

BRYOPHYTE AND MACROFOSSIL INDICATOR SPECIES
OF NORTHERN PEATLANDS

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1. Leaves with upper cells similar in size and shape, sometimes different from lower cells, but cells never having a reticulate network of alternating cell types 2
1. Leaves with alternating large, clear cells and small dense cells, forming a reticulate network 31
 2. Leaves circular in outline, as wide as long; cells rounded, with obvious thickened corners (trigones) [*Leiomylia \(Mylia\) anomala*](#)
 2. Leaves elliptic to lanceolate-ligulate, much longer than wide; cells with no thickened corners (one exception) 3
3. Leaves plicate 4
3. Leaves without longitudinal folds 5
 4. Leave curved (falcate), with very short (usually double) costa [*Ptilium crista-castrensis*](#)
 4. Leaves straight, with single long costa extending nearly to leaf apex [*Tomenthypnum nitens*](#)
5. Leaves multi-stratose, consisting of broad costa, overlapping laminae encasing vertical lamellae; lower cells forming clear, unistratose sheath..... [*Polytrichum strictum*](#)
5. Leaves uni-stratose, without lamellae; lower cells not forming clear sheath..... 6
 6. Leaves curved (falcate)..... 7
 6. Leaves straight 13
7. Costa very short and double, never extending beyond $\frac{1}{3}$ of leaf length; leaves ending in a short, blunt point [*Scorpidium scorpioides*](#)
7. Costa long and single, extending at least to mid-leaf; leaves long-acuminate..... [*Drepanocladus sensu lato*](#) 8

8. Upper leaf margins entire 9
8. Upper leaf margins serrulate, sometimes minutely so with only 1-3 apical teeth 11
9. Alar cells clear, enlarged, thin-walled, and forming distinct marginal groups; stems with central strand and small epidermal cells [*Drepanocladus aduncus*](#)
9. Alar cells not much different from basal cells, not forming distinct groups, at most 1-3 hyaline, inflated, fragile cells at basal margin; stems either without central strand or epidermis of larger cells compared to outer cortical cells 10
10. Leaves often somewhat striate; alar cells not differentiated; stems without central strand [*Hamatocaulis vernicosus*](#)
10. Leaves without any evidence of striations; alar cells 1-3, hyaline, inflated, and fragile cells at basal margins; stems with central strand 12
11. Cells at mid-leaf 14-95 um long, with square to short-fusiform cell ends [*Scorpidium cossonii*](#)
11. Cells at mid-leaf 61-140(-179) um long, with short- to long-fusiform ends [*Scorpidium revolvens*](#)
12. Costa strong, ending in or just below apex; alar cells abruptly inflated [*Warnstorfia exannulata*](#)
12. Costa weak, ending $\frac{1}{2}$ to $\frac{2}{3}$ the distance up leaf length; alar cells gradually enlarged [*Warnstorfia fluitans*](#)
13. Upper leaf cells with very wavy and regularly nodulose walls; leaves ending in decurrent, papillose, hyaline point [*Racomitrium lanuginosum*](#)
13. Upper leaf cells with straight mostly evenly thickened walls to occasionally irregularly thickened walls; leaves ending in non-hyaline point 14
14. Upper leaf cells elongate-linear, mostly greater than (6)10:1 length:width ratio 15
14. Upper leaf cells rounded-quadrate to long-hexagonal, mostly (1)2-6:1 length:width ratio 24
15. Leaves blunt (rounded-obtuse), rarely with tiny apiculus 16
15. Leaves sharply pointed (acute to acuminate) 21
16. Costa long and single, ending in or just below apex (upper $\frac{4}{5}$ th) of leaves 17
16. Costa short and more or less double and ending below mid leaf or single and ending about midleaf 18
17. Alar cells abruptly inflated, forming conspicuous groups of hyaline, thin-walled cells; costa ending at leaf apex [*Calliergon giganteum*](#)
17. Alar cells gradually enlarged, forming inconspicuous groups of colored, thick-walled cells; costa ending below leaf apex [*Straminergon \(Calliergon\) stramineum*](#)
18. Alar cells abruptly inflated to form groups of hyaline thin-walled cells 19

