-11 μ in diameter, smooth; calyptra cucullate.

Comments:

Barbula fallax Hedw. grows on moist, shaded sandstone banks and vertical walls. The generic name means little beard, referring to the twisted, tufted peristome of 32 hair-like divisions.

Barbula fallax Hedw.

- 35. Leaf, 34 X
- 36. Habit, 10 X
- 37. Capsule and calyptra, 34 X
- 38. Peristome, 45 X



FAMILY: POTTIACEAE

Gymnostomum aeruginosum Sm.

Plants small, in dirty-green tufts; stems erect, 2-7 mm. high or rarely 40 mm; leaves loosely erect-incurved and moderately crisped when dry, spreading when moist, often with recurved tips, about 1-1.3 mm. long, lingulate or linear-lanceolate, concave but not particularly keeled; costa disappearing near the apex; apices bluntly acute to narrowly rounded-obtuse, with an occasional leaf ending in a sharp, pellucid cell; margins plane, often sinuate, papillose-crenulate; upper cells 7-11 μ , rounded-hexagonal, obscure and pluripapillose; lower cells short-rectangular, moderately firm-walled.

Dioicous; perichaetial leaves scarcely differentiated; seta 3-5 mm. long, yellow; shiny, pale brown; operculum obliquely long-rostrate, 0.5-0.7 mm. long; urn 0.6-0.8 mm. long, oblong-cylindric, thin-walled, finely shriveled-striolate when dry and empty; annulus none; peristome none; spores 10-13 μ in diameter, very slightly roughened; calyptra smooth.

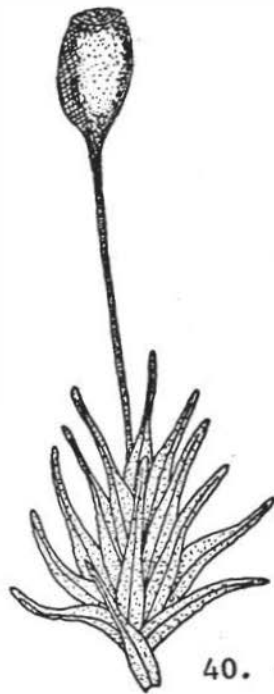
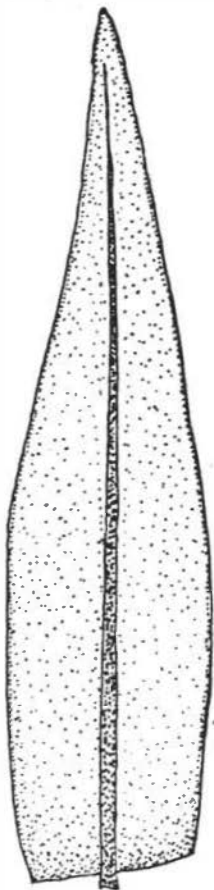
Comments:

Gymnostomum aeruginosum Sm. grows on moist or very dry, shaded sandstone walls, and occasionally is found on rock exposed to direct sunlight. This moss is called the Naked-Hole Moss, referring to the absence of a peristome.

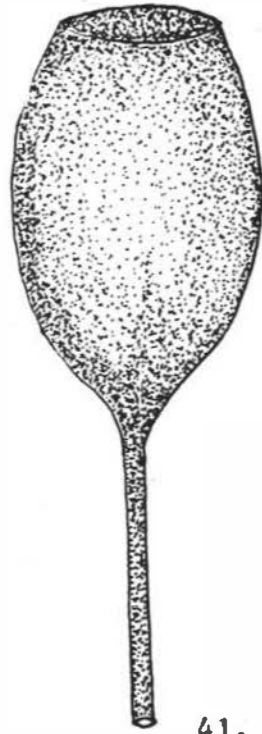
The genus name means naked mouth, referring to the absence of a peristome.

Gymnostomum aeroginosum Sm.

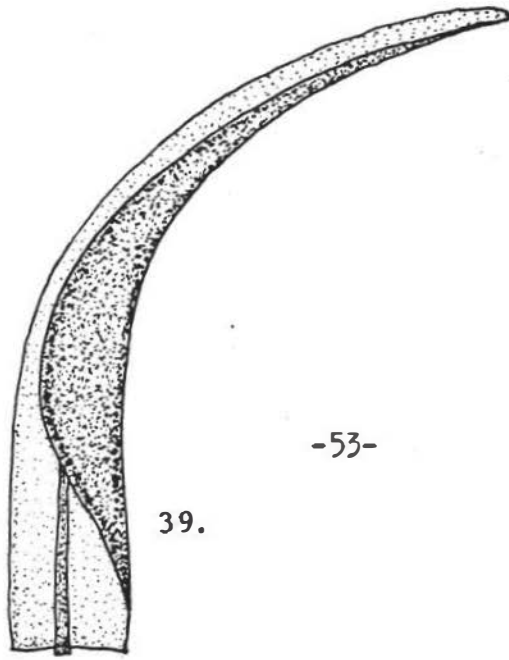
- 39. Leaves, 34 X
- 40. Habit, 15 X
- 41. Capsule, 15 X



40.



41.



39.

FAMILY: GRIMMIACEAE

Grimmia apocarpa Hedw.

Plants in small, loose, dark, olive-green or blackish tufts; stems erect or ascending, branched, 1-3.5 cm. high; leaves erect when dry, erect-spreading when moist, ovate-lanceolate, 1.3-2 mm. long, ending in a rather short, hyaline, denticulate awn but often muticous; costa distinct, projecting as a ridge along back of leaf, disappearing in or below apex, not papillose on back; apices subobtuse, hyaline, hair points short, somewhat spinulose, up to 0.5 mm. or more in length, sometimes absent; margins entire throughout or serrate above, revolute nearly to the apex; cells of leaves subopaque to opaque, with thick, sinuose walls; the upper cells roundish quadrate, 5-10 μ in diameter, the basal cells subquadrate and short-rectangular.

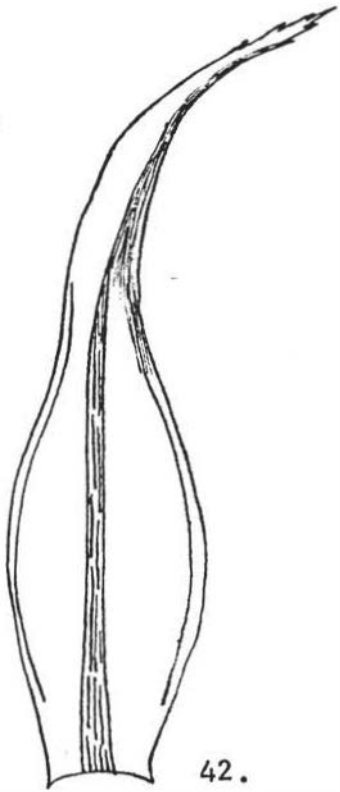
Autoicous; perichaetial leaves erect, conspicuously enlarged, broadly ovate; seta erect, about 0.5 mm. long; capsule immersed, broadly ellipsoidal, about 1 mm. long, smooth, dark reddish-brown; annulus none; operculum red, low conic, with short beak; stomata few, at extreme base of urn; peristome single, teeth reddish-brown, lanceolate, finely papillose; spores 7-12 μ in diameter, finely roughened, reddish-brown; calyptra mitrate, lobed, 0.75 mm. long.

Comments:

Grimmia apocarpa Hedw. is a rock growing moss, growing especially in dry, exposed places. This species is best recognized by its small, rigid, often blackish or dark-brown to olive-green tufts or cushions.

Grimmia apocarpa Hedw.

- 42. Leaf, 34 X
- 43. Habit, 5 X
- 44. Capsule and calyptra, 34 X



42.



43.



44.

FAMILY: GRIMMIACEAE

Grimmia laevigata (Brid.) Brid.

Plants in loose, irregular, flat, wide tufts, gray or dull gray-green; stems erect, about 1 cm. high; leaves crowded, imbricate, closely appressed when dry, lower leaves small, ownless, upper leaves gradually larger, oblong-oval, ovate-lanceolate, or rather broadly ovate, 1-1.5 mm. long, bistratose except at base; apices abruptly ending in hyaline hair-point as long as or longer than rest of leaf, usually strongly spinulose; costa narrow, flat, ending in apex of leaf; margins plane, not thickened; upper leaf cells regular, rounded quadrate, 6-9 μ in diameter, chlorophyllose, basal cells quadrate, the cells near costa subhyaline to hyaline, elongated or rectangular.

Dioicous; perichaetial leaves larger than leaves of stems, with a longer hair point; seta erect, 1-2 mm. long, straight, yellowish; capsule emergent to exserted, erect or nearly so; operculum conical with short beak; urn ovoid or ellipsoid, 1-2 mm. long, smooth when dry with narrow mouth, reddish-brown; annulus of 3 rows of cells; peristome single, teeth 16, reddish brown, papillose, irregularly 2-3 cleft to approximate middle; spores 12-16 μ in diameter, yellow, smooth; calyptra mitrate, lobed at base.

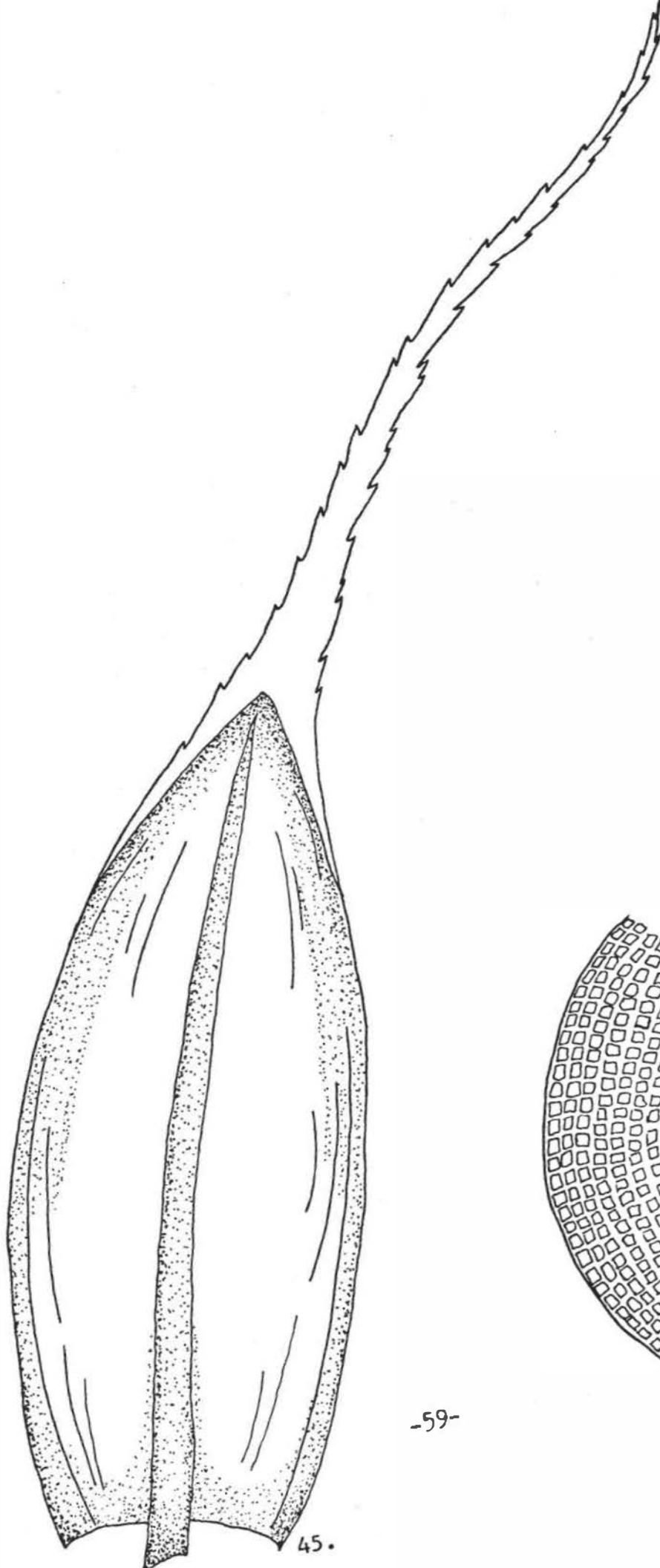
Comments:

Grimmia laevigata (Brid.) Brid. prefers to grow on dry rocks and boulders often exposed to direct sunlight.

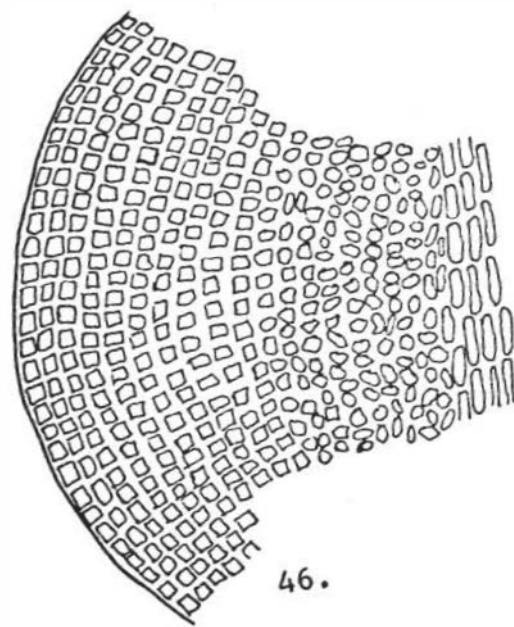
Grimmia laevigata (Brid.) Brid.

45. Leaf, 25 X

46. Basal cells, 430 X



45.



46.

FAMILY: GRIMMIACEAE

Hedwigia ciliata Hedw.

Plants in loose, dull mats, green, yellow or brown and usually grayish green or glaucous when dry, often hoary; stems spreading, irregularly branched, 2-10 cm. long, with rhizoids, not stoloniferous; leaves erect or appressed, with apices recurved, spreading when moist, 1.3-3 mm. long, broadly oblong-ovate; apices acute to acuminate, subhyaline to hyaline; margins revolute, irregularly spinulose-serrate at apex, not bordered; cells of leaves with thick walls, oblong, subquadrate, quadrate, rectangular, the median and upper cells papillose, in longitudinal rows, rounded or hexagonal, lower ones elongated, those near the base quadrate, the median basal cells linear, smooth, yellow, incrassate, and porose, the basal marginal cells green and quadrate in many rows.

Autoicous; perichaetial leaves larger, conspicuously ciliate toward the apex, seta very short, erect, yellowish; capsule immersed, erect, sessile; operculum broad, convex, sometimes mammillate; urn globose, or ovoid, wide-mouthed, 0.5-1 mm. in diameter; annulus none; peristome none; spores 20-32 μ in diameter, yellowish, obscurely angled, finely papillose; calyptra small, conic-mitrate, hairy.

Comments:

Hedwigia ciliata Hedw. prefers dry sandstone rock or granite boulders. This species often appears hoary, because of the colorless tips of the leaves. The specific name refers to the long, jointed,

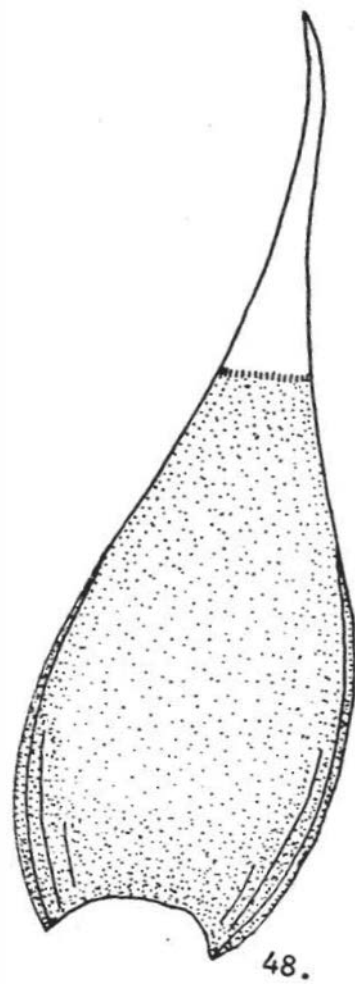
hyaline cells fringing the perichaetial leaves.

The genus was named for Johannes Hedwig, a professor of botany at Leipeig, whose Species Muscorum of 1801 is accepted as the starting point for the nomenclature of mosses.

Hedwigia ciliata Hedw.

47. Habit, 5 X

48. Leaf, 34 X



FAMILY: BUXBAUMIACEAE

Diphyscium foliosum (Hedw.) Mohr

Small plants in rigid, dark-green or brownish, densely clustered mats or tufts; stems very short, 1-2 mm. high; leaves strongly curled and contorted when dry, erect-spreading when moist, 1.3-4 mm. long, broadly ligulate or lingulate; apices obtuse or rounded-obtuse and cuculate; margins erect, crenate above the base; costa broad and flattened, ending near apex; upper cells rounded-quadrate to hexagonal, 6.5-7.5 μ wide, mammillose-bulging on both surfaces, basal cells rectangular, hyaline, smooth.

Dioicous; perichaetial leaves very large, up to 8 mm. long, with costa long-excurrent as a brown, spinulose awn, cells with notably thickened cross-walls; seta very short; capsule nearly sessile, greenish-yellow, becoming golden brown when mature, inclined, immersed in or slightly emergent from the perichaetial leaves; operculum 1.1-2 mm. long, acute conical, curved; urn conic-ovoid, ventricose, very unsymmetric, about 3-6 mm. long; annulus present, small; stomata numerous, at base of urn; peristome teeth very short and irregular, the outer peristome lacking or rudimentary, the endostome whitish and conspicuous; spores 9-10 μ in diameter, finely papillose; calyptra conic, acute, covering operculum.

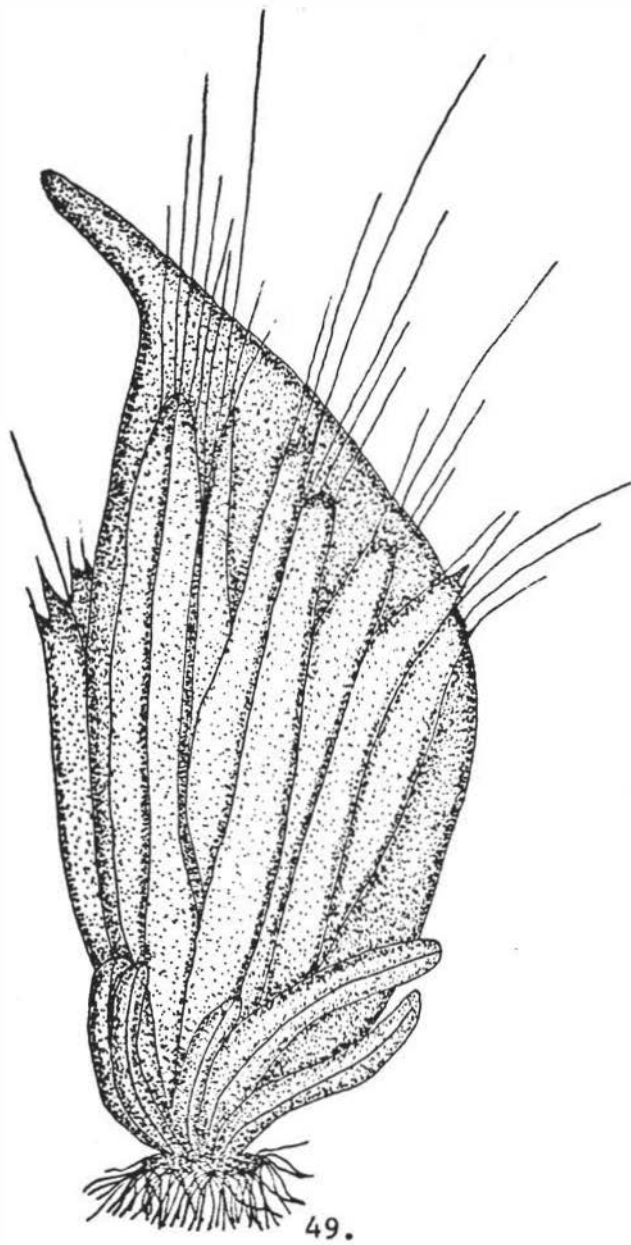
Comments:

Diphyscium foliosum (Hedw.) Mohr grows on shaded sandstone bluffs and rock walls along streams. This moss is often called the Wheat-grain Moss because of its resemblance to a grain of wheat in size and appearance. Diphyscium foliosum has also been called

the Powder Gun Moss, because pelting rain drops cause spores to be emitted in little puffs to a distance of at least two inches.

Diphyscium foliosum (Hedw.) Mohr

49. Habit, 15 X



FAMILY: ORTHOTRICHACEAE

Orthotrichum strangulatum Beauv.

Plants in tufts or in small, dense cushions to scattered, dark green to almost black except young tips; stems erect 3-5 mm. high; leaves closely imbricate, the upper ovate-lanceolate to oblong-lanceolate, 1.8-2.3 mm. long; apices blunt or bluntly acute; costa strong, ending at or near the apex; upper cells 9-13 μ wide, irregularly rounded, moderately incrassate, low-papillose, median cells rounded-hexagonal, dense, papillose; margins revolute nearly to apex, entire.

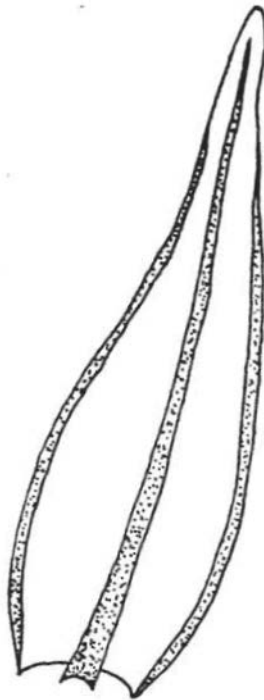
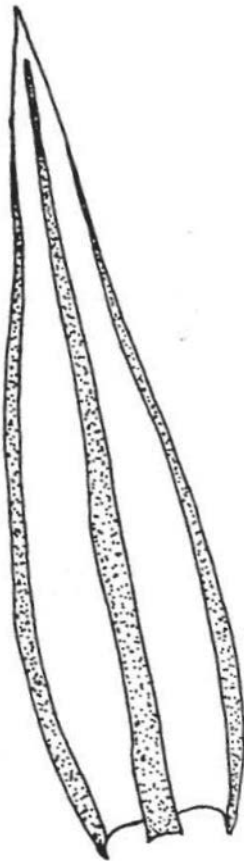
Autoicous; perichaetial leaves only slightly differentiated; seta short, about 0.3 mm. long; capsules emergent, 1.5-2 mm. long, oblong-cylindric when moist, narrower, deeply 8-ribbed, strongly strangulate and tapered to the seta when dry, chestnut-brown; operculum conic, rostellate; urn oblong-cylindric to subcylindric, tapering gradually to seta, stomata few, immersed; annulus present; peristome double, teeth 16, papillose, reflexed when dry; spores 11-18 μ in diameter, papillose; calyptra mitrate, hairy with many erect, papillose hairs.

Comments:

Orthotrichum strangulatum Beauv. prefers to grow on dry rock often exposed to direct sunlight. The conspicuously strangulate capsules with straight, heavy, chestnut-brown ridges which become contiguous on complete contraction are distinctive. The generic name refers to the straight or upright hairs on the calyptra.

Orthotrichum strangulatum Beauv.

- 50. Habit, 5 X
- 51. Dried capsule, 15 X
- 52. Leaves, 25 X



FAMILY: AULACOMNIACEAE

Aulacomnium heterostichum (Hedw.) BSG.

Plants in rather loose, green or sometimes yellowish-green tufts; stems 1.5-4 cm. high; leaves dense, erect, concave and slightly undulate, often inclined in one direction, not altered on drying, oblong or oblong-ovate, not decurrent; apices subacute or obtuse and apiculate; costa ending somewhat below apex; leaves 2-3.5 mm. long; margins plane or narrowly recurved below the middle, coarsely serrate in upper 1/2 or more; median cells of leaves rounded-quadrate or ellipsoidal, 8-16 μ in diameter, smooth.

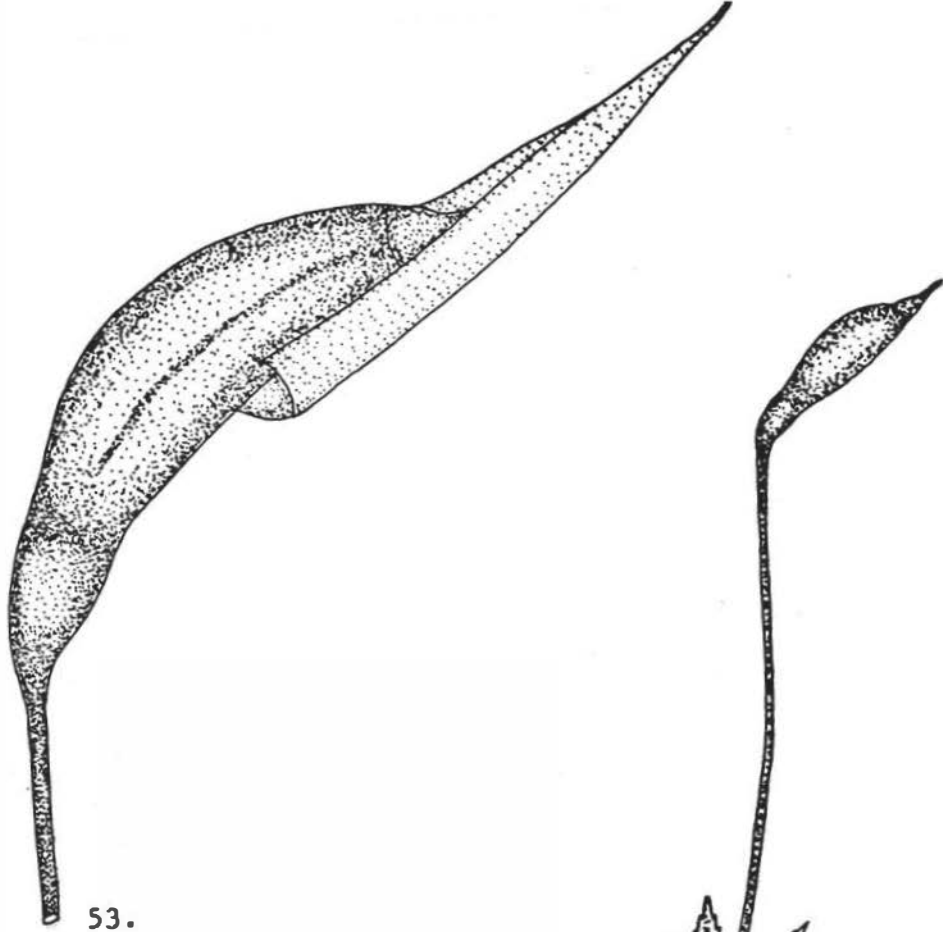
Autoicous; seta erect, 8-17 mm. long, reddish-brown; capsule suberect or inclined, somewhat curved, 2.5-3.5 mm. long; annulus present; operculum obliquely rostrate; urn arcuate, 6-8 striate, tapering below into a short neck; peristome teeth pale yellow, hyaline and minutely papillose in upper 1/3; cilia of endostome 2-3 between the segments; spores 9-15 μ in diameter, very finely papillose; calyptra cucullate, long rostrate.

Comments:

Aulacomnium heterostichum (Hedw.) BSG. is often associated with Bartramia pomiformis on moist, shaded banks or on humus covering the rock. The generic name is from the Greek Aucabulus, meaning to have furrowed lobes, referring to the ribbed capsules of this moss.

Aulacomnium heterostichum (Hedw.) BSG.

