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

*Revised through 17 May 2010*

***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 *Fissidens*

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

Leaves flat, **decurrent** & **confluent**; protonemata **luminous**; “Goblin Gold”; WS\* *Schistostega*

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

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 *Plagiomnium*

Leaves **crowded**, unbordered & + **undulate**; capsules plicate (dry); E *Aulacomnium*†

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

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

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

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

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

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

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

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

Stems **smooth**; leaves crowded and **appressed**; on **soil** near rocks; A/A *Conostomum*

***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\* *Anomobryum*

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

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

Stems **green**.

Cells +**prorulose**; leaves **5-ranked** and serrate; plants bluish**-white**; A/A *Conostomum*

Cells **smooth**; leaves radially arranged.

Leaves **serrulate** & **unbordered**; **immersed** capsules: E *Pleuridium*†

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

***Group A3 – Stems distinctly tomentose***

Group A3

Stems covered with **pigmented** (reddish to brownish) rhizoidal tomentum to near apex.

Leaves **squarrose-recurved** & heart shaped; fens; N *Paludella*

Leaves **ovate** to broadly elliptical.

Rhizoidal initials in **longitudinal rows**; endostome fused into a **dome**; N *Cinclidium*

Rhizoidal initials **not** in rows; endostome segments **free**; N\* *Rhizomnium*†

Leaves **oblong-**lanceolate to oblong-lingulate.

Cells **pleuripapillose**; terminal cell long and **smooth**;brood bodies **axillary**; N\* *Zygodon*†

Cells **unipapillose**; terminal cell **papillose**; brood bodies **terminal**; WS *Aulacomnium*†

Leaves **lanceolate** to **subulate**-**setaceous**; WS *Dicranum*

Stems covered with **white-wooly** tomentum.

Leaves with green sheets (**lamellae)** on their surface; bogs; N\* *Polytrichum*†

Leaves **lacking** lamellae; WS *Dicranum*

***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\* *Anomobryum*

Leaves obtuse to **acute**; costa percurrent to **excurrent**; cells ~**4:1**; WS *Bryum*†

Plants with stems covered with **pigmented** (reddish to brownish) **tomentum**.

Rhizoidal initials in **longitudinal rows**; endostome **fused** into a dome; N *Cinclidium*

Rhizoidal initials **not** in rows; endostome segments **free**; N\* *Rhizomnium*

Plants **neither** julaceous **nor** tomentose.

Leaves **bordered** by elongated cells.

Leaves distinctly **toothed**; cells **smooth**; leaves **plane**; WS *Mnium*†

Leaves **entire;**  WS *Bryum*†

Leaves **not** bordered.

Leaves **serrulate** +**throughout**; cells **prorulose**; WS *Philonotis*†

Leaves +**serrulate** near the **apex**; cells **smooth**.

Leaves **subulate**; alar cells **inflated**, **thick**-walled & **reddish**; N\* *Blindia*

Leaves **not** subulate; alar cells +**undifferentiated**; WS *Pohlia*†

***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 *Paludella*

Leaves squarrose-recurved only when wet (+appressed when dry).

Cells **intermediate** in length; WS *Dicranella*†

Cells **short**.

Leaves +**bordered** by **longer**, or **shorter** & **thick**-walled cells; **1\***; WS *Tortula*†

Leaves **unbordered**; **2\***; WS *Barbula*†

***Group A6 –Leaves falcate-secund***

**Group A6**

Plants **grayish**; costa **>1/2** leaf breadth with **3**(4) cell layers; green **striations** on leaves; N\* *Paraleucobryum*†

Plants **green**; leaves unistratose & **lacking** striations; costa usually **<1/5** leaf breadth.

Alar cells **obvious**; capsules **rarely** strumose; **various** habitats; **2\***; WS *Dicranum*†

Alar cells +**undifferentiated**; plants **small**, mostly <1cm; WS *Dicranella*†

***Group A7 –Leaves subulate / setaceous (8:1 or greater)***

Group A7

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 *Bruchia*†

Capsules **globose** to **ovoid**, **lacking** a distinct neck.

