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Jungermanniales of Coles and Clark Counties of Illinois

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JUNGERMANNIALES OF COLES AND CLARK COUNTIES OF ILLINOIS

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INTRODUCTION

The purpose of this paper is to provide a simplified guide to the identification of the acrogynous species of the Order Jungermanniales, (leafy liverworts), in the Class Hepaticae, of Coles and Clark Counties in Illinois. The descriptions and drawings, hopefully, will serve to aid students who may not be professional bryologists in the identification of the leafy Jungermanniales without intensive laboratory work.

The Order Jungermanniales comprises a significant part of the bryophyte flora of the Coles and Clark County area of east central Illinois and are characterized by two rows of small "leaf-like" outgrowths situated near the upper side of the "stem." The "leaf-like" appendages are somewhat notched at the apex, toothed, and oftentimes positioned over smaller "leaves." Midribs are lacking. The "leaf" cells are isodiametric.

> The sex organs of these leafy species are usually terminal or axillary. The sporophyte is a sporogonium, and consists of a seta and foot. The sporangium wall is usually 1 or more cells thick and possesses a columella which is sterile (Frye and Clark, 1937).

The sporangium generally remains within the calyptra until the spores mature. The cells of the seta elongate rapidly and the seta breaks through the calyptra. Dehiscence in most

species is by four valves. Spores germinate, when environmental conditions permit, into the prothallial stage of the liverwort life cycle. The gametophyte is generally dorsiventral. Liverworts fall easily into two well-developed groups (Acrogynae and Anacrogynae) which are determined by the position of the archegonia. The descriptive groups within the Jungermanniales are the Anacrogynae, referring to thalloid liverworts which have archegonia which develop dorsally, and Acrogynae, which have Archegonia which develop at the leaf apex. Only the acrogynous members of the Jungermanniales will be considered in this study. The antheridia are usually oval in outline and often nearly sessile. Non-sexual reproductive bodies called gemmae are present in many species.

The Jungermanniales show a great deal of external differentiation. "Their internal tissues, however, are mostly parenchyma" (Campbell, 1918). The Jungermanniales develop from one apical cell which varies in form in different genera or even different species of the same genus.

Some of the Jungermanniales included in this study may be rare or non existent at this time. Clearing, farming, and promiscuous collecting may be responsible for this decline in populations.

The outline below (Schuster, 1966) is the general classification system used in this paper. Starred (*) names occur in the area under consideration (Coles and/or Clark Counties).

Class I. Hepaticae

Subclass A. Jungermanniae

Order 1. Takakiales

Family 1. Takakiaceae

Genus. Takakia Hatt. & Inoue

Order 2. Calobryales

Family 2. Haplomitriaceae

Genus. Haplomitrium Nees

Calobryum Nees

Order 3. Jungermanniales

Suborder A. Herbertinae

Family 3. Herbertaceae

Genus. Herberta S. F. Gray

Herpocladium (Mitt.) Schust.

Pleurocladopsis Schust.

Family 4. Vetaformaceae

Genus. Vetaforma Fulf. & Tayl.

Family 5. Blepharostomaceae

Genus. *Blepharostoma (L) Dumort.

Archeophylla Schust.

Temnoma Mitt.

Archeochaete Schust.

Trichotemnoma Schust.

Haplochaete Schust.

Family 6. Chaetocoleaceae

Genus. Chaetocolea Spr.

Family 7. Isotachidaceae

Genus. Isotachis Mitt.

Neesioscyphus Grolla

Eoisotachis Schust.

Suborder B. Ptilidiinae

Family 8. Ptilidiaceae

Genus. Ptilidium Nees

Family 9. Lepicoleaceae

Genus. Lepicolea Dumort.

Family 10. Chaetophyllopsidaceae

Genus. Chaetophyllopsis Schust.

Family 11. Trichocoleaceae

Genus. *Trichocolea Dumort. Corr Nees

Family 12. Lepidolaenanceae

Genus. Lepidolaena Dumort.

Suborder C. Lepidoziinae

Family 13. Lepidoziaceae

a. Subfamily Lepidozioideae

Genus. *Lepidozia Dumort. emend. Joerg.

b. Subfamily Bazzanioideae

Genus. *Bazzania S. F. Gray, corr. Carr

c. Subfamily Lembidioideae

Genus. Lembidium Mitt.

d. Subfamily Zoopsidoideae

Genus. Paracromastigum Fulf. and Tayl.

e. Subfamily Mytilopsidoideae

Genus. Mytilopsis Spr.

Family 14. Calypogeiaceae

Genus. *Calypogeia (L) Corda

Suborder D. Jungermanniiae

Series a.

Family 15. Lophoziaceae

Genus. Chandonanthus Mitt.

*Lophozia Dumort. emend. K.

Leiocolea K. Mull

Barbilophozia Schust.

Gymnocolea Dumort.

Tritomaria Schiffn.

Family 16. Jungermanniaceae

Genus. Jungermannia Ruppies L.

Nardia S. F. Gray

*Jamesoniella (Spr.) Schiffn.

*Plectocolea (Lyell) Mitt.

Family 17. Gyrothyraceae

Genus. Gyrothyra Howe

Family 18. Marsupellaceae

Genus. Marsupella Dumort.

Gymnomitrion Corda

Family 19. Scapaniaceae

Genus. Diplophyllum Dumort. emend. Lindb.

*Scapania Dumort.

Family 20. Delavayellaceae

Genus. Delavayella Steph.

Series b.

Family 21. Balantiopsidaceae

Genus. Balantiopsis Mitt.

Family 22. Schistochilaceae

Genus. Schistochila Dumort.

Series c.

Family 23. Lophocoleaceae

a. Subfamily Lophocoleoidae

Genus. *Lophocolea Dumort.

b. Subfamily Leptoscyphoideae

Genus. Leptoscyphus Mitt.

c. Subfamily Harpanthoideae

Genus. *Harpanthus (W & M) Spruce

Geocalyx Nees.

Family 24. Chonecoleaceae

Genus. Chonecolea Grolle

Family 25. Plagiochilaceae

Genus. *Plagiochila Nees and Mont.

Chiastocaulon Carl

Plagiochilidium Herz

Plagiochilion Hatt.

Xenochila Schust.

Achrochila Schust.

Syzygiella Spr.

Family 26. Acrobolbaceae

Genus. Acrobolbus G.L. & N.

Goebelobryum Grolle

Tylimanthus Mitt.

Austrolophozia Schust.

Hypogastranthus Schiffn.

Family 27. Southbyaceae

Genus. Arnellia Lindb.

Southbya Spr.

Gongylanthus Nees.

Series d.

Family 28. Antheliaceae

Genus. Anthelia

Family 29. Cephaloziaceae

a. Subfamily Hygrobielloideae

Genus. Hygrobiella Spr.

Pleuroclada Spr.

Metahygrobiella Schust.

b. Subfamily Cephalozioideae

Genus. Cephalozia Dumort.

*Nowellia Mitt. ex. Godman

Cladopodiella Buch

Protocephalozia Spr.

Alobiellopsis Schust.

Alobiella Spr.

Pigafettoa Massal.

c. Subfamily Schiffnerioideae

Genus. Schiffneria Steph.

Family 30. Cephaloziellaceae

Genus. Cephaloziella (Spr.) Schiffn

Cephaloziopsis (Spr. Schiffn, emend. Schust.

Family 31. Adelanthaceae

a. Subfamily Odontoschismatoideae

Genus. Odontoschisma Dumort.

b. Subfamily Adelanthoideae

Genus. Adelanthus Mitt.

Calyptrocolea Schust.

Pseudomarsupidium Herz.

Wettsteinia Schiffn.

c. Subfamily Marsupidioideae

Genus. Marsupidium Mitt.

d. Subfamily Jackielloideae

Genus. Jackiella Schiffn.

Suborder E. Personniellinae

Family 32. Personniellaceae

Genus. Perssoniella Herz.

Suborder F. Radulinae

Family 33. Radulaceae

Genus. *Radula Dumort.

Suborder G. Porellinea

Family 34. Porellaceae

Genus. *Porella L.

Family 35. Frullaniaceae

Genus. *Frullania Raddi

Jubula Dumort.

Family 36. Geobeliellaceae

Genus. Geobeliella Steph.

Family 37. Lejeuneaceae

a. Subfamily Nipponolejeuneoideae

Genus. Nipponolejeunea Hatt.

b. Subfamily Tuyanaelloideae

Genus. Tuyamaella Hatt.

Siphonolejeunea Herz.

Austrolejeunea Schust.

c. Subfamily Lejeuneoideae

Tribus Holostipae

Genus. Lopholejeunea Schiffn.

Tribus Schizostipae

Genus. Lejeunea Libert

d. Subfamily Myriocoleoideae

Genus. Cladocolea Schust.

e. Subfamily Paradoxae

Tribus Calatholejeuneae

Genus. Calatholejeunea Goebel

Tribus Diplasiae

Genus. Diplasiolejeunea (Spr.) Schiffn.

Colura Dumort.

Aphanotropis Herz.

Myriocoleopsis Schiffn.

Tribus Aphylliae

Genus. Cololejeunea (Spr.) Schiffn.

Leptocolea (Spr.) Evans

f. Subfamily Metzgeriopsidoideae

Genus. Metzgeriopsis Goebel

Suborder H. Pleuroziinae

Family 38. Pleuroziaceae

Genus. Pleurozia Dumort.

Eopleurozia Schust.

LIST OF JUNGERMANNIALES OF COLES AND CLARK COUNTIES OF ILLINOIS

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HISTORICAL REVIEW

Man's recognition of the hepatics dates back to the time of the tombs and scrolls of the Egyptian Pharaohs. Drawings of plants resembling Marchantia are very evident in the art of that time. Scientific study of the hepatics began near the nineteenth century as the European continent started to evolve with the onset of the Age of Printing. The development and use of new means of recording stimulated men to investigate and exchange scientific information.

The classical works of Aristotle (384-322 BC)* led the way to in-depth studies of liverworts. The first New World descriptions of liverworts was published by Franciscus Hernandez (1651) in a work entitled Rerum Medicarum Novae Hispaniae Thesaurus Seu Plantarum Animalium Mineralium Mexicanorum.

With the development of the compound microscope, all forms of scientific investigation flourished. John Ray (1686) prepared and published Historia Plantarum which dealt with the microscopic anatomy of liverworts. He was proclaimed the father of that branch of bryology concerned with what is now the Jungermanniales. This study included numerous leafy liverworts such as Plagiochila asplenioides, Frullania, Lophocolea bipennata, and Cephalozia bicuspidata.

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*Indicates inclusive years individual worked wtih Jungermanniaceae and does not refer to a specific publication.

In the early 1700's,* Tournefort, Vaillant, Dillenius, and Ruppius were responsible for the bulk of the work done in the field of hepatics. Ruppius introduced the name Jungermannia at this time. Linnaeus did very little work on the naming of the hepatics. Most of the accepted species' names originated from the now classical publications of the preceding men.

Micheli (1729-1740),* a Florentine botanist, surveyed local liverworts and divided them into two primary groups: the group Muscoides, which includes species with incubous leaves, such as Bazzania trilobata, Porella spp., Frullania spp. and the group Jungermanniae which are characterized by succubous leaves, and include Scapania, Cephalozia, and Lophocolea, among others.

The German botanist, Hedwig (1784-1798),* separated the bryophytes into two groups, the mosses and the liverworts. Further separation and study of these groups was done by the French botanist de Jussieu (1789-1791).* Hooker (1816) followed with a publication on the British Jungermanniae which served as an important taxonomic guide for many years.

In the early 1830's,* several European botanists were concurrently, yet independently, involved in the description of new Hepatic species. The works of Raddi in Italy, studying Etruscan liverworts in that country, S. F. Gray in England and Dumortier in Belgium, differed in the naming and

characterization of several genera and species. This resulted in a great deal of confusion. Many of the names proposed by Gray were eventually adopted, after being changed from their original feminine form to the masculine. Further contributions in the field of bryological taxonomy were made by the prominent botanists Corda (1828-1829)* and Nees von Esenbeck (1833-1838),* but it was not until the Jungermanniae and some of the Metzgeriales were divided into more homogenous genera in 1841, a time of many species descriptions, that many of the names proposed by these two men were accepted. The work of Nees von Esenbeck proved to be invaluable, but the taxonomy of the hepatics was at best rugged until Gottsche, (1844) published the Synopsis Hepaticarum, which then served as the basis for further systematic hepaticological studies. In this book many of the names proposed by Raddi and Dumortier were acknowledged.

Hofmeister (1851)* discovered alternation of generations. The discovery of alternation of generations and the critical morphological and ontological studies of Leitgeb (1874-1881)* provided direction for further phylogenic studies. These studies were carried on in part by Howe (1896-1903),* who published works on the hepatics.

Modern systematic classification of bryophytes is based on the polyphyletic evolution from erect gametophytes

to the reduced sporophyte generation (Schuster, 1966). A great deal of hepaticologic study was carried out in Europe by Müller (1898-1955),* Schiffner (1890-1936),* Sullivant (1846-1856),* Austin (1872-1879),* Underwood (1888-1896),* and Stephani (1883-1916)* in accordance with the new systematic classification. These men were also responsible for most of the early work on bryophytes done in North America. In the thirty-five years that followed, many attempts were made toward the refinement of the taxonomic system. Today, many of the synonyms have been noted and revised, but there is still confusion and names are being changed. Several investigators have been working to revise the confusing taxonomy and to organize the Class Hepaticae and the Order Jungermanniales in a more homogenous and comprehensive manner.

LITERATURE REVIEW

Many reports of the bryophytes of Illinois have been published but most appear to be inconclusive as far as the hepatics are concerned. Several of the most important follow: Wolf and Hall (1878) attempted the first county-wide bryological survey in Illinois. Their findings included mosses and liverworts from Fulton, Jackson, Johnson, and Union Counties. They listed 153 species of mosses and 45 species of liverworts. Brendel (1887) studied the flora of Peoria County and found 87 species of mosses and 27 species of liverworts. Galligar (1934) reported 35 mosses and 5 liverworts from Macon County. Hague (1937) reported 92 liverwort species found in Carroll, Champaign, Cook, DeKalb, Fulton, Henderson, Jo Daviess, Johnson, Kankakee, Knox, LaSalle, Lake, Macon, Marion, Menard, Ogel, Peoria, Rock Island, St. Clair, Stark, Tazwell, Union, Wabash, and Will Counties. Richards (1940) reported 33 mosses and 18 liverworts from the area of Starved Rock State Park. Vaughan (1941) reported on the bryophytes of the Rocky Branch region of Clark County, citing 14 liverworts and 73 mosses. Arzeni (1947) reported 130 mosses and 42 liverworts which he collected and identified from Coles and Clark Counties. Hatcher (1952) reported on 63 mosses and 30 liverworts of the southern Illinois counties of Jackson, Pope, and Union. Dr. G. N. Jones also did work on Illinois hepatics, but unfortunately, died before his

efforts were published. Skorepa (1968) conducted studies on the liverworts of southern Illinois in which he reported 58 species of liverworts.

MATERIALS AND METHODS

The liverworts reviewed in this paper were collected in Coles and Clark Counties in Illinois. They were identified from the author's personal collection with the use of keys, and comparison with specimens in the Stover herbarium, Eastern Illinois University, and the University of Illinois herbarium. As reported in the description of each species, these specimens were collected from various habitats.

The authors collection was corroborated in part by his advisor, Dr. C. B. Arzeni, Eastern Illinois University, Charleston. Voucher specimens were placed in the Stover herbarium of Eastern Illinois University.

Taxonomic keys from Arzeni (1950), Conard (1956), Frye and Clark (1937) and Schuster (1966) were used for identifying and classifying the specimens observed for the preparation of this study.

Drawings and descriptions of the external morphology, and microscopic anatomy were made for each species. The descriptions include the taxonomy of the liverwort, the reported range, habitat, and general comments which might be useful in field and laboratory recognition of the species in question.

IDENTIFICATION OF LIVERWORTS

A pocket knife and occasionally a geologist's hammer, plastic bags, and a marking pen are useful items for the collection of study specimens. In the field, tentative identification can be made with the use of a hand lense and a field key.

Laboratory study requires a working knowledge of terminology and several good dichotomous keys. A binocular and compound microscope are also essential. Fresh specimens are best for study, but dried material may be used.

The gametophyte of the acrogynous Jungermanniales always grows from a single cell and is foliose. Archegonia are apically orientated and surrounded by perichaetial bracts. Antheridia are usually born singly or in small numbers in leaf axils. They are surrounded by perigonial bracts. In east-central Illinois sexual reproductive structures of liverworts are generally produced in the spring with maturation of spores progressing throughout the growing season. The germination of these spores usually occurs the following spring or summer.

The leafy liverworts usually grow prostrate or ascending with 2-ranked leaves. The manner in which the leaves overlap is an important characteristic in species identification. Overlapping leaves are arranged in either an incubous or succubous manner.

In the acrogynous Jungermanniales, elongation of the ventral side of the stem results in an incubous leaf arrangement (Figure 1). In the incubous arrangement the upper margin of the leaf (toward the apex of the stem) overlaps the lower margin of the leaf above. Plants showing incubous leaf arrangement generally grow on tree trunks and in a more or less vertical position.

The succubous leaf arrangement is characterized by the lower margin of the leaf (toward the base of the stem) overlapping the upper margin of the leaf below (Figure 2). Succubous forms are often complicated bilobed and may possess water sacs.

Branching patterns in the Jungermanniales are usually dichotomous. Adventitious branches may often develop into independent plants. Gemmae may be present on branches or on leaf margins.

Trigones are thickenings at the angles of cells and are often useful characteristics inthe identification of leafy liverworts (Figure 3). They vary in size and shape.

Consideration of the above mentioned characteristics alone are useless. When combined with other morphological characteristics such as leaf and underleaf arrangement and attachment, perianth size and shape, and other characteristics found in keys, identification of specimens to species is fairly easily achieved.