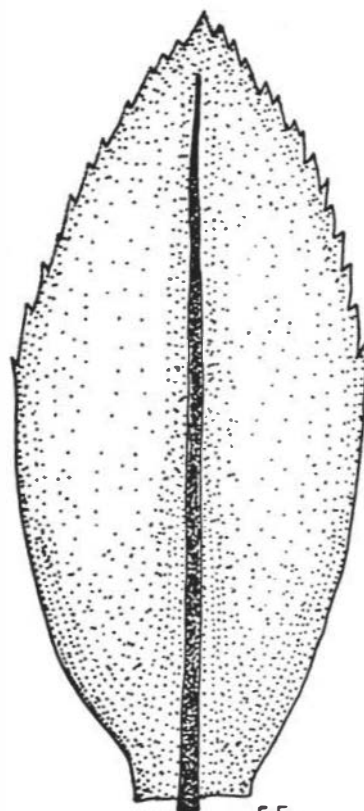
- 53. Capsule and calyptra, 30 X
- 54. Habit, 4 X
- 55. Leaf, 30 X



53.



54.



55.

FAMILY: BARTRAMIACEAE

Bartramia pomiformis Hedw.

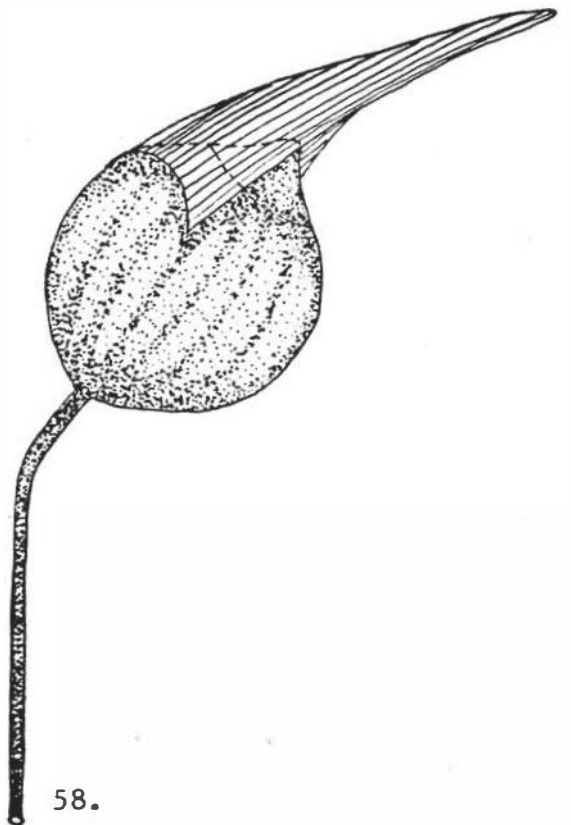
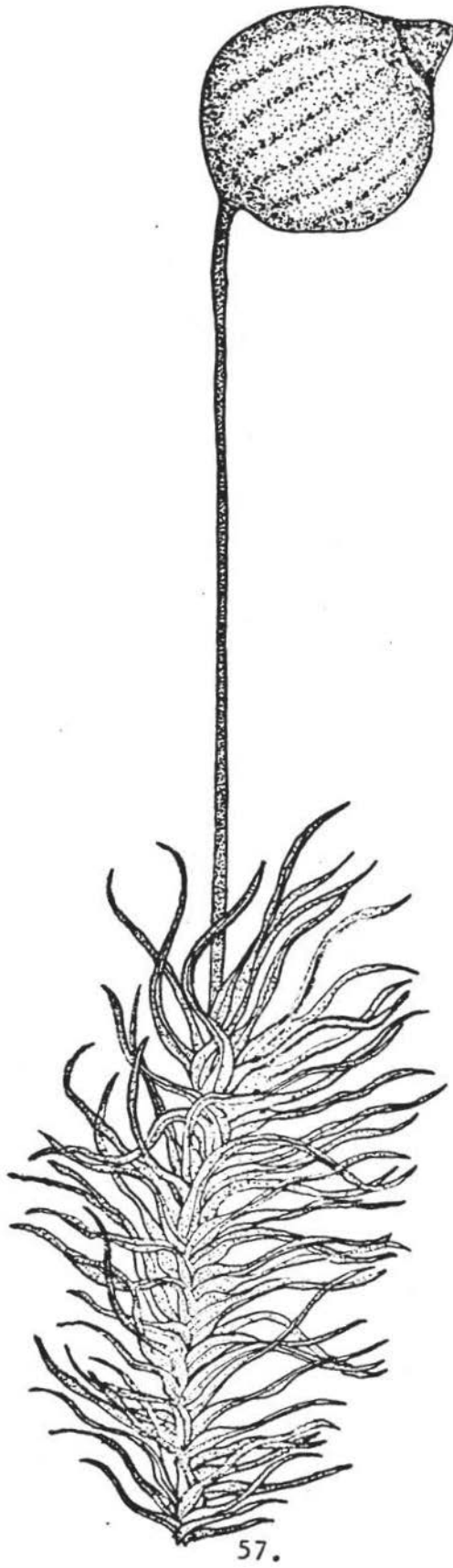
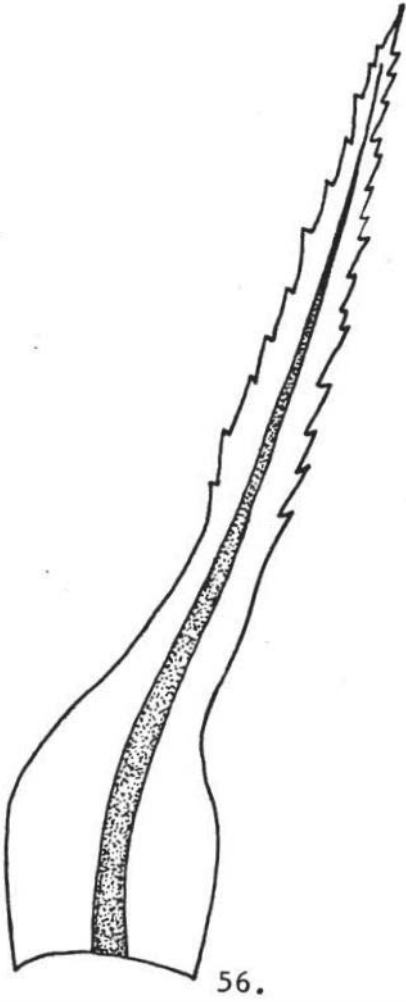
Plants in rather dense, soft green or yellowish, sometimes glaucous-green tufts, tomentose below; stems erect, 2-6 cm. high; leaves crowded, flexuose or crisped when dry, spreading when moist, 4-5.5 mm. long, linear-lanceolate; costa stout, shortly excurrent; apices acuminate; margins revolute almost to the apex, bistratose and doubly serrate; median cells rounded-quadrate, incrassate, unipapillose on both surfaces; upper cells subquadrate and short-rectangular; synoicous or autoicous; the perigonia next to the perichaetia, perichaetial leaves filiform; seta erect, 8-20 mm. long, reddish-brown; capsule 1.5-2 mm. long, inclined to horizontal; reddish to dark chestnut-brown; operculum convex, short; urn globose to ovoid, deeply furrowed when dry; annulus none; peristome double, teeth inserted somewhat below the mouth, lanceolate, red-brown, about 0.4 mm. long, very finely papillose, strongly barred at back; endostome pale-brown, shorter than the teeth, consisting of a well-developed basal membrane and broad segments; spores 20-24 μ in diameter, brown, coarsely papillose; calyptra small, cucullate, smooth.

Comments:

Bartramia pomiformis Hedw. is called the Apple Moss because of its apple-like shaped capsules. This moss is often associated with Aulacomnium heterostichum and Dicranum scoparium growing on sandstone banks and humus covering the rock. In addition to the apple-like capsules, the slender, crisped and contorted leaves with papillose cells are distinctive.

Bartramia pomiformis Hedw.

- 56. Leaf, 34 X
- 57. Habit, 11 X
- 58. Capsule and calyptra, 11 X



FAMILY: BRYACEAE

Bryum pseudotriquetrum (Hedw.) Schw.

Plants relatively robust, in dense, dark-green or reddish tufts; stems erect, 1.5-5 or sometimes 11 cm. high; simple or forked, rigid, red, tomentose below; leaves rather remote below, somewhat larger and more crowded above, twisted and contorted when dry, erect-spreading when moist, 2.5-4 mm. long, oblong-lanceolate, ovate-lanceolate, or elliptic; apices acute and often cuspidate, to acuminate; narrow at insertion and narrowly but distinctly decurrent; margins entire or serrulate near apex, revolute to apex or nearly so; costa reddish throughout, or red below and brownish above, strong, percurrent to briefly excurrent; upper cells oblong-hexagonal, up to 50 μ long and 15 μ wide, with walls moderately thick, marginal cells yellowish pellucid, linear, in 3-4 rows, forming a distinct border, basal cells red, rectangular, inflated.

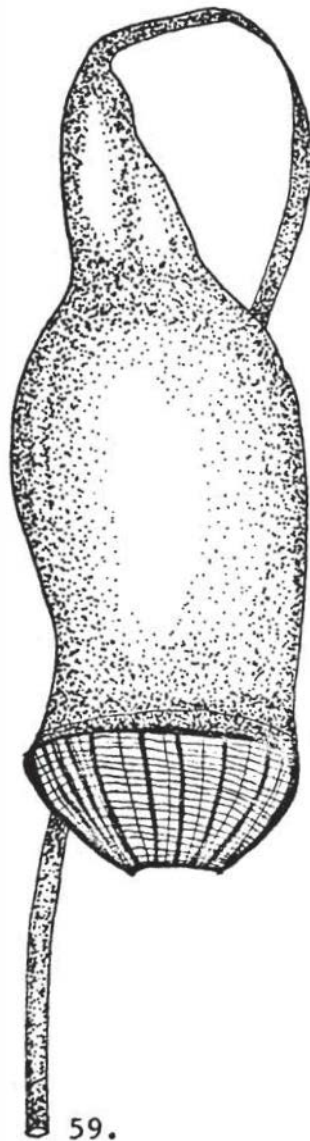
Dioicous or synoicous; seta erect, 25-60 mm. long, dark-red below, red-brown above, or dark purple; capsules inclined to pendulous; brown to red-brown, glossy; operculum large, convex-conic, apiculate; urn clavate to subcylindric, 3-4 mm. long, slightly contracted below mouth when dry and empty, generally straight, tapering into a neck sometimes as long as the urn; annulus wide, deciduous; peristome double, teeth brownish-yellow below, subhyaline and papillose above, cilia 3, strongly appendiculate; spores 11-20 μ in diameter, brownish-yellow, smooth or faintly roughened; calyptra small, cucullate, fugacious.

Comments:

Bryum pseudotriquetrum (Hedw.) Schw. is not common, growing on very moist shaded sandstone bluffs, or on wet soil covering the rock. This moss is called the Red-Stemmed Bryum, and is easy to recognize in a sterile state because of the red stems and obviously decurrent leaves with rather broad points.

Bryum pseudotriquetrum (Hedw.) Schw.

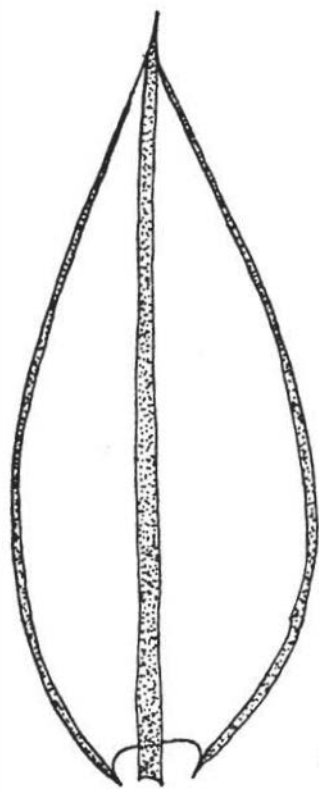
- 59. Capsule, 15 X
- 60. Habit, 3 X
- 61. Leaves, 12 X



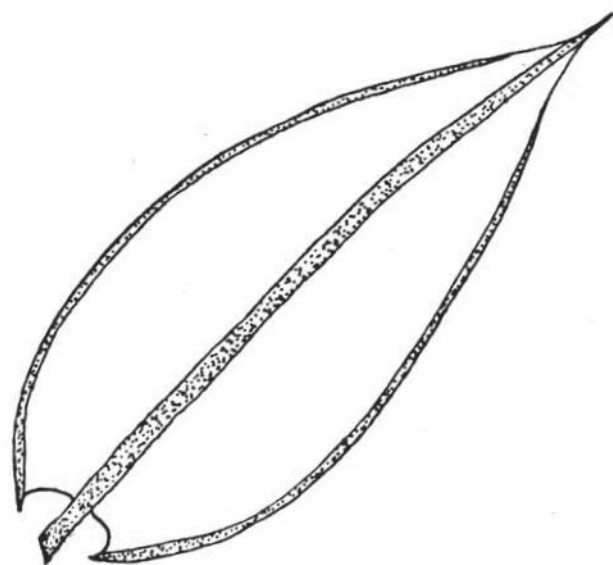
59.



60.



61.



FAMILY: BRYACEAE

Leptobryum pyriforme (Hedw.) Schimp.

Plants in loose or close tufts, light yellowish-green, glossy; stems erect, 0.5-1.5 cm. high, black, flexuose, rarely producing minute, reddish, club-like hairs in axils of upper leaves; leaves flexuose when dry, erect-spreading to spreading when moist, the upper larger than the lower, very long and narrow, linear-setaceous, 4-5 mm. long, sometimes denticulate at the tip; costa usually broad, slightly excurrent; margins plane, entire below, denticulate above, median cells narrowly linear, thin-walled.

Synoicous or sometimes dioicous; seta erect, flexuose, 10-45 mm. long, red-yellow or orange-brown; capsule inclined, horizontal or pendulous, 1.7-2.5 mm. long, brown or yellow-brown; annulus wide; operculum convex to hemisphaerical; urn pyriform with a long, narrow neck, the neck much contracted upon drying and wrinkled with age, peristome double, teeth yellow, linear-lanceolate; cilia of endostome in 3's or occasionally in 4's; spores 9-13 μ in diameter, smooth or very finely papillose, brownish; calyptra small, cucullate, long-rostrate, fugacious.

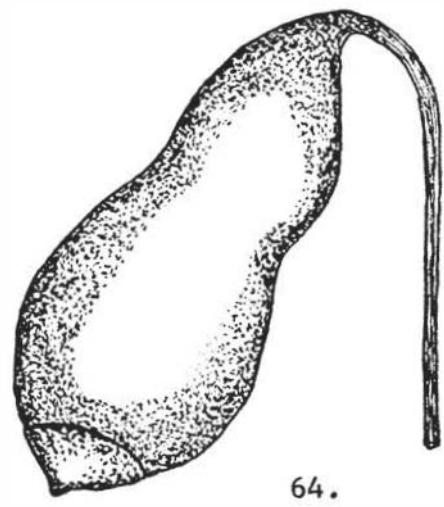
Comments:

Leptobryum pyriforme (Hedw.) Schimp. grows on moist, shaded vertical sandstone walls, and occasionally on rocks near water.

The generic name means slender or delicate Bryum, referring to its narrow, almost setaceous leaves. Other names for this moss are Pear Moss, referring to the pear-shaped capsules, and Long Neck Moss, because of the long, narrow neck of the capsule.

Leptobryum pyriforme (Hedw.) Schimp.

- 62. Leaves, 34 X
- 63. Habit, 11 X
- 64. Capsule, 34 X



FAMILY: BRYACEAE

Pohlia nutans (Hedw.) Lindb.

Plants in loose tufts, dark-green or yellowish-green; stems erect, 1-4 cm. high, simple or with basal or lateral branches, red; leaves longer and more crowded above, 2-4 mm. long, erect, twisted around the stem when dry, ovate-lanceolate to linear-lanceolate; costa strong, subpercurrent; apices acuminate; margins slightly reflexed, denticulate toward apex, entire below; median cells of leaves linear, long-rhomboidal or elongate-hexagonal, up to 70μ long and 10μ wide.

Paroicous; antheridia generally in pairs in axils of perichaetial leaves; seta erect, often curved, 14-33 mm. long, rarely 50 mm. long, orange-yellow to reddish-brown; capsule horizontal to pendulous, yellowish, light-brown or orange-brown; annulus biseriate; operculum convex-conic, acute or bluntly apiculate, urn pyriform, oblong or obovate, symmetrical to slightly curved, 2.5-4 mm. long, the neck about $1/3$ its length, sometimes contracted when dry; peristome double, teeth yellowish-orange, up to 0.54 mm. long, abruptly narrowed above; endostome segments perforate or gaping, cilia 2-3, well-developed; nodulose or somewhat appendiculate; spores $16-21\mu$ in diameter, yellowish, finely papillose; calyptra cucullate, generally smooth and fugacious.

Comments:

Pohlia nutans (Hedw.) Lindb. often grows on moist, shaded sandstone banks and vertical walls, occasionally on soil in rock

crivices. This species is often called the Nodding-Pohlia, referring to the pendulous capsules, which, along with the orange setae, help in field identification.

Pohlia nutans (Hedw.) Lindb.

- 65. Leaf, 34 X
- 66. Habit, 10 X



FAMILY: MNIACEAE

Mnium affine Bland.

Plants moderately large, in green or yellow-green loose or dense tufts; fertile stems erect or nearly so, 3-9 cm. high, reddish-brown, usually brown-tomentose below; sterile stems spreading to deflexed, often elongate, prostrate or arched; leaves erect, or spreading and strongly contorted when dry, spreading when moist, 5-8 mm. long, elliptic to oblong-obovate, bases subdecurrent to decurrent; apices acute to rounded-obtuse, abruptly cuspidate-pointed; margins toothed nearly to base, by teeth of 1-3 cells, or teeth often short and blunt and sometimes nearly lacking; costa strong, percurrent to excurrent as a cuspidate point; upper median cells nearly hexagonal or oblong-hexagonal, 22-35 μ long and 33-65 μ wide, walls thin to moderately thick-walled, somewhat thickened at corners.

Dioicous; seta erect, single, or rarely in 2's or 3's from the same perichaetium, reddish, 18-50 mm. long; capsule pendulous, brownish-yellow; operculum apiculate; urn oblong-cylindric, narrowed to a short and inconspicuous neck, 3-5 mm. long; stomata somewhat immersed in the short neck; annulus biseriate; peristome double, teeth 16, inner peristome orange to brown, outer peristome yellow, densely papillose, cilia in groups of 2-4, often longer than teeth; spores 26-29 μ in diameter, yellowish, finely papillose; calyptra cucullate, inconspicuous, fugacious.

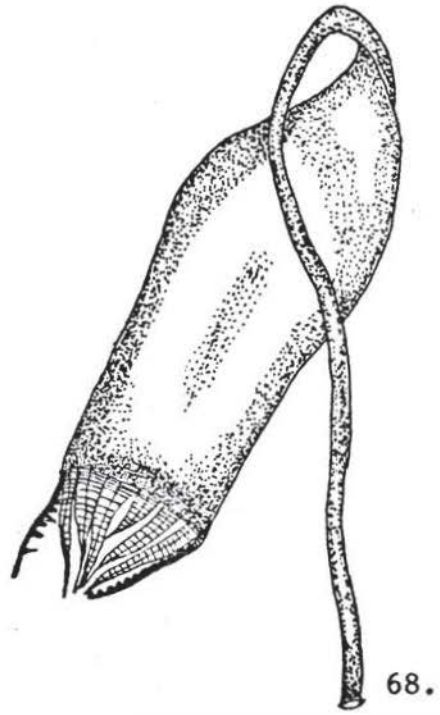
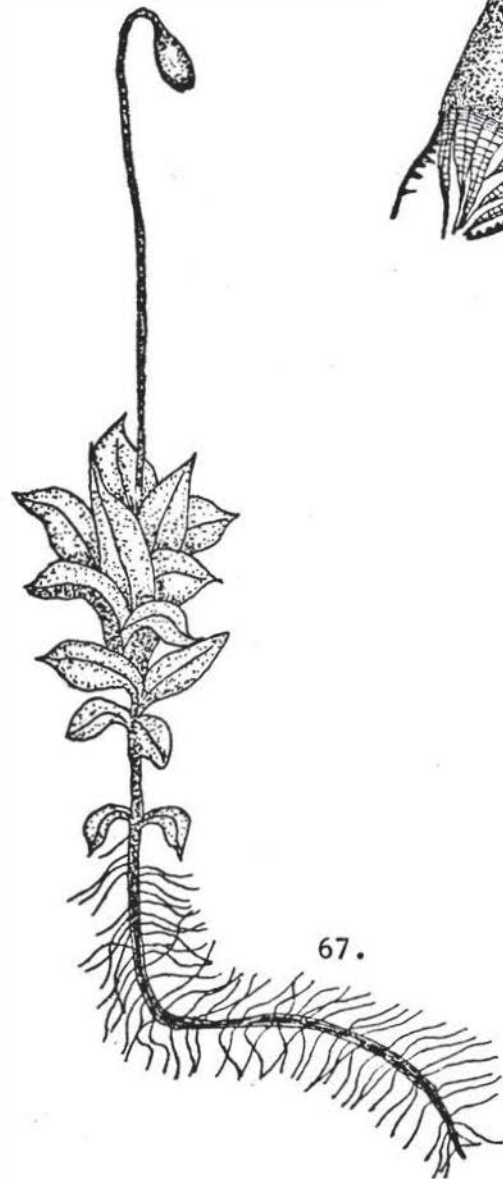
Comments:

Mnium affine Bland. prefers shaded sandstone bluffs and moist walls, or wet soil covering rock.

Mnium affine Bland.

67. Habit, 2 X

68. Capsule, 10 X



FAMILY: MNIACEAE

Mnium cuspidatum Hedw.

Plants in dark or yellowish-green, loose mats or tufts; fertile stems 2-3.5 cm. high, green, radiculose below; sterile stems spreading or horizontal, often stoloniform-attenuate, \pm complanate-foliate; leaves erect or erect-spreading, strongly crisped and contorted when dry, about 3-4.5 mm. long, obovate to oblong-oval, bases narrow, decurrent; costa percurrent or shortly excurrent, greenish; apex acute to cuspidate-acuminate; margins serrate in upper 1/2-2/3 with single 1-celled acute teeth; median cells of leaves collenchymateous, irregularly rounded hexagonal, 20-25 μ in diameter, with larger cells intermingled;

Synoicous; inner perichaetial leaves small and lanceolate, seta single, erect, 10-33 mm. long, reddish-yellow or brownish; capsule 2-3 mm. long, subpendulous to pendulous, yellowish or brownish; operculum convex-conic; urn oblong to oval, neck very short; stomata immersed, in the neck; annulus of 3-4 rows of cells, deciduous in pieces; peristome double, teeth 16, yellow, about 0.8 mm. long, papillose; endostome brown, the basal membrane fenestrate, cilia in groups of 2-4; spores 24-31 μ in diameter, yellow, finely papillose; calyptra.

Comments:

Mnium cuspidatum Hedw. grows on moist, shaded sandstone banks and vertical walls. This is one of the commonest mosses in eastern North America, and is easily recognized by its obovate leaves that

are crisped when dry, and toothed only above the middle along with barrel-shaped capsules. In a sterile condition, it consists of spreading stotons with leaves loosely arranged in two rows.

Mnium cuspidatum Hedw.

69. Habit, 4 X



69.

FAMILY: MNIACEAE

Mnium punctatum Hedw.

Plants large, in loose, pale to dark green, often reddish tufts; stems erect, reddish, mostly simple, 2.5-7.5 cm. high, often tomentose; leaves distant, except in terminal rosettes, erect or spreading, moderately contorted when dry, spreading when moist, 3.5-9 mm. long, elliptic or obovate from a narrow base; costa strong below, percurrent, ending in apiculus, or ceasing just below tip; apices broadly rounded to slightly emarginate, usually apiculate; margins entire, border purplish-brown or reddish, of 1-5 rows of elongated, incrassate cells; median cells of leaves irregularly hexagonal, rounded-hexagonal, elongate-hexagonal, or nearly rhomboidal, 50-150 μ long and 30-50 μ wide; thin-walled to fairly thick-walled, pitted.

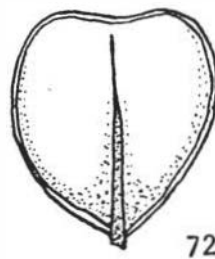
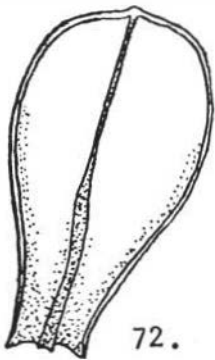
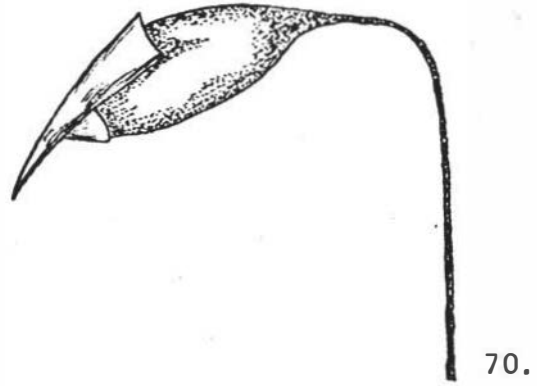
Dioicous; inner perichaetial leaves small and lanceolate; seta single, rarely paired, erect, purplish-brown or reddish, rather glossy, 2-4 cm. long; capsule horizontal to pendulous, yellowish or brownish with age; operculum acutely rostrate; urn ovoid, oval-oblong, or oblong-cylindric, up to 5 mm. long, slightly furrowed when dry, neck short and inconspicuous; stomata completely immersed, in the neck; annulus of 1-3 rows of cells; peristome double, teeth 16, yellowish-brown, about 0.6 mm. long, papillose; endostome brown, with cilia cohering, in 2's or 3's; spores 29-41 μ in diameter, brownish-yellow, finely papillose.

Comments:

Mnium punctatum Hedw. prefers wet rock along creeks, or rocks in brooks and streams, but often is collected on moist shaded banks along creeks. This species is characterized by broad, emarginate leaves often ending in a short, stout spiculus.

Mnium punctatum Hedw.

- 70. Capsule and calyptra, 5 X
- 71. Habit, 2 X
- 72. Leaves, 10 X



FAMILY: HYPNACEAE

Brachythecium salebrosum (Web. & Mohr) BSG.

Plants in loose, somewhat shiny, dark green yellowish-green or brownish mats; stems prostrate, creeping or somewhat ascending, freely branched; stem leaves 2-2.5 mm. long; branch leaves loosely erect or erect-spreading, sometimes loosely falcate, strongly plicate, 1.8-2 mm. long, lanceolate or ovate-lanceolate; costa about $\frac{2}{3}$ the leaf length; apices gradually long-acuminate; margins irregularly recurved below, serrulate above; median cells linear-flexuose, 8-12:1, basal cells shorter, broader, alar cells numerous, subquadrate and rather thin-walled, not opaque.

Autoicous; perichaetial leaves slenderly long-acuminate from a sheathing base; seta erect, 10-27 mm. long, yellowish or reddish, smooth; capsule reddish-brown, oblong-cylindric, inclined to horizontal; operculum conic, acute or apiculate, about 1 mm. long; urn oblong-ovoid, usually curved, 2-2.5 mm. long; annulus poorly developed in 1 row; peristome double, perfect, teeth 16, chestnut-brown, cilia of endostome usually in 2's; spores 13-18 μ in diameter, brownish, finely papillose; calyptra narrowly cucullate, extending to middle of urn, fugacious.

Comments:

Brachythecium salebrosum (Web. & Mohr) BSG is a very common moss in disturbed places such as lawns, but may also be found growing on shaded rock walls and bases of tree trunks. The generic

name means short capsule, referring to the relatively short and thick capsule in most species of Brachythecium, as compared with other Hypnum-like mosses.

Brachythecium salebrosum (Web. & Mohr.) BSG.

- 73. Habit, 2 X
- 74. Habit, 5 X
- 75. Capsule, 10 X
- 76. Leaf, 10 X



73.



