EVANSIA

Volume 1 **Number 2**

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ISSN 0747-9859

ARTIFICIAL KEY TO THE GENERA OF LIVERWORTS OF OREGON

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1. PLANTS THALLOSE, the gametophytes either flat and strap-like (branching or not), or in irregular, fleshy mounds, or in dichotomizing rosettes.. 2

1'. PLANTS LEAFY, the gametophytes with clearly differentiated stems and leaves; the stem varying from circular to ellipsoidal in section; leaves arranged regularly along the stems, varying from finger-like projections to deeply lobed, pluridentate or entire-margined laminae............ Group A

2. THALLUS CELLS EACH WITH A SINGLE, LARGE CHLOROPLAST; sporophytes emerging from mounds on the thallus, cylindrical, growing steadily from a basal meristem until several cm long, maturing gradually from the apex down, eventually splitting vertically into two twisted, thread-like valves.. <u>ANTHOCEROS</u>

2'. THALLUS CELLS WITH SEVERAL TO MANY CHLOROPLASTS; sporophytes with ovoid capsule, the contents maturing at one time, usually elevated on a seta.............................. Group B

Group A
(Leafy Liverworts)

1. LEAVES DEEPLY LOBED, THE LOBES PARTLY OR COMPLETELY RESOLVED into many hair-like, uniseriate cilia.......................... 2

1'. LEAVES CONSISTING MAINLY OF A UNISTRATOS PLATE OF CELLS (whether lobed or not), uniseriate cilia (if any) few and/or inconspicuous.. 4

2. BASAL PORTION OF LEAVES LAMINAR, above the base divided into lobes fringed with many cilia.......................... <u>PTILIDIUM</u>

2'. LEAVES DIVIDED TO THE BASE INTO SEVERAL NARROW SEGMENTS, each mostly only 1 or 2 cells wide............................ 3

3. LEAVES AND UNDERLEAVES SIMILAR, consisting of 3 or 4 segments that are uniseriate to the base; stme sparingly branched; common... <u>BLEPHAROSTOMA</u>

3'. UNDERLEAVES REDUCED TO 2 OR 3 VERY SHORT DIVISIONS; leaf segments 2 or more cells wide at base; stem regularly pinnately branched; reported from Washington and California, not yet Oregon................................ <u>KURZIA</u>

4. OIL-BODIES ABSENT OR SOLITARY (1 per median leaf cell) in fresh, living material.................................. Group A1

4'. OIL-BODIES 2 OR MORE PER CELL, or specimen dried................... 5

5. LEAVES DEEPLY BILOBED, THE SMALLER DORSAL LOBE FOLDED over the larger ventral lobe.................................... 6

5'. LEAVES LOBED OR NOT, if bilobed and folded then the DORSAL LOBE MUCH LARGER than the ventral lobe................... 8

6. LEAF LOBES SHARPLY POINTED, very gradually narrowed, lanceolate to acutely triangular; perianth more or less terete, plicate, usually white tipped; gemmae absent.. DOUINIA OVATA

6'. LEAF LOBES USUALLY ROUNDED, occasionally mucronate or abruptly narrowed, not lanceolate; perianth compressed or terete, concolorous; gemmae sometimes present................ 7

7. LEAF LOBES ROTUND OR RENIFORM to ovate or short lingulate; fold often sharp and keeled; perianth compressed, wide at the mouth; gemmae smooth, ellipsoidal; shoot tips mostly curving down.................................. SCAPANIA

7'. LEAF LOBES NARROWLY LINGULATE to oblong-lingulate; fold founded; perianth terete, plicate, narrowing to the mouth; gemmae angular (stellate); shoot tips mostly curving upward................................ DIPLOPHYLLUM

8. LEAVES (or large dorsal lobes of leaves) CLEARLY INCUBOUS (with stem tip up, the leaves overlap or are angled like a venetian blind turned up)......................... Group A2

8'. LEAVES SUCCUBOUS (with stem tip up, the leaves overlap like a venetian blind turned down) OR TRANSVERSE (at right angles to the stem).................................. 9

9. PLANTS ISOPHYLLOUS, the underleaves hardly different from the leaves in size or shape, the stem thus having 3 rows of leaves.. Group A3

9'. PLANTS ANISOPHYLLOUS, the underleaves smaller than and/or differing from the leaves, or underleaves absent................ 10

10. LEAVES ROTUND TO OVATE, ENTIRE AND UNLOBED (some species with occasional leaves retuse or emarginate)............. Group A4

10'. LEAVES VARIOUSLY LOBED, or at least their margins with distinct teeth.. 11

11. LEAVES UNLOBED BUT WITH SHORT MARGINAL TEETH; leafy shoots usually lacking rhizoids....................... PLAGIOCHILA

11'. LEAVES DISTINCTLY LOBED, not merely dentate margined; rhizoidssometimes abundant along leafy shoots............ Group A5

Group A1
(Leafy Liverworts with Oil-bodies Solitary or Lacking)

