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Key to the Mosses of the Okoboji Region

H.S. Conard

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A KEY TO THE MOSSES OF THE OKOBOJI REGION

by

H. S. Conard and B. O. Wolden

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June, 1932

A KEY TO THE MOSSES OF THE OKOBOJI REGION*

H. S. Conard and B. O. Wolden

The Okoboji Region as here understood includes the area readily available to botanists working at the Iowa Lakeside Laboratory, namely Emmet, Dickinson, Osceola and Lyon Counties, Iowa, the Sioux Quartzite outcrops in Brown and Cottonwood Counties, Minn., and the vicinity of Heron Lake, Minn. No additional species have been found in brief forays in Palo Alto, Clay, O'Brien, Sioux, Plymouth, Woodbury, Cherokee, Webster and Kossuth Counties, so that these counties may be considered to be included in the list. It covers, therefore, the known mosses of northwestern Iowa. Additional species appear in Winnebago County, and become more numerous eastward.

The list of species in this key is based upon Wolden's "Moss and Lichen Flora of Western Emmet County" (8), and subsequent collections of Wolden published by Blagg (2, 3, 4). We have recently collected together in most of the region, under guidance of Mr. Wolden, seeing again the majority of the species and adding a few which are here published for the first time for the area. The lists published by Shimek (7) and Cavanagh (5, 6) have also been considered and we entered in the Key those species which through the kindness of Miss Cavanagh, we have seen. Species not seen, and for which therefore we cannot assume responsibility, are given in footnotes.

The identifications of Wolden's Emmet County list were by G. B. Kaiser of the Sullivant Moss Society. Later material has been checked by A. LeRoy Andrews, E. B. Bartram, A. J. Grout, G. R. Jones and G. B. Kaiser, to all of whom we are indebted. Amblystegium and Drepanocladus were referred to Grout. Specimens of all species given in the key, excepting *Amblystegium brevipes*, *Bryum intermedium* and *Orthotrichum anomalum* are accessible in the herbaria of the authors. Species marked with an asterisk (*) have been collected by Wolden in Emmet County.

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* Contribution from the Iowa Lakeside Laboratory.

A number of names found in the published lists are believed to be in error:

Hypnum fluitans is probably our *Drepanocladus aduncus.*

Ephemerum sessile cannot be found or verified.

Fabronia gymnostoma, kindly communicated by Miss Cavanagh, we believe to be better referred to *F. octoblepharis.*

Amblystegiella subtilis, Bryum inclinatum, Campylium radicale, Catharinea crispa, Drepanocladus vernicosus, Fissidens adiantoides, F. bryoides and *F. subbasilaris* are found to be wrongly identified.

Authorities for names are not cited, since the names are understood to be as given in Grout's "Mosses with hand-lens and microscope". *Grimmia poecilostoma* (Card. & Seb.) Limpr., identified by G. R. Jones (*G. glauca* and *G. leucophaea* of other lists) is not given in Grout's book. The species of Amblystegium and Drepanocladus are treated in harmony with Grout's "Moss Flora of North America." The student will not be satisfied with the meager descriptions afforded by the Key, but will want to have at hand a suitable manual. Hence the reference to Grout, and the retention of his names.

The Key is obviously patterned after Grout, but an attempt has been made to include both leaf and capsule characters, wherever both are diagnostic. Thus both sterile and fertile material can be traced in the same key. Helpful corrections and modifications will be welcomed by the authors.

We are indebted to the Administration of the State University of Iowa, and especially to Professor G. W. Martin, Director of the Iowa Lakeside Laboratory, for the use of the facilities of the Laboratory (which gave us the opportunity to work together) and for the privilege of publishing under their auspices.

KEY TO GENERA

1. Plant thalloid: a green scale-like growth, without distinction of stem and leaf (Fig. 1-3) Hepaticae
1. Plant showing stem and leaves (Fig. 11, 14, 27, 29, 40) 2
2. Lvs. 2-ranked (dorso-laterally), without midrib, the cells isodiametric; sporophyte short-lived (Fig. 11-19) Hepaticae
2. Lvs. with midrib; or if without midrib, many ranked, the leaf or the cells or both elongate; sporophytes persisting for weeks or months (Fig. 21-52) Musci

HEPATICAE

1. Plant thalloid: a green scale-like growth (Fig. 1-3, 20) 2
1. Plant showing stem and leaves (Fig. 11, 14, 19) 11
2. Thallus watery-translucent, without air spaces 3
2. Thallus opaque, with air chambers 4
3. In rosettes to 2 cm. across; capsule erect, rod-like, long lived (Fig. 20) .....14. Anthoceros
3. In small (to 2 cm. long) irregularly pinnate-lobed thalli, in water or marshes (Fig. 10) .....7. Aneura
3. In clustered running thalli, each 5-10mm. across; on moist earth ....8. Pellia
4. Without visible pores opening into air chambers 5
4. Surface showing polygonal areas, with an air pore in each polygon (Fig. 7) 9
5. On earth 6
5. In water, floating 8
6. On upland soil or rocks; margins red-purple beneath; purple scales with 2 linear appendages (Fig. 9). .....6. Reboulia
6. On margins of ponds; without scales; green 7
7. Thalli very numerous, 1-2mm. wide, in dense beds (Fig. 1) .....1. Riccia
7. Thalli 1-few in a place, 2-4mm. wide (Fig. 2) .....2. Ricciocarpus
8. Thalli 1-2mm. wide, 5-25mm. long, branched (Fig. 1) .....1. Riccia
8. Thalli 2-10mm. across, about as long as wide (Fig. 2) .....2. Ricciocarpus
9. Polygons 1-1.3mm. across; pore at tip of a colorless mound (Fig. 5) .....3. Conocephalum
9. Polygons 0.5mm. across or smaller; pores barrel-shaped 10
10. With marginal scales beneath; gemmae cups common (Fig. 3, 4) ....4. Marchantia
10. No marginal scales or gemmae; rare (Fig. 6) .....5. Preissia
11. Lvs. with an underlobe, incubous; underleaves present (Fig. 11, 12) 12
11. Lvs. without underlobes, succubous (Fig. 14, 19) 13
12. Underlobe forming a helmet-shaped sac; shoots ½mm. wide (Fig. 12, 13) .....9. Frullania

12. Underlobe not sac-like; shoots 1-2mm. wide (Fig. 11) .....10. Porella
13. Some or all lvs. notched at apex (Figs. 14, 15, 18) .....12. Lophocolea
13. Lvs. rounded; no underleaves; shoots 1mm. wide or less (Fig. 19) ....13. Jungermannia
13. Lvs. obovate; underleaves minute, wedge-shaped; shoots 2-3 mm. wide ....11. Plagiochila

MUSCI

1. Lvs. long and narrow, with parallel vertical plates of cells (Fig. 22, 23) on upper surface of midrib; teeth of peristone 32 or 64, not transversely jointed or barred (Fig. 21) .....*Nematodontae* Polytrichaceae 2
1. Lvs. without vertical plates; teeth 8, 16 or 32, transversely jointed or barred, or absent (Fig. 26, 30, 36) *Arthrodontae* 3
2. Lvs. without green lamina (Fig. 22), but with membranous sheathing base; caps. stout, angular; calyptra hairy .....15. Polytrichum
2. Lvs. with distinct lamina, not sheathing at base (Fig. 23); caps. slender cylindric; calyptra hairless .....16. Catharinea
3. Lvs. 2-ranked, split at base, clasping stem and next leaf above; with midrib (Fig. 28) .....17 Fissidens
3. Lvs. not split along upper margin 4
4. Plants erect, unbranched except for annual renewal of growth; seta from tip of stem (or apparently lateral because of renewal shoots) (Fig. 25-29) Acrocarpi 5
4. Plants creeping widely, branching continuously, sometimes with erect shoots (Fig. 40-52); seta from a lateral bud 29