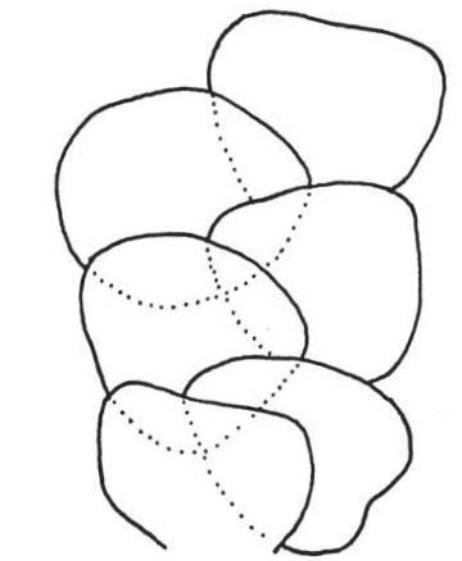

Figure 1

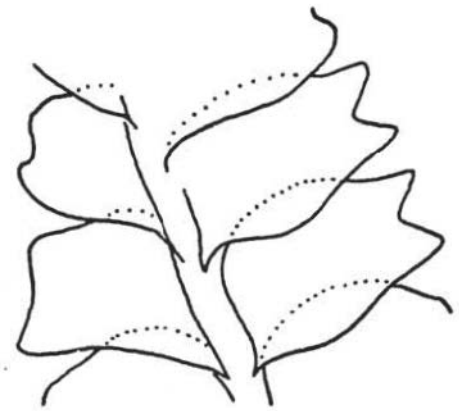

Figure 2

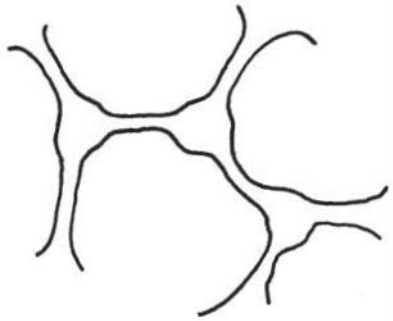

Figure 3

GENERAL KEY TO THE BRYOPHYTES

1) Plants leafy, with "stem" and "leaves".....2

1) Plants body thalloid; scale-like; without distinction between stem and leaf; green or purple.....3

2) Leaves usually possessing a midrib and spaced at equal distances from the stem; never notched at apex or lobed; sporophyte persisting for weeks or months; no elaters. Class Musci.

2) Leaves are very often notched near the apex; no midrib present; when lobed, the smaller lobe is often folded against the larger one; sporophyte short lived; slender elaters present..... Class Hepaticae* (Leafy liverworts).

3) Plant prostrate; each cell containing one large chloroplast; sporophyte persisting for weeks to months; irregular elaters present; no midrib or gemmae.....Class Anthocerotae.

3) Cells containing many small chloroplasts; sporophyte persisting for only a few days; capsule globular or elongated.....Class Hepaticae* (Thalloid liverworts).

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*Only the leafy Jungermanniales, Class Hepaticae, are considered in this paper.

KEY TO THE LEAFY LIVERWORTS, JUNGERMANNIALES OF COLES AND CLARK COUNTIES, ILLINOIS

1) Leaves deeply divided into filiform sections...2

1) Leaves entire, toothed, or divided into 2-4 lobes at the apex.

2) Leaves divided into many thread-like divisions; stems hairy; underleaves similar to upper leaves; plants large; pale-green to yellow in color; no trigones; on most soil or sandstone rocks; rare...*Trichocolea tomentella*.

2) Leaves divided into 2-4 filiform segments; plants small and thin; resembling a filamentous alga; forming delicate thread-like growths on wet shady soils or rotten wood; rare...*Blepharostoma trichophyllum*.

3) Leaves curved or flattened, not folded...4

3) Leaves not curved or flattened; complanate-bilobed...13

4) Leaves incubous, with the upper margin of the leaf (toward the apex of the stem) overlapping the lower margin of the leaf above; leaf slopes toward the base of the stem...5

4) Leaves succubous, with the lower margin of the leaf (toward the base of the stem) overlapping the upper margin of the leaf below; leaf slopes toward the apex of the stem...7

5) Leaves split halfway or more into 3-6 lobes, plants forming filmy growths on shaded, moist, sandy soils or rocks, shady banks, and rotten wood; rare...*Lepidozia reptans*.

5) Leaves entire or toothed; not lobed or divided...6

6) Leaves firm with three notches at the apex, often bending down when dry; branches appear dichotomous; plants green or brown, often inhabiting moist, shaded logs or rocks, very rarely fruiting; rare... *Bazzania trilobata*.

6) Leaves entire and flattened; cells large (.03-.055 mm); underleaves two-lobed; unique subterranean perigynium present, plants pale green and watery; inhabiting moist soils or decaying wood...*Calypogeia trichomanis*.

7) Leaves toothed, at least on the distal margins...8

7) Leaves not toothed; leaves 2-4 lobed...9

8) Leaves broadly ovate and often toothed (10 or more); margins turned back and extending below its point of attachment (decurrent); plants large, yellowish green...Plagiochila asplenioides.

8) Leaves nearly transversely attached; densely compact, stem thick and fleshy; plants bluish in color; rare...Lophozia incisa.

9) Underleaves conspicuous...10

9) Underleaves small or absent...11

10) Underleaves lanceolate-subulate; plants pale and growing close to the substrata on humus, rotten logs and moist sandstone; rare...Harpanthus scutatus.

10) Underleaves with a single tooth; leaves with two short acute lobes, or entire, or notched at the apex (emarginate); gemmae uncommon; generally pale green to whitish; very common...Lophocolea heterophylla.

11) Leaves entire.....12

11) Leaves with long acuminate lobes ending in two filiform segments; lower margin curled over to form a sac; plants slender, inhabiting wet areas, sandstone, or decaying wood; reddish-brown to purple in color...Nowellia curvifolia.

12) Perianth united at the base with adjacent female bracts; plants mostly yellowish-green to green, with reddish rhizoids; inhabiting moist, shaded rocks and soil...Plectocolea hyalina.

12) Perianth on the end of a main shoot, its mouth edged with many small hairs; plants form green patches in shaded areas, reddish-brown in sun; common on moist sandstone or ground...Jamesoniella autumnalis.

13) Underlobe larger than upper, larger lobe round-ovate; both lobes decurrent with sharply toothed margins; perianth with wide, flattened mouth; red-brown gemmae at apex of shoots; plants medium to large; green to reddish in color, plants inhabiting moist soils or rocks...Scapania nemorosa.

13) Underlobe smaller than upper and completely hidden by it; flat or sac-like...14

14) Underleaves present.....15

14) Underleaves absent, rhizoids attached in tufts to underlobes; flattened perianths common; one large oil body nearly fills each cell; on bark or stone...Radula complanta.

15) Underleaf tongue-shaped, conspicuous, underlobe of leaf tongue-shaped, attached at only one end; leaves closely overlapping; plants large and dull green; corticolous or rock-inhabiting...Porella platyphylloidea.

15) Underleaf notched at apex, underlobe forming a sac or pouch; perianth obcordate ridged lengthwise, with a tubular snout; plants black to red-brown to green; often corticolous...Genus Frullania...16

16) Underlobes flat, not forming sacs; perianth unknown; rock inhabiting...Frullania riparia.

16) Underlobes not flat; forming a sac...17

17) Leaves containing large red cells (paracysts); underleaves cordate or auriculate at base; plants red-brown; large; corticolous...Frullania asagrayana.

17) Leaves not containing paracysts.....18

18) Leaf cells without trigones or intermediate thickenings; monoicous; corticolous... Frullania inflata.

18) Leaf cells with trigones and intermediate thickenings; dioicous...19

19) Upper lobes spreading to squarrose (wide apart) when wet, and clasping stem; plants large; red-brown... *Frullania squarrosa*.

19) Upper lobes flattened and closely overlapping; wet or dry; plants small; blackish; no ocelli, corticolous... *Frullania eboracensis*.

DESCRIPTIONS AND ILLUSTRATIONS

Lepidoziaceae

Bazzania trilobata (L) S. F. Gray

Reported Range: Coles and Clark Counties - very rare

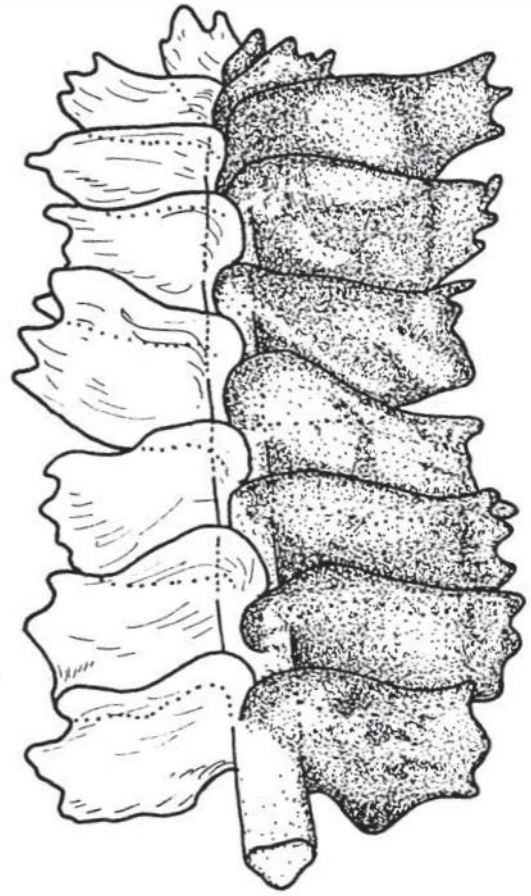
Habitat: Growing in dense patches on damp, shady banks or on rocks. It is sometimes found on rotting wood.

Description: Forms dense dark green to olive green tufts. The main stem is dichotomously branched and grows laterally on the ground. The branches originate from the under side of the stem. The leaves are imbricate and tridentate with acute teeth. The leaf cells are large and round to quadrat. Large trigones are present. The sporophyte is on short branches with few bracts. The perianth has a small mouth with short teeth. The capsule is 4-valved, shiny brown and ovate. The spores are red to brown in color.

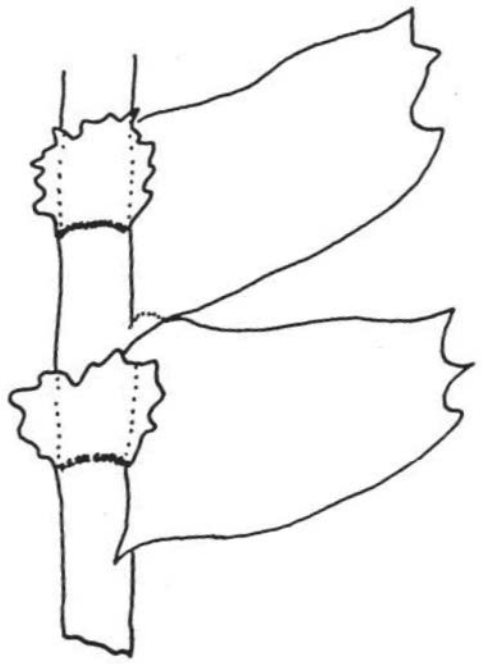
Comments: This plant is very striking because of its deflexed leaves when dry, its large size, and its olive green color. Branches dichotomous and leaves 3-toothed at apex.

Bazzania trilobata (L) S. F. Gray

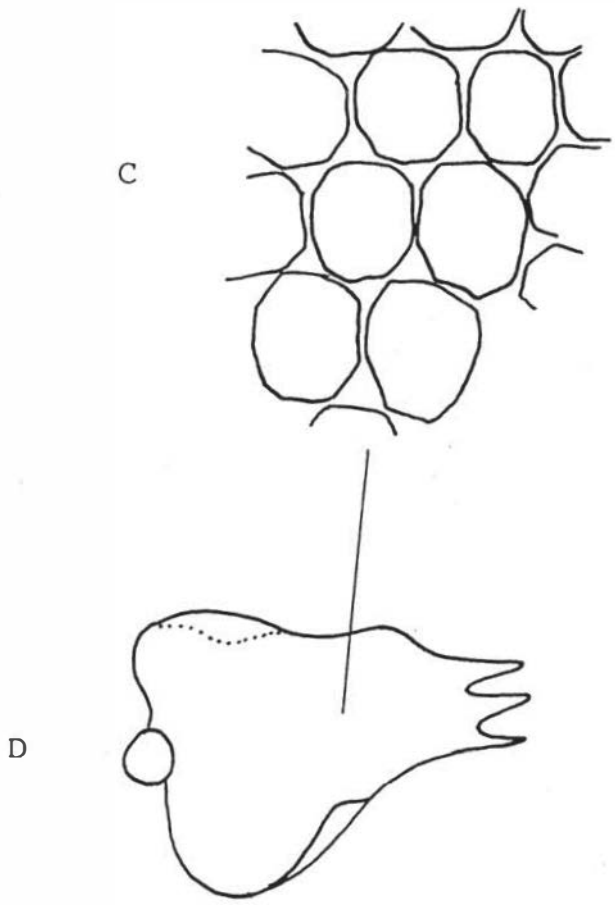
A) dorsal view of sterile stem (X 15)
B) ventral view of sterile stem (X 35)
C) areolation and trigones (X 300)
D) leaf (X35)



A



B


C
D

Blepharostomaceae

Blepharostoma trichophyllum (L) Dumort.

Reported Range: Coles and Clark Counties - not common

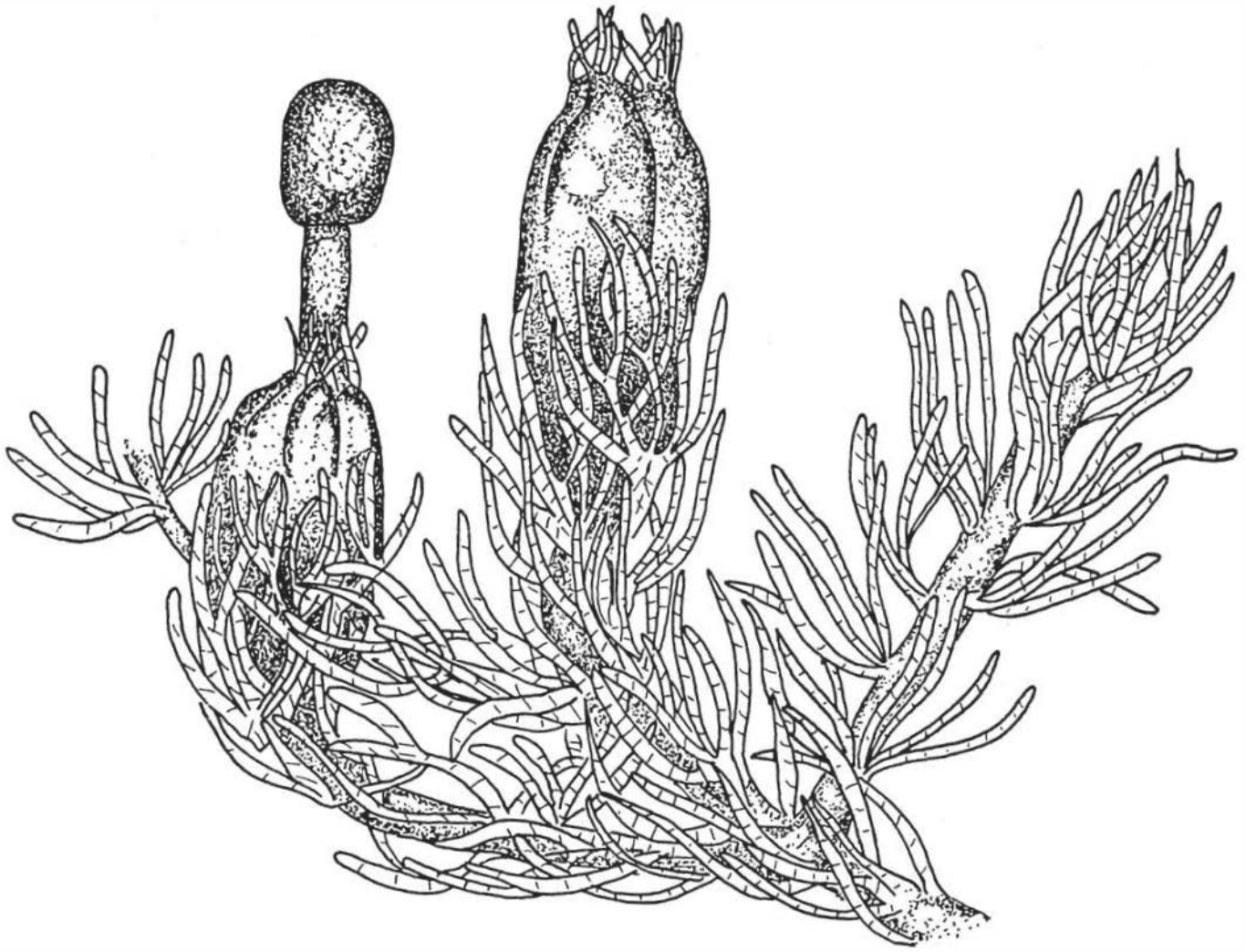
Habitat: Growing on rotten wood and rich soil in woods, on sandstone

Description: Forms small greenish yellow Alga-like patches. Branches are lateral. Leaves are transverse and divided nearly to the base in three or four threads. Each thread is composed of 8-18 oblong cells. Trigones are absent. Perianth terminal. Capsule oblong and 4-valved. Spores reddish brown.

Comments: One of our smallest liverworts when viewed under a microscope or hand lens. Its appearance is similar to a highly branched alga.

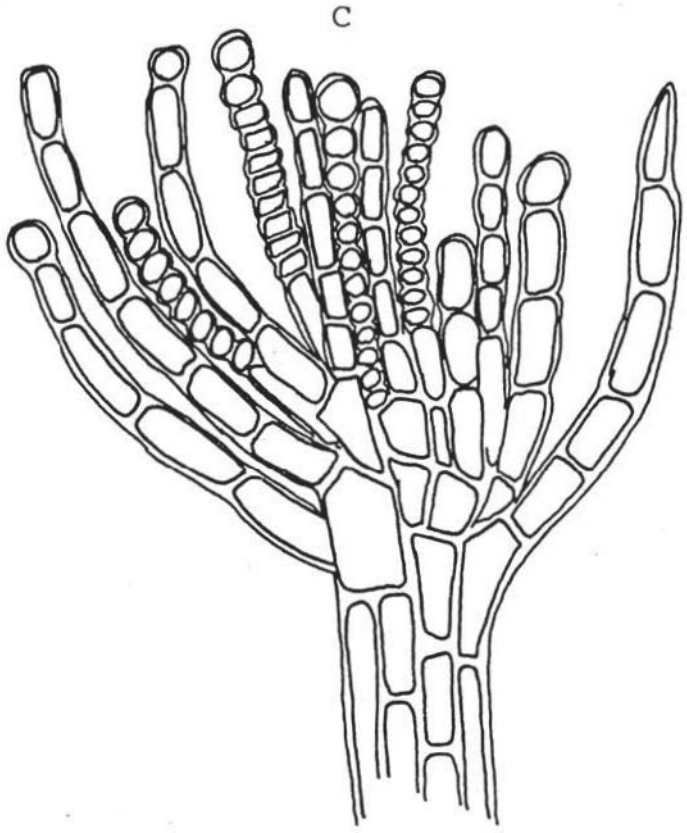
Blepharostoma trichophyllum (L) Dumort.