1. OIL-BODIES PRESENT, 1 PER CELL (rarely more)...................... 2

1'. OIL-BODIES LACING IN ALL CELLS.................................... 4

2. OIL-BODIES COLORLESS, lumpy-amorphous; minute alpine plants growing on soil............................ NARDIA BREIDLERI

2'. OIL-BODIES BROWN OR GREENISH-BROWN, plate-like and granular; growing on rocks or trees............................ 3

3. LEAVES BILOBED, THE DORSAL LOBE MUCH SMALLER than the ventral lobe; very rare.................. SCAPANIA GYMNOSTOMOPHILA

3'. LEAVES BILOBED, THE DORSAL LOBE MUCH LARGER than the ventral lobe; widespread in western Oregon.................. RADULA

4. UNDERLEAVES LARGE, mostly as long as the leaves.................... 5
4'. UNVERLEAVES MINUTE OR LACKING.................................... 6

5. UNDERLEAVES LANCEOLATE, unlike the bilobed leaves.................................... PLEUROCLADA ALBESCENS
5'. UNVERLEAVES BILOBED, much like the bilobed leaves........... Group A3

6. PLANTS MEDIUM SIZED, 1.5-3 mm wide; stems stout and fleshy, to 0.9 mm thick; rare, in subalpine meadows or under heather............................ SCHOFIELDIA MONTICOLA
6'. PLANTS SMALL, to 1.2 mm wide; stems slender, to 0.35 mm thick; many species, widespread................. CEPHALOZIA

Group A2
(Leafy Liverworts with Incubous Leaves)

1. LEAVES WITH A BASAL LOBULE folded under on the ventral side, not visible from above.................................... 2
1'. LEAVES LACKING A LOBULE.. 5

2. UNDERLEAVES ABSENT; the cells each with a single, large, brown or greenish-brown oil-body............................ RADULA
2'. UNDERLEAVES PRESENT and conspicuous; oil-bodies usually numerous in each cell.. 3

3. LOBULE MODIFIED INTO AN URN- OR HOOD-SHAPED STRUCTURE attached to the stem by a short, slender stalk........... FRULLANIA
3'. LOBULE MERELY A FOLD OR FLAP of leafy tissue....................... 4

4. UNDERLEAVES ENTIRE; the lobule a leafy flap, not inflated; common and widespread...................................... PORELLA
4'. UNDERLEAVES BILOBED; the lobule inflated, not leaf-like; rare, if found in Oregon at all................. LEJEUNEA CAVIFOLIA

5. LEAVES DIVIDED HALF THEIR LENGTH or more into 3-4 finger-like lobes; underleaves deeply 3-4 lobed; small plants (shoots less than 1 mm across) with regular pinnate branching....................... LEPIDOZIA REPTANS
5'. LEAVES AND (usually) UNDERLEAVES ENTIRE TO SHALLOWLY 2-3 TOOTHED; larger plants with less branching................... 6

6. LEAVES ENTIRE OR RARELY BIDENTATE at apex; plants delicate, pale, often with gemmae; underleaves rotund and emarginate to deeply bilobed; plants prostrate with numerous rhizoids.. CALYPOGEJA
6'. LEAVES NORMALLY 2-3 DENTATE AT APEX; plants firm, opaque, olive-green to brownish; lacking gemmae but often with caducous leaves; underleaves squarish, shallowly and irregularly 2-3 dentate; plants ascending with few rhizoids.. BAZZANIA

Group A3
(Leafy Liverworts with Isophyllous Shoots)

1. LEAVES AND UNDERLEAVES BIFID TO BELOW THE MIDDLE, the lobes acuminate; leaves mostly imbricate........................ 2
1'. LEAVES AND UNDERLEAVES ENTIRE TO BILOBED, when bilobed the sinus hardly reaching the middle of the leaf and the lobes rounded to obtuse; leaves usually remote, hardly overlapping... 3

2. LEAVES WITH BANDS OF ELONGATED CELLS extending up the lobes; leaf cells with coarse, bulging trigones; oil-bodies averaging 7-13 per cell; plants dark; leaf tips not appressed......................... HERBERTUS ADUNCUS
2'. LEAF CELLS MORE OR LESS UNIFORM IN SHAPE and wall thickness, without bulging trigones; oil-bodies lacking; leaves strictly appressed, the shoots julaceous; plants usually whitish........................ ANTHELIA

3. LEAVES BILOBED 1/2 to 1/4 their length; oil-bodies rare or absent; sporophytes borne in long perianths................................. HYGROBIELLA LAXIFLORA
3'. LEAVES ENTIRE, irregularly ovate to rhombic; oil-bodies conspicuous, smaller than chloroplasts, numerous; perianths absent, the sporophyte emerging from a large, fleshy calyptra....................... HAPLOMITRIUM HOOKERI

Group A4
(Leafy Liverworts with Round, Entire Leaves)