Calyptrae mitrate or **cucullate**; spores numerous & **small**; WS *Pleuridium*†

Calyptrae **rudimentary**; spores few & **large** (>100µ); E *Archidium*†

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 *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

Upper cells +bistratose; capsules inclined, asymmetric & strumose; WS *Oncophorus*†

Leaves with a broad, single costa (>1/3 the leaf width).

Alar cells inflated & hyaline or colored (brownish to reddish).

Costa **3**(4) cell **layers** thick (middle & dorsal layers **green** & "**striped"**); N\* *Paraleucobryum*

Costa lacking the above unique characters.

Inner basal cells **pale**, **enlarged** & extending up along the costa; N\* *Dicranodontium*

Alar cells **+undifferentiated**; capsules **pyriform**; WS *Leptobryum*

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 *Arctoa*

Capsules **smooth** (dry); peristome teeth **erect**, +**entire** & **papillose**; N\* *Blindia*

Capsules lacking any of the above unique characters; substrates various.

Cells with **cuticular ridges**; peristome teeth +**entire** & **papillose**; N\* *Dicranoweisia*

Cells **smooth**; peristome teeth **forked** & pitted-**striolate** below; WS *Dicranum*†

Alar cells +undifferentiated.

Cells intermediate to long; peristome teeth usually present.

Plants small (<2mm); leaves little altered (dry); on rocks; WS *Seligeria*†

Cells short; annulus compound; peristome teeth mere stubs; WS\* *Brachydontium*

***Group A9 – Leaves with hair-points or awns***

Group A9

Plants **minute** (mostly <5 mm high) with +**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\* *Acaulon*†

Plants growing on **dung**, animal remains, or other highly nitrogenous materials; the "**dung** **mosses**".

Hypophysis greatly **differentiated** & **colored**; peristome teeth **chambered**; N, CP & SA *Splachnum*†

Hypophysis narrowly **pyriform** & +urn-colored; peristome teeth **not** chambered; N *Tetraplodon*†

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

Leaves "fleshy" from crowded **lamellae** covering a very broad costa; WS *Polytrichum*†

Leaves with distinct **border**.

Cells **short** (+isodiametric); pleuripapillose or smooth; WS *Desmatodon*†

Cells **intermediate** in length; smooth.

Capsules **pendent** & **pyriform**; WS *Bryum*†

Leaves with large, lax & **hyaline** basal cells contrasting with dense upper cells.

Basal cells pale with **brown**, **thickened** cross walls; calyptrae **campanulate**; WS *Encalypta*†

Basal cells **thin**-**walled** & **non-pigmented** throughout; calyptrae **cucullate**.

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

Peristome of 32 +**erect** teeth on a **low** basal membrane; WS *Desmatodon*†

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 *Ulota*†

Leaves **not** crisped when dry; basal cells **undifferentiated**; WS\* *Orthotrichum*†

Plants in tufts, **cushions** & mats on **rocks**.

Calyptrae small, **cucullate** or **mitrate**.

Capsules **systylious**; calyptrae **short**; in **wetter** habitats; WS *Schistidium*†

Capsules **not** systylious; calyptrae **to** operculum; in **dryer** habitats; WS *Grimmia*†

Plants on **soil** primarily.

Cells **intermediate** in length; capsules **pendent** & **pyriform**; WS *Bryum*†

Cells **short** (+isodiametric); capsules mostly **erect** & **cylindrical**; WS *Desmatodon*†

***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 +**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 with a **narrow costa** having **<20** lamellae; WS *Atrichum*

Leaves with **ridge**-like lamellae on the **back** (dorsal side) of the costa; WS *Dicranum*†

Leaves with fine, **white**, threadlike **filaments** in a tangled, cobwebby **weft**; N\* *Saelania*

***Group A11 – Leaves undulate***

Group A11

Leaves **complanate** (attached all around the stem but twisted into one plane); E *Aulacomnium*†

Leaves with **lamellae** on the costa; WS *Atrichum*†

Leaves **lacking** any of the above unique characteristics; N *Dicranum*†

***Group A12 – Leaves involute***

**Group A12**

Leaf margins involute **wet** or dry.