A) shoot with perianth (X 80)
B) areolation (X 300)
C) gemmae (X 400)



A

C



B

Calypogeiaceae

Calypogeia trichomanis (L) Corda

Reported Range: Coles and Clark Counties - very common

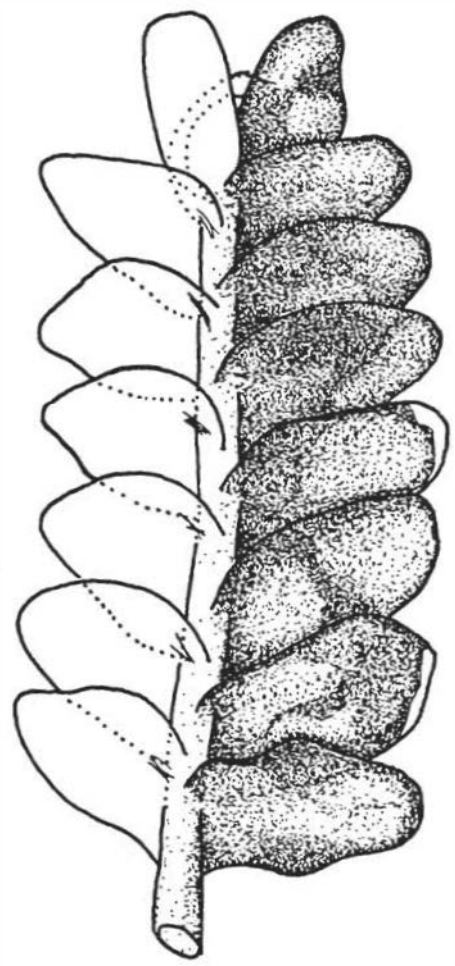
Habitat: Grows in scattered patches on sandy banks, sandstone, and shaded ravine banks in wooded areas.

Description: Forms prostrate, moderate sized scattered green patches. Stems seldom branched. Rhizoids originate from the base of stipules. Leaves are incubous and alternate. Leaf cells are large and thin walled. Trigones present but very small. Bracts are 2-3 paired and small. Gemmae when present clustered near tip. Spores pale brown.

Comments: Underleaves bilobed, scarcely twice as wide as the stem.

Calypogeia trichomanis (L) Corda

A) dorsal view of a sterile shoot (X 20)
B) ventral view of a sterile shoot (X 20)
C) areolation (X400)
D) leaf arrangement (X 40)



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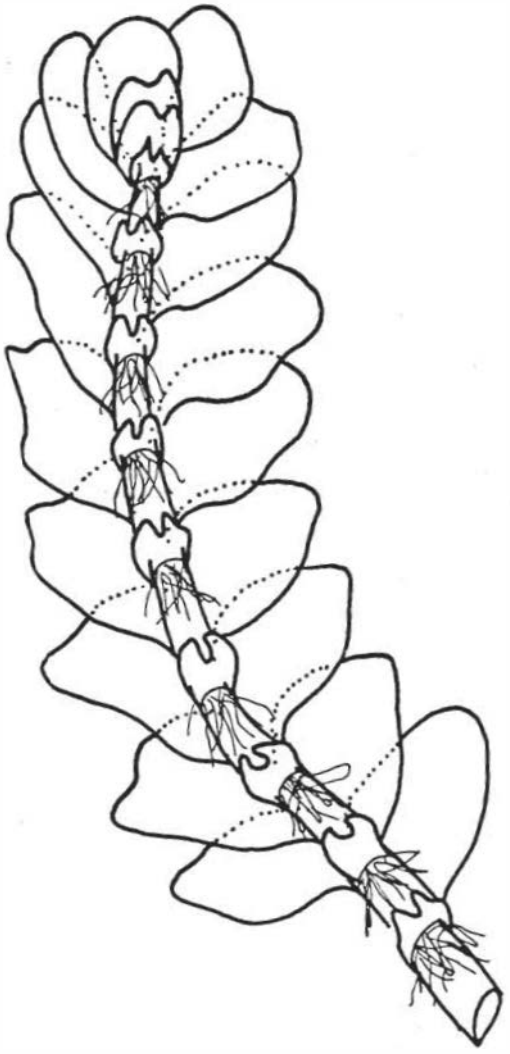

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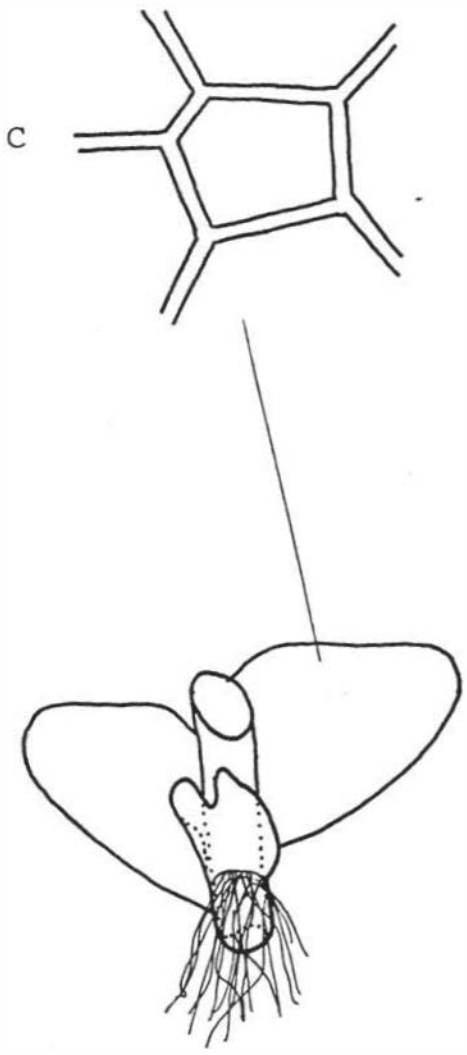

C
D

Frullaniaceae

Frullania asagrayana Mont.

Reported Range: Coles County - common

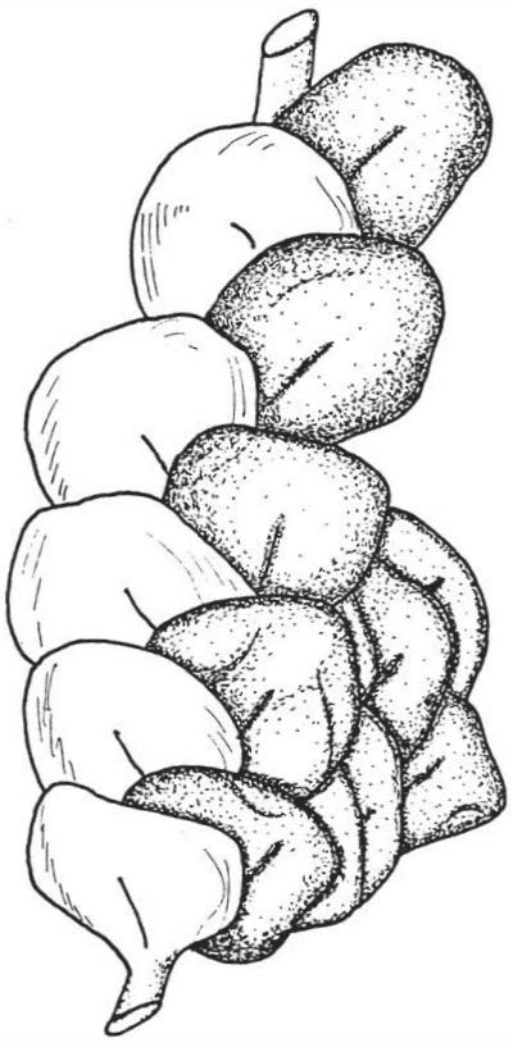
Habitat: Growing on tree bark, rocks, and rotten wood in moist areas.

Description: Plants in green to red brown patches. Stems with many branches. Leaves imbricate. Margins entire. Underleaves with two uneven lobes. Underleaf margins are slightly indented. Perianth emergent and dorsally flattened.

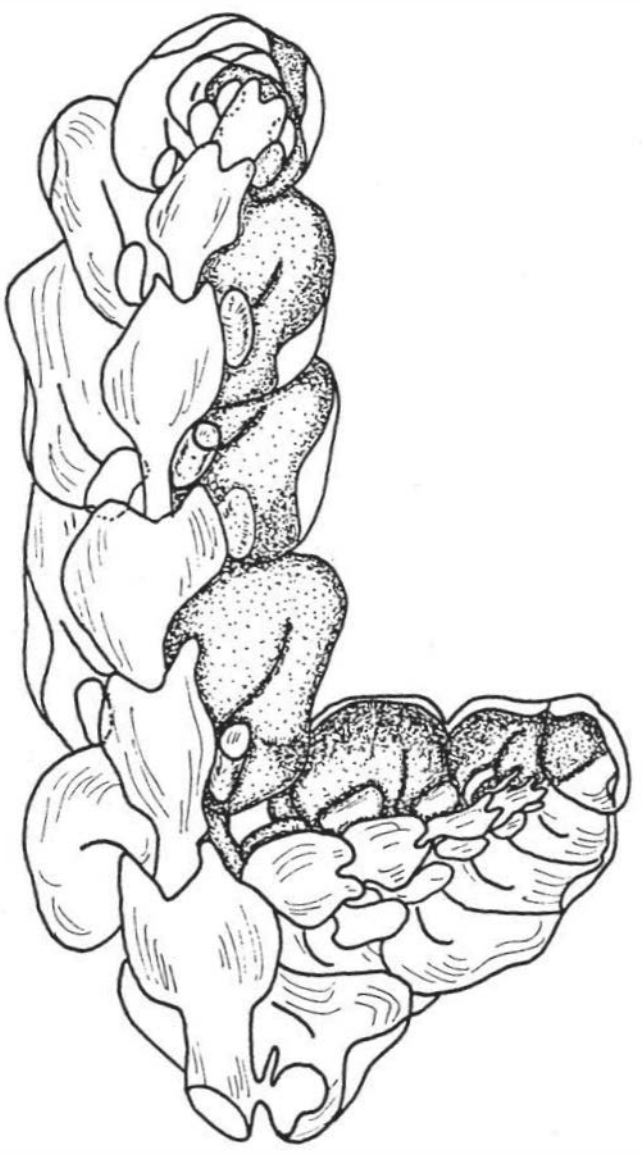
Comments: This plant is rather large. The ocelli in a row on the leaf is a characteristic which will help differentiate this species. May be reddish brown in color. Loosely attached to substratum.

Frullania asagrayana Mort.

A) dorsal surface of stem (X 30)
B) ventral view of sterile shoot (X 40)
C) areolation (X 400)
D) ventral view of leaf arrangement (X 50)



A



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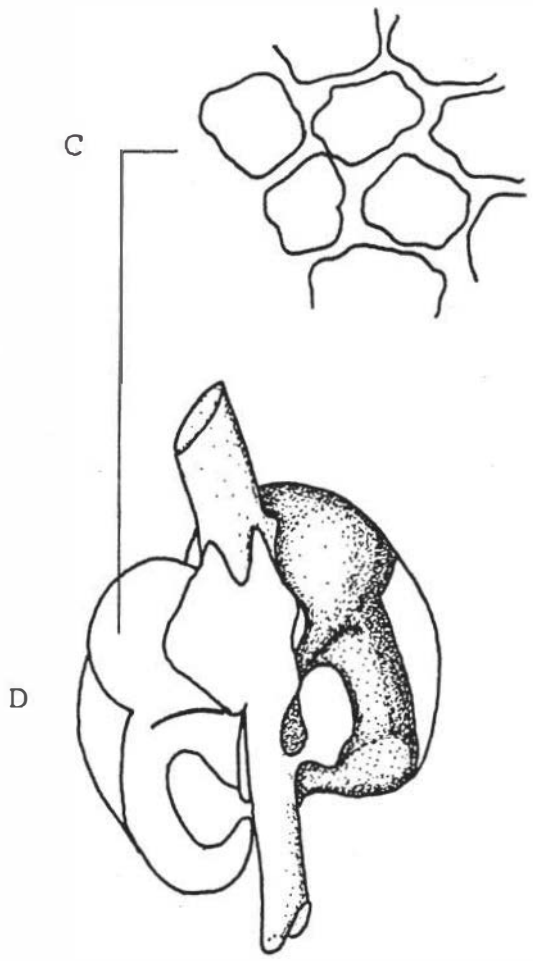

C
D

Frullaniaceae

Frullania eboracensis Gottsche

Reported Range: Coles and Clark Counties - common

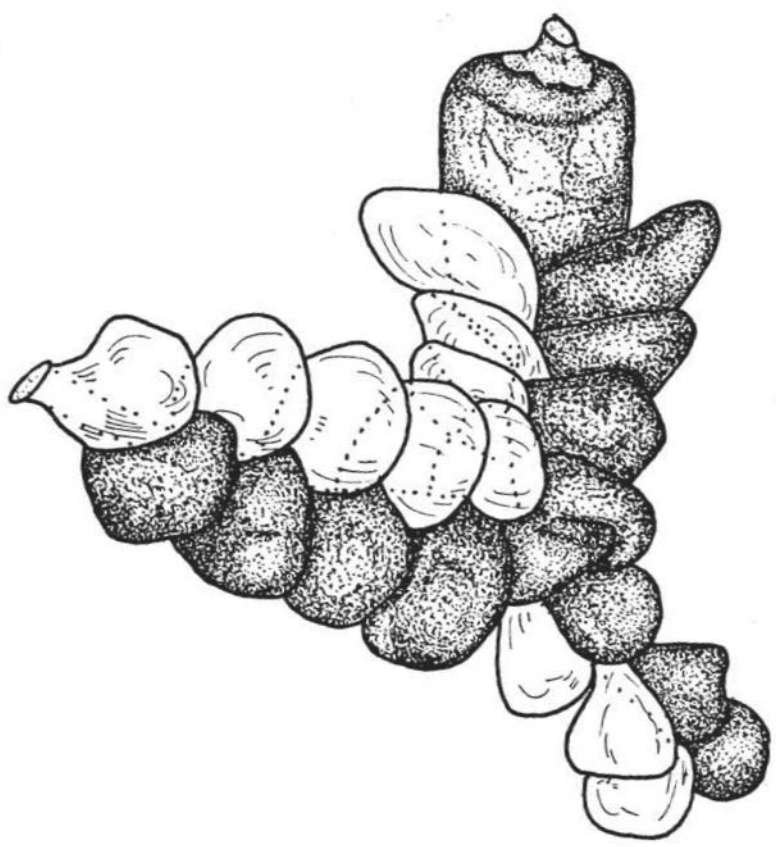
Habitat: On trees, stumps and rocks.

Description: Plant grows in green to red-brown prostrate patches. The stems are irregularly pinnate with numerous branches. Leaves imbricate. Dorsal lobe of stem leaf suborbicular. Concave at tip and cordate at base. Margin entire. Cells of mid leaf are thin walled with large trigones. Intermediate thickenings common. Underleaves 2 lobed, rhombic to ovate with none or one tooth on one or both sides. Gemmae may be present on leaf margins. Perianth dorsoventrally compressed and half emergent.

Comments: Color tends to be dark green to brownish-black. There are never ocelli present and it clings firmly to the substratum.

Frullania eboracensis Gottsche

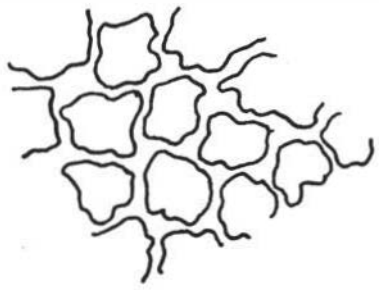
A) stem dorsal surface with perianth (X 30)
B) ventral view of stem with perianth (X 30)
C) areolation (X 400)
D) ventral view of stem and leaf arrangement (X 60)



A

B

C



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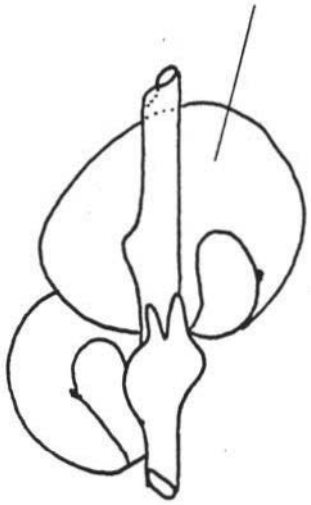


Frullaniaceae

Frullania inflata Gottsche

Reported Range: Coles and Clark Counties - common

Habitat: Found on rocks, trees, and decaying wood.

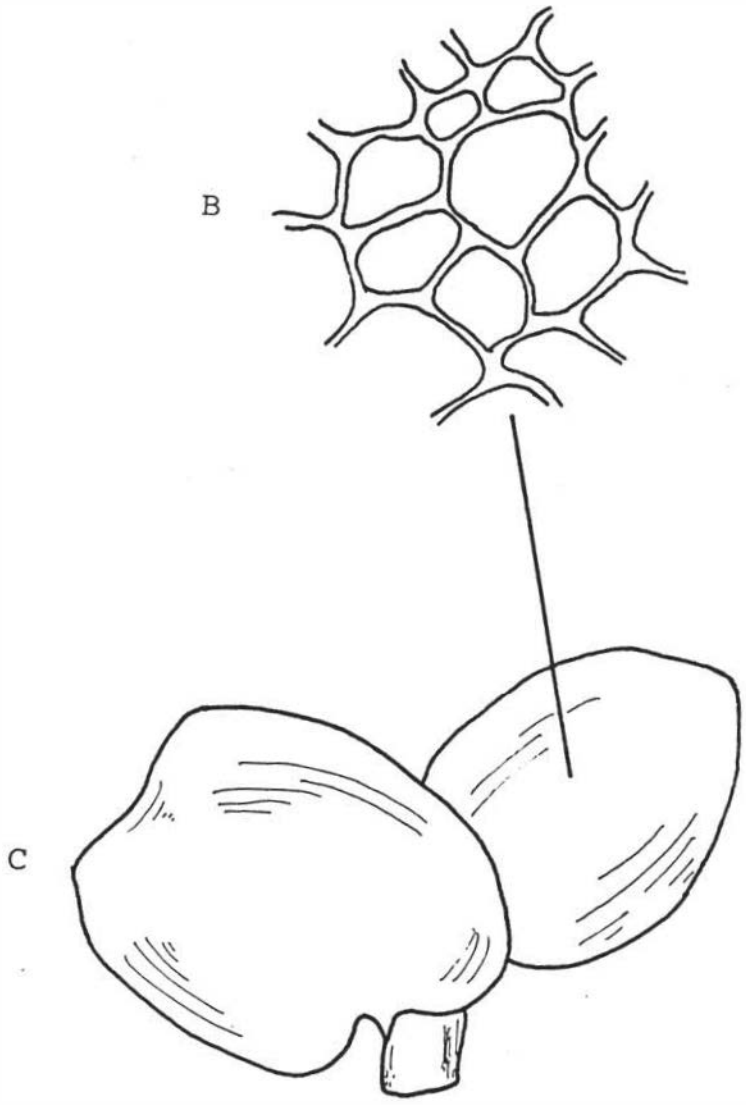
Description: Plant grows in loose reddish-brown to green patches, often intermingled with other bryophytes. Stems prostrate with numerous side branches, irregularly pinnately arranged. Leaves imbricate, and inflated in the upper and outer parts. Leaf cells with thick walls. Trigones absent. Rhizoids present near plant base. Underleaves subimbricate and two lobed. Gemmae unknown.