ACROCARPI

5. Lvs. papillose, without midrib; often white-tipped; on rocks; caps. covered by lvs., without peristome .....22. Hedwigia
5. Lvs. papillose, with midrib (Fig. 24, 35) 6
5. Lvs. not papillose, or only faintly so on upper back 15
6. Leaf margin rolled upward (involute) (Fig. 31) 7
6. Leaf margin rolled backward (revolute), at least above 8
6. Leaf margin plane (not rolled); tiny tufted rock-moss without peristome (Fig. 35) .....25. Gymnostomum
7. Seta distinct, 5-15mm.; peristome imperfect (Fig. 31) .....24. Weisia
7. Seta shorter than capsule; without operculum .....23. Astomum[1]
8. Lvs. evenly tapering from base to slender apex 11
8. Lvs. ovate or tongue-shaped, with a point or hair on the rounded tip 9
9. Tip composed of the excurrent midrib; peristome of twisted threads 10
9. Tip made of single cells beyond tip of rib; peristome white, imperfect (Fig. 24) .....27. Desmatodon
10. Leaf tip very short and stout; peristome wholly of threads .....26. Barbula

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[1] *Phascum floerkianum*, lvs. revolute, "on open drift hill near West Okoboji Lake" is reported by Cavanagh (6).

10. Leaf tip slender, hair-like; peristome threads from a netted basal membrane (Fig. 26) ..... 28. Tortula
11. Lvs. entire 12
11. Lvs. irregularly crenate near apex; capsule elongate, ribbed ..... 35. Aulacomnium
11. Lvs. distinctly and sharply serrate; caps. nearly globular, with mouth on one side of tip 14
12. On earth or earthy rocks; peristome twisted; seta about 1cm. tall ..... 26. Barbula
12. On bark, well above ground (Fig. 27) ..... 30. Orthotrichum
12. On rocks, firmly attached, independent of soil 13
13. Peristome teeth erect when dry ..... 30. Orthotrichum
13. Peristome teeth folded back against outside of capsule when dry 29. Ulota
14. Lvs. very slender, recurved; plants of wooded banks (Fig. 25) ..... 37. Bartramia
14. Lvs. ovate-lanceolate, erect or spreading; in very wet places ..... 36. Philonotis
15. Very black tufted moss on rocks; caps. covered by lvs.; teeth red ..... 21. Grimmia
15. Ordinary green mosses; midrib present 16
16. Lvs. oval; cells small, isodiametric, thick-walled; peristome of twisted threads from a netted basal membrane (Fig. 26) ..... 28. Tortula
16. Lvs. oval (1:5 or less); cells large, distinct 17
16. Lvs. long, slender (1:6 or more); pointed 23
17. Cells rectangular, distinct; lvs. clustered at ground level on the very short stems; annuals (Fig. 29) 18
17. Cells hexagonal; lvs. 5-10mm. long, in a rosette at top of a stem 1-2cm. tall; perennial (Fig. 37) ..... 43. Rhodobryum
17. Cells hexagonal to rhombic, or rarely elongate; lvs. equally placed along a distinct stem; caps, nodding 20
18. Caps. erect, globular or bowl-shaped, without peristome; lvs. sharply toothed in upper half (Fig. 29) 19
18. Caps. nodding, pear-shaped, the operculum to one side of tip (Fig. 32); lvs. entire or nearly so ..... 33. Funaria
19. Caps. immersed (no seta) ..... 31. Aphanorhegma
19. Seta distinct; caps. above lvs. (Fig. 29) ..... 32. Physcomitrium
20. Caps. barrel-shaped; stems often rooting at tips (Fig. 39) ..... 44. Mnium
20. Caps. pear-shaped (Fig. 33); stems strictly erect, usually densely tufted 21
21. Lvs. relatively far apart, the chlorophyll sparse (in flecks on cell walls when dry) ..... 40. Mniobryum
21. Lvs. crowded or close, evenly green (or white-tipped) 22
22. In dense sods everywhere; lvs. spreading when moist, or julaceous and white tipped ..... 41. Bryum
22. Stems julaceous, flagelliform; cells narrow; very rare, on Sioux quartzite ..... 42. Anomobryum
23. Lvs. 5-6mm. long, with stout midrib 24
23. Lvs. less than 5mm. long 26

24. Lvs. suddenly narrowed to tip, toothed near apex; inner peristome entirely of cilia (Fig. 34) ..... 34. Timmia
24. Lvs. very finely tapered from base to apex 25
25. Lvs. all curved to one side, channelled; toothed on back of midrib; plants in big cushions ..... 20. Dicranum
25. Lvs. hairlike, wavy; caps. pear shaped, nodding ..... 38. Leptobryum
26. Tiny tufted annuals with caps. sessile among the lvs.; no peristome ..... see footnote 2.
26. Seta and peristome well developed; perennial 27
27. Margins plane 28
27. Margins revolute nearly to the finely toothed apex; seta and inclined caps. mahogany red (Fig. 38); common ..... 18. Ceratodon
27. Lvs. channeled by upturned margins, or plane and entire; caps. erect, or kinked to one side below the mouth; teeth split half way down ..... 19. Dicranella
28. Lvs. toothed above; with strong midrib; caps. large, nodding; mesic ..... 39. Pohlia
28. Lvs. entire, without midrib; in bogs ..... 57. Campylium
29. Lvs. apparently 2-ranked; large mosses with stems arching over and rooting at tips; caps. barrel-shaped, nodding, from erect leafy shoots (acrocarpous); common (Fig. 39) ..... 44. Mnium
29. Very black tufted moss on rocks; caps. covered by lvs.; teeth red, (acrocarpous) ..... 21. Grimmia
29. Stems creeping, or if erect, branching freely (Fig. 40-52) 30

PLEUROCARPI

30. Main stems creeping in soil; erect shoots bushy-branched at top (2-5cm. tall) (Fig. 48) ..... 53. Climacium
30. Stems not normally buried in earth 31
31. Lvs. strongly toothed, papillose at outer end of each cell ..... 51. Bryhnia
31. Lvs. opaque because of papillae on cells; entire, or toothed at apex 32
31. Lvs. translucent, not papillose 37
32. Lvs. without midrib, often white-tipped; caps. covered by lvs., without operculum (acrocarpous) ..... 22. Hedwigia
32. Lvs. with midrib (Leskeaceae) 33
33. Lvs. almost orbicular, coarsely an dirregularly toothed; on oak trees (Fig. 44) ..... 49. Thelia
33. Lvs. more elongate, entire or nearly so (Fig. 40-43) 34
34. Lvs. strongly papillose, slenderly acuminate, the costa ending near the middle; on trees, rare ..... 47. Fabroleskea
34. Not showing the above combination of characters 35
35. Evenly pinnately branched; paraphyllia many or few (Fig. 40) ..... 45. Thuidium

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[2] *Pleuridium palustre* with caps. wholly enclosed by lvs., "along edge of canal, Upper Gar Lake", and *Amphidium californicum* with caps. projecting from lvs. "on sandy ground near Spirit Lake" are minute mosses reported by Miss Cavanagh (6).

