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List of the bryophytes of Yellow Bay Biological Station, Lake Co., Montana

compiled by Toby Spribille[1]

On 8-9 May 1997, a group of 25 people, mostly Forest Service botanists and ecologists from the interior Pacific Northwest, gathered at the University of Montana Biological Station at Yellow Bay of Flathead Lake (Lake Co., Montana; 47°52'30"N 114°03'W) to attend an introductory bryological course taught by Drs. Dale Vitt and Lars Söderström. The course lectures primarily concentrated on basic morphology and ecology, and the relevance of cryptogam science to ecosystem-oriented natural resource management. There were also a number of field outings during which participants collected extensively on the peninsula which juts out into Flathead Lake and helps form Yellow Bay. The collecting resulted in a number of interesting finds, including at least one new species for Montana, *Herzogiella striatella*. A list was made of the bryophytes found, which is presented here.

Yellow Bay is situated in the middle of a strip of some of the warmest forests in Montana. These are chiefly composed of Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) and grand fir (*Abies grandis*) and frequently also paper birch (*Betula papyrifera*). The understory is frequently dominated by 1-2 metre-tall ninebark shrub (*Physocarpus malvaceus*). The parent material is sedimentary, reflected in the moss flora by the presence of a number of calciphiles, such as species of *Encalypta*, *Grimmia anodon* and *Tortella tortuosa*.

Cryptogamic studies at the Yellow Bay Biological Station go back a number of years. Harris & Harris (1904) reported on the collecting of mosses and lichens, mostly in the Mission Mountains, while based at the Biological Station in 1901. A bryology course was taught by Seville Flowers at the Biological Station in 1967, followed five years later by a bryology course taught by A.J. Sharp in 1972. A moss collection was built up and maintained at the Biological Station at this time (J. Elliott, pers. comm.) which has since gone missing (S. Gillespie, pers. comm.).

The bryology courses were followed by a summer course in lichenology taught by Mason Hale in 1977, and a pteridology course taught by Warren Wagner in 1978. If any bryophyte lists were ever made for the Yellow Bay is unknown.

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An attempt is made here to outline the bryoflora of Yellow Bay, for the purposes of increasing the written documentation of the bryoflora in western Montana forests. Specimens were collected for each of the taxa reported here, and were verified by either Dale Vitt or Lars Söderström. Collector, number and repository are given for noteworthy collections, with numerous other collections remaining in the possession of the author and some of the participants. Taxonomy follows Anderson et al. (1990) for mosses, except for Campyliadelphus, which follows Hedenäs (1997) and Hong (1997) for hepatics.

Mosses

Antitrichia californica Sull. in Lesq. On rock near tip of peninsula.
Atrichum selwynii Aust. Colonizing bare mineral soil.
Aulacomnium androgynum (Hedw.) Schwaegr. On rotting wood.
Barbula convoluta Hedw. On bare mineral soil.
Brachythecium albicans (Hedw.) Schimp. in B.S.G. Ruderal, in lawns and footpaths.
Brachythecium cf. *asperrimum* (Mitt.) Sull. Collected on peninsula. The plants are aberrant from members of the B. frigidum group in being autoicous.
Brachythecium frigidum (C. Müll.) Besch. Common moss in and along Yellow Bay Creek.
Brachythecium hylotapetum B.Hig. & N.Hig. On humus in the woods near the creek.
Brachythecium leibergii Grout On rotten log.
Brachythecium salebrosum (Web. & Mohr) B.S.G. On a wet log in Yellow Bay Creek.
Bryum argenteum Hedw. Ruderal, on bare mineral soil.
Bryum caespiticium Hedw. Ruderal, on bare soil.
Campyliadelphus chrysophyllus (Brid.) Kanda In rock crevices and on soil just above high water line of Flathead Lake. An infrequent species in northwest Montana.
Ce*ratodon purpureus* (Hedw.) Brid. On bare soil, ruderal.
Coscinodon calyptratus (Hook. in Drumm.) C.Jens. ex Lindb. On dry rocks on the peninsula.
Cratoneuron filicinum (Hedw.) Spruce Emergent from Yellow Bay Creek.
Dicranoweisia crispula (Hedw.) Lindb. ex Milde On rock.
Dicranum scoparium Hedw. Growing on humus and rotten wood in the forest.
Dicranum tauricum Sapehin Common, on rotten wood.
Ditrichum flexicaule (Schwaegr.) Hampe On peninsula, in rock crevices.
Encalypta sp. On unstable mineral soil on banks above high water line on peninsula, in shelter of shrubs of *Arctostaphylos uva-ursi*.
Encalypta procera Bruch In rock crevices on peninsula.
Encalypta rhabdocarpa Schwaegr. In rock crevices on peninsula.
Eurhynchium praelongum (Hedw.) Schimp. in B.S.G. (*Kindbergia p.*) Near creek, on humus.
Eurhynchium pulchellum (Hedw.) Jenn. On humus and tree bases.
Fissidens osmundoides Hedw. Rare, a small colony found in only one place, on rock just below the high water line, on the peninsula, *Spribille 6638* (ALTA).
Funaria hygrometrica Hedw. On disturbed bare mineral soil along footpath west of entrance to compound.
Grimmia anodon Bruch & Schimp. in B.S.G. Common, on rock on the peninsula.
Grimmia cf. *pulvinata* (Hedw.) Sm. On rock.

Herzogiella striatella (Brid.) Iwats. On rotten wood, Shevock 15360 (ALTA, CAS). A rare species, not reported from the interior Northwest by Lawton (1971) and new to Montana.
Homalothecium nevadense (Lesq.) Ren. & Card. Common on rock on the peninsula.
Hygrohypnum cf *luridum* (Hedw.) Jenn. Emergent from Yellow Bay Creek.
Hylocomium splendens (Hedw.) Schimp. in B.S.G. Growing on humus in the forest
Metaneckera menziesii (Hook. in Drumm.) Steere. On vertical rock faces.
Mnium spinulosum Bruch. & Schimp. in B.S.G. On rotting wood in the shade.
Orthotrichum affine Brid. On alder branches along the creek.
Orthotrichum cupulatum Brid. On rock, along the peninsula.
Orthotrichum laevigatum Zett. f. *macounii* (Aust.) Lawt. & Vitt On rock, along the peninsula, mixed with *Homalothecium nevadense*.
Orthotrichum speciosum Nees in Sturm On alder branches along the creek.
Plagiomnium cuspidatum (Hedw.) T. Kop. Damp soil along Yellow Bay Creek.
Plagiomnium medium (Bruch & Schimp) T. Kop. On damp soil along the creek.
Pleurozium schreberi (Brid.) Mitt. Growing on humus in the woods.
Polytrichum juniperinum Hedw. On disturbed soil.
Pseudoleskea radicosa (Mitt.) Mac. & Kindb. (=*Lescuraea r.*) On rock.
Pterigynandrum filiforme Hedw. On dust-impregnated driftwood along the lakeshore.
Pterogyneurum ovatum (Hedw.) Dix. Very rare, one plant on loose bare mineral soil with Encalypta. The seta on this and other recently collected Montana specimens is considerably exserted, resembling P. lamellatum, but the capsules are more ovate than in that species and the peristome is always lacking.
Rhytidiadelphus triquetrus (Hedw.) Warnst. Common, on humus and litter in the woods.
Roellii roellii (Broth. in Röll) Andrews ex Crum On footpath west of main entrance.
Sanionia uncinata (Hedw.) Loeske On rotten wood and shrub bases, Yellow Bay Creek.
Schistidium apocarpum (Hedw.) Bruch & Schimp. in B.S.G. (s.lat.) On rock.
Schistidium rivulare (Brid.) Podp. On rock just below high water, at tip of peninsula.
Timmia austriaca Hedw. In the woods on humus.
Tortella tortuosa (Hedw.) Limpr. On soil and in rock crevices on the peninsula.
Tortula mucronifolia Schwaegr. On small mineral soil patches in the woods.
Tortula princeps De Not. Over rock.
Tortula ruralis (Hedw.) Gaertn. et al. Common in disturbed soil.

Hepatics

Barbilophozia barbata (Schreb.) Loeske On rotting wood and humus in the woods.
Cephalozia lunulifolia (Dum.) Dum. On damp rotting wood.
Chiloscyphus polyanthus (L.) Corda On tree limb.
Jamesoniella autumnalis (DC.) Steph. On rotting wood.
Jungermannia cf. *hyalina* Lyell On rotten wood.
Lepidozia reptans (L.) Dum. On rotten wood.
Lophocolea bidentata (L.) Dum. On tree limb, with *Chiloscyphus. Shevock 15367* (CAS).
Lophozia longidens (Lindb.) Macoun On rotten wood.
Lophozia ventricosa (Dicks.) Dum. On rotten wood.
Ptilidium pulcherrimum (G.Web.) Vainio On rotten wood.

Acknowledgements. Thanks are extended to the participants in the workshop for their enthusiasm about bryology and their contributions to this list: Roger Amerman, Mike Arvidson, Rod Clausnitzer, Alexia Cochrane, Therese Gibson, Val Goodnow, Alma Hanson, Michael Hays, Paul Johnson, John Joy, Brian Kelley, Kirk Larson, David Lebo, Paula Lehr, Scott Mincemoyer, Mark Mousseaux, Emma Pharo, John Pierce, Linda Pietarinen, Andrea Pipp, Steve Shelly, Jim Shevock, Dan Svoboda, Sheila Thompson and Jim Vanderhorst. Special thanks go to the instructors, Dale Vitt and Lars Söderström, for their excellent and captivating instruction, and to Michael Lolley for making the workshop possible. Won Shic Hong, University of Great Falls, Montana, is thanked for verifying some of the hepatic collections.

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The *Sphagna* of Grafton Lakes State Park

William R. Town and Marilou Pudiak-Town[1]

Grafton Lakes State Park is located in the north-central portion of Rensselaer County, New York, on a geological formation called the "Rensselaer Plateau". The Park consists of 671 acres of land and 471 acres of water surface made up of four natural ponds and one man-made reservoir (all of which, at one time or another, were used to supply water to the City of Troy, New York). In 1963, the State of New York acquired the property from the City of Troy and Grafton Lakes State Park was officially opened to the public in 1971.

About 550 million years ago, a large volcanic island arc developed within the Iapetus Ocean (an ocean off the east coast of proto-North America) as a result of the oceanic crust of the proto-North American continental plate being subducted beneath a continental plate to the east (the Taconic Island Arc); the island arc eventually collided with the proto-North American continent (the collision referred to as the "Taconic Orogeny") (Isachsen et al. 1991). At the beginning of the collision, the eastern edge of proto-North America was bent upward in the west and downward in the east. The uplift on the west arched and fractured the edge of the continent, raising the carbonate rocks of the continental shelf above sea level and exposing them to erosion (Isachsen et al. 1991). East of the uplift, the continental shelf was bent downward; as that edge approached the subduction zone, it sank beneath the sea forming a deep marine trough (Isachsen et al. 1991). Silty mud and impure sand of late Middle Ordovician age were deposited on top of the continental shelf carbonate rocks in the trough (Isachsen et al. 1991). As the collision proceeded, the rocks in the trough were pushed westward over the rocks on the shelf; this stack of rock was, in turn, pushed westward over other shelf rocks on huge thrust faults (Isachsen et al. 1991). One such piece of rock from the trough is preserved today as the Rensselaer Plateau which lies on top of the carbonate shelf rocks.

The surface rock of the Rensselaer Plateau is referred to as Rensselaer Graywacke which ranges in thickness from less than 30 meters (100 feet) in the northwest corner to more than 305 meters (1000 feet) in the central and western portions of the plateau. The matrix is typically dark green, gray or red and is composed predominantly of fine sand-sized quartz particles; beneath the Rensselaer Plateau are beds of limestone and dolostone (Potter 1972).

The Rensselaer Plateau (also called the Grit Plateau) is a gently rolling upland that occupies most of the central portion of Rensselaer County.

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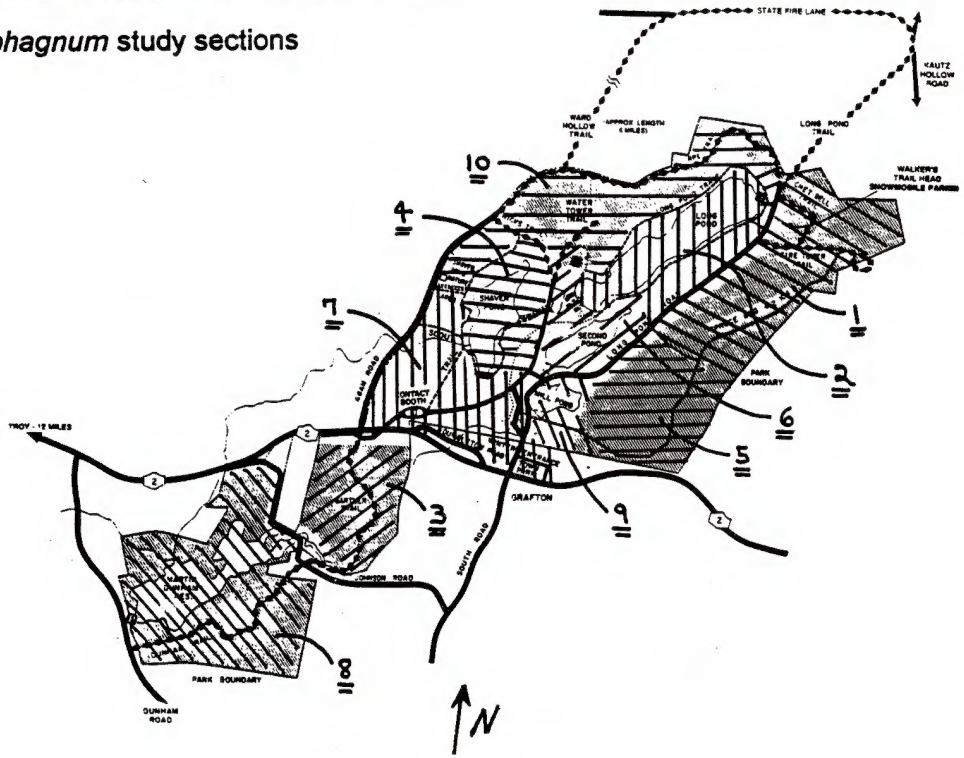
GRAFTON LAKES STATE PARK

Sphagnum study sections



Steep escarpments rim the plateau on all sides, but the broad summit at about 460 meters (1500 feet) seldom achieves a local relief of more than a few tens of feet. Large boulders and occassional outcrops of massive green sandstone occur on the plateau in a hemlock-maple-beech forest containing numerous swamps and bogs.

Ice completely covered Rensselaer County during the last glaciation (23,000 to 13,500 years ago) which stripped away most of the preglacial deposits and weathering products; thus, virtually all of the soils in the county have formed in the 13,000 years since the glacier left -- eskers and kames are common (Potter 1972).

In winter, the average temperature in 24F (-4.4C); in summer, the average temperature is 69F (21C). Annual precipitation averages 0.97 meter (38 inches); the average seasonal snowfall is 1.7 meters (67 inches). The average relative humidity is 60% in mid-afternoon and 80% at dawn.

The soils in Grafton Lakes State Park range from very stony loam to very stony silt loam to muck (Work 1979). The loams have a very friable, very dark grayish-brown surface layer about 5 centimeters (2 inches) thick with subsoil extending to depths as much as 1.5 meters (60 inches) (Work 1979). Reaction of the surface layer and upper part of the subsoil is very strongly acidic to slightly acidic. The stony loam soils are more well drained than the silty loam soils; the mucks are frequently ponded or flooded. The five lakes in Grafton Lakes State Park have an average surface pH of 7.2 (except after very heavy rains or snow at which time the surface pH drops back to slightly acidic); the lakes are monitored monthly for pH as well as nitrate, phosphate, calcium, chlorine and dissolved oxygen concentrations.

Because of the large size of Grafton Lakes State Park (1,142 acres), the Park was arbitrarily but conveniently "divided" into ten sections using already-existing natural boundaries (i.e. roads, trails, lakes, streams, etc.) to facilitate *Sphagnum* location and identification studies (see the accompanying map for location of sections). In all 427 samples of *Sphagnum* were collected which yielded 24 different species. The following alphabetical tabulation of *Sphagnum* species lists the number of collections per section, the total number of samples of each species collected and a ranking from most common in the Park (1) to least common in the Park (18).

Voucher specimens of all samples of *Sphagnum* collected at Grafton Lakes State Park are on file both at the herbarium at S.U.N.Y. at Binghamton and the T.P.S., Inc. herbarium.

Sphagnum species (Andrus 1980)	<----------Section----------> 1	2	3	4	5	6	7	8	9	10	total	rank
S. angustifolium (Russow) C. Jens.	2	0	1	0	0	1	1	0	1	1	6	13
S. bartlettianum Warnst	2	0	0	0	0	1	0	0	0	1	4	15
S. capillifolium (Ehrh.) Hedwig	14	2	3	3	1	5	1	0	3	13	45	4
S. centrale C. Jens.	7	0	2	1	0	0	1	0	0	0	11	10
S. compactum DC.	0	0	0	0	0	0	1	0	0	0	1	18a
S. fallax (Klinggr.) Klinggr.	11	0	0	2	0	1	2	0	0	0	16	8a
S. fimbriatum Wils.	16	3	1	7	0	122	3	7	5		56	2
S. flavicomans (Card.) Warnst.	3	0	0	0	0	0	0	0	0	0	3	6
S. flexuosum Dozy & Molk.	2	0	3	2	0	1	2	2	0	0	12	9
S. fuscum (Schimp.) Klinggr.	3	0	0	0	0	0	0	0	1	1	5	14
S. girgensohnii Russow	15	0	4	1	2	2	1	3	1	6	35	6
S. henryense Warnst.	0	0	0	0	0	0	0	0	0	2	2	17a
S. innundatum (Russow) C. Jens.	0	0	0	0	0	0	0	0	1	0	1	18b
S. isoviitae Flatb.	0	0	1	0	0	0	0	0	0	0	1	18c
S. lescurii Sull.	1	0	0	0	0	0	4	1	4	0	10	11
S. magellanicum Brid.	3	0	0	0	1	2	0	0	0	1	7	12a
S. palustre L.	17	1	2	6	2	8	1	0	1	2	40	5
S. russowii Warnst.	23	3	2	2	2	7	1	2	1	8	51	3
S. squarrosum Crome	11	0	1	0	3	0	0	0	0	1	16	8b
S. subfulvum Sjors	0	0	0	0	0	0	0	0	0	1	1	18d
S. subtile (Russow) Warnst	12	0	0	0	2	0	1	0	0	2	17	7
S. teres (Schimp.) Angstr.	2	0	4	1	0	0	0	0	0	0	7	12b
S. wulfianum Girg.	1	0	1	0	0	0	0	0	0	0	2	17b

Acknowledgment: The authors wish to thank Dr. Richard Andrus, S.U.N.Y. at Binghamton, for his help and patience in confirming the *Sphagnum* species identifications.

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The genus *Orthodicranum* (Musci: Dicranaceae) in Maine

Bruce Allen[1]

Orthodicranum is a segregate taxon of *Dicranum* Hedw. It has often been recognized as a genus in European floristic treatments, but generally given only subgeneric or sectional status in North American and Japanese floristics works. Peterson (1979) revised the taxon for North America and considered it worthy of generic rank because of six differences with *Dicranum*: 1. capsules straight vs. curved; 2. capsules smooth to wrinkled vs. ribbed; 3. alar cell region unistratose vs. bistratose; 4. peristome teeth <60 µm wide vs. > 70 µm; 5. specialized asexual structures common vs. rare; 6. habitat of rocks and wood vs. soil or humus. Of these six differences, two (specialized habitat and specialized asexual structures) are probably correlated characters best treated as a single feature. The peristomal difference can be dismissed outright since in both structure and ornamentation the peristomes of *Orthodicranum* and *Dicranum* are identical. Likewise, the capsule surface distinction is of little importance since a continuum exists between the genera: *Orthodicranum* has smooth to weakly furrowed capsules, *Dicranum* has weakly to strongly furrowed capsules.

Whether *Dicranum* should be recognized in a broad sense with many subgeneric units or subdivided into segregate genera such as *Orthodicranum* is an academic question that plagues many large, complex genera. This is because while genera and subgeneric units must not be polyphyletic both are abstract constructions capable of implying the same phylogenetic relationships. The choice of any one system is subjective and can depend as much on the utility of the classification as on perceived and weighted structural differences. In a monographic sense generic recognition is often given to any non-polyphyletic group with at least three distinguishing features. *Orthodicranum* in a monographic sense should be recognized at the generic level on the basis of the above three differences with *Dicranum*. However, the criteria for generic recognition in a floristic sense are stricter in that the utility of the classification should be taken into account. It makes no sense to use a generic classification in a floristic work that requires detailed microscopic work to discover the genus at hand. In such cases a broad generic category which reflects phylogenetic relationships at the subgeneric level is pragmatic and sensible.

In the case of *Orthodicranum* it is especially difficult to decide on its level of recognition in a floristic sense. On the one hand, *Orthodicranum* and *Dicranum*

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are gametophytically very similar, but on the other hand they generally occupy distinctly different habitats which makes their recognition, in a practical way, possible. Habitat preferences in mosses can be unreliable, and indeed in *Orthodicranum* and *Dicranum* there are some species that blur the habitat distinctions between the two groups. Nevertheless, the habitat differences between these two groups are distinct enough that, in conjunction with the above noted structural differences, I am inclined to recognize *Orthodicranum* at the generic level. A single key treating all *Dicranum* and *Orthodicranum* species in Maine will be given in a future account of *Dicranum*.

Orthodicranum (C. Müll.) Loeske, Stud. Morph. Syst, Laubm. 85: 1910.

Dicranum sect. *Orthodicranum* C. Müll., Syn. Musc. Frond. 1: 371. 1848. Lectotype: *Dicranum flagellare* Hedw. (Peterson, 1979)

Dicranum sect. *Orthocarpa* Bruch & Schimp. in B.S.G., Bryol. Eur. 1: 115. 1847 (fasc. 37--40 Mon. 11).

Dicranum sect. *Montana* Hartm., Handb. Skand. Fl. (ed. 5): 390. 1849.

Dicranum [rank not indicated] *Orthodicranum* B.S.G., Bryol. Eur. 1: 6. 1851. (fasc. 46--47 Consp. 1: VIII). *Nom. nud.*

Dicranum subg. *Crassidicranum* Limpr., Laubm. Deutschl. 1: 370. 1886.

Dicranum sect. *Crassidicranum* (Limpr.) Nyh., Bot. Not. 1953: 297. 1953.

Dicranum subg. *Leiodicranum* Limpr., Laubm. Deutschl. 1: 367. 1886.

Dicranum sect. *Leiodicranum* (Limpr.) Amann, Fl. Mouss. Suisse 2: 58. 1919.

Dicranum sect. *Crassinervia* Roth, Eur. Laubm. 1: 237. 1904.

Scytalina Hagen, Kongel. Norske Vidensk. Selsk. Skr. 1914 (1): 129. 1915. *Nom. illeg. incl. gen. prior.*

Dicranum subg. *Crassidicranum* Limpr. *emend.* Takaki, J. Hattori Bot. Lab. 27: 76. 1964.

Plants small to medium-sized, in mats on living or dead bark, decaying wood, and rocks, occasionally on humus or bare soil. Stems erect, sparsely branched, moderately tomentose. Leaves erect-spreading, erect-incurved, falcate-secund to crisped when dry, ovate-lanceolate to lanceolate, smooth or papillose at back, acute to long acuminate, margins entire, serrate or serrulate; costa excurrent or percurrent; upper cells quadrate to short rectangular, smooth-walled, basal cells elongate, short rectangular to subquadrate, smooth or porose, alar cells, thin-walled, inflated, reddish-brown, unistratose. Vegetative reproduction by fragile leaf apices, flagellate branches or microphyllous leaves. Dioicous. Monseteous. Capsules erect, cylindric, smooth, wrinkled or weakly furrowed, not strumose, stomates at base of capsule, annulus rudimentary, opercula conic-rostrate; peristome haplolepideous, teeth 16, divided in upper half, outer surface vertically striate. Spores 10--25 µm, smooth to lightly papillose or roughened. Calyptrae cucullate.

1. Leaf tips broken, leaves stiffly erect-incurved when dry .....*O. virde*
1. Leaf tips intact, leaves falcate-secund or crisped when dry 2
    2. Plants with stout, terete flagellate branches in upper leaf axils that bear erect, non-contorted leaves .....*O. flagellare*
    2. Flagellate branches absent or flagellate branches weak, bearing contorted, crispate, microphyllous leaves 3
3. Leaves bistratose above; costa occupying 1/3 or more of the leaf base ....*O. fulvum*
3. Leaves unistratose above; costa occupying less than 1/3 of the leaf base 4
    4. Dry leaves slightly crisped to falcate-secund, cells smooth or slightly papillose at back ..... *O. flagellare*
    4. Dry leaves strongly crisped, cells bulging to papillose at back .... *O. montanum*

1. *Orthodicranum flagellare* (Hedw.) Loeske, Stud. Morph. Syst, Laubm. 85: 1910.
    Dicranum flagellare Hedw., Sp. Musc. Frond. 130. 1801.
    Scytalina flagellaris (Hedw.) Hagen, Kongel. Norske Vidensk. Selsk. Skr. 1914 (1): 132. 1915.

Plants small to medium sized, dull or shiny, dark-green, green, or yellowish-green above, brownish below. Stems 3--50 mm long. Leaves crowded, falcate-secund or erect-patent to erect-spreading when wet, falcate-secund to crisped when dry, ovate-lanceolate to lanceolate, smooth or roughened above at back, 2--4 mm long, acute; margins erect below, subtubulose above, serrulate near apex; costa percurrent to short excurrent; upper cells irregularly subquadrate, thick-walled, not porose, 17--25 µm x 12 µm wide; basal cells rectangular-elongate, thick-walled, 32--62 µm x 5--10 µm; alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Clusters of branches with minute appressed leaves commonly present in the upper leaf axils. Setae 10--15 mm long, yellow becoming brown with age; capsules erect, cylindrical, weakly furrowed, 1.5--3 mm long; opercula 1.5--2 mm long. Spores lightly papillose, 12--18 µm. Calyptra 2.5--3 mm long.

On tree trunks, rotting stumps, logs, or boulders in woods and in crevices of rock outcrops in shaded or exposed situations, on rocks along ocean shoreline, and on humus and stream banks. In Maine known from Androscoggin (*Allen 2427* MO), Aroostook (*Allen 16304* MO), Cumberland (*Allen 6028* MO), Franklin (*Allen 15850* MO), Hancock (*Redfearn 37743* MO), Kennebec (*Allen 15743* MO), Lincoln (*Allen 9243* MO), Oxford (*Allen 16679* MO), Penobscot (*Allen 16524* MO), Piscataquis (*Richards & Cooper 87* MAINE), Sagadahoc (*Allen 14602*

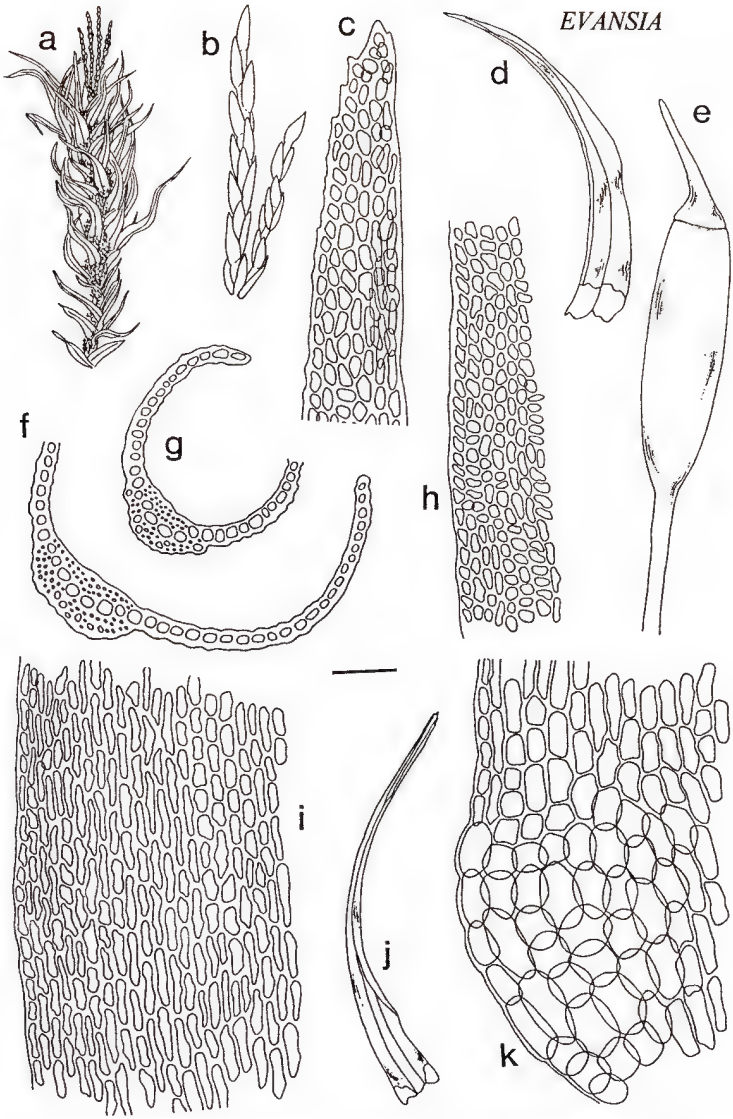

Figure 1. *Orthodicranum flagellare*. a. Habit. b. Flagellate branches. c. Leaf apex. d. & j. Leaves. e. Capsule and operculum. f. & g. Leaf cross-sections. h. Median leaf cells at margin. I. Basal leaf cells at margin. k. Alar cells. Scales in mm: bar = 0.05 (c,f,g,h,i,k); bar = 0.64 (d,j); bar = 0.77 (b); bar = 1.37 mm (a); bar = 0.74 mm (e). Figures c,f,g,h,i,k from *Allen 14602*, figures d,j from *Allen 2427*, figure b from *Redfearn 37743,* figure a from *Allen 2439*, figure e from *Allen 9407d,* (all MO).

MO), Somerset (*Allen 9401* MO), Washington (*Pedano 319* MO), and York (*Redfearn 37824* MO) Counties. Reported from Waldo (Parlin 1924, 1939) County.

Orthodicranum flagellare is a moderate sized species with shiny, concave, usually erect-patent leaves, subquadrate, non-porose upper leaf cells, and elongate basal cells. A distinctive feature of *O. flagellare* is its apical clusters of microphyllous branchlets that are nearly always present. It is a very common species in Maine where it occurs in a broad range of habits, e.g., tree bark, rotting logs, humus, soil or bare rock. It can be found along trails, in moist forests, dry rock faces, and even on the rocky coast line within reach of salt water. Not surprising, it is widely distributed throughout the northern hemisphere and also found in the Caribbean, Central and South America, Asia and India. *Orthodicranum flagellare* often grows mixed with *O. fulvum* or *O. montanum*. *Orthodicranum fulvum* is a somewhat larger plant with dark-green leaves, an exceptionally wide costa, and short basal leaf cells. *Orthodicranum montanum* is usually a smaller more slender and delicate plant with strongly crispate leaves and upper leaf cells bulging- papillose at back. *Dicranum fuscescens* differs from *O. flagellare* in having leaf margins partially or entirely bistratose.

2. *Orthodicranum fulvum* (Hook.) Roth *in* Cas. Gil, Fl. Ibér. Bríof., Musg. 176. 1932.

Dicranum fulvum Hook., Musci Exot. 2: 149. 1819.

Campylopus fulvus (Hook.) Kindb., Bih. Kongl. Svenska Vetensk.-Akad. Handl. 7(9): 88. 1883.

Paraleucobryum fulvum (Hook.) Loesk. *in* Podp., Consp. Musc. Eur. 153. 1954.

Plants medium to robust, dull or shiny, dark-green above, yellow to brown or blackish below. Stems 1--4 cm long. Leaves crowded, falcate-secund or erect spreading when wet, irregularly crisped to falcate-secund when dry, lanceolate, strongly roughened above at back, 5--7 mm long, acuminate; margins erect below, subtubulose above, serrulate near apex; costa short- excurrent, very broad and filling 1/3 or more the leaf base and nearly the entire upper leaf, in cross-section with a gradual transition from costa to lamina; upper cells short rectangular to irregularly subquadrate, thick-walled, not porose, 7.5--12.5 µm x 7.5--10 µm; basal cells short-rectangular to subquadrate, thick-walled, not porose, 7.5--30 µm x 12.5 µm; alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Setae 10--25 mm long, yellow to brown; capsules erect, cylindrical, 2--3 mm long, annulus non-revoluble; opercula 1--2 mm long. Spores 15--20 µm, lightly roughened. Calyptra 4 mm long.

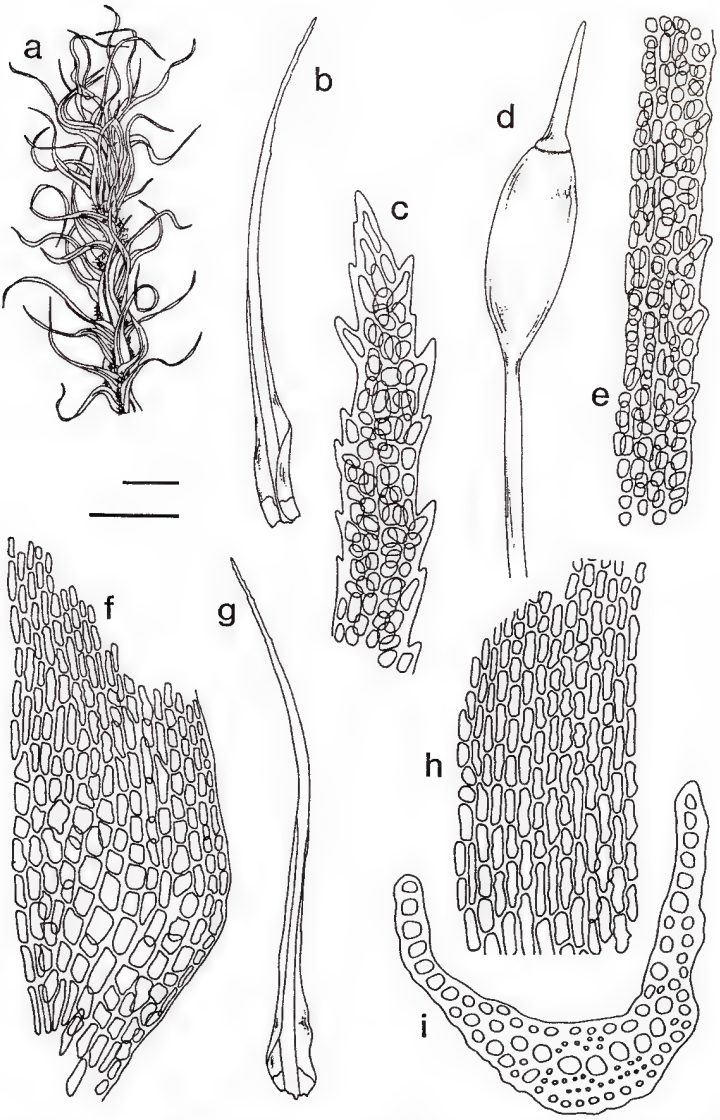

Figure 2 *Orthodicranum fulvum*. a. Habit. b. & g. Leaves. c. Leaf apex. d. Capsule and operculum. e. Median leaf cells at margin. f. Alar cells. h. Basal leaf cells at margin. I. Leaf in cross-section. Upper bar = 0.05 (h); lower bar = 0.1 (f); lower bar = 0.05 (c,e,i); lower bar = 1.1 mm (b,d,g); lower bar = 4.25 mm (a). All figures from *Allen 19964* (MO).

In dense mats or cushions on rocks and boulders in woods and along streams, on bare surfaces or in cracks of vertical rock faces. In Maine known from Androscoggin (*Allen 14731* MO), Cumberland (*Lowe* MAINE), Franklin (*Allen 15837* MO), Hancock (*Allen 2071* MO), Kennebec (*Allen 15709* MO), Knox (*Allen 14636* MO), Lincoln (*Allen 9235* MO), Oxford (*Allen 10079* MO), Penobscot (*Allen 16531* MO), Piscataquis (*Allen 16565* MO), Sagadahoc (*Allen 16629* MO), Somerset (*Allen 9374* MO), Waldo (*Allen 10377* MO), Washington (*Holmes 104* MO), and York (*Redfearn 31134* MO) Counties.

Orthodicranum fulvum is found on bare rocks and boulders or over humus on rocks in mesic, forest conditions. It also occurs on bare, very dry but shaded, cliff faces and rock outcrops. It is a dark green moss with a brown to blackish color at base and usually crispate leaves, but its leaves can also be falcate-secund both wet and dry. The best diagnostic feature of *O. fulvum* is its extraordinarily broad costa which occupies up to 1/3 the leaf base and nearly the entire upper leaf. In cross-section the costa gradually tapers into the lamina making it difficult to determine where the costa ends and the lamina begins. This odd feature is also seen in some species of *Campylopus*. Other distinctive features of the species include its short, non-porose basal leaf cells and mostly bistratose upper lamina.

Orthodicranum viride is structurally similar to *O. fulvum* in having a dark green color, broad costa, and short basal leaf cells. The two species are often placed in their own subgenus (*Crassidicranum*) or section (*Crassinervia*). *Orthodicranum viride*, however, is found primarily on bark rather than rock, has leaves stiffly erect to erect-incurved, and fragile leaf apices that are entire above. *Orthodicranum flagellare* and *O. fulvum* occupy similar habitats, have much the same aspect, and can be more or less the same size. *Orthodicranum flagellare* differs from *O. fulvum* in its narrower costa, unistratose lamina, long, often porose basal leaf cells, and the common presence of apical clusters of terete, flagellate branches with erect, non-contorted leaves. *Dicranum fuscescens* is also similar in aspect to *O. fulvum*, but it differs in its narrower costa, and its lamina that is bistratose only on the leaf margins. In the field *O. fulvum* can be very difficult to distinguish from *Paraleucobryum longifolium*. This is because both species have very broad costae and erect symmetric capsules. *Paraleucobryum longifolium* has slender, falcate-secund leaves that are very different from the crispate leaves of *O. fulvum*. However, the leaves of *O. fulvum* are sometime falcate-secund when dry. *Paraleucobryum longifolium* differs radically from *O. fulvum* in its costa cross-section which like *Leucobryum* has a layer of chlorocysts between two layers of hyalocysts. In the field *P. longifolium* can be distinguished from falcate-secund expressions of *O. fulvum* by its narrower leaves with gray-green to slate color rather than dark-green to fulvous.

3. *Orthodicranum montanum* (Hedw.) Loeske, Stud. Morph. Syst, Laubm. 85: 1910.

Dicranum montanum Hedw., Sp. Musc. Frond. 143. 1801.

Scytalina montana (Hedw.) Hagen, Kongel. Norske Vidensk. Selsk. Skr. 1914 (1): 129. 1915.

Plants small to medium sized, dull or shiny, dark-green, green, or yellowish-green above, brownish below. Stems 4--20 mm long. Leaves crowded, erect to patent-spreading when wet, curled and crispate when dry, ovate-lanceolate to lanceolate, roughened above at back, 2--4 mm long, acute; margins erect below, concave above, serrulate near apex; costa percurrent to short excurrent; upper cells irregularly subquadrate, thick-walled, not porose, 3--8 µm x 2--4 µm; basal cells rectangular-elongate, thick-walled, smooth or porose, 8--23 µm x 4 µm; alar cells usually enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells, at times poorly developed. Plants often with clusters of weak branches with minute, crispate microphyllous leaves in the leaf axils. Setae 8--10 mm long, yellow becoming brown with age; capsules erect, cylindrical, smooth to lightly furrowed, 1.5--2 mm long; opercula 1--1.5 mm long. Spores 12--17 µm, smooth to lightly papillose. Calyptra 2 mm long.

On boulders or rocks, vertical rock faces, tree trunks (*Abies*, *Acer*, *Betula*, *Quercus*), decorticated and rotting logs or tree stumps, also on bare soil or humus. In Maine known from Androscoggin (*Allen 14692* MO), Aroostook (*Allen 16313* MO), Cumberland *(Allen 2443* MO), Franklin (*Allen 10277* MO), Hancock *(Magill 11783* MO), Kennebec (*Allen 10130* MO), Knox (*Allen & Allen 6071* MO), Lincoln (*Allen 19960* MO), Oxford (*Allen 16697* MO), Penobscot (*Allen 16545* MO), Piscataquis (*Allen 16577* MO), Sagadahoc (*Allen 16618* MO), Somerset (*Allen 9436* MO), Waldo (*Allen 10315* MO), Washington (*Pedano 607* MO), and York (*Allen 13052* MO) Counties.

