

NE Sub-Guide to Rarely Branched (mostly acrocarpous) Mosses

Revised through 12 January 2009

Reminder: A dagger (†) indicates that not all of the species within the given genus have the character(s) defining that Group. Abbreviations for the **distribution** of taxa are found at the end of the Concordance. Abbreviations for the number of **stereid bands** in costa cross sections are found in the Introduction & at the end of this section.

Group A1 – Shoots flat or angular, not round

Group A1

Shoots **flattened**; leaves **2-ranked** (lying in one plane).

Leaves **distichous** (attached in two rows on opposite sides of the stem).

Leaves **cleft** at anterior edge and clasping posterior edge of next leaf; WS

Leaves **conduplicate**, crowded, & progressively larger; the “Sword” moss; WS*

Leaves flat, **decurent** & **confluent**; protonemata **luminous**; “Goblin Gold”; WS*

Leaves **needle-like**; a roughened subula from a sheathing, shiny-white base; WS

Leaves **complanate** (attached all around the stem, but twisted into one plane).

Leaves with a long, single **costa**; cells **smooth**

Leaves **distant** on stoloniferous shoots & **bordered** by linear cells; WS

Leaves **crowded**, unbordered & \pm **undulate**; capsules plicate (dry); E

Fissidens

Bryoxiphium

Schistostega

Distichium

Plagiomnium

Aulacomnium†

Shoots **triangular**; leaves **3-ranked**.

Plants **minute** with **immersed** capsules; leaves **broadly** ovate with **recurved** apiculi; WS

Plants **larger** with **exserted** capsules; leaves ovate **lanceolate**, squarrose & **decurent**.

Cells **intermediate** & **smooth**; in calcareous **wetlands**.

Capsules with well-defined **neck**; endostome **longer** than exostome; N

Capsules **short** & **black** (golf clubs); endostome **reduced** to lacking; N

Acaulon†

Meesia†

Catoscopium

Shoots **angular**; leaves **4-5 ranked**.

Stems densely **tomentose**; leaves **squarrose** recurved; in calcareous **wetlands**; N

Paludella

Group A2 – Shoots julaceous when wet

Group A2

Stems **red**.

Stems **sparsely** forked; capsule necks mostly **short** to **moderate** in length.

Cells **long** (~8:1); N*

Cells **intermediate** (~4:1).

Upper leaves **apiculate**; capsules **pendent**; peristome **double**; WS

Anomobryum

Bryum†

Stems **green**.

Cells **smooth**; leaves radially arranged.

Leaves **serrulate** & **unbordered**; **immersed** capsules; E

Leaves **entire** & **bordered** with **longer** cells; **exserted** capsules; WS

Pleuridium†

Bryum†

Group A3 – Stems distinctly tomentose

	Group A3
Stems covered with pigmented (reddish to brownish) tomentum.	
Leaves squarrose-recurved & heart shaped; fens; N	<i>Paludella</i>
Leaves ovate to broadly elliptical.	
Rhizoidal initials in longitudinal rows ; endostome fused into a dome ; N	<i>Cinclidium</i>
Rhizoidal initials not in rows; endostome segments free ; N*	<i>Rhizomnium</i> †
Leaves oblong -lanceolate to oblong-lingulate.	
Cells unipapillose ; terminal cell papillose ; brood bodies terminal ; WS	<i>Aulacomnium</i> †
Leaves lanceolate to subulate-setaceous ; WS	<i>Dicranum</i>
Stems covered with white-wooly tomentum.	
Leaves with green sheets (lamellae) on their surface; bogs; N*	<i>Polytrichum</i> †
Leaves lacking lamellae; WS	<i>Dicranum</i>

Group A4 – Stems red

	Group A4
Plants julaceous .	
Stems occasionally forked; leaves ovate to ovate-lanceolate & concave.	
Leaves broadly obtuse to acute; costa ending subpercurrent ; cells ~ 8:1 ; N*	<i>Anomobryum</i>
Leaves obtuse to acute ; costa percurrent to excurrent ; cells ~ 4:1 ; WS	<i>Bryum</i> †
Plants with stems covered with pigmented (reddish to brownish) tomentum .	
Rhizoidal initials in longitudinal rows ; endostome fused into a dome; N	<i>Cinclidium</i>
Rhizoidal initials not in rows; endostome segments free ; N*	<i>Rhizomnium</i>
Plants neither julaceous nor tomentose.	
Leaves bordered by elongated cells.	
Leaves distinctly toothed ; cells smooth ; leaves plane ; WS	<i>Mnium</i> †
Leaves entire ; WS	<i>Bryum</i> †
Leaves not bordered.	
Leaves serrulate ± throughout ; cells prorulose ; WS	<i>Philonotis</i> †
Leaves ± serrulate near the apex ; cells smooth .	
Leaves subulate ; alar cells inflated, thick-walled & reddish ; N*	<i>Blindia</i>
Leaves not subulate; alar cells ± undifferentiated ; WS	<i>Pohlia</i> †