35. Not evenly pinnate; paraphyllia rarely seen 36
36. Lvs. very small, ovate, more or less acute but not hair-tipped; caps. erect; common ..... 46. Leskea
36. Lvs. closely appressed to stem, crowded, hair-tipped; or spreading and more or less tongue-shaped (Fig. 41-43) ..... 48. Anomodon
37. Lvs. with midrib (costa) 38
37. Lvs. without midrib 46
38. Without paraphyllia 39
38. With numerous oval, toothed paraphyllia; in marshes, rare 55. Cratoneuron
39. In water or marshes; lvs. turned to right and left of stem, the tapered tips bent down (at least at ends of stems) (Fig. 52) ..... 54. Drepanocladus
39. Lvs. 2-ranked, glossy, not bent down (Fig. 51) ..... 52. Eurhynchium
39. Lvs. nearly equally placed around stem 40
40. Very slender mosses; lvs. about 1mm. long; cells of leaf mostly rhombic 41
40. Stouter; lvs. larger; cells mostly linear 43
41. Lvs. close to stem or spreading; midrib straight 42
41. Lvs. clearly to strongly bent back shortly above base (squarrose) (Fig. 47) ..... 57. Campylium
42. Lvs. irregularly dentate with entire cells projecting from margin; caps. erect ..... 64. Fabronia
42. Lvs. nearly or quite entire; caps. curved, strongly contracted below mouth when dry ..... 58. Amblystegium
43. Lvs. rounded at apex; rare ..... 56. Calliergon
43. Lvs. pointed at apex 44
44. Lvs. acuminate, very entire (Fig. 49) ..... 58. Amblystegium
44. Lvs. more or less toothed on margin 45
45. Foliage dull or somewhat shiny; lvs. often pleated lengthwise (Fig. 50); no spur on back; beak of operculum short ..... 50. Brachythecium
45. Foliage glossy; little pleated, if at all; midrib ending in a spur on back of leaf; beak of operculum long ..... 52. Eurhynchium
46. Lvs. about 1mm. long, or less 47
46. Lvs. 2-3mm. long 49
46. Lvs. 3.5-7mm. long; streaming from rocks in brooks ..... 65. Fontinalis
47. Lvs. with straight axis, erect or spreading 48
47. Lvs. squarrose (axis sharply bent back) (Fig. 47); caps. curved ..... 57. Campylium
47. Lvs. with sharp points all bent downward ..... 59. Hypnum
48. Very dark green or olive, small moss on trees and old wood; clustered buds on tips of some branches; many square alar cells; caps. erect ..... 63. Platygyrium
48. Very tiny mosses, the lvs. scarcely visible without a lens; few if any square alar cells ..... 61. Amblystegiella
49. Lvs. flat, not folded, in flat sprays (Fig. 51); margin toothed or entire; no distinct alar cells; caps. curved, inclined ..... 60. Plagiothecium
49. Lvs. large, shiny, entire, with distinct square alar cells; when sprays are flat, marginal lvs. folded ..... 62. Entodon

SYSTEMATIC LIST AND KEY TO SPECIES

Hepaticae **Marchantiales** **Ricciaceae**

1. Riccia

1. In floating clusters or mats, or stranded (Fig. 1) ....*R. fluitans**

2. Ricciocarpus

1. With a fringe of scales beneath when floating; in shallow water, or stranded (Fig. 2) .....*R. natans**

Marchantiaceae

3. Conocephalum

1. Thallus 1-1.5cm. wide; aromatic when bruised (Fig. 5). .....*C. conicum**

4. Marchantia

1. With umbrella-shaped erect reproductive shoots; pores oval (Fig. 3, 4) .....*M. polymorpha**

5. Preissia

1. On cool rock faces; pores round (Fig. 6, 8) .....*P. quadrata*

6. Reboulia

1. Thallus 4-6mm. wide; porous under a lens (fig. 9) .....*R. hemisphaerica**

Jungermanniales **Metzgeriaceae**

7. Aneura

1. Thallus 10-12 cells thick at middle (fig. 10) .....*A. pinguis**

8. Pellia

1. Thalli about 8mm. wide; species unknown*

Jungermanniaceae

9. Frullania (Figs. 12, 13, 16)

1. Autoicous (antheridia and archegonia on same plant) .....*F. inflata**

1. Dioicous (on different plants) ..... *F. bolanderi**

10. PORELLA

1. Underlobes narrower than underleaves, tapering to apex (Fig. 11) ..... *P. platyphylla**

11. PLAGIOCHILA

1. Leaf margins slightly bent down, upper surface convex ..... *P. asplenioides**

12. LOPHOCOLEA

1. Lvs. 1mm. wide, some of them entire (Fig. 14, 15, 17) ..... *L. heterophylla**
1. Lvs. much smaller, deeply notched, with 1-celled gemmae at tips (Fig. 18) ..... *L. minor**

13. JUNGERMANNIA

1. Leafy stems about 1mm. wide, scattered or in mats (Fig. 19) ..... *J. sphaerocarpa*

Anthocerotales **Anthocerotaceae**

14. ANTHOCEROS

1. Spores yellow, with finely granular surface (Fig. 20) *A. laevis**

Musci **Bryales** **Nematodontae**
Polytrichaceae

15. POLYTRICHUM (Fig. 21)

1. Lamellae covered by transparent leaf margins 2
1. Lamellae uncovered; margins toothed (Fig. 22) 3
2. Leaf ending abruptly in a colorless hair ..... *P. piliferum*
2. Leaf tapering to a colored point ..... *P. juniperinum**
3. Terminal cell of lamellae notched; caps. nearly cubical (Fig. 22) ..... *P. commune*
3. Terminal cell of lamellae rounded, not enlarged; caps. much longer than broad ..... *P. gracile*

16. CATHARINEA

1. Lamellae covering ⅓ to ¼ of width of leaf. (Fig. 23) ..... *C. angustata**
1. Lamellae covering 1/8 to 1/10 of leaf. ..... *C. undulata**[3]

[3] Var. *altecristata* with lamellae 5, 6-12 cells high, "on partly shaded bank on W. Okoboji Lake" is reported by Miss Cavanagh (6).