Orthodicranum montanum is a small species with a dark-green color and strongly crispate leaves. It is a common species especially abundant on bark at the base of trees, but is also found on boulders and rock faces or even bare soil. It generally reaches its largest size on saxicolous substrates. It is often confused with *Orthodicranum flagellare*, and the two species frequently grow mixed. *Orthodicranum flagellare* is a larger plant than *O. montanum*, with firmer, less crispate leaves that are smooth to weakly papillose at back, and it has stout, terete brood branches in the upper leaf axils. *Orthodicranum montanum* has weak, fragile brood branches bearing minute and strongly crispate, microphyllous leaves. Its small size, strongly crispate leaves, and leaf cells that are often stoutly mammillose dorsally can cause confusion with the Pottiaceae or *Amphidium*. It

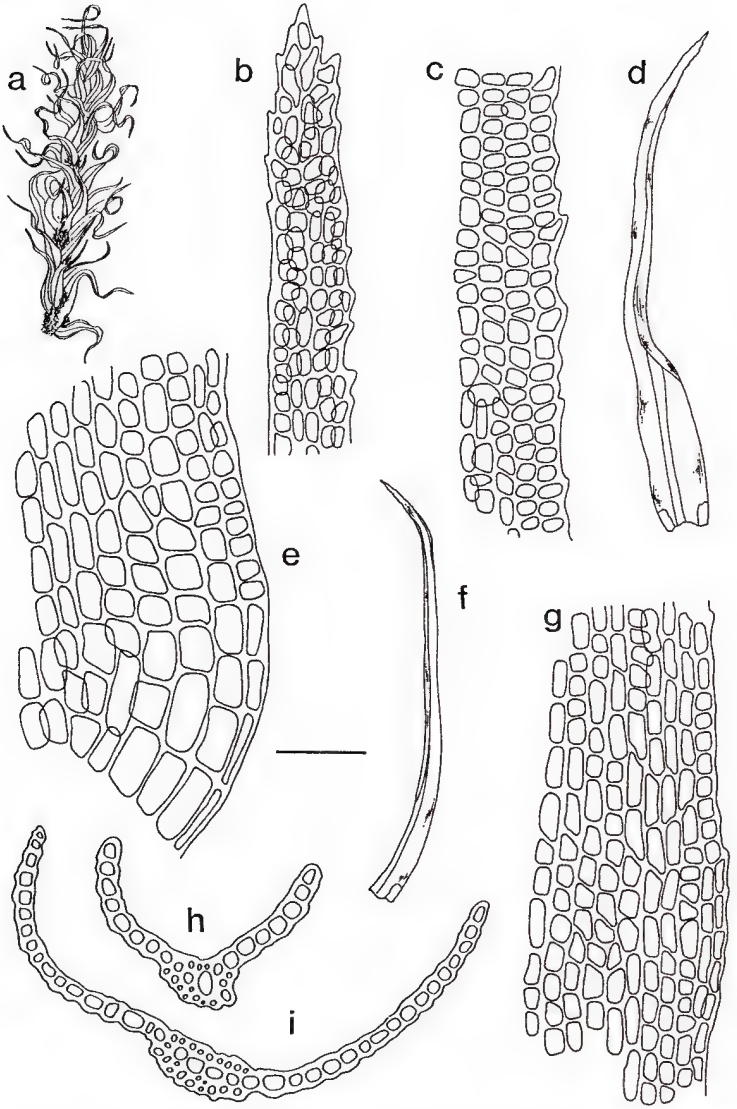

Figure 3. *Orthodicranum montanum*. a. Habit. b. Leaf apex. c. Median leaf cells at margin. d & f. Leaves. e. Alar cells. g. Basal leaf cells at margin. h & I. Leaf in cross-section. Scales in mm: bar = 0.05 (b,c,e,g,h,i); bar = 0.5 (d,f); bar = 2.1 (a). Figures a,i from *Allen 16627,* all others from *Allen 6071,* (both MO).

differs from those mosses in having usually well developed alar cells and a dicranaceous peristome. Its small size can also cause confusion with *Dicranella* which differs from *O. montanum* chiefly in having undifferentiated alar cells. Small plants of *O. montanum,* consisting mostly of minute, reduced leaves, can be especially difficult to recognize because their alar cells tend to be very weakly developed.

4. *Orthodicranum viride* (Sull. & Lesq.) Roth *in* Cas. Gil, Fl. Ibér. Bríóf., Musg. 176. 1932

Campylopus viridis Sull. & Lesq. *in* Sull., Musci Hep. U.S. 103. 1856.

Dicranum viride (Sull. & Lesq.) Lindb., Hedwigia 2: 70. 1863.

Paraleucobryum viride (Sull. & Lesq.) Podp., Consp. Musc. Eur. 153. 1954.

Plants medium sized, dull, dark-green to bright green, yellowish-green above, brownish below. Stems to 20 mm long. Leaves crowded, erect-spreading when wet, stiffly erect incurved to erect spreading, at times flexuose when dry, lanceolate, roughened-papillose above at back, 4--5 mm long, long-acuminate, ending in a linear, multistratose, deciduous point; margins erect below, subtubulose above, entire; costa long-excurrent; upper cells irregularly oblate, quadrate to short-rectangular, thick-walled, not porose, 7.5--25 µm x 10--12.5 µm wide, papillose or smooth; basal cells irregularly oblate, quadrate to short-rectangular, thick-walled, not porose, 7.5--22.5 µx 7.5--10 µm wide; alar cells enlarged, thin-walled, bulging, forming distinct groups of hyaline to reddish-brown, quadrate to rectangular cells. Sporophytes not seen from Maine. Setae 12--15 mm long, yellow becoming brown with age; capsules erect, cylindrical, smooth to weakly furrowed, 2--2.5 mm long; opercula 1.5 mm long. Spores smooth to lightly papillose, 12--18 µm. Calyptra not seen.

On tree trunks, bark of *Acer, Betula*, *Fagus*, and *Quercus*, rarely on boulders and rocks in woods. In Maine known from Androscoggin (*Allen 14693* MO), Aroostook (*Allen 16320* MO), Cumberland (*Allen 15919* MO), Franklin (*Allen 10270B*), Hancock (*Allen 16293* MO), Kennebec (*Allen 14787* MO), Lincoln (*Solomon 20125* MO), Oxford (*J.A. Allen* NY), Piscataquis (*Allen 16554A* MO), Somerset (*Allen 9310* MO), and Washington (*Pedano 545* MO) Counties.

In Maine *Orthodicranum viride* differs from all other *Orthodicranum* species in having stiffly erect-spreading to erect-incurved leaves with fragile, often broken, multistratose apices. Plants of *O. viride* from North Carolina are different from Maine plants in having a yellow-green rather than dark green color and more arching rather than stiffly erect-incurved leaves. The North Carolina plants have

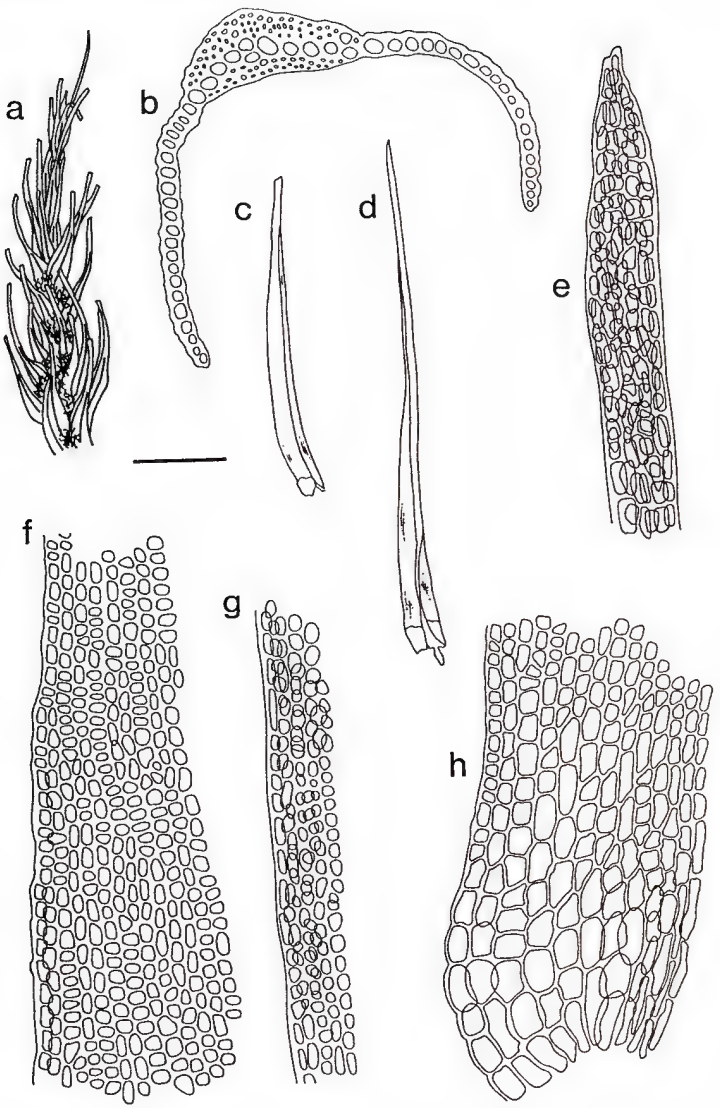

Figure 4. *Orthodicranum viride*. a. Habit. b. Leaf in cross-section. c. & d. Leaves. e. Leaf apex. f. Median leaf cells at margin. g. Upper leaf cells at margin. h. Alar cells. Scales in mm: bar = 0.04 (e); bar = 0.05 (b,f,g,); bar = 0.07 (h); bar = 0.5 (c,d); bar = 1.5 (a). Figures a,b,c,d,g from *Allen 16293,* figures e,f,h from *Allen 1330,* (both MO).

an aspect remarkably similar to some species of *Campylopus*, and the presence of a broad costa and short basal leaf cells adds to its similarity with that genus. A broad costa and short basal cells are features also found in *O. fulvum*, and both species have been placed in *Campylopus* and *Paraleucobryum*. The presence of erect rather than cygneous setae separates *O. viride* from *Campylopus*. *Paraleucobryum longifolium* differs in having falcate-secund leaves and a costal cross-section that has a layer of chlorocysts between two layers of hyalocysts. Sporophytes of *O. viride* are rarely seen in North American collections, the above sporophyte description was taken from a Canadian collection (*Ireland 14081* MO) gathered on Prince Edward Island.

Literature Cited.

Peterson, W. 1979. A revision of the genera *Dicranum* and *Orthodicranum* (Musci) in North America North of Mexico. xiv + 453 pp. Ph.D. Dissertation, University of Alberta, Canada.

Bryophytes from states of Arkansas, Missouri, Oklahoma and the Interior Highlands of North America, *Fontinalis sphagnifolia*, *Fontinalis welchiana* and *Weissia sharpii* new to Oklahoma, and other new county records

Carl Darigo[1]

This paper reports on mosses and liverworts from Arkansas (Fig. 1), Missouri (Fig. 2) and Oklahoma (Fig. 3), and the Interior Highlands of North America, including *Fontinalis sphagnifolia* (C. Müll.) Wijk & Marg., *Fontinalis welchiana* Allen and *Weissia sharpii* Anderson & Lemmon new to Oklahoma, along with 104 new county records.

The Interior Highlands of North America include the southern portion of Missouri, much of Arkansas, a small region in southern Illinois and extend along the eastern border of Oklahoma.

The Missouri River cuts, in an approximate east-west direction, through the state of Missouri. North of the river is found the Glaciated Prairie, an area that occupies about the northern one-third of the state. South of the river lies the northern edge of the Interior Highlands. The Springfield Plateau occupies the northwestern part, while northern and northeastern sections consist of the Salem Plateau, with the most common habitat being oak-hickory forests. The Prairie section is immediately west of the Springfield Plateau, while the Border region occupies the first tier of counties north of the Missouri River. In eastern Oklahoma, several counties form the western limits of the Springfield Plateau, Boston Mountains, Arkansas Valley and Ouachita Mountains. Arkansas northern counties are mainly concentrated in the Salem Plateau.

Personal collections were made either during Botany Group outings of the Webster Groves Nature Study Society, or on private trips. Several previously unpublished collections by Bruce Allen and Bill Summers are included.

Most of the Oklahoma data resulted from determinations of Gilford J. Ikenberry specimens collected from the 1930's to 1950's. The Ikenberry collections were purchased by the Missouri Botanical Garden in 1981. Gilford J. Ikenberry was

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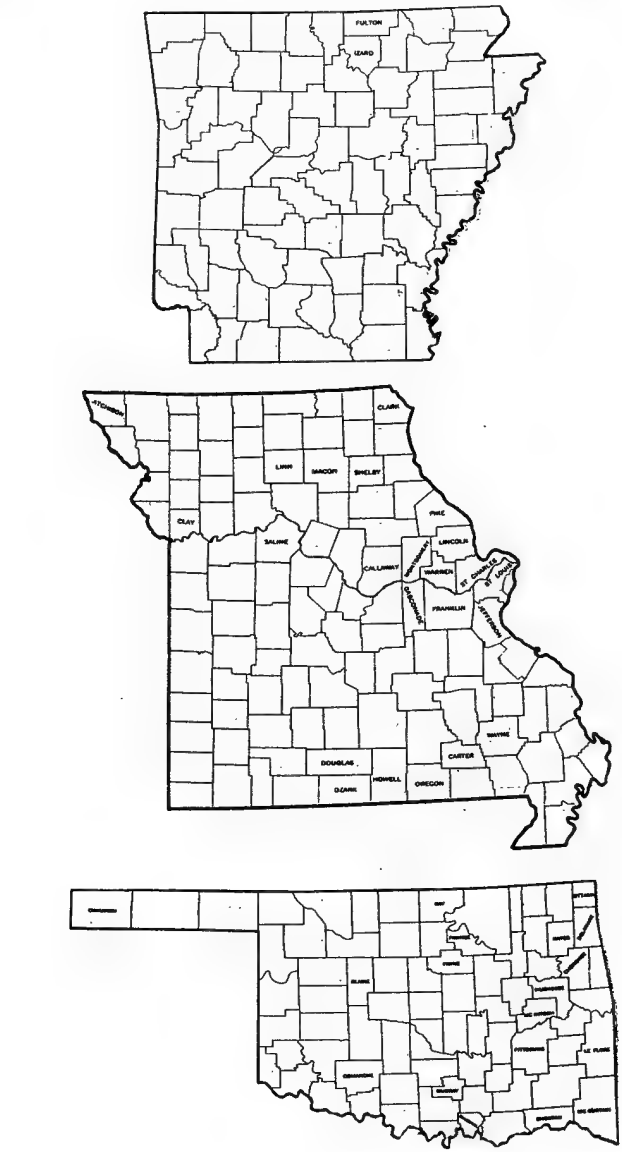
FULTON
IZARD
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WARREN
FRANKLIN
WAYNE
DOUGLAS
CARTER
OZARK
HOWELL
OREGON

born in 1890 in Nebraska, graduated from Kansas State University in 1912 and obtained his master's degree from the same school in 1924. After teaching botany in various schools in Kansas and North Dakota, Ikenberry received his PhD degree in botany from Ohio State University in 1933. Dr. Ikenberry was with the U. S. Forest Service in California from 1933 to 1935, then taught at Eastern New Mexico University from 1935 to 1939. He taught botany at Oklahoma State University until retirement in 1960. Dr. Ikenberry was very interested in bryophytes and with his colleagues collected many moss specimens, mainly in New Mexico, Oklahoma, North Dakota, northern Michigan, California, Ohio and Vermont.

New moss records were distributed as follow:

ARKANSAS--Interior Highlands (3)

Salem Plateau: Fulton-1, Izard-2

MISSOURI--Interior Highlands (32)

Border--10: Clay-1, Montgomery-6, St. Charles-1, Warren-2

Salem Plateau--22: Carter-3, Franklin-1, Jefferson-1, Gasconade-4, Howell-2, Oregon-1, Ozark-3, Wayne-7

MISSOURI--Non-Interior Highlands (10)

Glaciated Prairie: Atchison-7, Linn-1, Macon-2

OKLAHOMA--Interior Highlands (27) (*denotes new listing for OK county, others previously reported for OK county, but not Interior Highlands)

Boston Mountains--6: *Cherokee-2, Muskogee-2, *Muskogee-2

Ouachita Mountains--5: LeFlore-1, *LeFlore-1, *McCurtain-3

Springfield Plateau--16: Delaware-9, Mayes-4, *Mayes-3

OKLAHOMA--Non-Interior Highlands (19)

Blaine-2, Choctaw-2, Cimarron-2, Comanche-1, Kay-1, Marshall-1, McIntosh-2, Murray-1, Ottawa-3, Pawnee-2, Payne-1, Pittsburg-1

New liverwort records were distributed as follows:

MISSOURI--Interior Highlands (9)

Border--4: Callaway-1, Lincoln-1, Montgomery-1, St. Charles-1

Prairie--1: Saline-1

Salem Plateau--4: Douglas-1, Franklin-2, St. Louis-1

MISSOURI--Non-Interior Highlands (3)

Glaciated Prairie: Clark-1, Pike-1, Shelby-1

OKLAHOMA--Interior Highlands (1)

Ouachita Mountains-1: McCurtain-1

All specimens were verified by Bruce Allen or Alan Whittemore and are deposited at MO. Moss distribution comments were taken from Redfearn (1983). Arkansas and Oklahoma counties are identified with state abbreviation and Missouri counties with none. Interior Highlands region is also specified for Oklahoma counties.

Mosses

AMBLYSTEGIACEAE

Amblystegium serpens (Hedw.) Schimp. in B.S.G. var. *serpens* - **Howell**: Howell Memorial Park Cemetery, 7 miles N of West Plains, Darigo & Haller 2902. **Montgomery**: Graham Cave State Park, Darigo & Darigo 3061.

A. varium (Hedw.) Lindb.- **Atchison**: Brickyard Hill Conservation Area, Darigo & Darigo 2969.

Campylium chrysophyllum (Brid.) J. Lange - **Delaware-OK** (SP): Dripping Springs, Ikenberry. **Izard-AR**: 4 miles S of Horseshoe Bend, Darigo 2861.

C. hispidulum (Brid.) Mitt.- **Ottawa-OK**: Twin Bridges State Park, Darigo & Darigo 2994. **Wayne**: Lake Wappapello State Park, Darigo 3017.

Cratoneuron filicinum (Hedw.) Spruce - **Linn**: Pershing State Park, Darigo & Darigo 2920.

Hygroamblystegium tenax (Hedw.) Jenn. var. *tenax* - **Gasconade**: Mint Springs Natural Area, Darigo & Darigo 3042

Leptodictyum humile (P. Beauv.) Ochyra - **Fulton-AR**: Mammoth Spring State Park, Darigo 2875.

L. riparium (Hedw.) Warnst.- **Atchison**: Rockport Memorial Park, Rockport, Darigo & Darigo 2924.

L. riparium (Hedw.) Warnst.(*laxirete expression*) - ***Mayes-OK** (SP): Camp Scott, near Locust Grove, Ikenberry. This collection is the "laxirete expression" version, found in flowing water; has been reported previously in only three Oklahoma counties, all in Interior Highlands

ANOMODONTACEAE

Anomodon attenuatus (Hedw.) Hüb.- **Mayes-OK** (SP): N end of Spavinaw Lake, Ikenberry.

Haplohymenium triste (Ces. *in* De Not.) Kindb.- **Gasconade**: Mint Springs Natural Area, Darigo & Darigo 3041.

BRACHYTHECIACEAE

Brachythecium acuminatum (Hedw.) Aust. var. *acuminatum* - **Wayne**: Lake Wappapello State Park, Darigo 3014.

B. acuminatum (Hedw.) Aust. var. `(Kindb.) Redf. & Crum - **Montgomery**: Graham Cave State Park, Darigo & Darigo 3062. **Pawnee-OK**: near Keystone, Ikenberry.

Common in Missouri, but infrequently collected; has been reported in only one other Oklahoma county. Differs from var. *acuminatum* in having shorter, broader, more concave and acute leaves, and shorter leaf cells.

B. oxycladon (Brid.) Jaeg.- **Atchison**: Brickyard Hill Conservation Area, Darigo & Darigo 2970.

B. rivulare Schimp. *in* B.S.G.- **Delaware-OK** (SP): Drippings Springs, Waterfall (GJI). Only previous Oklahoma report has been in this county, but not in Interior Highlands.

Eurhynchium hians (Hedw.) Sande-Lac.- **Atchison**: Rockport Memorial Park, Darigo & Darigo 2922. **Gasconade**: Mint Springs Natural Area, Darigo & Darigo 3040.

BRYACEAE

Bryum argenteum Hedw.- **Atchison**: Hwy 275 at Iowa border, Darigo & Darigo 2971. **Montgomery**: Graham Cave State Park, Darigo & Darigo 3058.

B. caespiticium Hedw.- **Izard-AR**: 4 mi S of Horseshoe Bend, Darigo 2862. **Ottawa-OK**: Twin Bridges State Park, Darigo & Darigo 2995.

B. dichotomum Hedw.- **Franklin**: River Round Conservation Area, Darigo & Darigo 3045. **Jefferson**: Mastodon State Historic Site, Darigo & Darigo 3068. **Montgomery**: Graham Cave State Park, Darigo & Darigo 3065. Uncommon.

Leptobryum pyriforme (Hedw.) Wils.- **Clay**: Watkins Mill State Historic Site, Darigo & Darigo 3009. Uncommon, first report for a Border County.

DICRANACEAE

Dicranum condensatum Hedw. **Wayne**: Lake Wappapello State Park, Darigo 3019.

DITRICHACEAE

Ceratodon purpureus (Hedw.) Brid. var. ***purpureus*** - **Wayne**: Lake Wappapello State Park, Darigo 3018.

ENTODONTACEAE

Entodon cladorrhizans (Hedw.) C. Müll.- **Delaware-OK** (SP): Dripping Springs, Ikenberry 1866.

E. seductrix (Hedw.) C. Müll.- **Delaware-OK** (SP): Dripping Springs, Ikenberry. **Marshall-OK**: 5 miles N of Willis, Ikenberry. **Murray-OK**: Arbuckle Mountains., Gatewood (GJI).

ERPODIACEAE

Venturiella sinensis (Vent. *in* Rabenh.) C. Müll. var. ***angustiannulata*** Griffin & Sharp *ex* Griffin - **Blaine-OK**: Roman Nose State Park, Ikenberry.

FABRONIACEAE

Fabronia ciliaris (Brid.) Brid. var. ***ciliaris*** - **Warren**: Wright City Cemetery, Darigo & Darigo 3054.

FISSIDENTACEAE

Fissidens adianthoides Hedw.- **Ozark**: GladeTop Trail, Mark Twain National Forest,

Allen 20227. Uncommon.

F. fontanus (B. Pyl.) Steud.- **Mayes-OK** (SP): Camp Scott, near Locust Grove, Ikenberry.

FONTINALACEAE

Fontinalis novae-angliae Sull. var. *latifolia* Card.- **McIntosh-OK**: NE of Checotah, McCollom (GJI). Previous Oklahoma listings (1991) as "*F. novae-angliae* Sull." are possibly *F. novae-angliae* Sull. var. *latifolia* Card.

F. sphagnifolia (C. Müll.) Wijk & Marg.- ***Cherokee-OK** (BM): 15 miles NE of Braggs, Ikenberry 1795. Collected from a creek bed on 20 June 1950; represents an Oklahoma state record and also the first Interior Highlands record in Oklahoma. This species has only been found twice in Missouri and is shown as Endangered on that state's Rare and Endangered Species Checklist. ***McCurtain-OK** (OM): Beavers Bend State Park, Ikenberry.

F. sullivantii Lindb.- ***Cherokee-OK** (BM): Big Springs Creek, near Peggs, Sherman (GJI). **Mayes-OK** (SP): Camp Scott, near Locust Grove, Ikenberry. This species had been reported only twice in Oklahoma, both from Interior Highlands, and in Missouri is listed as Endangered.

F. welchiana Allen - ***LeFlore-OK** (OM): near Ludlow, Ikenberry. This specimen, collected in a dry creek bed on 27 August 1939, represents an Oklahoma state record and also the first Interior Highlands record in Oklahoma. ***McCurtain-OK** (OM): Beavers Bend State Park, Ikenberry. **Comanche-OK**: Wichita Mountains Preserve, Ikenberry.

GRIMMIACEAE

Grimmia pilifera P. Beauv.- **Delaware-OK** (SP): Dripping Springs, Ikenberry.

Schistidium apocarpum (Hedw.) Bruch & Schimp. in B.S.G.- **Kay-OK**: near Ponca City, Davy 55 (GJI). ***Mayes-OK** (SP): N end of Spavinaw Lake, Ikenberry

S. rivulare (Hedw.) Podp. var. *rivulare* - **Pawnee-OK**: near Keystone, Ikenberry

HEDWIGIACEAE

Hedwigia ciliata (Hedw.) P. Beauv.- **Delaware-OK** (SP): Dripping Springs, Ikenberry.

HYLOCOMIACEAE

Pleurozium schreberi (Brid.) Mitt.- **Carter**: Peck Ranch Conservation Area, Allen 20251. Uncommon.

HYPNACEAE

Homomallium adnatum (Hedw.) Broth.- **Montgomery**: Graham Cave State Park, Darigo & Darigo 3063.

Platygyrium repens (Brid.) Schimp. *in* B.S.G.- **Wayne**: Lake Wappapello State Park, Darigo 3015.

Pseudotaxiphyllum elegans (Brid.) Iwats.- ***McCurtain-OK** (OM): Beavers Bend State Park, Ikenberry. Common in Interior Highlands, but first record for Oklahoma portion and only listed twice previously for that state.

LESKEACEAE

Haplocladium virginianum (Brid.) Wat. & Iwats.- **Muskogee-OK** (BM): 3 miles E of Braggs, Ikenberry 1831.

Leskea gracilescens Hedw.- **Atchison**: Rockport Memorial Park, Rockport, Darigo & Darigo 2923. **Macon**: Long Branch State Park, Darigo & Darigo 2918. **Ottawa-OK**: Twin Bridges State Park, Darigo & Darigo 2993.

L. obscura Hedw.- **Macon**: Long Branch State Park, Darigo & Darigo 2918a.

Lindbergia brachyptera (Mitt.) Kindb.- **Atchison**: Rockport Memorial Park, Rockport, Darigo & Darigo 2921. **Wayne**: Wappapello Dam Visitor Center, Darigo 3023.

LEUCOBRYACEAE

Leucobryum glaucum (Hedw.) Ångstr. *in* Fries - **Delaware-OK** (SP): Dripping Springs, Ikenberry.

LEUCODONTACEAE

Leucodon julaceus (Hedw.) Sull. - **Delaware-OK** (SP): Dripping Springs, Ikenberry. **Mayes-OK** (SP): E end of Spavinaw Lake, Ikenberry.

MNIACEAE

Plagiomnium. ellipticum (Brid.) T. Kop.- **Oregon**: Betsy Hollow, Mark Twain National Forest, Summers 5167a. **Ozark**: Caney Mountain Conservation Area, Darigo & Summers 2880. This species has been reported in the Middle West and eastern North America, but is rare in the Interior Highlands. In Missouri, has been found in only five counties and is listed as Rare.

P. rostratum (Schrad.) T. Kop.- **Howell**: Indian Creek, Mark Twain National Forest, Darigo & Summers 2895. Reported from Missouri in 1981, but has been recorded in only one other county.

ORTHOTRICHACEAE

Drummondia prorepens (Hedw.) Britt. - **Mayes-OK** (SP): E end of Spavinaw Lake, Ikenberry. **Ozark**: GladeTop Trail, Mark Twain National Forest.

Orthotrichum ohioense Sull. & Lesq. *in* Aust.- **Blaine-OK**: Roman Nose State Park, Ikenberry. **Choctaw-OK**: near Hugo, Ikenberry 746. **LeFlore-OK** (OM): 5 miles N of Smithville, Ikenberry.

O. pumilum Sw.- **Muskogee-OK** (BM): Greenleaf Lake, near Braggs, Ikenberry.

O. pusillum Mitt.- **Choctaw-OK**: near Hugo, Ikenberry 746. **Pittsburg-OK**: 2 miles NW of Haileyville, Ikenberry. **Warren**: Wright City Cemetery, Darigo & Darigo 3053.

O. strangulatum P. Beauv.- **St. Charles**: Busch Conservation Area, Darigo & Darigo 3057.

POLYTRICHACEAE

Polytrichum commune Hedw. var. *commune* - **Carter**: Peck Ranch Conservation Area, Allen 20248.

POTTIACEAE

Barbula unguiculata Hedw.- **Montgomery**: Graham Cave State Park, Darigo & Darigo 3066

Didymodon rigidulus Hedw. var. ***gracilis*** (Schleich. *ex* Hook. & Grev.) Zand.- **Ozark**: Glade Top Trail, Mark Twain National Forest, Allen 20229. Listed as Rare in Missouri and has been found in only four other counties.

Syntrichia pagorum (Milde) Amman - ***Muskogee-OK** (BM): Brown Hollow, near Braggs, Ikenberry.

S. papillosa (Wils. *in* Spruce) Jur.- **Carter**: Peck Ranch Conservation Area, Allen 20247. Listed as Rare in Missouri and has been found in only three other counties.

Tortula plinthobia (Sull. & Lesq.) Sull.- **Cimarron**: near Kenton, Ikenberry.

Weissia sharpii Anderson & Lemmon - **Payne**: 1½ miles NE of Ripley, Ikenberry 453. This specimen, collected 21 March 1941 from a rock in woods, represents an Oklahoma state record. The plants were mixed with *Schistidium apocarpum* (Hedw.) Bruch & Schimp. *in* B.S.G. **Cimarron**: near Kenton, Ikenberry.

PTYCHOMITRIACEAE

Ptychomitrium incurvum (Schwaegr.) Spruce - **Wayne**: Lake Wappapello State Park, Darigo 3016.

THUIDIACEAE

Thuidium delicatulum (Hedw.) Schimp. *in* B.S.G.- **Delaware-OK** (SP): Dripping Springs, Ikenberry 1866A. **Gasconade**: Mint Springs Natural Area, Darigo & Darigo 3039. ***Muskogee-OK** (BM): Brown Hollow, near Braggs, Ikenberry.

Liverworts

AYTONIACEAE

Reboulia hemisphaerica (L.) Raddi - **Clark**: Battle of Athens State Park, Darigo, Summers, & Vanderbilt 2276. **St. Louis**: Rockwoods Reservation, Darigo 2466.

JUBULACEAE

Frullania eboracensis Gott.- **Montgomery**: Graham Cave State Park, Darigo & Darigo 3064.

F. inflata Gott.- **Franklin**: Robertsville State Park, Darigo 3032.

LOPHOCOLEACEAE

Lophocolea. bidentata (L.) Dum.- **Franklin**: Meramec Conservation Area, Darigo & Clauson 3007.

L. heterophylla (Schrad.) Dum.- **Callaway**: Koenig property near Williamsburg, Darigo & Vanderbilt 1958.

MARCHANTIACEAE

Marchantia polymorpha L.- **Saline**: Arrow Rock State Historic Site, Darigo & Darigo 2707.

PTILIDIACEAE

Trichocolea tomentella (Ehrh.) Dum.- **Douglas**: Dimcher Hollow, Mark Twain National Forest, Allen 20244.

RICCIACEAE

Ricciocarpos natans (L.) Corda - **Lincoln**: Sandy Island Eagle Sanctuary-TNC, Darigo 2731. **Pike**: Hamburg Ferry Access, Darigo & Darigo 2783. **St. Charles**: Weldon Springs Conservation Area, Darigo & Sullivan 1952.

SCAPANIACEAE

Scapania nemorea (L.) Grolle - **Shelby**: Oxbow Nature Trail near Bethel, Darigo Vanderbilt 2300. **McCurtain-OK** (OM): Beavers Bend State Park, Ikenberry. First report of this species in Oklahoma portion of Interior Highlands.

Acknowledgments: The author wishes to thank Bruce Allen and Bill Summers for permission to publish their collections, Frank Bowers for use of his Oklahoma Moss Checklist (1991), Steve Churchill for furnishing information on the Ikenberry biography, Bruce Allen and Alan Whittemore for sharing their time and expertise, Jésus Muñoz for his help on several *Grimmia* specimens, Jeanne Clauson, Dolly Darigo, Karen Haller, Father James Sullivan, Bill Summers and Sue Vanderbilt for their collecting help, and also Father James Sullivan and other Webster Groves Nature Study Society members for their interesting outings.

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Gyroweisia reflexa, a moss new for the United States

William R. Manierre[1]

The tiny moss *Gyroweisia reflexa* (Brid.) Schimp. has been discovered in Michigan's Upper Peninsula. This species has been reported only once before from the North American continent, from Owen Sound at the base of the Bruce Peninsula of Ontario. The Michigan plants were found on mortar between rocks of Jacobsville sandstone making up the chimney of a log cabin built at the Huron Mountain Club on the shore of Lake Superior in 1895. Also on the mortar, in close association with the *Gyroweisia*, was the lichen *Bacidia sabuletorum* (Schreb.) Lettau, kindly determined for me by Dr. Richard C. Harris.

Having collected the very rare *Gyroweisia tenuis* on sandstone cliffs a mile down the beach from the cabin, I felt that I had found a new stand of that same moss. It did not, however, look quite right, and I took it, accordingly, to Dr. Howard Crum for verification. He recognized it as *G. reflexa* and pointed out the peculiarities of annulus and peristome that give that species definition (as illustrated by Brotherus 1924, Crum & Anderson 1981, and Zander 1983).

In spite of its extreme rarity, this moss includes in its distribution five nations on three continents. It was described by Bridel (1826) from southern France, from the vicinity of Avignon and later reported by Geheeb (1906) from "des pierres murales humides" (perhaps from a mortared wall as the species grew in association with the calcicolous *Tortella nitida*) in the Pyrenees of Spain; Algiers was included in its range of distribution by Brotherus (1924). E. A. Moxley found the moss in Canada at Owen Sound, Ontario, in 1934. Some years later, on request, he sent specimens to Henry S. Conard "for consideration."

In 1945 Conard gave an interesting account of his identification of the moss which until then had been misidentified as a *Gymnostomum*.. He considered it without question to be *Gyroweisia reflexa* and the only known collection from North America. The collection remains (and is represented in the herbaria of the University of Michigan and the New York Botanical Garden), but as Conard put it, "the locality has been blasted away; Moxley hopes to find another lot. Good luck to him." In the summer of 1961, Professor Crum visited the place where Moxley said he found it, inside the city of Owen Sound and certainly not a likely place for a rarity, but he was unable to find the species. Because Moxley also reported from the Owen Sound area the exceedingly rare fern, *Schizaea pusilla*, known only from the New Jersey Pine Barrens, the origin of his specimen of *Gyroweisia* has remained in some doubt, as noted by Crum & Anderson (1981).

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However, the discovery of the species elsewhere in the Great Lakes region, in northern Michigan, seems to confirm the Ontario record. The considerable disjunction between the Great Lakes region and the Mediterranean is indeed strange, but the species appears to occupy limy habitats and not necessarily natural ones — habitats in which bryologists scarcely expect to find a species of rarity! Conard concluded his report by welcoming *Gyroweisia reflexa* to the flora of North America, and I am pleased to add it to the flora of Michigan and the United States.

Specimens of the Michigan collection have been deposited at NYBG, MI, DUKE, MO, and the author's private herbarium. — I would like to express extreme gratitude to Howard Crum for sharing with me over the past 10 years his encouragement, expertise, and time.

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Additions to the bryophyte flora of Alabama from two Bibb County nature preserves, including first reports of *Plagiochasma crenulatum* and *Trichostomum brachydontium* east of the Mississippi River and other range extensions.

Paul G. Davison[1] and Alfred R. Schotz[2]

Portions of Bibb County along the Cahaba and Little Cahaba Rivers are known to support many rare species of vascular plants, including eight taxa recently discovered new to science (see Allison 1993, 1994; Gould 1996) and more than 60 additional species considered rare (see Allison 1995). Many of these rare vascular plants occur in areas with shallow soils and outcroppings of Ketona Dolomite and Lenoir Limestone. Two such areas, Pratt's Ferry Nature Preserve and Goat Glade, are now under the ownership and protection of The Nature Conservancy of Alabama. Both preserves are within the intersection of three physiographic provinces: the Cumberland Plateau, Upper Coastal Plain, and Ridge and Valley. Bryological collections made June 14, 1996 during a cursory visit to these nature preserves have added to the interesting plant life known for Bibb County. Four state record bryophytes and an additional liverwort at its northernmost known occurrence were discovered. These are: *Trichostomum brachydontium* and *Plagiochasma crenulatum*, both previously unknown east of the Mississippi River; *Rectolejeunea spiniloba* (new to Alabama) and *Cheilolejeunea clausa* (known previously in Alabama only from Mobile Co.), both subtropical disjuncts; and *Palamocladium leskeoides*, known in limited extent from the eastern U.S. and reported here for the first time from Alabama.

Collection numbers listed below are P. G. Davison's (PGD). Specimens are housed in UNAF with duplicates elsewhere as noted.

Pratt's Ferry Nature Preserve

The Pratt's Ferry Preserve encompasses 15 acres of high forested bluffs overlooking the Cahaba River, approximately 6.5 air miles northeast of Centreville. Vegetation of the Preserve is represented by a mosaic of small hebaceous openings with poorly developed arborescent layers occurring in association with shallow soils underlain by Lenoir Limestone. Characteristic taxa of these openings include *Agalinis tenuifolia*, *Aster patens*, *Aster shortii*, *Pellaea atropurpurea*, *Schizachyrium scoparium*, and *Sporobolus clandestinus*.

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The remaining area is comprised of a bouldery woodland with a partially open to filtered canopy and a relatively dense shrub layer, with principal species including *Acer barbatum*, *Cercis canadensis*, *Fraxinus americana*, *Hypericum frondosum*, *Juniperus virginiana*, *Quercus alba*, *Quercus rubra*, *Quercus sinuata* var. *sinuata*, *Rhus aromatica*, *Sideroxylon lycioides*, and the globally imperiled *Croton alabamensis* var. *alabamensis*. Several rare species, as classified by the Alabama Natural Heritage Program (1997), also occur at the site, most notably *Asplenium ruta-muraria*, *Carex eburnea*, *Cladrastis kentukea*, *Marshallia mohrii*, *Rudbeckia triloba* var. *pinnatiloba*, and *Sedum nevii*.

MOSSES

Trichostomum brachydontium Bruch in F. Muell. On dry limestone in partial shade at top edge of cliff roughly 80 ft. above the Cahaba R. PGD no. 3687, June 14, 1996, det. R. Zander (DUKE, BUF).

In the U.S. previously known only from Big Bend National Park, Texas (Magill 1976). Zander (personal communication) states that the Alabama material is robust, excellent, and easily identified by the stout, strong mucro of the leaves. The range of the species as given by Zander (1994) is Central and South America, Mexico, West Indies, Texas, Europe, Africa, and Australasia.

Palamocladium leskeoides (Hook.) E.G. Britt. On dry limestone in partial shade at top edge of cliff roughly 80 ft. above the Cahaba R. PGD no. 3681, 3686, June 14, 1996.

In eastern North America, apparently known previously from only six counties in five states (North Carolina, Oklahoma, Tennessee, Texas, & West Virginia) (see Crum & Anderson 1981). In addition to the Alabama record above, we add an additional location from Georgia collected during the 1988 Blomquist Bryological Foray: Walker County, on rock face near Sitton Gulch Creek, PGD 828 TENN.

Palamocladium leskeoides occurs perhaps more commonly outside the U.S. Its range: Mexico to northern South America, the West Indies, and the U.S. (see Crum and Anderson 1981; McFarland 1994).

Other mosses collected at Pratt's Ferry (June 14, 1996):
Anomodon minor (Hedw.) Fuernr. On limestone in seasonal streambed. PGD 3673
Bryoandersonia illecebra (Hedw.) Robins. Humus over limestone. PGD 3682
Entodon macropodus (Hedw.) C.M. On limestone in seasonal streambed. PGD 3678
Fissidens bryoides Hedw. On limestone in seasonal streambed. PGD 3675
Fissidnes obtusifolius Wils. On limestone in seasonal streambed. PGD 3674

Hyophilia involuta (Hook.) Jaeg. & Sauerb. On limestone, seasonal streambed. PGD 3677
Pleurochaete squarrosa (Brid.) Lindb. On exposed, dry limestone. PGD 3685

It is of interest to note that the uncommon *Taxiphyllum cuspidifolium* (Card.) Iwats. is historically known from "near Pratt's Ferry," Harper no. 35 (specimens in NY and US, see Ireland 1969). This speices, found disjunctively in Japan, is known from just a few localities in four states (Alabama, Florida, North Carolina, and Tennessee, see Ireland 1986; Crum & Anderson 1981-as *Isopterygium cuspidifolium*). We include here a newly discovered and 2nd locality for Alabama: Colbert County, on limestone bluff-base in hardwood forest along bank of Tennessee River, Muscle Shoals TVA Reservation, female plants with archegonia, PGD no. 4064, 13 December 1997, det. W. R. Buck.

LIVERWORTS

Cheilolejeunea clausa (Nees & Mont.) Schust. Humus over limestone around the edges of shrubby vegetation in area of exposed rock outcrops at top edge of cliff roughly 80 ft. above the Cahaba R., PGD no. 3682, June 14, 1996.

The Bibb County material has the following characters regionally distinctive for the species: very broad underleaves, many slightly longer than wide; underleaves auriculate at their insertion; and leaf cells with coarse trigones. The specimens studied were without sex organs, thus apparently dioicous and therefore not referable to the otherwise similar, monoicous and pantropical *Cheilolejeunea trifaria* (Reinw. et al.) Mizut.

For eastern North America Schuster (1980) reports *Cheilolejeunea clausa* as "constantly corticolous" and known only from the extreme outer Coastal Plain: Alabama (Mobile Co. only), Florida, and Mississippi. In Bibb County the constant ground occurrence and mat formation atop humus over rock is novel for the species as found in the U.S. The species is otherwise neotropical occurring in South America, Central America and the West Indies.

Rectolejeunea spiniloba (Lindenb. & G.) Schust. On limestone, in crevices and over convex rock face at dry spillway of seasonal streambed. PGD no. 3677, 3679, 3680, June 14, 1996.

A neotropical species of limited range: Mexico, Cuba, and in the U.S. previously known only from Florida and Louisiana (Schuster 1980). Like the occurrence of *Cheilolejeunea clausa*, the Bibb County populations are the northernmost for the species.

Other liverworts collected at Pratt's Ferry (June 14 1996):
Frullania asagrayana Mont. Male & female plants on shaded log. PGD 3683
Frullania britonniae Evans. On CERCIS CANADENSIS. PGD 3689
Frullania inflata Gott. On limestone in seasonal streambed. PGD 3676
Leucolejeunea unciloba (Lindenb.) Evans. On CERCIS CANADENSIS. PGD 3690
Porella pinnata L. On limestone in seasonal streambed. PGD 3672
Riccardia cf. chamedryfolia (With.) Grolle. On soil over limestone in seasonal streambed. PGD 3675

Goat Glade

Goat Glade is contained within the Bibb County Glades Preserve, a 229 acre sanctuary located along the Little Cahaba River, approximately 6.0 air miles southwest of West Blocton. The Preserve is highlighted by a series of mostly treeless glades that have developed over Ketona Dolomite, an unusually pure dolomite with only about 2% impurities. These glades are represented by a remarkable concentration of rare plants, including seven currently undescribed taxa, two federally-listed species and 11 others that are recognized as species of concern by the U.S. Fish and Wildlife Service.

Plagiochasma crenulatum Gott. On soil in gully-like moist drainage at lower edge of glade just inside wooded margin along Little Cahaba River. PGD no. 3705, June 14, 1996, det. A. Whittemore.