Group A5 – Leaves squarrose-recurved

	Group A5
Leaves squarrose-recurved when dry (or wet).	
Leaves 5-ranked & folded to appear heart shaped ; stems densely tomentose ; fens; N	<i>Paludella</i>
Leaves squarrose-recurved only when wet (±appressed when dry).	
Cells intermediate in length; WS	<i>Dicranella</i> †
Cells short .	
Leaves ± bordered by longer , or shorter & thick-walled cells; 1* ; WS	<i>Tortula</i> †
Leaves unbordered ; 2* ; WS	<i>Barbula</i> †

Group A6 –Leaves falcate-secund

Plants grayish , longitudinal, green striations on back of leaves; costa >1/3 leaf breadth; N* Plants green ; leaves unistratose & lacking striations; costa usually <1/5 leaf breadth. Alar cells obvious ; capsules rarely strumose; various habitats; 2* ; WS Alar cells ±undifferentiated ; plants small , mostly <1cm; WS	<p style="text-align: right;">Group A6</p> <p style="text-align: right;"><i>Paraleucobryum</i>†</p> <p style="text-align: right;"><i>Dicranum</i>†</p> <p style="text-align: right;"><i>Dicranella</i>†</p>
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Group A7 –Leaves subulate / setaceous (8:1 or greater)

Plants small to minute (mostly <5 mm high) with ±immersed capsules growing on bare soil , usually as winter annuals ; the " pygmy ephemerals " as defined here. Setae straight ; capsules immersed & cleistocarpous . Capsules pyriform with a conspicuous, stomatose neck; spores small ; WS Capsules globose to ovoid , lacking a distinct neck. Calyptrae mitrate or cucullate ; spores numerous & small ; WS Calyptrae rudimentary ; spores few & large (>100µ); E Plants larger with exserted capsules growing on various substrates. Leaves with bases distinctly incurved to expanded & clasping . Cells intermediate in length & prorulose/papillose ; upper cells ±bistratose ; WS Cells intermediate in length & smooth . Capsules with distinct , very long necks ; WS Capsules lacking a distinct neck. Plants larger ; peristome single with forked teeth. Teeth divided to base , round & papillose ; WS Teeth divided to mid-point , flat & pitted-striolate ; WS Cells short & smooth Upper cells ±bistratose ; capsules inclined , asymmetric & strumose ; WS Leaves with a broad, single costa (>1/3 the leaf width). Alar cells inflated & hyaline or colored (brownish to reddish). Leaves with green , longitudinal striations on the back; N* Leaves lacking striations. Inner basal cells pale, enlarged & extending up along the costa; N* Alar cells ±undifferentiated ; capsules pyriform ; WS Leaves lacking the above unique characteristics. Alar cells distinctly differentiated . Capsules obovoid to pyriform ; on rocks . Capsules ribbed (dry); peristome teeth wide- flaring , ±split & striolate ; N Capsules smooth (dry); peristome teeth erect , ±entire & papillose ; N* Capsules lacking any of the above unique characters; substrates various . Cells with cuticular ridges ; peristome teeth ±entire & papillose ; N* Cells smooth ; peristome teeth forked & pitted- striolate below; WS Alar cells ±undifferentiated . Cells intermediate to long; peristome teeth usually present. Plants small (<2mm); leaves little altered (dry); on rocks ; WS Cells short ; annulus compound ; peristome teeth mere stubs ; WS*	<p style="text-align: right;">Group A7</p> <p style="text-align: right;"><i>Bruchia</i>†</p> <p style="text-align: right;"><i>Pleurodium</i>†</p> <p style="text-align: right;"><i>Archidium</i>†</p> <p style="text-align: right;"><i>Bartramia</i>†</p> <p style="text-align: right;"><i>Trematodon</i>†</p> <p style="text-align: right;"><i>Ditrichum</i>†</p> <p style="text-align: right;"><i>Dicranella</i>†</p> <p style="text-align: right;"><i>Oncophorus</i>†</p> <p style="text-align: right;"><i>Paraleucobryum</i></p> <p style="text-align: right;"><i>Dicranodontium</i></p> <p style="text-align: right;"><i>Leptobryum</i></p> <p style="text-align: right;"><i>Arctoa</i></p> <p style="text-align: right;"><i>Blindia</i></p> <p style="text-align: right;"><i>Dicranoweisia</i></p> <p style="text-align: right;"><i>Dicranum</i>†</p> <p style="text-align: right;"><i>Seligeria</i>†</p> <p style="text-align: right;"><i>Brachydontium</i></p>
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Group A9 – Leaves with hair-points or awns