Arthrodontae **Aplolepideae** **Fissidentaceae**

17. FISSIDENS (Fig. 28)

1. Stems 3cm. long; in water ..... *F. julianus*
1. Shorter, and not in water 2
2. Lvs. bordered by narrow long cells; minute ..... *F. incurvus**
2. Lvs. bordered by 2 or 3 rows of paler cells; large .. *F. cristatus**
2. Lvs. not bordered; sporophyte at end of shoot; on moist rocks 3
3. Lvs. entire; operculum scarcely beaked ..... *F. obtusifolius*
3. Lvs. finely toothed; beak long, needle-like ..... *F. osmundioides**

Dicranaceae

18. CERATODON

1. In small or large dense sods (Fig. 38) ..... *C. purpureus**

19. DICRANELLA

1. Seta yellowish; lvs. bent to one side (Fig. 30) .. *D. heteromalla**
1. Seta red; lvs. symmetric[4] ..... *D. varia**

20. DICRANUM

1. Caps. stout, curved; seta 2-4cm. long ..... *D. scoparium**

Grimmiaceae

21. GRIMMIA

1. Lvs. with short hair tip or none; on boulders. ..... *G. apocarpa**
1. Lvs. with long white hair tip; on Sioux quartzite .... *G. poecilostoma*[5]

22. HEDWIGIA

1. More or less prostrate; with white tips ..... *H. albicans**
1. Lacking the white tips ..... var. *viride**

Tortulaceae

23. ASTOMUM

1. Lvs. spirally twisted when dry; caps. in autumn and early spring ..... *A. sullivantii**

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[4] *Dicranella rufescens* with red seta and large, thin walled, transparent leaf cells, "on seepy ground near Lower Gar Lake" is reported by Miss Cavanagh (6).

[5] As *G. leucophaea* Grev. in Cavanagh (6), and *G. glauca* as identified by G. N. Jones.

24. Weisia

1. Whole plant ½cm. tall, in little sods (Fig. 31) ..... *W. viridula**

25. Gymnostomum

1. Pale green, about 1cm. tall; not seen in fr. (Fig. 35) ..... *G. calcareum*

26. Barbula

1. Midrib extending beyond the blunt apex of leaf *B. unguiculata**
1. Midrib ending in the gradually tapered apex ..... *B. fallax**

27. Desmatodon

1. Plant with sporophyte about 1cm. tall, on rock faces (Fig. 24) ..... *D. arenaceus*

28. Tortula

1. Leaf cells smooth; hair tip smooth; on earth (Fig. 26) ..... *T. mucronifolia**
1. Lvs. papillose; hair tip rough; on Sioux quartzite ..... *T. ruralis*

Diplolepideae Acrocarpae Orthotrichaceae

29. Ulota

1. Capsule gently tapering into seta ..... *U. americana*

30. Orthotrichum

1. On rocks 2
1. On trees (Fig. 27) 3
2. Capsule half exposed above lvs ..... *O. porteri*
2. Capsule completely lifted above lvs., rounded abruptly to the seta ..... *O. anomalum*
3. Lvs. round-obtuse at apex; margins scarcely recurved; strongly papillose ..... *O. obtusifolium*
3. Lvs. with a minute hyaline apiculus ..... *O. schimperi**

Funariaceae

31. Aphanorhegma

1. On muddy shores, in open clusters ..... *A. serratum**

32. Physcomitrium

1. Seta 5-15mm. long; lvs. serrate above (Fig. 29) *P. turbinatum**
1. Seta scarcely longer than lvs.; lvs. nearly entire ..... *P. hookeri**

33. FUNARIA

1. Seta 2-4cm. tall, bent and twisted (Fig. 32) ....*F. hygrometrica**

Timmiaceae

34. TIMMIA

1. Calyptra erect at bend of seta (Fig. 34) .....*T. cucullata**

Aulacomniaceae

35. AULACOMNIUM

1. 1-4 cm. tall, pale green, in tufts; very rare .....*A. palustre**

Bartramiaceae

36. PHILONOTIS

1. Stems red, darker below; rare .....*P. fontana**

37. BARTRAMIA

1. In soft cushions 5-20cm. across, 3-5cm. tall (Fig. 25) .....
.....*B. pomiformis**

Bryaceae

38. LEPTOBRYUM

1. Plant about 3cm. tall; caps. thin walled .....*L. pyriforme**

39. POHLIA

1. Plant 3-4cm. tall; caps. thick walled .....*P. nutans**

40. MNIOBRYUM

1. Pale green, watery moss; not seen fruiting .....*M. albicans**

41. BRYUM (Fig. 33, 36)

1. Lvs. strongly decurrent; in wet places .....*B. bimum**
1. Lvs. not decurrent 2
2. Tiny matted silvery moss of dry places; lvs. not bordered .....
..... *B. argenteum**[6]
2. Larger, green; lvs. bordered by narrow cells 3
3. Cilia lacking or rudimentary 6
3. Cilia present, appendiculate (Fig. 36i); seta curved but not the caps. (Fig. 33) 4

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[6] B. *argenteum lanatum*, white hairy with hair-like leaf tips, occurs on Sioux Quartzite.

4. Costa long excurrent 5
4. Costa percurrent or shortly excurrent ..... *B. capillare**
5. Dioicous (antheridia and archegonia on different plants) ..... *B. caespiticium**
5. Synoicous (antheridia and archegonia in same cluster) ..... *B. intermedium*
6. Caps. curved; inner peristome nearly free from outer; teeth simply cross-barred ..... *B. uliginosum*[*7]
6. Caps. symmetrical; inner peristome firmly adhering to outer; teeth with vertical and oblique bars on inner face *B. pendulum*[*8]

42. Anomobryum

1. In small sods, or rising singly among liverworts ..... *A. filiforme americanum*

43. Rhodobryum

1. Mostly in sods 5-30cm. across (Fig. 37) *R. roseum* (*ontariense*)*

44. Mnium

1. Lvs. without marginal teeth; large ..... *M. affine rugicum**
1. Lvs. with single teeth on margin 2
1. Lvs. with teeth in pairs ..... *M. marginatum**
2. Teeth on upper half of leaf only; very common (Fig. 39) ..... *M. cuspidatum**
2. Teeth all around, of 2-3 cells each ..... *M. affine ciliare**

Pleurocarpi Leskeaceae

45. Thuidium

1. Apical cell of branch leaf papillose; paraphylia very numerous on stem (Fig. 40 l, p) 2
1. Apical cell of branch leaf not papillose ..... *T. microphyllum**
2. Branching closely pinnate; branches tapering ..... *T. abietinum*
2. Branching bipinnate, "fern-like" (Fig. 40s) 3
3. Stem lvs. erect-spreading when moist, gradually tapering to apex; perichaetial lvs. ciliate ..... *T. delicatulum**
3. Stem lvs. recurved-spreading when moist, abruptly narrowed to apex; perichaetial lvs. not ciliate ..... *T. recognitum**

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[7] Also identified as *B. pallens* and *B. inclinatum*, we think wrongly so (H. S.C.)

[8] Formerly reported as *B. inclinatum*.