Comments: Perianth inflated when mature - tapering into a short break.

Frullania inflata Gottsche

A) ventral view of short and perianth (X 75)
B) areolation (X 400)
C) dorsal view of stem (X 150)

A


B
C

Frullaniaceae

Frullania riparia Hampe

Reported Range: Coles and Clark Counties - common

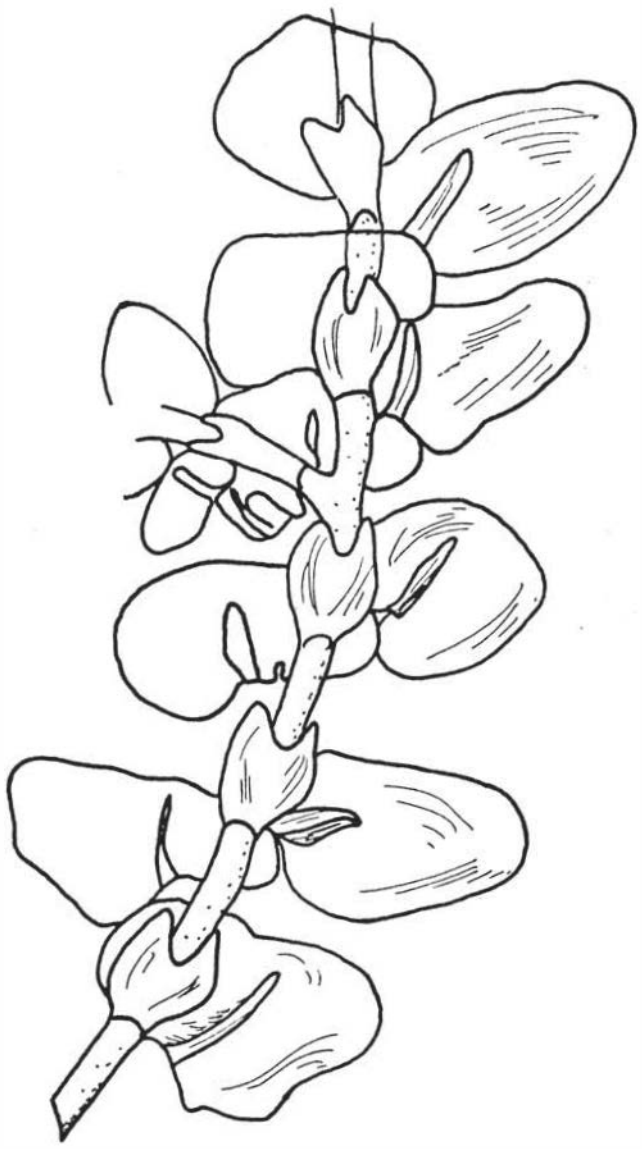
Habitat: On rocks and trees in moist shaded areas.

Description: Plant grows in loose flat tufts which are green to brown and are irregularly pinnate. Leaves somewhat far apart and imbricate. Lobes of leaves are cordate at the base, the margins entire and sinuate. Underleaves bifid. Leaf cell walls near the middle of the leaf are slightly thickened with trigones present. Gemmae, when present, are near the tip of the shoot.

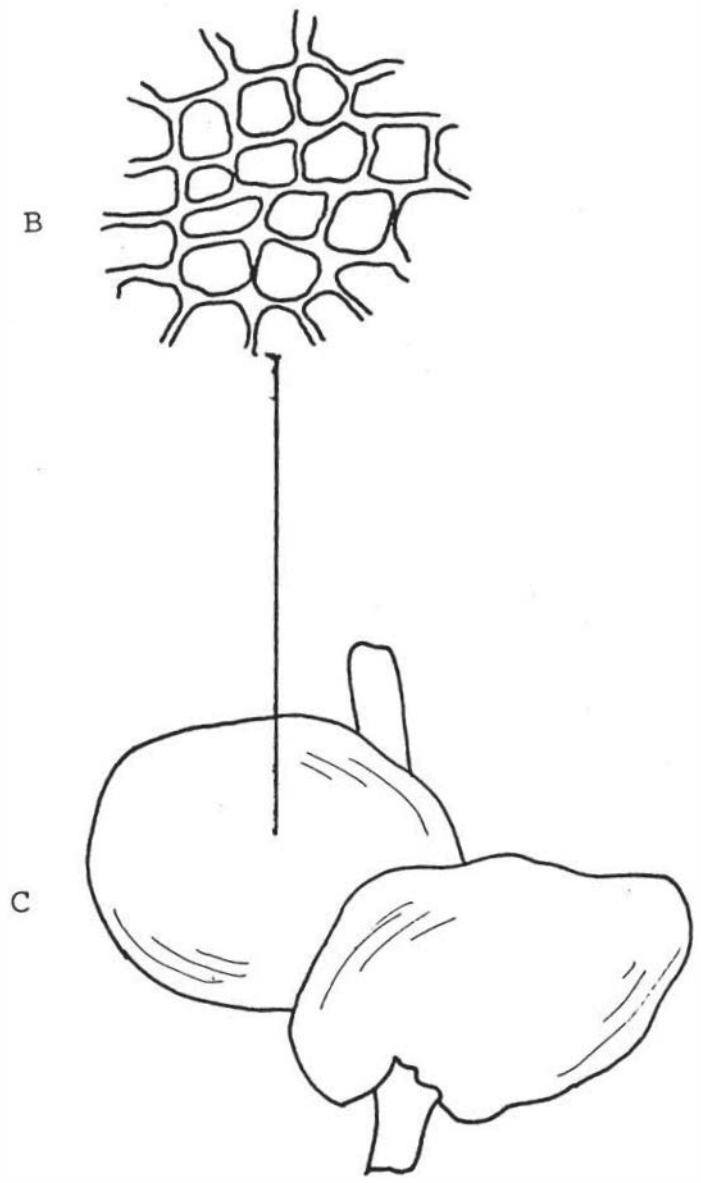
Comments: Name implies growth near water. Underleaves flat, not sac-like. Grows in very loose patches.

Frullania riparia Hampe

A) ventral view of stem (X 75)
B) areolation (X 300)
C) dorsal view of leaf attachment (X 100)



A


B
C

Frullaniaceae

Frullania squarrosa Dumort.

Reported Range: Clark County - not common

Habitat: Found on trees, logs, and rocks

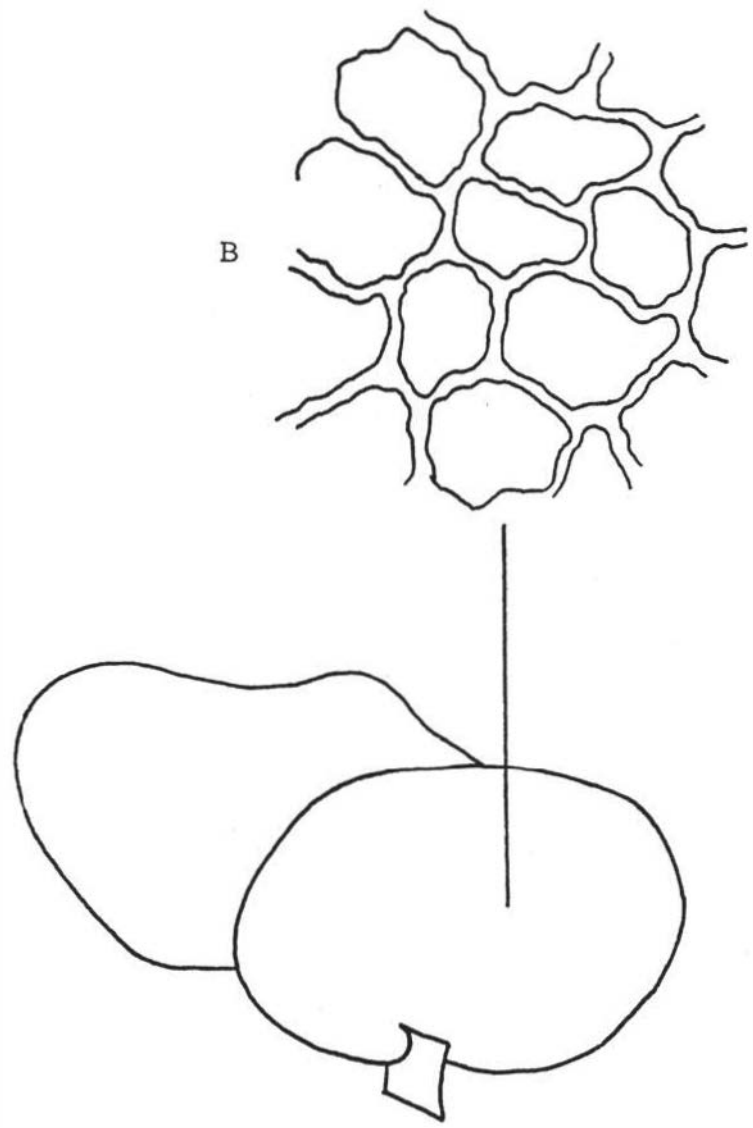
Description: Plant grows close to the substrate or in loose red-brown to green mats. The stems are irregularly pinnate with numerous branches. Leaves imbricate - lobes rolled around stem when dry - square when turgid. Leaf margins entire. Leaf cells thick walled with wall thickenings. Trigones moderately large. Gemmae unknown.

Comments: Leaves roll around stem when dry, square-shaped when turgid.

Frullania squarrosa Dumort.

A) ventral view of stem (X 75)
B) areolation (X 400)
C) dorsal view of leaf attachment (X100)

A


B
C

Harpanthaceae

Harpanthus scutatus (Web & Mohr) Spruce

Reported Range: Clark County

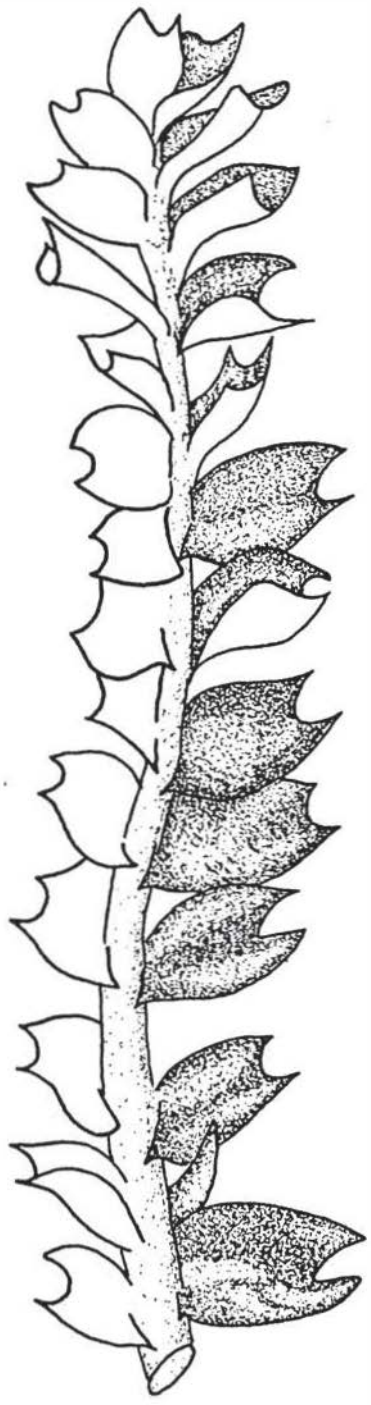
Habitat: Growing flat, feathery, and creeping on shaded banks and rotting logs - not common

Description: Forms flat, feathery, creeping patches, olive green. Stems are slightly branched. Short white rhizoids present. Leaves horizontally inserted. Insertion of upper part of leaf is in a line with the side of the stem, the base is decurrent. Leaf cells are 4-6 sided, and thin walled. Trigones - small. Underleaves subulate. Perianth club-shaped.

Comments: Small subulate underleaves are a very important diagnostic characteristic.

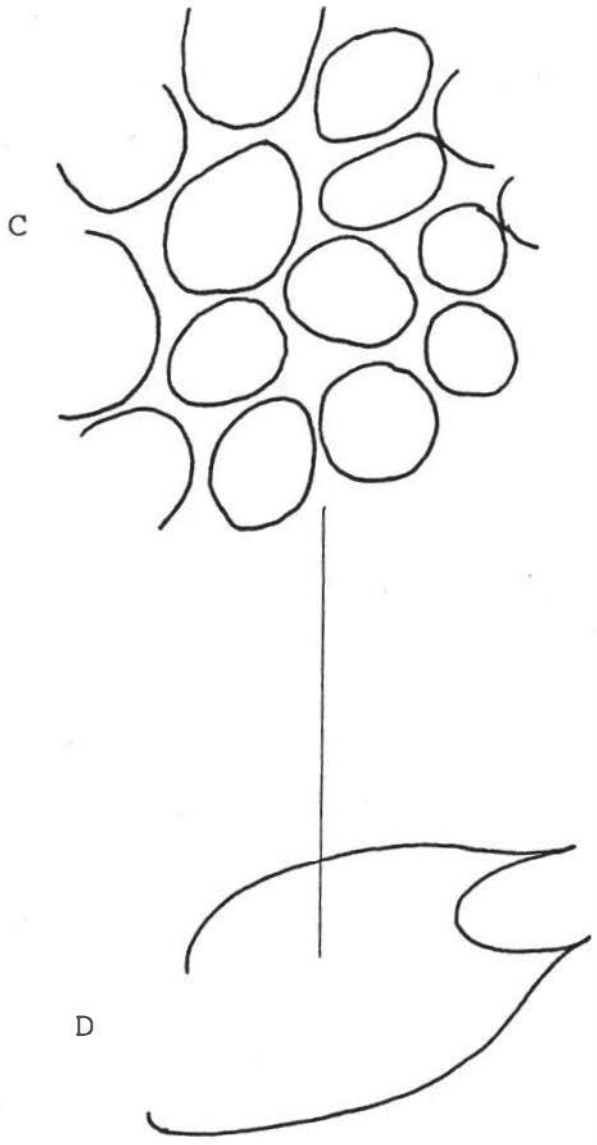
Harpanthus scutatus (Web & Mohr) Spruce

A) dorsal view of sterile shoot (X 40)
B) underleaf attachment (X 80)
C) areolation (X 300)
D) leaf (X 80)



A

B


C
D

Jungermanniaceae

Jamesoniella autumnalis (De Cand.) Steph.

Reported Range: Clark County - very common

Habitat: On decaying stumps, logs, soil, and around the bases of trees.

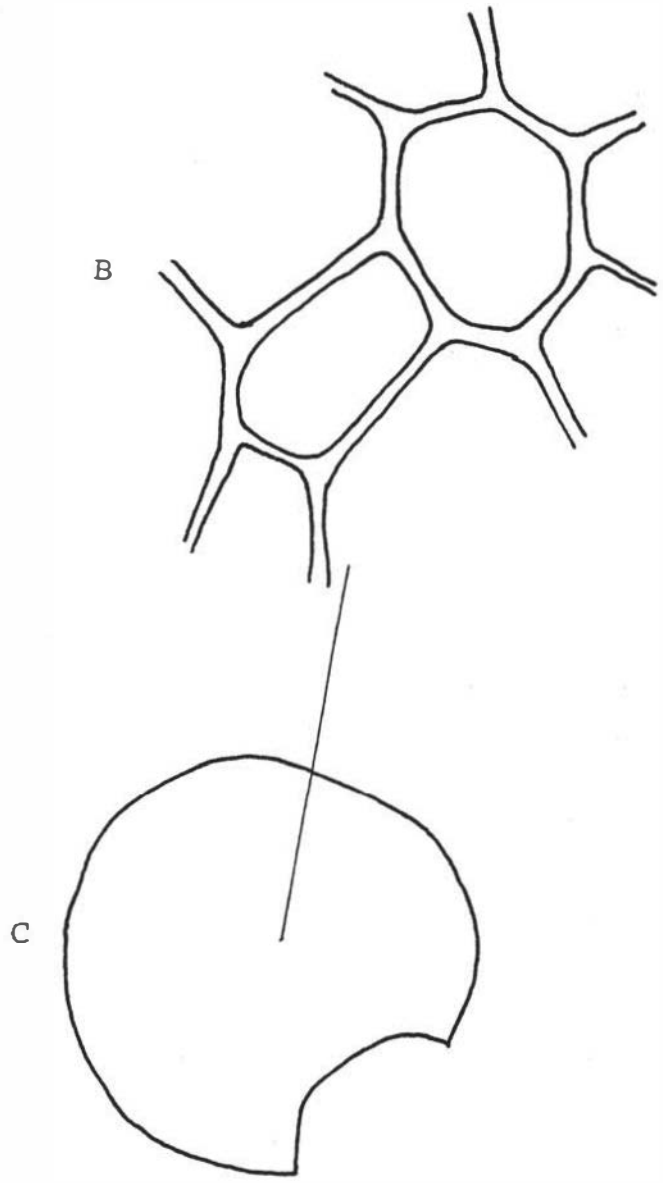
Description: Forms green patches in shaded areas and reddish brown patches in sunny areas. Plants sparingly branched. Leaves imbricate - obliquely inserted. Median cells with small trigones and thin walled. Underleaves usually small if apparent at all. Rhizoids numerous. Perianth 4-5 plicate with uniseriate cilia 4-6 cells long. Antheridia often grouped along stem.