Leaf margins **infolded** / **inflexed** over **photosynthetic** lamellae or filaments; WS *Polytrichum*†

Leaf margins **inrolled** over laminae **lacking** lamellae or filaments.

Leaf cells **papillose**.

Capsules **exserted** & **operculate**; WS *Weissia*

Capsules **immersed** to emergent, **cleistocarpous**; E *Astomum*

Leaf margins involute when **dry**; **plane** to erect when **wet**; cells **bulging** on upper surface; E *Hyophila*

***Group A13 – Leaves +all costa***

**Group A13**

Leaves channeled & **subtubulose**; E *Leucobryum*

***Group A14 – Leaves with a broad, single costa***

**Group A14**

Leaves **bristle-like** (setaceous) or with distinct hair-points.

Leaves with costa of **3**(4) cell **layers** (middle & dorsal layers **green** & “**striped**”); N\* *Paraleucobryum*

Leaves **crowded** at stem tips; reddish, axillary **hairs** common; WS *Leptobryum*

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\* *Dicranodontium*

Leaves with alar cells **little** differentiated; WS *Dicranella*†

Leaves **oblong**-**lanceolate**; capsules elongate, curved & with a conspicuous neck; N *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 *Plagiomnium*

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**, +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 **toothed** above.

Upper leaf cells densely **pleuripapillose**; capsules **smooth**; **2\***

Older leaves **brick-red**; stems **lacking** a hyalodermis; WS *Bryoerythrophyllum*

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

Leaves +**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 +**erect** teeth on a **low** basal membrane; WS *Desmatodon*†

Leaves **+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 +**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\* *Buxbaumia*

Leaves with a border of **elongate** cells contrasting with **shorter** medial cells.

Plants erect, **rosulate**-foliate & large; from horizontal, underground stems; WS *Rhodobryum*

Plants strongly **flattened**; leaves twisted into one plane (**complanate**); WS *Plagiomnium*

Plants with **red stems; s**tems **tomentose**.

Rhizoidal initials in **longitudinal rows**; endostome fused into a **dome**; N *Cinclidium*

Rhizoidal initials **not** in rows; endostome segments **free**; N\* *Rhizomnium*

Plants **lacking** the above unique characteristics.

Leaves with **lamellae** on the costa; WS *Atrichum*

Leaves with **paired teeth** on margins; WS *Mnium*†

Leaves with **single teeth** on margins.

Leaves **rounded-obtuse** & apiculate; upper cells in **oblique** rows; N\* *Pseudobryum*

Leaves **rounded-obtuse** & apiculate; upper cells **not** in oblique rows; N\* *Plagiomnium*

Leaves **acute** to awned; cells **not** in oblique rows; capsules **pendent** & **pyriform**; WS *Bryum*†

Leaves with **entire** margins.

Leaf cells>**3:1**.

Capsules **pendent** & **pyriform**; WS *Bryum*†

Capsules **erect**; leaves **rounded-obtuse**; upper cells in **oblique** rows; N\* *Pseudobryum*

Leaf cells **1-2:1**; A/A *Cyrtomnium*

Leaves with margins differing in **color** and/or **opacity** from the medial laminae.

Peristome (32) **spirally** twisted above a **high** basal membrane; WS *Tortula*†

Peristome (16) **obliquely** slanted above a **low** basal membrane; WS *Desmatodon*†

***Group A19 – Leaves with distinct alar cells***

**Group A19**

Stems **tomentose**; alar cells **inflated**, **hyaline** & +**yellow-brown** towards the margin; WS *Dicranum*

Stems **not** or indistinctly tomentose; alar cells **not** as above.

Costa **broad**, >**1/3** leaf width; alar cells **inflated**, & hyaline to brownish to **reddish**.