46. Leskea

1. Lvs. more than 2x as long as wide, acute to acuminate 2
1. Lvs. less than 2x as long as wide, acute to obtuse 3
2. Capsule straight, erect ..... *L. polycarpa**
2. Capsule curved, but erect ..... *var. paludosa**
3. Lvs. symmetric, with a pleat on each half; margins often recurved; the commonest tree moss ..... *L. gracilescens**
3. Lvs. unsymmetric, not pleated; margins plane ..... *L. obscura**

47. Fabroleskea

1. Small, dark colored, loosely spreading ..... *F. austinii**

48. Anomodon

1. Lvs. ending in a hair point (Fig. 43) ..... *A rostratus**
1. Lvs. more or less tongue-shaped 2
2. Midrib ending well below the rounded apex of lf. (Fig. 41) ..... *A. minor**
2. Midrib nearly touching apex; lvs. with a tiny point and sometimes a few teeth at tip (Fig. 42) ..... *A. attenuatus**

49. Thelia

1. Light green; julaceous; papillae forked (Fig. 44) ..... *T. asprella**

Hypnaceae

50. Brachythecium[9]

1. Lvs. strongly pleated lengthways (Fig. 50) 2
1. Lvs. not pleated, or only slightly so when dry 5
2. Lvs. very strongly pleated (Fig. 50); alar cells small, cubical; caps. nearly erect; very common ..... *B. oxycladon**
2. Lvs. less plicate; caps. inclined to horizontal 3
3. Stem lvs. broadly triangular-ovate; cubical alar cells very numerous ..... *B. digastrum**
3. Stem lvs. ovate-lanceolate, acuminate; basal cells broad, distinct 4
3. Stem lvs. lanceolate, gradually and evenly tapering from base to apex ..... *B. flexicaule**
4. Seta smooth ..... *B. salebrosum**
4. Seta rough above ..... *B. campestre**

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[9] See figures in Grout: Mosses with hand lens and microscope, the differences in cell details being quite indescribable.

5. Lvs. evenly tapering from base to apex, the margin a straight line; seta smooth; common in bogs ..... *B. acutum**
5. Lvs. with curved margins 6
6. Mostly on trees; seta smooth; caps. erect, straight 7
6. Mostly on soil or rocks or in water; caps. curved 8
7. Larger; cells elongate ..... *B. acuminatum**
7. Smaller; cells rhombic, 4-8 : 1 ..... *B. cyrtophyllum**
8. Small, in thin mats, clinging closely; seta rough above ..... *B. plumosum**
8. Large, stout, sometimes bushy; seta rough throughout 9
9. In or near water; lvs. strongly decurrent, the alar cells enlarged and inflated ..... *B. rivulare**
9. In rich woods; lvs. slightly decurrent, without peculiar alar cells ..... *B. rutabulum**

51. Bryhnia

1. Lvs. 1mm. long or less; in delicate green sods ..*B. graminicolor**

52. Eurhynchium

1. Lvs. 2-ranked; apical cells of leaf not peculiar ....*E. serrulatum**
1. Lvs. all round stem; apical cells broad and short 2
2. Lvs. broadly ovate; seta rough ..... *E. hians**
2. Branch lvs. lanceolate, blunt; stem lvs. broadly ovate, abruptly short-acuminate; seta smooth ..... *E. strigosum robustum**

53. Climacium

1. Base of leaf auriculate-cordate; cells 5-7 times longer than wide (Fig. 48) ..... *C. americanum**
1. Base of leaf simply cordate; cells 10 :1 ..... *C. dendroides*

54. Drepanocladus

1. Lvs. strongly falcate-secund; no enlarged alar cells (Fig. 52) 2
1. Lvs. falcate-secund or not so; with a cluster of inflated alar cells (Fig. 46) 3
2. Plant reddish; lvs. with long slender acumination (Fig. 52); cells very long and narrow, 10-30 :1, 0.006mm. wide ..... *D. revolvens**
2. Plant green to yellowish; acumination and cells of leaf shorter ..... *D. intermedius**
3. Alar cells colorless, thin walled; costa slender .....*D. aduncus* 4

3. Alar cells colored, thick walled; costa stout; robust land form with crowded falcate lvs. ..... *D. sendteneri*[10]
4. Lower leaf cells linear 5
4. Lower leaf cells oblong-hexagonal ..... *D. a. polycarpus* 7
5. Stem lvs. falcate-secund, channeled at apex ..... *D. a. typicus* 6
5. Stem lvs. flat, straight (except at tips of stems), lanceolate ..... *D. a. kneiffii intermedius**
6. Lvs. 3-4mm. long, with long slender falcate acumination ..... *D. a. t. aquaticus**
6. Lvs. lanceolate; cells narrowly linear, flexuose; auricles of inflated cells very large ..... *D. a. t. pseudofluitans*
7. Stems mostly creeping or floating 8
7. Stems erect, stout, in large sods (Fig. 46) ..... *D. a. p. uncus*
8. Lvs. with long slender acumination, falcate; aquatic ..... *D. a. p. aquaticus*
8. Lvs. with acumination about ½ the length of the rest of the leaf; aquatic ..... *D. a. p. filicuspis*
8. Lvs. strongly secund, with short channeled acumen; on earth ..... *D. a. p. gracilescens**[11]

55. Cratoneuron

1. Costa percurrent; cells 3-6:1 ..... *C. filicinum**

56. Calliergon

1. Stems green; in wet places ..... *C. cuspidatum**
1. Stems red; in mesic woods ..... *C. Schreberi**

57. Campylium

1. Midrib distinct; lvs. gradually acuminate (Fig. 47) ..... *C. chrysophyllum**
1. Midrib absent, or very short, or double 2
2. Very slender; alar cells not enlarged; on dry ground or wood ..... *C. hispidulum**
2. Stouter; alar cells inflated; basal cells thick walled, porose; in bogs, often erect ..... *C. stellatum**

58. Amblystegium[12]

1. Midrib very stout, extending into apex or beyond; in or near water (Fig. 45, 49) 2

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[10] Also forma *gracilescens*

[11] Also subform *tenuis*

[12] See figures in Grout: Mosses with hand lens and microscope, the differences in cell details being quite indescribable.

1. Midrib ending near middle of leaf, or above 3
2. Stem lvs. cordate-ovate, acuminate (Fig. 49) .....*A. irriguum**
2. Stem lvs. cordate-ovate, acute or obtuse (Fig. 45) .....*A. orthocladon**[13]
2. Stem lvs. lance-ovate, with slender acumen .....*A. fluviatile brevifolium*
3. Median cells rhomboid, 8:1 or wider 5
3. Median cells long and slender, 10:1 or narrower .....*A. riparium* 4
4. On earth or rotten wood; cells very slender .....*A. r. typicum**
4. Stems long, soft, streaming in water .....*A. r. fluitans**
5. Costa very feeble; cells short and broad; lvs. less than 1mm. long 6
5. Costa very strong for size of leaf; lvs. less than 1mm. long .....*A. varium**
5. Costa of medium strength; lvs. 1mm. or more long 7
6. Lvs. pressed close to stem when dry; on old wood or bark .....*A. serpens**[14]
6. Lvs. spreading when dry .....*A. juratzkanum**
7. Lvs. slightly toothed on margin; cells 4-6:1 8
7. Lvs. very entire; cells 6-8:1 9
8. Midrib reaching into base of acumination .....*A. trichopodium**
8. Midrib ending about middle of leaf .....*A. t. kochii**
9. Lvs. broadly ovate, shortly acuminate .....*A. brevipes*
9. Lvs. lance-ovate, acuminate .....*A. riparium laxirete**

59. Hypnum

1. Dark green, in dense thin mats .....*H. reptile**

60. Plagiothecium

1. Lvs. serrate nearly or quite to base (Fig. 51) ....*P. deplanatum**
1. Lvs. entire, or rarely denticulate at apex .....*P. denticulatum**

61. Amblystegiella

1. Thin closely attached films on rocks or bark .....*A. adnata**

62. Entodon

1. Shoots cylindric .....*E. seductrix**[15]
1. Shoots very flat .....*E. cladorrhizans**

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[13] A form with shorter costa in var. *brevinerve.*

[14] A very slender form is var. *tenue**

[15] Var. *minor,* ''lvs., seta and capsule shorter than in type'', ''at base of bur oak, near Lower Gar Lake'' is reported by Cavanagh (6).