Comments: Underleaves of this species are generally very small or not noticeable. Leaves never waxy in appearance.

Jamesoniella autumnalis (De Cand.) Steph.

A) shoot with perianth (X 30)
B) areolation (X 80)
C) leaf (X 35)

A


B
C

Lepidoziaceae

Lepidozia reptans (L) Dumort.

Reported range: Clark County - rare

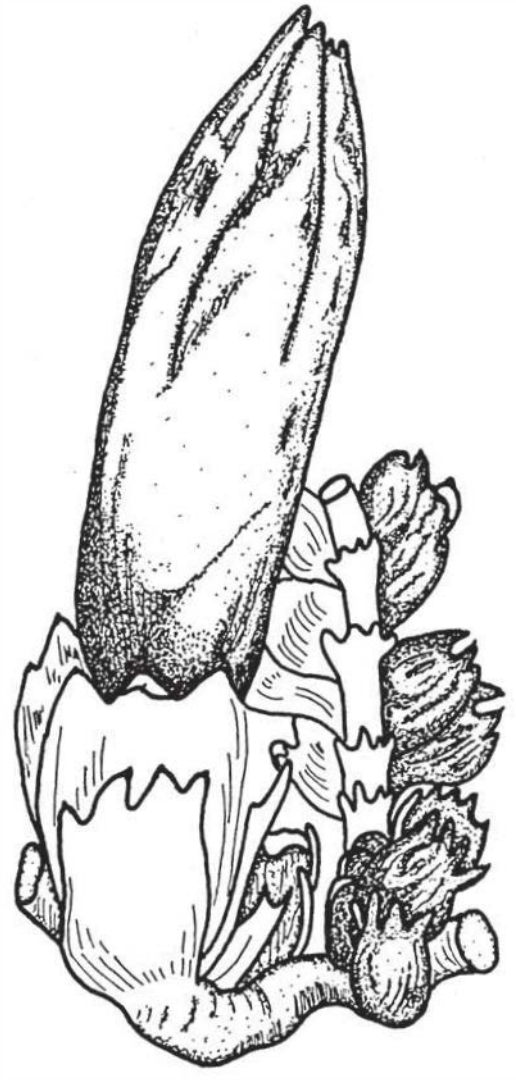
Habitat: Growing in tufts on rotting wood or moist banks in woods. Rarely on sandstone rocks in Clark County.

Description: Forms dense yellowish-green tufts. The main stem grows prostrate and is often 2-3 branched. Rhizoids are abundant near base of plant. Leaves imbricate, and are slightly longer than wide. Leaf cells are thick walled. Trigones absent. Bracts paired and numerous at base of perianth. Capsule oblong, deep brown, and dehiscent in four equal parts. Spores reddish-brown.

Comments: This plant is easily recognized by the leaf. It is divided into triangular segments 1/3 - 1/2 the length of the leaf.

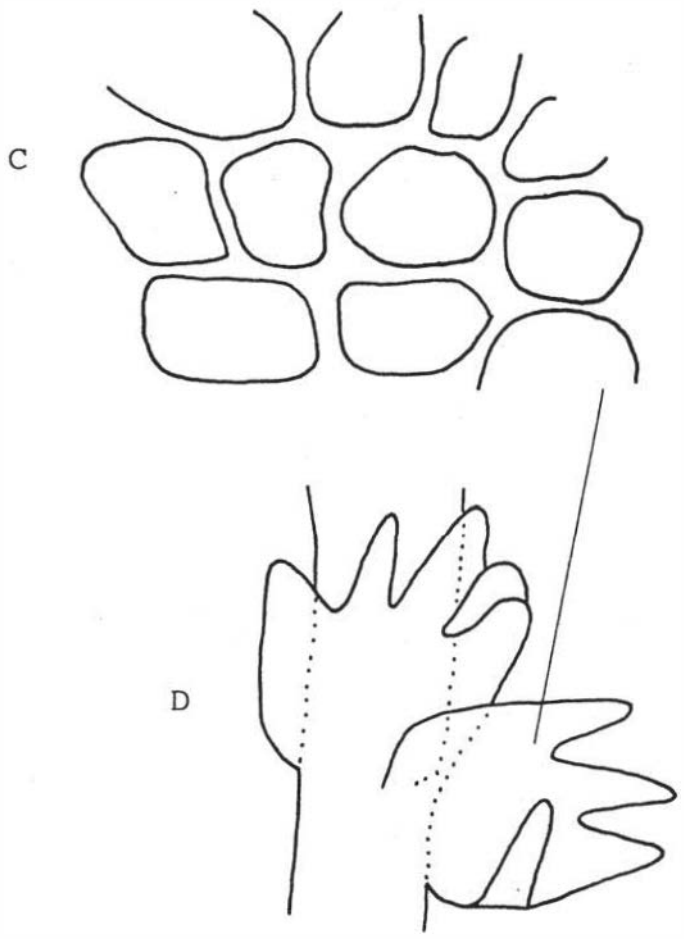
Lepidozia reptans (L) Dumort.

A) stem with perianth (X 30)
B) ventral view of stem (X 30)
C) areolation (X 80)
D) leaf (X 50)



A

B


C
D

Lophocoleaceae

Lophocolea heterophylla (Schrad.) Dumort.

Reported Range: Coles and Clark Counties - very common

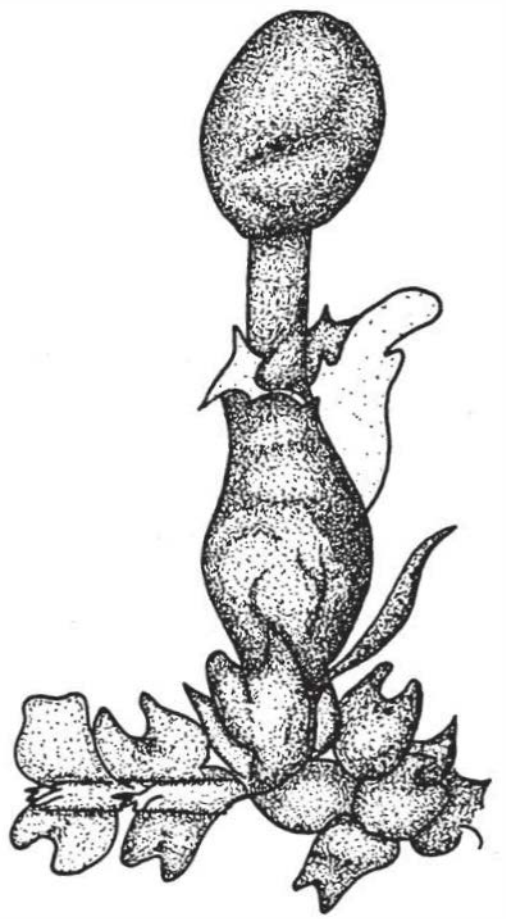
Habitat: This species grows best at the base of trees, on decaying logs, and stumps in moist woodlands. It also occurs on sandy or gravelly soil and on sandstone.

Description: Forms flattened pale green to whitish tufts, and is one of the first liverworts that might be seen as one approaches a decaying log. It is characterized by its procumbent stems which in the spring have many upright perianths and capsules. The leaves are imbricate and bifarious. The leaf cells are 4-5-6 sided. Trigones absent. Small corner thickenings may be apparent but are not considered to be trigones. Perianth terminal on main stem. Spores brown.

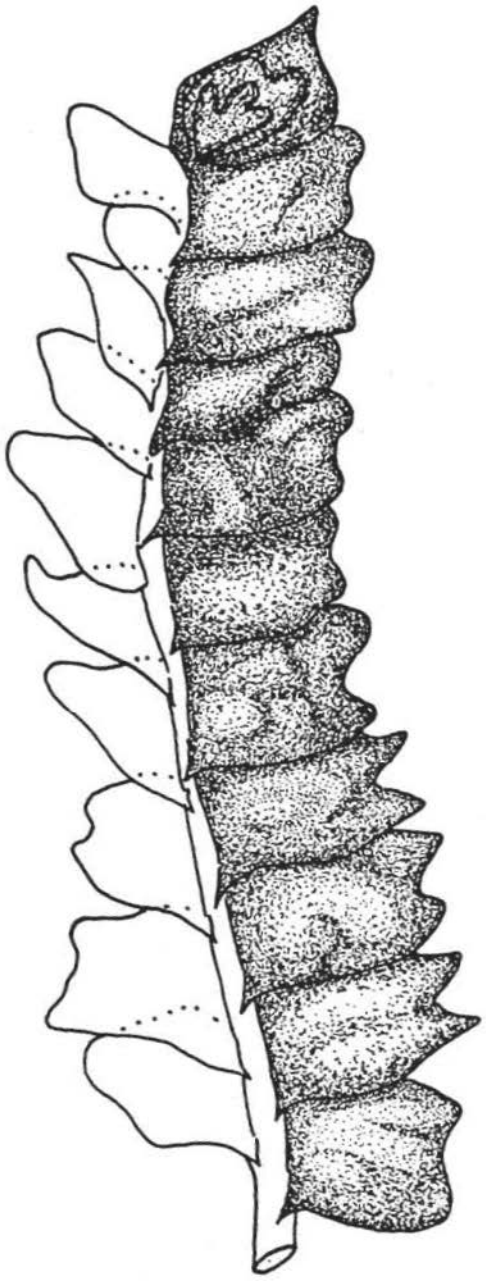
Comments: The leaves of this plant are only slightly bifid or nearly entire. Younger plants sometimes have bifid leaves. Underleaves are bilobed to 1/2 leaf length and possess a single tooth.

Lophocolea heterophylla (Schrd.) Dumort.

A) shoot with perianth (X 25)
B) dorsal view of a sterile shoot with leaf arrangement (X 50)
C) ventral view of a sterile shoot with leaf arrangement (X 30)
D) areolation (X 350)
E) leaf (X 50)



A



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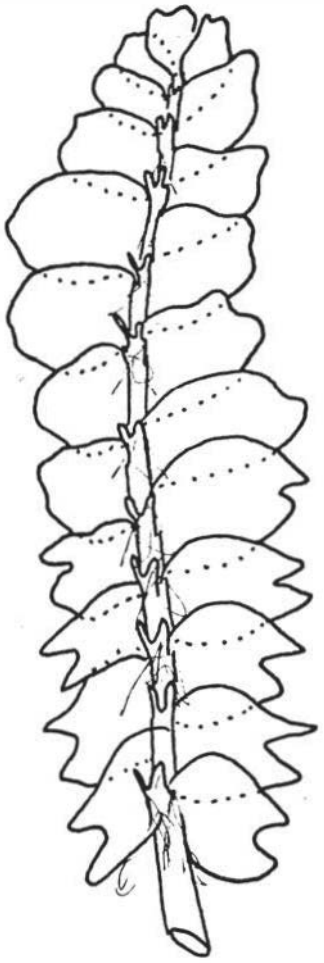
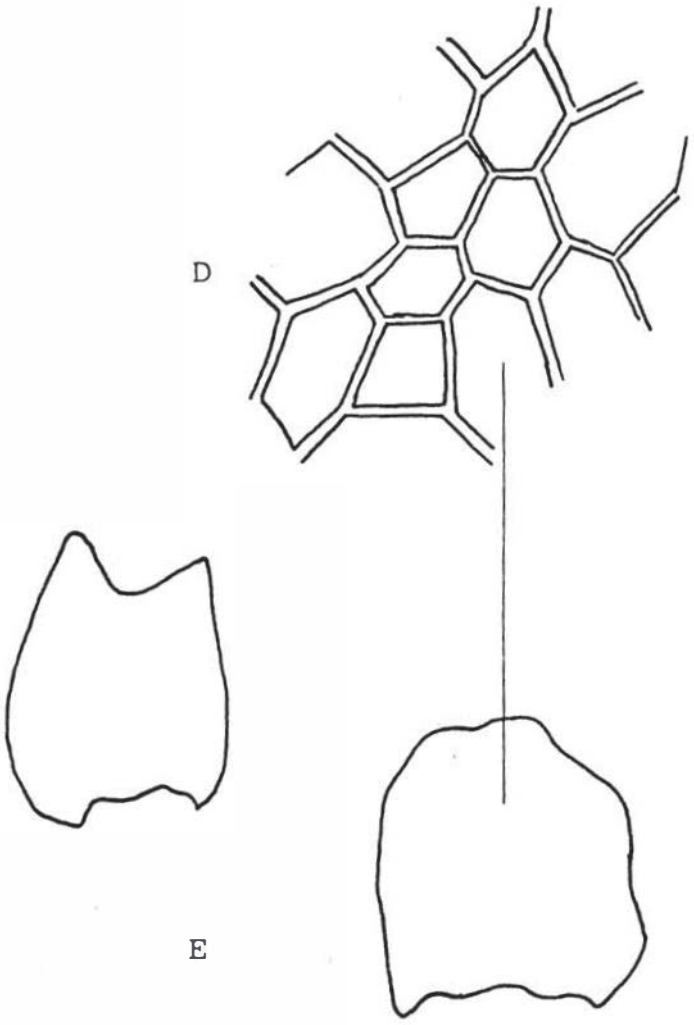


C


D
E

Jungermanniaceae

Lophozia incisa (Schrad.) Dumort.

Reported Range: Coles and Clark Counties - rare

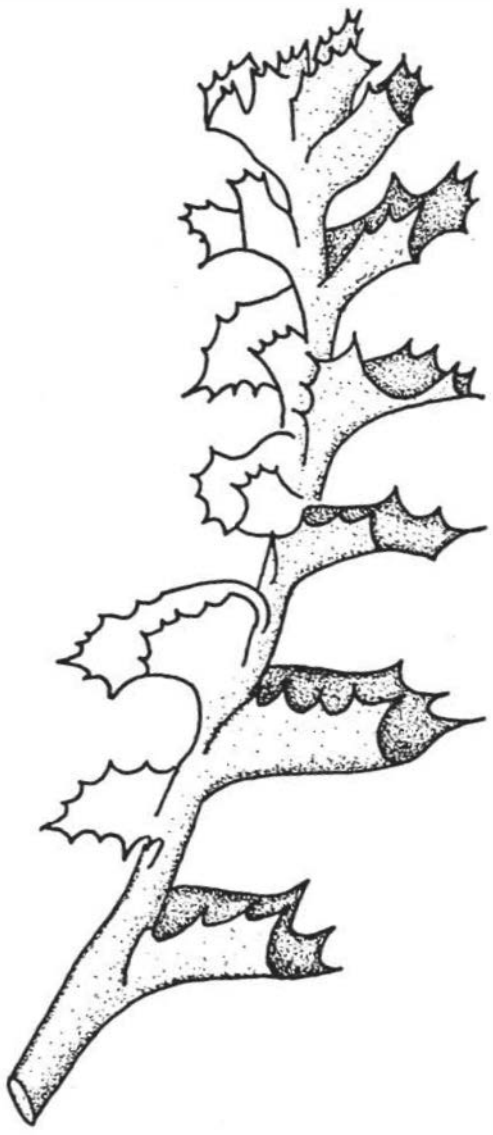
Habitat: Growing on rocks and soil - in very moist shaded wooded areas.

Description: Forms blue-green tufts in early spring. The stems are very thick for the plant size. The dark chlorophyll granules that are found in the thin cells of the stem are partially responsible for the blue-green color. The leaves are succubous and horizontally inserted. Leaves are divided into three parts down to the middle of the leaf. Leaf cells are 4-5-6 sided and smooth. Trigones small. Perianth is round and barrel-shaped near the mouth. Capsule oval and very dark brown. Spores are brown.

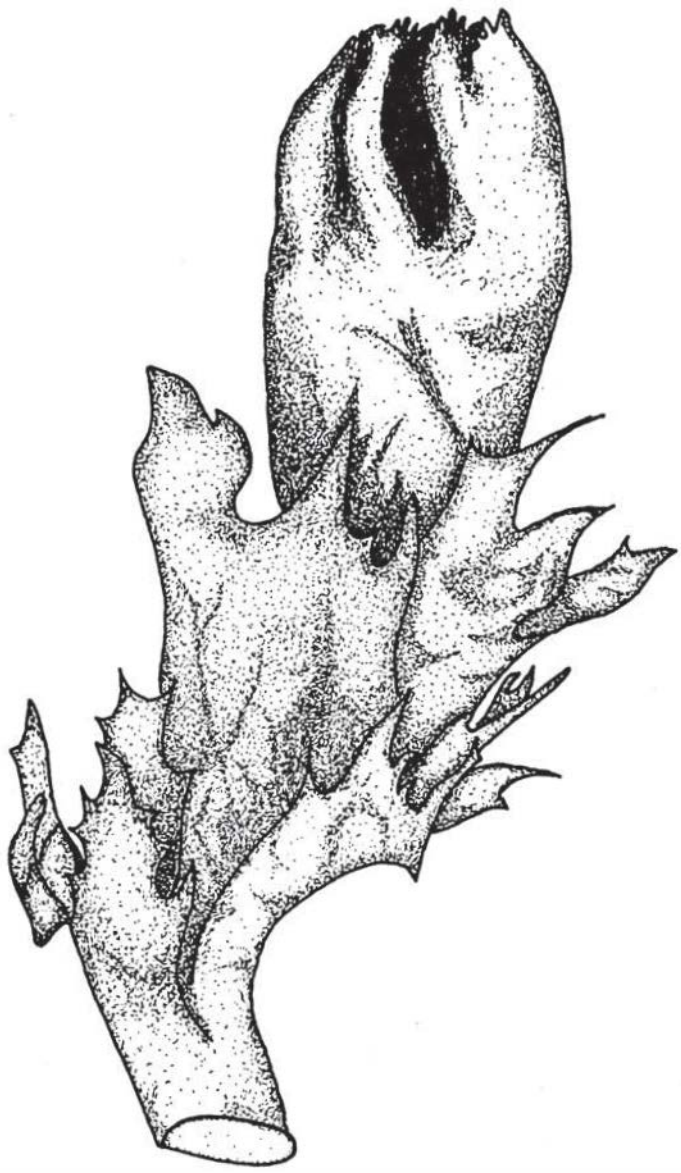
Comments: This very small liverwort is easily distinguished from other species in the field by its blue-green color. The leaves are coarsely toothed and 3-4 lobed. The plant resembles small curly lettuce.

Lophozia incisa (Schrad.) Dumort.