Occurring with male and female sex organs but carpocephala not developed. According to Alan Whittemore (personal communication) this is a fairly common species ranging from Honduras north to northern Nuevo Leon, Mexico, and southern Arizona, but not previously known from the eastern U.S.

Cheilolejeunea clausa (Nees & Mont.) Schust. Shaded, humus over rock at lower edge of glade just inside wooded margin along Little Cahaba River. PGD no. 3706, June 14, 1996

Also found at Pratt's Ferry preserve where, as at Goat Glade, it grows closely associated with *Bryoandersonia illecebra.*

Acknowledgements. We thank: Richard Zander for identifying *Trichostomum brachydontium* and for pointing out the paper by Magill; Alan Whittemore for identifying *Plagiochasma crenulatum*; David Smith for identifying and immediately recognizing in the field *Palamocladium leskeoides* in Georgia; William Buck for identifying *Isopterygium cuspidifolium* and for pointing out the historical Pratt's Ferry collection. We also thank Leon Bates, Paul Kittle, Jim Lacefield, and Fran Menapace who shared their insights and observations with us during the outing to Bibb County.

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Macrolichens from Priest River Experimental Forest, Idaho

B. McCune[1] and R. Rosentreter[2]

A week-long lichen training in July 1997 at Priest River Experimental Forest in northern Idaho brought together 34 botanists from federal agencies in Montana, Idaho, Oregon, and Washington. This note reports plot data and interesting finds from those activities. Contributors were K. Ahlenslager, M. Arvidson, J. Barker, W. Bernardy, R. Clausnitzer, A. Cochrane, J. Duff, L. Eno, S. Garvin, T. Gibson, V. Goodnow, M. Hays, J. Hill, J. Joy, B. Kelley, J. Hutton, D. Lebo, T. Lillybridge, M. Lolley, M. Lowry, M. Mousseaux, D. Penny, L. Pietarinen, A. Pipp, M. Roantree, S. Shelly, T. Spivey, T. Spribille, H.-G. Stroh, K. Suzuki, D. Svoboda, J. Tonn, and J. Warofka. Nomenclature follows Esslinger and Egan (1995) for the most part.

Priest River Experimental Forest is in northern Idaho less than 1 degree south of the Canadian border. It is centered in the inland extension of oceanic influence (McCune 1984). The Experimental Forest is unusual in the northern Rocky Mountains for its abundance of *Pinus monticola* and *Tsuga heterophylla*.

We used Forest Health Monitoring style plots (McCune et al. 1997) except that ground-dwelling macrolichens were included as well and the time constraint was increased from 2 hours to 2.5 hours. Two practice plots (A and B) near the Forest headquarters were collaborative efforts resulting in a single consensus abundance value for each macrolichen species for each plot. Subsequent plots (1 - 8) were studied in groups of 3 to 5, but each person working independently. This provided multiple samples of the same plot, each by a different observer. A collection was made for every data point reported here and identifications were verified by either McCune or Rosentreter.

Plots were scattered to include much of the community variation in mature to old forests on the Experimental Forest, including two plots at the top of the highest point, Gisborne Mountain (Table 1).

Species found on the plots (Table 2) included many coastal disjuncts, the most unusual of these being *Cetraria subalpina, Hypogymnia inactiva,* and *Platismatia stenophylla*. The infrequent *C. pallidula* was found in three plots, usually on twigs of *Larix occidentalis*.

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The riparian *Populus* - *Picea* forest hosted several uncommon species, including *Collema furfuraceum, Evernia prunastri, Lobaria hallii, Ramalina dilacerata, R. farinacea,* and *R. thrausta. Lobaria hallii* was unusually abundant on *Populus trichocarpa* in that plot and near the Experimental Forest headquarters.

	Plot	N of Spp	Elev. (m)	Latitude	Longitude
Valley *Pseudotsuga/Tsuga*	A	36	700	48°21'	116°50'
Valley *Pseudotsuga/Tsuga*	B	42	700	48°21'	116°50'
Abies lasiocarpa, S slope	1	27	1705	48°21'	116°45'
Abies lasiocarpa - shrub, N slope	2	28	1705	48°21'	116°45'
Thuja - Tsuga, N slope	3	33	1300	48°21'	116°47'
Thuja - Tsuga, N slope, seepy	4	25	1250	48°21'	116°45'
Thuja - Tsuga creekbottom	5	34	760	48°21'	116°49'
Dry *Pseudotsuga* rocky ridgelet	6	45	800	48°21.5'	116°49'
Picea plantation, valley bottom	7	44	690	48°20'	116°51'
Populus - Picea floodplain	8	40	680	48°20.5'	116°51'
Average number of species		36.5			
Total number of species		89			

Table 1. Plot Characteristics and number of macrolichen species.

The creekbottom *Thuja* forest (plot 5) was fairly typical of such forests in northern Idaho, containing a concentration of epiphytic cyanolichens (*Lobaria, Nephroma*) unusual in the Rocky Mountains. A new crustose lichen for Idaho, *Cyphelium karelicum,* was found by D. Svoboda on bare wood adjacent to a fire scar on the base of a *Thuja plicata* in plot 5.

Two other macrolichens were seen on the plots but not recorded in the data: the P- chemotype of *Stereocaulon tomentosum* (also known as *S. sasakii* var. *tomentosoides*) on plot 7 and *Solorina crocea* on the north side of Gisborne Mountain (Plot 2).

Acknowledgments. We thank Bob Dutton, manager of the Priest River Experimental Forest for his assistance; Toby Spribille and Michael Lolley for organizing the event, and Region 1 of the U. S. Forest Service and Kootenai National Forest for sponsoring the training.

Table 2. Macrolichens in ten plots on Priest River Experimental Forest. Plots A and B contain single abundance ratings based on group consensus. Plots 1 through 8 contain abundance ratings averaged across 3 to 5 observations.

Species	Plots										No.
	A	B	1	2	3	4	5	6	7	8	Plots
Alectoria imshaugii	1	0	2.0	0.0	2.0	2.3	1.0	0.6	1.3	0.0	7
Alectoria sarmentosa	3	3	3.0	2.5	3.3	3.3	2.0	3.0	3.0	1.5	10
Bryoria capillaris	3	2	1.8	0.0	2.0	0.8	0.0	0.6	0.0	0.8	7
Bryoria fremontii	0	3	1.8	1.8	1.3	0.0	3.0	2.4	0.0	1.3	7
Bryoria fuscescens	3	3	2.8	1.0	2.0	0.0	2.0	1.2	2.0	3.0	9
Bryoria glabra	0	0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2
Bryoria pseudofuscescens	0	3	0.0	0.0	0.0	0.3	0.0	0.4	0.8	0.3	5
Cetraria chlorophylla	3	3	3.0	0.0	2.3	2.0	2.0	2.4	2.3	1.3	9
Cetraria merrillii	0	1	0.2	0.0	0.3	0.0	0.0	0.4	0.0	0.0	4
Cetraria orbata	3	2	2.4	0.0	0.8	0.0	0.0	0.0	0.8	0.0	5
Cetraria pallidula	3	3	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	3
Cetraria platyphylla	3	3	3.0	1.5	2.8	1.8	1.0	3.0	0.0	0.8	9
Cetraria subalpina	0	0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1
Cladonia albonigra	3	3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	3
Cladonia cariosa	3	3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3
Cladonia carneola	0	0	0.0	1.0	0.0	0.0	0.0	0.4	2.0	0.0	3
Cladonia cenotea	3	0	0.0	0.0	0.0	0.0	1.0	1.0	3.0	2.5	5
Cladonia cervicornis	0	0	0.0	1.3	0.0	0.0	0.0	1.0	0.5	0.0	3
Cladonia chlorophaea	0	0	0.0	1.8	0.0	0.0	1.0	0.0	0.0	1.5	3
Cladonia coniocraea	0	0	0.0	0.0	0.3	1.3	1.0	0.0	0.8	0.0	4
Cladonia deformis	0	3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5	3
Cladonia ecmocyma	0	0	0.0	2.3	0.0	0.0	0.0	0.0	0.8	0.0	2
Cladonia fimbriata	3	0	1.8	1.8	1.5	0.8	1.3	0.4	1.8	1.0	9
Cladonia multiformis	3	3	0.0	2.3	0.0	0.0	0.0	1.8	2.0	0.0	5
Cladonia ochrochlora	3	3	0.0	0.0	1.3	0.5	1.0	0.8	1.3	0.0	7
Cladonia phyllophora	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1
Cladonia pyxidata	0	0	0.0	0.8	0.3	0.0	0.0	2.6	0.0	0.0	3
Cladonia squamosa	3	0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	2

Cladonia sulphurina	3	0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	2
Cladonia transcendens	0	0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.5	2
Cladonia umbricola *	3	0	0.0	0.0	0.0	0.0	2.0	0.4	0.3	1.5	5
Cladonia verruculosa	0	0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	1
Collema furfuraceum	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1
Esslingeriana idahoensis	3	1	0.2	0.0	2.3	1.5	0.3	1.2	0.0	0.0	7
Evernia prunastri	0	1	0.0	0.0	0.0	0.0	0.0	0.4	0.8	2.3	4
Hypogymnia apinnata	0	0	0.0	0.0	1.8	0.8	0.7	0.0	0.0	0.0	3
Hypogymnia imshaugii	3	3	2.4	3.0	1.8	2.8	3.0	3.0	3.0	1.3	10
Hypogymnia inactiva	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1
Hypogymnia metaphysodes	0	3	0.6	0.0	2.3	2.5	0.0	1.8	1.5	0.8	7
Hypogymnia occidentalis	3	3	0.0	0.8	1.5	0.0	2.3	2.8	2.0	0.3	8
Hypogymnia physodes	3	3	1.4	1.5	3.0	2.8	3.0	3.0	3.0	2.5	10
Hypogymnia rugosa	0	0	1.6	0.0	1.0	2.0	0.0	0.4	0.0	0.0	4
Hypogymnia tubulosa	3	3	3.0	2.3	2.0	1.3	1.0	1.2	0.0	0.0	8
Leptogium saturninum	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1
Letharia vulpina	3	3	2.4	1.8	2.8	2.8	0.3	2.6	1.3	2.0	10
Lobaria hallii	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.5	2
Lobaria pulmonaria	3	0	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	2
Melanelia exasperatula	0	0	0.0	0.0	1.5	0.0	0.0	0.2	0.0	1.0	3
Melanelia multispora	0	0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	1.5	2
Melanelia subaurifera	0	0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1
Melanelia subelegantula	0	0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1
Nephroma helveticum	0	1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	2
Nephroma parile	0	3	0.0	0.0	0.0	0.0	2.0	1.0	0.0	0.0	3
Nephroma resupinatum	0	1	0.0	0.0	0.0	0.0	0.7	0.0	0.5	0.0	3
Nodobryoria abbreviata	3	1	0.4	0.0	1.0	0.5	0.0	0.0	0.0	0.0	5
Nodobryoria oregana	0	1	1.2	0.8	0.3	2.0	0.0	0.0	0.8	0.0	6
Parmelia hygrophila	3	3	2.2	0.0	1.5	0.8	2.7	0.6	1.5	0.0	8
Parmelia sulcata	3	3	0.6	0.0	0.5	1.5	1.3	2.4	2.5	2.0	9
Parmeliopsis ambigua	3	3	3.0	2.0	3.0	3.0	2.7	2.8	2.3	1.8	10
Parmeliopsis hyperopta	3	3	2.4	2.8	2.8	2.3	2.0	1.0	1.8	2.0	10
Peltigera aphthosa	0	0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	1
Peltigera britannica	0	0	0.0	0.0	0.0	0.0	0.0	0.4	2.3	0.0	2
Peltigera canina	0	0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	1

Peltigera cinnamomea	0	3	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.5	3
Peltigera collina	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.8	2
Peltigera didactyla	3	2	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	3
Peltigera elisabethae	0	3	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	2
Peltigera kristinssonii	0	0	0.0	1.0	0.0	0.0	0.0	0.6	0.0	0.0	2
Peltigera leucophlebia	3	3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	3
Peltigera membranacea	3	3	0.0	1.5	0.0	0.8	2.0	1.0	0.0	2.0	7
Peltigera neopolydactyla	3	0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	2
Peltigera ponojensis	0	0	0.0	1.3	0.0	0.0	0.0	1.8	0.0	0.0	2
Peltigera praetextata	0	3	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	2
Peltigera rufescens	0	0	0.0	0.0	0.0	0.0	0.0	0.6	0.8	0.0	2
Peltigera venosa	3	0	0.0	1.8	0.3	0.0	0.0	0.0	0.0	0.0	3
Platismatia glauca	3	3	3.0	2.3	3.5	3.0	3.0	3.0	3.0	3.0	10
Platismatia stenophylla	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1
Polychidum muscicola	0	0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	1
Ramalina dilacerata	0	0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.8	2
Ramalina farinacea	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1
Ramalina thrausta	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1
Usnea filipendula group	0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	2
Usnea glabrata	0	0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1
Usnea lapponica	3	2	0.0	0.0	0.0	0.0	0.0	1.0	1.5	3.0	5
Usnea scabrata	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1
Vulpicida canadensis	0	3	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.3	3
Xanthoria candelaria	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1
Xanthonia polycarpa	0	0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2
Xanthoparmelia cumberlandia[t]	0	0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	1
Number of Observers	18	18	5	4	4	4	3	5	4	4	

* "*Cladonia umbricola*" includes all non-fruiting UV+ subulate species
t = Needs confirmation with TLC

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The genus *Dicranum* (Musci: Dicranaceae) in Maine

Bruce Allen[1]

Dicranum is a genus of about 100 species found primarily in the Northern Hemisphere. It is an acrocarpous moss that usually grows terrestrially on soil or humus in both forests and exposed situations, and is also encountered on humus over rocks and boulders. Occasionally the genus is found on tree trunks or on bare rocks. Most *Dicranum* species have a strong single costa, usually well-developed alar cells, elongate and porose basal cells, long-rostrate opercula, vertically striate-papillose peristome teeth that are divided half-way, and cucullate calyptrae. In terms of species number it is one the largest genera, as well as one of the mostly commonly encountered mosses, in the Maine flora. Most of the Maine species can be recognized in the field and the combination of large species number, its prevalence, and distinguishability make the genus especially fun to collect.

The genus has been subdivided into seven sections: *Dicranum*, *Spuria* B.S.G., *Fuscescentiformia* Kindb., *Muehlenbeckia* Peters. *ex* Nyholm, *Elongata* Hag., *Crassinervia* Roth, and *Montana* Hartm. (Bellolio-Trucco & Ireland 1990; Nyholm 1987). Two of these sections (*Crassinervia* and *Montana*) are here segregated as the genus *Orthodicranum* Loeske, which was also done by Peterson (1979). Drawing meaningful sectional boundaries around the remaining five sections is difficult because of character-state reticulation. Removing these characters from sectional consideration results in three sections each marked by a single odd feature (*Elongata*, *Fuscescentiformia* and *Muehlenbeckia*) and one section (*Spuria*) that lacks any distinctive feature. In this treatment only two sections are used: section *Dicranum* and an expanded section *Spuria*.

The name *Dicranum* is derived from the Greek "*dikranon* – a pitchfork" in reference to its divided or forked peristome teeth.

Dicranum Hedw., Sp. Musc. Frond. 126. 1801.

Plants small to robust in dense or loose tufts, yellowish green to dark green, dull or shiny; stems tomentose, central strand present. Leaves erect-spreading, falcate-secund, erect-appressed, spreading, straight, crispate or contorted when dry, smooth or rugose, lanceolate to ovate-lanceolate, subulate, acuminate, acute or obtuse, smooth or papillose at back, concave or keeled above, laminal cells uni- or

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bistratose; marginal cells uni- or bistratose, plane or incurved, serrate to entire; costa strong, ending below the apex to percurrent or short-excurrent, smooth, papillose, mammillose, toothed to serrate or with serrate ribs at back, in cross-section guide cells and stereids differentiated, at times with the outer ventral and/or dorsal surface layer of cells enlarged; upper cells oblate, quadrate, subquadrate, triangular, rectangular to elongate, thick- or thin-walled, porose or straight-walled; lower cells usually elongate, porose or straight-walled; alar cells usually well developed, bistratose. Dioicous with full-sized male plants or pseudautoicous with dwarf male plants. Setae long, single or aggregate; capsules cylindric, suberect to curved and inclined, variously furrowed when dry, stomatose at base of capsule, opercula rostrate, annuli usually rudimentary, deciduous or persistent; peristome teeth 16, divided to the middle, vertically striate-papillose below, papillose above. Spores finely papillose. Calyptrae cucullate, smooth, entire.

1. Leaf tips broken, leaves stiffly erect-incurved when dry ... *Orthodicranum viride*
1. Leaf tips intact, leaves erect-spreading, falcate-secund, or crisped when dry . 2
    2. Plants with stout, terete, flagellate branches bearing erect, non-contorted leaves. ..... *Orthodicranum flagellare*
    2. Plants without flagellate branches or flagellate branches weakly developed, bearing reduced, contorted, and crispate leaves ... 3
3. Upper leaf cells porose-pitted and sinuose, generally elongate 4
3. Upper leaf cells not or indistinctly pitted and sinuose, short, irregularly quadrate to sub-rectangular 8
    4. Leaves wide-spreading, strongly undulate; perichaetia often with multiple setae ..... *Dicranum polysetum*
    4. Leaves erect-spreading or secund, smooth or weakly undulate; perichaetia with single or multiple setae 5
5. Leaves mostly over 10 mm long; costa at midleaf with a double row of guide cells; perichaetia often with multiple setae ..... *Dicranum majus*
5. Leaves mostly less than 9 mm long; costa nearly always with a single row of guide cells; perichaetia with single setae 6
    6. Leaves falcate-secund, lanceolate, keeled above, apex sharply acute, margins strongly serrate above; costa with 2–4 sharp, well-developed ridges on upper dorsal surface .. *Dicranum scoparium*
    6. Leaves erect to appressed, broadly ovate-lanceolate, concave above, apex acute to broadly acute or obtuse, margins entire to weakly

serrulate or serrate above; costa smooth or with 1–2 weak ridges on upper dorsal surface 7

7. All leaves entire to weakly serrulate; plants of ombrotrophic bogs ..... [*D. leioneuron*]

7. Leaves subentire, serrulate or serrate; plants of eutrophic bogs or dry, exposed habitats ..... *D. bonjeanii*

8. Leaf cells bistratose above ..... *Orthodicranum fulvum*

8. Leaf cells unistratose above or bistratose only on the margins 9

9. Cells of the upper leaf margins partially or entirely bistratose 10

9. Cells of the upper leaf margins unistratose 11

10. Leaves slightly undulate at base; leaf cells irregularly shaped and rounded at the corners, not in distinct rows; upper margins slightly serrulate with few bistratose regions; costa smooth to slightly papillose above ..... *D. acutifolium*

10. Leaves smooth at base; leaf cells regularly shaped and sharply angled, in more or less distinct rows; upper margins sharply serrate with extensive bistratose regions on both sides; costa usually spinose above ..... *D. fuscescens*

11. Alar cells unistratose; capsules erect 12

11. Alar cell bistratose; capsules curved 13

12. Dry leaves slightly crisped to falcate-secund, cells smooth or slightly papillose at back ..... *Orthodicranum flagellare*

12. Dry leaves strongly crisped, cells bulging to papillose at back ..... *Orthodicranum montanum*

13. Leaves keeled above 14

13. Leaves concave above 16

14. Leaves erect, weakly contorted, undulate when dry, broadly acute or obtuse; costa often subpercurrent; upper leaf cells 12--32µm long, smooth or weakly papillose at back, rarely with projecting teeth at back; perichaetia with single setae ..... *Dicranum undulatum*

14. Leaves spreading, crispate, not or undulate mostly at margins when dry, acute; costa percurrent to shortly excurrent; upper leaf cells 3.5--17 µm long, strongly papillose and often with projecting teeth at back; perichaetia with single or multiple setae 15

15. Leaves to 9 mm long, wide-spreading from base, strongly crispate often secund above, slightly but consistently undulate at least at the margins; setae multiple ..... *Dicranum ontariense*
15. Leaves to 5 mm long, erect-incurved from the base, weakly crispate, not secund, not or indistinctly undulate; setae single .. *Dicranum condensatum*
    16. Leaves undulate, broadly ovate-lanceolate, cells sharply and irregularly subquadrate to triangular, walls unevenly thickened, coarsely papillose at back ..... *Dicranum spurium*
    16. Leaves not undulate, narrowly lanceolate, cells quadrate, elliptical or rectangular, walls evenly thickened, not or moderately papillose at back 17
17. Leaves falcate-secund to erect-patent when dry; costa in cross-section with a surface layer of enlarged cells above the ventral stereids ....*[Dicranum muehlenbeckii]*
17. Leaves erect-appressed when dry; costa in cross-section without a ventral layer of enlarged cells above the ventral stereids ..... *Dicranum elongatum*

Dicranum* section *Dicranum

Plants medium to robust, to 15 cm high. Leaves undulate or smooth, falcate-secund, wide-spreading to erect-spreading or erect, lanceolate to ovate-lanceolate, apex acuminate, acute, or obtuse; upper cells usually elongate, porose-pitted and sinuose; costa percurrent to excurrent, median cross-section with one or two rows of guide cells, 2 stereid bands, cells in ventral or dorsal surface layer sometimes enlarged and thin-walled, often 2–4 ridged on upper, dorsal surface, ridges serrate or toothed, occasionally smooth at back. Pseudautoicous or dioicous. Capsules suberect to inclined, nearly smooth to strongly ribbed; annulus rudimentary, of several rows of thin-walled persistent cells.

In section *Dicranum* the species commonly have long, porose upper leaf cells and a costa that is variably ridged at back. Although the section is fairly easy to recognize there are some species (i.e., *D. leioneuron*) that have short upper leaf cells and non-ridged costae, while plants formerly placed in section *Elongata* can have long, porose upper leaf cells. The annulus in section *Dicranum* is often given as absent. In this study I have found the annulus in section *Dicranum* to be rudimentary but differentiated, consisting of several rows of thinner-walled,

horizontally elongated cells. This annulus type is not significantly different from that found in some members of section *Spuria*.

1. *Dicranum bonjeanii* De Not *in* Lisa, Elenc. Musch. 29. 1837.

Plants medium, glossy, green or yellowish-green above, brownish below. Stems to 6 cm long. Leaves crowded, erect when wet, erect to erect-spreading, sometimes twisted at apex when dry, broadly ovate-lanceolate, smooth or lightly undulate at back, 4–5 mm long, broadly acute to obtuse, tubulose to concave above; margins incurved below, involute above, subentire, serrulate or serrate; costa subpercurrent, percurrent to short-excurrent; cells smooth, upper cells rhomboidal to short rectangular, thick-walled, sinuose, porose, 22–62 µm x 10–18 µm, basal cells rectangular-elongate, thick-walled, sinuose, porose, 50–120 µm x 10–15 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae 1 per perichaetium, 18–25 mm long, yellow, becoming red with age; capsules curved, inclined to horizontal, cylindric, not strumose, weakly furrowed, 2.5.–3.0 mm long; opercula 2 mm long. Spores lightly papillose, 17–25 µm. Calyptra not seen.

On hummocks in bogs or terrestrial on soil and humus over rocks and boulders, often in full and direct sunlight. In Maine known from Knox (*Allen & Allen 6059* MO); Hancock (*Allen 3732* MO), Lincoln (*Allen 1257* MO); Somerset (*Allen 9403* MO), Waldo (*Allen 10335* MO), and Washington (*Leonardi 269* NYS) Counties.

Dicranum bonjeanii is treated here in a broad sense to include medium sized plants with erect to erect-spreading, broadly ovate-lanceolate, concave leaves that are sometimes twisted at apex when dry, and often subentire to serrulate above. Its upper leaf cells are short, thick-walled, and porose and its costa is slightly ridged at back. This treatment of the species includes two expressions that are ecologically and somewhat morphologically distinct. The first expression is usually found on soil over rocks or is terrestrial in forests and often grows in full and direct sunlight. This expression (all of the collections cited above) has smooth leaves, broadly acute to obtuse leaf apices, and leaf margins that are variably serrate. Often within a single collection there are some plants with leaves that are obtuse and nearly entire and other plants with acute, serrate leaves. This expression grades into *D. scoparium*. The second expression is found in bogs (Washington County, *Pedano 627* MO, *Leonardi 283* NYS, *Miller 11804* NYS) and appears to match more

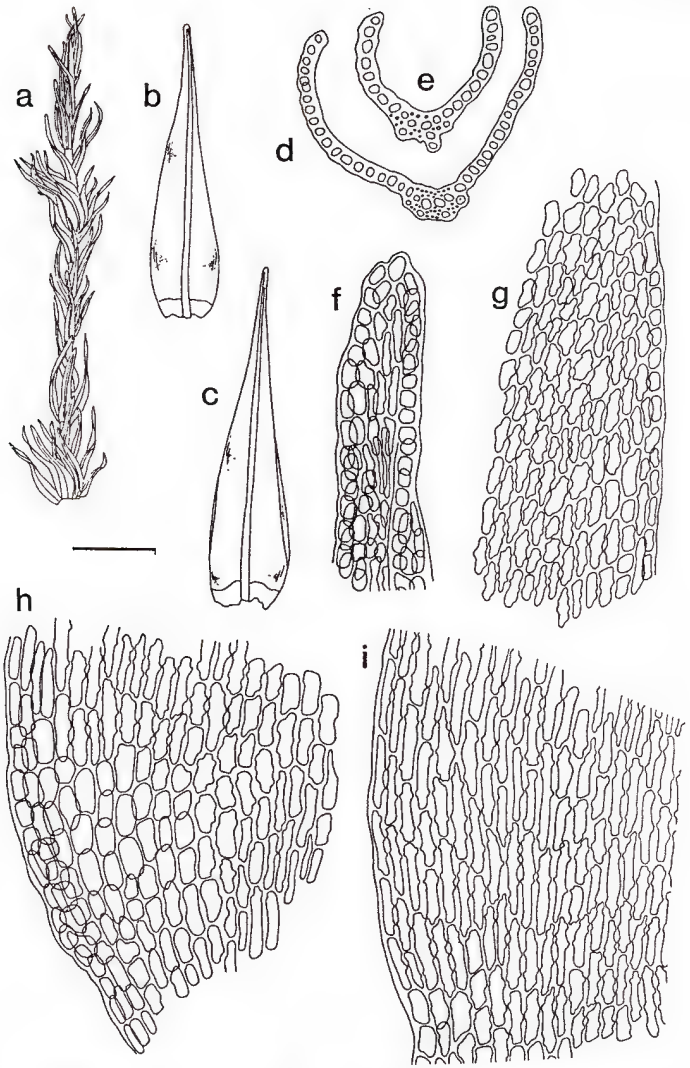

Figure 1. *Dicranum bonjeanii*. a. Habit. b. & c. Leaves. d. & e. Leaf cross-sections. f. Leaf apex. g. Median leaf cells at margin. h. Alar cells. i. Basal leaf cells at margin above alar region. Scales in mm: bar = 0.01 (e–ii); bar = 0.57 (d,e); bar = 1.7 (a). All figures from *Allen 9403* (MO).

closely the European concept of *D. bonjeanii*. It has narrow leaves that are undulate at base, acute at the apex, and sharply serrate. This expression approaches *D. leioneuron* but that species differs in having more rounded obtuse leaf apices, less pronounced dorsal ridges on its costa, and leaves with leaf margins entire to slightly serrulate. The two species apparently occupy different habitats, *D. leioneuron* occurs in ombrotropic bogs, while this second expression of *D. bonjeanii* is found in eutropic bogs (Ahti & Isovitta 1962).

2. *Dicranum leioneuron* Kindb. *in* Macoun, Bull. Torrey Bot. Club 16: 92. 1889.

Plants medium, glossy, green or yellowish-green above, brownish below. Stems to 4 cm long. Leaves crowded, erect when wet, erect to erect-spreading, twisted at apex when dry, broadly ovate-lanceolate, smooth at back, 4–5 mm long, broadly acute to obtuse, tubulose to concave above; margins incurved below, involute above, entire; costa subpercurrent, smooth to slightly roughened at back; cells smooth, upper cells rhomboidal to short rectangular, thick-walled, sinuose, porose, 25–62 µm x 12–18 µm, basal cells rectangular-elongate, thick-walled, sinuose, porose, 50–120 µm x 10–15 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Sporophytes not seen. "Setae solitary, 2.0–2.5 cm long, yellow to reddish yellow; capsules yellow, arcuate, inclined, more or less] furrowed when dry, 2.5–3.0 mm long; operculum 1.5–2.0 mm long; spores 14–24 µm." (Bellolio-Trucco & Ireland 1990).

On hummocks in ombrotrophic, raised and blanket bogs. Not yet collected in Maine.

Dicranum leioneuron is a boreal species known from Canada and northwestern Europe. Ahti & Isoviita (1962) considered it a pronounced ombrotrophic species characteristic of raised and blanket bogs in the coastal zones of those areas. The species is not yet known from Maine, but it occurs nearby in Nova Scotia and there are many suitable raised/blanket bog habitats for its occurrence in Maine (see Nichols 1918; Worley 1980).

Dicranum leioneuron has erect to erect-spreading, concave to tubulose, broadly ovate-lanceolate leaves that are often obtuse at the apex. Its upper leaf cells are short and broad, its leaf margins smooth to faintly serrulate, and its costa is smooth to slightly ridged on the upper dorsal surface. This combination of charcteristics

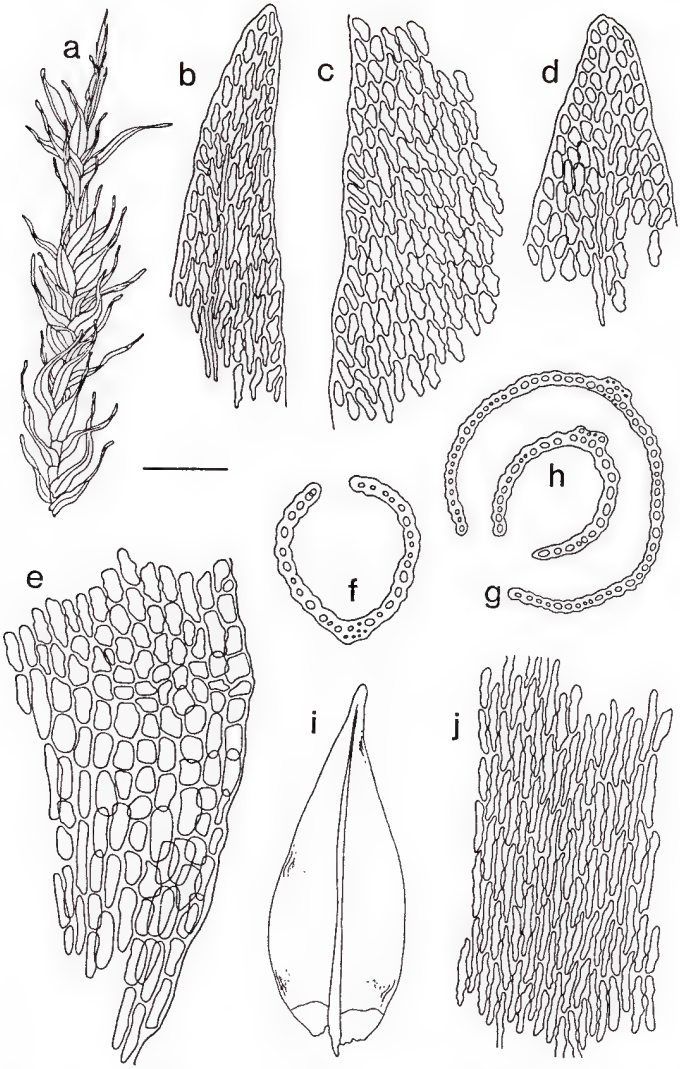

Figure 2. *Dicranum leioneuron*. a. Habit. b. & d. Leaf apices. c. Median leaf cells at margin. e. Alar cells. f., g. & h. Leaf cross-sections. i. Leaf. j. Basal leaf. cells. Scales in mm: bar = 0.1 (b,c,d,e,f,g,h,j); bar = 0.79 (i); bar = 2.55 (a). All figures from *Ireland 11826* (MO)

would seem to easily distinguish it from *D. scoparium* which typically has falcate-secund, keeled, lanceolate leaves that are sharply acute at the apex, sharply serrate leaf margins and have 2–4 spinose ridges on the back of the costa. However, *D. scoparium* is extremely variable in all of its features and apparently has expressions that grade into *D. leioneuron*. Crum and Anderson (1981) took a broad view of *D. scoparium* and incorporated both *D. leioneuron* and *D. bonjeanii* into that species. *Dicranum leioneuron* and *D. bonjeanii* are very similar. They differ somewhat in costal ornamentation (the dorsal ridges of *D. bonjeanii* tend to be more pronounced than those of *D. leioneuron*), and subtly in their leaf margins. In *D. leioneuron* all leaf margins are entire to slightly serrulate, while in single collections of *D. bonjeanii* some plants have leaves that are nearly entire and others have at least a few leaves that are bluntly serrate or dentate. The two species also appear to occupy different habitats, *D. leioneuron* occurs in ombrotrophic bogs, while *D. bonjeanii* is found in eutrophic bogs and in a forests on thin soil over rocks, sometimes in full and direct sunlight.

3. *Dicranum majus* Sm., Fl. Brit. 3: 1202. 1804.

Plants robust, glossy, green or yellowish-green. Stems to 12 cm long. Leaves falcate-secund when wet or dry, lanceolate from an ovate base, smooth or slightly undulate when dry, 9–11 mm long, gradually and narrowly acuminate, concave above; margins erect, serrate above; costa percurrent to short excurrent, toothed above on dorsal surface, in cross-section with two rows of guide cells, two stereid bands, and the dorsal surface layer of enlarged cells; cells smooth, upper cells elongate to oval, incrassate, pitted and sinuose, 42–68 µm x 7–10 µm, basal cells elongate, incrassate, pitted and sinuose, 50–112 µm x 10–12 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae 1–5 per perichaetium, 25–45 mm long, yellow; capsules curved, inclined to horizontal, cylindric, strumose, furrowed, 2.5.–3.5 mm long; opercula 2–3 mm long. Spores lightly papillose, 17–25 µm. Calyptra 6–7 mm long.

On humus over rock or soil in moist coniferous woods or *Thuja*-swamps. In Maine known from Hancock (*s.coll.* MAINE), Knox (*True* NY), Lincoln (*Allen 1319* MO), Oxford (*Holms 253* MO), Sagadahoc (*Davis* NY), and Washington (*Merello & Merello 17* MO) Counties. Reported from Androscoggin County (Parlin 1939).

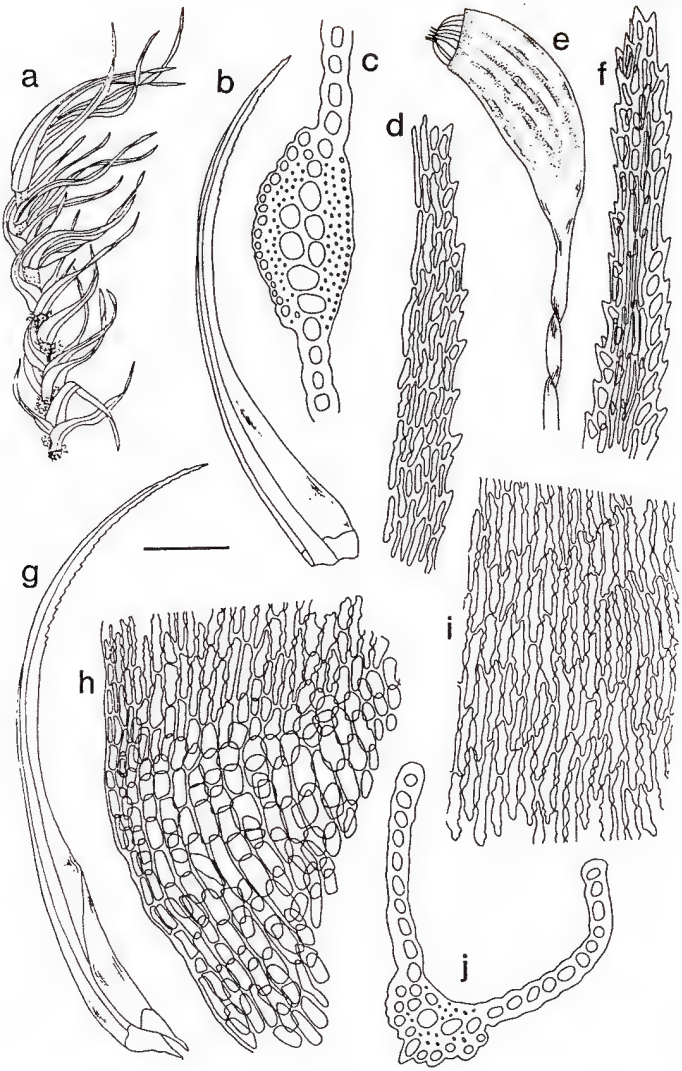

Figure 3. *Dicranum majus*. a. Habit. b. & g. Leaves. c. Cross-section at midleaf. d. Upper leaf cells at margin. e. Capsule. f. Leaf apex. h. Alar cells. i. Median leaf cells. j. Cross-section at upper leaf. Scales in mm: bar = 0.05 (c,j); bar = 0.1 (d,f,h,i); bar = 1.2 (b,e,g); bar = 2.83 (a). All figures from *Allen 1319* (MO).

Dicranum majus is a robust species with long slender, falcate-secund leaves that are toothed, not ridged, on the dorsal surface of the costa. It has the general aspect of a robust collection of *D. scoparium* but differs from that species in having perichaetia with multiple setae, and a costa that is toothed rather than ridged at back and, two rows of guide cells in its costa. The development of the second row of guide cells in the costa of this species is variable. Often this second row extends throughout the width of the costa, but at other times it is reduced to one or two guide cells in the median part of the cross-section. *Dicranum scoparium* is a distressingly variable species and some especially robust collections (e.g., *Allen 10185*) can have a second row of one or two guide cells in the median part of the cross-section. *Dicranum majus* differs from these robust expressions of *D. scoparium* in having a complete layer of enlarged cells on the dorsal surface of the costa, and perichaetia with multiple yellow setae. In *D. scoparium* the dorsal surface has a few enlarged cells separated by small, thick-walled stereid cells, and the perichaetia have single setae that are red at maturity. Crum and Anderson (1981) noted that the leaves of *D. majus* can have streaks of bistratose cells in the upper part of the leaf, but this feature is not always easy to see. *Dicranum majus* is a species of the moist, coastal regions in Maine, but it has also been found in moist inland stations.

4. *Dicranum polysetum* Sw., Monthly Rev. 34: 538. 1801.
Dicranum undulatum Ehrh. ex Hoffm., Deutschl. Fl. 2: 39. 1796.
Dicranum rugosum Brid., Musc. Recent., Suppl. 1. 175. 1806.

Plants medium to robust, glossy, green or yellowish-green, with dense white or reddish-brown tomentose. Stems 3–12 cm long. Leaves spreading and flexuose, occasionally somewhat secund, when wet or dry, lanceolate, 7–10 mm long, gradually and narrowly acuminate, keeled, undulate; margins plane to erect above, broadly recurved at base, sharply serrate above; costa percurrent to subpercurrent, with 2 serrate ridges on upper dorsal surface, ridges toothed, in cross-section with one row of guide cells, two stereid bands; cells smooth, upper cells elongate, incrassate, pitted and sinuose, 37–100 µm x 10–12 µm, basal cells elongate, incrassate, pitted and sinuose, 62–125 µm x 10–20 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae 1–5 per perichaetium, 20–35 mm long, yellow, becoming red with age, capsules curved, inclined to horizontal, cylindric, not strumose, furrowed, 2.5.–3.5 mm long; opercula 2.5–3 mm long, rostra often curved upward.

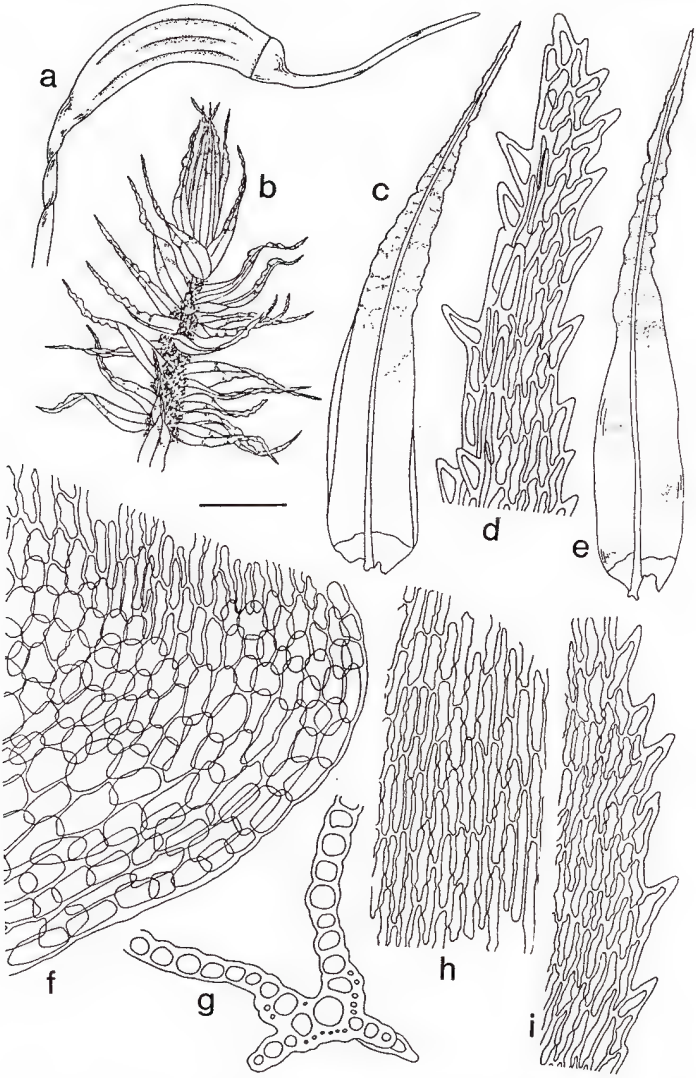

Figure 4. *Dicranum polysetum*. a. Capsule and operculum. b. Habit. c. & e. Leaves. d. Leaf apex. f. Alar cells. g. Leaf cross-section. h. Basal leaf cells. i. Upper leaf cells at margin. Scales in mm: bar = 0.1 (d,f,h,i); bar = 0.05 (g); bar = 1.13 (a); bar = 1.36 (c,e); bar = 3.4 (b). All figures from *Allen 14607* (MO).