63. PLATYGYRIUM

1. In dense mats 5mm. thick .... *P. repens**

Fabroniaceae

64. FABRONIA

1. Fine film on Cedar tree bark ..... *F. octoblepharis*

Fontinalaceae

65. FONTINALIS

1. Lvs. distant, loosely spreading ..... *F. lesurii**

Species, varieties and forms in the key

Hepaticae	16
Musci	128
	144
In footnotes, from Cavanagh	6
Total	150

Known from Emmet County

Hepaticae	14
Musci	100
	114

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EXPLANATION OF TERMS USED IN THE KEY

acumen, a tapering leaf tip whose margins are concave; hence acuminate (Fig. 43, 44, 47, 49)

alar cells, the cells at the basal-marginal angles of a leaf (Fig. 46)

apiculus, a little abrupt point on a rounded leaf tip (Fig. 24)

appendiculate, with knobs or short bars at intervals (Fig. 36, 1)

auriculate, bowed out like ears (Fig. 48, 1)

autoicous, archegonia and antheridia on separate shoots from the same plant

cordate, notched or heart shaped

costa, a midrib of a leaf; costate, with a costa

crenate, with coarse rounded teeth

decurrent, margins of leaf continued down along stem

dentate, with coarse teeth sloping equally toward base and apex of leaf

denticulate, finely dentate

excurrent, protruding beyond the lamina

falcate, curved, sickle shaped (Fig. 46, 52)

flagelliform, long and slender, whip-like

flexuose, wavy and winding

gemma, a 1- or few-celled propagating body

hyaline, clear, transparent

incubous, arranged like shingles on a roof if base of plant is at ridge and apex at eaves (Fig. 11, 12)

julaceous, cylindrical and smooth or downy

lamina, the flat green part of a leaf

lanceolate, about 4 times as long as wide, broadest near base and tapering to a point

mesic, of a moist habitat, neither very wet nor very dry

orbicular, nearly circular

ovate, egg-shaped in outline

papilla, a tiny lump or knob on a cell wall; hence papillose (Fig. 24, 32)

paraphyllia, thread-like or tiny leaf-like growths on a stem (Fig. 40p)

percurrent, of a costa that runs clear to the tip of a leaf (Fig. 25, 31)

perichaetial, around base of seta

porose, of thick walls with thin spots (pores)

recurved, bent backward (downward)

revolute, rolled backward more closely than recurved (Fig. 37, 1)

secund, all turned to one side, usually downward (Fig. 52)

serrate, saw-toothed

sessile, without any stalk

squarrose, spreading and recurved (Fig. 47)

succubous, arranged like shingles on a roof if base of plant is at eaves and apex at ridge (Fig. 14, 19)

underleaf, a small leaf on the under side of stem (Fig. 11, 12)

underlobe, a lobe of the leaf folded under and lying close to the leaf (Fig. 11, 12)

EXPLANATION OF PLATES

Figures of Hepaticae are mostly from drawings by Miss Esther Collette; figures of Musci are by Miss Mary Perry. This help is gratefully acknowledged by the authors.

Plate I

1. *Riccia fluitans,* entire plant, nat. size.
2. *Ricciocarpus natans,* floating form with ventral scales, and with capsules in midrib; nat. size.
3. *Marchantia polymorpha,* showing antheridial receptacles, gemma cup and at *a* marginal scales on ventral side, and median ventral scales; nat. size.
4. *Marchantia polymorpha,* archegonial receptacle, nat. size.
5. Receptacle of *Conocephalum conicum,* with one perianth projecting from under side; nat. size.
6. Receptacle of *Preissia quadrata* seen from above showing 4 thalloid areas with pores; x 1.5.
7. Polygonal areas of thallus with an air pore in each area, x 4.
8. Ventral-median scale of Preissia, x 10.
9. Ventral-median scale of Reboulia, x 10.
10. Thallus of *Aneura pinguis,* nat. size.
11. *Porella platyphylla* seen from beneath, showing underleaves (central row) and underlobes; x 10.
12. Frullania from beneath, showing underleaves and underlobes, x 20.
13. Perianth of Frullania, seen from above, with tubular opening and two dorsal ridges; x 15.
14. *Lophocolea heterophylla,* with terminal perianth; x 12.
15. Unopened capsule of *Lophocolea heterophylla,* x 12.
16. Elater from capsule of *Frullania,* x 50.
17. Elater from capsule of *Lophocolea heterophylla,* x 50.
18. Leaf of *Lophocolea minor* with gemmae, x 12.
19. *Jungermannia sphaerocarpa,* seen from the side, x 5.
20. *Anthoceros laevis.* Sporophytes rising from their perianths, the larger one split in two (dehisced), showing columella; nat. size.
21. *Polytrichum juniperinum*; teeth of peristome (nematodontous), x 20.
22. *P. commune;* trans. sec. leaf, showing lamellae, x 20.
23. *Catharinea angustata*; *a,* cross section, *b,* entire leaf, x 15 and 10.
24. *Desmatodon arenaceus*; *a, b,* leaf tips; *c,* peristome; x 20.
25. *Bartramia pomiformis*; *a,* top of plant with sporophyte; *b,* leaf; x 5.
26. *Tortula mucronifolia,* peristome, x 15.
27. Orthotrichum, with "immersed" capsule, x 5.
28. Fissidens leaf, split on one side near base, x 15.
29. *Physcomitrium turbinatum,* x 5.
30. *Dicranella heteromalla,* capsule with arthrodontous teeth, x 10.
31. *Weisia viridula* leaf seen from above (margins involute), and cross sections of leaf at different levels, x 15.
32. *Funaria hygrometrica,* capsule, x 10.
33. Bryum capsule, nodding, pear-shaped, x 10.
34. *Timmia cucullata,* capsule and calyptra, x 10.
35. *Gymnostomum calcareum; a,* leaf; *b,* leaf apex; *c,* cells from middle of leaf.