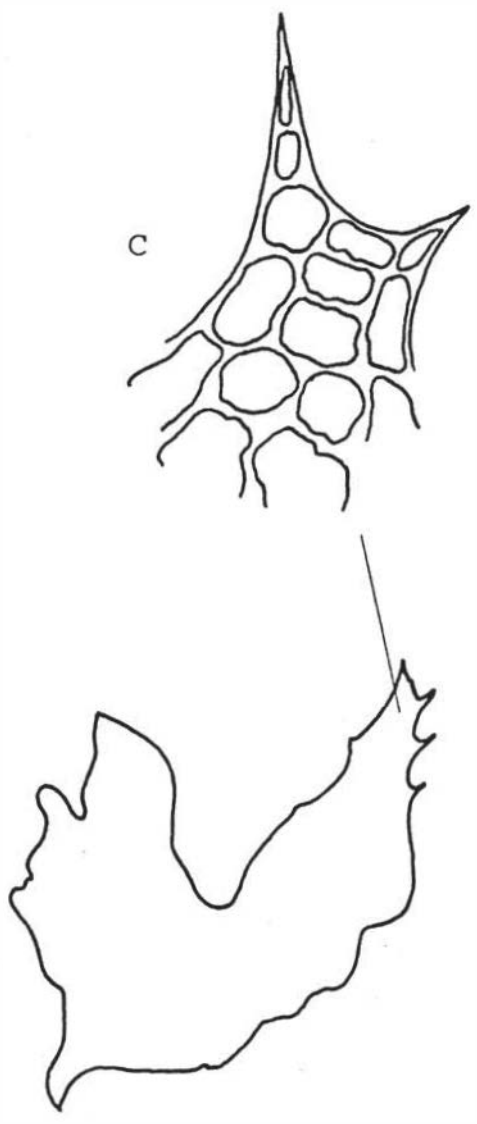
A) dorsal view of sterile stem (X 15)
B) dorsal view of shoot with perianth (X 25)
C) leaf apex and areolation (X 160)
D) leaf (X 100)



A



B


C
D

Cephaloziaceae

Nowellia curvifolia (Dicks.) Mitt.

Reported Range: Clark County - not common

Habitat: This plant has a narrow tolerance in growth range. It grows primarily on logs in a late stage of decay. Nowellia requires a great deal of humidity for growth.

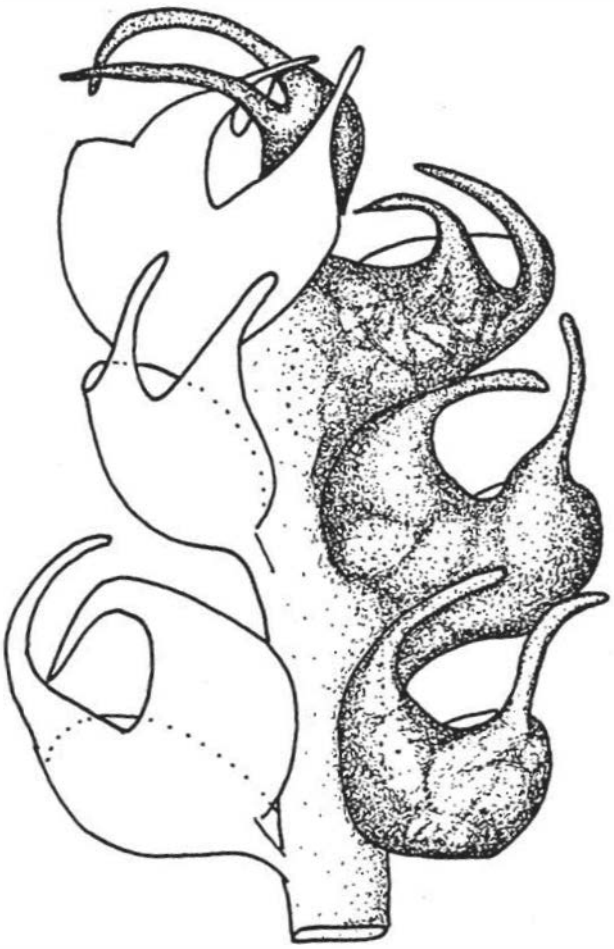
Description: Forms loose prostrate patches which range from green to a red purple color. It has short lateral branches and many rhizoids. The leaves are loosely imbricate and almost transversely inserted. The leaf cells are small. The perianth large and rosy purple in color.

Comments: The liverwort is usually easy to sight identify. It often is brownish red and has capsules. The leaves are deeply divided into two long ciliate extensions. Large ventral water sacs are present.

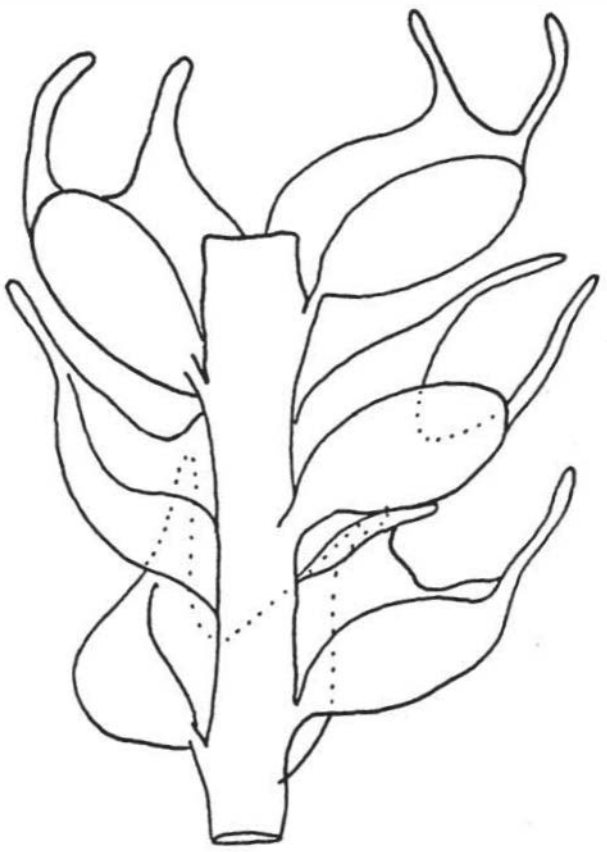
Nowellia curvifolia (Dicks) Mitt.

A) shoot with perianth (X 30)
B) sterile shoot apex (X 60)
C) ventral view of a sterile shoot (X 60)
D) areolation (X 600)
E) leaf (X 30)

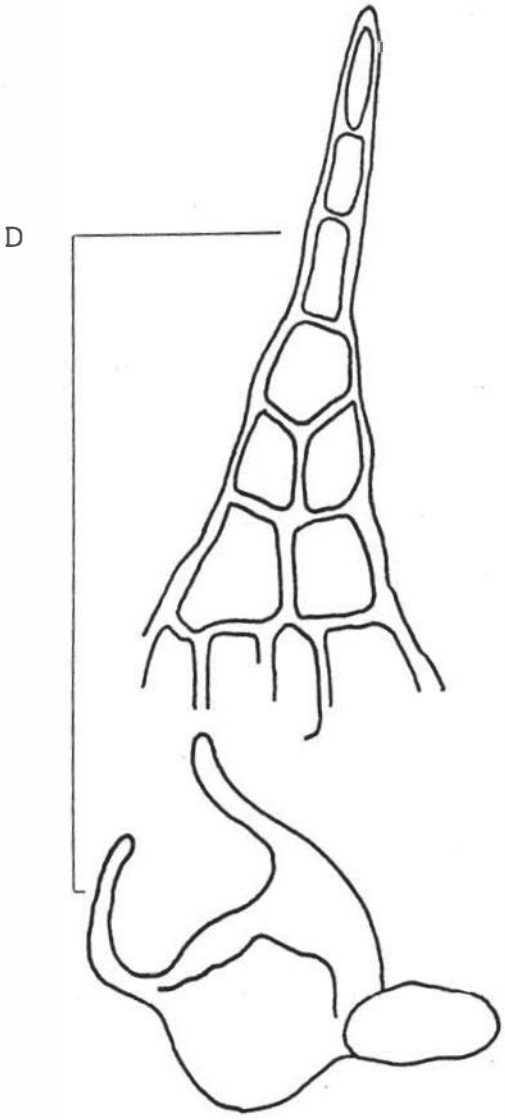
A



B



C



E

Plagiochilaceae

Plagiochila asplenioides (L) Dumort.

Reported Range: Coles and Clark Counties - very common

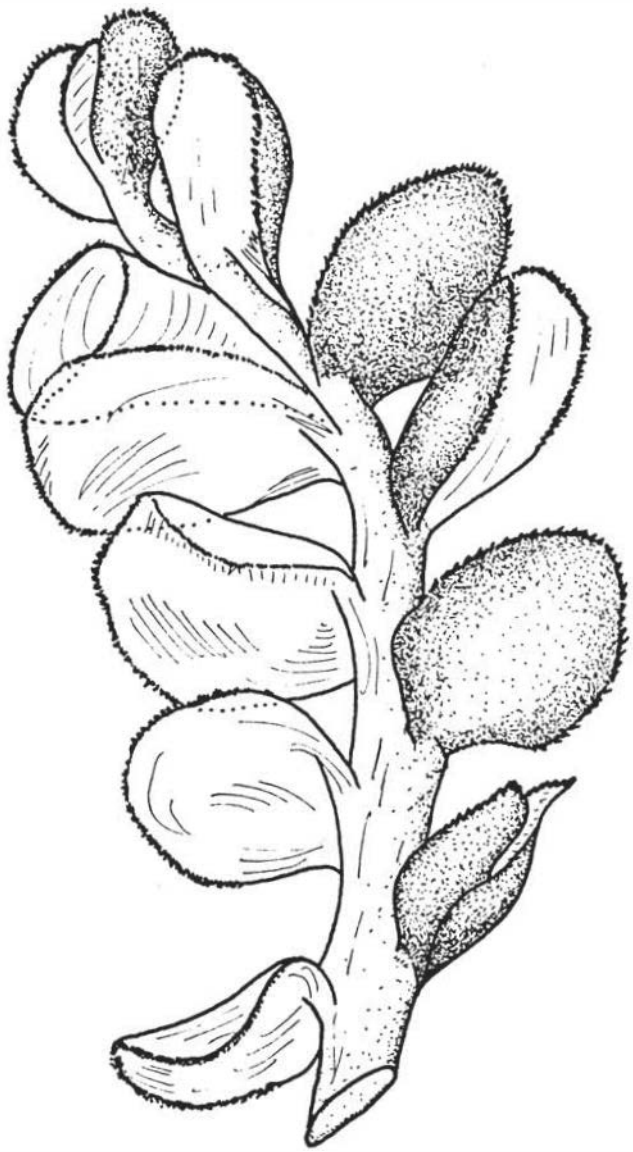
Habitat: Growing in dense patches on moist soil covered rocks in a shaded environment. It is reported to grow at the base of trees, on loamy banks and on calcareous soil in wooded areas.

Description: Forms large creeping mats among other mosses and liverworts. The mats are light green to greenish brown in color. Underleaves usually absent. Leaf ovate. Leaf margins variable. Leaf cells thin with definite corner thickenings. Perianth generally twice as long as bracts. Capsule oval. Spores brown.

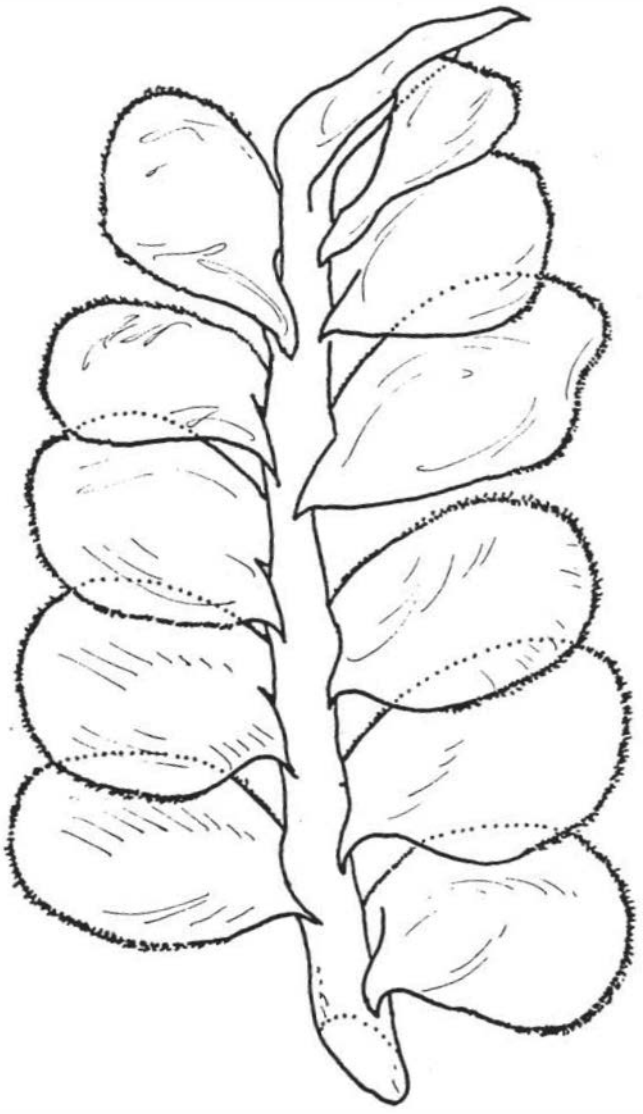
Comments: Leaf margins are usually spinose or toothed.

Plagiochila asplenioides (L) Dumort.

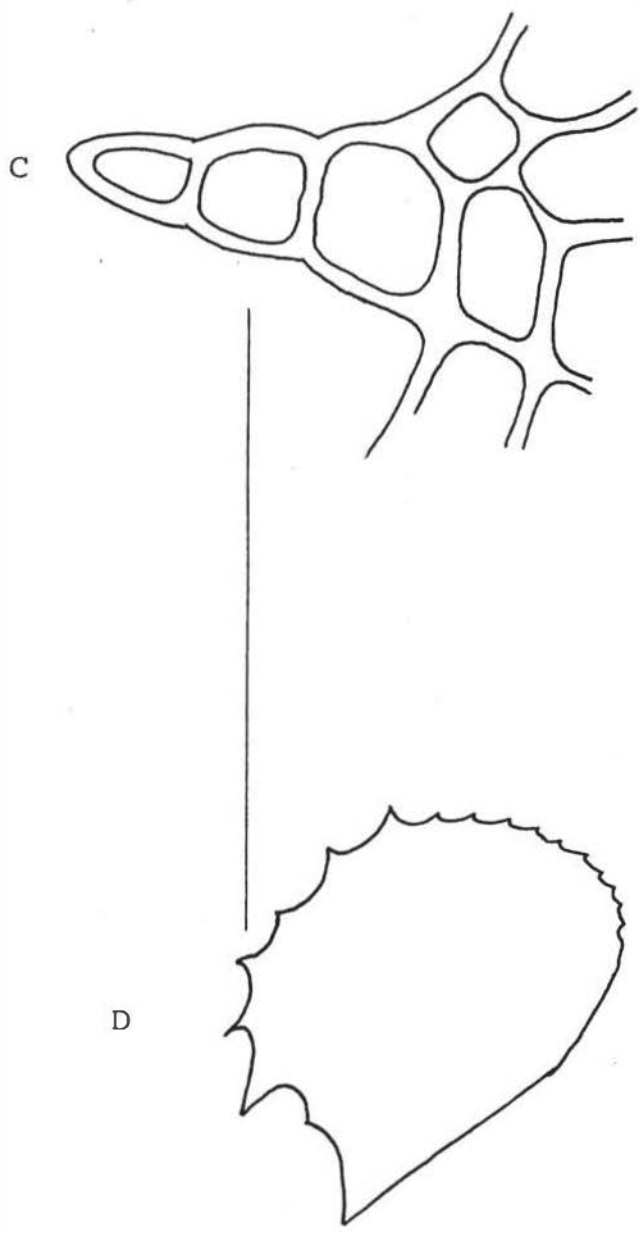
A) dorsal view of sterile shoot (X 20)
B) ventral view of sterile shoot (X 20)
C) areolation (X 400)
D) leaf (X 20)



A



B


C
D

Jungermanniaceae

Plectocolea hyalina (Lyell) Mitt.

Reported range: Clark County - rare

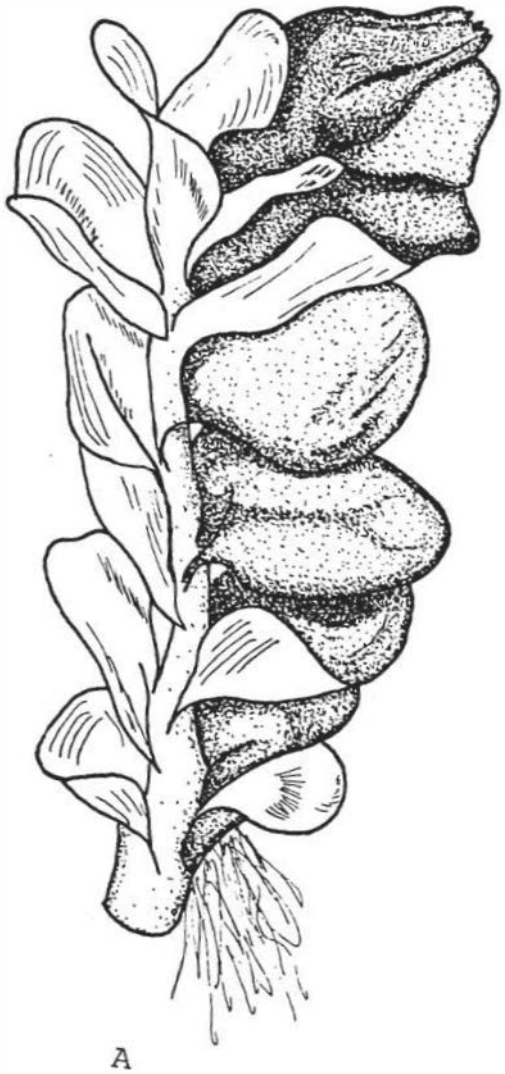
Habitat: On wet rocks and moist clay banks in lowland areas.

Description: Forms prostrate pale green to yellowish green patches. Stems with ascending terminal growth. Ventral side of stem may be purplish. Branching moderate to heavy. Leaves succubous, without lobes, and alternate with margins entire. Rhizoids numerous. Leaf cells round to hexagonal with thin walls and distinct trigones. The perianth is ovoid and emergent.

Comments: The pale yellowish green (hyaline) leaves glisten. This and the reddish purple stem and rhizoids are good diagnostic characteristics.

Plectocolea hyalina (Lyell) Mitt.