Spores slightly papillose, 15–25 µm. Calyptra 5–6.5 mm long.

On humus or soil over rocks, boulders, cliffs, and on forest (*Spruce-Fir*) floor. In Maine known from Androscoggin (*Allen 14675* MO), Aroostook (*Pursell 11415* MO), Cumberland (*Allen 19986* MO), Franklin (*Allen 15863* MO), Hancock (*Allen 3733* MO), Kennebec (*Allen 14782* MO), Knox (*Allen & Allen 6056* MO); Lincoln (*Allen 1267* MO); Oxford (*Allen 16703* MO), Penobscot (*Merrill 12* MO), Piscataquis (*Richards & Cooper 94A* MAINE), Sagadahoc (*Allen 14606* MO), Somerset (*Allen 9365* MO), Waldo (*Allen 10382* MO), Washington (*Pedano 613* MO), and York (*Mann* NY) Counties.

Dicranum polysetum is commonly found on the forest floor, but when it occurs on rocks or boulders it is always associated with a layer of soil or humus. It has spreading, strongly undulate leaves that glisten when dry, perichaetia with generally multiple setae, and is nearly always densely tomentose. The tomentum can be either white or reddish-brown. Microscopically, *D. polysetum* has long, porose and pitted cells throughout the leaf, sharply serrate upper leaf margins, broadly recurved lower leaf margins, and 2 distinctive ridges on the upper dorsal surface of the costa that have one or two rows of teeth.

This species could be confused with *D. undulatum* since both species have undulate leaves, but *D. undulatum* is monosetous, has erect-incurved leaves with smooth to slightly roughened costae, serrulate leaf margins, broadly acute to obtuse leaf apices, and shorter, smooth-walled upper leaf cells. *Dicranum ontariense* is similar to *D. polysetum* in being polysetous and in having somewhat undulate leaves. It differs from *D. polysetum* in having narrower, contorted to crispate leaves, undulations generally restricted to the marginal area of the leaf, papillose to spiculose roughened costae, and short, smooth-walled upper leaf cells that are often papillose at back.

5. *Dicranum scoparium* Hedw., Sp. Musc. Frond. 126. 1801.

Plants medium to robust, dull or glossy, green or yellowish-green above, brownish below, with dense white or reddish-orange tomentose. Stems 3–9 cm long. Leaves crowded, falcate-secund to erect-spreading when wet or dry, smooth to somewhat undulate, narrowly or broadly lanceolate, smooth at back, 4–9 mm long, gradually acuminate, keeled above; margins erect below, incurved above, strongly serrate

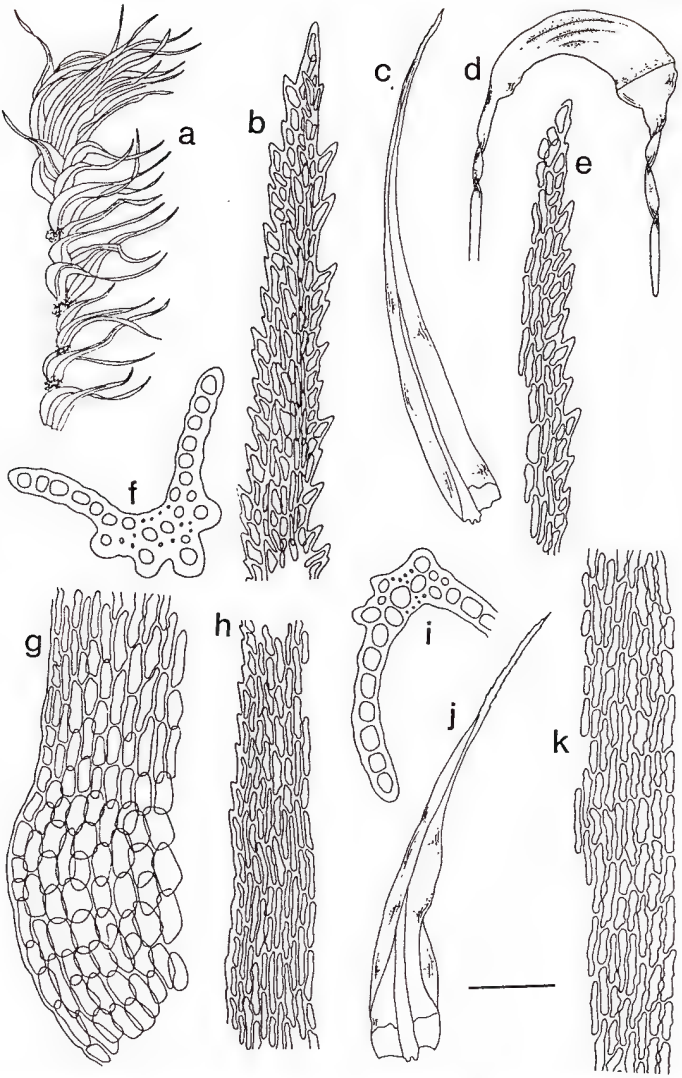

Figure 5. *Dicranum scoparium*. a. Habit. b. Leaf apex. c. & j. Leaves. d. Capsule and operculum. e. Upper leaf cells at margin. f. & i. Leaf cross-sections at upper leaf. g. Alar cells. h. Median leaf cells at margin. k. Basal leaf cells. Scales in mm: bar = 0.05 (f,i); bar = 0.1 (b,e,g,h,k); bar = 1.05 (c,j); bar = 1.19 (d); bar = 3.52 (a). All figures from *Allen 10248* (MO).

above; costa percurrent to short excurrent, strongly 2–4 serrate-ridged at back; cells smooth, upper cells subrectangular, rectangular, to elongate, thick-walled, porose and sinuose, 20–87 μm x 7.5–12.5 μm, basal cells rectangular-elongate, thick-walled, porose and sinuose, 32–125 μm x 5–10 μm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae single, 17–40 mm long, yellow becoming red with age, capsules exserted, curved, suberect to horizontal, cylindric, smooth or variously furrowed, 2.5–5 mm long, struma present or absent; opercula inclined, long-rostrate, 3–4 mm long. Spores slightly papillose, 15–20 μm. Calyptra 5–6 mm long.

On humus or soil on ground in woods, bogs or exposed situations, on stream banks, or along trails, over boulders, rotting wood, rarely on bark of tree trunks (*Quercus*). In Maine known from Androscoggin (*Merrill 18* MAINE), Aroostook (*Pursell 11406* MO), Cumberland (*Allen 15920* MO), Franklin (*Pursell 11139* MO), Hancock (*Allen 2085* MO), Kennebec (*Merrill 16* MO), Knox (*Allen 14640* MO), Lincoln (*Allen 1543* MO), Oxford (*Allen 16718* MO), Penobscot (*Allen 16517* MO), Piscataquis (*Merrill 155* MO), Sagadahoc (*Allen 16601* MO), Somerset (*Allen 9325* MO), Waldo (*Solomon 20165* MO), Washington (*Merello & Hawthorne 6* MO), and York (*Allen 13044* MO) Counties.

Dicranum scoparium is a very common and variable species in Maine. It occurs in many moist or dry forest habitats and can also tolerate disturbed situations such as roadsides or pathways. Usually the species can be recognized by its short falcate-secund leaves that are strongly keeled and sharply serrate, and perichaetia with single setae. The setae in *D. scoparium* are yellow at first but become dark red with age. As with *D. polysetum* the plants often have a dense mat of white or reddish-brown tomentum. Microscopically, its keeled leaves, long, porose and sinuose upper leaf cells, sharply serrate leaf margins, and costae that have 2-4 well-developed serrate to toothed ridges on the upper dorsal surface are good diagnostic features of the species. Plants that occur on humus or soil over boulders and rocks often are smaller and more compact.

While the species is extremely variable in nearly all aspects, there are two especially confusing expressions of the species. The first is a compact form with broadly ovate-lanceolate leaves, weakly keeled leaves that are more or less erect to erect-spreading, short upper leaf cells, weakly serrulate to nearly smooth upper

leaf margins, and poorly developed ridges on the upper dorsal surface of the costa. This expression closely approaches *D. leioneuron* or *D. bonjeanii.* At the other extreme is a robust expression (*Allen 10185* MO) that closely approaches *D. majus* in size, aspect, and in having a second row of one or two guide cells in the median part of the costal cross-section. *Dicranum majus* differs from this robust expression of *D. scoparium* in having a complete layer of enlarged cells on the dorsal surface of the costa and perichaetia with multiple setae that are yellow at maturity. In *D. scoparium* the dorsal surface has a few enlarged cells separated by small, thick-walled stereid cells, and the perichaetia have single setae that are red at maturity.

***Dicranum* sect. *Spuria* B.S.G.**, Bryol. Eur. 1:118. 1847 (fasc. 37–40 Mon. 12).

Dicranum sect. *Fuscescentiformia* Kindb., Eur. N. Amer. Bryin. 2: 197. 1897.

Dicranum sect. *Elongata* Hag. Kongel. Norske Vidensk. Selsk. Skr. 1914(1): 140. 1915.

Dicranum sect. *Muehlenbeckia* Peterson *ex* Nyholm, Illus. Fl. Nord. Moss. 1: 53. 1987.

Plants medium to robust. Leaves undulate or smooth, falcate-secund, wides-spreading to erect-spreading or erect, lanceolate to ovate-lanceolate, apex acuminate, acute, or obtuse; upper cells usually short, occasionally elongate, usually straight-walled, occasionlly porose-pitted; costa percurrent to excurrent, median cross-section with one row of guide cells, 2 stereid bands, cells in ventral surface layer enlarged, thin-walled or short, thick-walled, smooth or papillose at back. Pseudautoicous or dioicous. Capsules suberect to curved, nearly smooth to strongly ribbed; annulus rudimentary, of several rows of thin-walled, deciduous or persistent cells.

Section *Spuria* is used here in a broad sense since the above four sections grade so closely into one another in most features. Three of the sections (*Elongata, Fuscescentiformia* and *Muehlenbeckia*) are marked by a single odd feature while section *Spuria*, in the narrow sense, is devoid of distinguishing features. Section *Elongata* is marked by plants with long, often porose upper leaf cells remarkably similar to those seen in section *Dicranum*. Section *Muehlenbeckia* is based solely on its unusual costa which has a ventral layer of enlarged cells. The same feature is also seen in some members of section *Dicranum*. Section *Fuscescentiformia* is based on the presence of full-sized rather than dwarf male plants, and upper leaf

cells in distinct rows. Full-sized male plants, however, are found in members of section *Elongata*, while the leaf cell feature is neither constant within the section nor absent from members of other sections.

6. *Dicranum acutifolium* (Lindb. & Arnell) C. Jens. *ex* Weinm., Förteckn. Skand. Växt. Moss. 2: 8. 1937.
Dicranum bergeri var. *acutifolium* Lindb. & Arnell, Kongl. Svenska Vetensk. Acad. Handl. 23(10): 79. 1890.

Plants medium, dull, green or yellowish-green above, brownish below. Stems to 7 cm long. Leaves crowded, falcate to erect-spreading when wet, falcate-secund, falcate, erect-spreading, to somewhat flexuose or curled when dry, slightly undulate at base, lanceolate, smooth to slightly papillose at back, 5–6 mm long, acuminate, keeled above; margins erect below, involute above, weakly and irregularly serrulate above, with few areas of bistratose cells on one or both margins; costa excurrent, smooth to slightly papillose at back; cells smooth or slightly papillose at back, upper cells irregularly rounded, subquadrate, short-rectangular, or oblate, not in distinct rows, thick-walled, not porose, 10–25 µm x 7.5–12.5 µm, basal cells rectangular-elongate to elongate, thick-walled, straight-walled or weakly porose, 37–75 µm x 5–10 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Sporophytes not seen. "Setae solitary, 1.5–2.5 cm long, yellowish to reddish yellow; capsules brown to reddish brown, arcuate, inclined to horizontal, furrowed when dry, rarely slightly stumose, 2.0–2.5 mm long; operculum 1.5–2.5 mm long; spores 14–28 µm." (Bellolio-Trucco & Ireland 1990).

On cliffs, Hamilin Peak and summit of Mt. Katahdin. In Maine known from Piscataquis (*Crane 582* MO; *Briggs 2* NY) County.

Dicranum acutifolium is an arctic-alpine species that is difficult to recognize because it is so similar to some expressions of *D. fuscescens*. Both species have bistratose cells on the leaf margins and falcate-secund leaves that are flexuose to curled when dry. *Dicranum acutifolium* is usually a larger plant than *D. fuscescens* with leaves weakly undulate at base, leaf margins with few areas of bistratose cells and slightly serrulate, a smooth to weakly papillose costa, irregularly shaped and rounded upper leaf cells, and dwarf male plants. In contrast, *D. fuscescens* has leaves smooth at base, sharply serrate upper leaf margins with extensive areas of

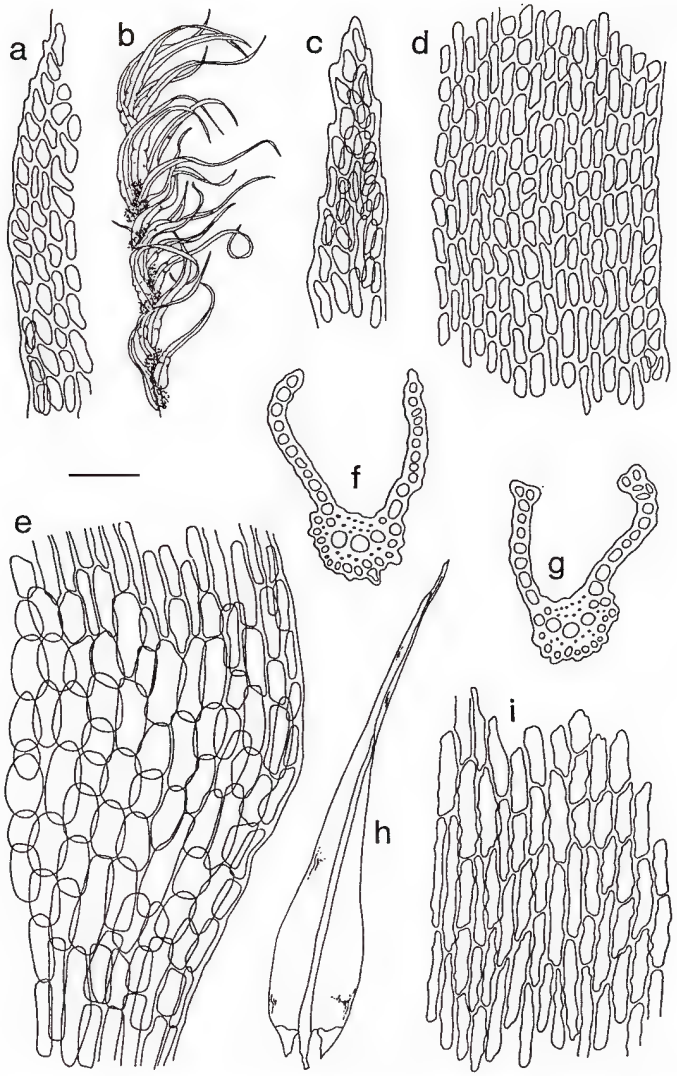

Figure 6. *Dicranum acutifolium*. a. Upper leaf cells at margin. b. Habit. c. Leaf apex. d. Median leaf cells at margin. e. Alar cells. f. & g. Cross-sections at upper leaf. h. Leaf. i. Basal leaf cells. Scales in mm: bar = 0.05 (a,c,d,e,f,g,i); bar = 0.7 (h); bar = 1.8 (b). Figures b,f,g,i from *Crane 582* (MO), figures a,c,d,e,h from *Briggs 2* (NY).

bistratose cells, a costa that is usually toothed to sharply serrate at back, regularly shaped and sharply angled upper leaf cells that occur in distinct rows, and full-sized male plants.

This species, also known in eastern United States from New Hampshire (Allen 1992) and New York (Peterson 1979), was reported from Oxford County (*Richards 6017* DUKE, MAINE) by Peterson (1979). The Oxford County collection has the overall size and aspect of *D. acutifolium,* weakly serrulate leaf margins, and a roughened rather than sharply serrate costa at back. However, its leaves are smooth at base and its upper leaf cells are quadrate to subrectangular, sharply angled and in distinct rows.

It seems to be better placed in *D. fuscescens.*

7. *Dicranum condensatum* Hedw., Sp. Musc. Frond 139. 1801.
Dicranum sabuletorum Ren. & Card., Rev. Bryol. 15: 70. 1888.

Plants medium, dull, green or yellowish-green above, brownish below. Stems to 3 cm long. Leaves crowded, erect-spreading when wet, erect-incurved and somewhat crisped when dry, broadly lanceolate, ovate-lanceolate to lanceolate, papillose at back, 2–5 mm long, shortly acuminate, strongly keeled above; margins erect below, incurved above, serrulate to serrate near apex; costa percurrent to short excurrent; cells papillose at back, upper cells irregularly subquadrate, short-rectangular, triangular, or oblate, thick-walled, porose, 3.7–15 µm x 3.7–12.5 µm, basal cells rectangular-elongate, thick-walled, porose, 28–102 µm x 7.5–17.5 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae 12–15 mm long, yellow; capsules curved, inclined to horizontal, cylindric, weakly furrowed, 1.5–2 mm long; opercula inclined, long-rostrate, 2–2.5 mm long. Spores slightly papillose, 15–27 µm. Calyptra 3.5 mm long.

Terrestrial in open boggy ground. In Maine known from Hancock (*Redfield* MO, NY) and Lincoln (*Chamberlain* MO) Counties.

Dicranum condensatum is a common species in the southeastern and Interior Highlands regions of North America, but is rarely encountered in Maine. It grows

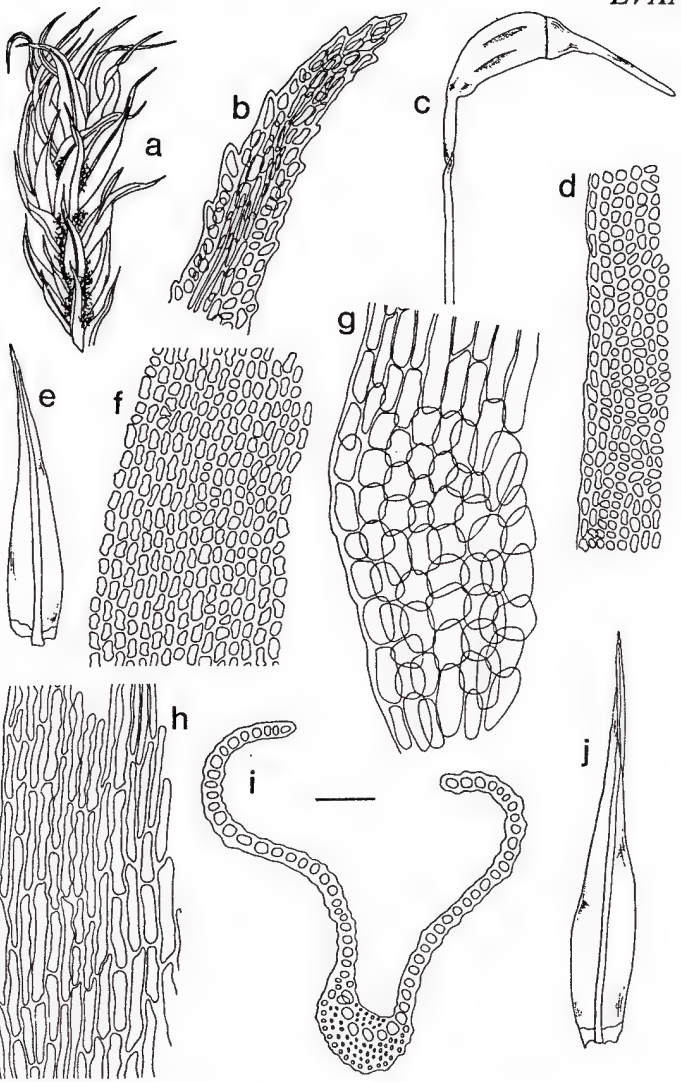

Figure 7. *Dicranum condensatum*. a. Habit. b. Leaf apex. c. Capsule and operculum. d. Upper leaf cells at margin. e. & j. Leaves. f. Median leaf cells. g. Alar cells. h. Basal leaf cells at margin. i. Cross-section at midleaf. Scales in mm: bar = 0.05 (b,d,f,g,h,i); bar = 0.6 (c); bar = 0.7 (e,j); bar = 1.7 (a). All figures from *Redfield* (NY).

on bare soil or sand in shady forest and exposed situations. It often exhibits great variation in its aspect, with leaves erect-incurved to crisped when dry. Consistent features of the species include leaves sharply keeled in cross-section, upper leaf cells irregular in shape, and perichaetia having a single seta. It can be confused with *D. spurium* which differs in having a more turgid aspect, broader leaves that are tubular-concave in cross-section, and very irregularly shaped leaf cells. *Dicranum ontariense* is similar to *D. condensatum* in having keeled leaves, but that species has longer (to 9 mm), narrower, wide-spreading leaves that are flexuose, often secund, undulate (especially at the margins) and strongly contorted when dry, and 2–5 setae per perichaetium.

8. *Dicranum elongatum* Schleich. *ex* Schwaegr., Sp. Musc. Frond., Suppl. 1(1): 171. 1811.

Plants slender, glossy, green or yellowish-green above, brownish below, in compact tufts. Stems to 6 cm high. Leaves crowded, erect-spreading wet, erect-spreading, erect-flexuose to erect-appressed when dry, lanceolate, smooth at back, 2–4 mm long, shortly acuminate to narrowly subulate, tubulose above; margins erect at base, incurved above, entire to faintly denticulate near apex; costa percurrent to short excurrent, smooth or weakly roughened at back; cells smooth, upper cells irregularly subquadrate, triangular, oblate, short-rectangular, or elongate, thick-walled, not or indistinctly porose, 5–37.5 µm x 5–10 µm, basal cells rectangular-elongate, thick-walled, porose, 30–88 µm x 10 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Dioicous. Sporophytes not seen. "Male plants as large as the females. Setae solitary, 1.5–2.0 cm long, yellowish to yellowish brown or reddish yellow; capsules yellowish brown, nearly straight and erect to slightly arcuate, striate when dry, 1.5–1.8 mm long; operculum 1.2–1.8 mm long; spores 12–22 µm." (Bellolio-Trucco & Ireland 1990).

Near summit of Mt. Katahdin and Gardiner Mountain. In Maine known from Aroostook (*Lowe* MAINE, MO) and Piscataquis (*Merrill 14* MO) Counties.

Dicranum elongatum is an arctic-alpine species known only from high mountain localities in Maine. The plants are slender with compact, elongated stems, erect, tubulose leaves, entire leaf margins, and thick-walled, at times elongate and indistinctly porose, upper leaf cells. *Dicranum muehlenbeckii* and *D. spurium* are

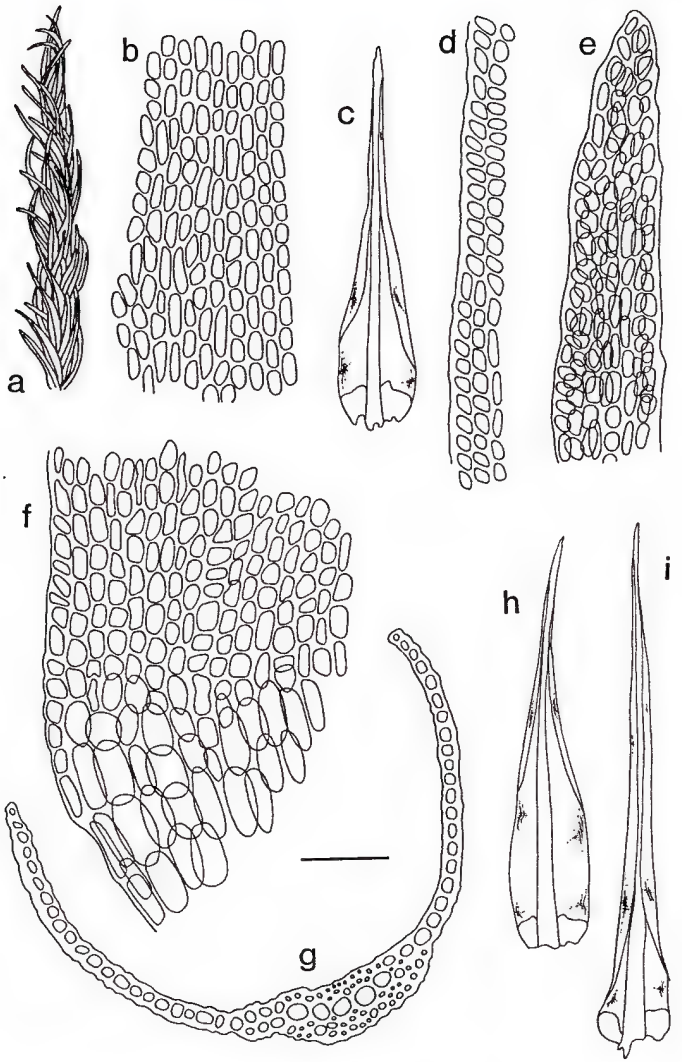

Figure 8. *Dicranum elongatum*. a. Habit. b. Median leaf cells. c., h., & i. Leaves. d. Upper leaf cells at margin. e. Leaf apex. f. Alar cells and basal cells at margin. g. Cross-section at midleaf. Scales in mm: bar = 0.05 (b,d,e,f,g); bar = 0.5 (c,h,i); bar = 2.12 (a). All figures from *Hermann 19594* (MO).

similar in having concave leaves. These species are much more robust than *D. elongatum* and have consistently non-porose upper leaf cells. In addition, *D. muehlenbeckii* differs from *D. elongatum* in having falcate-secund to erect-patent leaves and a costa in cross-section with a surface layer of enlarged cells above the ventral stereids, while *D. spurium* has undulate, broadly ovate-lanceolate leaves and upper leaf cells that are coarsely papillose at back. *Dicranum elongatum* is extremely close to *D. groenlandicum*, another arctic-alpine species not yet known from Maine. *Dicranum groenlandicum* differs from *D. elongatum* in having more rounded leaf apices and more consistently elongate, porose upper leaf cells.

Although *D. elongatum* is an extremely variable species throughout most of its range, in Maine it is stenotypic. A previous report of this species from Somerset County (Allen 1991) is a misdetermination for *D. bonjeanii*.

9. *Dicranum fuscescens* Turn., Muscol. Hibern. Spic. 60. 1804.
Dicranum fuscescens Sm., Fl. Brit. 3: 1204. 1804, *hom. illeg.*

Plants medium, dull, green or yellowish-green above, brownish below. Stems 3–6 cm long. Leaves crowded, falcate to erect-spreading when wet, falcate-secund, falcate, erect-spreading, flexuose and curled to crisped when dry, lanceolate, smooth, 4–6 mm long, subulate, keeled above; margins erect below, recurved above, usually strongly and sharply serrate above, with bistratose cells on one or both margins; costa excurrent, sharply serrate to papillose at back; cells smooth or papillose at back, upper cells subquadrate to short rectangular, usually sharply angled, often in regular rows, thick-walled, not porose, 6–32 µm x 5–12 µm, basal cells rectangular-elongate to elongate, thick-walled, straight-walled or weakly porose, 25–63 µm x 5 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Dioicous. Setae 12–20 mm long, yellow becoming red with age; capsules curved, inclined to horizontal, cylindric, strongly furrowed, 2–2.5 mm long, weakly or strongly strumose; opercula inclined, long-rostrate, 1.5–2 mm long. Spores slightly papillose, 15–30 µm. Calyptrae 3–4 mm long.

On humus or soil along trails, over boulders, rotting stumps, or tree (*Picea*) bases in shaded forest situations, *Thuja* swamps, or exposed situations. In Maine known from Aroostook (*Allen 16423* MO), Cumberland (*Davis 169* MO), Franklin (*Allen 10246* MO), Hancock (*Allen 2084* MO), Lincoln (*Allen 1248* MO), Oxford

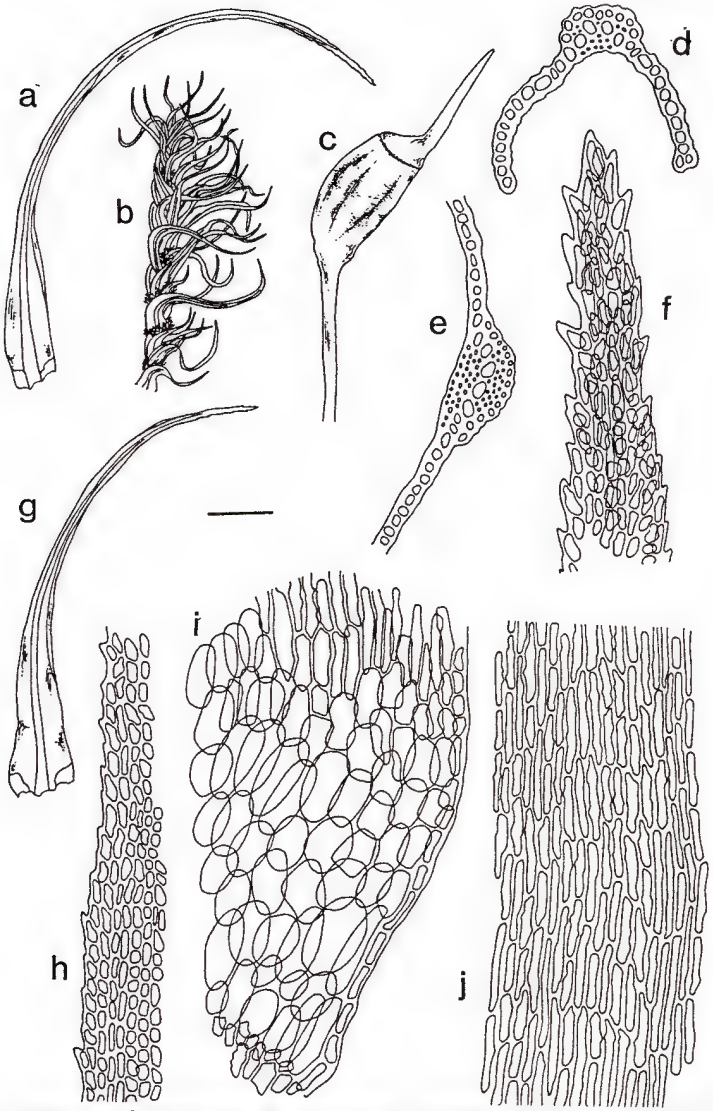

Figure 9. *Dicranum fuscescens*. a. & g. Leaves. b. Habit. c. Capsule and operculum. d. Cross-section at upper leaf. e. Cross-section at lower leaf. f. Leaf apex. h. Upper leaf cells at margin. i. Alar cells. j. Basal leaf cells at margin. Scales in mm: bar = 0.05 (d, e, f, h, i, j); bar = 1.0 (c); bar = 1.3 (a,g); bar = 2.0 (b). Figures b,c from *Allen 16423*

(*Richards 6017* DUKE, MAINE), Piscataquis (*Lowe* MAINE), Somerset (*Collins 1562A* NY), and Washington (*Merello & Hawthorne 4* MO) Counties.

Dicranum fuscescens has falcate to erect-spreading, crispate leaves that are keeled and papillose at back. Its costa is toothed to sharply serrate at back, its upper leaf cells short, non-porose, and it has sharply serrate leaf margins with bistratose cells. Other distinctive features include its full-sized male plants, fairly short setae, and strongly furrowed capsules. *Dicranum fuscescens* lacks distinctive field characteristics which makes it difficult to recognize in the field. It sometimes has an aspect similiar to *Orthodicranum flagellare* or *O. fulvum,* both of which differ from *D. fuscescens* in having erect capsules and alar cells in a single layer. In addition, *O. fulvum* differs in having leaves with bistratose cells above, while *O. flagellare* has a single layer of cells in the leaf margins and is often found with stout, terete, flagellate branches bearing erect, non-contorted leaves. Bistratose cells in the leaf margins of *D. fuscescens* immediately separate it from all other Maine species of *Dicranum* except *D. acutifolium. Dicranum acutifolium* is a somewhat larger, arctic alpine species that differs from *D. fuscescens* in having leaves weakly undulate at base, leaf margins with few areas of bistratose cells, more irregularly shaped upper leaf cells with rounded cell angles and only indistinctly in rows, upper leaf margins weakly serrulate, a weakly roughened subula, and dwarf male plants. Despite these many differences, the species are not always easy to distinguish. For example, the Oxford County specimen cited above has the overall size and aspect of *D. acutifolium,* as well as weakly serrulate leaf margins and a roughened costa at back. It is included here in *D. fuscescens* because its leaves are smooth at base, and its upper leaf cells are quadrate to subrectangular, sharply angled and in distinct rows.

A report of *D. fuscescens* from Somerset County (*Allen 9272*, Allen 1991) is a misdetermination for *D. fulvum*. Many European and Canadian moss floras give Smith as the author of this species, but Turner's publication has nine days priority (20 March 1804 vs 29 March 1804) over Smith's. (Stafleu & Cowan 1986).

10. *Dicranum muehlenbeckii* Bruch & Schimp. *in* B.S.G., Bryol. Eur. 1: 142. 1847. (fasc. 37–40. Mon. 38.30).

Plants medium, dull, green or yellowish-green above, brownish below. Stems to 7 cm long, densely tomentose. Leaves crowded, erect-spreading, falcate when wet,

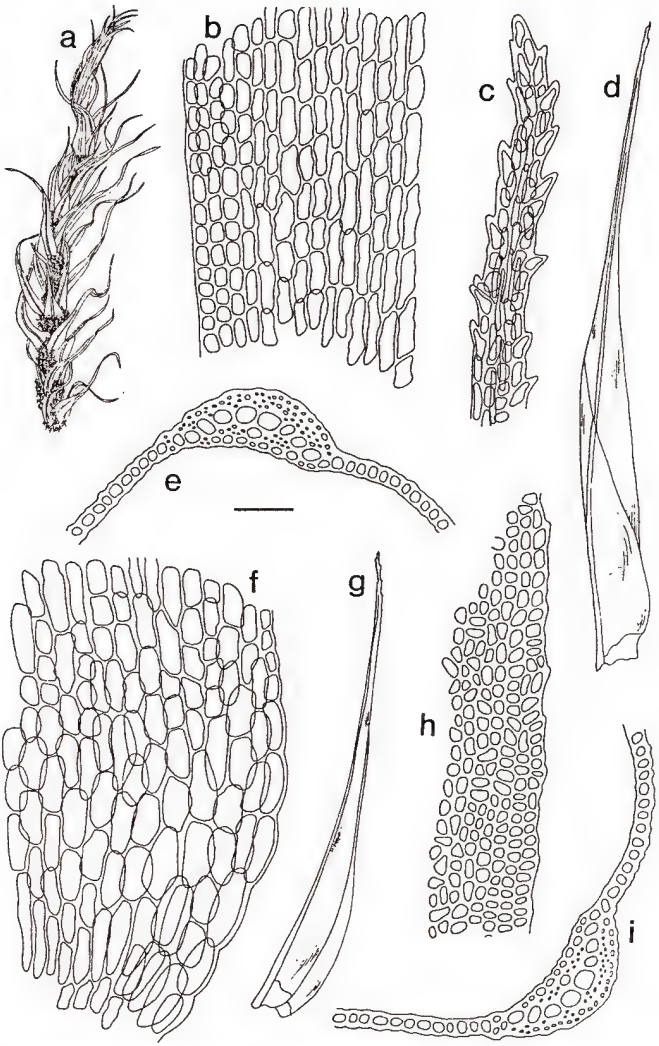

Figure 10. *Dicranum muehlenbeckii*. a. Habit. b. Basal leaf. cells at margin. c. Leaf apex. d. & g. Leaves. e. & i. Cross-sections midleaf. f. Alar cells. h. Upper leaf cells at margin. Scales in mm: bar = 0.05 (b,c,e,f,h,i); bar = 0.84 (d,g); bar = 2.0 (a). Figure a from *Allen 10588* (MO), figures b,c,d,f,g,h from *Mosses of North America 265* (MO), figures e,i from *Weber 6086* (MO), figures .

erect-spreading, circinate to crisped when dry, lanceolate to ovate-lanceolate, smooth, 5–7 mm long, acuminate, tubular-concave above; margins plane to erect below, incurved above, weakly serrulate to entire above; costa excurrent, smooth or weakly toothed at back above, in cross-section with a surface layer of enlarged cells above the ventral stereids; cells smooth to somewhat roughened at back, upper cells irregularly quadrate, short-rectangular, triangular or oblate, thick-walled, not porose, in more or less discrete rows, 5–25 µm x 10–15 µm, basal cells subrectangular, rectangular to elongate, thick-walled, straight-walled or porose, 25–92 µm x 10–15 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae one per perichaetum, 1.2–2 cm long, reddish to yellow-brown; capsules yellowish brown, cylindric, curved and inclined to sub-erect, furrowed, 2–4 mm long; opercula 2–3 mm long. Calyptrae to 6 mm long. Spores 15–25 µm.

Not yet known from Maine. Reported from Hancock (Schnooberger & Wynne 1941) and Piscataquis (Hermann 1970; Peterson 1979) Counties, but the specimens on which these reports are based are misdetermined: *Schnooberger & Wynne 153* (NY) = *D. ontariense; Hermann 19594* (NY) = *D. elongatum*; *Lorentz* (DUKE) = *D. elongatum*.

Although *D. muehlenbeckii* has yet to be found in Maine, it is known from nearby New York, Vermont, and Quebec. The species is separated from all other Maine species of *Dicranum* by the combination of its short, non-porose upper leaf cells, tubular-concave leaves that are entire to weakly serrulate above, and the presence of a costa in cross-section with a surface layer of enlarged cells above the ventral stereids. *Dicranum muehlenbeckii* has an aspect similar to *D. fuscescens* or *D. ontariense.* Both species differ from *D. muehlenbeckii* in having keeled leaves that are sharply serrate above and have a costa with only ventral stereids above the guide cells. *Dicranum fuscescens* further differs from *D. muehlenbeckii* in having areas of bistratose cells on the leaf margins and full-sized male plants. Although Peterson (1979) described the male plants of *D. muhlenbeckii* as full-sized, dwarf male plants were present in all of the collections with sporophytes I examined. The undulate leaves, commonly papillose upper leaf cells at back, and perichaetia with multiple setae of *D. ontariense* further separate it from *D. muehlenbeckii. Dicranum elongatum* is similar to *D. muehlenbeckii* in having concave leaves, entire to weakly serrulate upper leaf margins, and rounded, thick-walled upper leaf cells. It differs from *D. muehlenbeckii* in its smaller size, erect, incurved-flexuose

leaves, and in having only stereids on the ventral surface of its costal cross-sections.

11. *Dicranum ontariense* Peters., Canad. J. Bot. 55: 988. 1977.
Dicranum drummondii Sull. *in* Gray, Man. Bot. (ed. 2) 623. 1856, not *D. drummondii* C. Müll., Syn. Musc. Frond. 1: 356. 1848.

Plants medium to robust, dull or shiny, green or yellowish-green above, brownish below. Stems 2–11 cm long, with dense whitish or brownish tomentose. Leaves crowded, erect-spreading to secund when wet, often secund, undulate, wide-spreading at base, erect-incurved above and strongly contorted when dry, lanceolate, papillose at back, 5–8 mm long, long-acuminate to acute, strongly keeled above; margins undulate, plane or narrowly recurved at mid-leaf, sharply serrate; costa percurrent to short excurrent, papillose to spiculose at back; upper cells irregularly subquadrate, short-rectangular, oblong, or oblate, thick-walled, non-porose, 5–17.5 µm x 5–12.5 µm, basal cells rectangular-elongate, thick-walled, porose, 43–125 µm x 7.5–12 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae 1–3 per perichaetium, 20–27 mm long, yellow; capsules curved, horizontal, cylindric, strongly furrowed, 2–3 mm long; opercula inclined, long-rostrate, 2–3 mm long. Spores smooth to slightly papillose, of two sizes, 12.5–20 µm and 25 µm. Calyptrae 4 mm long.

On soil or humus on forest floor and over rock in shady forest or exposed situations. In Maine known from Aroostook (*Pursell 11343* MO), Cumberland (*Allen 15940* MO), Hancock (*Norton* MAINE), Kennebec (*Allen 14753* MO), Knox (*Allen & Allen 6061* MO), Lincoln (*Allen 1544* MO), Oxford (North American Musci Perfecti *374* MO), Penobscot (*Allen 16547* MO), Piscataquis (*Lowe* MAINE), Sagadahoc (*Lowe* MAINE), Somerset (*Allen 9411* MO), Washington (*Pedano 605* MO), and York (*Lowe* MAINE) Counties. Reported from Waldo County (Parlin 1924).