1. UNDERLEAVES RELATIVELY LARGE AND CONSPICUOUS, at least at tips of sterile shoots.. 2
1'. UNDERLEAVES ABSENT OR MINUTE, reduced to tiny, few-celled projections... 6

2. UNDERLEAVES BIFID TO MIDDLE OR BELOW; rhizoids restricted to small areas at the bases of the underleaves or concentrated around (but not on) raised, red pads between the underleaves.. 3
2'. UNDERLEAVES ENTIRE, lanceolate; rhizoids (when present) mostly scattered along ventral stem surface, sometimes partially tufted... 5

3. UNDERLEAVES OBLONG (RECTANGULAR), with parallel sides, the two sharply-pointed lobes pointing straight forward; rhizoids numerous around raised, red pads located on the ventral stem surface between the underleaves; on soil...................... GYROTHYRA UNDERWOODIANA
3'. UNDERLEAVES MOSTLY WIDER THAN LONG, the lobes divergent or with lateral lobes or cilia; rhizoids restricted to the bases of underleaves.......................... 4

4. AT LEAST SOME LEAVES ON THE STEM DISTINCTLY BILOBED; on decaying wood or bark.............................. LOPHOCOLEA
4'. LEAVES ALL ENTIRE except for occasional retuse or emarginate apices; on soil, rock or rarely wet wood, essentially aquatic............................ CHILOSCYPHUS

5. MEDIAN LEAF CELLS SMALL TO MEDIUM SIZED (15-40 µm), often with bulging trigones but not coarsely nodose; oil-bodies homogeneous or granular; gemmae absent; on soil .... NARDIA

5'. MEDIAN LEAF CELLS LARGE (45-50 µm wide or more); with coarse, knot-like trigones and nodose thickenings along cell walls; oil-bodies botryoidal; gemmae frequent; on Sphagnum .... MYLIA ANOMALA

6. PLANTS WITH STOUT, FLESHY STEMS and irregularly shaped, wavy, ruffled leaves; rhizoids (but not stems) intensely purplish-red .... FOSSOMBRONIA

6'. STEMS RELATIVELY FIRM AND SLENDER; leaves clearly rotund or ovate; rhizoids not reddish unless stems or parts of leaves similarly colored 7

7. LEAVES WITH DORSAL MARGINS RECURVED and with a shallow but distinct trough extending up the leaf midline from the base; oil-bodies usually composed of small but distinct granules .... PLAGIOCHILA

7'. LEAVES PLANE OR EVENLY CONCAVE; oil-bodies finely granulose to almost homogeneous 8

8. BASES OF FEMALE BRACTS LACERATE; perianth mouth ciliate; bracteole present; a few leaves retuse, not common but appearing regularly; on decaying wood or bark; apparently restricted to eastern half of the state .... JAMESONIELLA AUTUMNALIS

8'. BRACTS ENTIRE; perianth mouth lacking cilia although sometimes lobulate; bracteole absent; retuse leaves very rare; usually on soil, occasionally aquatic or on organic substrates; widespread .... JUNGERMANNIA

Group A5
(Leafy Liverworts with Lobed Leaves)

1. RHIZOIDS BRIGHT PURPLISH-RED; stem and leaves pure green; leaves mostly quadrate, with wavy or ruffled margins, appearing irregularly lobed .... FOSSOMBRONIA

1'. RHIZOIDS USUALLY COLORLESS OR BROWNISH, occasionally reddish when stems and/or leaves are similarly pigmented, sometimes hardly produced at all; leaves distinctly and regularly lobed 2

2. PLANTS SMALL TO MINUTE, healthy shoots less than 1 mm wide (excluding stray, depauperate strands) .... Group A6

2'. PLANTS SMALL TO LARGE, normal shoots mostly much greater than 1 mm wide 3

3. UNDERLEAVES LACKING OR INCONSPICUOUS on sterile shoots .... Group A7

3'. UNDERLEAVES QUITE DISTINCT ON STERILE SHOOTS 4

4. UNDERLEAVES LANCEOLATE OR IRREGULAR 5

4'. UNDERLEAVES REGULARLY BIFID TO BIFID-CILIATE 9

5. UNDERLEAVES SMALL, SUBULATE, OR FLAP-LIKE and varying to round-lobed.. 6
5'. UNDERLEAVES UNIFORMLY LANCEOLATE.................................. 8

6. UNDERLEAVES SMALL, SUBULATE; oil-bodies large, at least twice the size of the chloroplasts, granulose.. LOPHOZIA
6'. UNDERLEAVES VARIABLE, from small flaps to rather large and round-lobed on the same shoot; oil-bodies small and homogeneous or absent...................... 7

7. LEAVES REGULARLY BILOBED, occasionally trilobed; oil-bodies absent; rare, subalpine-alpine in northern Cascades; terrestrial............... SCHOFIELDIA MONTICOLA
7'. LEAVES SOMETIMES UNLOBED or retuse-emarginate; oil-bodies numerous, small and homogeneous; very rare in southern Cascades; aquatic................. LOPHOCOLEA