A) dorsal view of shoot and perianth (X 20)
B) ventral view of shoot and perianth (X 20)
C) areolation (X 600)
D) leaf (X 20)



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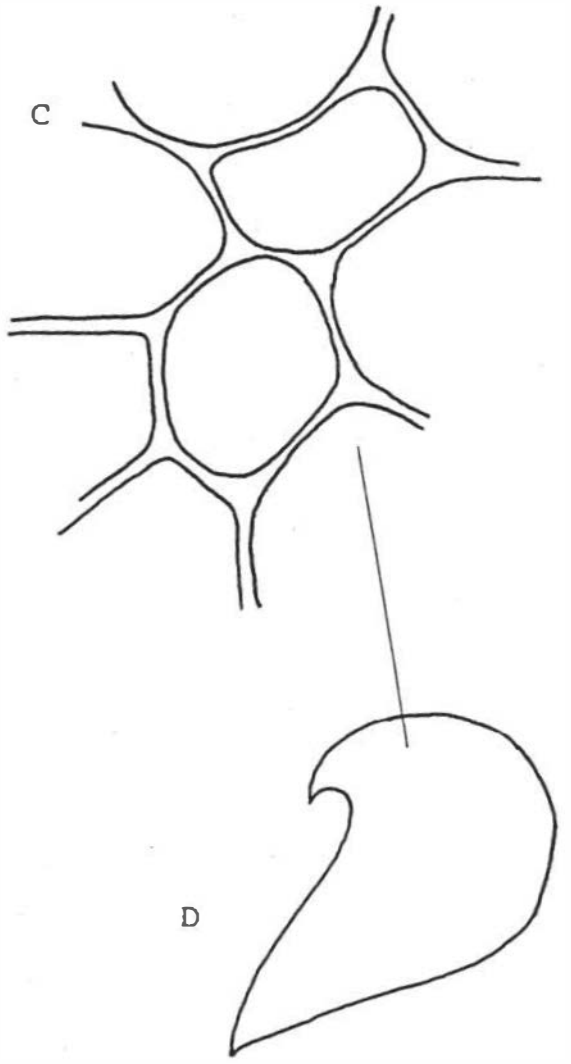

C
D

Porellaceae

Porella platyphylloidea (L) (Schwein) Lindb.

Reported Range: Coles and Clark Counties - not common

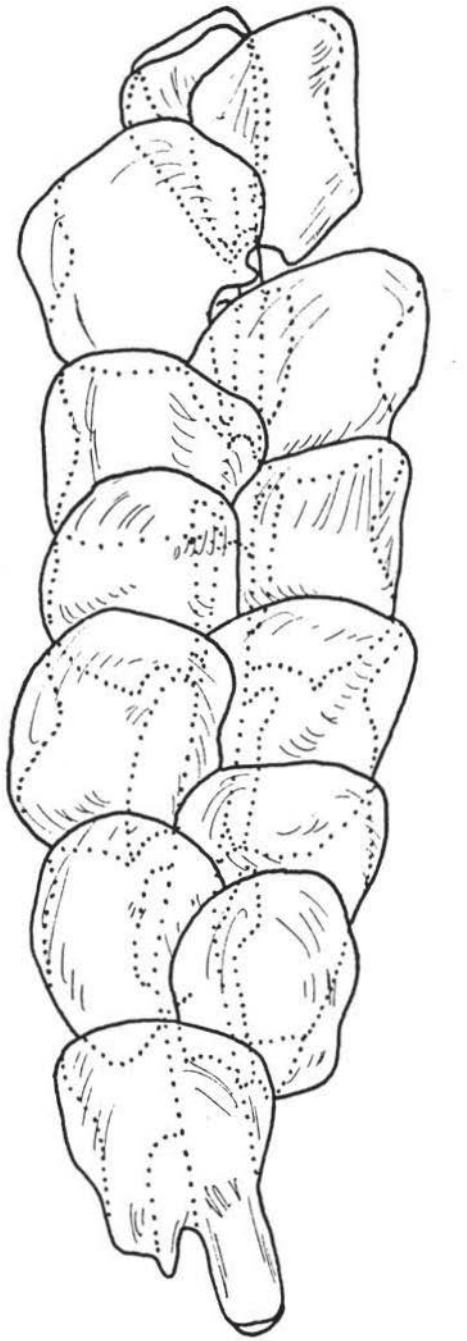
Habitat: In shaded areas on rocks - soil - logs and trees. Often found in limestone areas.

Description: Forms large yellowish-green to brown-green tufts. Stems with irregularly pinnate branches, few if any rhizoids. Leaves imbricate, incubous and alternate, margins entire. Occasionally there are one or two small teeth at the base of the leaf. Leaf cells are small, round and thin-walled; trigones small. Underleaves imbricate. Perianth pale yellow brown and 4-valved. Spores very large and brown.

Comments: Plants large - ventral lobe of leaf not as broad as the underleaf. Mouth of perianth with scattered cilia. Fruiting structures rare. Large underleaves and leaf arrangement make plant appear 5-ranked.

Porella platyphylloidea (Schwein) Lindb.

A) dorsal view of sterile stem (X 15)
B) ventral view of sterile stem (X 15)
C) areolation (X 100)
D) ventral view of stem (X 50)



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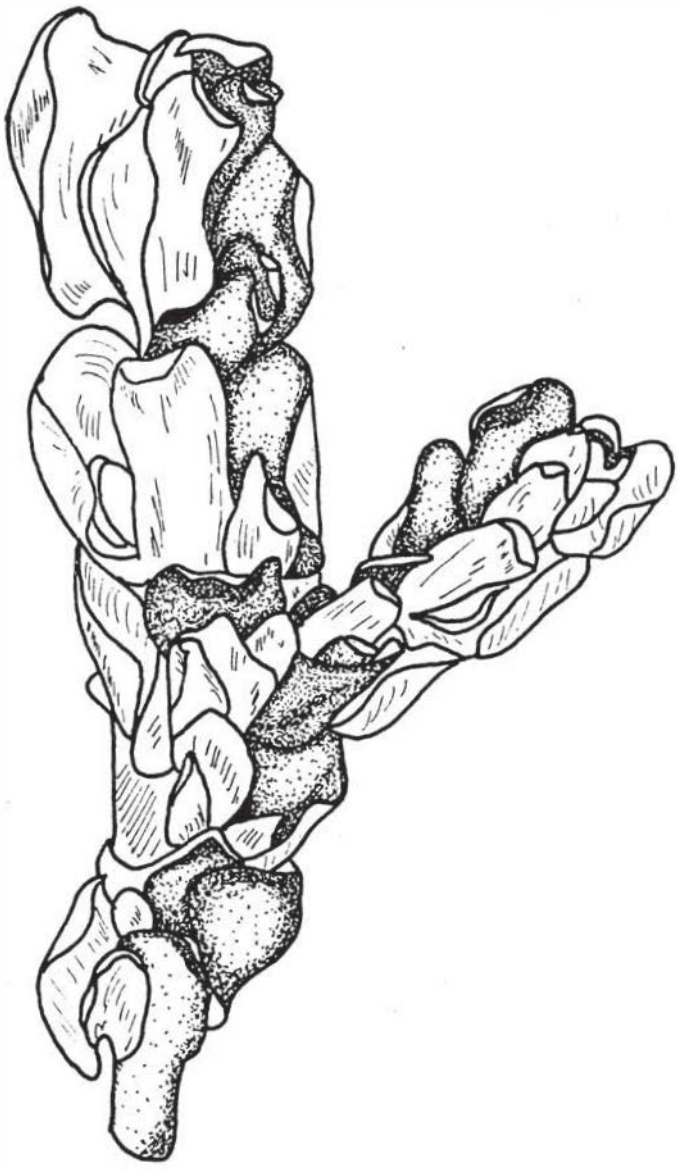

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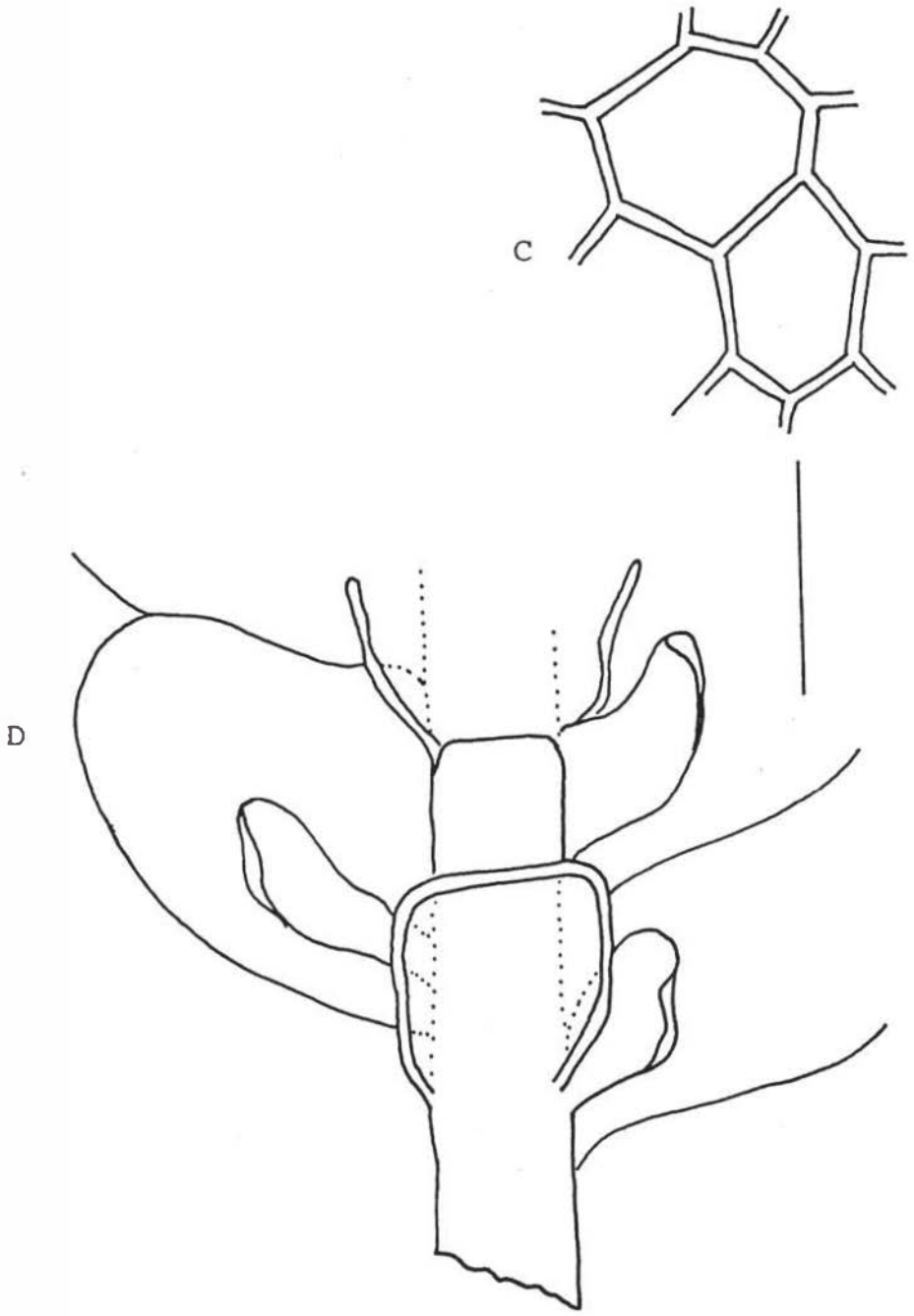

C
D

Radulaceae

Radula complanata (L) Dumort.

Reported Range: Coles and Clark Counties - not common

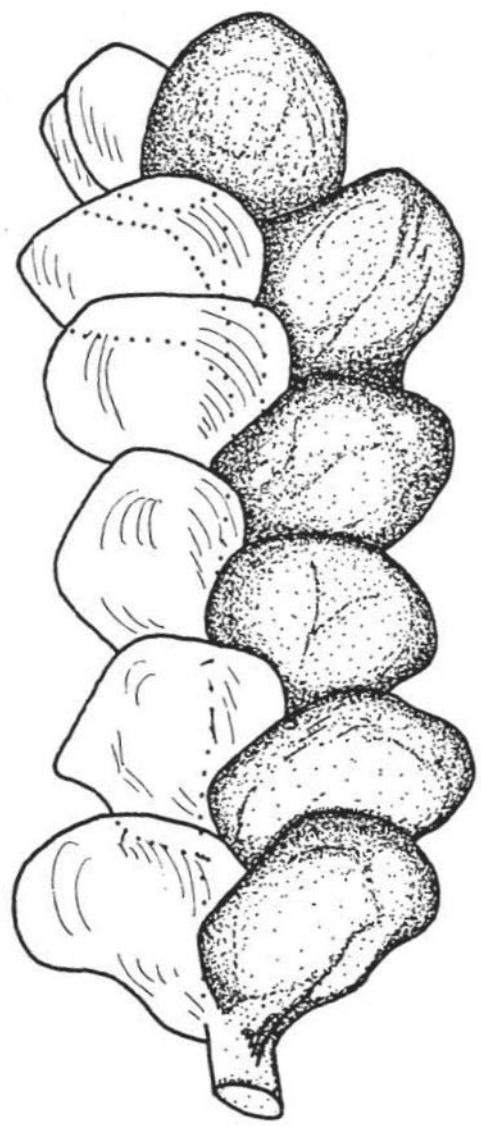
Habitat: This liverwort is chiefly corticolous. It is found most often on beech, ash, and elder tree bark in moist shaded wooded areas.

Description: Forms yellow green creeping and irregularly branched tufts or patches. Rhizoids common. Leaves imbricate and the postical lobe is less than half the size of the anticlinal lobe. Leaf cells are round to hexagonal and thin-walled. Trigones small. Capsule oval and dark brown. Spores large.

Comments: Very commonly found in the fruiting stage. Its flattened perianth, its round gemmae, and leaf cells containing one large oil body, are characteristics which differentiate this species from other corticolous species of leafy liverworts.

Radula complanata (L) Dumort.

A) dorsal view of sterile stem (X 30)
B) ventral view of sterile stem (X 30)
C) areolation (X 700)
D) leaf (X 45)



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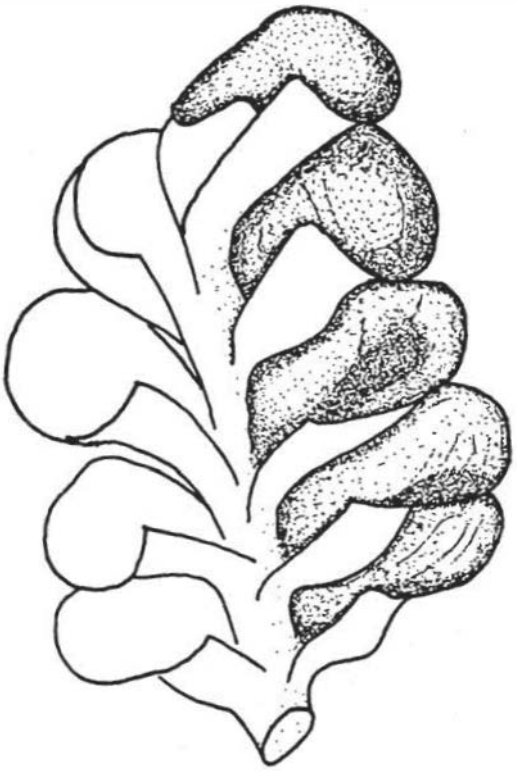

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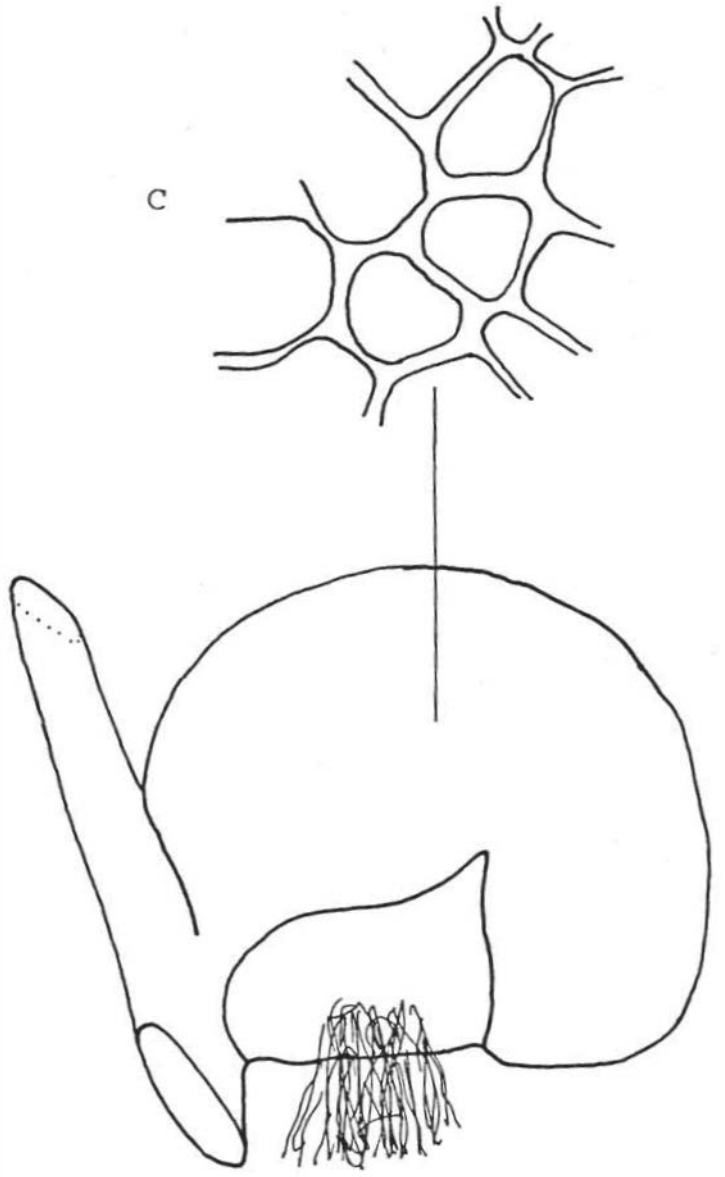

C
D

Scapaniaceae

Scapania nemorosa (L) Dumort.