Dicranum ontariense is a common moss found both in shaded, forested or sunny, exposed situations. Plants of *D. ontariense* have a distinctive aspect, with leaves distantly spaced and widely spreading at base, but erect-incurved at midleaf and strongly crisped, often secund above. Its leaves have a single layer of cells at the margins, are keeled above with sharply serrate, undulate leaf margins, and both its

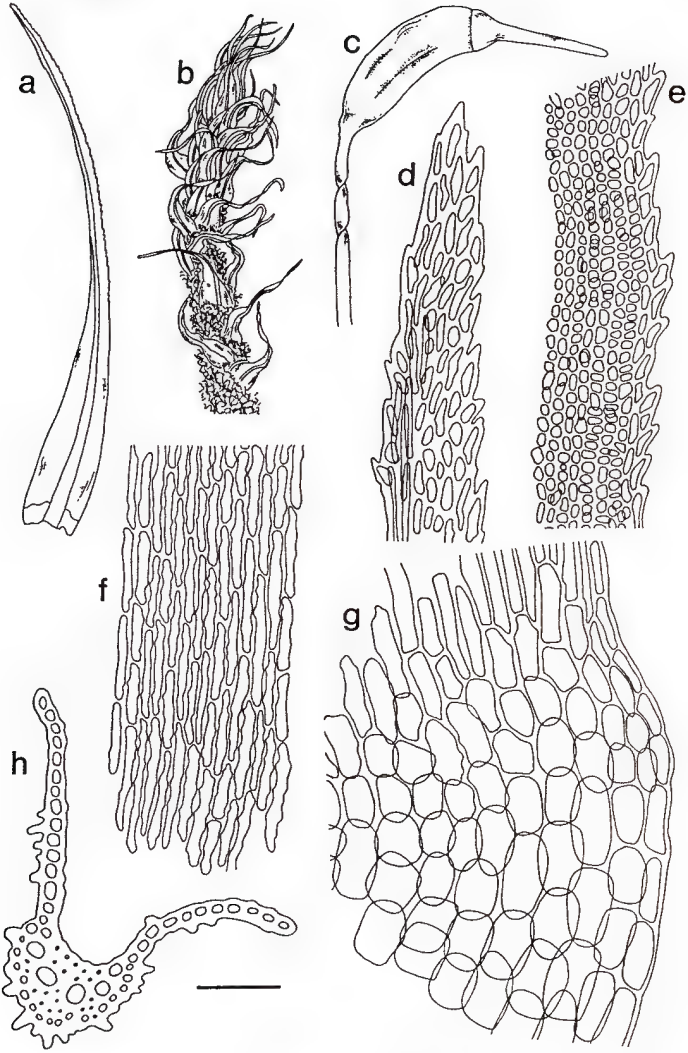

Figure 11. *Dicranum ontariense*. a. Leaf. b. Habit. c. Capsule and operculum. d. Leaf apex. e. Upper leaf cells at margin. f. Basal leaf cells. g. Alar cells. h. Cross-section upper leaf. Scales in mm: bar = 0.05 (h); bar = 0.07 (d,e,f,g); bar = 1.31 (a,c); bar = 3.19 (b). Figure c from *Allen 1530* (MO), figures a,b,h from *Pursell 11343* (MO), figures d,e,f,g from *Richards & Cooper 105* (MAINE).

short, irregularly shaped, upper leaf cells and costa are strongly papillose to spiculose on the upper dorsal surface. *Dicranum ontariense* is a densely tomentose species, and the tomentum can be white or light brownish in color, sometimes in single collections both colors are found. About half the perichaetia of *D. ontariense* have two or occasionally three setae and the rest have only one.

Dicranum ontariense can be confused with *D. condensatum* or *D. fuscescens*. *Dicranum condensatum* is similar to *D. ontariense* in having keeled leaves and short, irregularly shaped upper leaf cells; its differs in having shorter (to 5 mm vs. 9 mm long), broader, less consistently undulate leaves that are erect-incurved when dry rather than wide-spreading at base and single setae. *Dicranum fuscescens* differs from *D. ontariense* in having areas with two layers of cells on the leaf margins. *Dicranum polysetum* can also be confused with *D. ontariense* because of its distantly spaced, wide-spreading, undulate leaves and plurisetous condition. It differs from *D. ontariense* in having broader, non-crispate leaves that are strongly undulate on the leaf laminae, and long, porose upper leaf cells.

Dicranum ontariense has dwarf rather than full-sized male plants, and spores of two distinct sizes. The large-size spores are much less frequent than the smaller ones.

12. *Dicranum spurium* Hedw., Sp. Musc. Frond. 141. 1801.

Plants medium to robust, dull, green or yellowish-green above, brownish below. Stems to 7.5 cm long in dense or loose tufts, often interruptedly foliate, moderately tomentose. Leaves crowded, erect-spreading when wet, arched to erect-incurved, loosely imbricate, sometimes crisped-contorted when dry, broadly ovate-lanceolate to lanceolate, often undulate, 5–7 mm long, broadly acuminate, concave above; margins erect below, incurved above, serrulate above; costa percurrent, papillose to toothed above at back; cells strongly papillose at back, upper cells very irregular, subquadrate, short-rectangular, triangular, or oblate, thick-walled, irregularly thickened at the corners, 12–40 μm x 7–20 μm, basal cells elongate, thick-walled, porose, 55–157 μm x 10–13 μm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae one per perichaetia, 15–25 mm long, yellow; capsules curved, horizontal, cylindric, furrowed, 2–3 mm long, strumose; opercula inclined, long-rostrate, 2–2.5 mm long. Spores smooth to slightly roughened, 15–22 μm. Calyptrae 4 mm long.

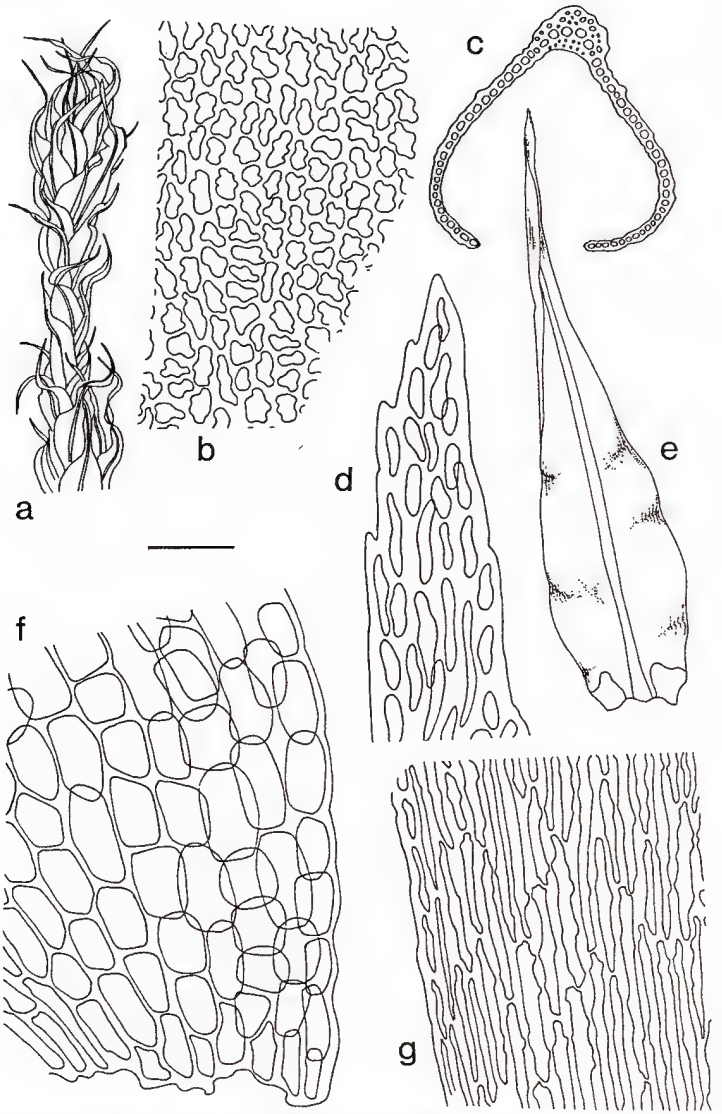

Figure 12. *Dicranum spurium*. a. Habit. b. Upper leaf cells. c. Cross-section upper leaf. d. Leaf apex. e. Leaf. f. Alar cells. g. Basal leaf cells. Scales in mm: bar = 0.05 (b,d,f,g); bar = 0.09 (c); bar = 0.95 (e); bar = 1.8 (a). All figures from *Allen 15772* (MO).

On soil or humus along trails, on forest floor, over rocks, under *Juniperus,* often near the ocean, also in full sunlight. In Maine known from Cumberland (*Allen 5998* MO), Hancock (*Allen 3698* MO), Knox (*Chamberlain & Norton 5308* NY), Oxford (*J.A. Allen* NY), Sagadahoc (*Allen 14600* MO), and Washington (*Holmes 314* MO) Counties. Reported from Franklin (Parlin 1939) County. The report of this species from Kennebec County (*Allen 14753* MO, Allen 1993) is a misdetermination for *D. ontariense.*

Dicranum spurium often has interruptedly foliate plants with broadly ovate-lanceolate, commonly undulate leaves that are erect at base and incurved above, giving the plants a loosely imbricate or turgid appearance when dry. It has tubular-concave leaves, irregularly shaped, irregularly angled upper leaf cells that are densely papillose at back, and entire to weakly serrulate upper leaf margins. Once known it is easy to recognize in the field because of its turgid aspect, but it is not a commonly encountered mosses and so may be confused with either *D. ontariense* or *D. condensatum*. These two species differ from *D. spurium* in having keeled rather than concave leaves. *Dicranum ontariense* and *D. spurium* have similarly crispate leaves when dry, but in *D. ontariense* the leaves are narrower above, the upper leaf margins are sharply serrate, the upper leaf cells more regularly shaped, and the perichaetia often have multiple setae. *Dicranum condensatum* also has narrower leaves and more regularly shaped upper leaf cells than *D. spurium*, and in addition, the leaves are obscurely undulate and less crispate when dry.

With the exception of the Oxford County specimen cited above, all of the Maine collections of *D. spurium* were made near the ocean. In these regions the species grows very well in open or partially forested situations, often in full and direct sunlight, and in association with the lichen genera *Cladonia* or *Cladina.*

13. *Dicranum undulatum* Brid.

Plants medium to robust, dull or shiny, green or yellowish-green above, brownish below. Stems 3–17 cm long, moderately brownish tomentose, often comally tufted. Leaves crowded, erect-spreading when wet, erect-incurved to secund and twisted to somewhat contorted when dry, leaves at stem apices erect and often twisted together, undulate, oblong-lanceolate to lanceolate, smooth or papillose at back, 6–8 mm long, long-acuminate, broadly acute to obtuse, strongly keeled above; margins undulate, plane, erect or reflexed, serrulate; costa subpercurrent to

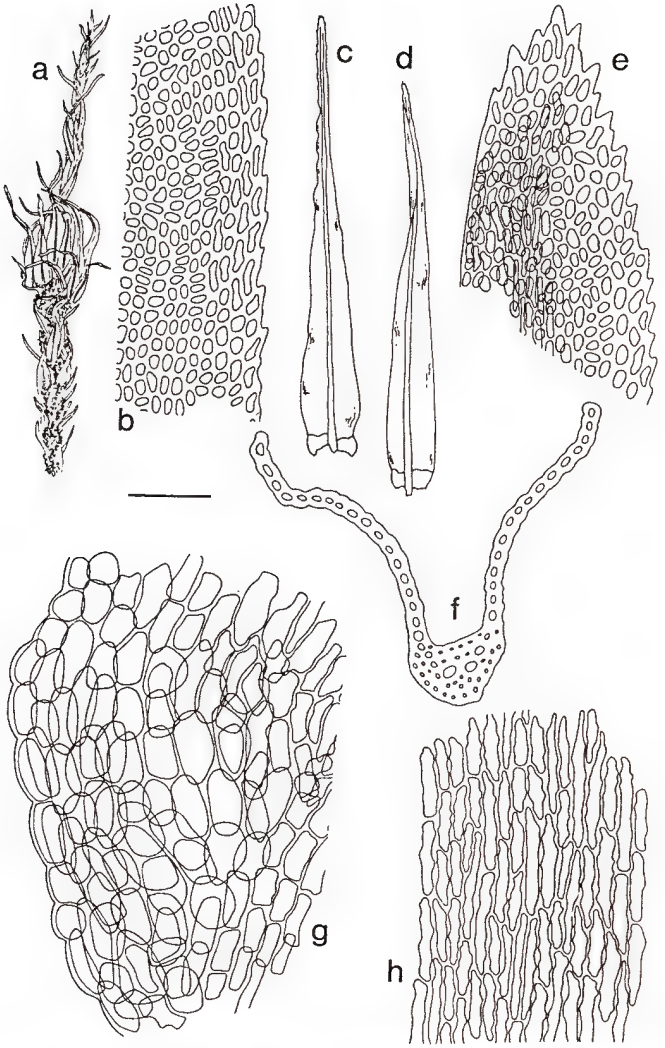

Figure 13. *Dicranum undulatum*. a. Habit. b. Upper leaf cells at margin. c. & d. Leaves. e. Leaf apex. f. Cross-section upper leaf. g. Alar cells. h. Basal leaf cells. Scales in mm: bar = 0.05 (f); bar = 0.07 (b,e,g,h); bar = 1.21 (c,d); bar = 5.1 (a). Figure a from *Allen 9435* (MO), figures b–e,g,h from *Allen 6015* (MO), figure f from *Rand* (NY).

percurrent, smooth or roughened at back; cells smooth or weakly papillose at back, upper cells irregularly subquadrate, oblate, or short-rectangular, in longitudinal rows, thick-walled, non-porose, 12–32 µm x 7.5–15 µm, basal cells linear, thick-walled, porose, 50–112 µm x 5–7.5 µm, alar cells enlarged, thin-walled, bulging, forming distinct groups of reddish-brown rectangular cells. Pseudautoicous. Setae one per perichaetium, 20–30 mm long, red, capsules, curved, horizontal, cylindric, weakly furrowed, 2–3 mm long; opercula not seen. Spores smooth to slightly papillose, of two sizes, 8.7–12.5 µm and 15–20 µm. Calyptrae not seen.

Terrestrial in bogs, on humocks, soggy edges of pools, often mixed with *Sphagnum*, occasionally on humus in woods. In Maine known from Androscoggin (*J.A. Allen* MO), Aroostook (*Lowe* MAINE), Cumberland (*Allen 6015* MO), Franklin (*Adams 14669* MAINE), Hancock (*Rand* MO), Kennebec (*Lowe* MAINE), Knox (*Allen & Allen 6063* MO), Oxford (*Adams 13165* MAINE), Sagadahoc (*Lowe* MAINE), Somerset (*Allen 9435* MO), Waldo (*Lowe* NY), and Washington (*Bowers 10159* MO) Counties.

Dicranum undulatum is often a robust species, to17 cm in height, with erect-incurved, undulate leaves. The large plant size of *D. undulatum* is often due to its comal tufted morphology (similar to that seen in the genus *Polytrichum*) which results in the accumulation of several years of growth. These plants have slender, erect, widely spaced leaves below a cluster of broader, erect-spreading, closely spaced leaves surrounding a perichaetum that appears to mark the end of one year of growth. Stem elongation continues from an erect branch that comes from the interior of the comal tuft. The leaves on this branch are erect, slender and widely spaced, and the branch ends in another stout comal tuft. Some long stems have 4–5 of these comal tuft segments. The stem and branch apices of *D. undulatum* are distinctive in having straight, erect leaves that are twisted together to form a long point. Other distinctive features of *D. undulatum* include its broadly acute to obtuse leaf apices, often subpercurrent costa, and mostly smooth, relatively large (12–32 µm) upper leaf cells.

The only other Maine species of *Dicranum* with such strongly undulate leaves is *D. polysetum* which differs from *D. undulatum* in having broader leaves that are wide-spreading at base, porose upper leaf cells, a costa with two dorsal ridges, and from 1–5 setae per perichaetum. *Dicranum ontariense* is similar to *D. undulatum*

in having leaves mostly undulate at the margins as well as somewhat on the lamina, keeled leaves, and non-porose upper leaf cells. It differs from *D. undulatum* in having strongly contorted and twisted leaves that are distinctly papillose at back, shorter (5–17 μm) more regularly shaped upper leaf cells, acute leaf apices with percurrent to short excurrent costae, and often multiple setae.

Dicranum undulatum is often found in boggy habitats associated with *Sphagnum* and *Polytrichum strictum* Menz. *ex* Brid. It is also is found in wooded or even exposed situations if sufficient moisture is available, conditions that are often found in the foggy coastal regions of Maine.

Acknowledgments. I thank Ronald A. Pursell for his comments and criticisms on an earlier version of this paper and the curators of DUKE, MAINE, NY, and NYS for the loan of specimens.

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Axillary Hairs in *Bartramia* section *Strictidium*

Dana Griffin, III[1]

In the course of preparing a treatment of the Bartramiaceae for the Flora of North America project, I have come across a heretofore unreported type of axillary hair in the genus *Bartramia.* This particular type occurs in the section *Strictidium* and consists of 2 or 3 cells with the terminal cell hyaline and inflated and the subterminal cell(s) pigmented and not inflated. Griffin & Buck (1989) surveyed axillary hair types in the Bartramiaceae, using this feature, in combination with other characters, to define subfamilies. In the subfamily Bartramioideae (to which *Bartramia* belongs), the axillary hairs were said to be "...relatively long with all of the cells elongated, although the cells themselves are hyaline, the cross walls of the basal cells are brown and strongly pigmented."

By contrast, the type of axillary hair reported here, which I discovered initially in *Bartramia stricta* Brid., accords perfectly with that type described by Griffin & Buck (ibid.) for the subfamily Breutelioideae. To this subfamily belongs the genus *Anacolia* which is relevant to the present discussion because in the vegetative state *Anacolia* can be and often is mistaken for section *Strictidium* of *Bartramia.* This potential for confusion first came to my attention in sorting through a rather large number of collections from western North America where *Bartramia stricta* is frequently misidentified as *Anacolia laevisphaera* (Tayl.) Flows. In other parts of the world the convergence of superficial morphologies may involve other species, but it always involves one or another species of *Anacolia* and section *Strictidium* of *Bartramia.* In South America the taxa in play are often *Anacolia laevisphaera* vs. *Bartramia ambigua* Mont. In southern Europe and the Mediterranean the confusion can be between *Anacolia webbii* (Mont.) Schimp. And *Bartramia stricta.*

To be sure, such apparent resemblance as exists between section *Strictidium* of *Bartramis* and the genus *Anacolia* is restricted to the gametophytes. When mature capsules are present (they frequently are not), there is no problem with identification. Even in the gametophytes there is a hyaloderm developed in *Bartramia* and which is absent in *Anacolia.* The problem here is that a cross section of the stem is required to score the hyaloderm character and evidently many

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collectors, in assigning names to their collections, do not take the extra step needed to determine the hyaloderm character state for each collection.

Because the short, globose-headed axillary hair type has been overlooked in *Bartramia*, I felt it necessary to examine representative members of the genus distributed among the three recognized sections. For all I knew, there might be other axillary hair types present in this genus that had not been taken into account.

The results of this quite limited survey indicate that the axillary hair type attributed to *Bartramia* by Griffin & Buck (ibid.) is restricted to sections *Bartramia* and *Vaginella* (see Fransén, 1995). Section *Strictidium* has an axillary hair type indistinguishable from that of *Anacolia* and several other members of the Breutelioideae. Insofar as axillary hair type was one of the characters used to justify segregating *Flowersia* from *Anacolia* (see Griffin & Buck, ibid.), it might reasonably be asked whether section *Strictidium* might better be positioned within the Breutelioideae and perhaps recognized as a segregate genus. I would not advocate taking this step for two reasons: 1) the capsules produced by members of section *Strictidium* are furrowed and most develop a definite, albeit reduced, peristome (capsules of *Anacolia* are irregularly wrinkled and gymnostomous) which is, in all major features, typical of that seen in other sections of *Bartramia* and 2) axillary hair type was only one of three distinctive characters on which *Flowersia* was founded. By itself, axillary hair type would not carry sufficient taxonomic weight to form the basis of a new genus, segregate or otherwise.

Mueller's concept of section *Strictidium* (see Brotherus, 1924) was grounded in a recognizable habit - stiffly erect, imbricate, nonclasping leaves and a somewhat erect, symmetric, furrowed capsule with a simple or, occasionally, no peristome. By adding to this set of characters an axillary hair type unknown elsewhere in the genus, the original concept of the section is strengthened. Further reinforcement of the sectional concept comes from biochemical studies in which certain triflavonoids (Seeger *et al*, 1995) and one cyclic derivative (Geiger *et al.*, 1995) have been isolated and used to characterize this section. Apparently, the only work left to do is an analysis of the DNA of *Strictidium* at which point we should have a fairly complete picture of where this section stands in relation to the other sections of the genus and, in a larger context, to the family as a whole.

Specimens examined:

***Bartramia section* Bartramia**

B. halleriana Hedw., Pakistan (*U. Schickhoff 212/m3* FLAS)

B. pomiformis Hedw., Br. Columbia (*Schofield et al. 47300* UBC)

Bartramia* section *Strictidium

B. ambigua Mont., Chile (herb. *Montagne*, TYPE-NY); Bolivia (*Herzog 3172* FLAS); Ecuador (*Steere E-204* NY)

B. stricta Brid., California (*Steere s.n.* 25 Mar. 1951 UBC), Colorado (*Weber 7314* UC Boulder); Br. Columbia (*Schofield 63799* UBC)

Bartramia* section *Vaginella

B. brevifolia Brid., Venezuela (*Griffin PV-899* FLAS)

B. ithyphylla Brid., Washington (*McFarlin A3586* FLAS)

B. mathewsii Mitt. ssp. *brasiliensis* Fransén, Brazil (*Griffin & Vital 179* FLAS)

B. potosica Mont., Peru (*P. & E. Hegewald 7584* FLAS); Venezuela (*Griffin & López F. PV-529* FLAS)

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Two Wisconsin lichen collections over 100 years old

John W. Thomson[1]

Recently in some rearranging in the WIS herbarium back stacks there turned up two boxes of lichen specimens collected by Lellen S. Cheney over a hundred years ago. The collections were in the original crumbling paper packets with only numbers for data but fortunately Cheney's original field notebooks are on file in the WIS herbarium and the localities and dates could be ascertained.

Cheney was a student at the University of Wisconsin, Madison, from 1887 to 1896, obtaining his BS degree in 1891 and Masters in 1896, then becoming a professor of pharmaceutical botany there until 1903. His main interests in research were with bryophytes and angiosperms and he contributed voluminously to the UW herbarium in those fields. He probably was hindered in the identification of the lichens by lack of adequate references in that period and they were thus laid aside.

One of the boxes contained a series of collections made by Cheney in the summers of 1893 and 1894 on trips made by canoe down the Wisconsin River from its source at Lac Vieux Desert, Vilas County, to its mouth on the Mississippi River at Prairie du Chien. As the trips were made prior to much of the development of the paper industry and sulphite mills along the river as well as several of the dams and flowages which altered his collecting areas, the collection is of great interest.

Wisconsin River Valley Collections of 1893 and 1894.

Acarospora chlorophana (Wahl.) Mass. Blackhawk Island, Wisconsin Dells, Juneau Co., *3947*.

Anaptychia setifera Räs. Granite Heights, Marathon Co., *2983*. This species is otherwise known in Wisconsin only from Door Co.

Anzia colpodes (Ach.) Stiz. Granite Heights, Marathon Co., *3141*.

Anaptychia palmulata Michx.) Vainio Granite Heights, Marathon Co., *2978*.

Arthonia caesia (Flot.) Körb. Mosinee, Marathon Co., *3318*.

Bacidia rubella (Hoffm.) Mass. Granite Heights, Marathon Co.,*2010*.

Bacidia schweinitzii (Tuck.) Schneid. On bark, Rainbow Rapids, Oneida Co., *1332*; Granite Heights, Marathon Co, *2997*, *3016*.

Biatora sphaeroides (Dickson) Körber Granite Heights, Marathon Co., *3009*, *3012*, *3151*.

Bryoria trichodes (Michx.) Brodo & Hawksw. Nekoosa, Wood Co., *3654*; Webster, Portage

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Co., *3447*.

Buellia disciformis (Fr.) Mudd Granite Heights, Marathon Co., *2973*.

Buellia stilingiana J. Stein. Mosinee, Marathon Co., *3316*; 3 mi below Knowlton, Marathon Co., *3354*.

Caloplaca cerina (Hoffm.) Th. Fr. Mosinee, Marathon Co., *3315*.

Caloplaca ferruginea (Huds.) Th. Fr. Stevens Point, Portage Co., *3496*.

Caloplaca oxfordensis Fink Witches Gulch, Wisconsin Dells, Adams Co., *3895*.

Cetraria arenaria Kärnefelt. On sandy soil. Muscoda, Iowa Co. *9229*. This species, rare in Wisconsin, was rediscovered at this same locality by H. H. Iltis in 1965. Apart from these collections it occurs in Door and Manitowoc Counties along the Lake Michigan shores and there is an old 1860 collection by T. J. Hale from near Wisconsin Dells from a site where it is now extinct, and another old 1860 collection by Hale from near St Croix Falls, Polk Co. It certainly is an endangered species in this state.

Cetrelia cetrarioides (Del. ex Duby) Culb. & Culb. Granite Heights, Marathon Co., *3014*, *3161*.

Cetrelia chicitae (Culb.) Culb. & Culb. Knowlton, Marathon Co., *3357*; Webster, Portage Co., *3442*.

Chaenothena furfuracea (L.) Tibell Cold Water Canyon, Wiscsonsin Dells, Adams Co. *3824*.

Cladina mitis (Sandst.) Hustich Crystal Lake, Vilas Co., *222*; Granite Heights, Marathon Co., *2991*, *3167*.

Cladina stellaris (Opiz) Pouz. & Vezda Newbold, Oneida Co., *1608*.

Cladina subtenuis (Des Abb.) Hale & Culb. Pine Lake, Vilas Co. *484*.

Cladonia apodocarpa Robb. Germantown, Juneau Co., *3733*.

Cladonia bacillaris (Ach.) Nyl. Conover, Vilas Co., *714*, *722*.

Cladonia botrytes (K. Hagen) Willd. Granite Heights, Marathon Co., *2987*.

Cladonia cariosa (Ach.) Sprengel Newbold, Oneida Co., *1567*.

Cladonia chlorophaea (Flörke) Sprengel NE of Tomahawk Lake, Oneida Co., *1014*; Germantown, Juneau Co., *3723*; Granite Heights, Marathon Co., *3155*.

Cladonia coniocraea FLörke) Sprengel Conover, Vilas Co., *730*; Doherty Lake, Oneida Co., *1277*; Rainbow Rapids, Oneida Co., *1304*, *1306*, *1311*, *1317*; Granite Heights, Marathon Co., *2987*.

Cladonia crispata (Ach.) Flotow Newbold, Oneida Co., *1562*.

Cladonia cristatella Tuck. Otter Rapids, Eagle River, Vilas Co., *890*; Rainbow Rapids, Oneida Co., *1333*; Newbold, Oneida Co., *1569*; Granite Heights, Marathon Co., *3003*, *3140*, *3707*; Grand Rapids, Wood Co., *3645*; Petenwell Rock, Juneau Co., *3697*.

Cladonia cylindrica (Evans) Evans Stevens Point, Portage Co.,*3504*.

Cladonia digitata (L.) Hoffm. Conover, Vilas Co., *697*; Rainbow Rapids, Oneida Co., *1256*.

Cladonia farinacea (Vainio) Evans Newbold, Oneida Co., *1528*.

Cladonia fimbriata (L.) Fr. Conover, Vilas Co., *733*; Rainbow Rapids, Oneida Co., *1303*.

Cladsonia furcata (Huds.) Schrad. Granite Heights, Marathon Co., *3168*.

Cladonia gracilis ssp. *turbinata* Ahti Lac Vieux Desert, Vilas Co., *188*; Conover, Vilas Co.,

722; Otter Rapids below Eagle River, Vilas Co., *894*; Rainbow Rapids, Oneida Co., *1334*, *1373*; McNaughton, Oneida Co., *1440*; Newbold, Oneida Co., 1568; Knowlton, Marathon Co., *3350*; N of Stevens Point, Portage Co., *3352*.

Cladonia peziziformis (With.) Laundon Grand Rapids, Wood Co., *3633*; Stevens Point, Portage Co,*3499*, *3507*.

Cladonia pleurota FLörke) Schaer. Coldwater Canyon, Wisconsin Dells, Adams Co., *3902*; Petenwell Rock, Juneau Co., *3708*.

Cladonia pyxidata (L) Hoffm. Germantown, Juneau Co., *3724*.

Cladonia rei Schaerer Germantown, Juneau Co., *3718*.

Cladonia squamosa (Scop.) Hoffm. Rainbow Rapids, Oneida Co., *1313*, *1320*; Newbold, Oneida Co., *1516*; Merrill, Lincoln Co., *2720*; Granite Heights, Marathon Co., *3963*, *3154*, *3165*; Cold Water Canyon, Wisconsin Dells, Adams Co., *3821*; Quincy Tsp., Adams Co., *3146*.

Cladonia uncialis (L.) Wigg. Petenwell Rock, Juneau Co., *3709*.

Cladonia verticillata (Hoffm.) Schaer. State line, Vilas Co., *562*; Doherty Lake, Oneida Co., *1127*; Rainbow Rapids, Oneida Co., *1336*; Newbold, Oneida Co., *1556*.

Collema cf. *nigrescens* (Huds.) DC. Stevens Point, Portage Co. *3510*.

Cyphelium tigillare (Ach.) Ach. Webster, Portage Co., *3457*.

Evernia mesomorpha Nyl. Nekoosa, Wood Co., *3653*, *3655*; Portage Co., *3446*.

Flavoparmelia caperata (L.) Hale Mosinee, Marathon Co., *3314*.

Graphis scripta (L.) Ach. Lac Vieux Desert, Vilas Co., *44*; Rainbow Rapids, Oneida Co., *1315*, *1326*, *1331*; Knowlton, Marathon Co., *3351*; Stevens Point, Portage Co.,*3509*.

Heterodermia hypoleuca (Ach.) Trevis Knowlton, Marathon Co., *3369*.

Heteroderma speciosa (Web.) Trevisan Mosinee, Marathon Co. *3301*.

Hypogymnia physodes (L.) Nyl. Granite Heights, Marathon Co. *3162*.

Icmadophila ericetorum (L.) Zahlbr. Newbold, Oneida Co., *1525*, *1590*.

Lasallia papulosa (Ach.) Llano Petenwell Rock, Juneau Co., *3683*.

Lecanora albella (Pers.) Ach. Mosinee, Marathon Co., *3312*.

Lecanora hagenii (Ach.) Ach. Granith Heights, Marathon Co., *2976*, *3011*; Mosinee, Marathon Co., *3314*; Stevens Point, Portage Co., *3495*, *3505*.

Leproloma membranaceum (Dickson) Vainio "Pedanwell Rock" near Necedah, Juneau Co., *3684*. This is an unusual sterile collection usually ignored by collectors. Our only other collections are from sandstone bluffs in Juneau and Sauk counties.

Leptogium cyanescens (Rabenh.) Körb. Grand Rapids, Wood Co., *3601*.

Lobaria pulmonaria (L.) Hoffm. Granite Heights, Oneida Co., *3137*.

Lobaria quercizans Michx. On yellow birch, Granite Heights, Marathon Co., *2985*, *3147*.

Loxospora elatina (Ach.) Mass. Granite Heights, Marathon Co. *3157*.

Melanelia septentrionalis (Lynge) Essl. Linwood Ferry, Portage Co., *3586*.

Menegazzia terebrata (Hoffm.) Mass. Granith Heights, Marathon Co., *2980*.

Myelochroa galbina (Ach.) Elix & Hale Stevens Point, Portage Co., *3498*; Granite Heights, Marathon Co., *3143*.

Pannaria pezizoides (Web.) Trevis Merrill, Lincoln Co., *2814*.

Ochrolechia trochophora (Vainio) Oshio Granite Heights, Marathon Co., *2977*, *3006*.
Parmelia saxatilis (L.) Ach. Stevens Point, Portage Co., *3368*.
Peltigera aphthosa (L.) Willd. Cold Water Canyon, Wisconsin Dells, Adams Co., *3791*.
Peltigera didactyla (With.) Laund. Germantown, Juneau Co., *3720*, *3722*; Stevens Point, Portage Co., *3501*.
Peltigera leucophlebia (Nyl.) Gyel. S of Wausau, Marathon Co., *3238*; Cold Water Canyon, Wisconsin Dells, Adams Co. *3808*.
Peltigera polydactyla (Neck.) Hoffm. Granite Heights, Marathon Co., *2968*.
Pertusaria amara (Ach.) Nyl. Rainbow Rapids, Oneida Co., *1312*.
Pertusaria multipunctoides Dibb. Tomahawk Lake, Oneida Co., *1144*; Grandmother Rapids, Oneida Co., *2310*.
Pertusaria velata (Turn.) Nyl. Knowlton, Portage Co., *3370*.
Phaeophyscia hirtella Essl. Mosinee, Marathon Co., *3240*, *3321*.
Phaeophyscia imbricata (Vainio) Essl. Granite Heights, Marathon Co., *3148*.
Physcia aipolia (Hoffm.) Hampe Mosinee, Marathon Co. *3222*, *3294*.
Physconia perisidiosa (Erichs.) Moberg. Knowlton, Marathon Co., *3317*.
Platismatia tuckermanii (Oakes) Culb. & Culb. Granite Heights, Marathon Co., *2975*.
Porpidia albocaerulescens (Wulfen) Hertel & Knopf. Cold Water Canyon, Wisconsin Dells, Adams Co., *3907*.
Porpidia macrocarpa (DC.) Hertel Stevens Point, Portage Co., *3491*.
Punctelia bolliana (Müll. Arg. Krog Webster, Portage Co., *3440*.
Punctelia rudecta (Ach.) Krog. Knowlton, Portage Co., *3356*.
Ramalina americana Hale Granite Heights, Marathon Co., *2953*; Knowlton, Portage Co., *3360*; Stevens Point, Portage Co., *3508*; Granith Heights, Marathon Co., *3145*; Petenwell Rock, Juneau Co., *3699*.
Ramalina intermedia Nyl. Coldwater Canyopu, Wisconsin Dells, Adams Co., *3903*; Petenwell Rock, Juneau Co., *3678*, *3679*.
Rhizoplaca chrysoleuca (Sm.) Zopf. Mosinee, Marathon Co., *3307*.
Rinodina pachysperma Magn. Knowlton, *3361*; Mosinee, Marathon Co., *3317*.
Sarcogyne clavus (Ram.) Kremph. Cold Water Canyon, Wisconsin Dells, Adams Co., *3904*.
Stereocaulon paschale (L.) Hoffm. Lac Vieux Desert, Vilas Co., *488*; Rainbow Rapids, Oneida Co., *1246*.
Stereocaulon saxatile Magn. Witches Gulch, Wisconsin Dells, Adams Co., *3900*. This rock-living species is more frequent in northern Wisconsin and this is the southernmost record for it in this state. It is doubtful that it is still present at the Dells, at least it has not been refound there.
Stereocaulon tomentosum Fr. Rainbow Rapids, Oneida Co., *1268*; below Stevens Point, Portage Co., *3511*.
Tuckermanopsis ciliaris (Ach.) Hale Cold Water Canyon, Wisconsin Dells, Adams Co., *3809*; Webster, Portage Co., *3448*.
Umbilicaria mammulata (Ach.) Tuck. Granite Heights, Marathon Co., *3160*.
Umbilicaria muhlenbergii (Ach.) Tuck. Granite Heights, Marathon Co., *3169*.

Usnea angulata Ach. Granite Heights, Marathon Co., *3000*, *3156*; Mosinee; Marathon Co., *3229*; Linwood Ferry, Portage Co., *3587*.
Usnea filipendula Stirton Granite Heights, Marathon Co., *2972*, *3007*, *3218*.
Usnea hirta (L.) Wigg. Granite Heights, Marathon Co., *2990*, *3144*, *3153*; Linwood Ferry, Portage Co., *3589*.
Usnea pennsylvanica Motyka Granite Heights, Marathon Co., *3136*.
Usnea rubicunda Stirt. Granite Heights, arathon Co., *2979*.
Usnea subfusca Stirt. Granite Heights, Marathon Co., 3013; between Wausau & Mosinee, Marathon Co., *3227*; Nekoosa, Wood Co., *3656*.
Xanthoparmelia angustiphylla (Gyel.) Hale Stevens Point, Portage Co., *3485*.
Xanthoparmelia cumberlandia (Gyelnik) Hale Lac Vieux Desert, Vilas Co. *116*.
Xanthoria polycarpa (Hoffm.) Rieber Granite Heights, Marathon Co., *3219*.

Madison, Dane County, Area Collections of 1890-1896.

The second box of Cheney collections came from the vicinity of Madison, Dane County, at that time a much smaller town, and some of what were then suburbs such as "Eagle Heights", "University Heights", "Fish Hatchery, 4 mi south of Madison", and "Lake Wingra", all of which have now been engulfed in the city of Madison. "Blue Mounds" in western Dane County and "Delton" in Sauk County must have been reached by Cheney via the suburban railroads then operating. Determination of this material yielded 50 species of which a few appear to be no longer extant in this state. This may be due to the altered atmospheric conditions and especially the former severe power and heating plant pollution present after the period in which Cheney worked and before the present improvements in emission controls.

Of those no longer to be found in the Madison area we note *Anaptychia palmulata, Bryoria furcellata, Caloplaca saxicola, Cyphelium tigillare, Diplotomma alboatrum, Evernia mesomorpha, Lobaria pulmonaria, Platismatia tuckermanii. Ramalina americana, Teloschistes chrysopthalmus, Tuckermanopsis ciliaris* and *Usnea hirta*. Many others on the Cheney list have not recently been found although they could possibly be present. The records are mainly from Dane County, but Fayette material is from northern Lafayette County, Delton is in northern Sauk County and is part of the Dells of the Wisconsin River.

List of species from Madison and vicinity.

Anaptychia palmulata (Michx.) Vainio On trees, Madison, 1890, *9238*.
Arthonia caesia (Flotow) Körber On tree, Eagle Heights, Madison, 1892, *9121*; Madison, 1890, *9027*.

Bryoria furcellata (Fr.) Brodo & Hawksw. S of Lake Monona, Madison, 1893, *9098*.
Caloplaca cerina (Ehrh.) Th. Fr. Madison, 1891, *9022*.
Caloplaca holocarpa (Hoffm.) Wade University Heights, Madison, 1892, *9073*, *9082*.
Caloplaca saxicola (Hoffm.) Nordin Blue Mounds, 1894, *9235*. This is one of only two records of this species for this state, the other is from Vernon County.
Caloplaca sideritis (Tuck.) Zahlbr. Eagle Heights, Madison, 1892, *9118*.
Candelaria concolor (Dicks.) Arn. Madison, 1890, *9039*.
Cladonia bacillaris (Ach.) Nyl. Eagle Heights, Madison, 1892, *9109*; south of Lake Monona, 1893, *9093*.
Cladonia chlorophaea (Flörke ex Sommerf.) Spreng. Lake Wingra, Madison, 1892, *9072*; Fish Hatchery, 1893, *9059*.
Cladonia cristatella Tuck. Eagle Heights, Madison, 1892, 9112; University Heights, Madison, 1890, *9079*.
Cladonia peziziformis (With.) Laundon Fish Hatchery, Madison, 1893, *9060*.
Cladonia rei Schaer. Lake Wingra, Madison, 1892, *9071*.
Cladonia verticillata (Hoffm.) Schaer. Delton, 1896, *9224*.
Collema cf. *tenax* (Sw.) Ach. W of Madison, 1894, *9010*.
Cyphelium tigillare (Ach.) Ach. S of Lake Monona, Madison, 1890, *9090*.
Dermatocarpon luridum (With.) Laundon Delton, 1896, *9223*; Eagle Heights (probably shore of Lake Mendota), Madison, 1892, *9115*. This is the only Dane County record for this species.
Dimelaena oreina (Hoffm.) Norman W of Madison, 1894, *9008*.
Diplotomma alboatrum (Hoffm.) Flotow Madison, 1890, 9024.
Evernia mesomorpha Nyl. S of lake Monona, Madison, 1893, *9097*. This is no longer to be found in this county.
Graphis scripta (L.) Ach. University Heights, Madison, 1894, *9234*; near Lake Wingra, Madison, 1890, *9067*; Eagle Heights, Madison, 1892, *9108*, *9114*, *9131*, 1893, *9108*.
Heterodermia hypoleuca (Muhl.) Trevisan Fayette, 1894, *9233*; University Heights, Madison, 1893, *9075*.
Hyperphyscia syncolla (Tuck. ex Nyl.) Kalb. Eagle Heights, Madison, 1892, *9125*.
Lasallia papulosa (Ach.) Llano Blue Mounds, 1894, *9192*, *9194*; Delton, 1896, *9925*, *9226*.
Lecanora cf. *argopholis* (Ach.) Ach. On boulders, Fayette, 1894, *9236*.
Lecanora cenisea Ach. Blue Mounds, 1894, *9193*.
Lecanora hybocarpa (Tuck.) Brodo S of Lake Monona, Madison, 1893, *9092*; Eagle Heights, Madison, 1892, *9111*, *9124*.
Lecanora symmicta (Ach.) Ach. S of Lake Monona, Madison, 1890, *9091*.
Lecidella elaeochroma (Ach.) Choisy Eagle Heights, Madison, 1892, *9130*; University Heights, Madison, 1893, *9081*.
Leptogium cyanescens (Rabenh.) Körber On cliff face, Fayette, 1894, *9228*; Blue Mounds, 1894, *9190*.
Leptogium lichenoides (L.) Zahlbr. Fish Hatchery, Madison, 1893, *9058*; Eagle Heights, Madison, 1893, *9149*.

Lobaria pulmonaria (L.) Hoffm. Blue Mounds, 1894, *9189*. This is a record southernmost-report for the state and no longer appears to occur at this locality.

Myelochroma galbina (Ach.) Elix & Hale University Heights, Madison, 1893, *9077*.

Peltigera didactyla (With.) Laundon Fish Hatchery, Madison, 1893, *9063*.

Peltigera rufescens (Weis.) Humb. Lake Wingra, Madison, 1892, *9068*, *9072*; Fish Hatchery, Madison, 1893, *9092*; Blue Mounds, 1894, *9195b*.

Phaeophyscia ciliata (Hoffm.) Moberg University Heights, Madison, 1893, *9085*; Madison, 1890, *9043*.

Physcia aipolia (Ehrh. ex Humb.) Fürn. W of Madison, 1894, *9009*; University Heights, Madison, 1893, *9076*; Madison, 1890, *9045*.

Physcia haleyi Thomson On rock, Fayette, 1894. *9233b*.

Physcia stellaris (L.) Nyl. University Heights, Madison, 1892, *9084*; 1893, *9080*; Greenbush, Madison, 1894, *9230*; Blue Mounds, 1894, *9189*; Madison, 1890, *9049*; 1891, *9023*.

Platismatia tuckermanii (Oates) Culb. & Culb. S of Lake Monona, Madison, 1893, *9095*. This is not now known from the south. *Psora pseudorussellii* Timdal Eagle Heights, Madison, 1892, *9117*.

Punctelia bolliana (Müll. Arg.) Krog University Heights, Madison, 1893, *9074*, *9078*; Madison, 1891, *9025*, *9037*.