	Group A9
Plants minute (mostly <5 mm high) with \pm immersed capsules growing on bare soil , usually as winter annuals ; the " pygmy ephemerals " as defined here.	
Leaves with reflexed tips; cells with single blunt papillae; WS*	<i>Acaulon</i> †
Plants growing on dung , animal remains, or other highly nitrogenous materials; the " dung mosses ".	
Hypophysis greatly differentiated & colored ; peristome teeth chambered ; N, CP & SA	<i>Splachnum</i> †
Hypophysis narrowly pyriform & \pm urn-colored; peristome teeth not chambered; N	<i>Tetraplodon</i> †
Plants lacking any of the above unique characteristics.	
Leaves "fleshy" from crowded lamellae covering a very broad costa; WS	<i>Polytrichum</i> †
Leaves with distinct border .	
Cells short (\pm isodiametric); pleuripapillose or smooth; WS	<i>Desmatodon</i> †
Cells intermediate in length; smooth.	
Capsules pendent & pyriform ; WS	<i>Bryum</i> †
Leaves with large, lax & hyaline basal cells contrasting with dense upper cells.	
Basal cells pale with brown, thickened cross walls; calyptrae campanulate ; WS	<i>Encalypta</i> †
Basal cells thin-walled & non-pigmented throughout; calyptrae cucullate .	
Peristome of 32 twisted teeth on a high basal membrane; WS	<i>Tortula</i> †
Peristome of 32 \pm erect teeth on a low basal membrane; WS	<i>Desmatodon</i> †
Leaves lacking the above unique characteristics.	
Leaf cells mostly smooth .	
Plants in tufts on tree trunks & branches (rarely on rocks).	
Leaves crisped when dry; basal cells yellow, thick-walled ; WC	<i>Ulota</i> †
Leaves not crisped when dry; basal cells undifferentiated ; WS*	<i>Orthotrichum</i> †
Plants in tufts, cushions & mats on rocks .	
Calyptrae small, cucullate or mitrate .	
Capsules systylious ; calyptrae short ; in wetter habitats; WS	<i>Schistidium</i> †
Capsules not systylious; calyptrae to operculum ; in dryer habitats; WS	<i>Grimmia</i> †
Plants on soil primarily.	
Cells intermediate in length; capsules pendent & pyriform ; WS	<i>Bryum</i> †
Cells short (\pm isodiametric); capsules mostly erect & cylindrical ; WS	<i>Desmatodon</i> †

Group A10 – Leaves with lamellae, ridges or filaments

	Group A10
Leaves with green , sheet-like lamellae .	
Leaves with a very broad costa covered by >20 lamellae.	
Lamellar apical cells papillose ; capsules \pm terete .	
Leaves subtubulose ; lamellar apical cells elliptic- pyriform ; WS	<i>Polytrichastrum</i>
Leaves oblong lanceolate ; lamellar apical cells \pm rounded ; WS	<i>Pogonatum</i>
Lamellar apical cells smooth or ridged; capsules sharply 4-5 angled ; WS	<i>Polytrichum</i>
Leaves with a narrow costa having <20 lamellae; WS	<i>Atrichum</i>
Leaves with ridge -like lamellae on the back (dorsal side) of the costa; WS	<i>Dicranum</i> †
Leaves with fine, white , threadlike filaments in a tangled, cobwebby weft ; N*	<i>Saelania</i>

Group A11 – Leaves undulate

Leaves **complanate** (attached all around the stem but twisted into one plane); E
 Leaves with **lamellae** on the costa; WS
 Leaves **lacking** any of the above unique characteristics; N