PLATE I

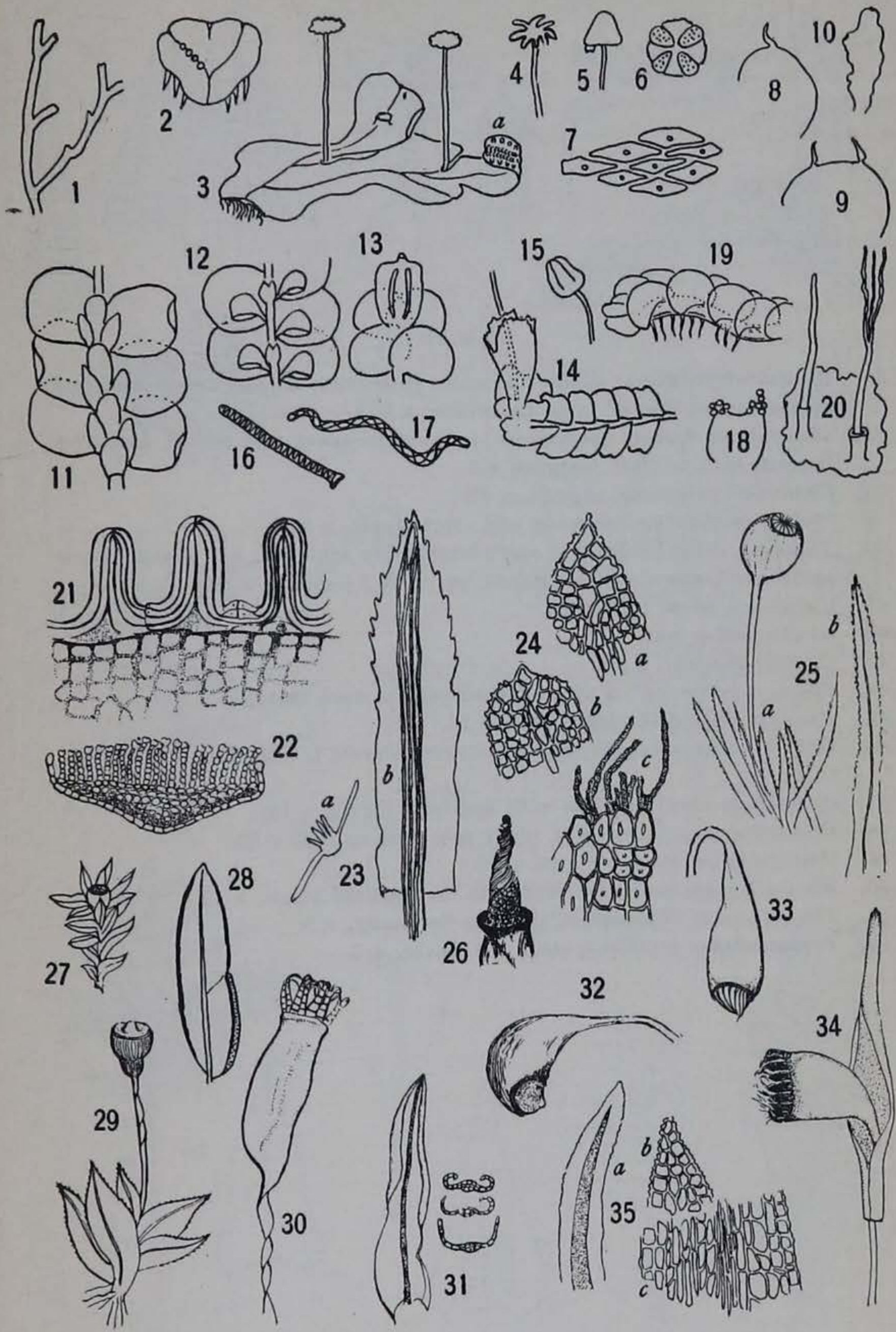
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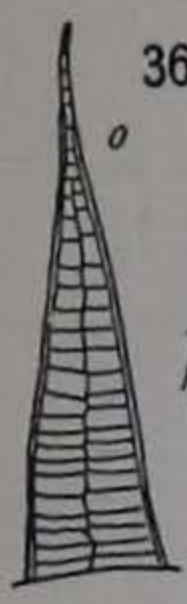
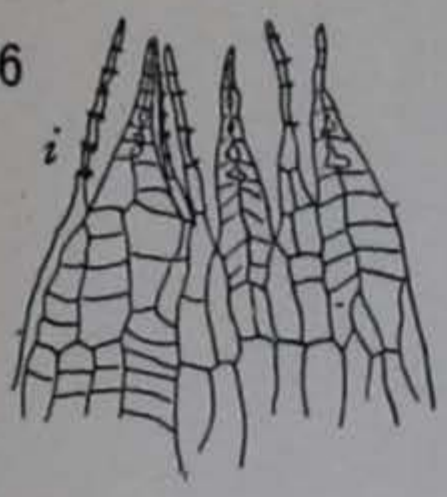
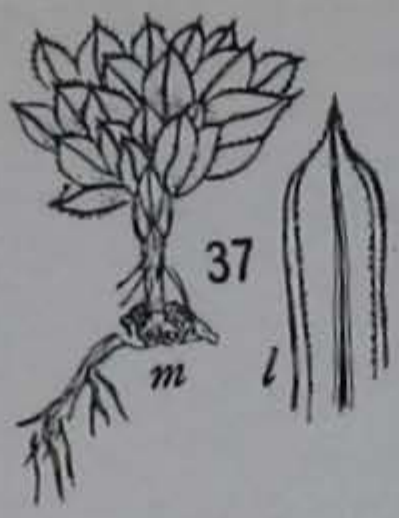
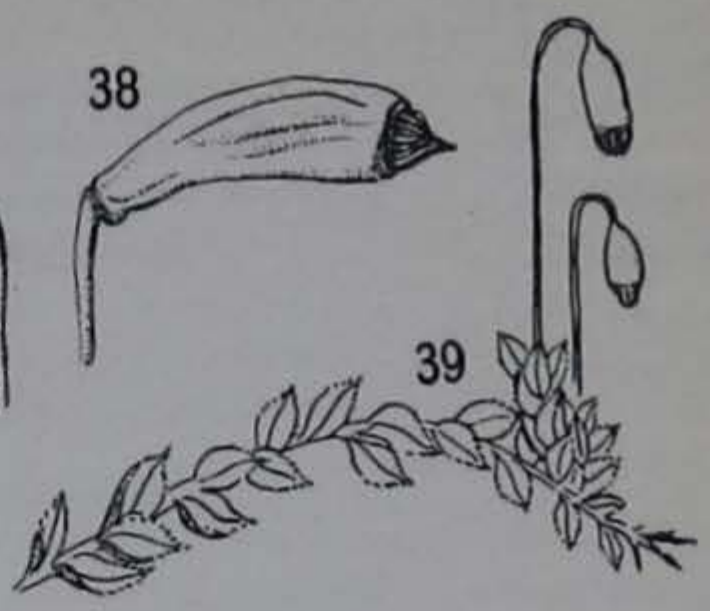
Plate II

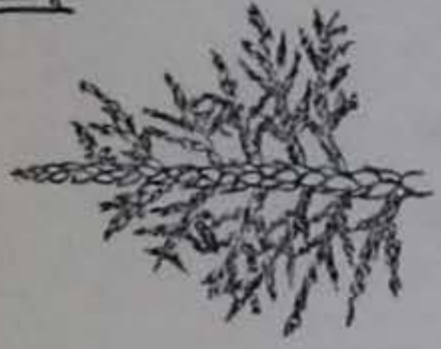
36. *Bryum intermedium*; *o*, tooth of outer peristome; *i*, teeth (segments) and appendiculate cilia of inner peristome; x 65.
37. *Rhodobryum roseum (ontariense)*; *m*, mature plant, nat. size; *l*, leaf from beneath with revolute margins, x 3.
38. *Ceratodon purpureus*, capsule, x 12.
39. *Mnium cuspidatum*, creeping and erect shoots, x 3.
40. *Thuidium delicatulum*; *s*, a shoot bipinnately branched, nat. size; *p*, paraphyllium; *l*, apical cell of branch leaf with 3 papillae, x 50.
41. *Anomodon minor* leaf, x 15.
42. *A. attenuatus* leaf, x 15.
43. *A. rostratus leaf*, x 20.
44. *Thelia asprella leaf*, x 20; a forked papilla much enlarged.
45. *Amblystegium orthocladon* leaf, x 15.
46. *Drepanocladus aduncus polycarpus uncus* Grout; *l*, leaf, x 20; *c*, alar cells, x 50.
47. *Campylium chrysophyllum* with squarrose leaves, x 15.
48. *Climacium americanum*; *m*, plant nat. size; *l*, leaf, x 12.
49. *Amblystegium irriguum* leaf, x 15.
50. *Brachythecium oxycladon* leaf with longitudinal pleats, x 15.
51. *Plagiothecium deplanatum*, showing flat spray, x 5.
52. *Drepanocladus revolvens*, stem and leaves, x 5.