8. CELL WALLS THIN, TRIGONES HARDLY DEVELOPED; underleaves somewhat lacerate; on peat...... HARPANTHUS FLOTOVIANUS
8'. CELLS USUALLY WITH BULGING TRIGONES; underleaves quite entire; on soil.. NARDIA

9. UNDERLEAVES SIMPLY BIFID TO BELOW THE MIDDLE, the lobes straight, entire, acuminate, pointing forward.. GEOCALYX GRAVEOLENS
9'. UNDERLEAVES EITHER CILIATE OR WITH SPREADING LOBES................ 10

10. UNDERLEAVES WITH LOBES SPREADING, usually with lateral teeth but not cilia; rhizoids restricted to small area at base of underleaf; oil-bodies botryoidal.. LOPHOCOLEA
10'. UNDERLEAVES CILIATE; rhizoids scattered; oil-bodies granulose to homogeneous........................ LOPHOZIA

Group A6
(Tiny Leafy Liverworts with Bilobed Leaves)

1. UNDERLEAVES CONSPICUOUS ON STERILE SHOOTS.......................... 2
1'. UNDERLEAVES MINUTE OR ABSENT ON STERILE SHOOTS..................... 4

2. UNDERLEAVES ALMOST OR QUITE AS LONG AS THE LEAVES.. PLEUROCLADA ALBESCENS
2'. UNDERLEAVES LESS THAN HALF AS LONG AS THE LEAVES.................. 3

3. OIL-BODIES SOLITARY OR 2-5 PER CELL, very large, homogeneous.. NARDIA
3'. OIL-BODIES SEVERAL PER CELL, about as small or smaller than the chloroplasts, granulose.................... CEPHALOZIELLA

4. STERILE SHOOTS JULACEOUS, the leaves appressed and overlapping; perianth poorly developed, never projecting beyond the female bracts; oil-bodies few, 2-3 (rarely to 6) per cell, lumpy-amorphous to granulose, more than twice as large as the chloroplasts.. 5

4'. STERILE SHOOTS WITH LEAVES MORE OR LESS REMOTE and/or spreading; perianth well developed; oil-bodies various, sometimes lacking.................................... 6

5. PLANTS PALE GREEN OR WHITISH............................ GYMNOMITRION
5'. PLANTS DARK GREEN TO BROWN OR EVEN BLACKISH............... MARSUPELLA

6. LEAVES TRANSVERSELY INSERTED.. 7
6'. LEAVES DISTINCTLY SUCCUBOUS.. 8

7. SHOOTS 0.5 mm WIDE OR WIDER; oil-bodies distinctly botryoidal................................. ANASTROPHYLLUM MINUTUM
7'. SHOOTS LESS THAN 0.5 mm WIDE; oil-bodies granulose..... CEPHALOZIELLA

8. PLANTS PELLUCID, THE CELLS LACKING OIL-BODIES; perianths trigonous; cells without trigones............. CEPHALOZIA
8'. PLANTS OPAQUE, THE CELLS WITH OIL-BODIES; perianths cylindrical; cells usually with trigones................. LOPHOZIA

Group A7
(Leafy Liverworts, Small to Large, with Lobed Leaves and No Obvious Underleaves)

1. LEAVES TRANSVERSELY INSERTED (the leaves sometimes somewhat secund); plants typically erect......................... 2
1'. LEAVES OBLIQUELY INSERTED, SUCCUBOUS; plants often sprawling or decumbent... 4

2. LEAVES EXTREMELY ASYMMETRICAL, mostly 3-lobed with the dorsal lobe much the smallest; usually with masses of reddish-brown gemmae at shoot apex.................. TRITOMARIA
2'. LEAVES RATHER EVENLY BILOBED; with reddish-scarlet gemmae or gemmae absent... 3

3. LEAF CELLS MOSTLY EVENLY THICKENED, without trigones; oil-bodies distinctly botryoidal; reddish-scarlet gemmae frequent; perianths (if produced, plants usually sterile) long-emergent; alpine...... ANASTROPHYLLUM MINUTUM
3'. LEAF CELLS WITH TRIGONES DISTINCT, usually bulging; oil-bodies finely granulose or lumpy-amorphous; gemmae absent; perianth short or absent; widespread..... MARSUPELLA

4. PLANTS SMALL (to 1.2 mm wide), PELLUCID; oil-bodies lacking in all cells; perianths trigonous............... CEPHALOZIA
4'. PLANTS MOSTLY LARGER, OPAQUE; oil-bodies present in most cells; perianths cylindrical.............................. 5

5. LEAF LOBES ROUNDED; rhizoids sparse; perianths inflated, caudUcous; plants usually dark brown or blackish; oil-bodies granulose, usually 4-8 per cell; gemmae absent; subalpine-alpine........................ GYMNOCOLEA INFLATA
5'. LEAF LOBES ACUTE (if rounded, then cells with numerous small, homogeneous oil-bodies); rhizoids usually abundant; perianths neither inflated nor caudUcous; plants usually greenish to light brown or reddish; oil-bodies various; gemmae often present; widespread...... LOPHOZIA