74.



75.



76.

FAMILY: HYPNACEAE

Cirriphyllum boscii (Schwaeger) Grout

Plants in golden-green, golden-yellow, or brownish-yellow mats, up to 20 ft. across; stems prostrate, 8-10 cm. long, often with stolons; leaves erect-spreading when moist, loosely imbricate when dry, broadly ovate, very concave, 2-2.5 mm. long, 1.4-1.5 mm. wide; bases decurrent with angles subauriculate; costa double and short, or single and extending $1/2$ - $3/4$ the length of the leaf; apices rounded and abruptly acuminate, the acumination filiform and twisted, margins serrate to middle of leaf; median leaf cells narrowly linear-rhomboidal, basal cells shorter; alar cells not differentiated.

Dioicous; perichaetial leaves abruptly or gradually narrowed to a long, slender acumen from a sheathing base; seta 1.5-3 cm. long, reddish-brown, smooth; capsule 3-4 mm. long, unsymmetric to arcuate, gradually narrowing into seta, brown; operculum conic, long rostrate, about $1/2$ length of urn; urn oblong, about 2 mm. long, contracted below mouth when dry and empty; annulus of 2 rows of cells; peristome perfect, teeth 16, cilia 2-3, nodose; spores about 16μ in diameter, nearly smooth; calyptra narrowly cucullate, smooth, fugacious.

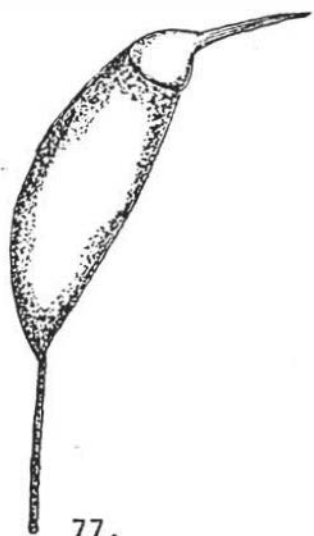
Comments:

Cirriphyllum boscii (Schwaeger) Grout is often growing on moist, shaded sandstone banks. This moss is often called the Spoon-Leaved Moss, because it is stoutly julaceous, with broad,

smoothly concave, cucullate leaves which end abruptly in a short, twisted point. The genus name refers to the hair-pointed leaves.

Cirriphyllum boscii (Schwaeger) Grout

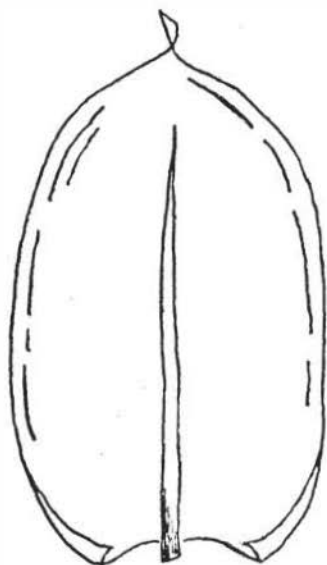
- 77. Capsule, 10 X
- 78. Habit, 4 X
- 79. Leaves, 15 X



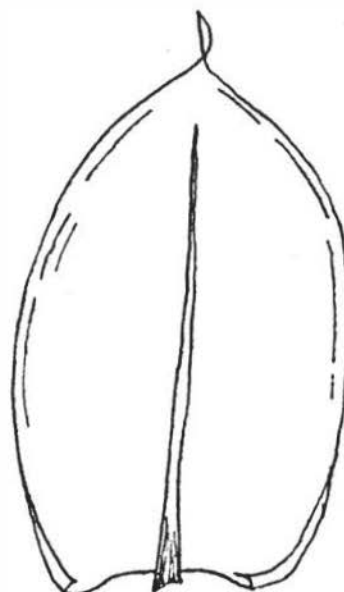
77.



78.



79.



FAMILY: HYPNACEAE

Climacium americanum Brid.

Plants robust, loosely caespitose, yellowish-green, glossy; primary stems prostrate, secondary stems erect, 3-9, rarely 13 cm. high, irregularly divided into a cluster of spreading to ascending, foliated, terete branches, 1.5-2.5 cm. long, tips acute to obtuse; paraphyllia filiform, conspicuous on branches and secondary stems; branch leaves erect, oblong-ovate to subcordate, 2-3 mm. long; margins coarsely toothed above, \pm decurrent and auriculate at base; costa ending just below apex; apices bluntly acute to short-acuminate; median cells of leaves oblong-hexagonal, 5-9:1, alar cells quadrate along margin to diamond-shaped elsewhere.

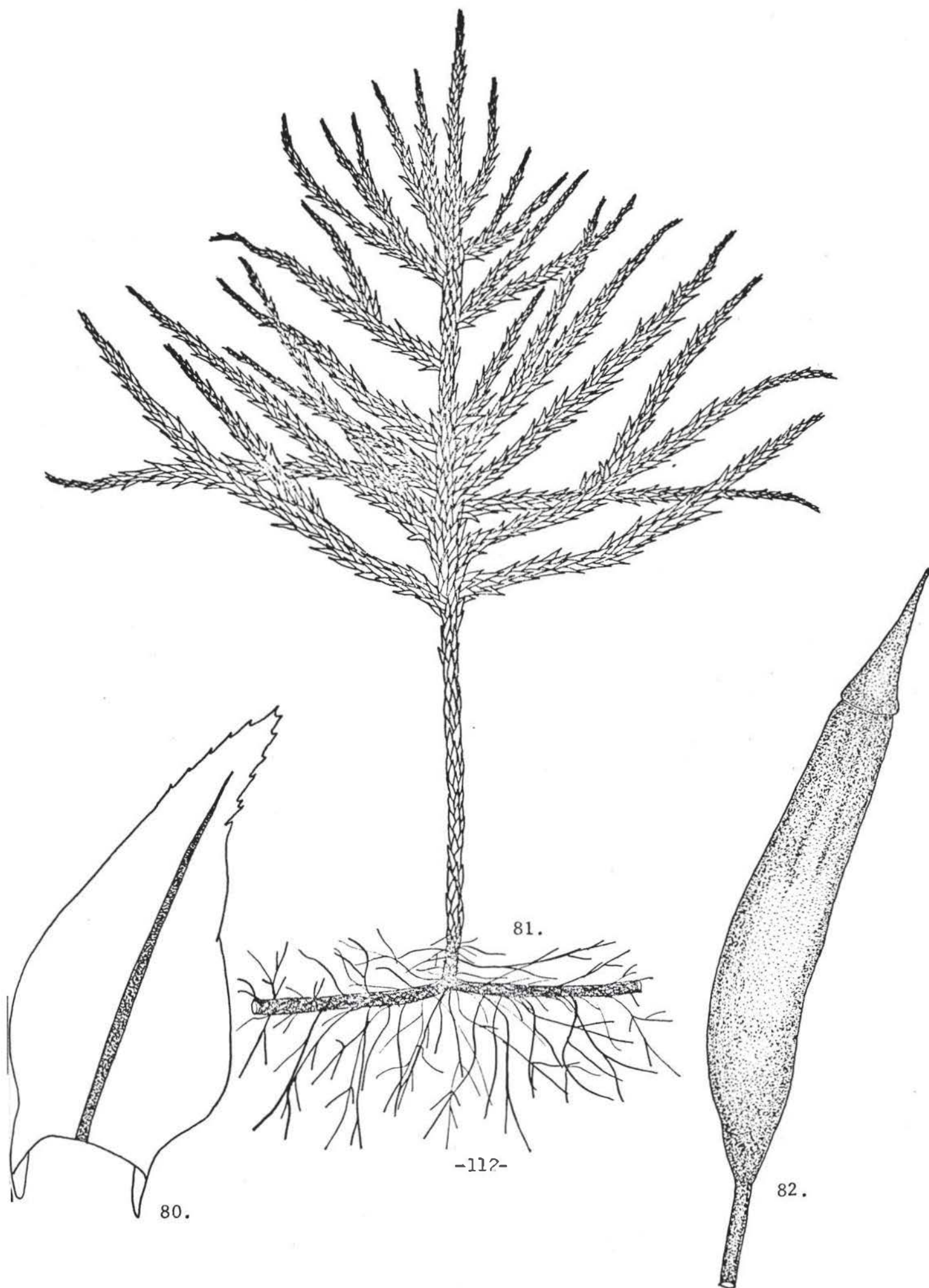
Dioicous; perichaetial leaves long-sheathing, perichaetia on secondary stems and bases of branches; seta erect, 18-44 mm. long, chestnut-brown; capsule 3.5-6 mm. long, oblong-cylindric, operculum conic-rostrate, about 1 mm. long; urn nearly smooth, slightly contracted below mouth when dry and empty; annulus none; peristome double, teeth 16, dark brown, papillose; endostome yellowish, with a very low basal membrane and linear segments papillose in vertical lines, split along the median line; spores 13-22 μ in diameter, minutely papillose; calyptra enclosing the entire capsule, somewhat twisted.

Comments:

Climacium americanum Brid. is commonly called the Tree Moss, or Christmas Tree Moss because of its typically erect and dendroid habit. The generic name refers to the broad perforations of the endostome segments which suggest a ladder. Climacium is not common, but may be found growing on moist shaded sandstone banks, often growing with Thuidium delicatulum (Hedw.) BSG.

Climacium americanum Brid.

- 80. Leaf, 30 X
- 81. Habit, 4 X
- 82. Capsule, 30 X



FAMILY: HYPNACEAE

Hypnum imponens Hedw.

Plants robust, in yellow-brown, to yellow-green mats; stems prostrate to suberect, creeping, regularly pinnate, red-brown; paraphyllia numerous, polymorphous, often lobed or dentate; stem leaves about 2 mm. long, falcate-secund, concave, broadly oblong-triangular to oblong-lanceolate; costa none or very short and double; apices curving toward substratum, slenderly acuminate; margins serrulate in upper half, usually reflexed near base; median leaf cells linear-flexuose, about 6 μ wide, 6-15:1, basal cells wider, thick-walled, often orange-brown in color, alar cells subquadrate to quadrate, incrassate and somewhat opaque in rather conspicuous groups, usually about 4-6 cells along the margin, below them a few somewhat inflated, quadrate, clear or orange-brown cells; branch leaves smaller with fewer quadrate alar cells.

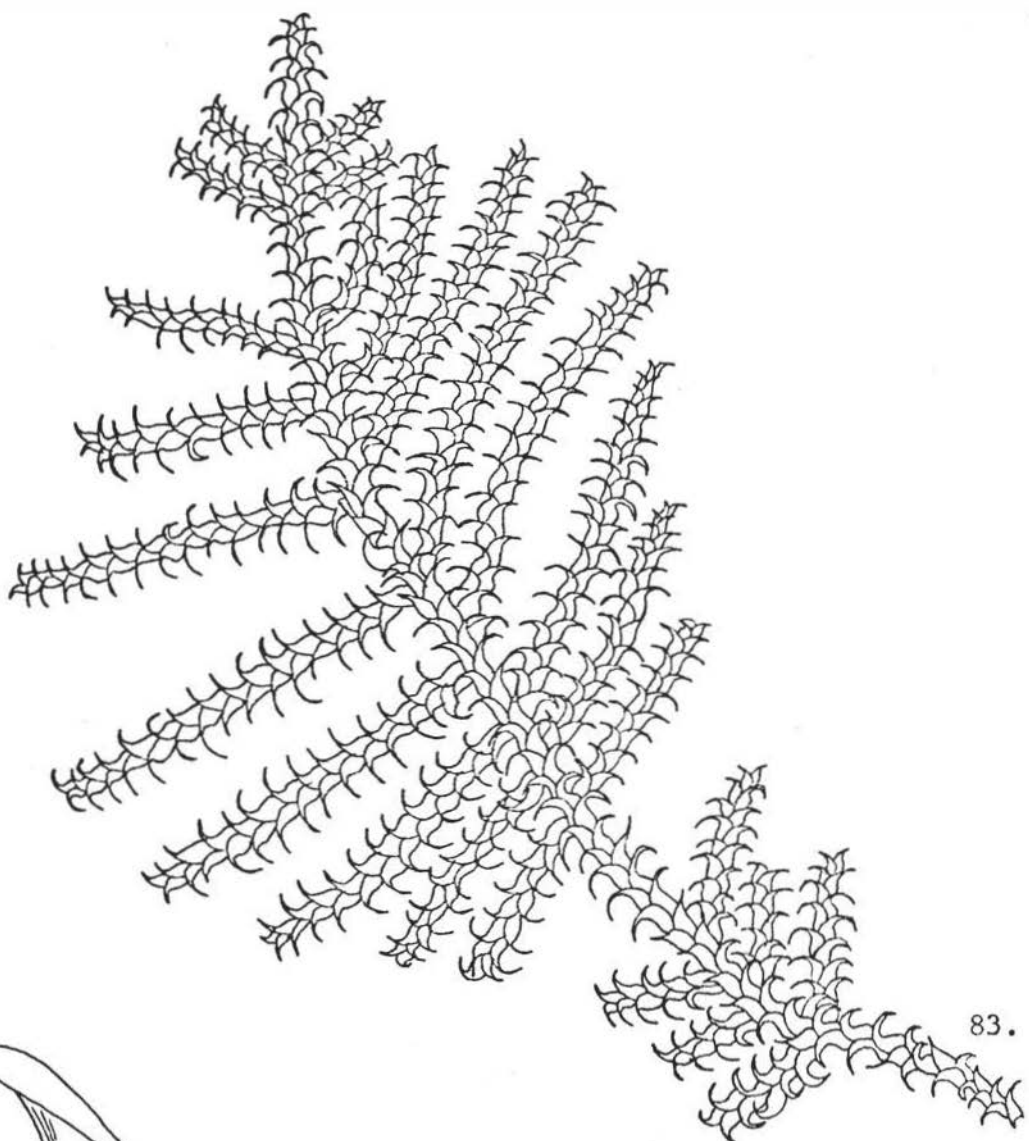
Dioicous; perichaetial leaves slenderly long-acuminate, somewhat striate; seta 10-35 mm. long, red; capsule 2.3-3 mm. long, suberect; operculum conic, long apiculate to rostellate, beak often oblique; urn cylindric, symmetric or slightly curved, smooth, red-brown; annulus none, or narrow and poorly differentiated; peristome double, perfect, teeth 16, golden brown; endostome yellowish, cilia single; spores 15-22 μ in diameter, yellowish, very finely papillose; calyptra narrowly cucullate, glabrous, fugacious.

Comments:

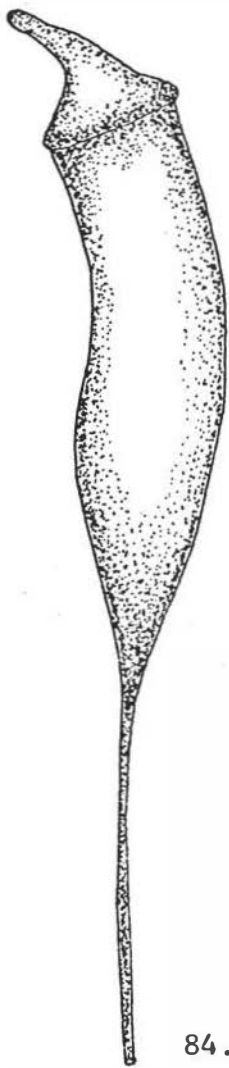
Hypnum imponens Hedw. typically grows on rotten logs, but very often is found growing on moist shaded rock walls and sandstone banks. The generic name is derived from a Greek work for sleep, applied in antiquity to some epiphytic mosses or lichens used as medicinal ingredients, and such mosses were used for stuffing pillows, thus inducing sleep.

Hypnum imponens Hedw.

- 83. Habit, 4 X
- 84. Capsule, 30 X
- 85. Leaves, 30 X



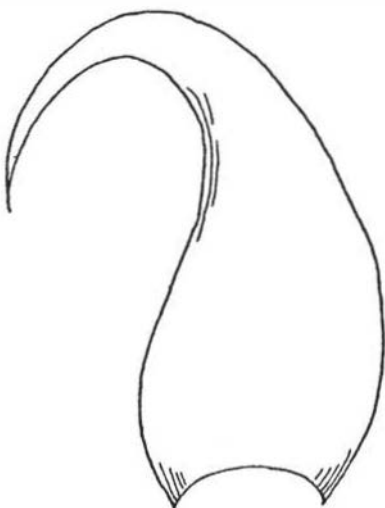
83.



84.



85.



FAMILY: HYPNACEAE

Plagiothecium denticulatum (Hedw.) B.S.G.

Plants moderately robust, in flattened, light to dark green, shiny mats; stems prostrate, irregularly divided; branches prostrate to ascending; leaves usually crowded and overlapping, complanate, rarely somewhat contorted when dry, 1.5-3 mm. long, asymmetric, oblong-ovate, bases slightly narrowed to insertion, strongly decurrent; costa none to short and double, occasionally forking with one branch reaching $1/3$ to $1/2$ the length of the leaf; apices broadly acute to acuminate; margins plane or revolute nearly to apex, entire, occasionally serrulate near apex; median cells of leaves linear to linear-rhomboidal, 10-15 μ wide; basal cells broader and shorter, subrectangular, pellucid; alar cells subrectangular, slightly inflated, hyaline, strongly decurrent, not forming distinct auricles.

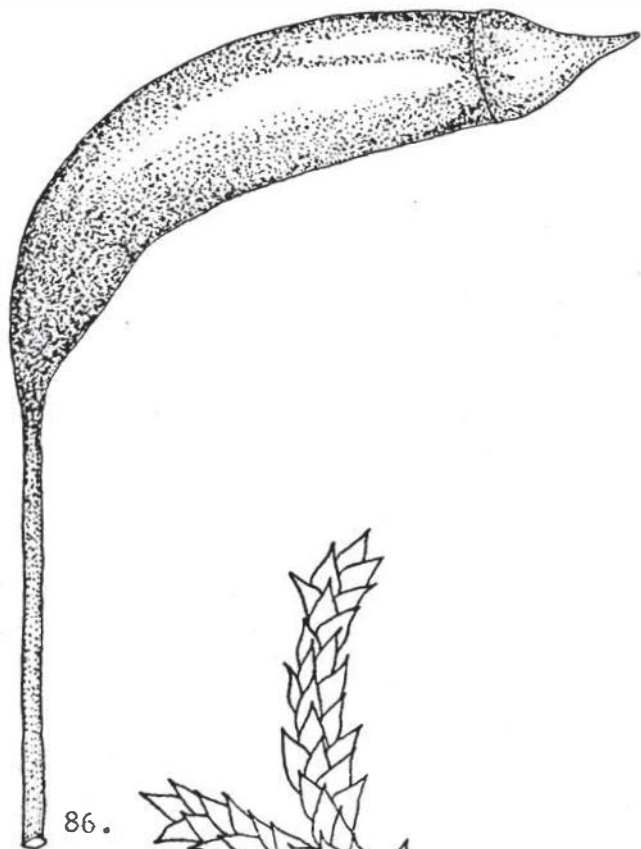
Autoicous, or sometimes dioicous; perichaetial leaves moderately enlarged, sheathing; seta 15-30 μ long; capsule suberect to horizontal, usually smooth when dry; operculum long conic to short rostrate, about $1/3$ as long as urn; urn oblong-cylindric, curved and asymmetric, 1.5-3 mm. long, with a distinct neck, contracted below the mouth when dry and empty; annulus deciduous, of 2-3 rows of cells; peristome perfect, teeth 16, hyaline and papillose above, yellowish below, cilia 2-3, nodose; spores 9-11 μ in diameter, smooth, yellowish or green; calyptra small, split on one side, whitish to straw colored, smooth, fugacious.

Comments:

Plagiothecium denticulatum (Hedw.) BSG. grows on moist, shaded, vertical sandstone walls and ledges. This moss is best recognized by its shiny, crowded, complanate leaves with a few small and irregular teeth at the very tips, with the leaf margins being distinctly recurved. The genus name refers to the obliquely inclined capsules.

Plagiothecium denticulatum (Hedw.) B.S.G.

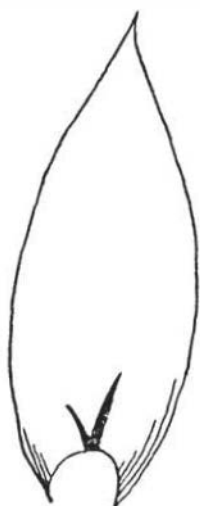
- 86. Capsule, 34 X
- 87. Habit, 10 X
- 88. Leaves, 34 X
- 89. Alar cells, 430 X



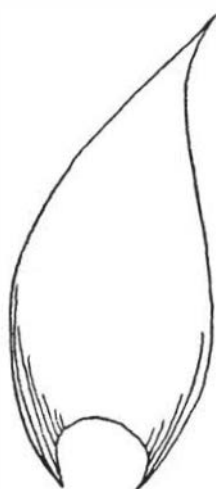
86.



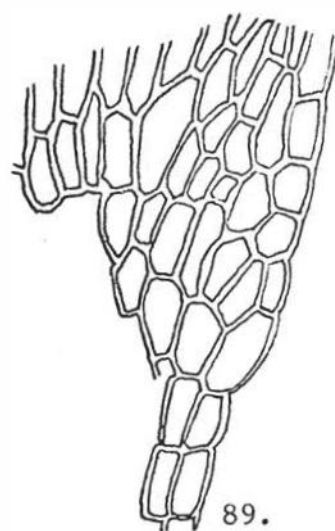
87.



88.



-120-



89.

FAMILY: HYPNACEAE

Platygyrium repens (Brid.) B.S.G.

Plants in rather small, flat, dark-yellowish golden or bluish-green, glossy mats; stems prostrate, creeping, freely branched, 2-6 cm. long; branches ascending, often somewhat curved, short, usually bearing numerous small brood-branches in axils of upper leaves; leaves closely embricate when dry, erect spreading when moist, oblong-ovate to oblong-lanceolate, concave, 0.8-1.3 mm. long, decurrent; costa short and double or lacking; apices acute to acuminate; margins entire or nearly so, reflexed in lower 1/2-2/3; median cells linear to linear-rhomboidal, 6-10:1; alar cells quadrate, extending up margin of leaf, 8-12 cells in marginal row, with 1 inflated outer basal cell.

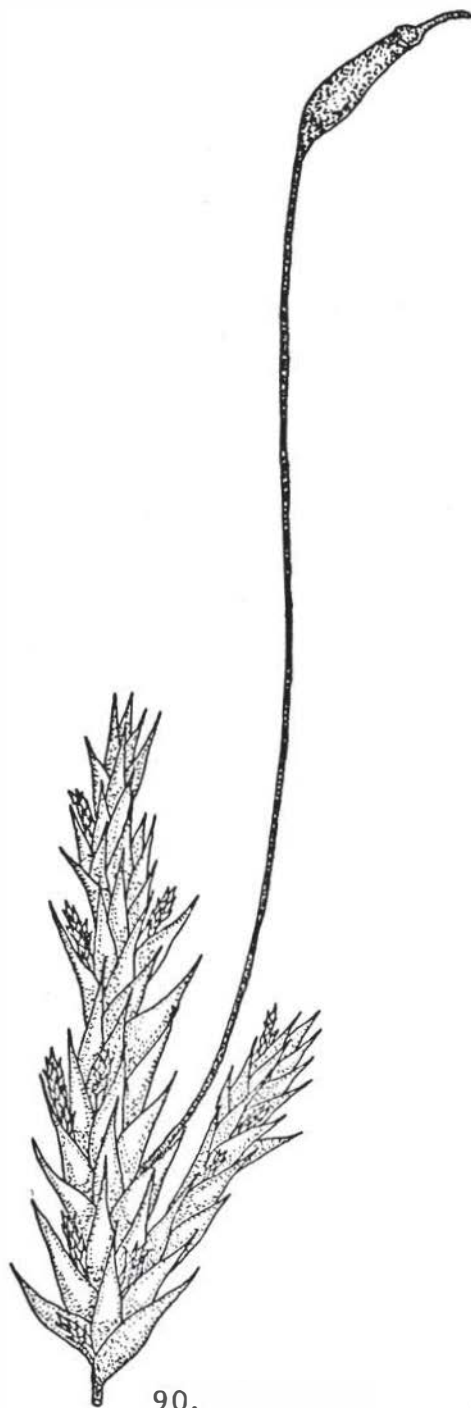
Dioicous; perichaetial leaves somewhat elongate, with \pm spreading tips; seta erect, 10-25 mm. long, chestnut-brown, smooth; capsule erect, 1.5-2.2 mm. long, cylindric 0.6-0.75 mm. in diameter; operculum long conic, obliquely conic-rostrate, about 0.6 mm. long, approximately 2/5 length of urn; urn erect, symmetric, oblong-cylindric, 1-2.5 mm. long, chestnut-brown; annulus of 2-4 rows of cells, persistent; peristome teeth 16, inserted near the mouth, linear-lanceolate, yellow-brown with hyaline margins, transversely striolate-papillose at base; endostome yellowish, smooth, about 2/3 as long as teeth, carinately split, cilia none; spores 11-15 μ in diameter, finely papillose, yellowish-brown; calyptra cucullate, long, glabrous.

Comments:

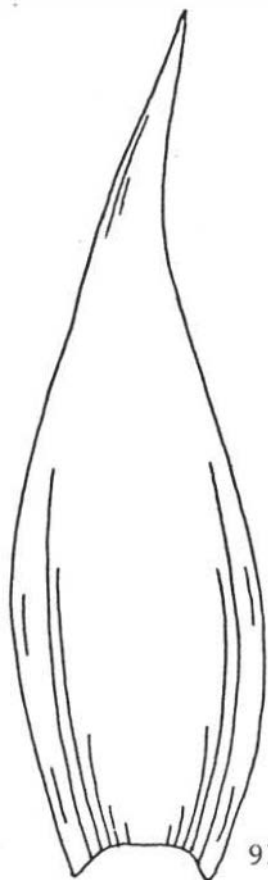
Platygyrium repens (Brid.) BSG. is common on decorticated logs, stumps, and bark of trees, and is rarely found growing on sandstone walls. The erect capsules, axillary clusters of small bud-like gemmae, and bluish-green or blackish-green color help in identification of this moss.

Platygyruim repens (Brid.) B.S.G.

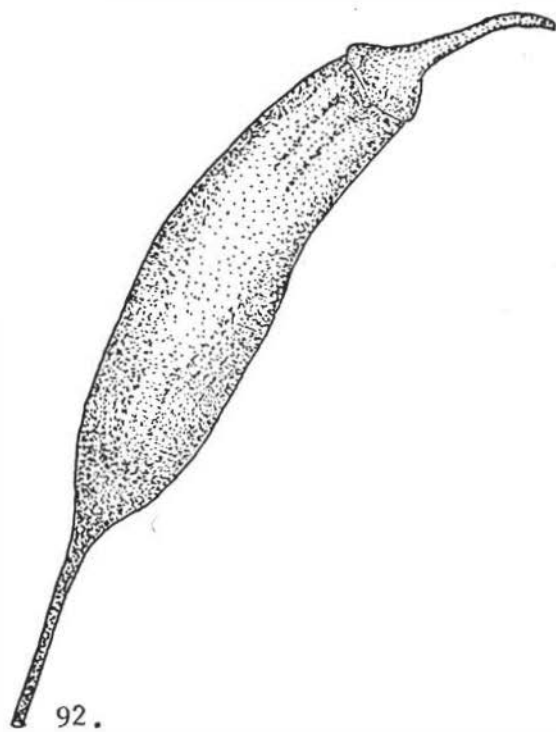
- 90. Habit with brood bodies, 10 X
- 91. Leaf, 30 X
- 92. Capsule, 25 X



90.



91.



92.

FAMILY: HYPNACEAE

Taxiphyllum deplanatum (Bruch & Schimp. ex. Sull.) Fl.