18. Alar cells forming groups of firm-walled, often colored cells..... 20
19. Leaves lingulate; stems with conspicuous hyalodermis; currently rare in peatlands
..... [*Calliergonella cuspidata*](#)
19. Leaves triangular to ovate; stems without hyalodermis; currently sporadic but locally
abundant in peatlands..... [*Calliergon richardsonii*](#)
20. Leaves ovate, about 1.0-1.5 times as long as wide; alar cells somewhat
enlarged and oblong, firm-walled; stems clear to brownish; plants unbranched
..... [*Pseudocalliergon \(Calliergon\) trifarium*](#)
20. Leaves oblong-ovate, about 2.0 times as long as wide, with abruptly incurved
upper margins; alar cells short-oblong with thick, orange walls, in concave
marginal groups; stems reddish; plants abundantly branched
..... [*Pleurozium schreberi*](#)
21. Costa double, very short to ending about midleaf 22
21. Costa long and single, ending in upper part of leaf 23
22. Leaves channeled in upper portion, gradually narrowed to apex from broadly
ovate base; leaf cells smooth, stems without paraphyllia [*Campylium stellatum*](#)
22. Leaves abruptly acuminate, appearing almost blunt; leaf cells prorulose; stems
with abundant paraphyllia..... [*Hylocomium splendens*](#)
23. Alar cells inflated; costa ending in leaf apex..... [*Cratoneuron filicinum*](#)
23. Alar cells somewhat enlarged or forming inconspicuous groups; costa ending below
leaf apex [*Brachythecium turgidum*](#)
24. Upper leaf cells papillose (with one large papilla), often irregularly thick-
walled, rounded-quadrate; stems with abundant reddish tomentum of rhizoids
..... [*Aulacomnium palustre*](#)
24. Upper leaf cells smooth, mostly thin-walled, quadrate to long-hexagonal;
stems without reddish tomentum of rhizoids 25
25. Leaves bordered by 1-several rows of elongate cells 26
25. Leaves without a border of differentiated cells 27
26. Leaves ovate to oblong-ovate; upper leaf cells 1-2:1 length:width ratio
..... [*Plagiomnium ellipticum*](#)
26. Leaves ovate-lanceolate to lanceolate; upper leaf cells 3-5:1 length:width ratio
..... [*Bryum pseudotriquetrum*](#)
27. Leaves ligulate, with recurved margins extending entire length of leaf
..... [*Meesia uliginosa*](#)
27. Leaves lanceolate to lanceolate-ovate, with plane leaf margins..... 28

28. Alar cells enlarged and forming well-defined, colored groups; leaves transversely undulate, serrate near apex	<i>Dicranum undulatum</i>	29
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29. Upper leaf cells quadrate to oblong		30
30. Leaves decurrent, (1.5)2.5-4.0 mm long, margins serrulate; upper leaf cells shortly rectangular	<i>Meesia triquetra</i>	
30. Leaves not decurrent, 0.8-1.5 mm long, margins entire; upper leaf cells quadrate.....	<i>Catoscopium nigratum</i>	
31. Branch leaf apices blunt, hooded, and cucullate; stem hyalodermis with fibrils		32
31. Branch leaf apices acuminate-truncate, open, concave, extreme apex appearing as if cut with a pinking shears; outer later of stem hyaline and enlarged or not, without fibrils		34
32. Green cell walls smooth	<i>Sphagnum magellanicum</i>	
32. Green cell walls ornamented on adjacent hyaline cell walls		33
33. Green cell walls ornamented with papillae, green cells trapezoidal in transverse section	<i>Sphagnum papillosum</i>	
33. Green cell walls ornamented with striae, green cells triangular in transverse section	<i>Sphagnum austinii</i>	
34. Branch leaf hyaline cells with numerous (usually 1-2 between fibrils) pores arranged like two strings of beads along sides of hyaline cells in contact with green cells; branch leaves sometimes slightly curved.....	<i>Sphagnum subsecundum</i>	
34. Branch leaf hyaline cells with 1-many pores arranged in a variety of patterns, but not chained along the cell sides; branch leaves straight		35
35. Green cells exposed on concave surface of leaves		36
35. Green cells exposed on convex surface of leaves	(Section <i>Acutifolium</i>)	46
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38. Apical pores of branch leaves large, elliptic to elongate.....	<i>Sphagnum riparium</i>	
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39. Green cells in transverse section extending to concave surface, forming an isosceles triangle..... 40
39. Green cells in transverse section enclosed by hyaline cells on concave side of leaf, not extending through to concave surface of leaf, forming an equilateral triangle. 45
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40. Stem green or colorless, stem leaves entire or fringed only at apex 41
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42. Lower portion of branch leaves without pseudopores..... [*Sphagnum cuspidatum*](#)
43. Stem leaves apiculate to acute [*Sphagnum fallax*](#)
43. Stem leaves blunt [*Sphagnum angustifolium*](#)
44. Stem leaves blunt [*Sphagnum balticum*](#)
44. Stem leaves apiculate to acute [*Sphagnum pulchrum*](#)
45. Branch leaf hyaline cells without pores on convex surface, with numerous (up to 10) large, unringed pores on concave surface [*Sphagnum majus*](#)
45. Branch leaf hyaline cells with numerous pores on convex surface, with 7-15 small, usually ringed pores arranged in 1-2 rows [*Sphagnum jensenii*](#)
46. Branch leaf pores very small ($\frac{1}{2}$ or less the width of the hyaline cell) and heavily ringed in upper $\frac{1}{3}$ of leaf [*Sphagnum warnstorffii*](#)
46. Branch leaf pores large (about $\frac{1}{2}$ to $\frac{2}{3}$ the width of the hyaline cell) and not ringed (oligotrophic *Acutifolia*) 47
47. Stem and leaves brown [*Sphagnum fuscum*](#)
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48. Stem leaves triangular-lanceolate, usually with some porose and fibrillose cells..... [*Sphagnum capillifolium*](#)
48. Stem leaves lingulate, without porose and fibrillose cells..... 49
49. Stem hyalodermis with some porose cells [*Sphagnum russowii*](#)
49. Stem hyalodermis without porose cells [*Sphagnum rubellum*](#)