Group A11
Aulacomnium†
Atrichum†
Dicranum†

Group A12 – Leaves involute

Leaf margins involute **wet** or dry.
 Leaf margins **infolded** / **inflexed** over **photosynthetic** lamellae or filaments; WS
 Leaf margins **inrolled** over laminae **lacking** lamellae or filaments.
 Leaf cells **papillose**.
 Capsules **exserted & operculate**; WS
 Capsules **immersed** to emergent, **cleistocarpous**; E
 Leaf margins involute when **dry**; **plane** to erect when **wet**; cells **bulging** on upper surface; E

Group A12
Polytrichum†

Weissia
Astomum
Hyophila

Group A13 – Leaves ±all costa

Leaves channeled & **subtubulose**; E

Group A13
Leucobryum

Group A14 – Leaves with a broad, single costa

Leaves **bristle-like** (setaceous) or with distinct hair-points.
 Leaves with **green**, longitudinal **striations** on the back; N*
 Leaves **crowded** at stem tips; reddish, axillary **hairs** common; WS
 Leaves **lacking** the above unique characteristics.
 Leaves with **strongly differentiated** alar cells (inflated & hyaline).
 Inner basal cells **pale, enlarged & extending** up along the costa; N*
 Leaves with alar cells **little** differentiated; WS
 Leaves **oblong-lanceolate**; capsules elongate, curved & with a conspicuous neck; N

Group A14

Paraleucobryum
Leptobryum

Dicranodontium
Dicranella†
Meesia†

Reminder: The costa in Groups A15 through A19 is long & single.

Group A15– Leaves with bases distinctly incurved to expanded & clasping

Group A15

Leaves **subulate** / **setaceous** (needle or bristle-like).

Cells **intermediate** in length & **prorulose/papillose**; upper cells **±bistratose**; WS

Bartramia†

Cells **intermediate** in length & **smooth**.

Capsules with **distinct**, very long **necks**; WS

Trematodon

Capsules **lacking** a distinct neck.

Plants **larger**; peristome **single** with **forked** teeth.

Teeth divided to **base**, **round** & **papillose**; WS

Ditrichum†

Teeth divided to **mid-point**, **flat** & **pitted-striolate**; WS

Dicranella†

Cells **short** & **smooth**; capsules **inclined**, **asymmetric** & **strumose**; WS

Oncophorus†

Leaves with **lamellae** or **ridges** on their laminae or costa.

Leaves with a very **broad costa** covered by **>20** lamellae.

Leaves mostly **unistratose**; peristome **present**.

Lamellar apical cells **papillose**; capsules **±terete**.

Leaves **subtubulose**; lamellar apical cells elliptic-**pyriform**; WS

Polytrichastrum

Leaves oblong **lanceolate**; lamellar apical cells **±rounded**; WS

Pogonatum

Lamellar apical cells **smooth** or ridged; capsules sharply **4-5 angled**; WS

Polytrichum

Leaves **lacking** any of the above unique characteristics; cells strongly **bulging** on upper surface; WS

Timmia

Group A16 – Leaves with long decurrencies

Group A16

Shoots **angular** in cross-section; leaves **squarrose** recurved; cells **short** & **papillose**; N

Paludella

Shoots **terete** (round in cross-section); capsules **pyriform** or **pendulous**.

Leaves distinctly **toothed** **±throughout**.

Marginal teeth **paired**; sterile stems **±erect** & **round**; WS

Mnium

Marginal teeth **single**; sterile stems **prostrate** & **complanate**; WS

Plagiommium

Leaves **entire** to **±serrulate** or **±toothed** at apex.

Leaves predominantly **broader near** the middle; capsules **pendent**.

Leaves commonly **bordered**; median cells **<4:1**; WS

Bryum†

Leaves **not bordered**; median cells **>4:1**; WS

Pohlia†

Leaves predominantly **broader** at the **base**; setae very **long**; capsules **±inclined**; N

Meesia†

Group A17 – Leaves with a distinct group of hyaline cells

Group A17

Note: hyaline cells may not be clearly distinct in very old leaves that have lost their chlorophyll.

Hyaline cells at **apex** of leaves; plants **whitish**.

Stems often **forked** or branched; cells **papillose** (simple & forked); capsules **immersed**; WS *Hedwigia*

Stems **rarely** branched; leaves **apiculate**; capsules **pendent**; cells **smooth**; WS *Bryum*[†]

Hyaline cells as **marginal wedges** broadest at the base of leaves.

Leaves **spreading** & crenulate to **entire**; upper cells **pleuripapillose**; WS *Tortella*

Hyaline cells in **abruptly differentiated**, \pm oval "**windows**" (cancellinae) in the lower 1/3 of leaves.