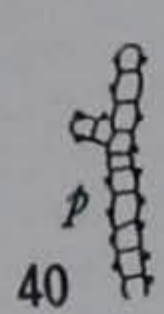


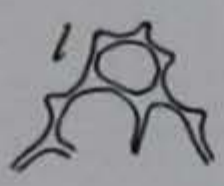


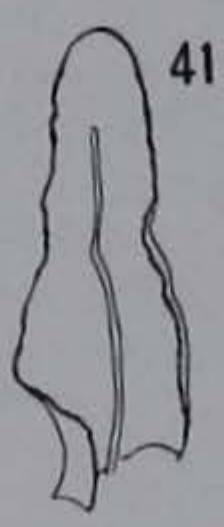


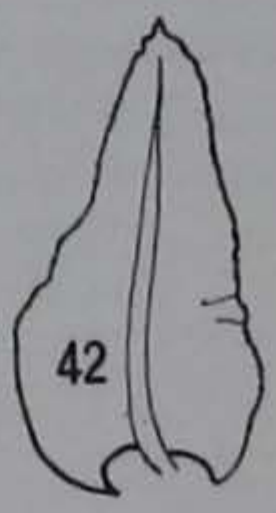


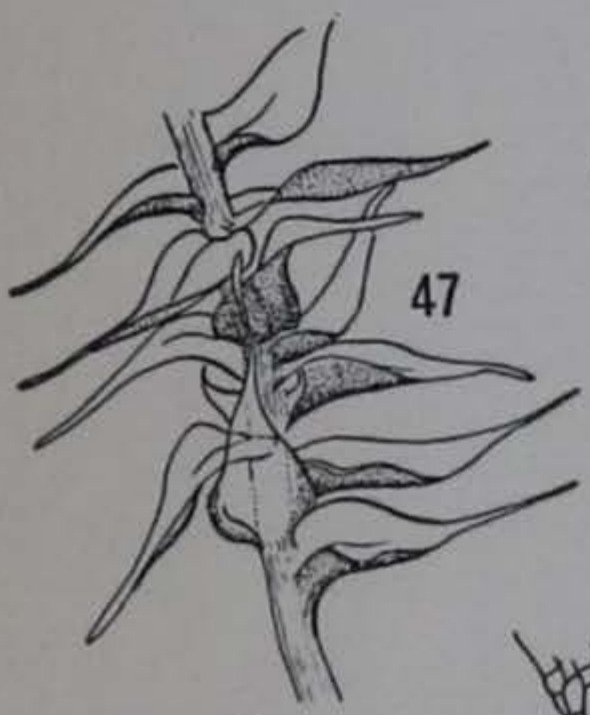


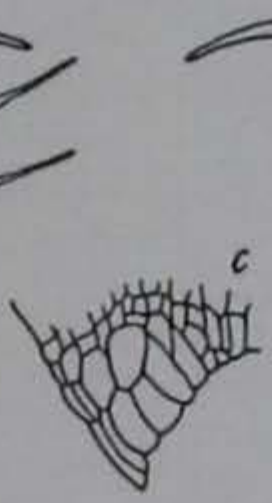


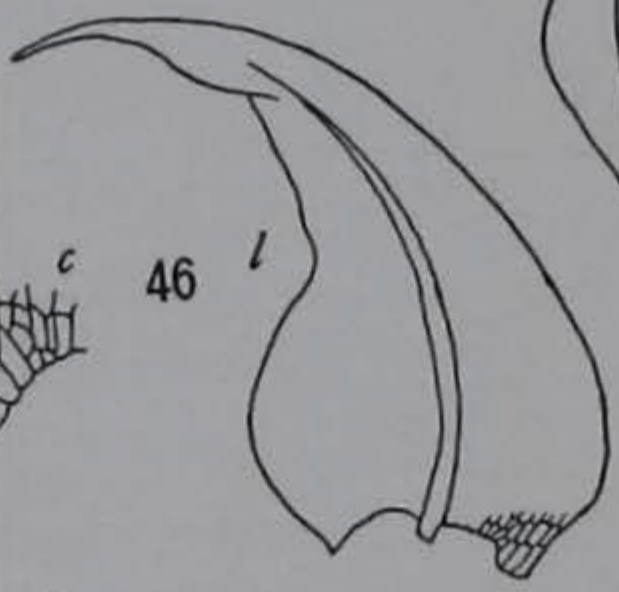


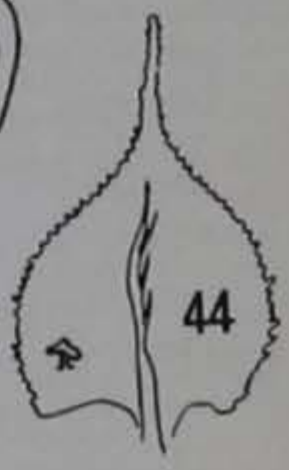


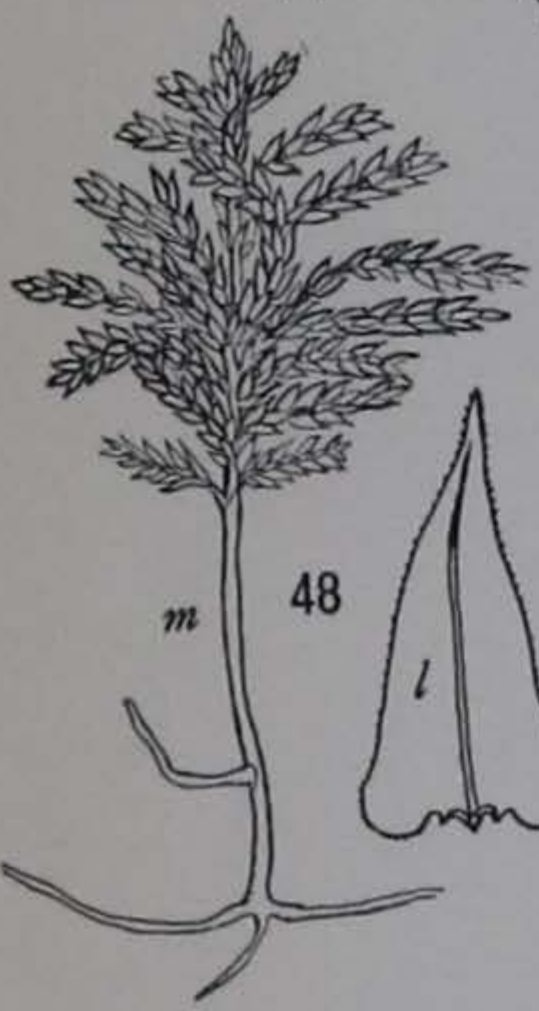












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