Group B
(Thallose Liverworts)

1. THALLUS DELICATE, composed of thin-walled, translucent cells, lacking air chambers; rhizoids all with smooth walls; lacking ventral scales (except Blasia)................... 2

1'. THALLUS ROBUST, often leathery, opaque, with internal air chambers often opening to the upper surface by epidermal pores; rhizoids dimorphic, those having smooth walls mingled with ones with internal peg-like thickenings; almost always with ventral scales............ Group B1

2. THALLUS IN SMALL MOUNDS OR ROSETTES; capsules sessile or embedded in thallus... 3

2'. THALLUS RIBBON-LIKE, often regularly and much branched; capsule exserted on a long seta................................ 4

3. FLASK-SHAPED INVOLUCRES CONSPICUOUS, individually sheathing antheridia or archegonia (plants dioecious), crowded, sessile on the upper surface of the thallus; mostly weedy......... SPHAEROCARPOS TEXANUS

3'. ARCHEGONIA, ANTHERIDIA AND CAPSULES EMBEDDED in the thallus........................... miskeyed RICCIA (see B1)

4. VENTRAL SCALES PRESENT, small, in two rows; thallus producing multicellular gemmae of two kinds, stellate gemmae exogenously on dorsal surface and ovoid gemmae in flask-shaped containers; Nostoc colonies embedded in thallus................. BLASIA PUSILLA

4'. VENTRAL SCALES ABSENT; gemmae (if any) not stellate, not produced in containers; Nostoc absent........................ 5

5. THALLUS WITH HAIRS ON MARGIN (one species hairy above, also); thallus with distinct, narrow midrib and broad, unistratose wings; less than 2 mm wide... METZGERIA

5'. THALLUS WITHOUT MARGINAL HAIRS; thallus tapering from middle to margin, unistratose portion (if any) not wide or abruptly demarcated; often considerably wider than 2 mm.................................. 6

6. SEX ORGANS ON SHORT VENTRAL OR LATERAL BRANCHES; thallus pinnately or palmately branched, less than 3 mm wide (except Aneura); rhizoids sparse................. 7

6'. SEX ORGANS ON DORSAL SURFACE OF THALLUS; thallus more or less dichotomously branching, usually more than 5 mm wide; rhizoids numerous.......................... 8

7. THALLUS 3-8 mm WIDE, DARK GREEN WITH A GREASY LUSTRE; branching more or less pinnate; plants prostrate; oil-bodies small, numerous (6-30+ per cell)......... ANEURA PINGUIS

7'. THALLUS 1-2 mm WIDE, DULL OLIVE GREEN TO LIGHT GREEN; branching pinnate or palmate; oil-bodies absent or large and few (less than 6 per cell).................... RICCARDIA

8. LACERATE OR TOOTHED SCALES surrounding antheridia and archegonia; montane plants.......................... MOERCKIA

8'. TUBULAR OR FLAP-LIKE INVOLUCRES protecting the archegonia; antheridia in pits in dorsal surface of thallus; sea level to alpine.......................... PELLIA

Group B1
(Thallose Liverworts with Complex, Differentiated Tissue)

1. FREE-FLOATING AQUATICS, sometimes stranded on mud by receding water.. 2

1'. TERRESTRIAL PLANTS growing attached to the substrate............... 3

2. FLOATING ON SURFACE OF WATER; with long, pendent, purplish scales ventrally; lobes dark green, 4-10 mm wide, with few bifurations............. RICCIOCARPUS NATANS

2'. SUBMERGED BENEATH SURFACE OF WATER; lacking conspicuous scales; lobes light green, narrow, to 1.5 mm wide, repeatedly bifurcating............. RICCIA FLUITANS

3. PLANTS REPEATEDLY BIFURCATING, FORMING ROSETTES; lobes with sharp, dorsal, median furrow, at least at lobe tips; sex organs embedded in thallus, the capsules developing without setae, remaining embedded in the thallus; lacking elaters................... RICCIA

3'. PLANTS NOT FORMING ROSETTES but sprawling more or less randomly; lobes without a sharp median furrow although sometimes canaliculate; sex organs variously placed, archegonia and capsules usually developing in specialized structures, often elevated above the surface of the thallus; elaters generally present.. 4

4. CELLS OF UPPER EPIDERMIS WITH LARGE, OFTEN BULGING TRIGONES........ 5

4'. CELLS OF UPPER EPIDERMIS WITHOUT LARGE TRIGONES.................... 6

5. CAPSULES BORNE ON STALKED, STAR-SHAPED RECEPTACLES; to date only from Columbia River Gorge...... REBOULIA HEMISPHAERICA

5'. STALKED RECEPTACLES LACKING, the capsules maturing on underside of thallus, inside a 2-valved, black, shiny involucre; common...................... TARGIONIA HYPOPHYLLA