Leaf margins **revolute**; peristome of **32 twisted** teeth; **1***; WS *Tortula*[†] (*Syntrichia*)

Hyaline, **inflated** & **thin-walled** cells across the **lower 1/3** of leaves.[#]

Leaves **revolute** at least below; **1***.

Leaves \pm **rounded** with short to **long** awns; cells **10-13 μ** ; **peristome** present.

Peristome of 32 **twisted** teeth on a **high** basal membrane; WS *Tortula*[†]

Peristome of 32 \pm **erect** teeth on a **low** basal membrane; WS *Desmatodon*[†]

Leaves \pm **acute**; cells **15-20 μ** ; peristome **none** or **rudimentary**; WS *Pottia*[†] (*Microbryum*)

Leaves **lacking** any of the above unique characteristics.

Cross walls of basal cells **thick** & **brown**; calyptrae long **campanulate**; **1***; WS *Encalypta*[†]

Cross walls of **normal** thickness; calyptrae **cucullate**.

Stems with a **hyalodermis**; papillae usually **bifid**; **2***

Stems **lacking** a central strand; WS

Oxystegus

Stems **lacking** a hyalodermis; papillae usually **C-shaped**; **1***.

Peristome of 32 **twisted** teeth on a **high** basal membrane; WS *Tortula*[†]

Peristome of 32 \pm **erect** teeth on a **low** basal membrane; WS *Desmatodon*[†]

[#]: *Note: Many taxa with short, papillose, medial cells possess basal cells that are somewhat differentiated, i.e., pale (translucent), less papillose, somewhat elongated and/or colored, especially near the insertion. The taxa in this Group A16 represent the extreme, strongly differentiated condition of a gradient while those taxa with the less differentiated basal cells are found in Group A23.*

Group A18 – Leaves with a distinct marginal border

	Group A18
Leaves ciliate at the margins. Plants primarily protonemata ; capsules inclined, ovoid & ventricose ; WS*	<i>Buxbaumia</i>
Leaves with a border of elongate cells contrasting with shorter medial cells. Plants erect, rosulate -foliate & large; from horizontal, underground stems; WS Plants strongly flattened ; leaves twisted into one plane (complanate); WS Plants with red stems ; stems tomentose . Rhizoidal initials in longitudinal rows ; endostome fused into a dome ; N Rhizoidal initials not in rows; endostome segments free ; N*	<i>Rhodobryum</i> <i>Plagiomnium</i> <i>Cinclidium</i> <i>Rhizomnium</i>
Plants lacking the above unique characteristics. Leaves with lamellae on the costa; WS Leaves with paired teeth on margins; WS Leaves with single teeth on margins. Leaves rounded-obtuse & apiculate; upper cells in oblique rows; N* Leaves rounded-obtuse & apiculate; upper cells not in oblique rows; N* Leaves acute to awned; cells not in oblique rows; capsules pendent & pyriform ; WS Leaves with entire margins. Capsules pendent & pyriform ; WS Capsules erect ; leaves rounded-obtuse ; upper cells in oblique rows; N*	<i>Atrichum</i> <i>Mnium</i> † <i>Pseudobryum</i> <i>Plagiomnium</i> <i>Bryum</i> † <i>Bryum</i> † <i>Pseudobryum</i>
Leaves with margins differing in color and/or opacity from the medial laminae. Peristome (32) spirally twisted above a high basal membrane; WS Peristome (16) obliquely slanted above a low basal membrane; WS	<i>Tortula</i> † <i>Desmatodon</i> †

Group A19 – Leaves with distinct alar cells

	Group A19
Stems tomentose ; alar cells inflated, hyaline & ±yellow-brown towards the margin; WS Stems not or indistinctly tomentose; alar cells not as above. Costa broad , >1/3 leaf width; alar cells inflated , & hyaline to brownish to reddish . Leaves with green , longitudinal striations on the back; N* Leaves lacking green striations. Inner basal cells pale, enlarged & extending up along the costa; N*	<i>Dicranum</i> <i>Paraleucobryum</i> <i>Dicranodontium</i>
Costa narrow , <1/3 leaf width. Alar cells enlarged to inflated & yellowish to brownish . Capsules obovoid to pyriform ; on rocks ; N* Capsules cylindrical ; substrates various . Cells with cuticular ridges ; peristome teeth ±entire & papillose ; N* Cells smooth ; peristome teeth forked & pitted- striolate below; WS Alar cells sub-quadrate & pale ; cells ±thick-walled & often nodulose ; WS	<i>Blindia</i> <i>Dicranoweisia</i> <i>Dicranum</i> <i>Grimmia</i> †