Plants small, in dense or loose, light-green or yellow, glossy mats; stems prostrate, 2-3 cm. long, irregularly divided, branches usually prostrate; pseudoparaphyllia lanceolate; leaves crowded and overlapping, spreading and strongly complanate, not plicate, 1.5-2 mm. long, ovate-lanceolate or occasionally oblong-lanceolate; costa absent to faint, very short and double; apices slenderly acuminate, narrowly acute; margins plane, or narrowly recurved near the base, serrulate nearly to base, sharply serrate above; median cells of leaves linear-flexuose, about 7 μ wide, alar cells short rectangular to quadrate, not clearly differentiated, 3-6 along margin.

Dioicous; perichaetial leaves erect at base, with slender, somewhat spreading acumina; seta 6-16 mm. long; capsule 1.3-2 mm. long, erect to somewhat inclined; operculum conic-convex to long-rostrate; urn oval-oblong, often arcuate, slightly plicate and constricted below the mouth and at the neck when dry; stomata in the neck; annulus none; peristome double, teeth 16; exostome teeth with non-perforate segments and cilia in 2's; spores about 11-13 μ in diameter, nearly smooth; calyptra small, split on one side, whitish to straw-colored, smooth, fugacious.

Comments:

Taxiphyllum deplanatum (Bruch & Schimp. ex. Sull.) Fl. is recognized by the crowded and overlapping, spreading and complanate

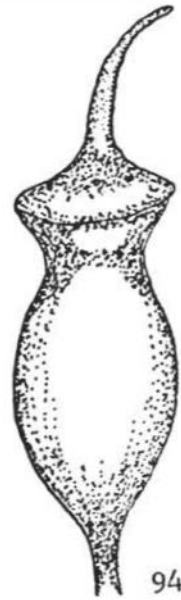
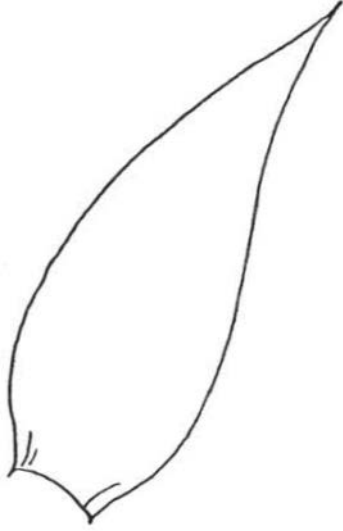
leaves with narrow points. The genus name refers to the apparent arrangement of leaves in two rows. This moss is found growing on moist, shaded sandstone walls and often under the ledges of the wall.

Taxiphyllum deplanatum
(Bruch. & Schimp. ex. Sull.) Fl.

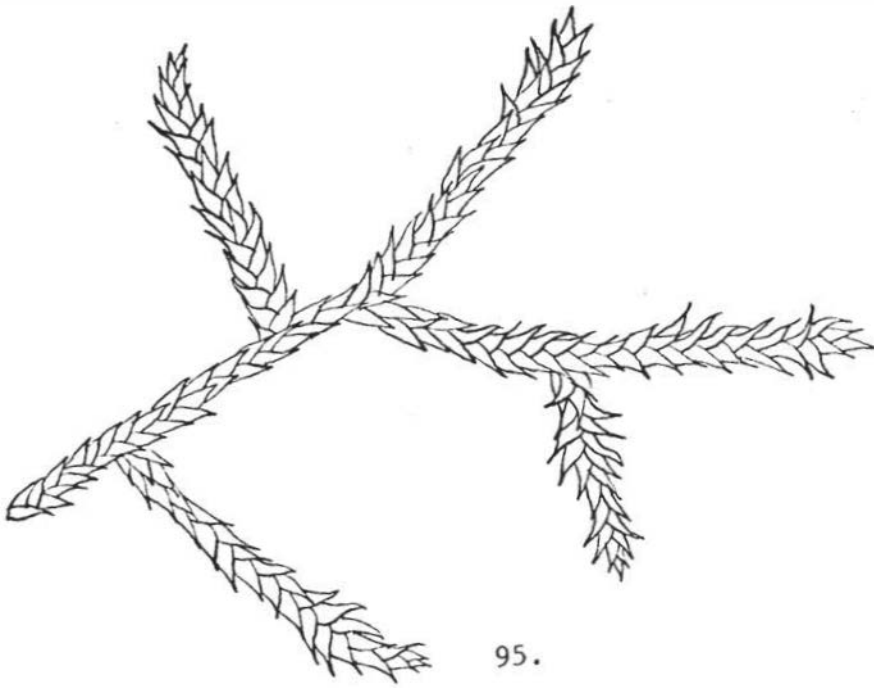
- 93. Leaves, 30 X
- 94. Capsule, 30 X
- 95. Habit, 10 X



93.



94.



95.

FAMILY: LESKEACEAE

Anomodon attenuatus (Hedw.) Hueben

Plants in loose, dark-green or yellowish to brown mats; primary stems prostrate, secondary stems loosely spreading; branches usually decurved when dry, tapered or flagelliform-attenuate; leaves of stems appressed when dry, erect-spreading when moist, broadly ovate at base, gradually or abruptly narrowed to an upper sublingulate portion, concave, 0.8-1.8 mm. long; costa strong, ending near or well below the apex; margins entire below, slightly serrulate near apiculus; median cells of leaves obscure, densely papillose on both surfaces, irregularly hexagonal to rounded quadrate, 6-9 μ in diameter.

Dioicous; perichaetial leaves moderately elongate, sheathing at base; seta 13-27 mm. long; capsule erect, 2-3 mm. long; annulus narrow or lacking; operculum long rostrate, 1.2-1.3 mm. long; urn cylindric, smooth, light brown, stomata at extreme base; peristome double, teeth 16, yellow, narrowly lanceolate; spores 10-15 μ in diameter, very finely papillose, greenish-brown; calyptra cucullate, smooth.

Comments:

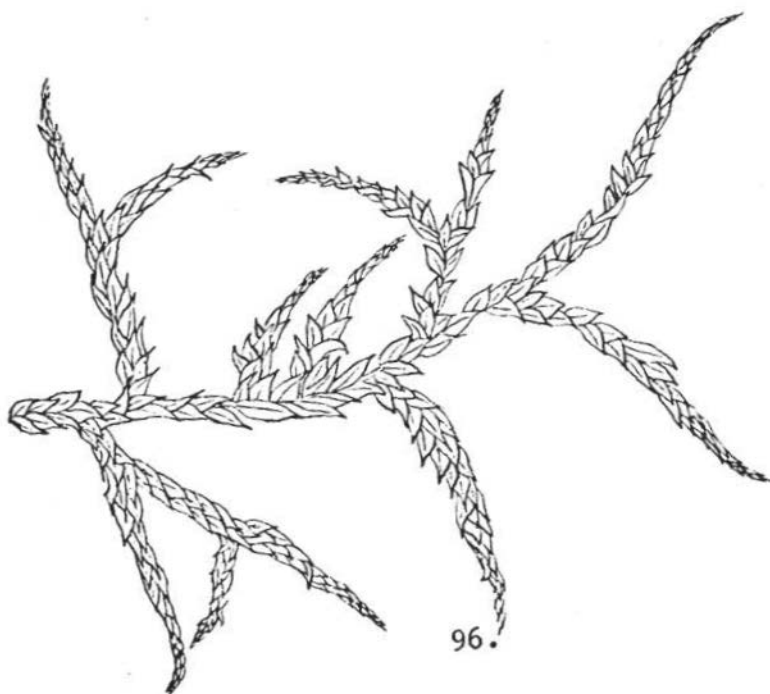
Anomodon attenuatus (Hedw.) Hueben grows on moist, shaded sandstone bluffs and vertical walls. This common species is best recognized by its drooping, tapered branches and broadly short-pointed leaves. The generic name Anomodon means an abnormal peristome.

It was based on a faulty interpretation of the segments of the endostome as arising between the teeth of the exostome, rather than from an inner peristomal layer as in other mosses with a double peristome.

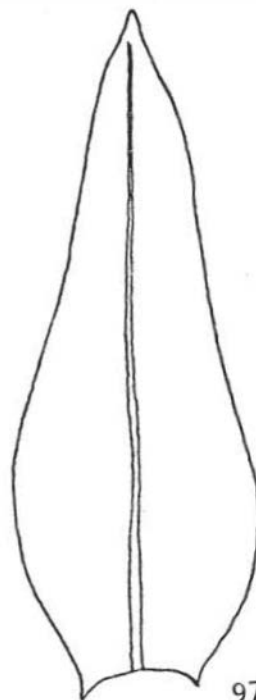
Anomodon attenuatus (Hedw.) Hueben

96. Habit, 8 X

97. Leaf, 18 X



96.



97.

FAMILY: LESKEACEAE

Anomodon minor (Hedw.) Fűrnr.

Plants in loose, dark or glaucous-green to yellowish or brownish-green mats; primary stems prostrate, secondary stems erect or nearly so, up to 4 cm. long, foliated stems and branches slightly flattened; leaves of secondary stems somewhat 2-ranked, appressed when dry, spreading when moist, broadly oblong from a broadly ovate base, rounded or round-obtuse at apex, up to 2 mm. long, slightly decurrent; costa strong, disappearing well below apex; margins entire; majority of cells of leaves densely papillose on both surfaces, median cells rounded-hexagonal, 9-12 μ in diameter, basal medial cells elongate, usually not papillose.

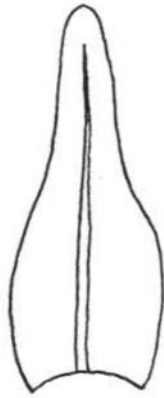
Dioicous; perichaetial leaves sheathing at base; seta erect, 6-12 mm. long, pale-yellow; capsule 1.5-2.3 mm. long; annulus of 2 rows of cells; operculum 0.6-0.9 mm. long, obliquely rostrate; urn oblong-cylindric or cylindric, brown, smooth; stomata none; peristome teeth 16, narrowly linear-lanceolate, about 0.32 mm. long, hyaline, faintly papillose; spores 11-15 μ in diameter, brownish, finely papillose or smooth; calyptra cucullate, smooth, extending to middle of urn or farther.

Comments:

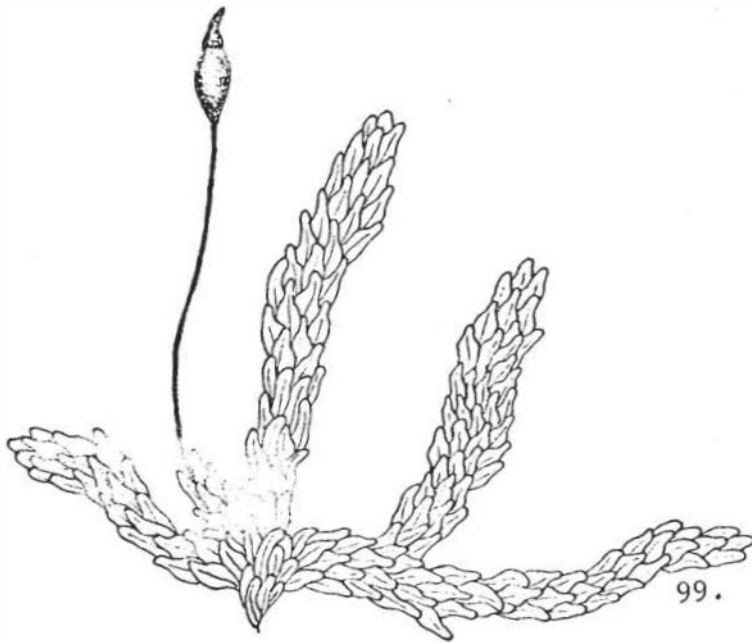
Anomodon minor (Hedw.) Fűrnr. often grows on moist, shaded or partially shaded sandstone bluffs, occasionally on calcareous rock. This species is often called the Blunt-leaved Anomodon, referring to its broadly lingulate, rounded-obtuse leaf tips.

Anomodon minor (Hedw.) Fűrnr.

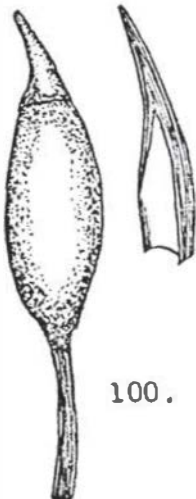
- 98. Leaves, 15 X
- 99. Habit, 10 X
- 100. Capsule and calyptra, 15 X



98.



99.



100.

FAMILY: LESKEACEAE

Thuidium delicatulum (Hedw.) BSG.

Rather robust, green or yellowish plants, fern-like in appearance; stems prostrate, 3-8 cm. long, spreading or arched-ascending, 2-3 pinnate; paraphyllia very abundant, especially on stems and primary branches, polymorphous but mostly filiform and branched, majority of papillae at center of cell or approximately so, the apical cells with 2-4 papillae; stem leaves appressed when dry, erect-spreading when moist, 0.6-1.4 mm. long, triangular-ovate, gradually or abruptly narrowed to a broad acumen, plicate; costa strong at base, gradually becoming thinner toward tip of leaf; ending well below apex; margins papillose-serrulate, revolute; cells irregularly oblong-hexagonal, 6-10 x 8-12 μ , coarsely unipapillose at back; leaves of primary branches erect-spreading, smaller, up to 0.5 mm. long, ovate, acute; costa 1/2-2/3 the leaf length; cells 6-8 x 8-12 μ , rhombic, incrassate, stoutly unipapillose, the papillae 4-12 μ high, the apical cell pluripapillose; leaves of secondary branches similar, but smaller.

Dioicous; perichaetial leaves up to 5 mm. long, ciliates below, denticulate above; seta 2-3 cm. long, reddish, smooth; capsule yellowish to chestnut-brown, suberect and moderately curved to horizontal and arcuate; operculum long-rostrate from a conic base, 0.75-2 mm. long; urn curved, cylindric, 3.5-4 mm. long; annulus of 2-3 rows of cells; peristome large, teeth 16, reddish to brownish-yellow, up to 0.9 mm. long,

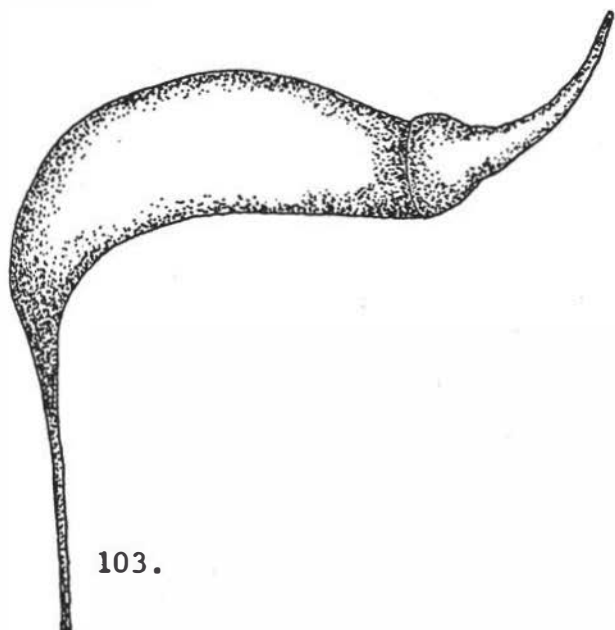
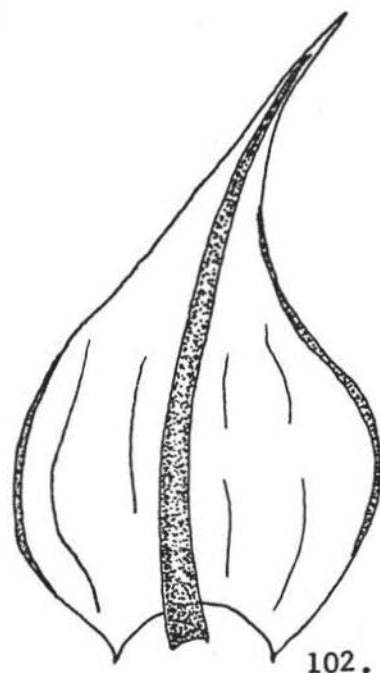
cilia 2-3, finely papillose; spores 12-24 μ long, smooth; calyptra cucullate.

Comments:

Thuidium delicatulum (Hedw.) BSG is known as the Common Fern Moss because of its conspicuous frondose growth habit. This moss grows on shaded sandstone bluffs and vertical walls. The generic name Thuidium is derived from the generic name for the arbor vitae, or northern white cedar, Thuja, because of the resemblance in feathery, frondose branching patterns of some of the species.

Thuidium delicatulum (Hedw.) BSG.

- 101. Habit, 4 X
- 102. Branch leaf, 25 X
- 103. Capsule, 15 X



101.

102.

103.

FAMILY: SPHAGNACEAE

Sphagnum palustre L.

Plants low and compact to robust, green, pale greenish white or often brownish-tinged; stems 8-10 cm. high; wood cylinder brown; cortical cells of stems in 3 layers, thin-walled, fibrillose, the outer cells with 1-4 or more irregularly rounded pores; stem leaves large, up to 3 mm. long and 1.25 mm. wide, long-lingulate to subspatulate; margins toothed, apex broadly rounded; branches in fascicles of 4-5, 2 spreading, with cortical cells in 1 layer, fibrillose, rectangular, inflated, frequently with 1 large pore; branch leaves imbricate to squarrose, broadly ovate, up to 3 mm. long, denticulate, margins involute, apex cucullate; hyaline cells of branch leaves somewhat convex on the outer surface, on the inner surface with elliptic to round pores in the corners and a few large, round pores at the middle, more numerous near the leaf margins, 2-8; on the outer surface with large, round pores at the ends and numerous, 3-10; smaller, elliptic; in cross section, green cells isosceles triangular and nearer the inner surface.

Dioicous; perichaetial leaves much larger and conspicuously differentiated; enclosing the sporophyte until maturity; sporophytes consist of a capsule and foot, elevated beyond the perichaetial leaves by elongation of the tip of the fruiting branch becoming a pseudopodium, capsule globose, dark-brown or black, conspicuously exserted, operculate, annulus and peristome absent; spores 24-29 μ in diameter, tetrahedral, yellow, finely

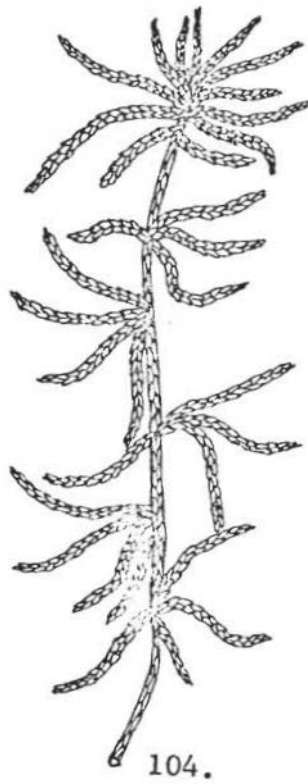
roughened or nearly smooth; calyptra a delicate, hyaline membrane enclosing the capsule until maturity and finally irregularly ruptured.

Comments:

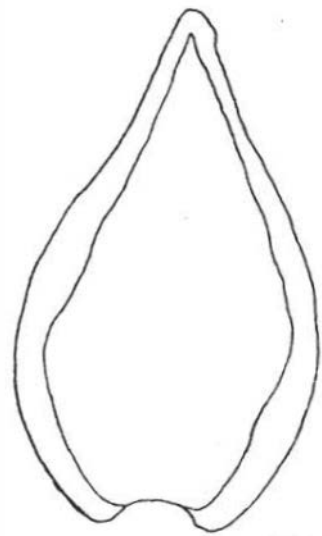
Sphagnum palustre L. is not common growing on very moist or wet sandstone walls in a seepage area. Sphagnum is commonly known as Peat Moss or Bog Moss, and is well known for its absorption properties.

Sphagnum palustre L.

- 104. Habit, 1.5 X
- 105. Leaf, 15 X
- 106. Cross section of branch leaf, 400 X



104.



105.



106.

FAMILY: PTILIDACEAE

Blepharostoma trichophyllum (L.) Dum.

Plants scattered or in small compact patches, green to yellowish-green; stems 4-20 mm. long, ascending to procumbent, flexuous, filiform; branches few to abundant, lateral; rhizoids few, colorless, long; leaves alternate, almost transversely inserted but incubously inclined, not decurrent, rather distant to approximate, widely spreading to erect, 3-4 lobed, rarely with 2 or 5 lobes, 500-960 μ long, about 900 μ wide, lobes each a thick rigid cilium, 8-12 cells long, sinuses descending about 0.9 the leaf length, acute to rounded; cells 40-70 μ long, 16-32 μ wide; walls somewhat thickened; underleaves resembling the leaves, a little smaller, lobes about 2 cells shorter.

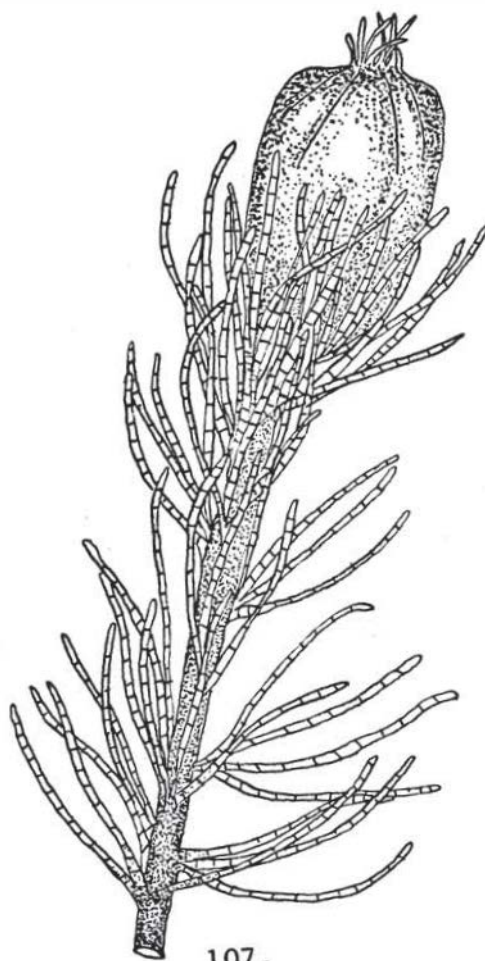
Plants bisexual or rarely unisexual; male inflorescences terminal on branches, or just below the female inflorescence, sometimes farther down; male bracts divided into 2-pronged segments; atheridia 1 or rarely 2, ovoid-globose, small, with stalk nearly as long as the body, paraphyses none; female inflorescence terminal on stems and branches, female bracts larger than the leaves, divided into 4-6 often several-forked segments; bracteoles smaller than the bracts; perianth free, 1/2 or more emergent, cylindric-clavate, 1.4-2.2 mm. long, 400-900 μ wide, obtusely 3-angled; mouth wide, ciliate, the cilia rigid, up to 7 cells long; sporangium ellipsoid, 4-valved to base, purplish-brown; seta 5-12 mm. long; calyptra free; elaters 130-300 μ long, 9-11 μ wide, spirals 2, reddish-brown; spores 14-18 μ , minutely verruculose, brown.

Comments:

Blepharostoma trichophyllum (L.) Dum. grows on moist, shaded sandstone walls and bluffs. The species name refers to the hair-like lobes into which the leaves are divided.

Blepharostoma trichophyllum (L.) Dum.

107. Habit with perianth, 45 X



107.

FAMILY: PTILIDIACEA

Trichocolea tomentella (Ehrh.) Dum.

Plants in large pale green or whitish-green patches; stems 5-12 cm. or longer, pinnate or multi-pinnately branched, yellowish-green, suberect or procumbent; leaves succubous, almost transversely inserted, palmately lobed almost to the base, the lobes divided into numerous single or branched capillary segments; cells hyaline, at base of leaf rectangular and thin-walled, narrowly cylindrical on the segments and appearing as if jointed; underleaves nearly resembling the leaves but smaller, about half the size of the leaves; rhizoids absent except a few at base of the stem.

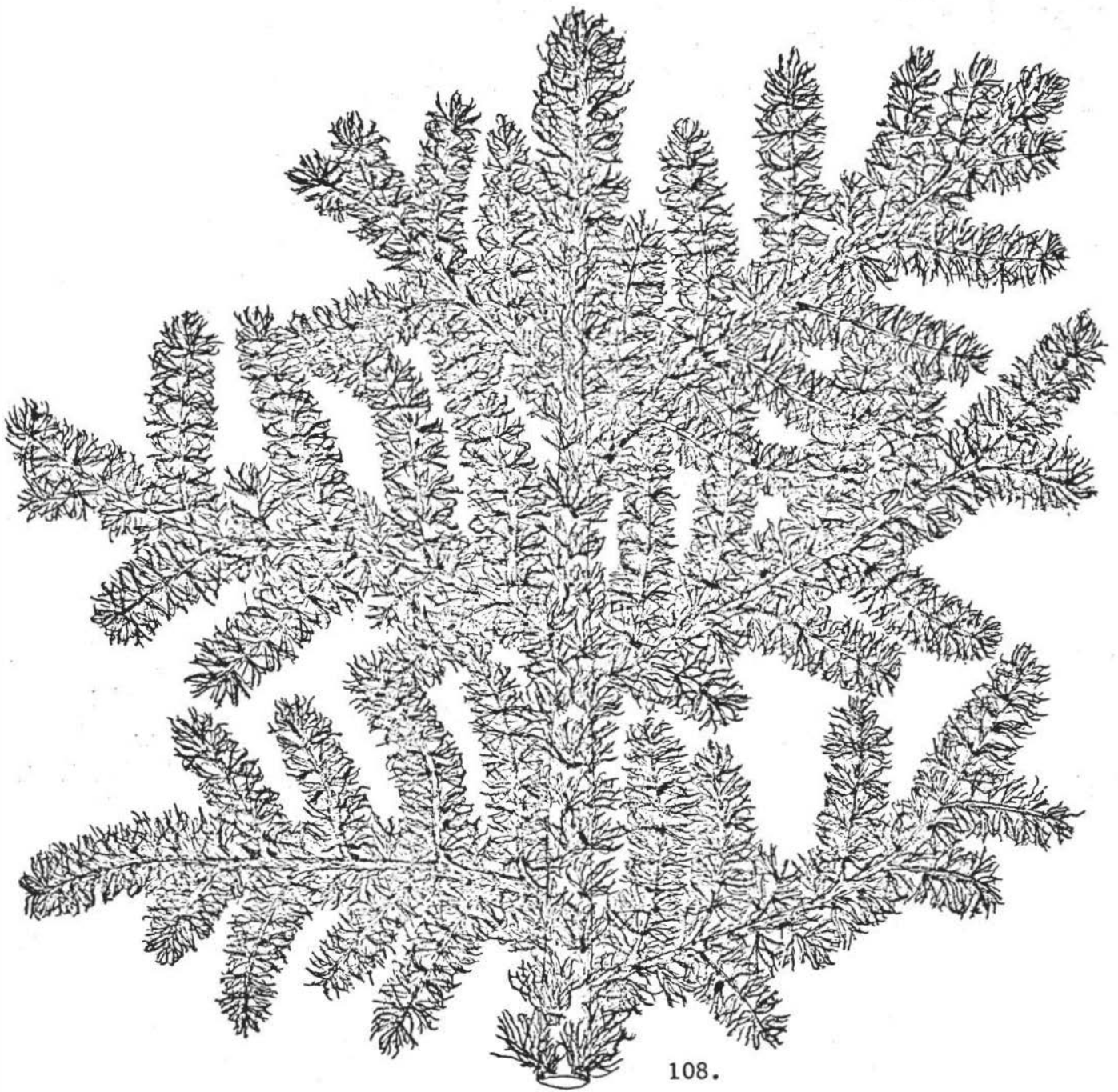
Dioicous; female inflorescence terminal on the stem but becoming axillary through innovations; calyptra cylindrical-clavate, fleshy, covered with capillary, branched, coarsely striate-punctate paraphyllia; capsule oblong, purplish-brown; spores 10-15 μ in diameter, reddish-brown, smooth; elaters bispiral; antheridia large, globose, usually in pairs.