Ramalina americana Hale Madison, 1890, *9040*; 1991, *9826*; Eagle Heights, Madison, 1892, *9113*; Lake Wingra, Madison, 1892, *9064*; S of Lake Monona, Madison, 1893, *9099*.

Teloschistes chrysopthalmus (L.) Th. Fr. On twigs, 4th Lake (Kegonsa), Madison, 1892, *9222*. This species seems to now be extinct in Wisconsin. There is also an old 1893 collection from Eagle Heights, Madison, by Heald and Buell in WIS.

Tuckermannopsis ciliaris (Ach.) Gyel. S of Lake Monona, Madison, 1893, *9088*; tamarack swamp near London, Jefferson Co., 1892, *9183*, *9184*.

Usnea hirta (L.) Wigg. S side Lake Monona, Madison, 1893, *9087*, *9094*.

Verrucaria calciseda DC. Eagle Heights, Madison, 1892, *9129*. This is the only Dane County record for this species which is common in southwestern Wisconsin on calciferous rocks.

Xanthoparmelia tasmanica (Hooker & Tayl.) Hale Eagle Heights, Madison, 1892, *9119*.

Xanthoriaa elegans (Link.) Th. Fr. On calcareous rock, Blue Mounds, 1894, *9237*.

Xanthoria polycarpa (Ehrh.) Rieber Madison, 1890, *9041*.

Atrichum tenellum - new state record in Maine

Lorinda Leonardi[1]

I had the opportunity in 1997 to assist Dr. Norton Miller during his fourth season of teaching a bryophyte seminar at the Humboldt Field Research Institute (formally Eagle Hill Research Station). The Humboldt Field Research Institute, located in Washington County, Maine, offers a wonderful setting in which to study natural history. Although many sites were visited during the seminar, a number of interesting and uncommon plants can be found within walking distance of the field station. One of these, *Atrichum tenellum* (Röhl.) Bruch & Schimp. *in* B.S.G., is a new state record. Dr. Bruce Allen, who has long been studying the moss flora of Maine, has not seen other collections of *A. tenellum* from this state.

Humboldt Field Research Institute is located on a peninsula, Dyer Neck, east of Mount Desert Island, Maine. The principal vegetation type at the institute is red spruce-balsam fir forest. The site of the collection is an open gravel pit that has not been in use for several years. A large population occurred on the floor of the pit on sand and gravel. No sporophytes were observed. In the field the plants were noteworthy for their small size (0.5-1.7 cm tall). *Atrichum tenellum* is reported to grow on sandy or clayey soil in disturbed or exposed areas, roadsides or open woodlands (Crum and Anderson, 1981; Ireland, 1982).

The specimen is deposited at NYS (accession # NYSi10163), with a duplicate at MO: *Atrichum tenellum* (Röhl.) Bruch & Schimp. *in* B.S.G., Maine: Washington County, Town of Steuben: ca. 3.5 miles southeast of Steuben, gravel pit at entrance to Eagle Hill Field Station, 44°27'57"N 67°56'11"W, on dry disturbed soil of gravel pit, 9 June 1997, *Leonardi* 1457.

Acknowledgment. Thank you to Norton Miller and Bruce Allen for verification of the collection.

Crum, H. A. & L. E. Anderson. 1981. Mosses of eastern North America. Vol. 2. Columbia University Press. New York.

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On the Corticulous Habit of *Hedwigia ciliata* (Hedw.) P. Beauv.

Paul L. Redfearn, Jr.[1]

In a recent attempt to relocate an earlier collection of *Orthotrichum diaphanum* Brid. on the campus of Southwest Missouri State University, I found a small colony (ca 1 cm in diameter) of *Hedwigia ciliata* about 6 feet high on the trunk of *Acer saccharum* Marshall. This tree was isolated at the edge of a large area cleared some years ago for campus expansion. *Hedwigia ciliata* has been reported on bases of trees such as hickories, oaks and beech by Crum & Anderson (1981), Redfearn (1983) and Sharp (1939). Barkman (1958) reported *Hedwigia ciliata* on the trunk of *Ulex europeus* L. in heathland of west Scotland. The occurrence of *H. ciliata* so high on the trunk of a tree is unusual and apparently not been observed before. Data for this collection is: Missouri, Greene County, campus of Southwest Missouri State University (*Redfearn 39346, MO*).

There are no suitable rock substrates nearby from which this colony could have been derived. It undoubtedly arrived by diaspore dispersal from some distance. Means of dispersal are always somewhat speculative and hard to validate experimentally so this dispersal may have been by spores or some other part of the plant.

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The Hedwigan Classification

The Hedwigan Soc., St. Louis, has issued Contr. Hedw. Soc. 1, The Hedwigan Classification, a facsimile of Hedwig's key to the genera of Mosses from his posthumous *Species Muscorum*. The facsimile is a single, broadside sheet, 28 by 35.5 cm on aged-looking laid paper, with the title and publication information added in the margins. It is folded twice, to approximate the folds in the original. Or, by special arrangement, unfolded, rolled, copies may be obtained.

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New State and County Mosses for the Great Plains

Robert F. Steinauer[1] & Steven P. Churchill[2]

Recent collections by the first author and resumption of studies on the mosses of the Great Plains by the second author has resulted in several new state and county records for Nebraska, North Dakota, Oklahoma, and South Dakota.

Aulacomnium palustre (Hedw.) Schwägr. Aulacomniaceae Nebraska: Sheridan County, Pine Creek approximately 0.5 mile east of Highway 250, N 1/2, Sec. 24, T29N, R44W, spring seep on south side of creek, 3 Sep 1997, *Steinauer 217* (MO). This species is only known in the Great Plains from about 12 widely scattered localites in the Great Plains; in Nebraska previously recorded from Brown, Holt, and Jefferson counties.

Brachythecium rutabulum (Hedw.) Schimp. *in* Bruch, Schimp. & W. Gümbel Brachytheciaceae North Dakota. Ramsey: margin of Sully Hill National Game Preserve, off Highway 57, *Tilia-Fraxinus* woods; shaded on leaf litter, *Churchill & Kantak 12484* (MO). Apparently new to North Dakota.

Calliergonella cuspidata (Hedw.) Loeske Amblystegiaceae Nebraska: Cherry County, Silver Lake fen, S 1/2, Sec. 15, T28N, R37W, on peat mounds, 8 Jul 1997, *Steinauer 98-C* (MO); Sheridan County, Pine Creek approximately 0.5 mile east of Highway 250, N 1/2, Sec. 24, T29N, R44W, spring seep on south side of creek, 3 Sep 1997, *Steinauer 222* (MO). New to Nebraska, and within the Great Plains previously known only from western Iowa.

Climacium dendroides (Hedw.) F. Weber & D. Mohr Climaciaceae Nebraska: Cherry County, Silver Lake fen, S 1/2, Sec. 15, T28N, R37W, on peat mounds, 8 Jul 1997, *Steinauer 98-B* (MO). This western and northern species is known within the Great Plains from the Black Hills (cf. Horton & Vitt, 1976).

Grimmia teretinervis Limpr. Grimmiaceae Nebraska: Keith County, southeast area of Lake McConaughy, north of Ogallala, 41°12'N, 101°11'W, on calcareous rock outcropsin grassland with scattered *Juniperus*, 19 May 1976, *Churchill 7304* (MO, NY); verif. J. Muñoz. South Dakota: Meade County, Stagebarn Canyon, south of Piedmont, 44°13'N, 103°23'W, on rock ledges of *Pinus* bluffs, 26 May 1977, *Churchill 9200* (MO); det. J. Muñoz. A further record for Oklahoma includes Rogers County (21 Jan 1974, *Mårtensson & Barclay s.n.*, MO). New

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[2] Missouri Botanical Garden, Box 299, St. Louis, MO 63166-0299

to Nebraska and South Dakota, previously known within the Great Plains from Kansas and Oklahoma (Ireland, 1982).

Hypnum pratense (Rabenh.) W. D. J. Koch ex Spruce Hypnaceae Nebraska: Cherry County, Silver Lake fen, S 1/2, Sec. 15, T28N, R37W, on peat mounds, 8 Jul 1997, *Steinauer 98-D, 98-E* (MO). New to Nebraska and the Great Plains.

Philonotis fontata (Hedw.) Brid. Bartramiaceae Nebraska: Sheridan County: Pine Creek approximately 0.5 mile east of Highway 250, N 1/2, Sec. 24, T29N, R44W, spring seep on south side of creek, 3 Sep 1997, *Steinauer 216* (MO). Previously known in Nebraska from Garden County; elsewhere in the Great Plains known from Oklahoma (Comanche County) and South Dakota (Pennington County and probably Shannon County, cf. Zales, 1973).

Pohlia nutans (Hedw.) Lindb. Bryaceae Nebraska: Sheridan County, Spring at base of sandhill on south side of Pine Creek valley, off Highway 250, SE 1/4, Sec. 15, T29N, R44W, on bank under overhang of spring, 4 Sep 1997 *Steinauer 240* (MO). Previously recorded from Brown, Dawes, Keya Paha and Sioux counties Nebraska, all associated with *Pinus ponderosa* forests.

Syntrichia bartramii (Steere) R. H. Zander Pottiaceae Oklahoma: Cimarron County: Black Mesa State Park, ca. 35 km northwest of Boise City, 36°51'N, 102°52'W, sandstone cliffs and boulders in low canyon grassland, 17 Aug 1979, *Churchill 11178* (MO). This southwestern *Syntrichia* species is new to Oklahoma and the Great Plains.

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Additions to the Moss Flora of New Mexico

Kelly W. Allred[1], Carl Darigo[2] & Richard D. Worthington[3]

This paper reports the occurrence of 35 mosses new to the state of New Mexico, adding to the recent inventories of Ireland et al. (1981, 1984), Mahler (1978, 1985), and Stark and Castetter (1982, 1986), as well as numerous short reports by various authors. Unless otherwise noted, verification was by Bruce Allen (specimens with duplicates at MO) and William A. Weber (specimens with duplicates at COLO). For ease of comparison with existing floras and checklists, nomenclature follows Anderson et al. (1990).

Bartramia brevifolia Brid. TAOS CO.: Trail to Wheeler Peak near Twining, 1938, *Ikenberry 391* (COLO, det. by Fransén [Fransén 1995]).

Bartramia potosica Mont. SAN MIGUEL: Near Las Vegas, 1927, *Arsene 18551* (FH, det. by Fransén [Fransén 1995]).

Brachythecium nelsonii Grout MORA CO.: Sangre de Cristo Mts, Pecos Baldy Lake, 1997, 11500 ft, *Allred 6852* (COLO, NMCR).

Brachythecium oedipodium (Mitt.) Jaeg. LINCOLN CO.: Near Ruidoso, 1936, *Ikenberry s.n.* (MO, det. by Ken McFarland).

Braunia secunda (Hook.) B.S.G. HIDALGO CO.: Peloncillo Mts, Clanton Draw 2-3 miles east of the crest, T32S R21W Sec 18, 1997, *Worthington 26583* (COLO, NMCR, UTEP). SIERRA CO.: Black Range, north Percha Creek, 6 miles north of Kingston, *Worthington 24979* (COLO, UTEP).

Bryohaplocladium angustifolium (Hampe & C. Müll.) Wat. & Iwat. OTERO CO.: Lincoln Natl. For., about 6 miles north of Piñon, T18S R15E Sec 12, 1997, *Maynard 286* (MO, NMCR). LINCOLN CO.: near Ruidoso River, Ruidoso, 1936, *Ikenberry s.n.* (MO).

Bryoxiphium norvegicum (Brid.) Mitt. SANDOVAL CO.: Santa Fe Natl. Forest, above Telephone Canyon and Seven Springs, 20 miles east of Cuba, 1993, *Norris 81646* (MO).

Bryum caespiticium Hedwig LINCOLN CO.: White Mts, upper Eagle Creek, T10S R11E Sec 25, 1996, *Worthington 25492* (COLO, NMCR, UTEP). SAN MIGUEL CO.: Sangre de Cristo Mts, Santa Fe Natl. For., Holy Ghost

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Campground, 1996, *Allred 6365* (MO, NMCR); along Panchuela Creek near Cowles, 1996, *Allred 6384* (MO, NMCR). SANDOVAL CO.: Sandia Mt Wilderness, along trail from summit to tramway, 1996, *Allred 6433* (COLO, NMCR). SANTA FE CO.: Hyde State Park, Santa Fe, 1937, *Ikenberry s.n.* (MO). TAOS CO.: Road near falls, Rito Angustura, Tres Ritos, 9000 ft, 1936, *Voth & Voth 15918* (MO).

Bryum dichotomum Hedw. BERNALILLO CO.: Rio Grande Nature Center, Albuquerque, 1991, *Briscoe s.n.* (MO).

Bryum pallens (Brid.) Sw. SANTA FE CO.: Hyde State Park, Santa Fe, 1937, *Ikenberry s.n.* (MO). TAOS CO.: Hondo Canyon, Taos, 1938, *Ikenberry s.n.* (MO).

Bryum pallescens Schleich. ex Schwaeger DOÑA ANA CO.: Organ Mountains, Filmore Canyon, 7500 ft, 1992, *Worthington 21130, 21131* (COLO, NMCR, UTEP). GRANT CO.: Upper part of Cherry Creek, T16S R13W, 7200 ft, *Worthington 8534, 8535* (COLO, UTEP).

Dichodontium pellucidum (Hedw.) Schimp. TAOS CO.: 2 miles above canyon entrance near Hondo River, Taos, 1938, *Ikenberry s.n.* (MO).

Dicranum fuscenscens Turn. var. *fuscenscens* TAOS CO.: 2 miles below Twining, *Ikenberry 722* (MO).

Dicranum scoparium Hedwig SAN MIGUEL CO.: Sangre de Cristo Mts, along Panchuela Creek near Cowles, 8500 ft, 1996, *Allred 6393* (COLO, NMCR). SANTA FE CO.: Ghost Canyon, Santa Fe, 1936, *Ikenberry s.n.* (MO); without locality, *Ikenberry 1743* (MO). TAOS CO.: Near Twining, 8500 ft, 1936, *Ikenberry s.n.* (MO). Also, Catron, Mora, and Lincoln counties, all at NMCR. It is odd that this very common moss of the mountain regions has not been reported before.

Didymodon rigidulus Hedwig var. *icmadophilus* (C. Müll.) Zander LINCOLN CO.: New Mexico State University Corona Ranch, 3/4 miles north of Johnson Well in karst sinkholes, 6100 ft, 1997, *Forbes 224* (COLO, NMCR).

Ditrichum flexicaule (Schwaegr.) Hampe. MORA CO.: Sangre de Cristo Mts, Pecos Baldy Lake, 11500 ft, 1997, *Allred 6861* (COLO, NMCR).

Fontinalis hypnoides Hartm. var. *hypnoides* CATRON CO.: Gila Natl. For., south fork Negrito Creek near confluence with Beaverdam Creek, 7400 ft, 1997, *Adams 247* (NMCR). SIERRA CO.: Black Range, along Percha Creek, 7000 ft, *Worthington 24973* (COLO, UTEP). TAOS CO.: Near falls, Rito Angustura, Tres Ritos, 9000 ft, 1936, *Voth & Voth 15768* (MO).

Hypnum pratense (Rabenh.) Spruce MORA CO.: Sangre de Cristo Mts, Beatty's Cabin area about 7 miles north of Cowles, 9400 ft, 1997, *Allred 6817* (COLO, NMCR).

Isopterygiopsis pulchella (Hedw.) Iwats. TAOS CO.: Carson Natl. For., Wheeler Peak Wilderness Area, Williams Lake, 11,000 ft, *Mahler 8239a* (CANM, det. by R. Ireland).

Isopterygium tenerum Mitt. DOÑA ANA CO.: Organ Mountains, *Stark 948*, *Stark & Castetter 1106* (MO).

Leptopterigynandrum austro-alpinum C. Müll. GRANT CO.: Pinos Altos area along road to Signal Peak, T16S R13W Sec 11, *Worthington 25283* (COLO, UTEP).

Lorentziella imbricata (Mitt.) Broth. OTERO CO.: White Sands Natl. Mon., about 2 km south of Lake Lucero, 3900 ft, 1998, *Anderson 7215* (COLO, NMCR).

Oncophorus wahlenbergii Brid. TAOS CO.: Carson Natl. For., Beaver Lake, 9500 ft, 1965, *Crutchfield 588* (MO).

Orthotrichum laevigatum Zett. LINCOLN CO.: Near Ruidoso River, Ruidoso, 1936, *Ikenberry s.n.* (MO).

Palustriella commutata (Brid.) Ochyra MORA CO.: Sangre de Cristo Mts, Pecos Baldy Lake, 11500 ft, 1997, *Allred 6854* (COLO, NMCR). TAOS CO.: Near Twining, 10,500 ft, 1938, *Ikenberry s.n.* (MO).

Palustriella decipiens (De Not.) Ochyra TAOS CO.: Near Twining, 1938, *Ikenberry 982* (MO).

Plagiomnium ellipticum (Brid.) T. Kop. SAN MIGUEL CO.: 1.5 miles up trail from shelters, Ghost Canyon, Cowles, 1936, *Voth & Voth 15806* (MO).

Platyhypnidium riparioides (Hedw.) Dix. LINCOLN CO.: Near Ruidoso River, Ruidoso, 1936, *Ikenberry s.n.* (MO). TAOS CO.: Big Arsenic Spring, Rio Grande Gorge Recreation Area, 1965, *Crutchfield 644* (MO).

Pohlia elongata Hedwig var. *elongata* DOÑA ANA CO.: Organ Mts, 1993, *Worthington 22250* (COLO, NMCR, UTEP). HIDALGO CO.: 500 ft from top of Animas Peak, 1947, *Harvill 2818b* (MO). SOCORRO CO.: Magdalena Mts, Water Canyon at start of Baldy Peak Trail no. 11, 1997, *Worthington 26607* (COLO, NMCR, UTEP).

Pottia bryoides (Dicks.) Mitt. HIDALGO CO.: Sierra Rica Mts, T29S R14W Sec 30, *Worthington 11847* (COLO, UTEP).

Rhizomnium punctatum (Hedw.) T. Kop. TAOS CO.: 35 miles southeast of Taos, 1938, *Ikenberry s.n.* (MO).

Tetraphis pellucida Hedwig OTERO CO.: Cloudcroft, 1938, *A.Barnett 10* (NMC, det. by K. Allred). SANDOVAL CO.: Jemez Mts, Santa Fe Natl. For., upper reaches of San Antonio Creek near Ice Caves, 1996, *Allred 6405* (COLO, NMCR).

Tortula brevipes (Lesq.) Broth. HIDALGO CO.: Big Hatchet Mts, T30S R15W Sec 29, 1993, *Worthington 21877* (COLO, NMCR, UTEP).

Tortula intermedia (Brid.) Berk. COLFAX CO.: Ripley City Park, Raton, 6650 ft, 1997, *Darigo 2985* (MO).

Tortula norvegica (Web.) Wahlenb. ex Lindb. DONA ANA CO.: Organ Mountains, northeast side of the Needles, 8000 ft, 1993, *Worthington 21565* (COLO, UTEP); Aden Crater, 4000 ft, *Lambert 677* (COLO, UTEP). HIDALGO CO.: Little Hatchet Mountains, Granite Pass, 5000 ft, *Worthington 20669* (COLO, UTEP). This species was previously reported from New Mexico by Flowers (1973), but without locality or specimen citation.

Acknowledgments. We gratefully acknowledge the assistance of Bruce Allen, Ken McFarland, Ron Pursell, Robert Ireland, and William A. Weber for verifying our identifications and providing encouragement in our study New Mexico mosses. The curators of MO and NMC graciously allowed access to their bryophyte collections.

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The genus *Trematodon* (Musci: Bruchiaceae) in Maine

Bruce Allen[1]

The Bruchiaceae are a segregate family of the Dicranaceae originally proposed (Schimper 1855) only for the genus *Bruchia*. Brotherus (1909) was the first to associate *Trematodon* with *Bruchia* when he placed the genera in the subfamily Trematodontoideae in the Dicranaceae. Britton (1913) returned *Trematodon* and *Bruchia* to the Bruchiaceae and expanded the family to include the genus *Pringleella*. All classifications since Britton's, however, placed these genera in the Dicranaceae, until Buck (1979) restored the Bruchiaceae for *Bruchia*, *Eobruchia*, *Pringleella*, and *Trematodon*. Recent opinions on the merits of the Bruchiaceae have been varied (for: Walther 1983, Allen 1994, Crum 1995, Churchill & Linares 1995; against: Crum & Anderson 1981, Vitt 1984, Rushing 1986). The Bruchiaceae are recognized here as a group of small, gametophytically reduced, acrocarpous mosses commonly found on bare disturbed soil that have capsules with long, well-developed, stomatose necks and large, highly ornamented spores with often distinct proximal and distal surfaces. As here defined the family is very similar to some members of the Ditrichaceae or Dicranaceae and may represent an intermediate taxon linking the two families.

While the merits of recognizing the Bruchiaceae are debatable there is no question that *Bruchia* and *Trematodon*, although they show remarkable differences in capsule and calyptra features, are closely related. The two genera have been shown to exhibit similar cytological features (Bryan 1956) and are able to hybridize (Rushing and Snider 1985). *Trematodon* differs from *Bruchia* in having a cucullate calyptra, well developed annulus, and a peristome present in most members. In contrast *Bruchia* has a mitrate calyptra, is cleistocarpous, and eperistomate.

Trematodon Michx., Fl. Bor. Amer. 2: 289. 1803.

Plants small, gregarious or loosely tufted; stems erect, simple. Leaves ovate-lanceolate; costa single, strong; alar cells undifferentiated. Autoicous or dioicous. Setae long or short; capsules exserted, long-rostrate, with a strongly differentiated, stromatose neck, operculate; peristome present or absent. Calyptrae cucullate. Spores large, reniform, highly ornamented.

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The name *Trematodon* combines the Greek "*trema* - an opening or hole" and "*-odon* - tooth" in reference to the perforated peristome teeth of some of its species. There are 83 species of *Trematodon* world-wide, an astounding number in view of the gametophytic simplicity of the genus. The taxonomy of *Trematodon* in the northern hemisphere has been fairly well worked out, but most of the southern hemispheric species remain untested. In Maine the genus is recognized by its long-necked capsules, undifferentiated alar cells, autoicous condition, vertically striate outer peristome surface, and subreniform spores. Plants of *Trematodon* have very reduced gametophytes and for that reason collections without sporophytes are difficult to distinguished from *Dicranella* or *Ditrichum*.

Capsule neck more or less equal to urn in length; leaves abruptly narrowed above, the costa completely filling the awn; leaf margins erect ..... *T. ambiguus*

Capsule neck twice as long as urn; leaves gradually narrowed above, the costa not occupying the width of the subula; leaf margins weakly recurved ..... [*T. longicollis*]

Trematodon ambiguus (Hedw.) Hornsch., Flora 2: 88. 1819.
Dicranum ambiguum Hedw., Sp. Musc. Frond. 150. 1801.

Plants scattered, yellowish green, terricolous; stems 3--10 mm long. Leaves evenly spaced, flexuose-spreading when wet, 2--4 mm long, oblong and clasping at base; apex abruptly contracted to a long awn; margins erect, entire; costa smooth, expanding at base of awn and filling the upper leaf; upper cells quadrate or oblate to shortly rectangular, 7.5--32 µm x 7.5-0--12.5 µm, thick-walled, basal cells narrowly long-rectangular to rhomboidal, 37--92 µm x 7.5-21 µm, whitish yellow, thin-walls. Autoicous. Setae 7-17 mm long, yellow; capsules inclined, reddish-brown, urns asymmetric, ellipsoidal, 1.0-2.0 mm long, neck 1.2-2.0 mm long, as long as, a little shorter or a little longer than the urn, strumose; annuli deciduous, revoluble; opercula rostrate, 1.0 mm long; stomata phaneroporic; peristome teeth red, lanceolate, vertically striate. Calyptrae yellow, 1.5 mm long. Spores subreniform, thickly papillose to subwarty, 25--32 µm.

On clayey loam along roadside, bare soil in field or gravel pit and wet soil at base of tree. In Maine know from Androscoggin (*Merrill 28* MO), Aroostook (*Norton* MAINE), Cumberland (*Chamberlain 902* (MAINE), Hancock (*Allen 2121* MO), Kennebec (*Merrill 7* MO), Oxford (*Parlin 12857* MAINE, MO),

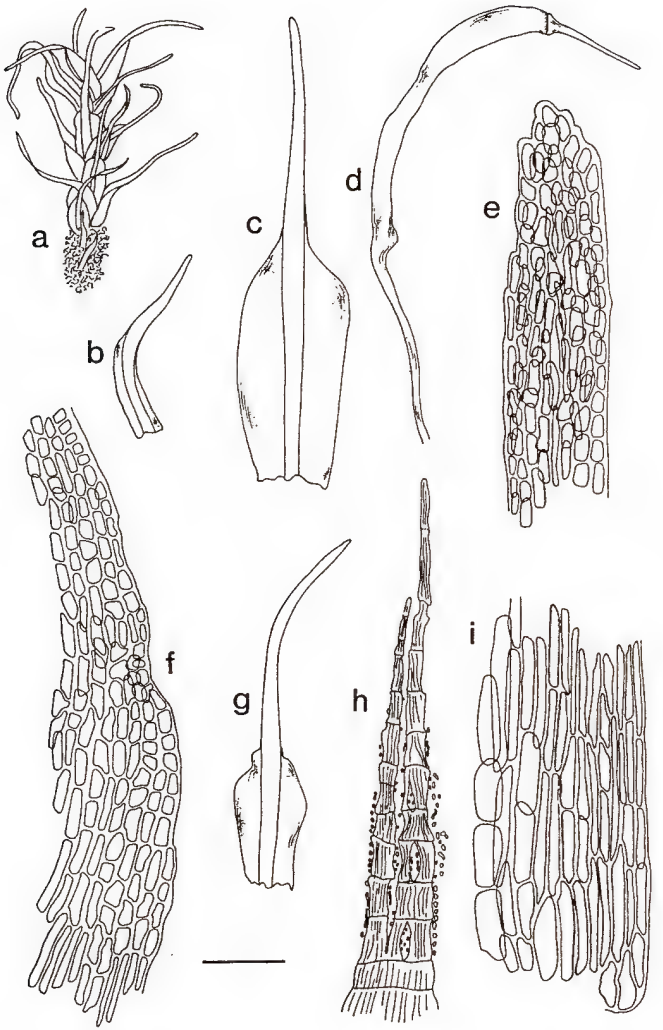

Figure 1. *Trematodon ambiguus*. a. Habit. b. Basal leaf. c. & g. Upper leaves. d. Capsule and operculum. e. Leaf apex. f. Median leaf cells at margin. h. Peristome tooth, dorsal (outer) surface. i. Basal leaf cells at margin in alar region. Scales in mm: bar = 0.05 (e,f,h,i); bar = 0.5 (b,c,g); bar = 1.01 (d); bar = 4.25 mm (a). All figures from *Allen 16536* (MO).

Piscataquis (*Allen 16563* MO), Sagadahoc (*Norton* MAINE), Somerset, (*Collins 1377* NY), Washington (*Allen 16269* MO), and York (*Carlson & Lowe* MAINE) Counties.

Trematodon ambiguus is a colonizer of bare, disturbed soil and is found throughout the northern boreal region of the world. In northeastern North America it occurs from Newfoundland to Ontario, south to Minnesota and Pennsylvania. It is also present in Central America, southern Asia, the Caucasus, China and India.

The capsule neck in *T. ambiguus* is wonderfully developed and is more or less the same size as the capsule urn. Nevertheless it is distinctly shorter than that of *T. longicollis*, which is generally twice the length of the urn. The most reliable features separating *T. ambiguus* from *T. longicollis* are gametophytic. *Trematodon ambiguus* has leaves with erect margins that are abruptly constricted at the base of the awn. As a result the costa completely fills the awn. In *T. longicollis* the leaf margins are recurved and leaves gradually narrow to the apex so that the lamina reaches to the apex.

Trematodon longicollis Michx., Fl. Bor. Amer. 2: 289. 1803.

Plants scattered, yellow-green, terricolous, 3-5 mm long. Leaves evenly spaced, flexuose spreading when wet, clasping, oblong to oblong-ovate at base, gradually linear-subulate above, 2-3 mm long; margins weakly recurved above, entire below, weakly denticulate by blunt teeth above; costa percurrent; upper cells short-rectangular, walls firm and thickened; basal cells laxly oblong-rhomboidal to long rectangular, pale whitish yellow. Autoicous. Setae 10-15 mm long, smooth, yellow; capsules inclined, yellow, urn ellipsoidal 1.5-2.0 mm long, neck 3.0-4.0 mm long; annuli deciduous, revoluble; opercula rostrate, 1.0 mm long; stomata cryptoporic and phaneroporic; peristome teeth red, lanceolate, vertically striate. Spores densely papillose or minutely warty.

Parlin (1939) lists three collections of this species from Maine: Houghton, 1936 [*Parlin 12857*], Hartford, 1936 *C.D. Adams*, and Byron, 1937 *C.D. Adams*. The Parlin specimen (MAINE, MO) is *T. ambiguus*. I have been unable to locate the other two collections.

Trematodon longicollis, unlike *T. ambiguus*, is primarily southern in distribution. In eastern North America the farthest north this species gets is

southern Ontario and northern New Jersey. If *T. longicollis* does occur in Maine it will represent a significant range extension for the species. *Trematodon longicollis* is otherwise known from the southeastern United States, Mexico to Brazil, the Caribbean, southeastern Europe, China, Japan, India, southeastern Asia, southern Africa and some Pacific islands.

Trematodon longicollis is marked by its very long necked capsules and gradually narrowed leaves that have narrowly recurved margins. *Trematodon ambiguus* differs from *T. longicollis* in having a shorter capsule neck, abruptly narrowed leaves with erect margins and a costa that flares outward at the base of the awn to occupy the entire subula.

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Mosses of Grey County, Ontario

Martina Krieger [1] & Joan Crowe [2]

Abstract: Two hundred and fifty two moss taxa are listed from Grey county, Ontario. Ten of them have not been reported previously.

Grey county is situated in southern Ontario between latitude 44° and 44° 47' N and longitude 80° 14' and 81° 8' W, and has an area of 4 426 km^2 . Much of the terrain consists of a gently undulating to rolling landscape with glacial remains deeply covering the Upper Ordovician as well as Upper, Middle and Lower Silurian bedrock in over 80 percent of the area. The Lower and Middle Silurian rocks are capped by dolostone and formed approximately 430 million years ago. They are exposed along the Niagara Escarpment which runs through the county into the Bruce Peninsula. Much of the lowland is used for farming. There is an extensive apple orchard area near Meaford, south of Georgian Bay. Remnant patches of Great Lakes-St. Lawrence deciduous forest are found throughout the area, especially on the highlands. From the escarpment, the land slopes gently to the west and is drained by sluggish rivers interspersed with extensive wetlands. Although the plants of the Niagara escarpment have been well studied, little attention has been paid previously to the wetlands in the southern part of the county.

In this study, thirty one sites were randomly surveyed from September 1996 to November 1996, ranging across all of the 16 townships. This included 11 ANSI sites where moss taxa had not been listed. In total, 408 specimens were identified, comprising a total of 120 species, ten of which have not been published previously. Specimens of the latter have been deposited in the herbarium of Wilfrid Laurier University in Waterloo, Ontario.

Moss collections have been made in the area since its settlement in the mid nineteenth century, some by John Macoun and most extensively by E.A. Moxley (1932). Many of these specimens are housed in the University of Toronto Cryptogam herbarium (TRTC) which was searched as part of this study. ANSI reports (Areas of Natural and Scientific Interest) from the Ministry of Natural Resources, Ontario were checked. Records were also obtained from the following publications.

[1] Wilfrid Laurier Univ., 75 University Avenue West, Waterloo, Ontario, N2L 3C5
[2] RR 5, Owen Sound, Ontario, N4K 5N7

The Bryophytes of Owen Sound and the Bruce Peninsula (Crum 1966), The Checklist of the Mosses of Ontario (Cain and Ireland 1975), the Atlas of Ontario Mosses (Ireland and Ley 1992). The final list from all these sources comprises 252 species. Nomenclature is according to Anderson, Crum and Buck, 1990.

New records for Grey County

Anomodon minor (Hedw.) Fürnr.
Bryum algovicum Sendtn. ex C.M.
Bryum flaccidum Brid.
Calliergon trifarium (Web. & Mohr) Kindb.
Dicranum spurium Hedw.
Distichium capillaceum (Hedw.) Bruch. & Schimp. in B.S.G.
Sphagnum cuspidatum Ehrh. ex Hoffm.
Sphagnum girgensohnii Russ.
Sphagnum papillosum Lindb.
Sphagnum russowii Warnst.

A collection number (MK) is given for each taxon collected in the course of this study. For all other taxa listed, one reference is given. See the codes below.

MK - Martina Krieger, **EM** - Eugene A. Moxley,
TR - University of Toronto cryptogam herbarium (TRTC),
IC - Ontario Checklist , **IL** - Atlas of Ontario Mosses.
(Further details available upon request)

Abietinella abietina (Hedw.) Fleisch. EM
Amblystegium serpens (Hedw.) Schimp. in B.S.G. MK 20
var *juratzkanum* (Schimp.) Rau & Herv. MK 44
Amblystegium varium (Hedw.) Lindb. MK 79
Anomodon attenuatus (Hedw.) Hüb. MK 42
Anomodon minor (Hedw.) Fürnr. MK 36
Anomodon rostratus (Hedw.) Schimp. MK 131
Anomodon rugelii (C. Müll.) Keissl. MK 46
Anomodon viticulosus (Hedw.) Hook. & Tayl. MK 163
Atrichum altecristatum (Ren. & Card.) Smyth & Smyth. TR
Atrichum angustatum (Brid.) Bruch & Schimp. in B.S.G. MK 31
Atrichum crispum (James) Sull. IC

Atrichum oerstedianum (C. Müll.) Mitt. IC
Atrichum undulatum (Hedw.) P. Beauv. MK 51
Aulocomnium androgynum (Hedw.) Schwaegr. IC
Aulocomnium heterostichum (Hedw.) Bruch & Schimp. in B.S.G. EM
Aulocomnium palustre (Hedw.) Schwaegr. MK 40
Barbula convulata Hedw. IC
Barbula unguiculata Hedw. IC
Bartramia pomiformis Hedw. EM
Brachythecium acuminatum (Hedw.) Aust. MK 80
Brachythecium campestre (C. Müll.) Schimp. in B.S.G. EM
Brachythecium digastrum C. Müll. & Kindb. in Mac. & Kindb. MK 298
Brachythecium laetum (Brid.) B.S.G. = *B. oxycladon* (Brid.) Jaeg. MK 15
Brachythecium oedipodium (Mitt.) Jaeg. MK 176
Brachythecium populeum (Hedw.) Schimp. in B.S.G. MK 39
Brachythecium reflexum (Starke in Web. & Mohr) Schimp. in B.S.G. MK 331
Brachythecium rivulare Schimp. in B.S.G. EM
Brachythecium rutabulum (Hedw.) Schimp. in B.S.G. MK 135
Brachythecium salebrosum (Web. & Mohr) Schimp. in B.S.G. MK 210
Brachythecium turgidum (Hartm.) Kindb. EM
Brachythecium velutinum (Hedw.) Schimp. in B.S.G. IC
Brotherella recurvans (Michx.) Fleisch. MK 179
Bryhnia graminicolor (Brid.) Grout. EM
Bryhnia novae-angliae (Sull. & Lesq. In Sull.) Grout. IC
Bryoerythrophyllum recurvirostre (Hedw.) Chen. MK 160
Bryum algovicum Sendtn. ex C. Müll. MK 7
Bryum argenteum Hedw. MK 142
Bryum capillare Hedw. MK 133
Bryum lisae De Not. var. *cuspidatum* Bruch & Schimp in B.S.G. = *B. creberrimum* Tayl. MK 195
Bryum flaccidum Brid. MK 232
Bryum pseudotriquetrum (Hedw.) Gaertn. et al. MK 140
Callicladium haldanianum (Grev.) Crum. MK 71
Calliergon cordifolium (Hedw.) Kindb. IC
Calliergon giganteum (Schimp.) Kindb. IC
Calliergon richardsonii (Mitt.) Kindb. in Warnst. IC
Calliergon trifarium (Web.& Mohr.) Kindb. MK 348
Calliergonella cuspidata (Hedw.) Loeske. IC
Campylium chrysophyllum (Brid.) J. Lange. MK 67
Campylium hispidulum (Brid.) Mitt. MK 132
Campylium polygamum (Schimp. in B.S.G.) C. Jens. IC
Campylium stellatum (Hedw.) C. Jens. MK 139
var. protensum (Brid.) Bryhn MK 26
Ceratodon purpureus (Hedw.) Brid. MK 2
Cirriphyllum piliferum (Hedw.) Grout MK 203
Climacium dendroides (Hedw.) Web. & Mohr. MK 189

Conardia compacta (C. Müll.) Robins. TR
Cratoneuron filicinum (Hedw.) Spruce. MK 112
Ctenidium molluscum (Hedw.) Mitt. IC
Cyrto-hypnum minutulum (Hedw.) Buck & Crum. IC
= *Thuidium minitulum*
Cyrto-hypnum pygmaeum (Schimp. in B.S.G.) Buck & Crum. EM = *Thuidium pygmaeum*
Desmatodon obtusifolius (Schwaegr.) Schimp. IL
Dichelyma pallescens Schimp. in B.S.G. IC
Dichodontium pellucidum (Hedw.) Schimp. IC
Dicranella heteromalla (Hedw.) Schimp. MK 83
Dicranella schreberiana var. *robusta* (Schimp. ex Braithw.) Crum & Anderson IC
Dicranella varia (Hedw.) Schimp. MK 13
Dicranoweisia crispula (Hedw.) Lindb. ex Milde. IC
Dicranum bonjeanii De Not. in Lisa. EM
Dicranum flagellare Hedw. MK 172
Dicranum fulvum Hook. MK 76
Dicranum fusescens Turn. MK 271
Dicranum montanum Hedw. MK 303
Dicranum ontariense Peters. MK 272
Dicranum polysetum Sw. MK 273
Dicranum scoparium Hedw. MK 29
Dicranum spurium Hedw. MK 108
Dicranum viride (Sull. & Lesq in Sull.) Lindb. MK 17
Didymodon fallax (Hedw.) Zand. MK 14
Didymodon rigidulus Hedw. TR
Didymodon tophaceus (Brid.) Lisa. TR
Diphyscium foliosum (Hedw.) Mohr. EM
Distichium capillaceum (Hedw.) Bruch & Schimp. in B.S.G. MK 130
Ditrichum flexicaule (Schwaegr.) Hampe. MK 94
Ditrichum pallidum (Hedw.) Hampe. IC
Drepanocladus aduncus (Hedw.) Warnst. EM
Drepanocladus capillifolius (Warnst.) Warnst. IC
Drepanocladus vernicosus (Mitt.) Warnst. IC
Drummondia prorepens (Hedw.) Britt. IC
Encalypta procera Bruch. MK 35
Entodon cladorrhizans (Hedw.) C. Müll. MK 19
Entodon seductrix (Hedw.) C. Müll. MK 145
Eurhynchium hians (Hedw.) Sande Lac. EM
Eurhynchium pulchellum (Hedw.) Jenn. MK 37
Fissidens adianthoides Hedw. MK 5
Fissidens bryoides Hedw. EM
Fissidens bushii (Card. & Thér.) Card. & Thér. MK 134
Fissidens dubius P. Beauv. MK 73

Fissidens fontanus (B. Pyl.) Steud. IC
Fissidens grandifrons Brid. EM
Fissidens obtusifolius Wils. IC
Fissidens osmundioides Hedw. MK 187
Fontinalis antipyretica Hedw. IL
Fontinalis dalecarlica Schimp. in B.S.G. EM
Fontinalis hypnoides (Hartm) var. *duriaei* (Schimp.) Husn. TR
Funaria hygrometrica Hedw. IC
Grimmia affinis Hoppe & Hornsch. ex Hornsch. IC
Grimmia pilifera P. Beauv. IC
Gymnostomum aeruginosum Sm. EM
Gyroweisia reflexa (Brid.) Schimp. IC
Hedwigia ciliata (Hedw.) P. Beauv. MK 89
Helodium blandowii (Web. & Mohr.) Warnst. IC
Helodium paludosum (Sull.) Aust. IC
Herzogiella turfacea (Lindb.) Iwats. IC
Heterocladium dimorphum (Brid.) Schimp. in B.S.G. IC
Homalia trichomanoides (Hedw.) Schimp. in B.S.G. MK 78
Homallium adnatum (Hedw.) Broth. MK 49
Hygroamblystegium fluviatile (Hedw.) Loeske EM
Hygroamblystegium noterophilum (Sull. & Lesq. in Sull.) Warnst. EM
Hygroamblystegium tenax (Hedw.) Jenn. EM
var. spinifolium (Schimp.) Jenn. TR
Hygrohypnum eugyrium (Schimp. in B.S.G.) Loeske. TR
Hygrohypnum luridum (Hedw.) Jenn. IC
Hylocomiastrum pyrenacium (Spruce) Fleisch. EM
Hylocomiastrum umbratum (Hedw.) Fleisch. EM
Hylocomium splendens (Hedw.) Schimp. in B.S.G. MK 75
Hymenostylium recurvirostre (Hedw.) Dix. IC
Hyophila involuta (Hook.) Jaeg. IC
Hypnum curvifolium Hedw. EM
Hypnum fertile Sendtn. IC
Hypnum imponens Hedw. IC
Hypnum lindbergii Mitt. MK 62
Hypnum pallescens (Hedw.) P. Beauv. MK 302
Hypnum pratense (Rabenh.) W. Koch. ex Spruce. IC
Hypnum recurvatum (Lindb. & Arnell) Kindb. IC
Hypnum vaucheri Lesq. TR
Isopterygiopsis pulchella (Hedw.) Iwats. MK 281
Leptobryum pyriforme (Hedw.) Wils. EM
Leptodictyum humile (P. Beauv.) Ochyra. MK 43
Leptodictyum riparium (Hedw.) Warnst. MK 220
Leskea polycarpa Hedw. IC
Leskeella nervosa (Brid.) Loeske. EM
Leucobryum glaucum (Hedw.) Ångstr. in Fries. MK 185