6. GEMMAE CUPS PRESENT on dorsal surface of thallus.................. 7

6'. GEMMAE CUPS OR GEMMAE LACKING.. 8

7. GEMMAE CUPS CIRCULAR; very common and widespread..................................... MARCHANTIA POLYMORPHA

7'. GEMMAE CUPS CRESCENTIC (lunate); rare except in urban areas, in gardens and greenhouses.............. LUNULARIA CRUCIATA

8. PALE VENTRAL SCALES CONSPICUOUSLY PROTRUDING beyond thallus margins; female receptacles arising from mid-dorsal surface of thallus; cells around pores with thickened radial walls..................... ATHALAMIA HYALINA

8'. VENTRAL SCALES NOT CONSPICUOUS around margins; female receptacles arising from edge of thallus, usually at apical notch; cells around pores without thickened radial walls.. 9

9. THALLUS LARGE, 8-20 mm (or more) wide; upper surface with very conspicuous, coarse, polygonal areolation ("alligator skin" pattern); common............ CONOCEPHALUM CONICUM

9'. THALLUS SMALL TO MEDIUM SIZED, mostly less than 8 mm wide; lacking conspicuous areolation............................ 10

10. EPIDERMAL PORES COMPOUND, the pore surrounded by a barrel-shaped wall, composed of several vertically layered tiers of cells, which projects into the underlying air chamber.......................... PREISSIA QUADRATA

10'. EPIDERMAL PORES SIMPLE, composed on a single layer of cells continuous with the epidermis.......................... 11

11. FEMALE RECEPTACLES CONIC OR HEMISPHERIC, usually more or less lobed; a delicate pseudoperianth present which surrounds each capsule with linear-lanceolate segments at maturity; common........... ASTERELLA

11'. FEMALE RECEPTACLES DISK-SHAPED, the margin elaborated into a thin, horizontal, unlobed wing or rim; pseudoperianth lacking; rare.... CRYPTOMITRIUM TENERUM

NAME CHANGES FOR SOME COMMON LICHENS AND ADDITIONS TO THE NORTH AMERICAN LICHEN FLORA

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In The Lichenologist 16(3) for 1984 J. R. Laundon reports on the lichen names published by William Withering in 1776. Withering is best known for placing the folk medicinal use of the foxglove (Digitalis) on a scientific basis which survives today in the use of digitalin for some kinds of heart disease. Since Withering's names are among the first published in the binomial system for lichens, their impact is significant. Laundon is to be commended for avoiding as many name changes as possible. However, since one of the cardinal principles of the International Code of Botanical Nomenclature is that the earliest name for a species must be used, some changes are unavoidable. They are listed below according to the page number in the second edition of Hale's How to Know the Lichens.

p. 49: Peltigera spuria (Ach.)DC. = P. didactyla (With.) Laundon

p. 53: Sticta fuliginosa (Dicks.) Ach. = S. fuliginosa (Hoffm.) Ach.

p. 132: Dermatocarpon fluviatile (G. Web.) Fr. = D. luridum (With.) Laundon

p. 137: Physconia pulverulenta (Schreb.) Poelt = P. distorta (With.) Laundon

p. 151: Collema tuniforme (Ach.) Ach. = C. fuscovirens (With.) Laundon
Leptogium palmatum (Huds.) Mont. = L. corniculatum (Hoffm.) Minks
Leptogium sinuatum (Huds.) Massal. = L. gelatinosum (With.) Laundon

p. 178: Cladonia conista (Ach.) Robb. = C. humilis (With.) Laundon s.lat.

p. 189: Cladonia pityrea (Flörke) Fr. = C. ramulosa (With.) Laundon

p. 194: Cladonia capitata (Michx.) Spreng. = C. peziziformis (With.) Laundon

In the same number of The Lichenologist Brian Coppins and Peter James transfer some of our common species of Lecidea out of the Lecideaceae into the Trapeliaceae. They are also ecologically significant since the Lecidea uliginosa group and L. granulosa are pioneers on acidic sands and humus and probably have a role in binding and stabilizing them for colonization by other plants.

Lecidea uliginosa (Schrad.) Ach. and L. oligotropha Laundon become Placynthiella uliginosa (Schrad.) Coppins & P. James and P. oligotropha (Laundon) Coppins & P. James. They also report a collection of P. icmalea (Ach.) Coppins & P. James from Ohio, new to North America. A quick check of New York specimens indicates that P. icmalea may be the most common species of Placynthiella in the state. It is also present at 2100 m in the Dominican Republic.

Lecidea aeruginosa Borrer, L. gelatinosa Flörke, L. granulosa (Hoffm.) Ach. and L. viridescens (Schrader) Ach. are transferred to Trapeliopsis. Lecidea aeruginosa reverts to its formerly used epithet as Trapeliopsis flexuosa (Fr.) Coppins & P. James since its usage is no longer blocked by an earlier homonym as in Lecidea. Trapeliopsis pseudogranulosa Coppins &

P. James is described as new based on a specimen from Vancouver Island, British Columbia, known otherwise only from Europe.