Comments:

Trichocolea tomentella (Ehrh.) Dum. is not common, growing on very moist shaded sandstone bluffs. This liverwort is often called the Fern Liverwort because of its frondose appearance. The genus name means hairy sheath, referring to the hairy, fleshy calyptra.

Trichocolea tomentella (Ehrh.) Dum.

108. Habit, 17 X



108.

FAMILY: CALYPOGEIACEAE

Calypogeia muellerana (Schiffn.) K. Miill.

Plants in flat patches or mats, green to brownish; stems 2-5 cm. long, prostrate to ascending, thick, sparingly branched; rhizoids numerous, from bases of underleaves, long, hyaline; leaves imbricate, very obliquely inserted, somewhat clasping the stem ventrally, slightly convex dorsally, broadly ovate to cordate; apex rounded to shortly 2-toothed, margins otherwise entire; median cells of leaves 30-80 μ , polygonal, walls thin; trigones mostly wanting; gemmae spherical to ellipsoid, yellowish-green; underleaves 1-3 times as wide as stem, orbicular to oval, slightly decurrent, distant but not greatly so, 2-lobed; lobes rounded to obtuse, sinus extending about 1/2 to base, narrow.

Plants bisexual; male inflorescences below the female ones, on very short branches from axils of underleaves; male bracts 4-6, 2-3 lobed, antheridia 1-2, ovoid; female bracts much smaller than the leaves, 2-3 lobed; perigynia solitary or paired, subcylindric; sporangium brown; elaters 8-10 μ wide, spirals 2, reddish-brown; spores 10-14 μ in diameter, pale brown, smooth.

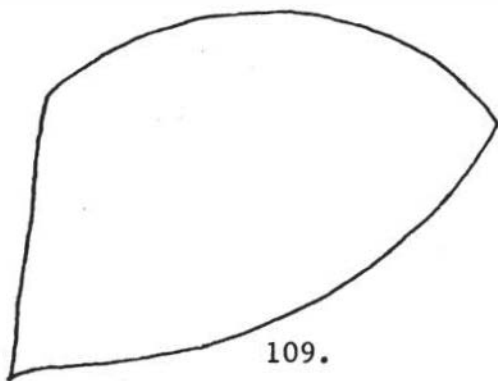
Comments:

Calypogeia muellerana (Schiffn.) K. Miill. grows on moist, shaded sandstone walls and ledges. Gemmae are very common in this hepatic. The generic name is from the greek words kalyx, meaning

flower cup, hypo, meaning under, and gē, meaning the earth; in reference to the subterranean pocket, or perigynium, in which the sporophyte matures. This species resembles C. trichomanes (L.) Corda except the oil bodies are colorless.

Calypogeia muellerana (Schiffn.) K. Miill.

- 109. Leaf, 45 X
- 110. Gemmae, 40 X
- 111. Underleaf, 80 X
- 112. Habit, 10 X
- 113. Ventral view, 40 X



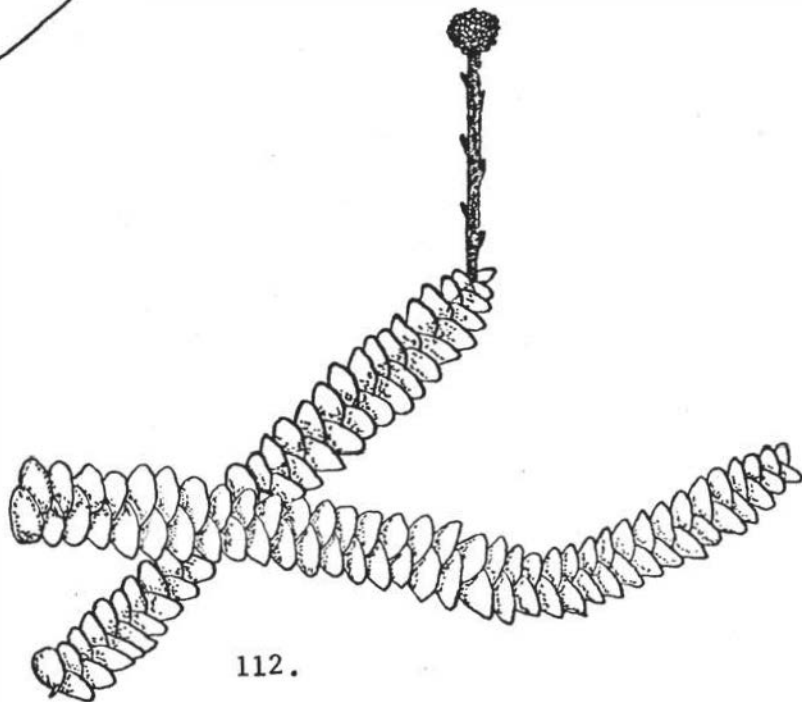
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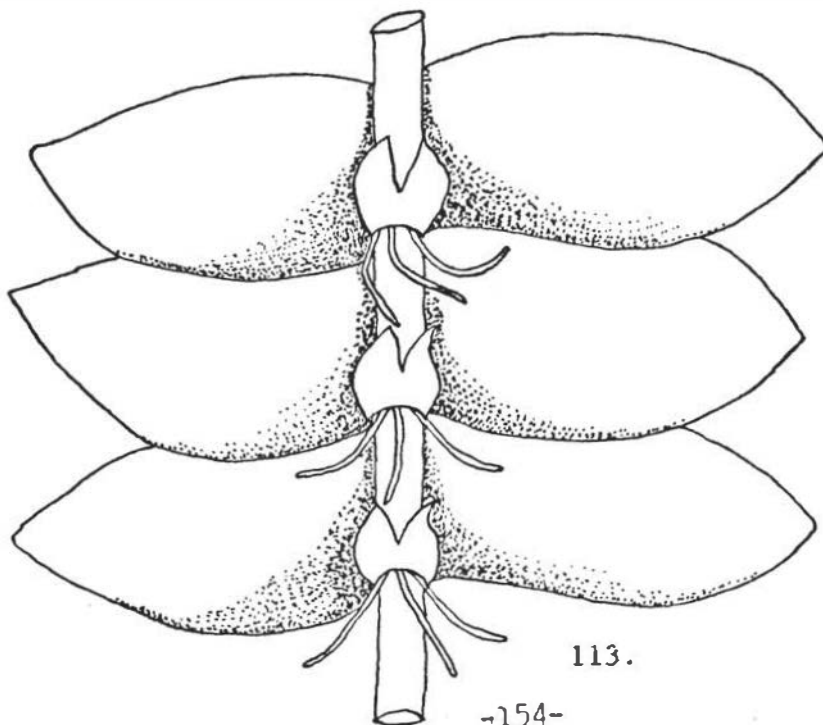
110.



111.



112.



113.

FAMILY: CEPHALOZIACEAE

Cephalozia media Lindb.

Plants small, in dark-green to yellowish-green patches; stems 1-2 cm. long, prostrate with the apex ascending, sparingly branched, without flagella; rhizoids scarce, long and colorless; leaves obliquely inserted, succubous, rotund-ovate, 1/3 bilobed, the sinus lunate to obtuse, the lobes incurved, acute; margins entire; cells 23-30 μ , polygonal, transparent; underleaves absent.

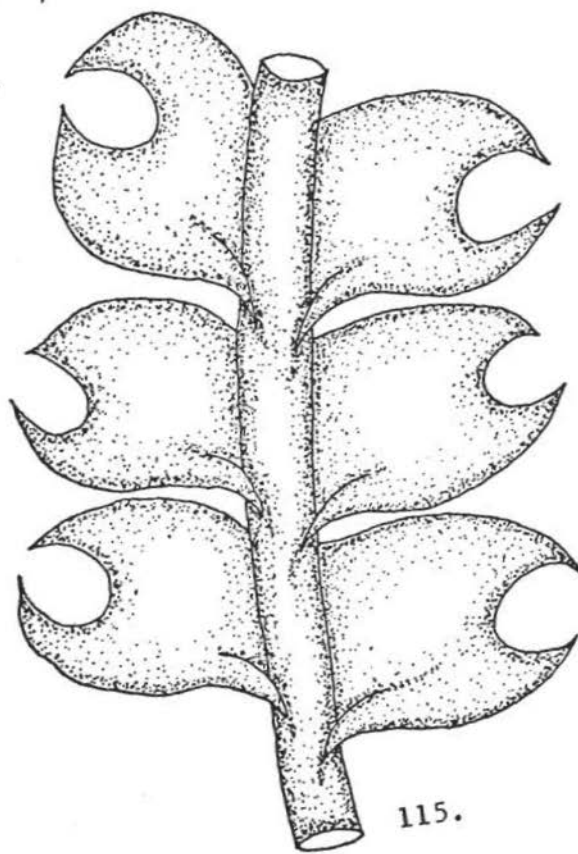
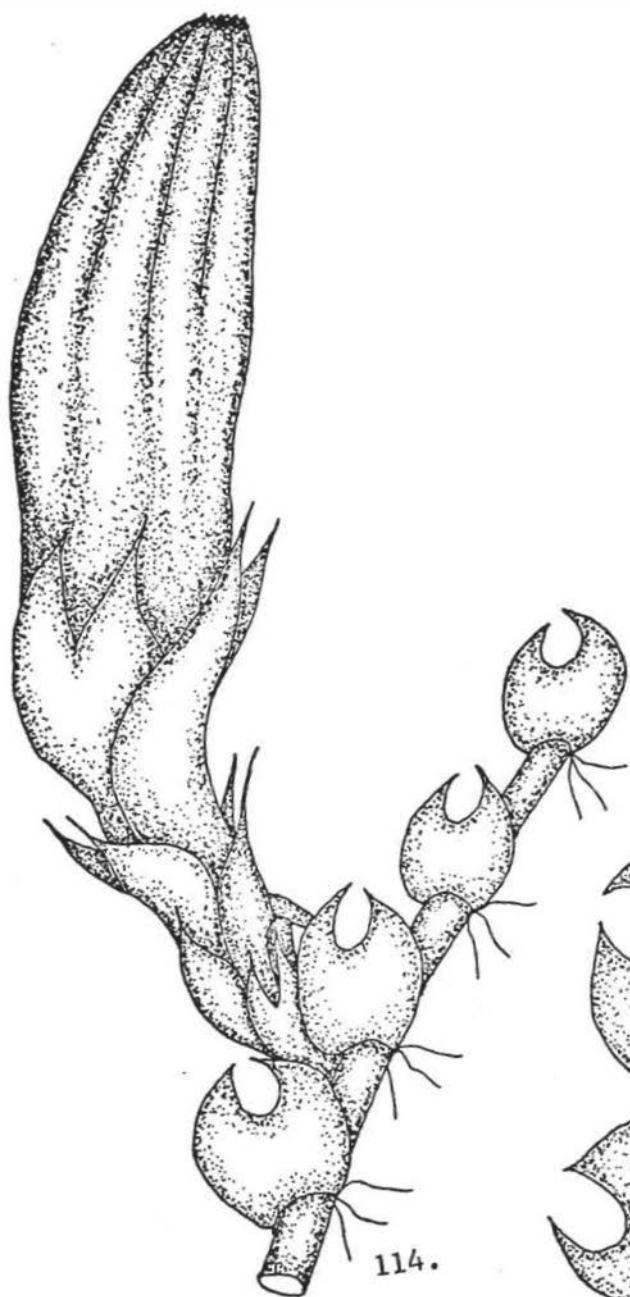
Dioicous, female inflorescence on a short postical branch; involucral bracts larger than leaves, oblong-rotund, 1/3 bilobed, lobes acute; bracteole resembling bracts, narrower; perianth subfusiform, the mouth somewhat contracted, crenulate-denticulate; capsule oblong-oval; spores 10-12 μ in diameter, reddish-brown, finely papillose; elaters 7-8 μ broad, bispiral, reddish-brown; antheridia oblong-oval, single; gemmae at apex of the stem in pale greenish-white clusters, oblong to pyriform, often angled and sometimes stellate, 1-celled.

Comments:

Cephalozia media Lindb. is common on moist shaded vertical sandstone walls, often creeping among Sphagnum in seepage areas of the walls. The genus name means head branch, in reference to the short, ventral female branches.

Cephalozia media Lindb.

- 114. Female plant with perianth, 15 X
- 115. Stem and leaves, 30 X



FAMILY: CEPHALOZIACEAE

Odontoschisma prostratum (Sw.) Trev.

Plants in mats or creeping among other bryophytes or bog plants, pale green to brownish or reddish-green; stems prostrate with ascending tips, irregularly branched; branches usually ventral, few; rhizoids scarce; leaves alternate, distinctly succubous, not to slightly decurrent dorsally, distant to loosely imbricate, unlobed to 2-lobed, roundish to shortly oblong, plane to slightly concave, 0.7-1.4 mm. long, 0.75-1.3 mm. wide; apex rounded to 2-lobed; margin entire; distinctly bordered; cells of leaf middle about 20 μ , of the margin about 14 by 23 μ , forming a border of 1-4 rows of different cells, these border cells more angular and with thick walls; walls thin except in border; fringes moderately large; gemmae unknown; underleaves more or less persistent but short-lived, linear to subulate, about 150 μ long and 50 μ wide, shortly bifid at apex.

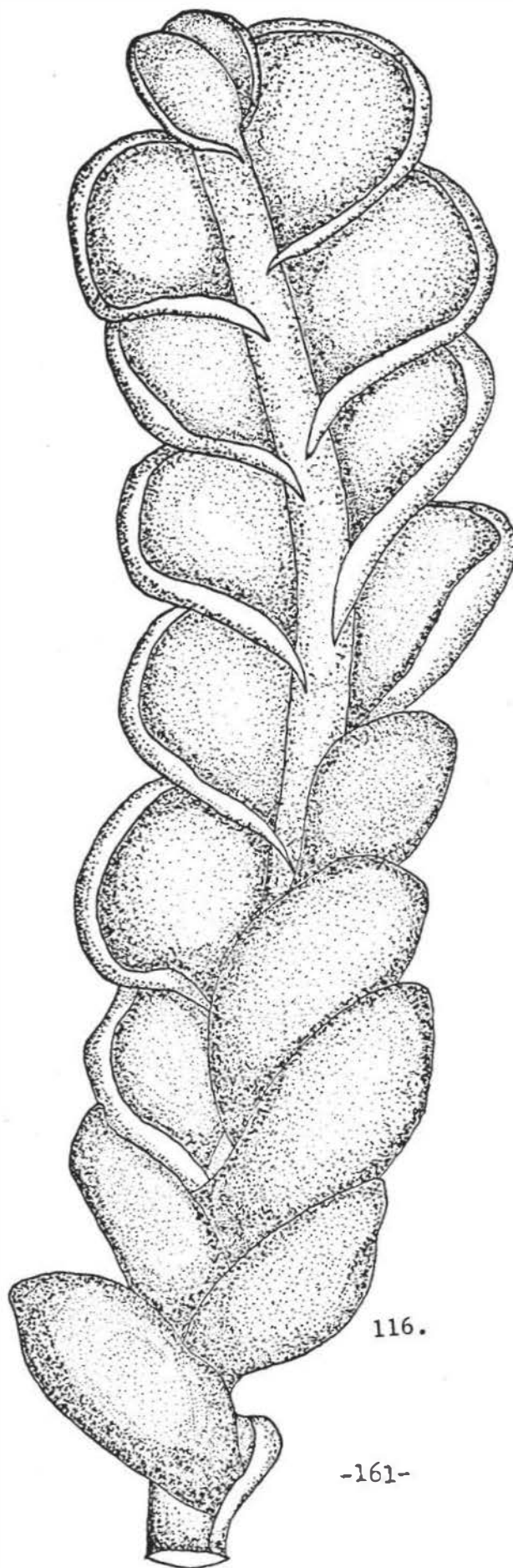
Plants unisexual; male branch ventral, short, modified; male inflorescence forms whole branch; antheridia 1; female branch ventral, short, modified; perianth cylindrical-ovoid, about 3 mm. long and 900 μ wide, slightly contracted at base and at apex, acutely contracted to the mouth; mouth 1/4-1/3 the diameter of the perianth, irregularly lobed; sporangium ovoid; elaters about 9 μ thick; spirals 2; spores about 12 μ in diameter, minutely verruculose.

Comments:

Odontoschisma prostratum (Sw.) Trev. grows on moist shaded sandstone rock walls and ledges, and often intermingled with other bryophytes on bluffs. The generic name is from the greek words odous, meaning tooth, and schisma, a split, in reference to the mouth of the perianth in most species. The specific name refers to the usual prostrate position of the plant. This plant is often confused with Jamesoniella autumnalis, but lacks a constricted perianth mouth with cilia.

Odontoschisma prostratum (Sw.) Trev.

116. Habit, 30 X



116.

FAMILY: CEPHALOZIELLACEAE

Cephaloziella hampeana (Nees.) Schiffn.

Plants in patches, green to brownish-green; stems 3-10 mm. long, prostrate, rather weak, little branched; rhizoids numerous, scattered, long; leaves of sterile stems alternate, almost transversely inserted, not decurrent, distant, simply 2-lobed, broadly cuneate to subquadrate; leaves near female inflorescences larger and loosely imbricate; margins entire to somewhat toothed in addition to the apical lobing; lobes triangular to ovate, acute to subacute, mostly divaricate, 4-10 cells wide at base; sinus descending 1/2-2/3 length of leaf, widely acute to obtuse; median cells of leaves 11-18 μ , polygonal, walls thin; trigones none; gemmae common, on margins of the younger leaves, about 15 μ wide and 20 μ long, 2-celled, brownish; underleaves rare or none, other than close to female bracteole.

Plants bisexual; male inflorescence terminal or farther down on ordinary branches; female inflorescence terminal on stem or ordinary branches; female bracts much larger than the leaves, loosely surrounding the perianth, 2-lobed to 1/3 their length, the lobes acute, sharply dentate to entire; perianth ovoid-ellipsoid to cylindric, 1/3-1/2 emergent, green throughout or somewhat hyaline above, with 4-5 plicae in upper half; mouth slightly crenate to dentate with bulging cells; elaters 8-9 μ thick, spirals loosely coiled, reddish-brown; spores 8-9 μ in diameter, minutely papillose, yellowish-brown.

Comments:

Cephaloziella hampeana (Nees.) Schiffn. is a very small hepatic growing on moist, shaded sandstone walls and bluffs. The generic name is the diminutive of Cephalozia, the genus from which most of the species of Cephaloziella were segregated. Cephale in greek means head, and ozos, branch, in reference to the usual short ventral branches.

Cephaloziella hampeana (Nees.) Schiffn.

117. Female plant with perianth, 80 X



117.

FAMILY: JUNGERMANNIACEAE

Jamesoniella autumnalis (DeCand) Steph.

Plants in dense patches, olive-green or the tips glaucous-green, reddish when old; stems prostrate, 1-4 cm. long, simple or branched, often innovating below the bracts; rhizoids numerous to near step tip; hyaline; leaves succubous, alternate, somewhat decurrent dorsally, crowded, large, not or hardly bilobed, convex; leaves of lower part of stem horizontal, spreading, oblong-oval; leaves of upper part of stem appressed, roundish-oval; apex roundish to retuse; margins entire; median cells of leaves 25-35 μ ; marginal cells about 20 μ , basal cells 35-50 μ ; walls thin, trigones small, distinct; underleaves present only on younger parts, frequently obsolete, commonly lanceolate or subulate. Plants unisexual; male inflorescence along the median part of the stem, bracts 8-12, erect; antheridia solitary, on a rather long stalk; female leaves oblong to roundish-oblong; bracteole larger than the bracts, lanceolate; perianth narrowly clavate-cylindrical, 4-5 plicate near the mouth, slightly contracted at tip; mouth large, with long, unequal cilia; seta long; sporangium ovoid, reddish-purple; elaters about 100 μ long and 8 μ thick, slightly attenuate; spirals 2, laxly coiled; spores 11-15 μ , finely verruculose, reddish-brown.

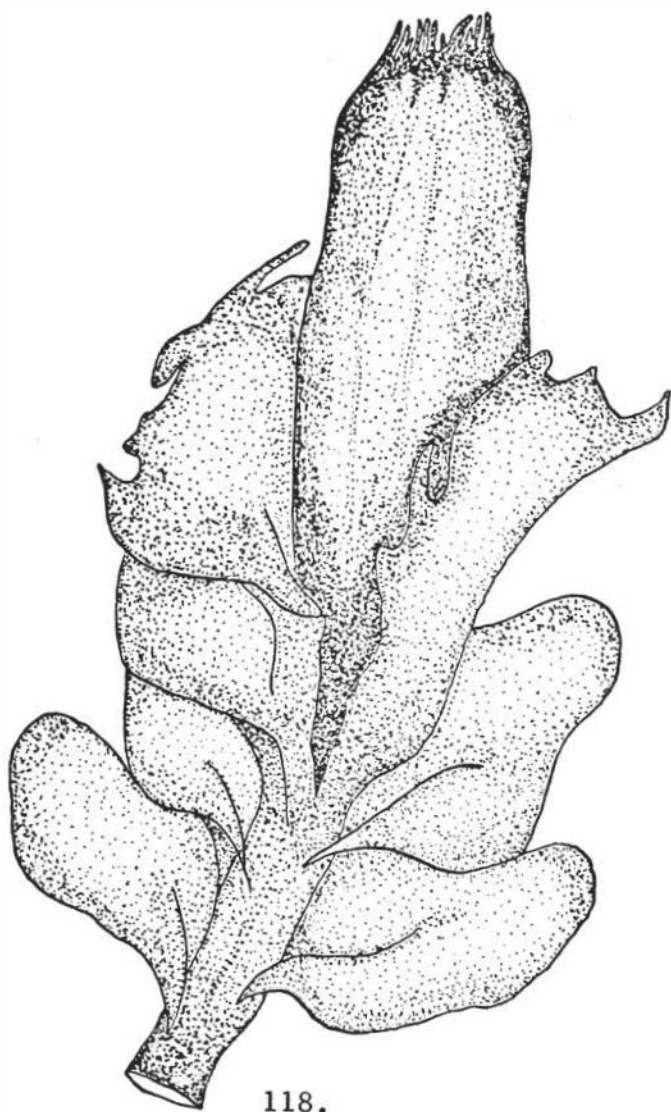
Comments:

Jamesoniella autumnalis (DeCand) Steph. is found on moist, shaded sandstone bluffs and vertical walls. This liverwort is

often confused with Odontoschisma prostratum, but J. autumnalis has a perianth with a constricted mouth with cilia surrounding it, whereas the perianth mouth of O. prostratum lacks cilia.

Jamesoniella autumnalis (DeCand) Steph.

118. Female plant with perianth; 30 X



118.

FAMILY: JUNGERMANNIACEAE

Lophozia incisa (Schrad.) Dum.

Plants small, in compact, bluish-green patches; stems short and thick, 4-10 mm. long, prostrate or ascending; leaves succubous, almost transversely inserted, half embracing the stem, the lower leaves distant, unequally bilobed, the upper leaves plicate-crispate, forming a crowded head at the apex of the stem, irregularly 2-5 lobed, the lobes dentate or spinous-dentate; cells 27-36 μ , roundish-quadrate, opaque through numerous chlorophyll granules and oil-bodies, thin walled, trigones small but distinct; underleaves absent; rhizoids long, numerous and crowded, colorless.

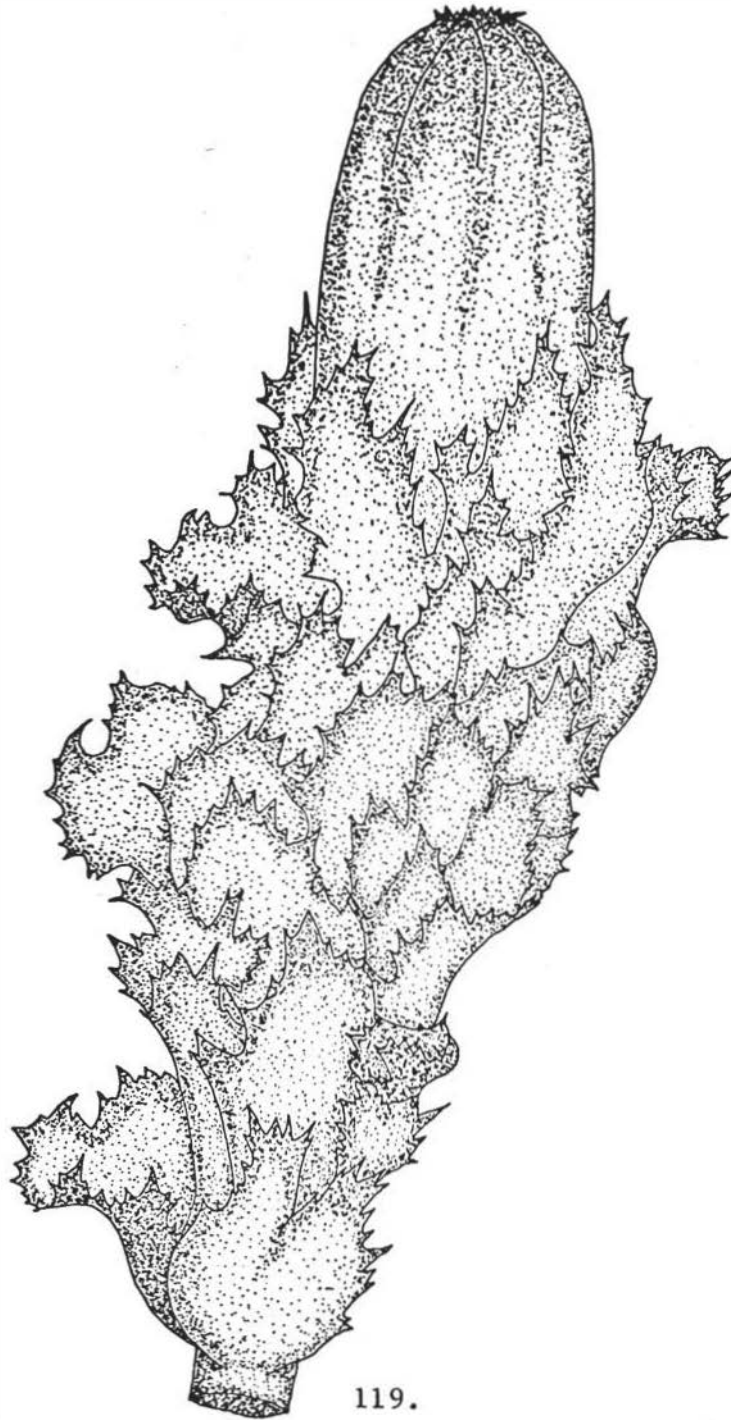
Dioicous; involucral bracts larger than the leaves, plicate-crispate, irregularly 3-5 lobed, the lobes spinous-dentate; bracteole lanceolate or absent; perianth narrowly obovate, obtusely plicate at the apex, the mouth ciliate-dentate; capsule oval, reddish-brown; spores 10-12 μ in diameter, finely granulate, brown; elaters bispiral, reddish-brown; antheridia 1-2, large, globose; gemmae greenish-yellow, in clusters at apex of the leaf lobes, 1-2 celled, pyramidal or irregularly 3-5 angled.

Comments:

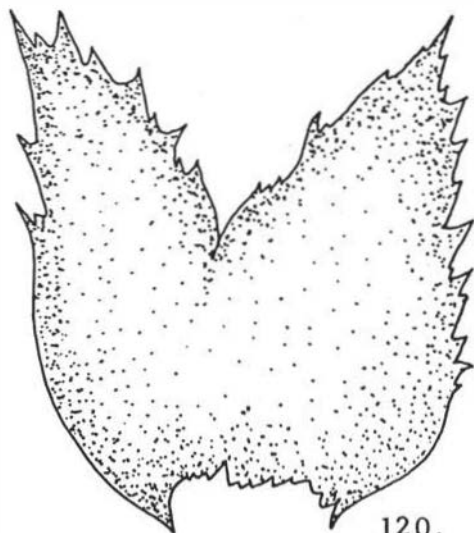
Lophozia incisa (Schrad.) Dum. is a rare find on moist, shaded sandstone bluffs growing among other bryophytes.