Reported Range: Coles and Clark Counties - very common

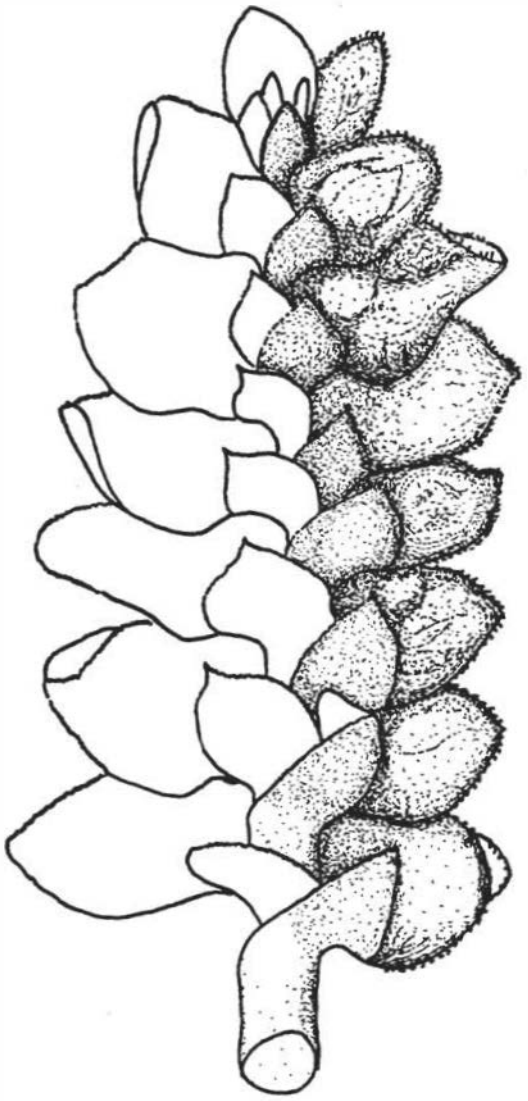
Habitat: Growing in loose tufts on shaded banks, rocks, and rotting wood.

Description: Stems with many branches. Rhizoids few. Leaves attached transversely. The two-lobed leaf features a small anticlinal lobe which is folded back over the larger postical lobe. Margin of leaf is dentate. Leaf cells are small and many-sided. Cell walls thick. Trigones absent. Perianth is terminal. Capsule red-brown. Gemmae often present in clusters on the leaf margins.

Comments: Gemmae are one-celled and form clusters near the leaf tip. Leaf cells are small.

Scapania nemorosa (L) Dumort.

A) dorsal view of sterile shoot (X 15)
B) ventral view of sterile shoot (X 15)
C) leaf margin (X 95) and areolation (X 400)
D) stem detail (X 15)



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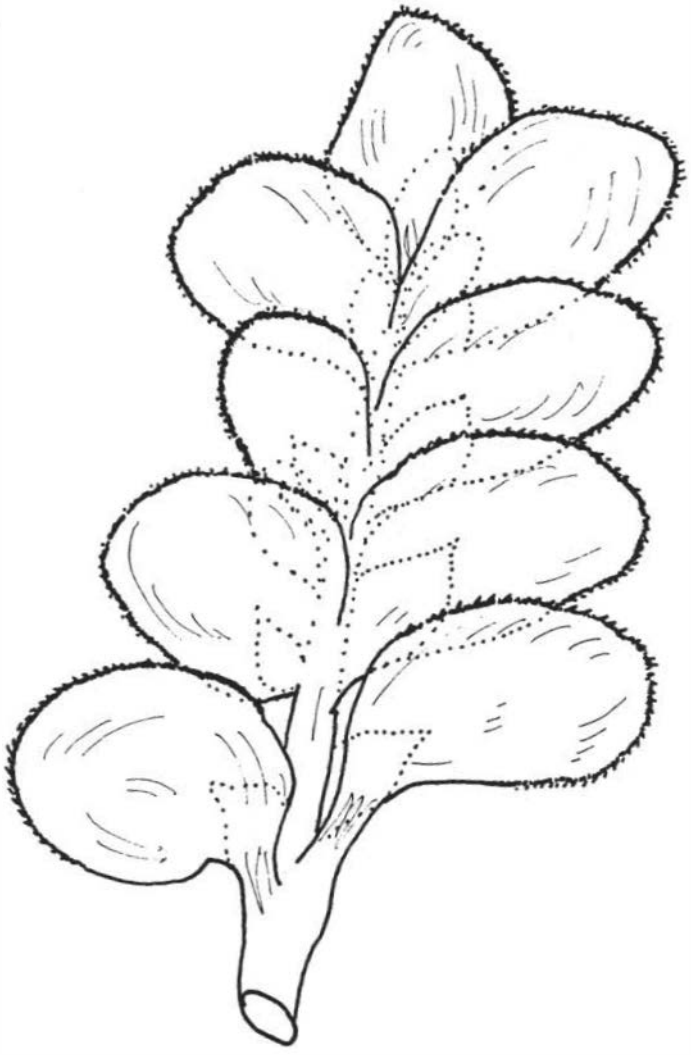

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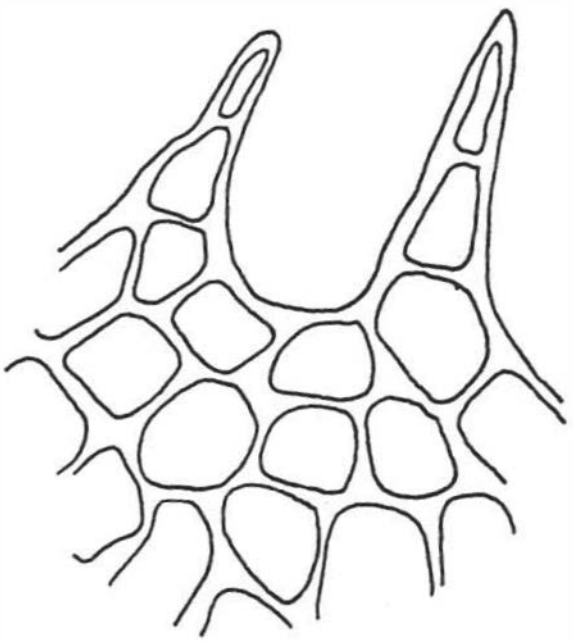

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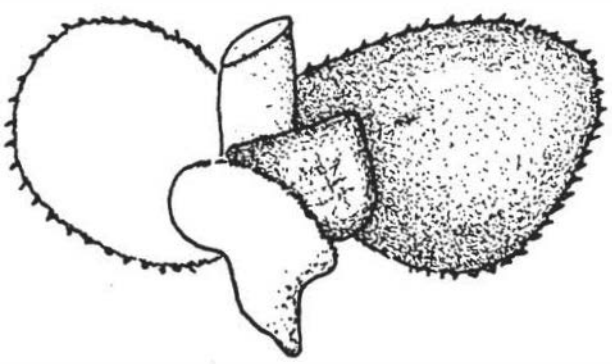


D

Trichocoleaceae

Trichocolea tomentella (Ehrh.) Dumort.

Reported Range: Clark County - very rare

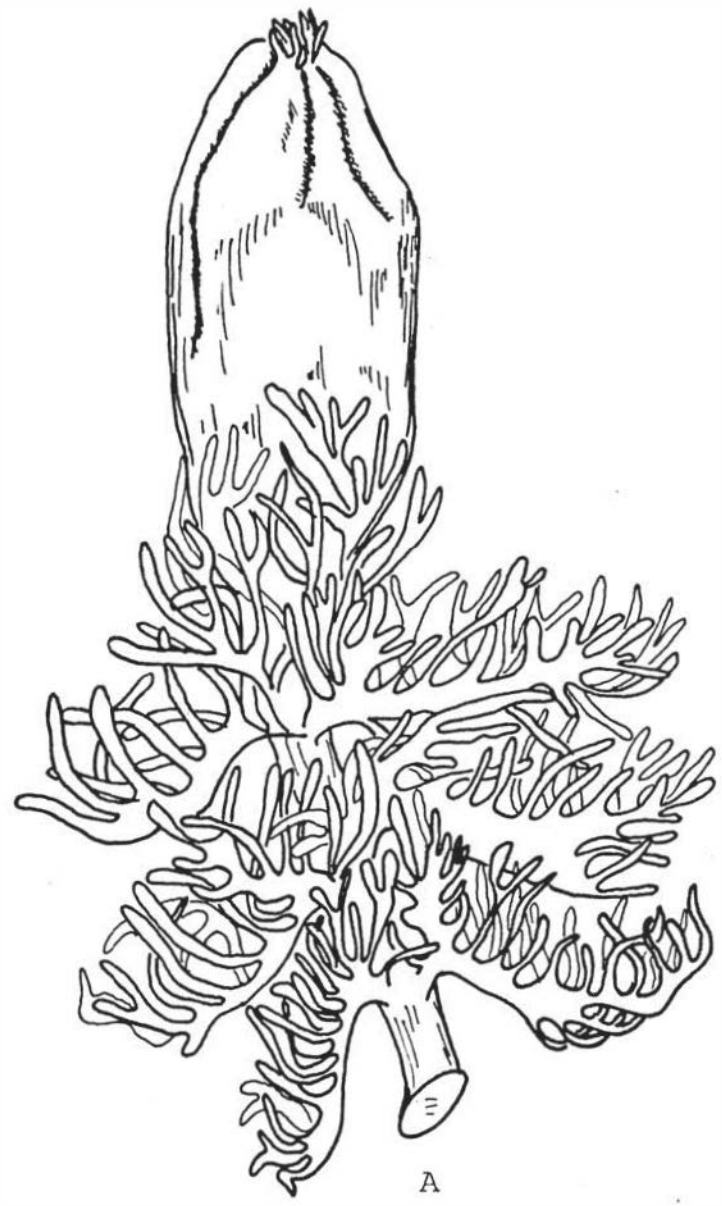
Habitat: Growing in very moist wooded areas on shaded rocks and rich soil.

Description: Forms extensive pale green to whitish green plumose patches in damp shaded wooded areas. Stems twice to three times branched. Each leaf is divided into four main uniserrate filaments. The cells of the leaf are much longer than wide. Trigones absent.

Comments: The plumose nature of the leaf is very conspicuous. Leaf appearance is similar to a branching algae.

Trichocolea tomentella (Ehrh.) Dumort.

A) stem with perienth (X 50)
B) leaf arrangement (X 250)
C) areolation (X 380)



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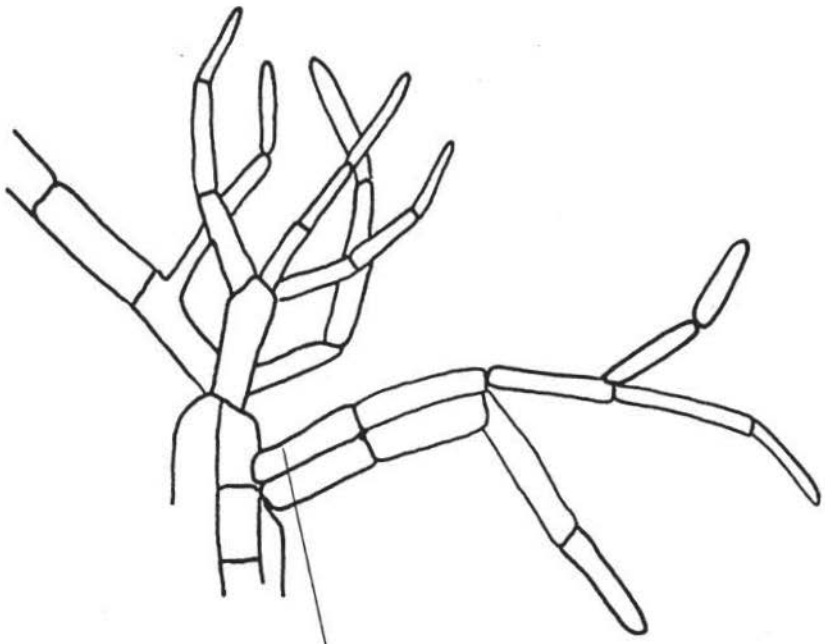

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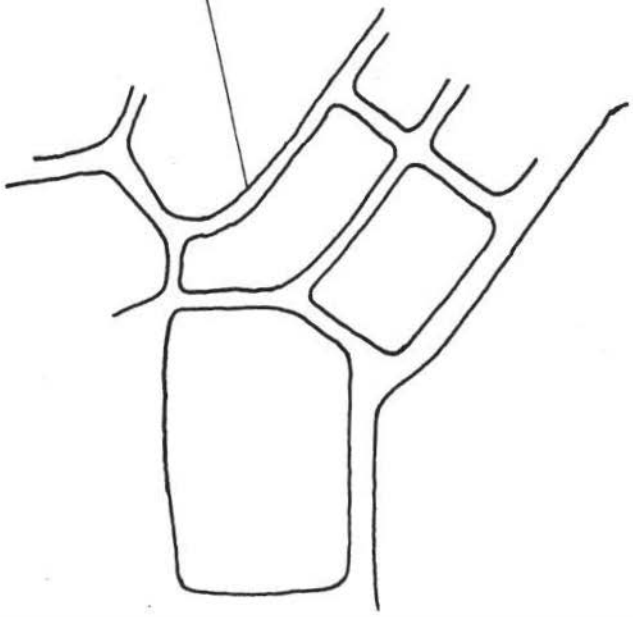

CONCLUSION AND SUMMARY

Recognition had been given to many of the persons who have collected, reported and studied liverworts in Coles and Clark Counties in Illinois. This paper is intended to be an extension of their work and another step in the recognition of the hepatics of this region.

Sixteen genera and twenty species of the thirty reported species of Jungermanniales were collected and identified from the Coles and Clark Counties of Illinois. Twelve species were found both in Coles and Clark Counties, while seven species were found only in Clark County and one only in Coles County. The presence or absence of these specimens does not necessarily signify the abundance or absence of the species in the area. Clearing and indiscriminate collecting has altered the presence of many of the Jungermanniales of the region.

Ten of the species collected were considered to be common and ten species to be uncommon or rare. Keys' drawings and descriptions of the specimens collected were made. Bryological packets were prepared for each specimen and are deposited in the Ernest L. Stover Herbarium at Eastern Illinois University, Charleston, Illinois.

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GLOSSARY

A

1. acrogynous--those liverworts in which the apical cell developes into the archegonium; sporophytes are always terminal.
2. acuminate--curvature of the leaf margin, tapering to a point at the apex.
3. acute--ending in a sharp angle, less than 90°.
4. anacrogynous--those liverworts in which the sporophytes are not terminal, but away from the stem apex, often borne laterally.
5. antheridium--the male reproductive organs containing the sperm.
6. apex--the tip, the end farthest from the point of attachement.
7. apical--referring to the tip or apex.
8. apiculate--terminating in a short, abrupt, sharp point.
9. appressed--lying flat.
10. archegonium--the female reproductive organs containing the egg.
11. areolation--the organization of cells of a leaf.
12. attenuate--tapering to a slendor point.
13. auriculate--referring to a bulge at the base of a leaf.

B

14. bidentate - possessing two teeth.
15. bifid--two-cleft to about the middle.
16. bilobed--with two lobes.
17. bracts--a modified leaf-like structure surrounding the base of reproductive organs.
18. brood-bodies--gemmae.

C

19. caespitose--growing together in tight tufts.
20. calyptra--a thin covering or hood over the capsule; it is remnants of the archegonium.
21. capsule--a spore-containing structure; seta and foot compose the sporophyte.
22. complanate--flattened in one dimension or plane.
23. complicate-bilobed--with two lobes folded together.
24. cordate--heart-shaped.
25. corticolous--tree- or bark-inhabiting.
26. cuticle--a thin outer layer covering the cell wall.

D

27. decurrent--running down; the margin of a leaf extending below its point of attachment forming a ridge or wing.
28. dentate--toothed leaf margins with teeth pointing outward.
29. dioicous--having male and female organs on separate plants.

30. distal--the point farthest from attachment.

E

31. elaters--only found in liverworts; elongate and generally spirally shaped cells mixed with the spores; often thought to aid in spore dispersal.
32. emarginate--notched at the apex.
33. entire--with an even margin, not toothed or indented.
34. filiform--thread-like.
35. foot--the basal portion of the sporophyte performing absorptive functions.

G

36. gametophyte--plant bearing the sexual structures.
37. gemmae--cells borne on the gametophyte; capable of reproducing the plant vegetatively.
38. gemmiparous--producing gemmae.
39. glaucous--grayish or bluish green.

H

40. hyaline--transparent and colorless.

I

41. imbricate--overlapping like shingles on a roof.

42. incubous--the upper margin of the leaf toward the apex of the stem overlapping the lower margin of the leaf above; leaf slopes towards the base of the stem.
43. involucre--a covering around the calyptra or perianth, aiding in protection; formed from modified bracts or a short tube.
44. isodiametric--applying to cells that are equal in diameter in all directions.

L

45. lanceolate--lance-shaped (leaf); broadest at base and tapering to a point.
46. lobe--a rounded division of a leaf.
47. lobule--a small lobe.
48. lunulate--crescent or half-moon shaped.

M

49. monoicous--having male and female sexual structures on the same plant.

O

50. oblique--of a leaf attachment--oblique on stem.
51. obovate--ovate, but with the broadest section at the distal end.
52. obtuse--blunt or rounded at the apex.

53. orbicular--nearly circular.
54. ovate--egg-shaped, with the broadest portion closest to the point of attachment.

P

55. paracyst--an enlarged cell, very different from surrounding cells, often brightly colored.
56. paroicous--antheridia in axils of archegonial bracts; monoicous.
57. perianth--a protective covering (sheath) over the archegonium or young sporophyte.
58. plicate--folded in pleats longitudinally.
59. prostrate--lying flat on substrata.
60. quadrate--nearly square or cubical.

R

61. rhizoids--filiform growths, serving as anchorage and absorptive structures.

S

62. saccate--leaves shaped like a sac.
63. seta--stalk of the sporophyte.
64. sinus--a notch or indentation between two adjacent lobes.
65. spore--a microscopic reproductive body.
66. sporophyte--the spore-bearing generation.

67. squarrose--widely spread; arranged at right angles to the stem.

68. stylus--a small, thin lobe, generally awl-shaped; conspicuous in Frullania.

69. succubous--the lower margin of a leaf (toward the base of the stem), overlapping the upper margin of the leaf below; leaf slopes toward apex of stem.

70. synoicous--with archegonia and antheridia mingled.

T

71. trigones--a thickening of cell walls where cells come together.

U

72. underleaf--a small leaf-like structure on the underside of the stem in liverworts.

73. underlobe--in a complicate-bilobed leaf; lobe lying nearest to the substratum.

74. undulate--referring to wavy leaf margins or surface.

APPENDIX

Location of Counties Surveyed in this Study