Additionally they describe a new species of Trapelia which provides a name for what will probably prove to be one of the most common sterile sorediate lichens on hard acidic rock in the eastern United States. Trapelia placodioides Coppins & P. James is known to me from Michigan and New York and may be pollution tolerant as it does well in the Bronx. It produces apothecia rarely in England but I have never found them in North American material.

MEGALOSPORA PORPHYRITIS IN EASTERN NORTH AMERICA

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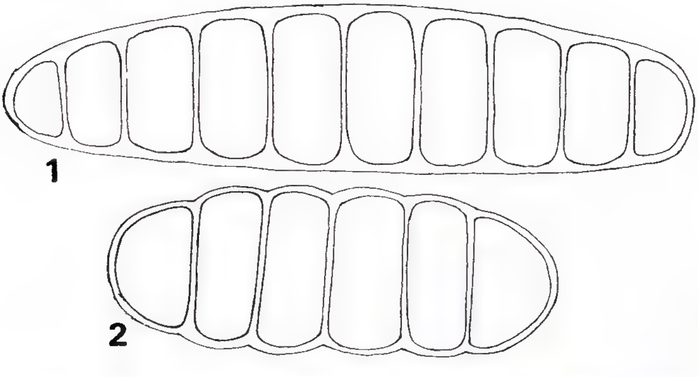
In Sipman's recent monograph of the lichen family Megalosporaceae (Biblioth. Lich. 18. 1983) he included Bombyliospora porphyritis (Tuck.) Massal. in Megalospora tuberculosa (Fée) Sipman. He gives reasons for this which may make sense from a worldwide perspective but on a regional basis it seems reasonable to recognize B. porphyrites at the species level. It is consistently sorediate, mostly sterile; always contains pannarin and zeorin; has smaller, fewer-celled spores; and has an Appalachian-Great Lakes distribution pattern. Therefore, I propose the new combination *Megalospora porphyritis* (Tuck.) R. C. Harris (Biatora porphyritis Tuck., Proc. Am. Acad. Arts Sci. 1: 253. 1848). I have verified collections from Quebec, Georgia, Michigan, New Hampshire, North Carolina, Vermont and Wisconsin. Megalospora tuberculosa (apparently only strain A, usnic acid and zeorin) occurs in Alabama, Florida and Louisiana.



Figures 1 and 2: Spores of Megalospora. Figure 1: M. tuberculosa. Figure 2: M. porphyritis. Both are ×840.

INTRODUCING PHENOLOGY

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The study of plants in regard to time comprises phenology. Broadly speaking, this includes developmental morphology as well as physiological processes and responses. However, in bryophytes the items usually examined are the time of fertilization, the development of antheridia and archegonia, and the development of the sporophyte. In other words, the primary focus is on reproduction. However, one is not limited to this area, and it is also profitable to monitor colonies (i.e., populations) with respect to their vegetative growth. Beginning with several German bryologists shortly after the turn of this century (notably Grimme, also Hagerup, Lackner and Jendralski), and with renewed interest in phenology inspired by S. W. Greene in 1960, bryologists have long noticed that species differ in the patterns in which gametangia and sporophytes mature. Some mosses are capable of developing mature spores in a couple of months following fertilization; other species require nearly two years. Even in those species requiring a similar duration, differences often occur in the phase at which the sporophyte overwinters. For example, Longton showed that sporophytes of Polytrichum alpestre overwinter with setae in the process of elongating, and require about 15 months to mature. Similarly, my own observations indicate that Forsstroemia trichomitria sporophytes take about 17 months to develop, but the resting phase during winter is passed in the embryonic condition.

As opposed to most flowering plants, in which flowers and fruits cannot normally survive freezing winters, reproductive structures of bryophytes are hardy. Not only embryos, but even young gametangia are capable of withstanding prolonged periods of freezing. Thus, several different patterns of sporophyte and gametangia maturation have evolved. The interval of fertilization, that period of time during which gametangia reach maturity (archegonia become receptive and antherozoids are released), is, however, restricted to periods of liquid water availability--generally spring through autumn in temperate zones. (Mediterranean mosses would be interesting to examine, since winters may be mild and wet.)

The value of studying phenology lies in understanding the different kinds of breeding systems that have evolved; in gaining insight into the evolution of spore dispersal; and in contributing to the systematics and identification of bryophytes. In addition, studies of communities of bryophytes, i.e., series of local populations, are still few in number. Little, if anything, is known about how the dimensions of a population change over time. A side benefit, if you are a taxonomist, to studying phenology, is that very often characters come under scrutiny that normally may be passed over as unimportant. For example, a number of responses occurs following fertilization in many pleurocarpous mosses, and some acrocarpous ones (leafy liverworts probably offer a fascinating area of study in this regard). Abortion of structures such as immature archegonia and embryos may occur, while fertilization stimulates the expansion of paraphyses, perichaetial leaves, and the complex formation of the vaginula. Patterns of development in these structures, and their distribution, may prove to be sound taxonomic characters. For example, in Cryphaea, paraphyses are absent, and unfertilized archegonia remain perched atop the vaginula, as opposed to most species in the related Forsstroemia, in which the perichaetial paraphyses may triple in length, and the unfertilized archegonia are scattered over the upper half of the vaginula.