Lophozia incisa (Schrad.) Dum.

- 119. Female plant with perianth, 30 X
- 120. Underleaf, 80 X



119.



120.

FAMILY: JUNGERMANNIACEAE

Plectocolea hyalina (Lyell.) Mitt.

Plants in patches, pale green to yellowish green or occasionally purplish; stems up to 15 mm. long, prostrate with ascending tips, often reddish on the ventral side; rhizoids numerous, long, hyaline to usually reddish; leaves alternate, succubous, roundish with wide base, concave; apices rounded; margin entire but somewhat undulate; cells subquadrate at margin, rounded to oval-hexagonal in middle; trigones large, distinct; oil bodies 4-10, elliptical, light brown, about 5 μ long; underleaves absent,

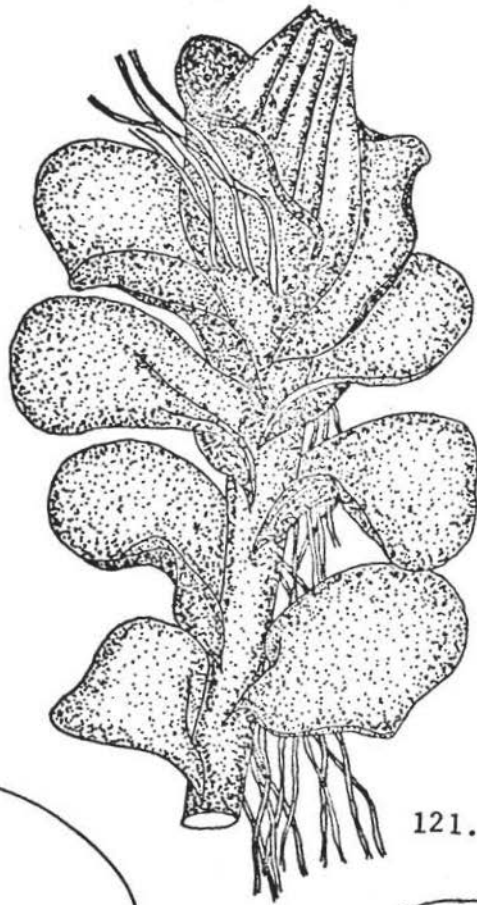
Plants unisexual; female bracts larger than leaves of sterile stems, recurved at apex, margin entire but undulate; perianth ovoid, 2/5 to 1/2 emergent, 4-6 plicate above; mouth with 4-5 crenulations; seta 1-2 cm. long; sporangium ovoid-globose, reddish-brown; elaters 8-10 μ thick, short; spirals 2, reddish brown; spores 14-17 μ in diameter, granular-papillate, brown.

Comments:

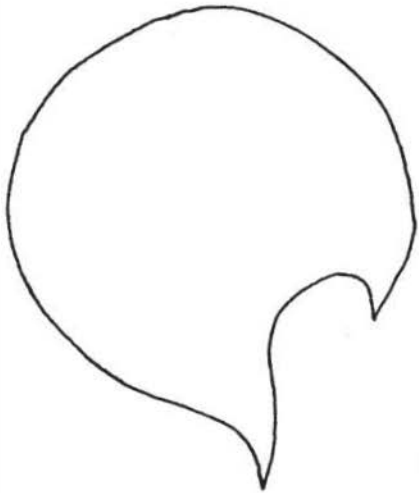
Plectocolea hyalina (Lyell) Mitt. is common on moist shaded banks and wet vertical sandstone walls.

Plectocolea hyalina (Lyell.) Mitt.

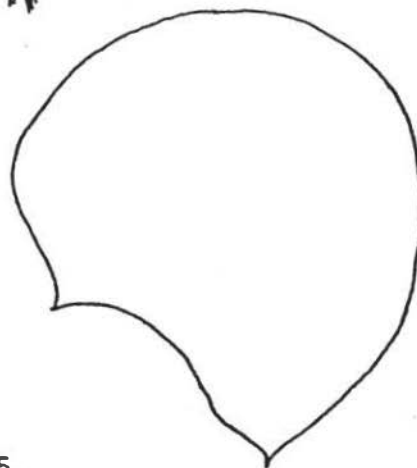
- 121. Female plant with perianth, 25 X
- 122. Leaves, 30 X



121.



122.



FAMILY: HARPANTHACEAE

Harpanthus scutatus (Web & Mohr) Spruce

Plants in small patches, pale green, becoming yellowish or reddish green when dry; leafy shoot about 1 mm. wide; stems up to 1.5 cm. long, prostrate with tips ascending, slender, pale green; branches few, ventral, from axis of the underleaves; rhizoids rather numerous, colorless, long, present to near tip of stem, in tufts at bases of underleaves; leaves alternate, succubous, approximate to imbricate, suberect to ascending, simply 2-lobed, broadly oval to oval-oblong, about $450\ \mu$ long and $400\ \mu$ wide, mostly concave; margins entire to subsinuate; lobes often unequal with the ventral one larger, acute; sinus descending $1/5$ to $1/3$ the leaf length, usually rounded to lunate, sometimes acute or obtuse; median cells of leaves $30-35\ \mu$, polygonal; marginal row sub-quadrate, walls thin, trigones small to rather large; oil bodies 4-8; underleaves erect-spreading, oblong-ovate or lanceolate, acute to obtuse, $300-350\ \mu$ long; gemmae very rare, 2-celled.

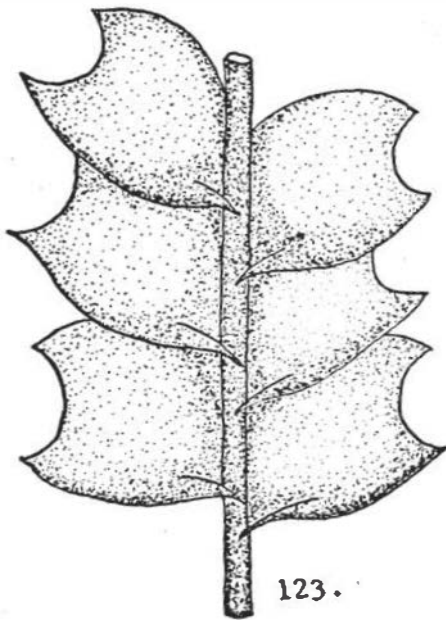
Plants unisexual; male plants near the female ones or in the same patches; male inflorescence spicate, bracts about $375\ \mu$ long; female bracts about $600\ \mu$ long, the lobes acute; perianth ovoid-oblong, about 1 mm. long and $400\ \mu$ in diameter; mouth somewhat narrowed, 3-5 lobed; sporangium ovoid, reddish-brown; elaters about $8\ \mu$ thick, spirals 8-10 μ , smooth to granulate, reddish-brown.

Comments:

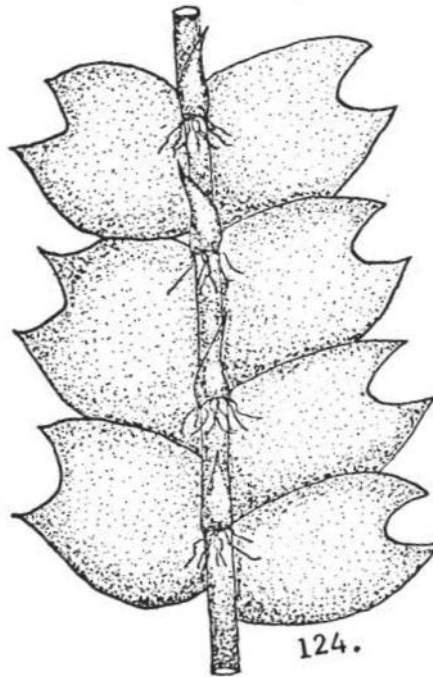
Harpanthus scutatus (Web & Mohr) Spruce is not very common, growing on moist, shaded sandstone walls and bluffs. This liverwort is often mistaken with Lophocolea minor, but can be separated by its subulate underleaves, while L. minor has bifid underleaves. The generic name is from the greek, harpe meaning a sickle, and anthos meaning a flower, referring to the curved lower part of the perigynium-like perianth. The specific name is from the latin word scutatus meaning provided with a shield, perhaps in reference to the roundish concave leaves.

Harpanthus scutatus (Web. & Mohr) Spruce

- 123. Dorsal view, 15 X
- 124. Ventral view, 15 X



123.



124.

FAMILY: HARPANTHACEAE

Lophocolea heterophylla (Schrad.) Dum.

Plants in flat pale yellow-green patches; stems creeping, irregularly branched, up to 2 cm. long; rhizoids numerous, fasciculate; leaves nearly horizontal, succubous, oblong-quadrate, variously lobed, the lower leaves smaller, distant or approximate, bilobed with the sinus obtuse and lobes obtuse or acute, the upper leaves larger, imbricate, the apex slightly narrowed and either rounded, truncate, retuse, or broadly emarginate, rarely all the leaves bilobed; cells 25-30 μ , polygonal, the walls thin, trigones usually present, small; underleaves rather large, bifid to below the middle into two subulate acuminate lobes, each usually with a tooth or cilium near the base; involucre bracts erect, slightly larger than the leaves, retuse or shortly and irregularly 2-4 lobed; bracteole deeply bifid, the segments lanceolate with 1-3 cilia or teeth on the margin.

Paroicous; perianth terminal on rather short branches, longly exserted, sharply 3-angled above, the mouth shortly trilobate, the lobes dentate; capsule oval; spores 11-13 μ in diameter, yellow-brown; elaters reddish brown; male bracts below perianth, antheridia single, globose; gemmae rare, 1-celled, on apex of leaves.

Comments:

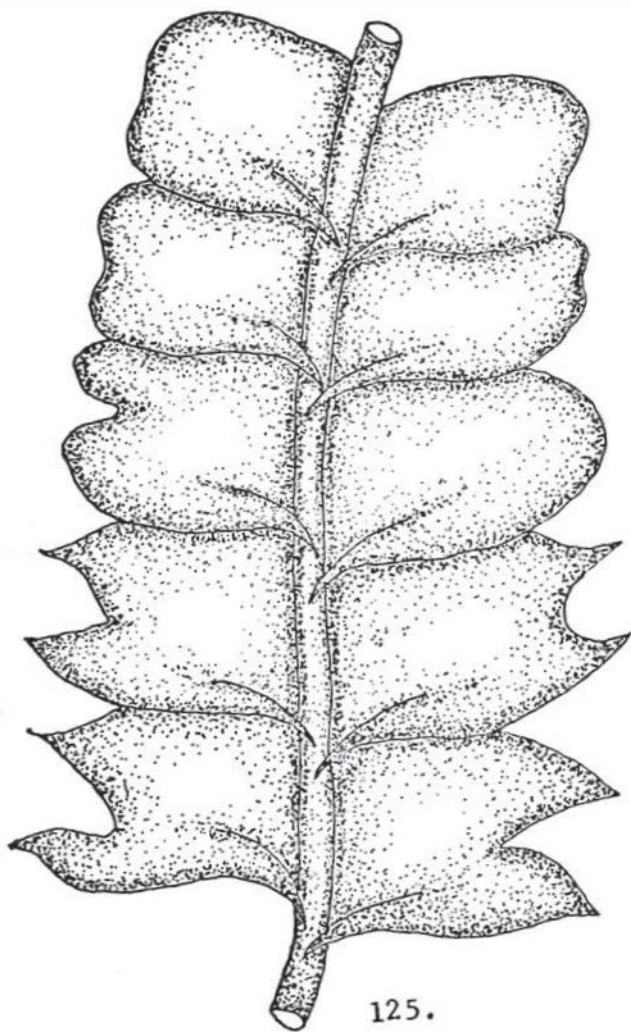
Lophocolea heterophylla (Schrad.) Dum. is common on shaded sandstone walls in dry places. The genus name is Greek for

crested sheath, referring to the toothed ridges of the perianth.
The species name refers to the leaves which are variously lobed
or nearly entire.

Lophocolea heterophylla (Schrad.) Dum.

125. Dorsal view, 30 X

126. Underleaf, 80 X



FAMILY: HARPANTHACEAE

Lophocolea minor Nees.

Plants in mats, yellowish-green; leafy shoots 1-2 mm. wide; stems prostrate, 0.5-1.5 cm. long, much branched; rhizoids in tufts at bases of underleaves; leaves alternate, succubous, simply 2-lobed, broadly ovate to almost quadrate, 250-380 μ long, 200-250 μ wide; margins entire, or erose through the formation of gemmae; lobes acute to rounded; sinus descending 1/4-1/3 the leaf length, mostly right angular to crescentic; cells of leaf middle 25-30 μ , of the lobes about 20 μ ; walls thin; trigones wanting; oil bodies up to 6 per cell; gemmae almost always quite common, the gemmiparous leaves becoming abnormal in form, gemmae on the tips and margins of the leaves, at first 1-celled and spherical, forming 2-to many-celled groups, yellowish-green, about 25 μ ; underleaves present, 1/3-1/2 as long as leaves, 2-lobed, the lobes lanceolate.

Plants mostly unisexual but rarely bisexual; female inflorescence terminal on a main stem or well developed branch; female bracts larger than leaves of sterile stems; perianth small, narrow, sharply 3-angled in upper half, occasionally gemmiparous; mouth 3-lobed, the lobes coarsely toothed; seta about 500 μ long; sporangium about 500 μ long, yellowish-brown, smooth; elaters 8-10 μ wide; spirals 2, reddish-brown; spores about 10 μ in diameter, smooth.

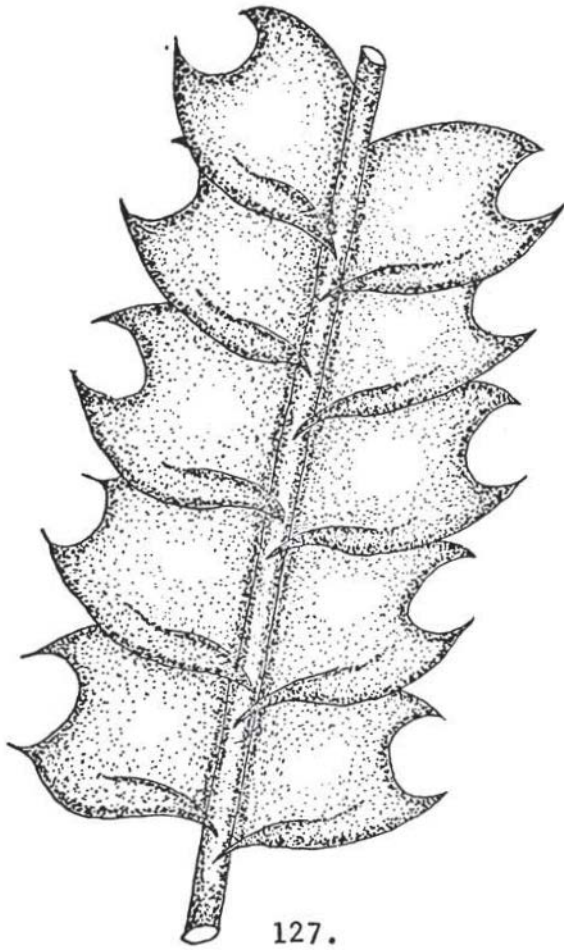
Comments:

Lophocolea minor Nees. grows on shaded sandstone walls and

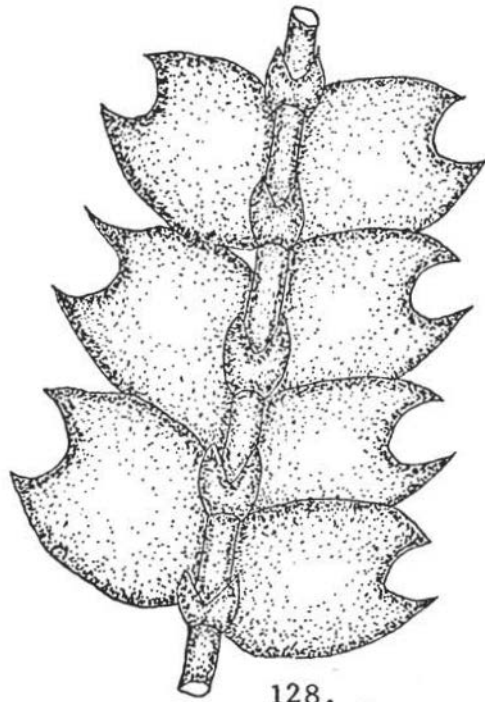
moist banks. This species is not common, and is often mistaken for Harpanthus scutatus, but L. minor has bifid underleaves as compared to subulate underleaves in H. scutatus.

Lophocolea minor Nees.

- 127. Dorsal view, 30 X
- 128. Ventral view, 30 X



127.



128.

FAMILY: PLAGIOCHILACEAE

Plagiochila asplenioides (L.) Dum.

Plants in patches or mats, green to dark green; leafy shoots 4-8 mm. wide; stems 2-10 cm. long, reddish brown, prostrate with the branches mostly ascending to erect, simple or irregularly branched, the prostrate portion rhizomatous; branches rather numerous, often from beneath the perianth; rhizoids wanting to quite scarce on ascending branches; leaves alternate, quite succubous, decurrent both dorsally and ventrally, spreading to erect-spreading, often horizontal, unlobed, roundly ovate, 2-4 mm. long, 1-3.5 mm. wide; dorsal margin usually entire, sometimes somewhat toothed along the upper part and rarely along its whole upper half; ventral margin usually dentate to near base; cells of the leaf middle 30-37 μ , of the leaf margin 22-30 μ , hexagonal; walls thin to slightly thickened; trigones small; oil bodies 6-12, small; gemmae unknown; underleaves wanting or present only near the tips of the shoots, minute, subulate or 2-lobed.

Plants unisexual; male plants usually in separate patches; male inflorescence terminal or farther down, antheridia 1-3; female bracts similar to leaves of sterile stems but wider and irregularly dentate; perianth oblong or somewhat clavate, 4-7 mm. long, 1/2-4/5 emergent; mouth bent to one side along a diagonal line making it appear to be sloping, irregularly ciliate-dentate; sporangium ovoid, about 1.5-2 mm. long, purplish-brown; elaters 140-200 μ long, 9-14 μ thick, spirals 2,

purplish; spores about 22-24 μ in diameter, reddish-brown.

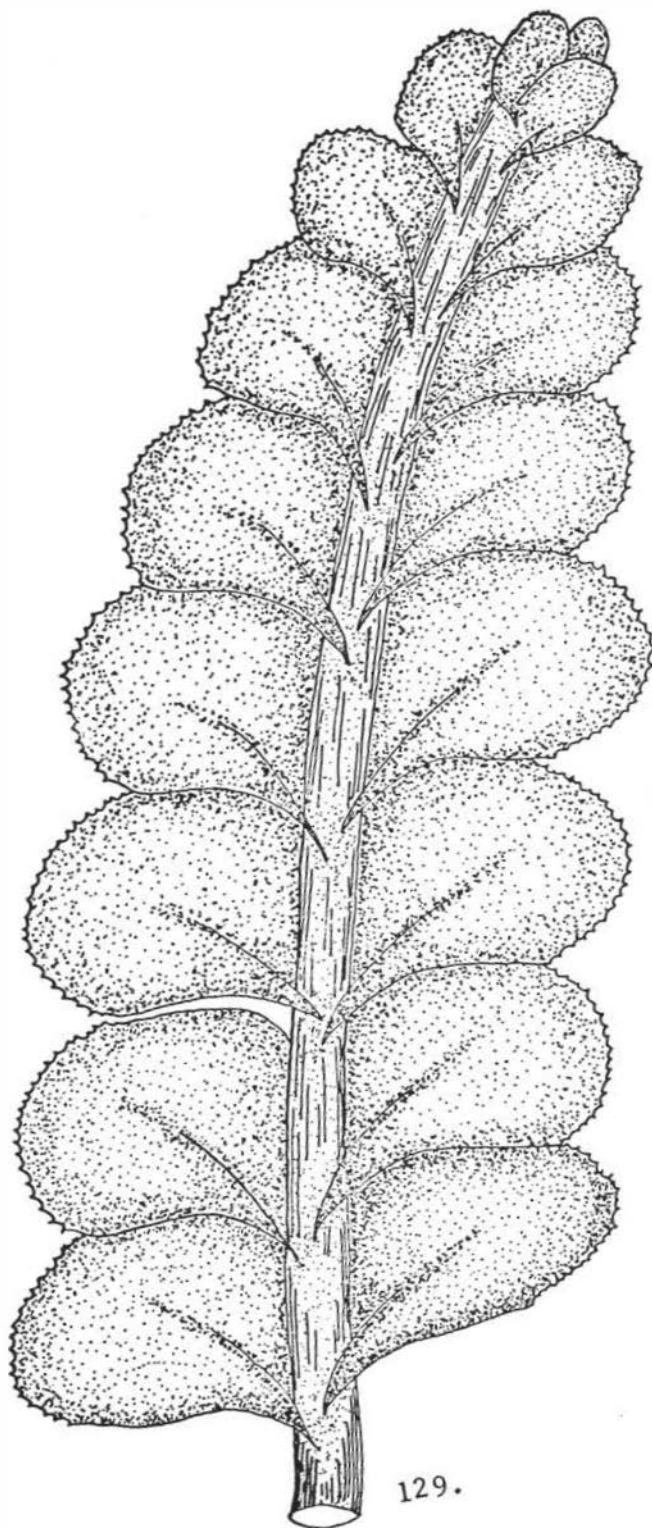
Comments:

Plagiochila asplenioides (L.) Dum. is found on moist shaded bluffs, wet rocks along creeks, and often on wet banks among other bryophytes. The generic name is derived from a greek word plagios, meaning sloping, and cheilos, meaning lip, in reference to the sloping mouth of the perianth. The specific name is derived from a fern genus Asplenium, since this liverwort often resembles some of these ferns.

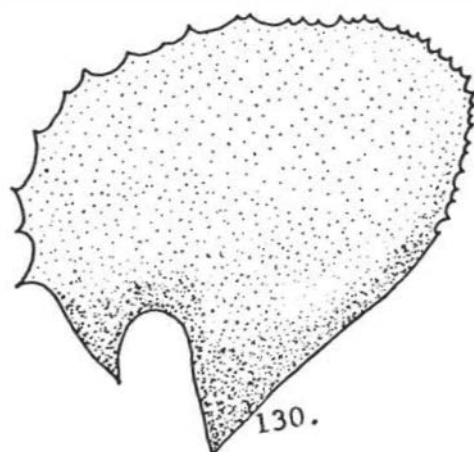
Plagiochila asplenioides (L.) Dum.

129. Dorsal view, 30 X

130. Leaf, 35 X



129.



130.

FAMILY: SCAPANIACEAE

Diplophyllum apiculatum (Evans) Steph.

Plants in yellowish-green to brownish or reddish patches; leafy shoots 1.3-2.5 mm. wide; stems 3-5 mm. long, about 170 μ thick, prostrate with ascending tips; rhizoids numerous on prostrate parts, hyaline; leaves nearly transversely inserted, not decurrent; keel slightly concave dorsally, 83-200 μ long; dorsal half of leaf divergent at an angle of 10-40 degrees, appressed to the stem, elliptic; apex rounded to acute, mostly with a point; margin entire to irregularly and indistinctly denticulate; ventral half horizontally widely spreading or arcuate at an angle of 60-85 degrees, lingulate to obovate, 3.5-6 times as long as the keel, 1.6-2.3 times as long as the dorsal lobe; apex acute, nearly always with a point; gemmae in clusters at tips of upper leaves, 1-2 celled, angular.

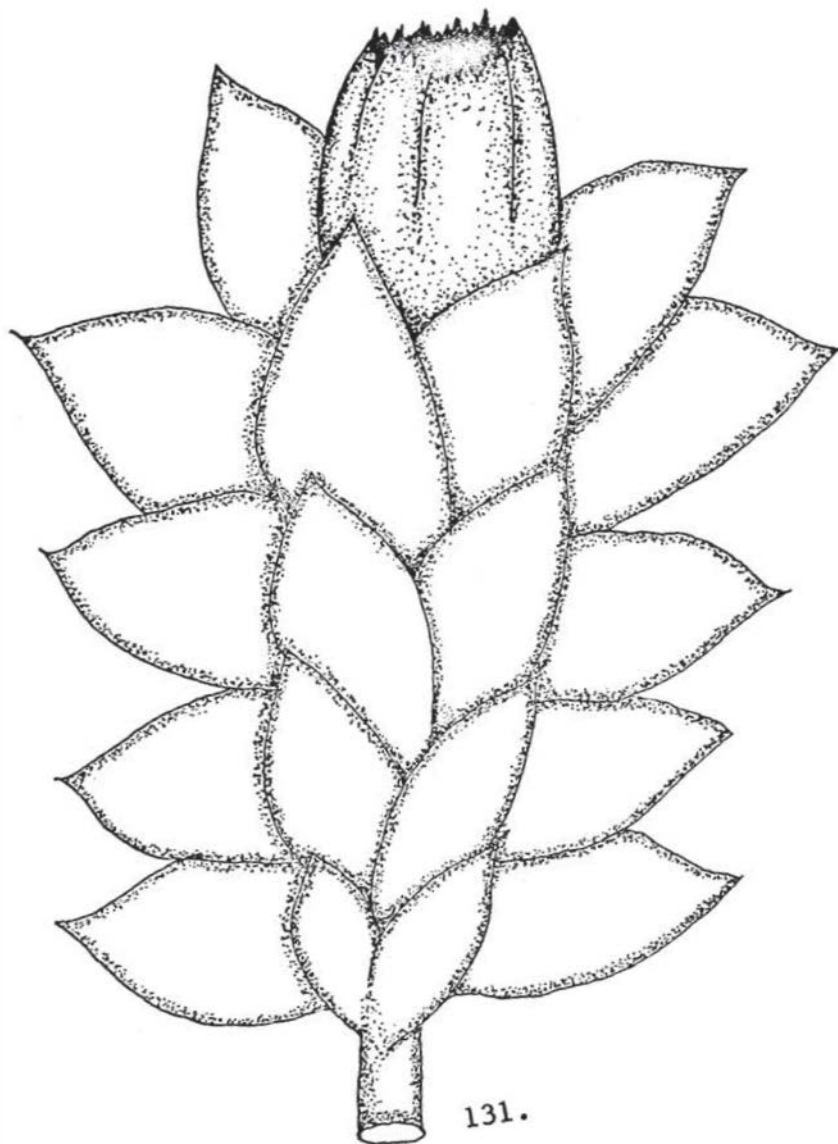
Plants bisexual; female inflorescence usually on a short branch arising just below the male inflorescence; female bracts similar to leaves of sterile shoots but much larger; perianth 1/3-1/2 emergent, obovoid, about 1.4 mm. long, with 4-6 rounded plicae in the upper half; mouth about 2/3 the width of the perianth, branched and ending in cilia; cilia 1-3 cells long; sporangium ovoid, reddish-brown; spores about 13 μ in diameter, yellowish-brown.