Group A20 – Leaves with costa extremely reduced to lacking

Leaves in **clusters** of **branches** around a central stem & a **network** of green & hyaline cells; WS
 Leaves **distichous**, **decurrent** & **confluent**; protonemata **luminous**; “Goblin Gold”; WS*
 Leaves **spinose** serrate; protonemata **persistent**; cells **smooth**; pygmy **ephemerals**; WS
 Leaves **lacking** the above unique characters.

Cells **papillose**; capsules **exserted** & **valvate** (4x); plants reddish-**black**; on **rocks**; N*
 Cells **smooth**.

Capsules **exserted** with **4 large teeth**; on undersides of **rock overhangs**; N
 Capsules **sessile** & **gymnostomous**; pygmy **ephemerals**; on **soil**; WS

Group A20*Sphagnum**Schistostega**Ephemerum*†*Andreaea*†*Tetrodontium*†*Micromitrium*

Reminder: Definitions for cell length to breadth ratios are found in the Introduction, the Overview & at the end of this section.

Group A21 – Cells long (>5:1) & smooth

Leaves **little** altered (dry); cell walls **not** thickened; capsules inclined to **pendulous**; WS

Group A21*Pohlia*†

Group A22 – Cells intermediate (2-5:1) & distinctly papillose

Leaves **ovate** & abruptly narrowed to a **short** acumen; papillae **simple**; W & VT

Leaves linear-lanceolate to **subulate** from an **erect** base; papillae **simple**; WS

Group A22*Philonotis*†*Bartramia*†

Group A23 – Cells intermediate (2-5:1) & distinctly prorulose

Setae **straight**; capsules **asymmetric** & **furrowed**; peristome teeth **lanceolate**.

Leaves with **bistratose** margins &/or lamina; **mesic** habitats; WS

Leaves **unistratose**; **hydric** habitats; WS

Setae **short**, capsules **immersed**

Leaves \pm linear-**lanceolate** & \pm **spinulose** above; protonemata **persistent**; WS

Leaves \pm **subulate** & **serrulate** above; protonemata **ephemeral**; WS

Group A23*Bartramia*†*Philonotis*†*Ephemerum*†*Bruchia*†

Group A24 – Cells intermediate & smooth (or indistinctly ornamented*)
Group A24

Leaves predominantly **broader near** or **above** the middle (\pm oblong or obovate).

Plants **small, winter annuals** on soil.

Capsules clearly **exserted**.

Costa **strong**; protonemata **ephemeral**; peristome **lacking**; WS

Physcomitrium

Costa **weak**; protonemata **persistent**; peristome **present**; WS*

Discelium

Capsules \pm **immersed** & \pm **pyriform**.

Leaves \pm **concave-obovate** & **serrulate**; capsules **operculate**; WS

Physcomitrium

Leaves \pm **concave-ovate** & **entire**; capsules **cleistocarpous**; WS

Bruchia[†]

Plants **otherwise**.

Leaves commonly bordered by **linear** cells; capsules pyriform & **pendent**; WS

Bryum

Leaves **unbordered**.

Medial cells **smooth** & **>5:1** (linear rhomboidal); capsules **pendent**; WS

Pohlia[†]

Medial cells **smooth** & **<4:1**; capsules inclined to **erect**.

Peristome of **4** massive teeth; plants **bud-like**; costa **weak**; on **rocks**; N

Tetradontium

Peristome of **16** teeth; costa **strong**; on **soil**.

Capsules with well-**differentiated** necks; calyptrae **mitrate**; N*

Tayloria

Capsules **lacking** a distinctive neck; calyptrae inflated **cucullate**.

Capsules **inclined** & **asymmetric**; WS

Funaria

Peristome **lacking**; capsules **erect** & **symmetric**; calyptrae **mitrate**; WS

Physcomitrium

Leaves predominantly **broader** near the **base** (\pm lanceolate).

Plants **small, winter annuals** on soil; capsules \pm **immersed** & **cleistocarpous**; WS

Bruchia[†]

Plants **otherwise**; capsules **exserted** & **peristomate**.

Leaves **3-ranked**; setae very **long**; plants of **calcareous** wetlands.