To conduct a phenological investigation, select several populations, preferrably monospecific, which appear to be representative for the area. It is best to select large, healthy populations, since there is usually little interest in randomizing samples: elucidating patterns are the goal, rather than quantitative comparisons between populations. Set up a schedule for visiting these populations; a biweekly one that lasts a year is preferred, as a longer interval between collections may obscure phenomena, and a shorter interval does not seem to yield significantly more information (though it may for annuals). Although observations in the field may be of value, much more is to be gained by examining the plants in the laboratory using a dissecting microscope capable of 30×. Carefully remove about 3-5 stems using forceps from each population in the field. Take healthy stems, and sample from different portions of the population: the object is to determine what the population is doing based upon a few samples. Be sure to get all of a secondary stem (ca. 20 mm) with pleurocarpous mosses, and to near ground or bark level in acrocarpous ones. Use ordinary paper collecting bags, one for each stem, rather than plastic, to ensure that the stems dry out as soon as possible. Even if it is raining when you collect the samples, brief observations of the disposition of stems in the field may reveal an interesting aspect, so it may be worthwhile to collect despite weather conditions.

Bryophytes afford one the opportunity to examine plants at one's own choosing if dry, since gametangia and sporophytes are arrested in development, regardless of their relative maturity. However, for delicate structures, it is best to examine the stems within several months. In the laboratory, place a stem in water and allow it to soak for a few seconds. Leave the branches intact, but carefully remove the leaves from the stem (not those from branches), over a distance of about 10-15 mm from the apex down. As you do so, be careful not to detach or injure any inflorescences that may be present. Follow this with the removal of the uppermost (nearest the stem apex) inflorescence. Place it in a drop of water on a fresh slide, and (very fine forceps are useful here along with a probe) remove the surrounding perigonial or perichaetial leaves one by one. If this becomes too tedious, and if only the sex organs are of interest, gametangia can be exposed without injury much faster by applying pressure with the side of a probe to the base of the inflorescence, separating the leaves from the gametangia with a single motion. Place a cover slip over the gametangia and observe under compound microscope. It is best if the cluster of gametangia remain cohesive after dissection in order to assign maturity index values. I have found the index values used by Longton to suit most mosses: 4=gametangia brown with apices ruptured; 3=gametangia green or hyaline with apices ruptured; 2=gametangia with unruptured apices and >1/2 full length; 1=gametangia with unruptured apices and <1/2 full length; A=abortive, gametangia brown and with unruptured apices. Assign an index value to each gametangium, then calculate a mean maturity index for each population on each date (or a grand mean for each species on each date). After a little practice, you should be able to determine the location of last season's inflorescences in relation to the current season's inflorescences along a stem. Sometimes a zone of different stem coloration, or a few branches will mark the boundary between two seasons of stem growth. If need be, the relative age of stage 4 gametangia can be used (i.e., the previous season's dehisced archegonia will look more withered than those of the current season).

The phenology of the sporophyte is somewhat easier to determine. Select a species that is already producing abundant sporophytes as a first subject. The same procedure is followed as above, except that only visible sporophytes (under 30x) are dissected. Stem leaves need not be removed if only sporophytes are of interest, though some perichaetia enclosing young embryos are fairly small and may require detailed inspection. While in most acrocarpous mosses terminal shoots are examined, in pleurocarpous mosses several sporophytes may occur along the same stem, and you will want to examine all of those from the current season. Once the sporophyte (along with the attached leaves and vaginula) is removed from the stem, the perichaetial leaves may be easily removed by applying pressure with the side of a probe to the middle of the vaginula. However, in embryonic sporophytes, you may want to remove the perichaetial leaves singly to avoid injuring the sporophyte. A useful system of maturity index values is as follows: 1=embryo, <1/2 size of full-sized embryo; 2=embryo, >1/2 size of full-sized embryo; 3=seta elongating; 4=capsule expanding in width; 5=capsule expanded, green; 6=capsule expanded, brown; 7=operculum fallen, >1/2 spores present in capsule; 8=operculum fallen, <1/2 spores remain. There will be intermediates between stages, since the development of a sporophyte represents a continuum.

Studying phenology of bryophytes offers a chance to observe living plants under natural conditions over a period of time. One quickly realizes how persistent most colonies are, though often covered with snow or ice or desiccated most of the time. Year after year reproduction is attempted, and occurs in many different fascinating patterns, many of which are undiscovered.

Volume one of Evansia is complete in two numbers.

Volume one, number one was issued on 4 September 1984.

Evansia
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