Comments:

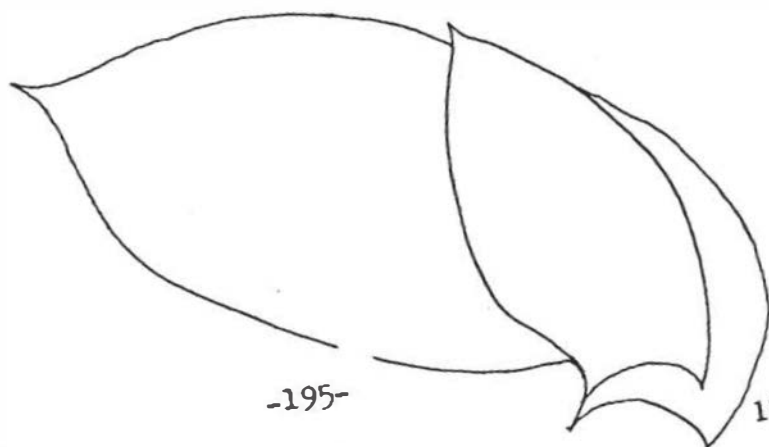
Diplophyllum apiculatum (Evans) Steph. is not a common species, growing on moist shaded banks along a creek. The species name is from the Latin apiculatus, meaning to have a small point at the tip, in reference to the point on the tips of most of the lobes of the leaves.

Diplophyllum apiculatum (Evans) Steph.

- 131. Female plant with perianth, 30 X
- 132. Dorsal view, 40 X



131.



-195-

132.

FAMILY: SCAPANACEAE

Scapania nemorosa (L.) Dum.

Plants in patches, green or olive-green to brownish or reddish; leafy shoots 2.5-4.5 mm. wide; stems 1-10 cm. long, erect, dark brown, paler toward the tip, simple or little branched; rhizoids scarce; leaves larger upward on the shoot, distant to imbricate; dorsal half of the leaf inserted transversely, not decurrent, broadly cordate-ovate to rectangular, 0.7-1.6 mm. long, 0.5-1.4 mm. wide; apex right-angular to rounded, usually obtuse; margin usually ciliate-dentate but sometimes entire, always entire at base; ventral half inserted transversely, not decurrent, elliptic to roundish-obovate, 1.1-2.8 mm. long, 0.75-2 mm. wide; apex obtuse to usually rounded; margin ciliate-dentate in upper half or more of leaf, entire at base; cells of middle of ventral leaf 14-22 μ , of margin 10-15 μ , oblong-rounded to polygonal; trigones small; gemmae common, present on most sterile plants, at apex of stem and of upper leaves, in clusters, 1-celled, ellipsoid to ovoid or sometimes pyriform, about 8 by 17 μ , reddish brown.

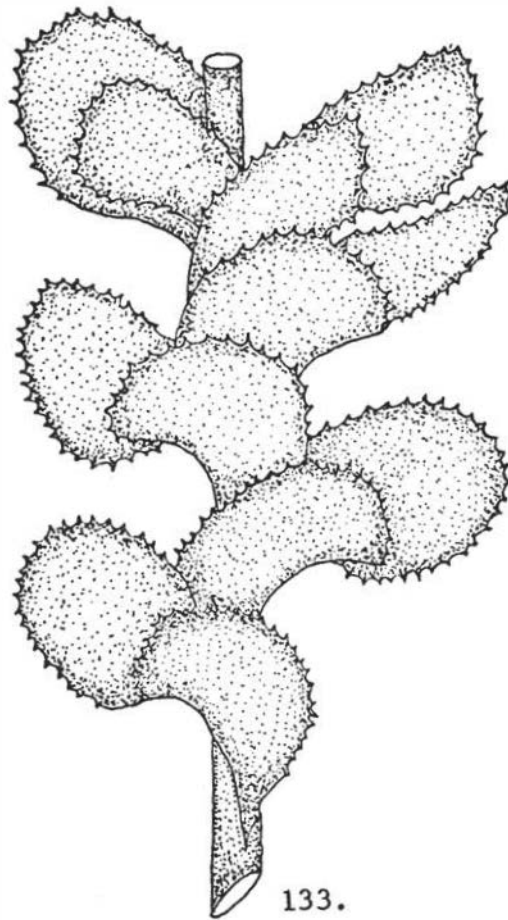
Plants unisexual; the two sexes in the same patch; male inflorescence terminal on modified stems, antheridia 3-6; female bracts larger than the leaves of sterile stems; perianth 1/2-3/5 emergent, oblong-obovoid; mouth truncate, shortly lobed and dentate; sporangium oblong-ovoid, brown; elaters about 150 μ long, 6-8 μ thick; spirals 2, yellowish-brown to reddish-brown.

Comments:

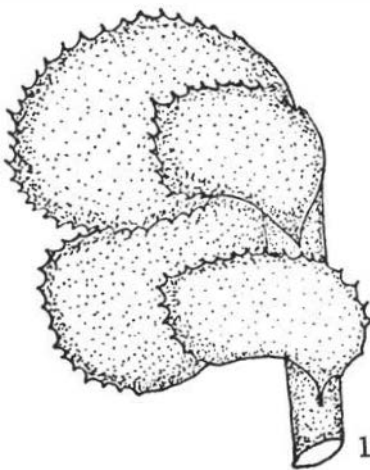
Scapania nemorosa (L.) Dum. is very common, growing on moist or very wet areas on sandstone banks, vertical walls, wet rocks along streams or creeks, and sometimes on rotten wood. The generic name is Greek, scapanion, meaning a spade or hoe, referring to the flattened perianth. The specific name is from the Latin word nemorosus, pertaining to a grove or woods, in reference to one of its habitats.

Scapania nemorosa (L.) Dum.

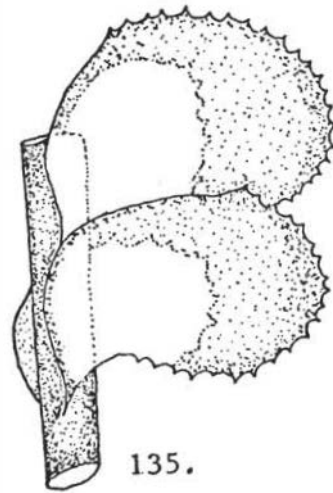
- 133. Stem and leaves, 15 X
- 134. Dorsal view, 17 X
- 135. Ventral view, 17 X



133.



134.



135.

FAMILY: PORELLACEAE

Porella platyphylloidea (Schwein.) Lindb.

Plants in patches, not glossy, dull yellowish-green to brownish-green or dark green; leafy shoots 1-2.5 mm. wide; stems prostrate, 3-8 cm. long, 2-3 pinnate; rhizoids scarce; leaves closely imbricate; dorsal half of leaf broadly obliquely ovate, spreading, 1.5-2.8 times as long as the ventral half; apex somewhat incurved, broadly rounded or more rarely obtuse; margins entire; ventral half ovate, about 1.5-2 times as wide as the stem; apex bluntly acute to rounded obtuse; underleaves roundish quadrate to oblong quadrate, erect to erect spreading, the base applied to the stem, 1-1.5 times as wide as the ventral half of the leaf, apex rounded to obtuse, usually reflexed; margin reflexed, entire, or sometimes sinuate to sparingly denticulate at apex.

Plants unisexual; female inflorescence a short lateral branch without normal leaves; perianth ovoid to pyriform, 1.5-1.9 mm. long; mouth distinctly 2-lipped, lips distantly denticulate to ciliate; seta not quite exserting the sporangium; sporangium spherical, 4-valved; elaters 180-250 μ long, 7-10 μ thick; spirals 1-3, brown; spores 36-55 μ in diameter, yellowish-brown.

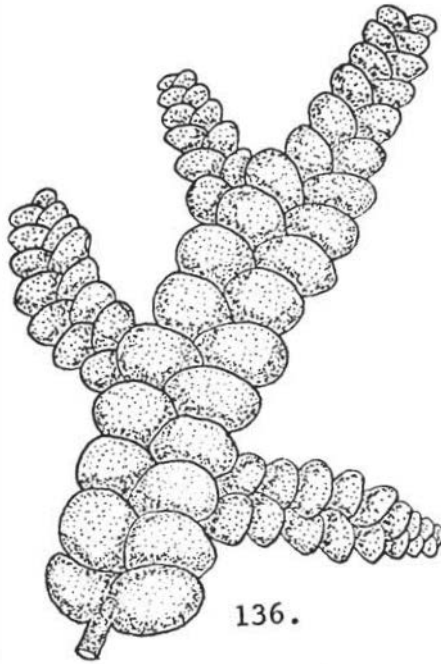
Comments:

Porella platyphylloidea Schwein. is a common leafy liverwort growing on dry rock walls and boulders. The species name is from the Greek platys, meaning flat or wide, and phyllon, leaf, in reference to the dorsal lobe of the leaf.

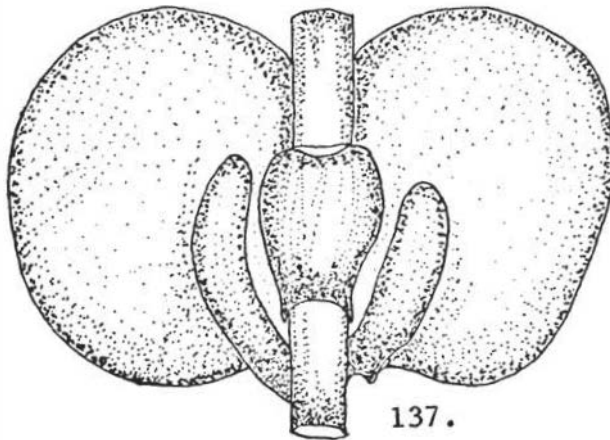
Porella platyphylloidea (Schwein.) Lindb.

136. Habit, 10 X

137. Ventral view, 30 X



136.



137.

FAMILY: FRULLANIACEAE

Frullania asagrayana Mont.

Plants in patches or in pendulous tufts, green or greenish-brown to reddish-brown or dark red; leafy stems 0.7-1.4 mm. wide; stems prostrate to ascending or pendulous, 1-5 cm. long, 120-180 μ thick, 1-2 pinnate; leaves imbricate; dorsal lobe of stem leaf ovate, 525-750 μ long, 500-650 μ wide; apex obtuse to rounded; margin entire; ventral lobe of stem leaf wholly saccate, obovoid, somewhat constricted near mouth, 175-250 μ long, 100-170 μ wide; stalk short; stylus usually quite conspicuous, suborbicular to sublanceolate; trigones present, large; paracysts about the same size as adjacent cells but more reddish, commonly in a vein-like row from base to about middle, in some leaves in several rows, or scattered to wholly wanting; gemmae absent; underleaves 2-lobed, shortly ovate to obovate; lobes acute to obtuse or rounded; margins entire, often undulate.

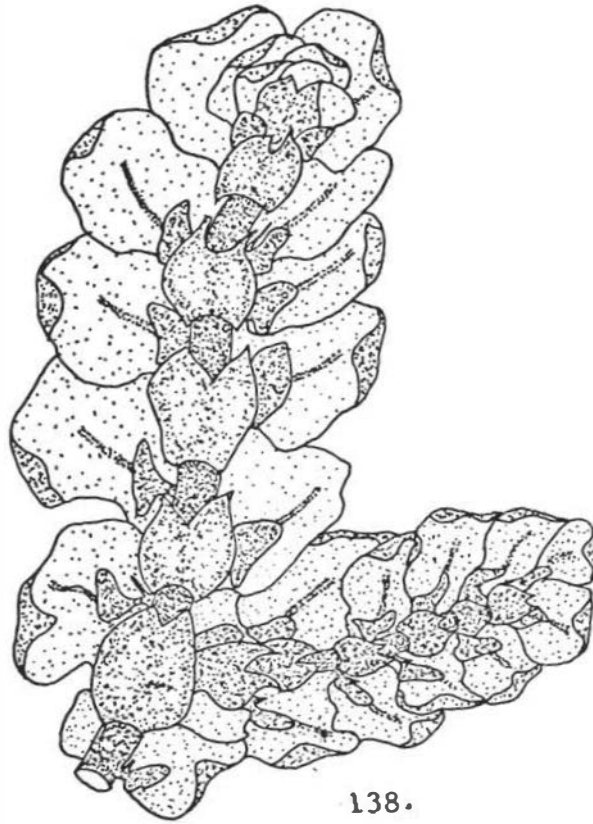
Plants unisexual; female inflorescence terminal on a short lateral branch; female bracts 2-lobed; perianth about 3/4 emergent, dorsally flattened, ellipsoid to obovoid, 1.4-1.9 mm. long, 0.9-1.1 mm. wide.

Comments:

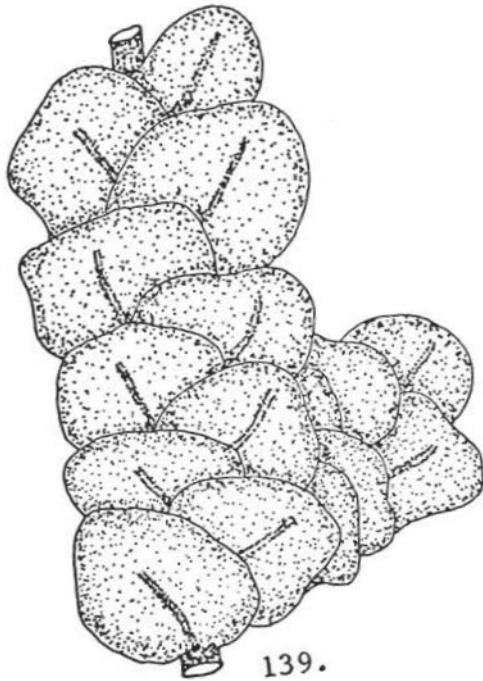
Frullania asagrayana Mont. is a small leafy liverwort that is often reddish in color, growing on dry to moist shaded sandstone rock. This species is named in honor of Dr. Asa Gray of Harvard University.

Frullania asagrayana Mont.

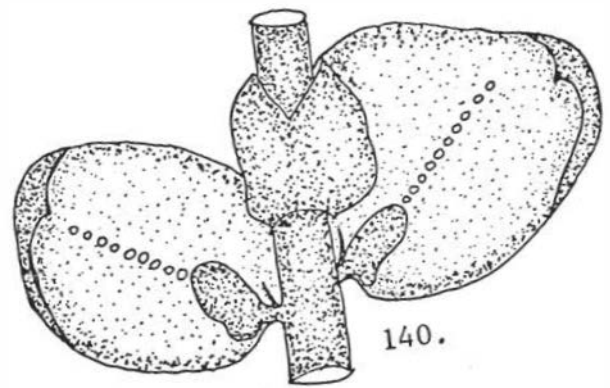
- 138. Ventral view, 25 X
- 139. Dorsal view, 25 X
- 140. Ventral view, 30 X



138.



139.



140.

FAMILY: FRULLANIACEAE

Frullania eboracensis Gottsche

Plants in patches, green or brownish to reddish or blackish; leafy shoots 450-800 μ wide; stems prostrate, closely applied to substratum, 1-3 cm. long, about 100 μ thick, irregularly pinnate; leaves imbricate; dorsal lobe of stem leaf suborbicular; apex broadly rounded; margins entire; 400-600 μ long, 400-500 μ wide; ventral lobe of stem leaf parallel with the stem or nearly so, wholly saccate, helmet-shaped, stalk short; stylus minute; trigones large; paracysts absent; gemmae or margins of leaves; underleaves 2-lobed, ovate to rhombic-ovate; lobes acute; margin entire to 1-toothed on one or both sides.

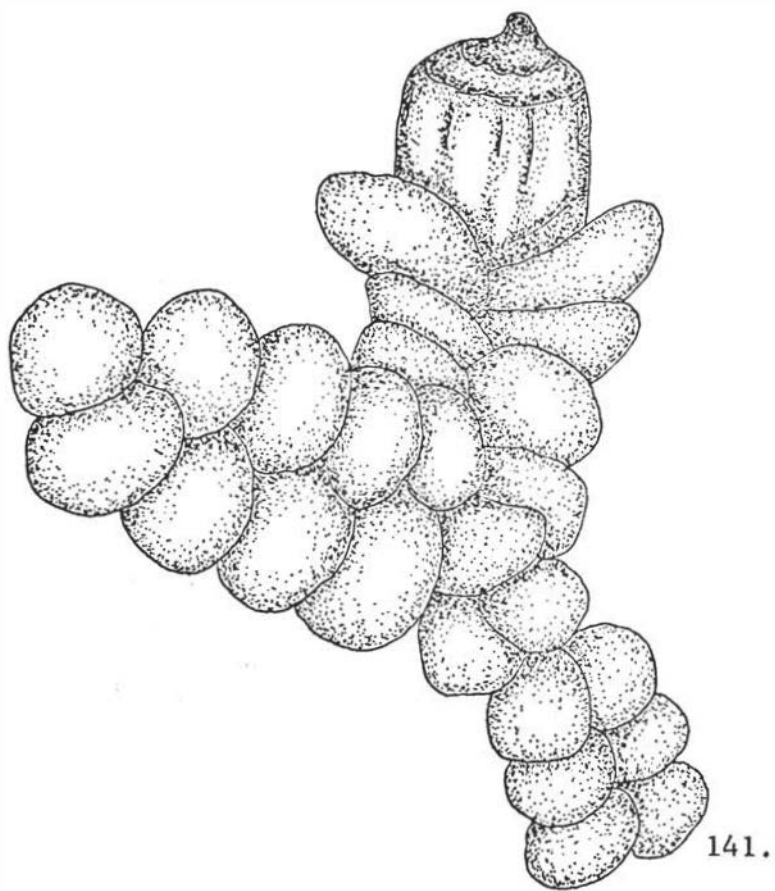
Plants unisexual; female inflorescence terminal on a main shoot; female bracts 2-lobed; perianth about 1/2 emergent, obovoid to obcuneate, 1-1.3 mm. long, 0.6-1 mm. wide, apex rounded to emarginately narrowed to the beak; mouth with beak 1-2 times as long as wide.

Comments:

Frullania eboracensis Gottsche is common on dry to moist rock walls and boulders.

Frullania eboracensis Gottsche

141. Female plant with perianth, 30 X



141.

FAMILY: PELLACEAE

Pellia epiphylla (L.) Corda

Thallus in extended flat patches, dark green with frequently a reddish tinge, about 10 mm. wide, irregularly dichotomously branched; margins undulate, apex cuneate or obovate; midrib broad, passing gradually into the 1-celled margin; rhizoids numerous from the midrib; ventral scales absent,

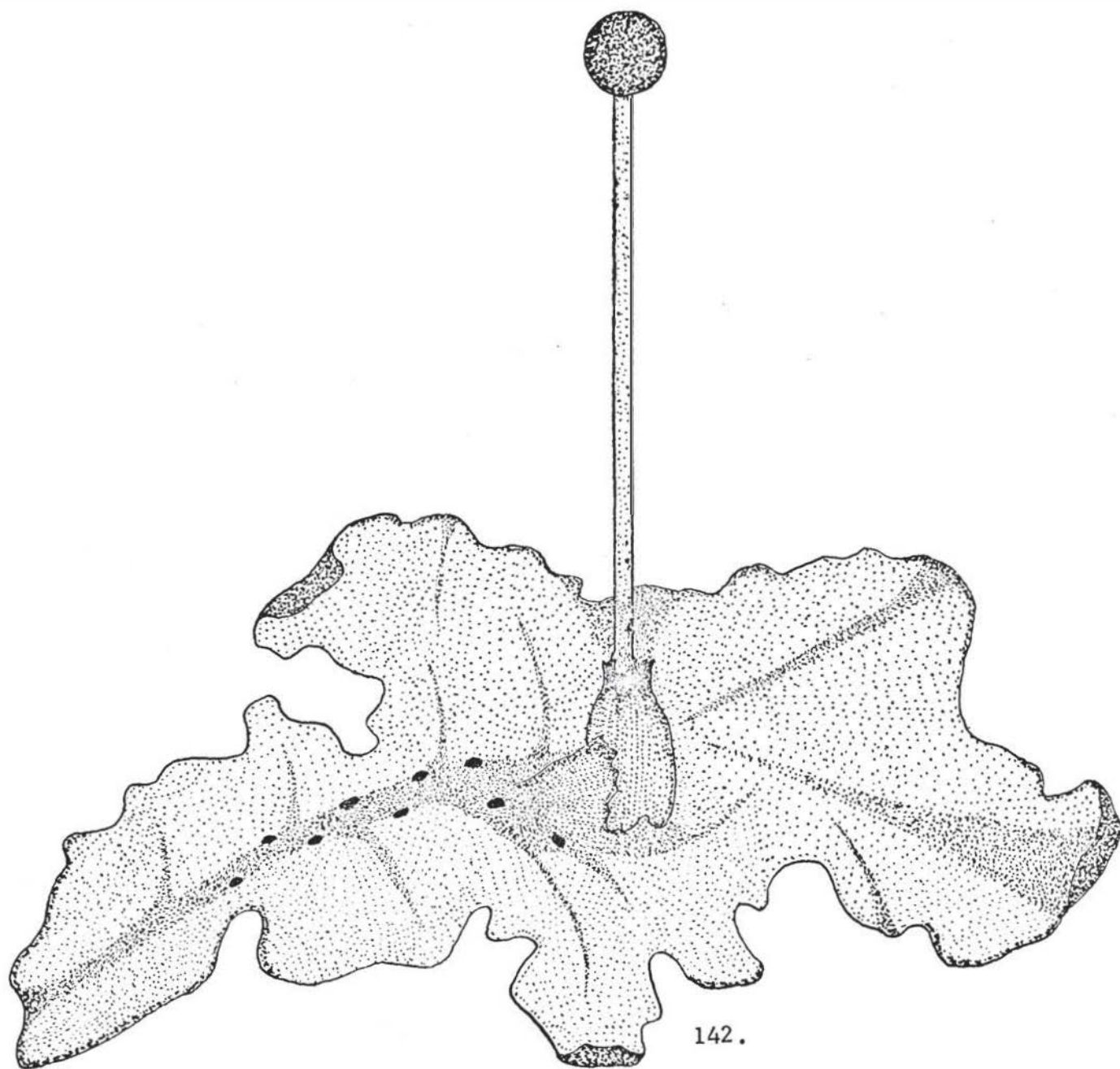
Paroicous; involucre reduced to a semi-cylindrical scale-like flap on the posterior side of the cavity from which the calyptra arises; calyptra much exserted, arcuate, cylindrical-clavate, rosy colored at the base and frequently also towards the apex; capsule globose, dark olive-green, of 2-3 layers of cells; pedicel hyaline, to 5 cm. long; spores 80-100 μ in diameter, oblong-oval, yellow-green; elaters very long and thin, contorted, 8 μ wide, mostly bispiral; antheridia behind the female inflorescence, beneath small, reddish elevated tubercles on the dorsal surface of the midrib; gemmae absent.

Comments:

Pellia epiphylla (L.) Corda is common on moist sandstone bluffs and walls, often growing with Conocephalum. The species name means upon-leaf, referring to the conspicuous sporophyte coming out of the upper side of a leaf-like gametophyte.

Pellia epiphylla (L.) Corda

142. Thallus with sporophyte, 10 X



FAMILY: BLASIACEAE

Blasia pusilla L.

Thallus in green or bluish-green rosettes, 1.5-2.5 cm. long, 3-5 mm. broad, repeatedly branched, with several rounded lobes, margins ascending and frequently crisped at the apex of the branches; midrib broad and flat below, gradually passing into the lobes; rhizoids numerous, from the midrib, white; underleaves ovate, dentate; leaf auricles generally two at the base of each lobe, hollow, becoming filled with Nostoc colonies and appearing as black spots on the thallus.

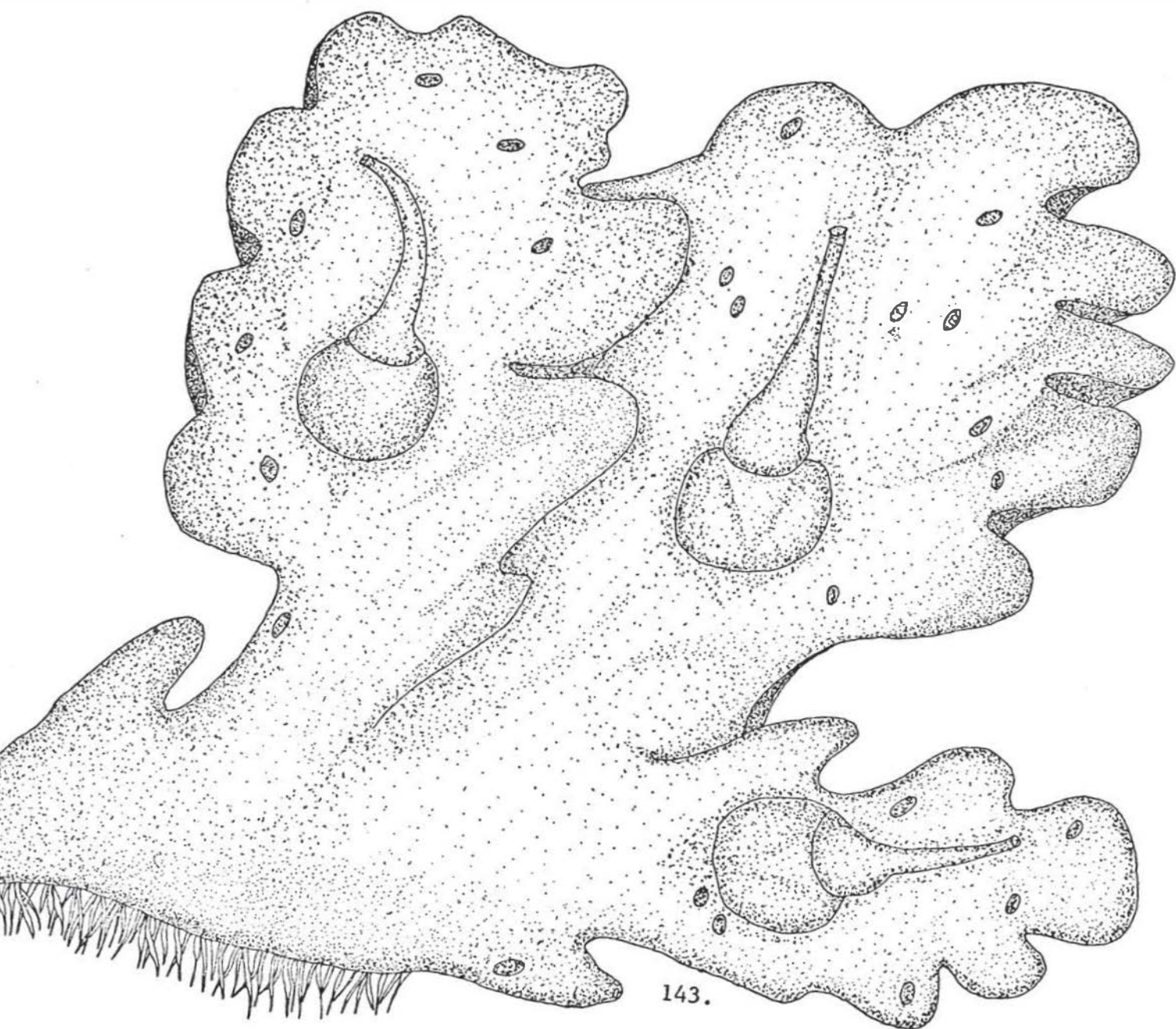
Dioicous; capsule rather longly pedicellate, pedicel to 2 cm. long, capsule oval; spores 33-43 μ in diameter, rounded-tetrahedral, yellowish-brown, granulate; elaters bispiral, pale yellow; male plant smaller than female; antheridia few, oval; gemmae of two kinds; one being round or oval, longly pedicellate, many celled, in flask-shaped receptacles with long necks on the dorsal surface of the midrib; the other occurring as loose stellate scales on the dorsal surface near the apices of the thallus.

Comments:

Blasia pusilla L. is not common on moist, shaded sandstone bluffs along streams. This species is often confused with Pellia, but can be recognized and separated apart from Pellia by the black spots on the thallus, and thallus that is lobed.

Blasia pusilla L.

143. Thallus with gemmae cups, 5 X



FAMILY: MARCHANTIACEAE

Conocephalum conicum (L.) Dum.