Leucodon brachypus Brid. IC
var. andrewsianus Crum & Anderson. MK 119
Leucodon julaceus (Hedw.) Sull. IC
Lindbergia brachyptera (Mitt.) Kindb. IC
Loeskeobryum brevirostre (Brid.) Fleisch. IL
Mnium ambiguum H. Müll. MK 122
Mnium marginatum (With.) Brid. ex P. Beauv MK 197
Mnium spinosum (Voit) Schwaegr. MK 11
Mnium stellare Hedw. IC
Mnium thomsonii Schimp. IL
Myurella julacea (Schwaegr.) Schimp. in B.S.G. IC
Myurella sibirica (C. Müll). Reim. TR
Neckera pennata Hedw. TR
Oncophorus wahlenbergii Brid. MK 227
Orthothecium intricatum (Hartm.) Schimp. in B.S.G. IC
Orthotrichum anomalum Hedw. MK 65
Orthotrichum obtusifolium Brid. EM
Orthotrichum ohioense Sull. & Lesq. in Aust. IC
Orthotrichum pumilum Sw. IC
Orthotrichum sordidum Sull. & Lesq. in Aust. MK 63
Orthotrichum speciosum Nees in Sturn. EM
var. elegans (Schwaegr. ex Hook. & Grev.) Warnst. TR
Oxystegus tenuirostris (Hook. & Tayl.) A.J.E. Sm. IC
Palustriella commutata (Brid.) Ochyra. MK 1
Paraleucobryum longifolium (Hedw.) Loeske. TR
Phascum cuspidatum Hedw. IC
Phascum floerkeanum Web. & Mohr. IC
Philonotis fontana (Hedw.) Brid. IC
Philonotis marchica (Hedw.) Brid. IC
Physcomitrium pyriforme (Hedw.) Hampe. EM
Plagiomnium ciliare (C. Müll.) T. Kop. MK 30
Plagiomnium cuspidatum (Hedw.) T. Kop. MK 52
Plagiomnium ellipticum (Brid.) T. Kop. IC
Plagiomnium medium (Bruch & Schimp. in B.S.G.) T. Kop. MK 41
Plagiomnium rostratum (Schrad.) T. Kop. MK 244
Plagiopus oederiana (Sw.) Crum & Anderson. EM
Plagiothecium cavifolium (Brid.) Iwats. MK 21
Plagiothecium denticulatum (Hedw.) Schimp. in B.S.G. IC
Plagiothecium laetum Schimp. in B.S.G. IC
Platydictya confervoides (Brid.) Crum. MK 64
Platydictya jungermannioides (Brid.) Crum. EM
Platydictya subtilis (Hedw.) Crum. EM
Platygyrium repens (Brid.) Schimp. in B.S.G. EM
Platyhypnidium riparoides (Hedw.) Dix. EM
Pleurozium schreberi (Brid.) Mitt. MK 341

Pohlia nutans (Hedw.) Lindb. MK 25
Pohlia wahlenbergii (Web. & Mohr.) Andrews. MK 329
Polytrichum commune Hedw. MK 316
Polytrichum formosum Hedw. MK 168
Polytrichum juniperinum Hedw. MK 70
Polytrichum ohioense Ren. & Card. IC
Polytrichum piliferum Hedw. IC
Polytrichum strictum Brid. MK 248
Pottia davalliana (Sm. in Drake) C. Jens. TR
Pottia intermedia (Turn.) Fürnr. MK 216
Pottia truncata (Hedw.) Fürnr. ex B.S.G. MK 217
Pseudoleskeela tectorum (Funck ex. Brid.) Kindb. IC
Ptilium crista-castrensis (Hedw.) DeNot. IC
Pylaisiella intricata (Hedw.) Grout. EM
Pylaisiella polyantha (Hedw.) Grout. MK 64
Pylaisiella selwynii (Kindb.) Crum et al. MK 237
Rauiella scita (P. Beauv.) Reim. IC
Rhizomnium appalachianum T. Kop. IC
Rhizomnium magnifolium (Horik.) T. Kop. IC
Rhizomnium pseudopunctatum (Bruch & Schimp.) T. Kop. MK 125
Rhizomnium punctatum (Hedw.) T. Kop. MK 120
Rhodobryum ontariense (Kindb.) Par. in Kindb. MK 47
Rhytidiadelphus triquetrus (Hedw.) Warnst. MK 98
Saelinia glaucescens (Hedw.) Broth. TR
Sanionia uncinata (Hedw.) Loeske. EM
Schistidium agassizii Sull. & Lesq. IC
Schistidium rivulare (Brid.) Podp. MK 66
Scorpidium scorpioides (Hedw.) Limpr. IC
Seligeria calcarea (Hedw.) Bruch & Schimp. in B.S.G. EM
Seligeria campylopoda Kindb. in Mac. & Kindb. IC
Seligeria donniana (Sm.) C. Müll. EM
Seligeria recurvata (Hedw.) Bruch 7 Schimp. in B.S.G. EM
Sphagnum capillifolium (Ehrh.) Hedw. MK 293
Sphagnum centrale C. Jens. ex H. Arnell & C. Jens. MK 126
Sphagnum cuspidatum Ehrh. ex Hoffm. MK 262
Sphagnum fimbriatum Wils. Ex Hook.*f.* IC
Sphagnum fuscum (Schimp.) Klingrr. IC
Sphagnum girgensohnii Russ. MK 183
Sphagnum magellanicum Brid. MK 260
Sphagnum papillosum Lindb. MK 252
Sphagnum quinquefarium (Lindb. ex Braithw.) Warnst. MK 254
Sphagnum rubellum Wils. MK 123
Sphagnum russowii Warnst. MK 184
Sphagnum squarrosum Crome. MK 182
Sphagnum warnstorfii Russ. MK 294

Sphagnum wulfianum Girg. MK 291
Taxiphyllum deplanatum (Bruch & Schimp. ex Sull.) Fleisch. TR
Tetraphis pellucida Hedw. MK 10
Thamnobryum alleghaniense (C. Müll.) Nieuwl. IC
Thuidium delicatulum (Hedw.) Schimp. in B.S.G. MK 175
Thuidium recognitum (Hedw.) Lindb. IC
Timmia megapolitana Hedw. EM
Tomenthypnum nitens (Hedw.) Loeske. MK 27
Tortella fragilis (Hook. & Wils in Drumm.) Limpr. MK 218
Tortella humilis (Hedw.) Jenn. IC
Tortella tortuosa (Hedw.) Limpr. MK 93
Tortula mucronifolia Schwaegr. IC
Tortula ruralis (Hedw.) Gaertn. et al. IC
Trematodon ambiguus (Hedw.) Hornsch. IC
Ulota coarctata (P. Beauv.) Hammar. MK 301
Ulota crispa (Hedw.) Brid. MK 24
Ulota hutchinsiae (Sm.) Hammar. IC
Warnstorfia exannulata (B.S.G.) Loeske. IC
Weissia controversa Hedw. IC

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The occurrence of *Pseudephemerum nitidum* (Hedw.) Loeske in North America, with some interesting observations

Kwok Leung Yip[1]

There are only a few reports of *Pseudephemerum nitidum* (Hedw.) Loeske from North America. Erskine (1947, 1950) first reported *Pseudephemerum nitidum* (as *Pleuridium axillare* Lindb.) from Wolfville Ridge, Windsor, Nova Scotia (*JSE 146, 160*). Lawton (1971) later recorded *Pseudephemerum nitidum* from British Columbia, but no specimen was cited. Schofield (1992) also listed *Pseudephemerum nitidum* in a checklist of the mosses of British Columbia. Ireland et al. (1980, 1987) cited the species from Nova Scotia (literature report) and British Columbia (specimen-based). However, Ireland (1982) excluded it from the flora of Maritime Provinces. Crum and Anderson (1981) did not include the *Pseudephemerum nitidum* in *Mosses of Eastern North America*, although Anderson et al. (1990) do cite it in the latest checklist of North American mosses. Because of some confusion surrounding the distribution of this apparently rare taxon, I initiated an herbarium search in an attempt to verify the existence of *Pseudephemerum nitidum* from North America.

The only collection for this taxon from British Columbia is *Schofield 22437*. I have examined specimens from UBC & WTU, and confirmed that it is *Pseudephemerum nitidum*. The lax cells of the single-costate leaves, with serrulate tips, characterize the species. The globose capsule usually seems lateral because of the indeterminate growth of the stem into a new leafy shoot.

I have tried to locate Erskine's (1947, 1950) specimens from Windsor, Nova Scotia. There is only one specimen (*JSE 241*) available from ACAD. The packet contains 5 smaller envelopes. Three are labeled number 1, 2, and 3. Envelope number 3 was labeled in pencil as "146"; this number was penciled down on the herbarium label as well. The other two envelopes are *Pleuridium subulatum* (Hedw.) Rabenh. and *Weissia muehlenbergiana* (Sw.) Reese & Lemon, as identified and annotated by R. R. Ireland in 1972. No *Pesudephemerum nitidum* was observed in this collection. Envelope number 1 contains *Pleuridium subulatum*; number 2, *Dicranella varia* (Hedw.) Schimp.; and number 3, a *Pohlia* species. The other published specimen of

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Erskine (*JSE 160*) was not found.

Therefore, in North America north of Mexico, *Pseudephemerum nitidum* can be verified only from British Columbia.

The correct citation of the taxon, according to Ochyra (1995), is as follows, along with the synonymies:

Pseudephemerum nitidum (Hedw.) Loeske, Stud. Morph. Syst. Laubm. 75. 1910.
P. nitidum (Hedw.) Reimers, Verh. Bot. Ver. Nrandenburg 74: 152. 1933. *hom. illeg.*
Phascum nitidum Hedw., Species Muscorum Frondosorum 19. 1801.
Pleuridium nitidum (Hedw.) Rabenh., Deutschl. Krypt. Fl. 2(3): 79. 1848.
Pleuridium axillare (J. E. Smith) Lindb., Öfv. K. Vet. Ak. Förh. 20: 407. 1863.
Phascum axillare Dickson *ex* J. E. Smith, English Botany 14: 1036. 1802. [c.f. Hedw., Spec. Musc. 20. 1801.]

Specimen examined. *Pseudephemerum nitidum.* CANADA. British Columbia. Richmond, Sea Island, MacDonald's Beach, Fraser River Delta, on silt hummocks in grassy area near river bank. Nov. 3, 1963, *Schofield 22437* (UBC, Acc#B71531; WTU-Lawton, a microslide).

Other specimens examined: CANADA. Nova Scotia. Hunts Co. Windsor. Nov. 4, 1946, *Erskine 241 "&146"* (ACAD-Brown; containing 3 small envelopes nos. 1-3). Annotated by Ireland in 1972 as "*Pleuridium subulatum* (Hedw.) Rabenh. + *Weissia muehlenbergiana* (Sw.) Reese & Lemon."

Some interesting observations. The sex condition of *Pseudephemerum nitidum* is usually reported as synoicous (e.g. Lawton 1971). This condition exists before the initiation of the indeterminate growth of stem apex. The axillary archegonia, mature sporophyte and the related vaginula are generally persistent on older part of the stem. Thus, they appears lateral after the new shoot develops. I have observed a plant like this from *Schofield 22437.*

Because of this growth habit, the taxon was named by Dickson as *Phascum axillare.* James Edward Smith (1802) gave a description worthy of mentioned: "Stem solitary, simple, leafy, flowering when about a line in height; but being immediately extended two to three lines higher in one simple continued branch, the fruit-stalk becomes lateral, or apparently axillary; and this circumstance affording a peculiar and striking mark of the species ... we are well aware of the truth of that great physiologist's [Dickson]

observation, that the fructification in this, as in other *Phasca*, is originally lateral." (p. 1036)

These observations of the taxon suggest the interesting growth habit is frequently overlooked in modern literature.

Acknowledgment. I would like to thank the curators of UBC, WTU, and ACAD for their generous help in retrieving the specimens for my study. Professor Jerry Snider kindly commented on my manuscript and improved the linguistic of the text.

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The genus *Timmia* (Musci: Timmiaceae) in Maine

Bruce Allen[1]

Timmia, the sole genus in the Timmiaceae, exhibits a fascinating array of distinctive features indicative of its phylogenetical isolation. *Timmia* species often have a Polytrichaceae-aspect, and as in many members of that family their leaves are differentiated into a basal sheath with long, hyaline to yellowish cells and an upper, spreading limb with short chlorophyllose cells. Also as in the Polytrichaceae, *Timmia* stems have exceptionally well-developed central strands and 1–4 leaf traces. Unlike the leaf traces common in the Polytrichaceae, those in *Timmia* are "false", i.e., they penetrate into the stem cortex but do not merge with the central strand. This type of leaf trace (discussed and figured by Hébant 1977, fig. 112 C) is also found in the Mniaceae, Splachnaceae and Funariaceae. *Timmia*, however, is remotely related to the Polytrichaceae since it lacks leaf lamellae and has an arthrodontous rather than a nematodontous peristome.

The arthrodontous peristome in *Timmia* is diplolepidous with both a well-formed exostome and endostome. The exostome consists of 16 narrowly triangular teeth with an interesting secondary deposition pattern on the dorsal (outer) surface. In the lower 2/3 of the teeth the lamellae are covered by closely spaced, finger-like projections, that are thickened or branched at the tips (Murphy 1988). In the upper 1/3 of the teeth there are vertical, thick, widely spaced striae and large papillae. On the lower ventral (inner) surface the trabeculae and lamellae are smooth and the trabeculae are high, closely spaced. The upper ventral (inner) surface is ornamented in the same manner as the upper dorsal (outer) surface (Murphy 1988). Although the exostome of *Timmia* is distinctive, there is nothing strikingly unusual about it; the same, however can not be said for the *Timmia* endostome.

The *Timmia* endostome has a high basal membrane, but no segment/cilia complex. In its place there are 64 morphologically similar filaments. The primary peristomial layer (PPL) in *Timmia* has 16 cells and these are clearly indicated by the cellular pattern on the dorsal (outer) surface of the basal membrane which is more or less smooth and has closely spaced, low trabeculae. On the ventral (inner) surface the inner peristomial layer (IPL) consists of 64 cells positioned so that 4 IPL cells oppose 1 PPL cell. An

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important feature of this pattern is that the 2 outermost vertical cell walls in each group of 4 IPL cells more or less aligns with the vertical walls on the PPL. In contrast, most moss endostomes have vertical walls on the PPL that straddle the middle of a single column of IPL cells. This offsetting of the IPL cellular pattern so that some IPL vertical walls line up with the vertical walls on the PPL is also seen in *Funaria*, *Encalypta*, *Splachnum*, *Orthotrichum*, and the Fontinalaceae. The substitution of 64 filaments for the normal segment/cilia complex of the endostome in combination with the offseting of the IPL cell layer makes the *Timmia* endostome unique. Nevertheless, it is possible to relate the segment/cilia complex found in most mosses to the 64 filaments of the *Timmia* endostome on the basis of their common PPL patterns. By this comparison, also made by Shaw and Rohrer (1984), the groups of 4 filaments opposite each PPL cell represent 2 cilia flanked on either side by ½ of a segment. Such an odd distribution of cilia and segment fragments is also seen in the Bryaceae (*Acidodontium*, some species of *Brachymenium*) and Bartramiaceae (*Bartramia*, *Breutelia*, and *Philonotis*).

Other unusual features of *Timmia* included the ornamentation of its leaf cells and distribution of its stomata. The leaf cells in *Timmia* are unistratose and highly mammillose. In *T. sibirica* Lindb. & Arnell the cells are mammillose on both surfaces, but in all other species only the ventral surface is mammillose, the dorsal surface is smooth. This odd type of mammillae is also seen in *Hyophila* (Pottiaceae) and a similar type associated with bistratose leaves is seen in *Timmiella* (Pottiaceae) and *Diphyscium* (Diphysciaceae). Although some species of *Timmia* have stomata concentrated in the neck region of the urn, others have stomata scattered throughout the urn. This feature is also seen in some members of the Orthotrichaceae and Splachnaceae.

Although most of the odd features of *Timmia* can be related to similar features in other mosses, they do not consistently point to a relationship between *Timmia* and any other moss. Rather the multiple occurences of these features seem to be examples of parallelism or convergences rather than indicators of natural relationships. It seems clear that *Timmia* is phylogenetically isolated. Even the species within the genus appear isolated as judged by the fact that the most revision of *Timmia* (Brassard 1979, 1980, 1984) recognized only 4 species and two varieties, yet subdivided the genus into 3 sections. *Timmia* is one of the few moss genera found only in the northern hemisphere. It is most common, and indeed often predominates, in the high arctic.

Timmia was named for Joachim Christian Timm, Bürgermeister of Malchin in the former German state of Mecklenburg (Crum & Anderson 1981).

Timmia Hedw., Sp. Musc. Frond. 176. 1801.

Plants medium to robust, in dark-green dense or loose tufts; stems erect, simple or forked. sparsely radiculose. Leaves lanceolate, incurved-curled when dry, differentiated into a erect sheathing base and an erect-spreading to wide-spreading limb; costa single, strong, subpercurrent, usually with two stereid bands; margins serrate to dentate above, upper cells rounded quadrate to rounded hexagonal, often mammillose on ventral surface, basal cells long-rectangular, hyaline to yellowish, alar cells undifferentiated. Autoicous or dioicous. Setae long, one to two per perichaetium; capsules inclined to pendulous, oblong-cylindric, asymmetric, smooth or indistictly striate, neck constricted, stomatose in neck or throughout the urn, annulus broad, persistent or revoluble, operculum hemispherical, mammillate; peristome double, exostome teeth 16, endostome yellow, basal membrane high, with 64 evenly spaced filaments, often fused into groups of 2 or 4. Calyptrae cucullate, smooth, naked, often not split to the base, adhering to the capsule neck or seta. Spores spherical, slightly papillosse.

Timmia megapolitana Hedw., Sp. Musc. Frond. 176. 1801.
Orthopyxis megapolitana (Hedw.) P. Beauv., Prodr. Aethéogam. 79. 1805.

Plants erect, in compact or loose tufts, dark green; stems to 4 cm long, in cross-section with 1 layer of small, thin-walled epidermal cells, outer cortex of 2–4 layers of larger, thick-walled cells, inner cortex cells enlarged, thin-walled, with1–4 leaf traces, central strand well-developed; rhizoids sparse, from scattered initials along stem and occasionally on leaves from upper costal cells, densely papillose. Leaves evenly spaced, flexuose or subtubulose, incurled when dry, erect-spreading to erect when wet, 4–7 mm long, differentiated into an oblong-lanceolate upper limb and an erect, hyaline to yellowish basal sheath; broadly acute; margins coarsely serrate to dentate above, serrulate at shoulders or below, plane to erect when wet, incurved when dry; costa single, strong, subpercurrent, mammillose at back; upper cells in irregular rows, rounded-hexagonal to quadrate, 7.5–15 µm long x 10–12.5 µm wide, firm-walled, bulging mammillose on ventral surface, smooth on dorsal surface, basal sheath cells long-rectangular, 50–127 µm x 7.5–12.5 µm, whitish-yellow, thin-walled, smooth below, with multiple papillae on cells at junction of sheath and limb. Autoicous, with 1-several perigonial buds at base

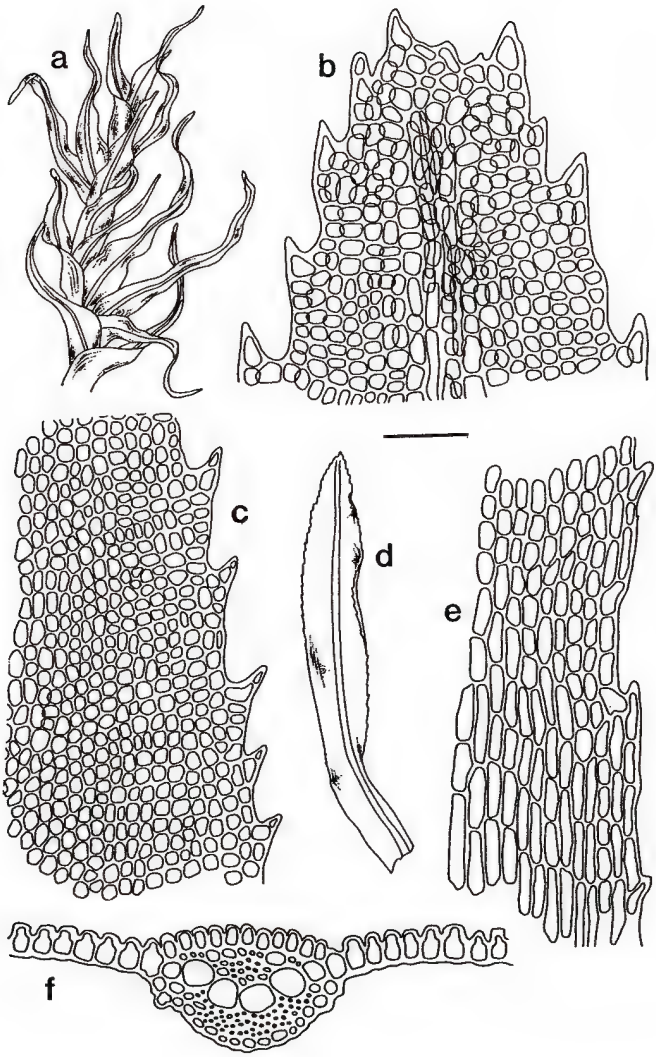

Figure 1. *Timmia megapolitana*. a. Habit. b. Leaf apex. c. Upper leaf cells at margin. d. Leaf. e. Marginal leaf cells at top of leaf sheath. f. Leaf cross-section through leaf limb. Scale in mm: bar = 0.05 (b,c,e,f); bar = 1 (d); bar = 2.12 mm (a). All figures from *J. A. Allen s.n.* (NY).

of perichaetia. Setae 1–2 per perichaetium,10–30 mm long, red; capsules horizontal to inclined, reddish-brown, oblong-cylindric, smooth to wrinkled or slightly furrowed when dry, asymmetric, constricted at neck, 2–3 mm long; annuli well-developed, 2–4 rows, revoluble; opercula conic to hemispheric, mammillate, 0.5 mm long; stomata scattered throughout the urn; peristome double, exostome teeth 16, yellow below, hyaline above, narrowly triangular, horizontally striate and finely papillose below, vertically barred and thickly papillose above, endostome yellow, basal membrane high, 64 evenly spaced filaments, often fused in groups of 2 or 4, filaments papillose, with long appendiculations. Calyptrae yellow, 4–6 mm, cucullate, usually not split at base, persistent on the capsule neck or seta. Spores slightly papillose 12.5–22 µm.

On soil. In Maine know from Somerset (*J. A. Allen s.n.* NY) County.

At first glance the gametophytes of *T. megapolitana* look like they belong in the Polytrichaceae and they could be confused with *Polytrichastrum alpinum* in the field. *Timmia megapolitana*, however, does not have lamellae on the ventral surface of its leaves. Sporophytically *T. megapolitana* differs from the Polytrichaceae in having a diplolepideous, arthrodontous peristome with 16 exostome teeth; the Polytrichaceae have a nematodontous peristome with 32 teeth that at first are attached to a membrane that more or less closes the capsule mouth. In addition, all Maine Polytrichaceae have large, mitrate, and densely hairy calyptrae while those of *T. megapolitana* are cucullate, smooth, and not usually fully divided at the base. As a result of this last feature the calyptrae in *T. megapolitana* often clasp either the base of the capsule or the seta. In the former case the calyptrae project above the capsule, and because it resembles the feather of an indian headress, this species is sometimes called the Indian Brave Moss (Crum 1983).

Microscopically, the differentiation of the leaf into a clasping basal sheath and an upper spreading limb - each part with distinctly different cell forms - and upper leaf cells that are mamillose on the ventral but smooth on the dorsal surfaces distinguish it from all other Maine mosses. Curiously, the leaf cells at the junction of the basal sheath in *T. megapolitana* often have multiple papillae. Rhizoids are usually sparsely developed in *Timmia megapolitana*. When they are present they arise from scattered initials on the stems, mostly clustered at the top of the sheathing part of the leaf, and from initials around the branch primordia. Occasionally rhizoids can be found on costal cells near the leaf apices.

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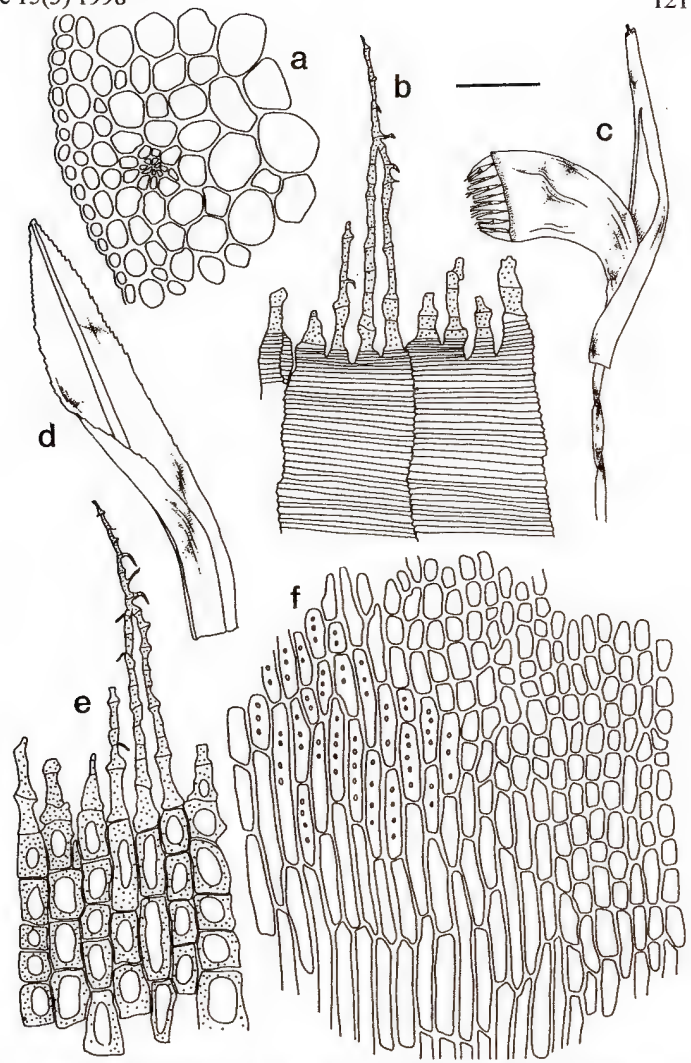

Figure 2. *Timmia megapolitana*. a. Stem cross-section with false leaf trace. b. Endstome, dorsal (outer) surface. c. Capsule and calyptra. d. Leaf. e. Endstome, ventral (inner) surface. f. Leaf cells at junction of leaf sheath and leaf limb. Scale in mm: bar = 0.05 (a,f); bar = 0.1 (b,e); bar = 1 (d); bar = 1.13 mm (c). Figures a,d,f from *J. A. Allen s.n.* (NY), figures b,e from *J. A. Allen 17* (MO), figure c from Mosses of North America Exsiccatae *65* (MO).

Liverworts and Hornworts of the Santa Rosa Plateau Ecological Reserve, Riverside County, California

William T. Doyle[1]

The Santa Rosa Plateau Ecological Reserve is located at the southeastern end of the santa Ana Mountains, Riverside County, California. It is cooperatively managed by the Nature Conservancy, the Riverside County Regional Park and Open-Space District, the California department of Fish and Game, the U. S. Fish and Wildlife Service, and the Metropolitan Water District of Southern California. The Reserve contains basalt-capped mesas, granite outcrops, vernal pools, riparian areas with deep year-round water-filled holes, oak woodlands, native grasslands, coastal sage scrub, and chaparral. A catalog of the vascular plant flora and description of the plant communities of the Reserve was published by Lathrop & Thorne (1985). The only previous report of liverworts of the Reserve was published by Weber, Bratt & Larson (1987), who found: *Riccia nigrella* DC and *R. trichocarpa* Howe.

My motivation for this study was the 1995 finding of *Geothallus tuberosus* Campb. In the Reserve. *Geothallus tuberosus* Campb. is a monotypic genus here-tofore considered to be restricted to the San Diego region of San Diego County (Worley & Doyle 1969), where it is everywhere threatened by habitat destruction. Populations were found both in the Reserve and across the road in the Sylvan Meadows Ranch, previously under private ownership, but recently purchased to be part of the Reserve Open Space. The presence of *G. tuberosus* Campb. in the Reserve is a range extension to the north of about 110 km. More significantly, however, these populations are protected from habitat destruction by urbanization.

Three additional unexpected species were found during this study: 1) *Sphaerocarpos drewii* Wigglesw., generally considered to be restricted to the San Diego region of San Diego County; 2) *Jungermannia rubra* Gott., not previously reported for southern California; and 3) *Anthoceros punctatus* L., very common in the Reserve, but not common elsewhere in California.

The list below is the result of several visits to the Reserve in 1995 and 1998. The number in parenthesis with each specimen refers to voucher specimens in the herbarium of W. T. Doyle.

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LIVERWORTS

Aytoniaceae

Asterella bolanderi (Aust.) Underw. Soil; bank of drainage along Punta Mesa Trail (7326).

Asterella californica (Hampe) Underw. Soil; bank of Cole Creek and near rock outcrops (7299).

Asterella palmeri (Aust.) Underw. Soil; steep banks and open areas in coastal sage scrub (7285).

Cryptomitrium tenerum (Hook.) Aust. Soil of shaded steep rock outcrop near crossing of Punta Mesa Trail and East Fork of De Luz Creek (7333).

Targioniaceae

Targionia mexicana Lehm. & Lindenb. Soil; widely distributed near rock outcrops (7301).

Ricciaceae

Riccia californica Aust. Soil; with grass in drainages at base of sloping native grasslands (7328).

Riccia campbelliana Howe. Soil; common in open areas throughout the Reserve (7280).

Riccia cavernosa Hoffm. Soil; damp, disturbed areas in drainages (7318).

Riccia nigrella DC. Soil; common in open areas throughout the Reserve (7283).

Riccia sorocarpa Bisch. Soil; common in open areas throughout the Reserve (7284).

Riccia trichocarpa Howe. Soil; common in open areas throughout the Reserve (7281).

Sphaerocarpaceae

Geothallus tuberosus Campb. Not common; margins of wet areas, for example, along Waterline Road (7295).

Sphaerocarpos drewii Wigglesw. Not common; scattered populations under shade of coastal sage scrub (7282).

Sphaerocarpos texanus Aust. Disturbed soil; widely distributed but not common (7324).

Fossombroniaceae

Fossombronia longiseta Aust. (This species needs critical review: populations with spores with < 25 cristae in optical section (7296), spores with > 30 cristae in optical section (7330), and spores that are hispid (7332) all occur.) *Fossombronia* is widespread throughout the Reserve.

Cephaloziellaceae

Cephaloziella divaricata (Sm.) Schiffn. var. *divaricata* (Sm.) Dumort. Soil; shaded bank of Adobe Creek near Ranch House (7335).

Jungermanniaceae

Jungermannia rubra Gott. Soil; shaded bank of Adobe Creek near Ranch House (7336).

Porellaceae

Porella bolanderi (Aust.) Pears. On granite boulders and trunks of Englemann oaks (9509).

HORNWORTS

Anthocerotaceae

Anthoceros fusiformis Aust. Soil; bank of drainages through coastal sage scrub (7329).

Anthoceros punctatus L. Soil; widespread, especially open areas in coastal sage scrub (7311).

Phaeoceros mohrii (Aust.) Hassel. Soil; widespread in open areas and drainages through coastal sage scrub (7309).

Phaeoceros pearsoni (Howe) Prosk. Soil; high on banks in riparian corridors (9521).

Phaeoceros sp. nov. (This species, also found elsewhere in California, has yet to be described.) Widespread in openings in coastal sage scrub (9491).

Acknowledgements. I want to thank Carole Bell, Reserve Manager, The Nature Conservancy, for making the Reserve available for this study.

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Splachnobryum in North America North of Mexico

William D. Reese[1]

Since 1981 *Splachnobryum* has been regarded as the sole genus of the family Splachnobryaceae (Koponen 1981). Prior to then the genus had been considered to belong in the Pottiaceae (e.g., Crum & Anderson 1981) or in the Splachnaceae, where it was placed originally by Müller (1869). The axillary archegonia, lack of paraphyses, single circle of peristome teeth (considered to represent the endostome by Koponen, 1981), and the peculiar axillary hairs (mucilage hairs sensu Koponen, 1981) help define the family. The latter are sometimes difficult to demonstrate; they are helpful in recognition of the genus. Somewhat similar axillary hairs also occur in the Pottiaceae, in *Globulinella globifera* (G. E. L. Hampe) W. C. Steere, except that in the latter the terminal cell is clavate and symmetric instead of swollen and asymmetric. Although approximately 40 accepted species names are listed by Wijk et al. (1967), it is likely that far fewer will be retained following world-wide revision.

The purpose of the present article is to present the results of a recent review of *Splachnobryum* for North America north of Mexico undertaken for the *Flora of North America* project. Breen and Pursell (1959), after reviewing specimens of *Splachnobryum* from the United States, Mexico, Central America, and the West Indies, recognized only *S. obtusum*. They placed many names into the synonymy of *S. obtusum*. Following Breen and Pursell, only a single species is accepted here for North America north of Mexico. The species is sparingly distributed in the southern and southwestern United States.

Splachnobryum obtusum (S. E. Bridel) J. K. A. Müller, Verh. K.-K. Zool.-Bot. Ges. Wien 19: 504. 1869. *Weissia obtusa* S. E. Bridel, Musc. Recent. Suppl. 1: 118. 1806; *Splachnobryum bernoulii* J. K. A. Müller.

Plants gregarious, small, dull, often encrusted with soil. Stems erect, mostly simple, to 1 cm tall but mostly much shorter; axillary hairs 2--3-celled, proximal cell(s) short, with faintly yellowish walls, distal-most cell swollen,

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somewhat asymmetric, colorless, often encrusted; gemmae on axillary rhizoids rare; rhizoid tubers inconspicuous, of several bulging cells in linear arrangement. Leaves soft, commonly shriveled when dry, rarely uncontorted or nearly so, 0.6--0.8 mm long, oblong to obovate or spatulate, sometimes decurrent from costa and margins; medial cells smooth to distinctly mammillose on one or both surfaces; cells in upper portion of leaf in ascending rows diverging from costa; margins plane, or a little recurved proximally, mostly crenulate distally; costa weak to strong, 1/2 leaf length to nearly percurrent, sometimes spurred or forked, or both, distally.

Not producing sporophytes in the United States. Exposed sites on damp or periodically wet limestone, marl, calcareous soil, mortar-work; sea level to 1000 m; Arizona, Florida, Louisiana, Oklahoma, Texas; Mexico; West Indies; Central America; South America; Africa; Hawaii.

Splachnobryum obtusum is almost entirely restricted to base-rich substrates in the United States and probably elsewhere in its broad range. It is an obscure moss, difficult to find in the field because of its small size, drab aspect, and lack of obvious field characters. Most specimens from the United States are comprised of tiny, poorly developed plants with short stems and small leaves.

The typical habitat in North America is open areas on limestone or other limy substrates along rivers and streams; in the latter habitat *S. obtusum* may form minor tufa deposits, sometimes mixed with other calciphilic mosses. In North America underdeveloped specimens of various other mosses, mostly Bryaceae and Pottiaceae, are sometimes misidentified as *Splachnobryum*. (The type material of *S. kieneri* R.S. Williams is a *Bryum*; cf. Andrews 1949.) Under the microscope the leaf shape, crenulate distal leaf margin, and upper leaf cells in ascending rows diverging from the costa, are helpful for identification. The oddly shaped axillary hairs are also helpful for identification, but may be difficult to demonstrate. The leaves of many specimens of this moss are difficult to rehydrate after drying.

Plants with archegonia are common in at least some of the material distributed as Grout's *North American Musci Perfecti 448*, collected by Faith Pennebaker Mackaness on mortar-work in old cemeteries in New Orleans. However, neither archegonia nor antheridia have been found in field-collected specimens of *S. obtusum* from the United States. Limy substrates do not occur naturally in the vicinity of New Orleans, suggesting that the cemetery populations might

have been introduced. (See Chopra & Rashid 1969 and Chopra & Sheel 1974 for observations on the sex organs of *Splachnobryum*.)

Rhizoid tubers, as reported by Arts (1996) for African specimens of *S. obtusum*, are present in at least some of the specimens from the Flora area, including the New Orleans material. Although plants with sporophytes have never been found in the field in the United States, fertile plants of *Splachnobryum* are known from the United States from a specimen collected in a greenhouse in November, 1910, at Philadelphia, Pennsylvania (NY). The specific identity of the greenhouse plants is uncertain.

Specimens Examined

[NOTE: *Splachnobryum obtusum* (as *S. bernoulii*) was reported from Georgia, from Stone Mountain, by Schnooberger (1948). The specimens are correctly determined but it is doubtful that they actually came from Stone Mountain. See comments under Georgia, below.]

ARIZONA. Virgin Basin, Lake Mead, 5 mi. NNE of Middle Point, *Clover 6269,* MICH, NY. Pinel Co., Aravaipa Canyon, coll. Jessie Portmann, *Haring 12,407*, 29 April 1959, MNA.

FLORIDA. Dade Co., *Breen 2777*, NY; Leon Co., *Reese sn.*, 12 Nov 1955, LAF, and *Reese 510*, NY; *Redfearn 1081*, COLO, DUKE, LAF, MO, NY, TENN; *Pursell 400MF68*, COLO, NY; *400MF79*, DUKE.

[GEORGIA. Atlanta, on top of Stone Mtn., *Clyde Schnooberger*, Aug. 1943, MICH, NY. The Schnooberger specimens are correctly identified. However, the indicated locality is suspect. In 1948 Schnooberger reported on a collection of mosses that she said were taken by her brother Clyde from the top of Stone Mountain, Georgia. Of the nine specimens, four were identified as *Barbula cruegeri* (= *B. indica*), two as *Pohlia cruegeri* (= *Bryum apiculatum*), two as *Splachnobryum bernoullii* (= *S. obtusum*), and one as *Grimmia laevigata.* The first three species are tropical--subtropical lowland mosses that are unlikely residents of the cool windy summit of Stone Mountain in northern Georgia. The *Grimmia* could have come from almost anywhere. There is nothing about the list of mosses that Schornherst (1945) published for Stone Mountain that would indicate a tropical--subtropical floral connection. Another cause for caution on the Stone Mountain attribution is that the two collections of *S. obtusum* as published by Schnooberger are listed

Distribution of *Splachnobryum obtusum* in North America north of Mexico.

as numbers *5903* and *5905*, but the numbers published for these same collections by Breen and Pursell are given as *5902* and *5904*. The latter numbers were published as *Pohlia cruegeri* by Schnooberger. In view of the above, *S. obtusum* is here excluded from the bryoflora of Georgia.]

LOUISIANA. Lafayette Parish, *Reese s.n.*, 31 Aug 1994 (In 1998 this site was destroyed), LAF; Orleans Parish, *Mackaness s.n.*, 25 April 1942, DUKE; *Mackaness s.n.*, 23 May 1942, LAF ex NO; 14 Sept 1942, BRIT, MICH, MO, NY, TENN, & 17 Oct 1942, LAF, the latter two being different issues of Grout's *North American Musci Perfecti 448*; New Orleans, St. Roch's Cemetery, *Mackaness 9*, 29 March 1942, MICH; West Feliciana Parish, *Reese 10952*, LAF.

OKLAHOMA. Murray Co., *Merrill 13363b*, MICH.

TEXAS. Brewster Co., Big Bend National Park, *Reese 11564*, *Reese & Valentine 18364*, LAF; Burnet Co., *Reese & Pursell 3462*, LAF; Cameron Co., *Reese & Pursell 3365, 3366*, LAF; Dallas Co., *Mahler 8245*, BRIT, *Whitehouse 26296*, BRIT, NY; Hill Co., *Pursell & Reese 4564*, COLO, *Reese & Pursell 3661*, LAF; Jim Wells Co., *Burandt & Galloway T-75*, LAF; Kendall Co., *Reese & Pursell 4341*, LAF; Sabine Co., *Reese & Pursell 3791*, LAF; Travis co., *Whitehouse 24793*, BRIT; Walker Co., *Reese & Pursell 3610*, LAF.

E. B. Bartram's Arizona Specimens of "Splachnobryum"

Arizona. Santa Cruz Co., *Bartram 145* (DUKE, NY), *616, 1446a* (also at TENN), NY. The *145* and *1446a* (a Holzinger exsic.) are probably *Bryum cyclophyllum*, as discussed by Breen and Pursell (1959). The *616* probably belongs in the Pottiaceae, although the specimen at NY was annotated by Breen as *Splachnobryum wullschlaegelii* J. K. A. Müller, which Breen and Pursell (1959) list as a synonym of *S. obtusum*. However, the axillary hairs of this material are not like those of *Splachnobryum*.

Philadelphia Greenhouse *Splachnobryum*

Pennsylvania, Philadelphia, greenhouse, Sept. and Nov. 1910, the latter c.fr., NY

Acknowledgments. I thank the curators of BRIT, COLO, DUKE, LAF, MICH, MNA, MO, NY, TENN for loans of the specimens upon which this report is based.

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The genus *Arctoa* (Musci: Dicranaceae) in Maine

Bruce Allen

Arctoa is a genus of small plants commonly found on bare rock or in rock crevices at high elevations in the north temperate regions or in the arctic. It is an autoicous genus with narrow setaceous leaves, single, excurrent costae, differentiated alar cells, and a *dicraneous*-type of peristome. It differs from other Maine members of the Dicranaceae by its costa which in cross-section consists of more or less homogenous cells. At times guide cells are somewhat differentiated, but distinct stereid bands are absent. The genus displays considerable variation in seta length and capsule shape. As a result, species with long setae and long, suberect, often strumose capsules have been segregated into the genus *Kiaeria*. These differences "... hardly justify making *Kiaeria* a separate genus ..." (Grout 1937), but more to point, there is complete overlap in seta length, as well as capsule orientation, symmetry, shape, and strumose development when the genera are considered on a world-wide basis. Dixon (1924) and Smith (1978) separate *Kiaeria* from *Arctoa* on the basis of leaves that are less abruptly contracted above the base and have less excurrent costae. This distinction is not easy to make and is valid only when considering *Kiaeria* and *Arctoa fulvella*.