Capsules with well-defined **neck**; endostome **longer** than exostome; N

Meesia

Capsules **short** & **black** (golf clubs); endostome **reduced** to lacking; N

Catoscopium

Leaves \pm **subulate** / **setaceous**.

Capsules **ovoid**; plants minute to very **small**; on **calcareous** rocks; WS (N)

Seligeria

Capsules long **cylindric**; peristome teeth **round**, fully **split** & **papillose**; WS

Ditrichum

Capsules \pm **oblong**, often **curved**; peristome teeth **flat**, **split** 1/2 & **pitted**; WS

Dicranella

Leaves with expanded, **sheathing** leaf bases; WS

Dicranella

Leaves **lacking** any of the above unique characteristics.

Plants on **calcareous rocks** & **small** (<2mm); setae **cygneous** (wet); N

Seligeria campylopoda

Plants of **calcareous wetlands**; setae very **long**; peristome **double**; N

Meesia

Plants of **Cu** or **S** rich soils; setae **lateral**; peristome **endostome** only; N*

Mielichhoferia

Plants of **disturbed** soil; setae **terminal**; peristome **single**; WS

Ditrichum

*: bulging, mammillose, indistinctly papillose (i.e. low papillae) or slightly prorulose.

Group A25 – Cells short (<2:1) & distinctly papillose

	Group A25
Leaves with expanded, sheathing bases; cells strongly bulging on upper surface; WS	<i>Timmia</i> †
Leaves distinctly toothed in the upper half.	
Cells unipapillose or mammillose; ventral stereid band weak or lacking .	
Leaves ±narrow ; cells coarsely papillose; capsules furrowed ; N	<i>Cynodontium</i> †
Leaves lacking the above unique characteristics.	
Cells pleuripapillose .	
Papillae forked ; basal cells with brown cross-walls; calyptrae long- cylindric ; WS	<i>Encalypta</i>
Papillae C-shaped .	
Basal cells with brown cross-walls; calyptrae long- cylindric ; 1* ; WS	<i>Encalypta</i>
Basal cell walls uncolored ; calyptrae cucullate .	
Peristome teeth long & twisted ; 2* ; WS	<i>Barbula</i> †
Peristome teeth short & erect ; 1* ; WS	<i>Desmatodon</i> †
Papillae conical .	
Cells with 4-7 papillae;	
Stems repeatedly forked; capsules elongate & urn-shaped ; 2* ; WS	<i>Amphidium</i>
Cells with 1-4 papillae.	
Costa with two stereid bands.	
Leaf margins revolute on both sides; peristome present.	
Papillae crowded ; basal cells hyaline ; peristome twisted ; WS	<i>Barbula</i> †
Papillae scattered ; basal cells green ; peristome ±oblique ; WS	<i>Didymodon</i> †
Leaf margins plane ; peristome lacking ; WS	<i>Gymnostomum</i>
Costa with one stereid band; peristome lacking .	
Sporophytes lateral ; stem rounded- triangular ; WS	<i>Anoetangium</i>
Sporophytes terminal ; stem round ; WS	<i>Gymnostomum</i>
Costa lacking stereid bands; peristome present .	
Basal marginal cells with thickened cross-walls; WS	<i>Ulota</i> †
Basal marginal cells ±undifferentiated ; WS	<i>Orthotrichum</i> †
Cells unipapillose .	
Leaves serrulate at apex; stems tomentose ; gemmae on stem extensions; WS	<i>Aulacomnium</i> †
Leaves entire .	
Capsules exserted ; peristome of 32 twisted teeth ; plants on soil & rocks ; 2* ; WS	<i>Barbula</i> †
Capsules ±emergent & valvate (4x); blackish plants on rocks ; 0* ; N*	<i>Andreaea</i> †
Capsules ±immersed with 16 ±reflexed teeth; plants on trees & rocks ; 0* .	
Basal marginal cells with thickened cross-walls; WS	<i>Ulota</i> †
Basal marginal cells ±undifferentiated ; WS	<i>Orthotrichum</i> †

Group A26 – Cells short (<2:1) & smooth (or indistinctly ornamented*)