Thallus large, dark green, dichotomously branched, 10-20 cm. long, 8-10 mm. wide; margins undulate; apex emarginate; dorsal surface with very conspicuous areolae, mostly hexagonal, pores simple, visible to naked eye, with 5-6 concentric rings of cells; epidermal cells thin-walled, angles not thickened; ventral surface pale green, midrib conspicuous, scales rather distant, in one row on each side, with a violet, reniform appendage.

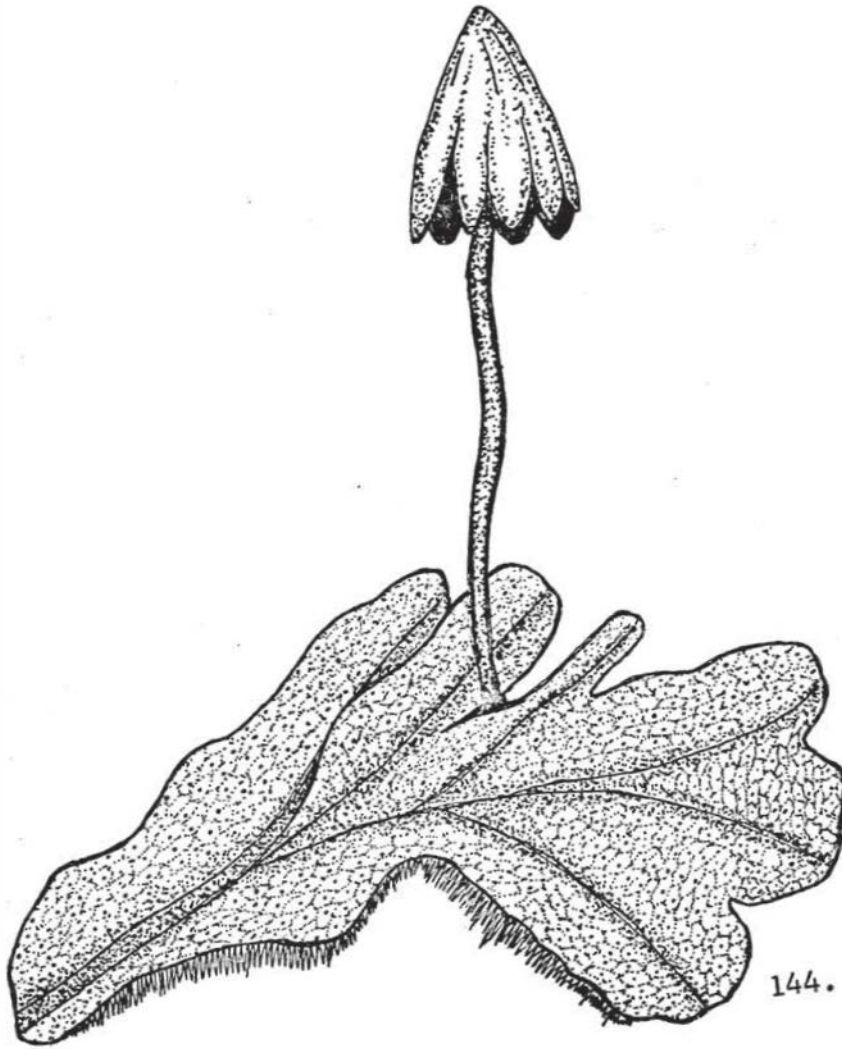
Dioicous; female peduncle from the apex of a branch, 3-6 cm. long; receptacle obtusely conical, almost entire, composed of 5-8 tubular involucre, each enclosing a single sporogonium; pseudoperianth absent; capsule with rather long pedicel, dehiscing at maturity by shooting off an apical cap, the remainder splitting longitudinally by 4-8 reflexed valves; spores large, 70-90 μ in diameter, papillose, many celled, beginning to germinate while still within the capsule; elaters 2-4 spiral; male receptacle disciform, papillose sessile at apex of a branch; gemmae cups absent.

Comments:

Conocephalum conicum (L.) Dum. grows on vertical shaded sandstone walls along creeks. When crushed, the thallus gives off a distinctive fragrance which is due to oil-bodies and mucilage organs. The genus and species names refer to the cone-shaped head of the female receptacle.

Conocephalum conicum (L.) Dum.

144. Thallus with receptacle, 2.5 X



144.

FAMILY: MARCHANTIACEAE

Marchantia polymorpha L.

Thallus dichotomously branched with broad midrib, 2-10 cm. long, 7-20 mm. wide, flat or slightly concave, margins sinuate-lobed, apex emarginate; dorsal surface with distinct hexagonal areolae; epidermal cells 5-6 angled, thin walled, angles not thickened; pores not visible to naked eye, little elevated with 4 superimposed concentric rings; ventral surface brownish, rhizoids smooth, yellowish; scales in three rows on each side, those at margin broadly ligulate, hyaline or purplish; midrib scarcely prominent below.

Dioicous; peduncle of female receptacle stellate with 4-10 elongated branches, each with a rhizoid canal underneath; involucre 2-valved, alternating with the branches, enclosing several sporogonia, each surrounded by a pseudoperianth; capsule oval, longly pedicellate, dehiscing to below the middle by irregular valves; spores 14μ in diameter, spherical, yellow; elaters $5-7\mu$ broad, long and attenuate, 2-spiral, yellow; peduncle of male receptacle shorter than female, receptacle disciform with 8 short rounded lobes; gemmae cups goblet-shaped with fringed margin, gemmae rotund-reniform, vertically inserted in groups at bottom of gemmae cups.

Comments:

Marchantia polymorpha L. grows on vertical shaded sandstone walls along creeks and on wet rocks in or along streams, brooks, or creeks. The goblet-shaped gemmae cups with fringed margins

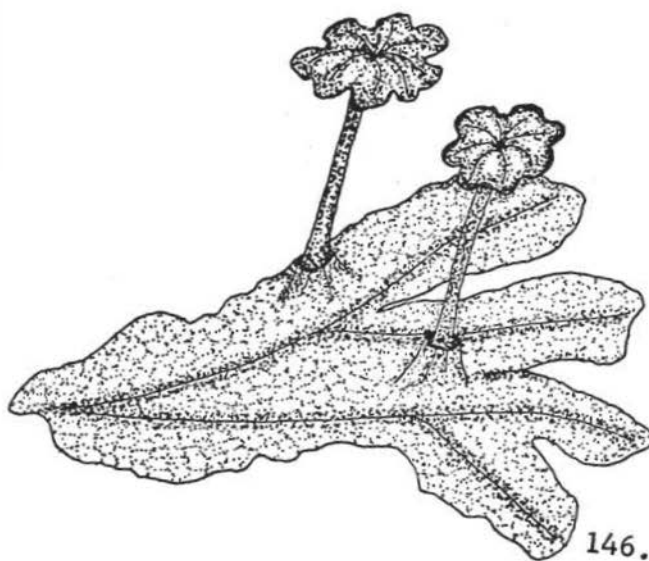
are almost always present on the dorsal surface of the thallus.

Marchantia polymorpha L.

145. Female plant with receptacle and
gemmae cup, 2 X
146. Male plant with receptacles, 2 X



145.



146.

FAMILY: MARCHANTIACEAE

Reboulia hemisphaerica (L.) Raddi

Thallus dichotomously branched, 10-30 mm. long, 6-8 mm. broad, light green with a purple margin, apex emarginate or bilobed, margins ascending, often crenulate; dorsal surface with epidermal cells 4-6 angled, the walls and angles much thickened, aerolae not distinct, pores simple, little elevated, with 5-6 concentric rings; ventral surface purple; scales imbricate, in one row on each side of midrib, obliquely lunulate, with two linear acute appendages; midrib thick.

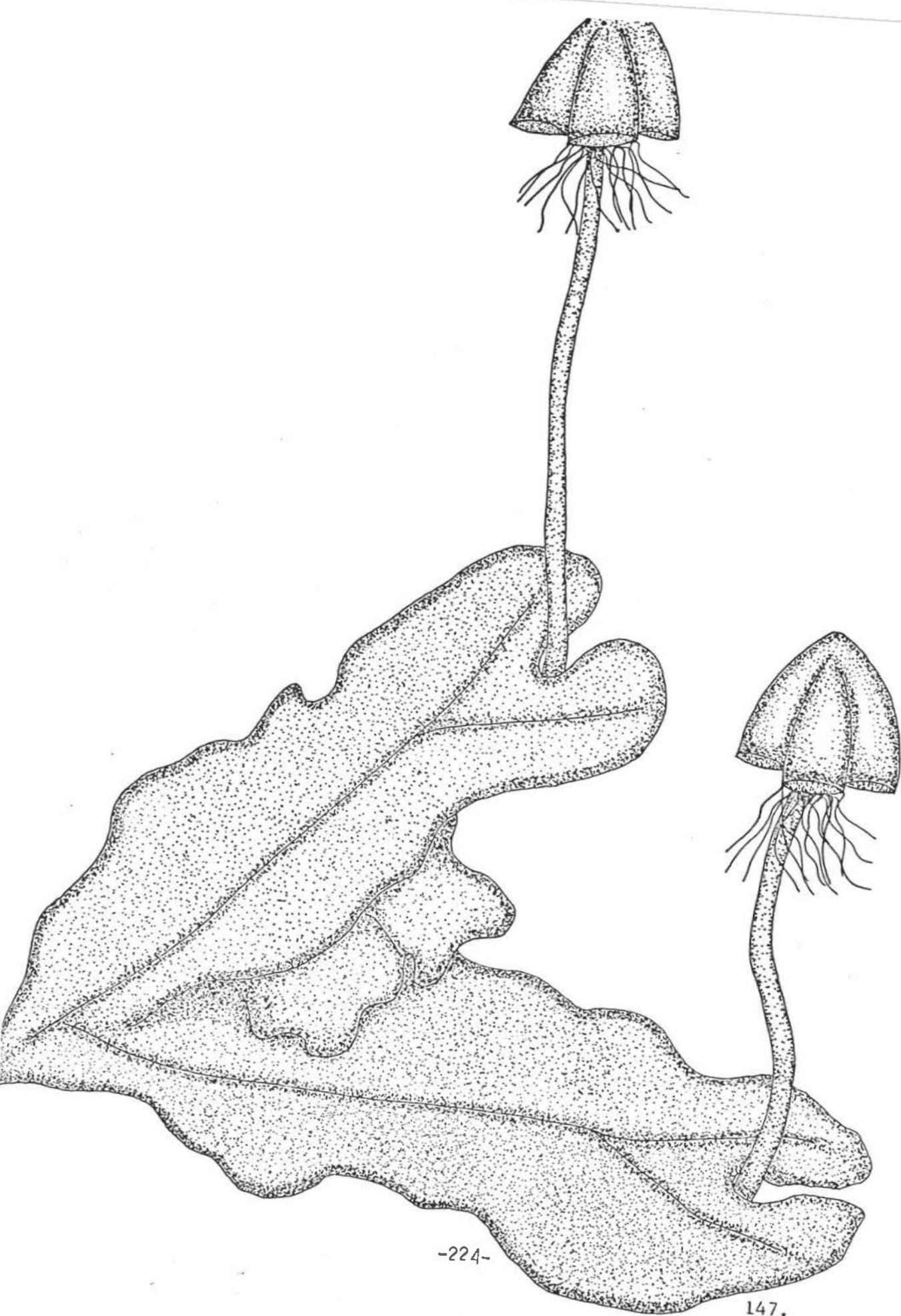
Dioicous; female penduncle 15-25 mm. long, arising from behind the apex of a thallus lobe; female receptacle conical or hemisphaerical, divided to the middle into 4-7 obtuse lobes with air spaces and compound pores; involucre arising from the ventral margin of the receptacle lobes, 2-valved, each enclosing a sporogonium; pseudoperianth absent; capsule subglobose, with a large foot, irregularly dehiscent at apex, the lower portion left behind as a hemisphaerical cup containing the spores and elaters; elaters 2-3 spiral; spores 65-76 μ in diameter, rounded-tetrahedral, brownish-yellow; male receptacle sessile, arising from behind the apex of a thallus lobe, oval to semicircular; gemmae absent.

Comments:

Reboulia hemisphaerica (L.) Raddi grows on moist shaded sandstone walls and bluffs or on sunny soil over the rock. The species name refers to the hemispheric shape of the female receptacle.

Reboulia hemisphaerica (L.) Raddi

147. Female plant with receptacles, 8 X



-224-

147.

FAMILY: ANTHOCEROTACEAE

Phaeoceros laevis (L.) Prosk.

Thallus suborbicular, in dark green or bluish green patches, 5-15 mm. in diameter, nearly flat, smooth, divided into broad obovate lobes, rounded at the apex; margins entire or crenate; costa absent; lamina one layered; ventral surface contains pores; cells 35-70 μ long and 30-35 μ wide, each cell containing one large chloroplast, rhizoids smooth.

Monoicous; involucre 2-3.5 mm. long, .7-1 mm. broad, cylindrical, slightly narrower towards the apex; sporogonium pod-like with a bulbous foot but without a pedicel, 15-25 mm. long, its walls containing chlorophyll and stomata, 70-77 x 25-30 μ ; mature capsule dehiscing from the apex downwards by two valves; a central columella developed, its apex being arched over by the spore forming layer; spores 46-56 μ , yellow, thickly granular-papillate; pseudoelaters pale brown, 25-45 μ long; antheridia in groups of 2-3 in receptacles scattered on the dorsal surface of the thallus.

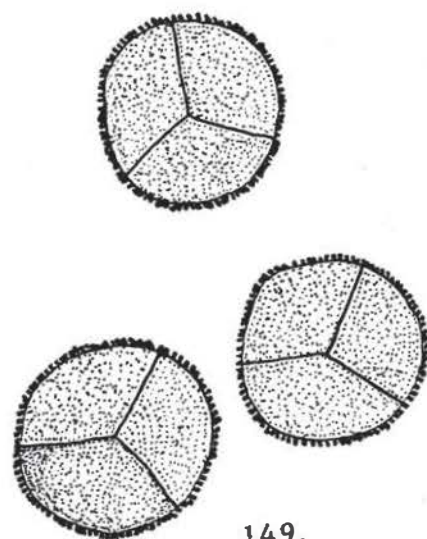
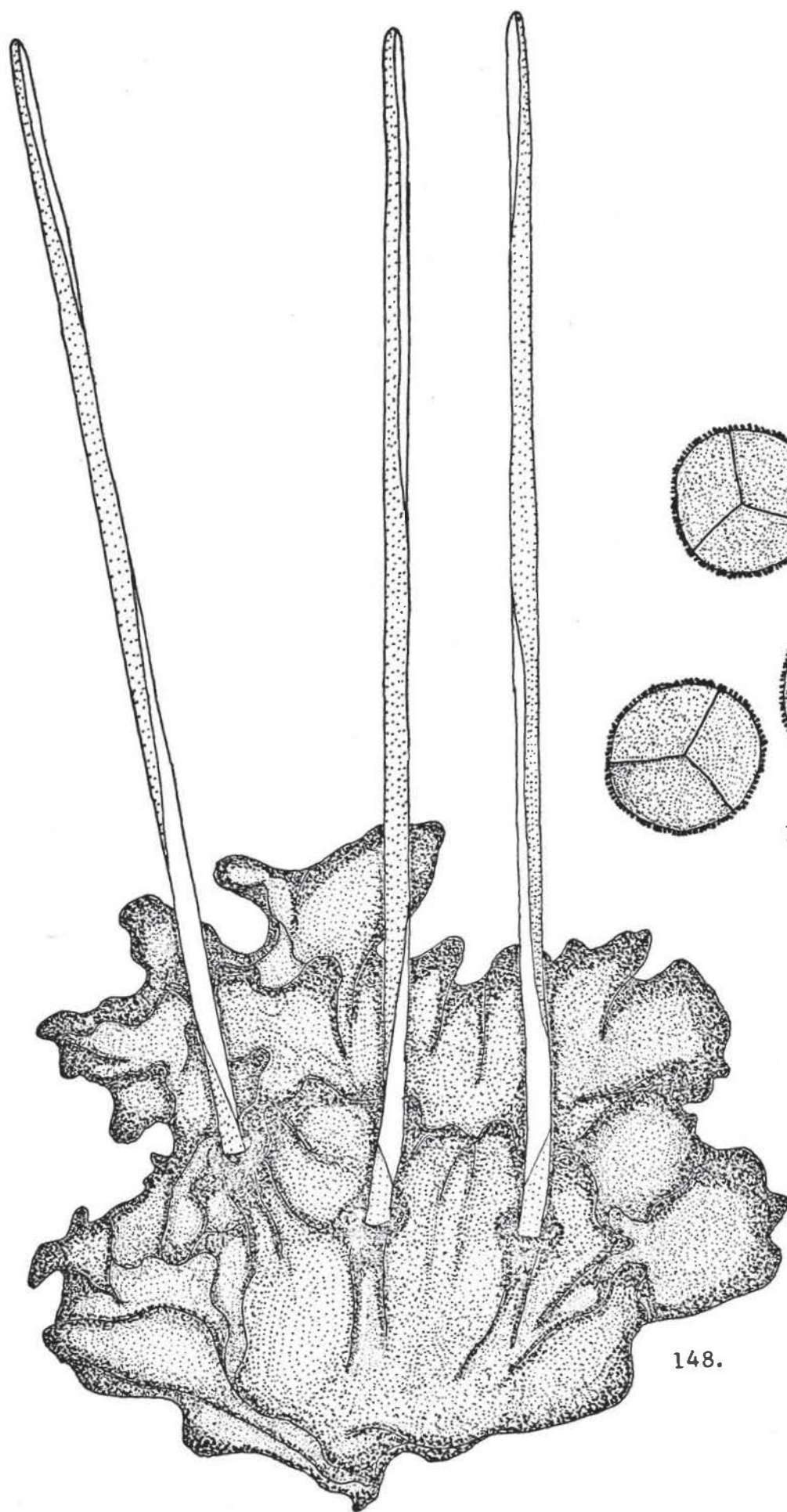
Comments:

Phaeoceros laevis L. is not common on moist sandstone walls and on rocks along creeks. The genus name means flower-horn, referring to the horn-like sporangia.

Phaeoceros laevis (L.) Prosk.

148. Thallus with sporophytes, 30 X

149. Spores, 80 X



DISCUSSION

Acrocarpous mosses represented many more species than pleurocarpous mosses collected on sandstone bluffs. The acrocarpi collected on sandstone bluffs are: Atrichum angustatum (Brid.) Bry., Aulacomnium heterostichum (Hedw.) B.S.G., Barbula fallax Hedw., Bartramia pomiformis Hedw., Bryum psudotriquetrum (Hedw.) Schw., Ceratodon purpureus (Hedw.) Brid., Dicranella heteromalla (Hedw.) Schimp. Dicranella varia (Hedw.) Schimp., Dicranum scoparium Hedw., Diphyscium foliosum (Hedw.) Mohr., Ditrichum pallidum (Hedw.) Hampe., Ditrichum pusillum (Hedw.) E. G. Britton, Fissidens bryoides Hedw., Leucobryum glaucum (Hedw.) Schimp., Mnium affine Bland., Mnium cuspidatum Hedw., Mnium punctatum Hedw., Pohlia nutans (Hedw.) Lindb., Polytrichum commune Hedw., and Tetraphis pellucida Hedw. Of the acrocarpous species collected, Atrichum angustatum (Brid.) Bry., Aulacomnium heterostichum (Hedw.) B.S.G., Dicranella heteromalla (Hedw.) Schimp., and Mnium cuspidatum Hedw. were the most frequent. The most infrequent acrocarpous species collected were: Ceratodon purpureus (Hedw.) Brid., Diphyscium foliosum (Hedw.) Mohr., Fissidens bryoides Hedw., and Pohlia nutans (Hedw.) Lindb. Pleurocarpous mosses collected were: Anomodon attenuatus (Hedw.) Hueben., Anomodon minor (Hedw.) Furnr., Cirriphyllum boscii (Schwaeger) Grout., Climacium americanum Brid., Hypnum imponens Hedw., and Thuidium delicatulum (Hedw.) B.S.G. Of the pleurocarpous species collected on

sandstone bluffs, Thuidium delicatulum (Hedw.) B.S.G. was the most frequent.

The most infrequent pleurocarp collected was Climacium americanum Brid. Leafy liverworts represented many more species than thalloid or near-thalloid liverworts collected on sandstone bluffs. The leafy liverworts collected were: Blepharostoma trichophyllum (L.) Dum., Calypogeia muellerana (Schiffn.) K. Mull, Cephalozia media Lindb., Cephaloziella hampeana (Nees.) Schiffn., Diplophyllum apiculatum (Evans) Steph., Harpanthus scutatus (Web. & Mohr.) Spruce., Jamesoniella autumnalis (De Cand.) Steph., Lophocolea heterophylla (Schrad.) Dum., Lophocolea minor Nees., Lophozia incisa (Schrad.) Dum., Odontoschisma prostratum (Sw.) Trev., Plagiochila asplenioides (L.) Dum., Plectocolea hyalina (Lyell.) Mitt., Scapania nemorosa (L.) Dum., and Trichocolea tomentella (Ehrh.) Dum. The most frequent species of leafy liverworts collected were: Calypogeia muellerana (Schiffn.) K. Mull., Lophocolea heterophylla (Schrad.) Dum., and Scapania nemorosa (L.) Dum. The most infrequent species collected were: Harpanthus scutatus (Web. & Mohr.) Spruce, Lophocolea minor Nees., and Trichocolea tomentella (Ehrh.) Dum. The thalloid liverworts collected on sandstone bluffs were: Blasia pusilla L., Pellia epiphylla (L.) Corda., and Reboulia hemisphaerica (L.) Raddi. One species of hornwort, Phaeoceros laevis (L.) Prosk. was infrequently collected.

Vertical sandstone walls provide another habitat for saxicolous mosses and liverworts. The following acrocarpous mosses were collected from vertical sandstone walls: Barbula fallax Hedw., Grimmia laevigata (Brid.) Brid., Gymnostomum aeruginosum Sm., Leptobryum pyriforme (Hedw.)

Schimp., Mnium affine Bland., Mnium cuspidatum Hedw., Orthotrichum strangulatum Schw., and Pohlia nutans (Hedw.) Lindb. The most frequent acrocarpous species collected was Mnium cuspidatum Hedw., and Leptobryum pyriforme (Hedw.) Schimp. was the most infrequent species collected. Pleurocarpous species collected on vertical walls were: Anomodon attenuatus (Hedw.) Hueben., Brachythecium salebrosum (Web. & Mohr.) B.S.G., Hypnum imponens Hedw., Plagiothecium denticulatum (Hedw.) B.S.G., Platygyrium repens (Brid.) B.S.G., Taxiphyllum deplanatum (Bruch. & Schimp. ex. Sull.) Fl., and Thuidium delicatulum (Hedw.) B.S.G. Of all species of moss collected on vertical sandstone walls, Mnium cuspidatum Hedw. and Thuidium delicatulum (Hedw.) B.S.G. were the most frequent, and Platygyrium repens (Brid.) B.S.G. was the most infrequent species collected. One species of Sphagnum was collected, being Sphagnum palustre L. Leafy liverworts collected on vertical sandstone walls were: Blepharostoma trichophyllum (L.) Dum., Calypogeia muellerana (Schiffn.) K. Miill., Cephalozia media Lindb., Cephaloziella hampeana (Nees.) Schiffn., Harpanthus scutatus (Web. & Mohr.) Spruce, Jamesoniella autumnalis (DeCand) Steph., Lophocolea heterophylla (Schrad.) Dum., Lophocolea minor Nees., Plectocolea hyalina (Lyell.) Mitt., and Scapania nemorosa (L.) Dum. The most frequent species collected was Scapania nemorosa (L.) Dum. The most infrequent species collected were: Harpanthus scutatus (Web. & Mohr.) Spruce., and Lophocolea minor Nees. Thalloid species collected on vertical sandstone walls were: Blasia pusilla L., Conocephalum conicum (L.) Dum., Marchantia polymorpha L., Pellia epiphylla (L.) Corda., and Reboulia hemisphaerica (L.) Raddi. Of the thalloid species collected, Conocephalum conicum (L.) Dum. was most frequently observed. The most infrequent species was Marchantia polymorpha L. Also, collected infrequently on vertical walls

was Phaeoceros laevis (L.) Prosk. a hornwort.

Several species of mosses and liverworts prefer to grow in a rather dry habitat, and grow on sandstone walls or boulders exposed to direct sunlight. These species of mosses collected on dry rock exposed to direct sunlight are: Dicranella varia (Hedw.) Schimp., Grimmia apocarpa Hedw., Grimmia laevigata (Brid.) Brid., Gymnostomum aeruginosum Sm., Hedwigia ciliata Hedw., and Orthotrichum strangulatum Schw. The most frequent species collected on rock exposed to direct sunlight were Grimmia apocarpa Hedw. and Hedwigia ciliata Hedw. The most infrequent species collected was Orthotrichum strangulatum Schw. Liverworts collected on exposed rock were: Frullania asagrayana Mont., Frullania eborascensis Gottsche., and Porella platyphylloidea Lindb.

Another habitat for moss and liverwort species is on wet rocks in or along streams, brooks or creeks. The following species were collected on wet rocks: Brachythecium salebrosum (Web. & Mohr.) B.S.G., Fissidens bryoides Hedw., Leptobryum pyriforme (Hedw.) Schimp., and Mnium punctatum Hedw. Liverwort species collected from wet rocks in or along streams, brooks or creeks were: Phaeoceros laevis (L.) Prosk., Conocephalum conicum (L.) Dum., Marchantia polymorpha L., Plagiochila asplenioides (L.) Dum., Reboulia hemisphaerica (L.) Raddi, and Scapania nemorosa (L.) Dum. Of all species collected on wet rocks, Scapania nemorosa (L.) Dum. was the most frequent, and Leptobryum pyriforme (Hedw.) Schimp. was the most infrequent.

Of the sixty-two bryophytes collected, thirty-eight of the species were mosses, and twenty-four of the species were hepatics. Mnium cuspidatum

Hedw. was the most frequent acrocarpous species collected, and Thuidium delicatulum (Hedw.) B.S.G. was the most frequent pleurocarpous species. Of the twenty-four hepatics collected, Scapania nemorosa (L.) Dum. was the most frequent leafy species collected, and Conocephalum conicum (L.) Dum. was the most frequent thalloid species collected.

CONCLUSION AND SUMMARY

A review of the literature reveals that no studies have been made on the saxicolous bryophytes of East-Central Illinois. Of the twelve county bryological studies and two state-wide bryological reports made in Illinois, none have mentioned the saxicolous bryophytes of Coles and Clark counties.

This research involves a taxonomic survey of the saxicolour bryophytes of Coles and Clark counties in Illinois. Sixty-two species of mosses and liverworts were collected in these counties representing thirty-two genera of mosses and twenty-two genera of liverworts. Collections were made from four different habitats: shaded sandstone banks, shaded vertical sandstone walls, dry sandstone walls or boulders exposed to direct sunlight, and wet rocks in or along streams, brooks or creeks. The collections were placed in standard bryological packets provided with standard data. All specimens determined by the author were corroborated by Dr. Charles B. Arzeni. Duplicated specimens were placed in the Ernest L. Stover Herbarium, Eastern Illinois University, Charleston, Illinois. Descriptions and illustrations were prepared for each specimen.

Of the sixty-two bryophytes collected, fifty-two were frequently reported in previous Illinois publications. Ten species were rare or considered to be rare. These are: Blepharostoma trichophyllum (L.) Dum., Bryum pseudotriquetrum (Hedw.) Schw., Diplophyllum apiculatum

(Evans) Steph., Harpanthus scutatus (Web. & Mohr) Spruce, Leptobryum
pyriforme (Hedw.) Schimp., Lophocolea minor Nees., Lophozia incisa
(Schrad.) Dum., Orthotrichum strangulatum Schw., Pohlia nutans (Hedw.)
Lindb., and Trichocolea tomentella (Ehrh.) Dum.

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Coles

Clark

Location of Counties Surveyed in this Study