The name *Arctoa* is derived from the Greek *"arktos* - a bear," it refers to the northern constellation *Ursa*, The Bear, and thus to the high northern or arctic regions in general.

Arctoa Bruch & Schimp. in B.S.G., Bryol. Eur. 1: 153. 1846 (fasc. 33–36 Mon. 1).
Kiaeria Hag. Kongel. Norske Vidensk. Selsk. Skr. 1914(1): 109. 1915.

Plants small, in yellow-green, green, or yellow-brown tufts; stems erect, simple or forked, sparsely radiculose. Leaves lanceolate to ovate-lanceolate, erect-spreading, flexuous or falcate-secund when dry, subulate; costa single, filling the upper leaf, excurrent, in cross-section cells more or less homogeneous; margins entire, roughened at apex, upper cells irregularly quadrate, short or long-rectangular, smooth, basal cells long-rectangular to linear, alar cells well-developed. Autoicous. Perigonial bud terminal on short branch or sessile below the perichaetia. Perichaetial leaves sheathing, long-setaceous. Setae long or short; capsules erect or suberect, obovate or oblong-cylindric, symmetric or asymmetric, somewhat furrowed when dry, stomatose

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in neck, annuli persistent or revoluble, opercula short-rostrate; peristome teeth 16, reddish-brown, narrowly triangular, vertically striate and papillose, divided in upper 1/2. Calyptrae cucullate, smooth. Spores smooth to slightly papillose.

Setae 3-6 mm; capsules more or less erect, obovate, symmetric, not strumose ..... *A. fulvella*
Setae 7-16 mm; capsules suberect, oblong, slightly asymmetric, strumose .... *A. blytii*

1. *Arctoa blytii* (Schimp.) Loesk. Stud. Morph. Syst. Laubm. 86. 1910.
Dicranum blytii Schimp., Kongl. Svenska Vetensk. Acad. Handl. 3, 34: 164. 1846. *Kiaeria blytti* (Schimp.) Broth., Laubm. Fennosk. 87. 1923.

Plants small, erect, in compact tufts, yellow-green, green, or yellow-brown; stems to 1–2 cm long, in cross-section with 1 layer of small, thin-walled epidermal cells, cortex of enlarged, thin-walled cells, central strand well-developed; rhizoids sparse. Leaves evenly spaced, erect, flexuose to falcate-secund wet or dry, 2–4 mm long, lanceolate or ovate-lanceolate, subulate; margins entire, erect; costa single, excurrent, roughened above, costal cells in cross-section homogeneous; upper cells irregularly quadrate, short or long-rectangular, 7.5–27 µm x 7.5 µm, firm-walled, smooth, basal cells long-rectangular to linear, 15–50 µm x 7.5 µm, smooth, alar cells well-developed, yellow-brown, firm-walled or inflated and thin-walled. Autoicous. Perigonial bud terminal on short branch or sessile below the perichaetia. Perichaetial leaves long-setaceous, to 5 mm long, sheathing at base. Setae 1 per perichaetium, 7–13 mm long, yellow to reddish-brown; capsules suberect and slightly asymmetric, reddish-brown, oblong, constricted below the mouth, slightly furrowed when dry, more or less strumose; annuli compound and deciduous; opercula short-rostrate, 0.5 mm long; stomata phaneroporic, on capsule neck; peristome teeth 16, reddish-brown, narrowly triangular, vertically striate and papillose, divided in upper 1/2. Calyptrae yellow, 1.5–2 mm, cucullate. Spores smooth to slightly papillose 13–18 µm.

In Maine known from Penobscot (*Hermann 19603* NY) and Piscataquis (*Norton* MAINE) Counties. Reported from Hancock County (Redfield & Rand 1894; Patterson 1930);

Arctoa blytii is a rare montane species in Maine. It has the field aspect of a *Dicranella* or *Ditrichum*, but these genera differ from *A. blytii* in having leaves that lack alar cell differentiation and a costa that has well-developed internal differentiation. *Blindia acuta* is similar in size to *Arctoa blytii* and it has well-developed alar cells as well as a costa that lacks internal differentiation. *Blindia acuta* is a fairly common species often found along streams or on rocks in more or less continuously seeping areas. It differs

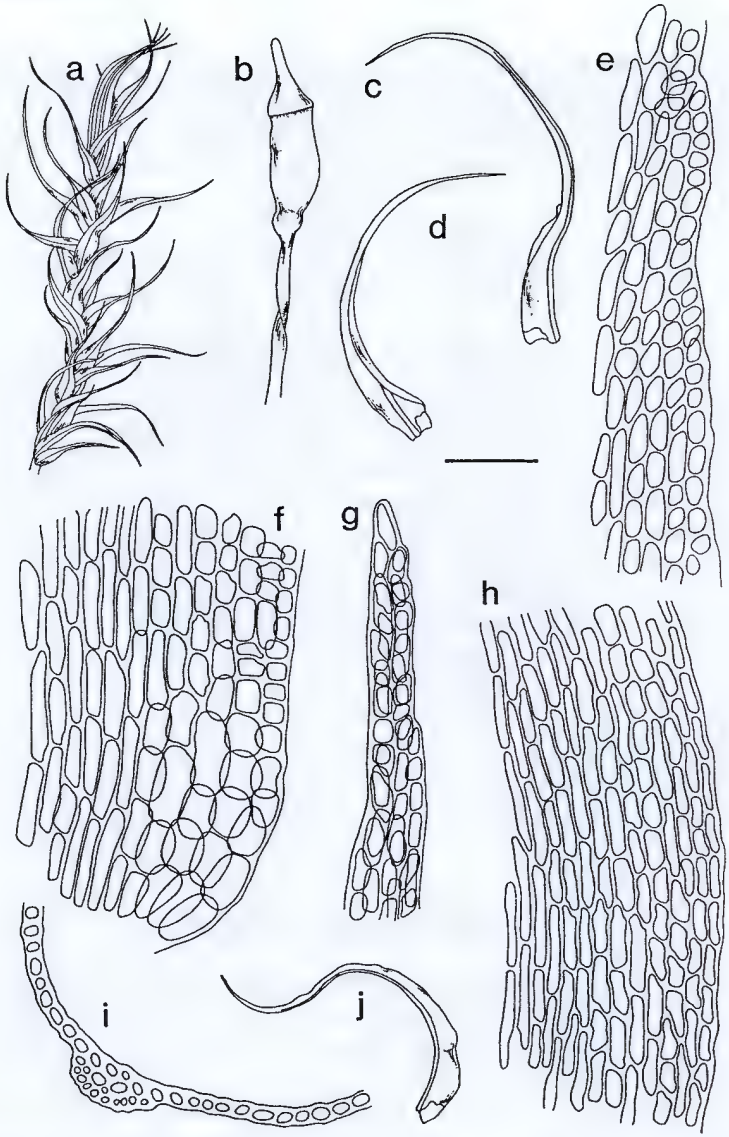

Figure 1. *Arctoa blytii*. a. Habit. b. Capsule and operculum. c. , d. & j. Leaves. e. Marginal cells at leaf middle. f. Alar cells. g. Leaf apex. h. Basal leaf cells. i. Leaf cross-section. Scale in mm: bar = 0.05 (e,f,g,h,i); bar = 0.71 mm (c,d,j); bar = 1 (b); bar = 1.62 mm (a). Figures e,f,g,h,i *Richards 220*; figures a & b *Frahm s.n.*; figures c,d,j Sullivant & Lesquereux, Musci Bor. Amer., ed. 2, *69*, (all MO).

from *A. blytii* in having orange-red, alar cells, a dioicous sexual condition, short, pyriform capsules, and entire, papillose peristome teeth. *Arctoa fulvella* and *A. blytii* are gametophytically very similar, *A. fulvella* differs from *A. blytii* in having a shorter seta, and more erect, symmetic, obovoid, non-strumose capsules.

2. *Arctoa fulvella* (Dicks.) Bruch & Schimp. in B.S.G.
Bryum fulvellum Dicks., Pl. Crypt. Brit., Fasc. 4, 10. 1801. *Dicranum fulvellum* (Dicks.) Sm. Fl. Brit. 3: 1209. 1804.

Plants small, erect, in compact tufts, yellow-green, green, or yellow-brown; stems to 1–2 cm long, in cross-section with 1 layer of small, thin-walled epidermal cells, cortex of enlarged, thin-walled cells, central strand well-developed; rhizoids sparse. Leaves evenly spaced, erect, flexuose to falcate-secund wet or dry, 2–3 mm long, lanceolate or ovate-lanceolate, subulate; margins entire, erect; costa single, filling most of the subula, long excurrent, roughened above, costal cells in cross-section homogeneous; upper cells irregularly short or long-rectangular, 12.5–30 µm x 7.5 µm, firm-walled, smooth, basal cells long-rectangular to linear, 25–62.5 µm x 7.5 µm, smooth, alar cells well-developed, yellow-brown, firm-walled or inflated and thin-walled. Autoicous. Perigonial bud terminal on short branch or sessile below the perichaetia. Perichaetial leaves long-setaceous, to 6 mm long, sheathing at base. Setae 1 per perichaetium, 3–6 mm long, yellow, becoming red; capsules erect and symmetric, reddish-brown, obovate, constricted below the mouth, slightly furrowed when dry; annuli 2–3 rows, persistent; opercula short-rostrate, 0.5 mm long; stomata phaneroporic, on lower 1/3–1/2 of capsule; peristome teeth 16, reddish-brown, narrowly triangular, vertically striate and papillose, irregularly divided or perforate in upper 1/2. Calyptrae yellow, 1.5–2 mm, cucullate. Spores slightly papillose 18–25 µm.

In Maine known from Piscataquis (Lowe MAINE) County.

Arctoa fulvella is known from a single alpine station in Maine. It is gametophytically very close to *A. blytii* and like that species has the field aspect of a *Dicranella* or *Ditrichum*. It differs from both *Dicranella* and *Ditrichum* in having well-differentiated alar cells and a costa that more or less lacks internal differentiation. These two features are also found in *Blindia acuta*, a fairly common species often associated with streams or other wet habitats. *Blindia acuta* differs from *A. fulvella* in having orange-red, alar cells, a dioicous sexual condition, short, pyriform capsules, and entire, papillose peristome teeth. *Arctoa blytii* differs from *A. fulvella* in having longer setae, and suberect, asymmetic, oblong, strumose capsules. As noted above Dixon (1896) and Smith (1976) maintain that the leaves of *A. fulvella* are more

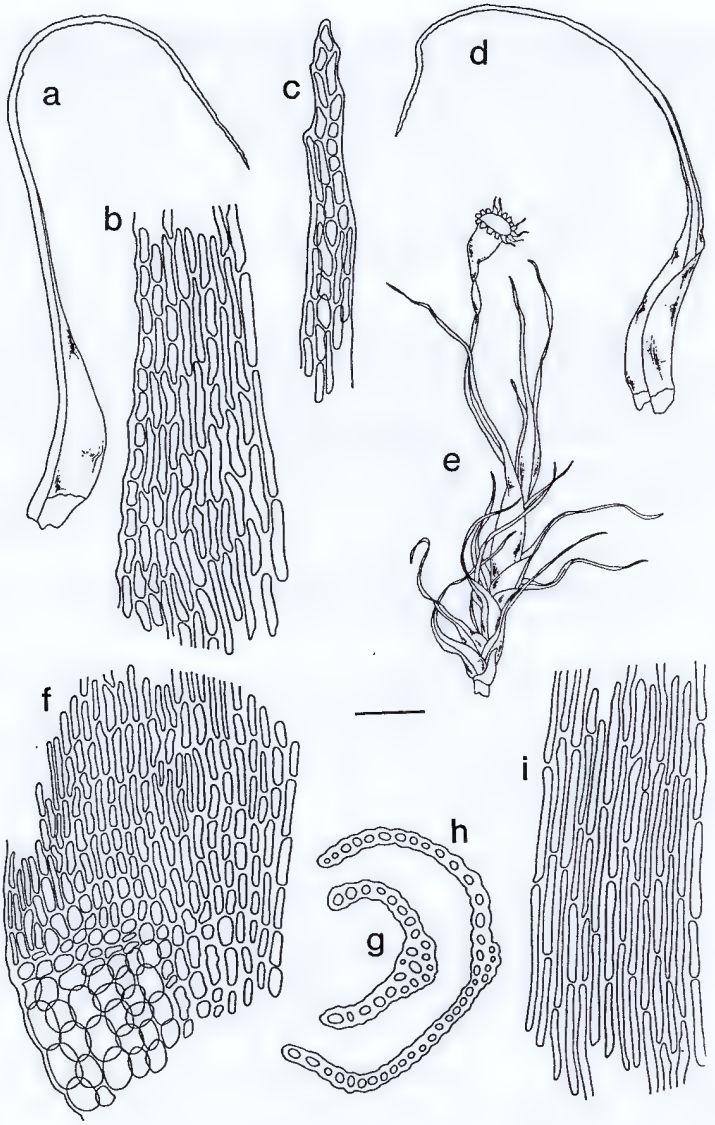

Figure 2. *Arctoa fulvella*. a. & d. Leaves. b. Marginal cells at leaf middle. c. Leaf apex. e. Habit. f. Alar cells. g & h. Leaf cross-sections. i. Basal leaf cells. Scale in mm: bar = 0.05 (b,c,f,g,h,i); bar = 0.5 (a,d); bar = 0.9 (e). Figures a,b,c,d,f,i *Lowe* (MAINE), figures e,g,h Grout, No. Amer. Musci Perf. *355* (MO).

abruptly contracted above the base and the costa is longer excurrent than in *A. blytii*. This distinction appears to hold up in the limit amount of material available for study, but the distinction is difficult to apply without some familiarity with the species. Care should be used when comparing figures 1 & 2 because they were drawn to different scales.

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The Moss Family Ptychomitriaceae in North America North of Mexico

William D. Reese

Two genera and six species of Ptychomitriaceae occur in North America north of Mexico: *Campylostelium*, with one species, and *Ptychomitrium*, with five species. The purpose of this article is to summarize the occurrence of these taxa in North America north of Mexico based on my review of the family for the Flora of North America project.

The acrocarpous habit; bistratose (at least in part) leaves with thickened and often serrate margins and smooth or nearly so laminal cells; single peristome; and mitrate, basally lobed, sometimes plicate calyptra make the Ptychomitriaceae recognizable. The family has been included in the Grimmiaceae by some authors, e.g., Churchill (1981), Lawton (1971), and Noguchi (1988), but is recognized as a distinct haplolepideous family by, e.g., Anderson et al. (1990), Brotherus (1925), Crum and Anderson (1981), and Vitt (1984).

KEY TO GENERA OF PTYCHOMITRIACEAE IN NORTH AMERICA NORTH OF MEXICO

1. Plants very small, delicate, leaves linear above base, entire, commonly circinate when dry; seta flexuous; calyptra smooth..... 1. *Campylostelium*
1. Plants small to robust, coarse, leaves acuminate above base, entire to serrulate or serrate, sometimes crispate but not circinate; seta straight; calyptra more or less plicate..... 2. *Ptychomitrium*

Campylostelium

Campylostelium saxicola (F. Weber & D. M. H. Mohr) P. Bruch & W. P. Schimper in P. Bruch, W. P. Schimper & W. T. Gümbel, Bryol. Eur. 2: 27. 1846.
Dicranum saxicola F. Weber & D. M. H. Mohr, Neues Bot. Taschenb. Anfänger Wiss. Apothekerkunst 1807: 167, 466. 1807.

Plants small, glossy, gregarious to cespitose, yellowish-green. Stems erect. Leaves 2--3 mm long, often circinately curled when dry, linear from a slightly broader base, apices acute, subcucullate; medial cells smooth; margins erect, entire, thickened

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distally. Seta 5--7 mm long, twisted below the capsule and flexuous when dry, often recurved when wet. Capsule ovoid-cylindric, 1--1.2 mm long, smooth to slightly wrinkled when dry; operculum red at base, 0.5--0.7 mm long; peristome teeth slender, red, entire to variously perforate or divided, densely papillose or spiculose, often nodose. Calyptra mitrate, 0.7 mm long, smooth, not plicate, mostly shallowly lobed at base. Spores 8--10 μm, smooth.

Mature spores present October to May. In forests and openings on acidic sandstone boulders and cliffs and in sandstone rock shelters, near sea level--1220 m.

Range in North America: (Figure 1) CANADA: P.E.I., Que. U.S.A.: Ala., Ark., D.C., Ind., Ky., Mass., N.H., N.J., N.C., N.Y., Ohio, S.C., Tenn., Va., Wash. Also in Europe.

This tiny moss has glossy crisped--sometimes circinate--leaves; it grows on shaded boulders in forests over most of its range but in rock shelters in the southern portion. *Campylostelium saxicola* is wide-spread in temperate eastern
North America but is only infrequently collected due to its inconspicuous nature. Its small delicate stature, smooth calyptra, and usually flexuous-curved seta distinguish it from *Ptychomitrium*.

Figure 1. Distribution in North America north of Mexico of *Campylostelium saxicola* (dots) and *Ptychomitrium serratum* (stars).

Ptychomitrium

Plants small to robust, tufted or cespitose, dark green to blackish. Stems erect to repent. Leaves erect to crispate when dry, margins entire to serrulate or serrate; medial cells smooth to slightly papillose. Asexual reproduction rare, by uniseriate gemmae on branched axillary filaments. Seta straight. Capsule ovoid to cylindric, symmetric or slightly curved, smooth to wrinkled or ribbed when dry. Calyptra mitrate, more or less plicate, lobed at base.

Key to Ptychomitrium in North America North of Mexico

1. Leaves coarsely serrate distally 2
1. Leaves entire or obscurely irregularly serrulate distally 3
   2. Leaves slenderly long-acuminate, 4--6 mm long; basal leaf margins broadly recurved on one or both sides; calyptra deeply lobed at base, lobes half length of calyptra ..... 1. *Ptychomitrium gardneri*
   2. Leaves broadly acuminate, 3--4 mm long; basal leaf margins plane and erect or irregularly narrowly recurved on one side at base; calyptra shallowly lobed at bases, lobes less than half length of calyptra. ..... 2. *Ptychomitrium serratum*
3. Plants dull, mostly corticolous; leaves straight or slightly contorted but not crispate when dry, margins mostly obscurely serrulate distally ..... 5. *Ptychomitrium drummondii*
3. Plants glossy, mostly on rock; leaves crispate when dry, margins entire..... 4
   4. Longest leaves mostly 2.5--4 mm long ..... 3. *Ptychomitrium sinense*
   4. Longest leaves mostly 2 mm long ..... 4. *Ptychomitrium incurvum*

1. *Ptychomitrium gardneri* C. L. Lesquereux, Mem. Calif. Acad. Sci. 1: 16. 1868.

Plants glossy, robust, tufted, green to dark-green. Stems erect to repent, to 5 cm tall. Leaves crispate-contorted when dry, narrowly acuminate, 4--6 mm long; margins coarsely serrate distally, recurved on one or both sides proximally; apex plane or with erect margins but not cucullate. Gemmae lacking. Seta 1--2(--3) per perichaetium, 4--10 mm long. Capsule cylindric, 2.5 mm, smooth to weakly striate-ribbed when dry; peristome teeth divided into filiform segments, densely papillose. Calyptra lobes half or more length of calyptra.

Mature spores present March to September. On limestone, basalt, and other rocks, and on concrete, rarely on soil, logs, and charred wood, in open sites, especially along rivers; 0--1400 m.

Range in North America: (Figure 2) CANADA: B.C. U.S.A. Calif., Idaho, Mont., Oreg., Wash. Also in Asia.

The robust glossy plants of *P. gardneri* are easy to recognize by their color; serrate, acuminate leaves; and narrow lobes of the deeply divided calyptra. The lobes of dry mature calyptrae often spread outward like the spokes of a wheel. The leaves are much longer and more narrowly acuminate than those of the somewhat similar *P. serratum*; the ranges of the latter and *P. gardneri* do not overlap.

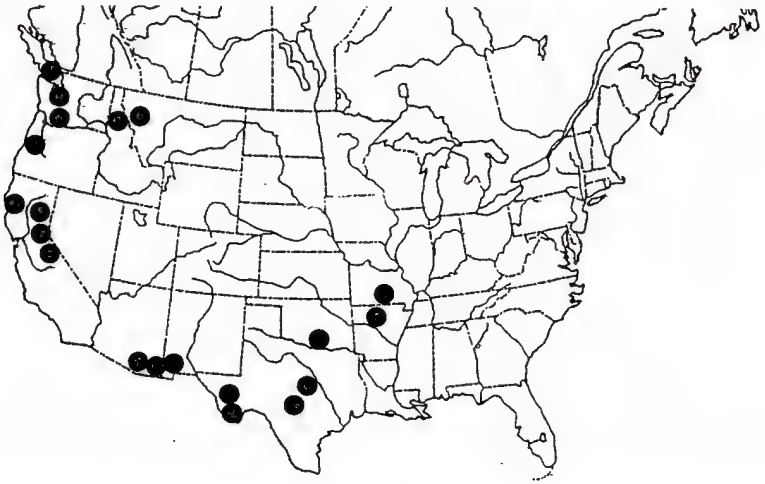

Figure 2. Distribution in North America north of Mexico of *Ptychomitrium gardneri* (dots in California and northwestern North America) and *P. sinense* (dots in southwestern and south central United States).

2. *Ptychomitrium serratum* (J. K. A. Müller) P. Bruch & W. P. Schimper in E. Bescherelle, Mém. Soc. Sci. Nat. Cherbourg 16: 286. 1872.
Brachysteleum serratum J. K. A. Müller, Syn. Musc. Frond. 1: 768. 1849.

Plants glossy, medium-size, tufted to cespitose, dark green. Stems erect to repent, to 1.5 cm tall. Leaves crispate when dry, broadly acute to acuminate, 3--4 mm long; margins coarsely serrate distally, erect or irregularly recurved proximally; apex plane

or with erect margins but not cucullate. Gemmae lacking. Seta 1(--4) per perichaetium, 3--4 mm long. Capsule cylindric, 2--2.4 mm, smooth to slightly or prominently wrinkled or ribbed when dry; peristome teeth divided into filiform segments, densely papillose. Calyptra lobes less than half length of calyptra.

Mature spores present March, April, and December. On calcareous rock and old concrete in forests; 0--2200 m.

Range in North America North of Mexico: (Figure 1) La., S.C., Tex. Also in Mexico and West Indies (Dominican Republic).

Ptychomitrium serratum grows in dark conspicuous tufts or cushions on basic rocks and old concrete. Its habitat, size, prominently serrate leaf margins, and plane leaf tips make it easy to recognize. It is somewhat similar to *P. gardneri* but plants of the latter are much larger; the two species do not co-occur. This moss has been collected repeatedly in Texas, mostly in Culberson County, in the Guadalupe Mountains, especially in McKittrick Canyon. It has also been found at a few sites in central and eastern Texas and in central and southern Louisiana, and at one site in South Carolina. Most of the specimens from eastern Texas, Louisiana, and South Carolina were taken from man-made calcareous substrates (concrete), but one colony from Louisiana grew on an old asphalt shingle roof.

3. *Ptychomitrium sinense* (W. Mitten) A. Jaeger, Ber. Tätigk. St. Gallischen Naturwiss. Ges. 1872--1873: 104. 1874.
Ptychomitrium leibergii G. N. Best, Bryologist 9: 80. 1906.

Plants glossy, medium size, cespitose, yellowish-green. Stems erect, to 1 cm tall. Leaves crispate-curled when dry, broadly acuminate, mostly 2.5--4 mm long; margins entire distally, plane proximally; apex cucullate to subcucullate. Gemmae lacking. Seta 1 per perichaetium, 3--4 mm long. Capsule ovoid, 1.5 mm, irregularly wrinkled when dry; peristome teeth divided into triangular segments, smooth. Calyptra lobes half or more length of calyptra.

Mature spores present January to June. On basic and acidic rock, occasionally on soil or wood, in forests; 100--2000 m.

Range in North America North of Mexico: (Figure 2) Ariz., Ark., Mo., N.Mex., Okla., Tex. Also in Mexico and Asia.

The plants are dark green and glossy; the leaves are tightly crispate when dry with the tips often circinate. The glossy pale or often brownish costa is very conspicuous in dry plants and is especially characteristic for this moss. When moist the leaf tips tend to be involute-cucullate and often falcate or somewhat uncinate. This species was known in North America under the name *Ptychomitrium leibergii* G. N. Best until Cao and Vitt (1994) showed that *P. sinense* was an older name for it.

4. *Ptychomitrium incurvum* (C. F. Schwägrichen) R. Spruce, Ann. Mag. Nat. Hist. 2, 3: 487. 1849.
Weissia incurva C. F. Schwägrichen, Spec. Musc. Suppl. 2, 1(1): 51. 116. 1823.

Plants glossy, small, cespitose, dark green. Stems erect, to 0.5 cm tall. Leaves crispate when dry, oblong-lanceolate, 2 mm long; margins entire, plane distally, erect proximally; apex cucullate to subcucullate. Gemmae rare, short-uniseriate or branched, several cells long, on branched axillary filaments. Seta 1 per perichaetium, 2--3 mm long. Capsule ovoid, 0.75--1.00 mm, smooth to wrinkled when dry; peristome teeth perforate but mostly not divided, densely papillose. Calyptra lobes about one third length of calyptra.

Mature spores present September--June. On acidic and calcareous rocks and soil, very rarely on tree bark, in open forests; 0--1400 m.

Range: (Figure 3) Ala., Ark., Conn., Del., D.C., Fla., Ga., Ill., Kans., Ky., La., Md., Mich., Miss., Mo., N.J., N.Y., N.C., Ohio, Okla., Pa., S.C., Tenn., Tex., Va., W.Va.

The dark-green little plants growing on rock, with their glossy leaves tightly crispate when dry, are unmistakable. The leaves are shorter than in *P. sinense* and are straight when wet, not somewhat falcate at the tips as is common in *P. sinense*. Sporophytes are very common in this moss and the old sporophytes persist for a long time. Sterile colonies of *P. incurvum* can be very reminiscent of *Weissia controversa*, but the *Ptychomitrium* plants are more glossy and their leaves have smooth cells and lack the strongly involute margins of *Weissia*.

5. *Ptychomitrium drummondii* (W. M. Wilson) W. S. Sullivant, Musc. Bor. Am. 30. 1856.
Grimmia drummondii W. M. Wilson, J. Bot. (London) 3: 90. 3. 1841.

Plants dull, small, cespitose, yellowish to dark green. Stems erect, to 0.5 cm tall. Leaves erect-appressed and straight to slightly flexuous when dry, broadly acuminate,

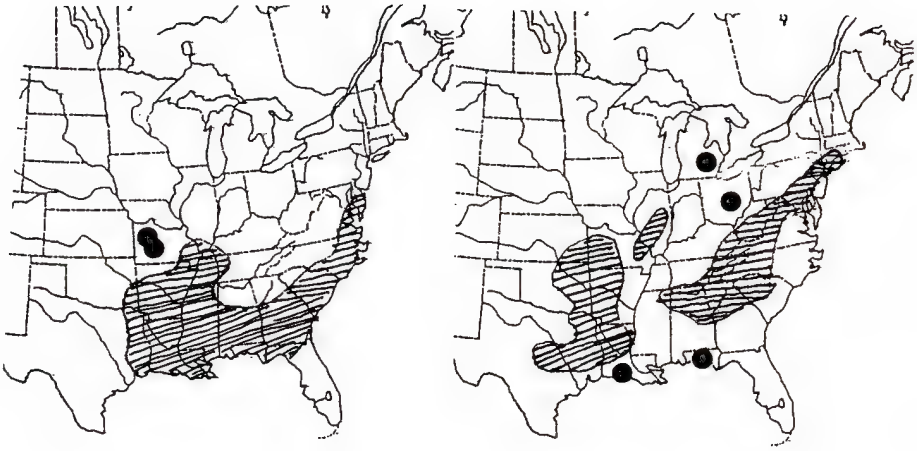

Figure 3. Distribution of Ptychomitrium drummondii (at left; dots and hatched area) and *P. incurvum* (at right; dots and hatched area).

1.5--2.0 mm long; margins mostly obscurely serrate distally, erect proximally; apex subcucullate. Gemmae lacking. Seta 1 per perichaetium, 2--3 mm long. Capsule ovoid, 0.75--1.00 mm, smooth to obscurely striate-ribbed when dry; peristome teeth undivided, papillose. Calyptra lobes one third to one half length of calyptra.

Mature spores present September to May. On tree bark, rarely on rock and soil, in humid sites; 0--300 m.

Range: (Figure 3) Ala., Ark., Del., Fla., Ga., Ill., La., Miss., Mo., N.C., Okla., S.C., Tenn., Tex., Va., W.Va.

The leaves are erect-appressed and straight or only a little curved when dry and, together with the bark substrate, make this dull dark green little moss easy to recognize. Sporophytes are very frequent and abundant. In urban areas in the

southeastern United States *P. drummondii* is often frequent and abundant on trees in parks and campuses and along city streets.

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Acknowledgments. I thank the curators of ALTA, BRIT(SMU), CANM, COLO, DUKE, FH, FLAS, LAF, MICH, MO, NY, OSC, TENN, UBC, UC, WTU for loan of the specimens upon which this study is based.

Representative Specimens Examined

Campylostelium saxicola CANADA. Prince Edward Island. Queens Co.: *Ireland 13712*, FH, MO. Quebec. Forillon National Park: *Belland 14594, 14618, 14642*, UBC. U.S.A. Alabama. Franklin Co.: *Anderson 26546*, DUKE. Arkansas. Madison Co.: *Redfearn 18856*, MICH. District of Columbia. *Chamberlain 1305*, MICH. Indiana. Morgan Co.: Morgan Co. *Welch s.n.*, 20 Sept. 1941, SMU(BRIT). Kentucky. Harlan Co.: *Meijer s.n.*, 3 Dec. 1978, MICH. Massachusetts. Worcester Co.: *Wilson 3368*, FH. New Hampshire. Newton, *Huntington s.n.*, 18 Oct. 1903. DUKE. New Jersey. Near Closter: MICH. New York. Near Blauntsville: *s. coll., s.n.*, 23 May 1866. NY. North Carolina. Jackson Co.: *Pursell 3484*, LAF. North Carolina. Macon Co.: *Slack 4153*, FLAS. Ohio. Pickaway Co.: *Bartley & Pontius 295*, DUKE. South Carolina. Pickens Co.: *Anderson 25,571*, DUKE. Tennessee. Cheatham Co.: *Sharp 34285*, FH, MICH. Virginia. Washington Co.: *Ralston III s.n.*, October 1963, NY. Washington. Lewis Co.: *Schofield & Boas 22326*, DUKE.

Ptychomitrium drummondii Alabama. Mobile Co.: *Reese & Pursell 2905*, LAF. Arkansas. Hempstead Co.: *Moore & Iltis 880*, FH. Delaware. Sussex Co.: *Smith s.n.*, 8 April 1939, DUKE. Florida. Leon Co.: *Schornherst 1640*, FH. Georgia. Macon Co.: *Anderson 5136*, FH. Illinois. Johnson Co.: *Magill 10908*, DUKE. Louisiana. Lafayette Parish: *Langlois s.n.*, 1885, FH. Mississippi. Madison Co. *Reese 17331*, LAF. Missouri. Madison Co.: *Vitt 1167*, MICH. North Carolina. Anson Co.: *Anderson 5021*, FH. Oklahoma. McCurtain Co.: *Redfearn 36982*, COLO. South Carolina. Kershaw Co.: *Anderson 5571*, FH. Tennessee. Montgomery Co.: *Clebsch 518*, MICH. Texas. Angelina Co.: *Reese 18101*, LAF Virginia. James City Co.: *Ordway s.n.*, 13 May 1937, FH.

Ptychomitrium gardneri CANADA. British Columbia. Vancouver Island, *Schofield 60,300*, DUKE, UBC. U.S.A. California. Placer Co.: *MacFadden s.n.*, 2 July 1934, *North American Musci Perfect 281*, FH. Idaho. Nez Perce Co.: *Meyer 64*, FLAS, SMU(BRIT). Montana. Lake Co.: *Flowers 10,187*, COLO. Oregon. Lane Co.: *Lawton 3412*, FH, LAF. Washington. Klickitat Co.: *Ireland & Lawton 8375*, MICH.

Ptychomitrium incurvum Alabama. Madison Co.: *Bryson 918*, MICH. Arkansas. Garland Co.: *LaMond 11*, SMU. Connecticut. New Haven, *Nichols s.n.*, October 1909; J. M. Holzinger, *Musci Acrocarpi Boreali-Americani 266*, FH, MICH. Delaware. Faulkland, *Commons s.n.*, 16 May 1886, COLO. District of Columbia, *Newman s.n.*, 8 June 1900, DUKE. Florida. Washington Co.: *Reese 811*, LAF Georgia. DeKalb Co.: Slopes of Stone Mountain, *Small*, April 1893, *Mosses of the Southern United States 25*, FH, LAF, SMU. Illinois. Champaign Co.: *McKnight 4390*, MICH. Kansas. Woodson Co.: *Churchill 10794*, LAF. Kentucky. Letcher Co.: *Risk 1431,* DUKE. Louisiana. Natchitoches Parish: *Reese 9401*, LAF. Maryland. Baltimore Co.: *Plitt s.n.*, 18 August 1900, DUKE. Mississippi. Tishomingo Co. *Anderson 26,574*, DUKE. Michigan. Washtenaw Co.: *Buck s.n.*, 27 April 1978, MICH. Missouri. Ste. Genevieve Co.: *Redfearn 28599*, LAF. New Jersey. Bergen Co.: *Nearing s.n.*, 7 March 1959, NY. New York. Long Island, *E. G. Britton s.n.*, December 1889, MICH. North Carolina. Forsyth Co.: *Schallert, F. Verdoorn, Musci Selecti et Critici, Ser. II, 87*, FH, MICH. Ohio. Pickaway Co.: *Bartley 2*, MICH. Oklahoma. Payne Co.: *Ikenberry 822*, MICH. Pennsylvania. Lancaster Co.: *Small s.n.*, 2/27/1892, FH. South Carolina. Chesterfield, *s.n.*, 14 March 1931, *A. J. Grout, North American Musci Perfecti 205,* FH, MICH, SMU. Tennessee. Blount Co.: *Sharp 34188*, FH. Texas. Angelina Co.: *Reese 18101*, [with P. drummondii], LAF. Virginia. Giles Co.: *Pursell 3828*, LAF. West Virginia. Maryland Heights, *Levy 2170*, DUKE.

Ptychomitrium serratum Louisiana. Rapides Parish: *Reese 1990*, LAF. South Carolina. Pickens Co.:*Anderson & Mishler 24,495*, DUKE. Texas. Bandera Co.: *Reese 6576*, LAF.

Ptychomitrium sinense Arizona. Santa Cruz Co.: *Haring s.n.*, 29 January--11 March 1945, *A. J. Grout, North American Musci Perfecti 472,* LAF. Arkansas. Marion Co.: *Allen 6263*, MICH. Missouri. Ozark Co.: *Redfearn 22917*, LAF. New Mexico. Hidalgo Co.: *Worthington 20,926*, COLO. Oklahoma. Murray Co.: *Sharp 4078*, DUKE. Texas. Brewster Co.: *Reese 11571*, LAF.

A disjunct population of *Dicranum brevifolium* (Lindb.)Lindb. in Southeastern Québec, Canada.

Jean Faubert

Serpentine outcrops are well known to harbor populations of plants far removed from the main range of their respective species. In the course of an ongoing study of such environments in eastern Québec, a greatly disjunct population of *Dicranum brevifolium* has been discovered. Collections from this site are as follows:

Specimens: Canada, Province of Québec, Matapédia County, La Rédemption, Mont Saint-Pierre, 48°26'55'' N. 067°50'03'' W. Altitude: 410m. On bare mineral soil of serpentine outcrop, north side of the mountain, 0,7 km east of town water reservoir. Most abundant associated taxa: *Weissia controversa* Hedw., *Bryum lisae* var. *cuspidatum* (BSG)Marg., *Ceratodon purpureus* (Hedw.)Brid.; other taxa of special interest are: *Moehringia macrophylla* (Hook.)Torr., *Adiantum aleuticum* (Rupr.)Paris and *Solidago calcicola* Fern. *J.Faubert & C.Grenier No.316*, 22 September 1996, also *No.363* and *No.388,* 23 June 1997 (in QFA and in author's herbarium). Most individuals sterile but a few old and dry sporophytes present.

According to Bellolio-Truco and Ireland (1990), *D. Brevifolium* is an arctic-alpine species that is found in the Arctic tundra or on exposed bluffs on humus and soil over rocks. In eastern Canada, the nearest published locality to the one discussed here is in Labrador, 709 km almost due north from Mont-Saint-Pierre. There is another disjunct locality 1273 km to the west, at the eastern end of Lake Superior in Ontario. Other than that, it has been collected along James Bay and in Québec's Far North.

Mont Saint-Pierre, at the foothills of the Appalachian Mountains, is located at the western end of the Gaspé Peninsula where it merges into the Lower Saint-Lawrence area of Québec. Those mountains are covered by a boreal forest that gradually merges into the mixed forest of the lower land that lies between the foothills and the the St-Lawrence River some 40 km to the northwest. The site of collection was submitted to scraping off during mining prospecting over 70 years ago. For this reason the exact state of the original vegetation is not precisely known. Old pictures show a very open landscape. Today, it is a patchwork of mounds of bare mineral soil and bare flat rockbed separated by depressions. These are generally damper and sustain clumps of

47 rang 4 est, Sant-Valérien(Québec), Canada, G0L 4E0

mixed forest on a thin layer of humus. The mounds, where *D. brevifolium* is found, are made of small rocks, pebbles, sand and dust and are quite dry because of their slope.

Key diagnostic characters of this species are: upper leaf cells short-quadrate, lower leaf cells elongated (less than 45μm) and pitted, costae very prominent and rounded on dorsal surface, the leaves strongly cirrate to crisped when dry. The leaves cross-section shows one row of guide cells with two well-developed and thick stereid bands, a dorsal row of differentiated cells, no enlarged ventral cells and cell walls between lamina cells strongly bulging. These cross sections are very distinctly shaped like a pair of tongs.

Literature

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Second collection of a little moss, *Fissidens littlei* (Williams) Grout, rediscovered from a little sinkhole in New Mexico after 63 years

Kelly W. Allred

Plants of *Fissidens littlei* (Williams) Grout were first collected by Elbert L. Little, Jr. in 1935, from gypsum plains on the Jornada Experimental Range (USDA), central Doña Ana County, New Mexico, and given the name *Moenkemeyera littlei* by R.S. Williams (1936). In a subsequent list of the bryoflora of the Experimental Range, Little (1937) described the habitat as "vertical walls of three gypsum sinks (2 to 8 feet below surface), gypsum deposits of plain, 1½ miles north of Middle Well, sec. 25, T.18S., R.1E., M.M. principal meridian." As far as is known, this was the only documented collection of this species for the next 63 years. (*Fissidens orcuttii* Grout, from Louisiana, has been confused with *F. littlei*, but *F. orcuttii* should be placed in synonymy under *F. amoenus* C. Mueller, Ron Pursell, pers. comm.)

Fissidens littlei was again collected in September 1998, from approximately the same site as the 1935 collection. It was found on the side walls of small sinkholes that resembled burrows of small animals. The sinkholes were approximately 20-30 cm in diameter, the opening slightly wider than tall, lying at the bottom of larger swale-like depressions (much like a drain). The moss was located about 20 cm into the holes and far enough back from the mouth to be shaded for most of the day. It was growing in small colonies 2-3 cm wide, intermingled with a few plants of the Pottiaceae, as yet unidentified. Two collections were made, from sinkholes about 100 meters apart. No other populations were found, though three other sinkholes were located in the area.

Little's description implies that the sinkholes were quite large, up to 8 feet deep and presumably large enough for a person to enter. No such sites were located in 1998. The terrain of the original 1935 sites has likely been modified since that time, as gypsum plains are easily eroded by rainfall and this is in an area grazed by livestock, which were observed congregating in the moist, thickly vegetated ground in the depressions surrounding the sinkholes. Their scrambling into and out of the depressions readily crumbles and corrodes the banks and walls.

The collection sites are to the west of the San Andres Mountains. To the east are extensive deposits of gypsum as well, situated within White Sands Missile Range (U.S. Army) and White Sands National Monument (Department of Interior). A

Herbarium, Dept. Animal & Range Sciences, New Mexico State Univ., Las Cruces, NM 88003

search of this area in October 1998 failed to find any mosses, though several promising sinkholes were located. The sites were quite dry, however, and they will need to be investigated again under more favorable growing conditions.

Fissidens littlei is distinguished by small size (1-2 mm high), elongated cells at the base of the vaginant laminae (scarcely a border), margins serrulate because of projecting cells, and cells mammillose rather than papillose.

Details of the 1998 collections are as follows:

New Mexico: Doña Ana County: Jornada Experimental Range (USDA), 1.5 miles (2.4 km) north of Middle Well, 2.6 miles (4.2 km) due east of Red Lake, N32°42.76' W106°47.12', gypsum plains of Chihuahuan Desert shrub savannah with *Prosopis glandulosa, Sporobolus nealleyi, Nerisyrenia linearifolia, & Calylophus hartwegii*, 4350 ft (1300 m), 2 Sep 1998, K.W. Allred 7286 (NMCR, PAC); same as previous, about 100 m east, K.W. Allred 7287 (NMCR). Identifications were verified by Ron Pursell (PAC).

Acknowledgments. Many thanks to Ron Pursell for his advice and help with identifications, and to Jornada Experimental Range, White Sands Missile Range, and David Anderson for their cooperation and allowing access. This little study was supported by the New Mexico Agricultural Experiment Station, New Mexico State University.

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Evansia: Fifteen Year Index

Bruce Allen & Robert E. Magill

Missouri Botanical Garden, P.O. Box 299, St., Louis, Missouri 63166

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MAINE MOSSES

A few copies of a preliminary draft of Maine Mosses, by Bruce Allen, are available for sale. This publication combines a distributional checklist of Maine mosses (at the county level) along with keys to all genera and species of mosses in Maine. Incorporated into the volume are the texts from the twenty-two taxonomic papers on Maine mosses Allen has published, to date, in Evansia. Illustrations from those papers are NOT included in this preliminary draft.

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