	Group A26
Leaves ±oblong- spathulate (broad in the middle & even broader above).	
Leaf margins inrolled when dry (erect or plane when wet); cells bulging on upper surface; E	<i>Hyophila</i>
Leaf margins usually revolute , at least in part; cells flat .	
Leaves ± bordered with longer cells; peristome teeth short & erect ; 1* ; WS	<i>Desmatodon</i> †
Leaves ± bordered with shorter cells; peristome teeth long & twisted ; 1* ; WS	<i>Tortula</i> †
Leaves unbordered .	
Propagula axillary ; peristome of 32 spirally twisted teeth ; 2* ; WS	<i>Barbula</i> †
Leaf margins plane ; cells flat & large (>15μ); peristome none or rudimentary; 1* ; WS	<i>Pottia</i> †
Leaves ±oblong- lingulate (tongue shaped) or oblong- ligulate (strap shaped); E & BC	<i>Diphyscium</i>
Leaves ± ovate (broadest in lower third; egg-shaped) & revolute ; peristome of 32 teeth; 2* ; WS	<i>Barbula</i> †
Leaves ovate-lanceolate to lanceolate (broadest near the base; lance-shaped).	
Leaves with expanded, sheathing leaf bases.	
Cells bulging on upper surface; capsules symmetric & oblong-ovoid ; WS	<i>Timmia</i>
Cells smooth ; capsules asymmetric & strumose (goiter-like swelling); WS	<i>Oncophorus</i>
Leaves with paired teeth on bistratose margins.	
Margins revolute below; cells with cuticular ridges ; perichaetia terminal ; N*	<i>Plagiopus</i>
Leaves bistratose , at least in part;	
Leaves curved to crisped (dry); cells bulging or flat.	
Calyptrae mitrate, lobed & plicate ; 2* ; WS	<i>Ptychomitrium</i>
Leaves lacking any of the above unique characters.	

Continued below at left margin

Continued from Group A26 above

Leaves **lacking** the above unique characteristics.

Capsules split along 4 sutures ; plants saxicolous & blackish ; N*	<i>Andreaea</i> †
Capsules with 4, massive teeth; leaves pellucid ; terminal gemmae cups ; WS	<i>Tetraphis</i>
Capsules with 8, 16 or 32 lanceolate teeth.	
Plants in tufts on tree trunks (rarely on rocks); diplolepidous .	
Leaves crisped when dry; basal cells yellow, thick -walled; WC	<i>Ulota</i> †
Leaves not crisped when dry; basal cells ±undifferentiated ; WS*	<i>Orthotrichum</i> †
Plants in tufts, cushions or mats on rocks .	
Peristomes diplolepidous .	
Basal cells very thick -walled, yellow & radiating from costa; WS	<i>Ulota</i> †
Basal cells +thick -walled, neither yellow & nor radiating; WS	<i>Orthotrichum</i> †
Peristomes haplolepidous .	
Capsules systylious ; calyptrae short ; in wetter habitats; WS	<i>Schistidium</i> †
Capsules not systylious; calyptrae longer ; in dryer habitats; WS	<i>Grimmia</i> †
Plants on soil primarily.	
Setae cygneous ; capsules yellowish & smooth ; calyptrae mitrate ; N*	<i>Campylostelium</i>
Setae bent at capsule base; capsules strumose & purple-red ; leaves revolute throughout & serrate apically; upper cells ±square ; WS	<i>Ceratodon</i>
Setae straight .	
Capsules ribbed ; in crevices of cliffs & boulders.	
Peristome teeth divided to half their length; N	<i>Cynodontium</i> †
Peristome teeth undivided ; E	<i>Rhabdoweisia</i>
Capsules smooth (or wrinkled when dry); calyptrae cucullate .	
Setae very long ; capsules inclined ; peristome double ; in fens ; N	<i>Meesia</i>
Setae shorter ; capsules erect ; peristome single ; on mineral soils .	
Basal cells hyaline ; peristome teeth twisted ; WS	<i>Barbula</i> †
Basal cells green ; peristome teeth ±oblique ; WS	<i>Didymodon</i> †

*: bulging, mammillose (cells both bulging & papillose) or indistinctly papillose, i.e. low papillae

Cell length to breadth ratio:

Long cells: >5:1; commonly termed linear.

Intermediate cells: 2-5:1; commonly termed elongated, rectangular, hexagonal or rhomboidal.

Short cells: <2:1; commonly termed isodiametric, quadrate, rounded-quadrate or sub-quadrate.

Cells = medial, laminal cells; cells ~2/3 of the way from insertion to apex, midway between the costa & the margin.

Number of stereid bands evident in costa cross-sections:

2* = costa with two stereid bands

1* = costa with one stereid band

0* = costa lacking stereid bands, i.e., **±homogeneous**

End.