Costa **3**(4) cell **layers** thick (middle & dorsal layers **green** & “**striped**); N\* *Paraleucobryum*

Costa **lacking** the above unique characters.

Inner basal cells **pale**, **enlarged** & extending up along the costa; N\* *Dicranodontium*

Costa **narrow**, <**1/3** leaf width.

Alar cells enlarged to **inflated** & **yellowish** to **brownish**.

Capsules **obovoid** to **pyriform**; on **rocks**; N\* *Blindia*

Capsules **cylindrical**; substrates **various**.

Cells with **cuticular ridges**; peristome teeth +**entire** & **papillose**; N\* *Dicranoweisia*

Cells **smooth**; peristome teeth **forked** & pitted-**striolate** below; WS *Dicranum*

Alar cells **sub-quadrate** & **pale**; cells +**thick**-walled & often **nodulose**; WS *Grimmia*†

***Group A20 – Leaves with costa extremely reduced to lacking***

**Group A20**

Leaves in **clusters** of **branches** around a central stem & a **network** of green & hyaline cells; WS *Sphagnum*

Leaves **distichous**, **decurrent** & **confluent**; protonemata **luminous**; “Goblin Gold”; WS\* *Schistostega*

Leaves **spinose** serrate; protonemata **persistent**; cells **smooth**; pygmy **ephemerals**; WS *Ephemerum*†

Leaves **lacking** the above unique characters.

Cells **papillose**; capsules **exserted** & **valvate** (4x); plants reddish-**black**; on **rocks**; N\* *Andreaea*†

Cells **smooth**.

Capsules **exserted** with **4 large teeth**; on undersides of **rock** **overhangs**; N *Tetrodontium*†

Capsules **sessile** & **gymnostomous**; pygmy **ephemerals**; on **soil**; WS *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***

**Group A21**

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

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

**Group A22**

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

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

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

**Group A23**

Leaves **julaceous** and **5-ranked**; peristome teeth **fused** at tip; A/A *Conostomum*

Leaves and peristome teeth **otherwise**.

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

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

Leaves **unistratose**; **hydric** habitats; WS *Philonotis*†

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

Leaves +linear-**lanceolate** & +**spinulose** above; protonemata **persistent**; WS *Ephemerum*†

Leaves +**subulate** & **serrulate** above; protonemata **ephemeral**; WS *Bruchia*†

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

**Group A24**

Leaves predominantly **broader near** or **above** the middle (+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+**immersed** & +**pyriform**.

Leaves +concave-**obovate** & **serrulate**; capsules **operculate**; WS *Physcomitrium*

Leaves +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 *Tetrodontium*

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** (+lanceolate).

Plants **small**, **winter annuals** on soil; capsules **+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 +**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 +**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 *Timmia*†

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 *Cynodontium*†

Leaves **lacking** the above unique characteristics.

Cells **pleuripapillose**.

Papillae **forked**; basal cells with **brown** cross-walls; calyptrae long-**cylindric**; WS *Encalypta*

Papillae **C-shaped**.

Basal cells with **brown** cross-walls; calyptrae long-**cylindric**; **1\***; WS *Encalypta*

Basal cell walls **uncolored**; calyptrae **cucullate**.

Peristome teeth **long** & **twisted**; **2\***; WS *Barbula*†

Peristome teeth **short** & **erect**; **1\***; WS *Desmatodon*†

Papillae **conical**.

Cells with **4-7** papillae;

Stems **repeatedly** forked; capsules elongate & **urn-shaped**; **2**\*; WS *Amphidium*

Stems **sparsely** forked; capsules +**pyriform**; **1**\* or lacking; WS\* *Zygodon*

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 *Barbula*†

Papillae **scattered**; basal cells **green**; peristome +**oblique**; WS *Didymodon*†

Leaf margins **revolute** on **one** side only; peristome **lacking**; WS *Hymenostylium*

Leaf margins **plane**; peristome **lacking**; WS *Gymnostomum*

Costa with **one** stereid band; peristome **lacking**.

Sporophytes **lateral**; stem rounded-**triangular**; WS *Anoectangium*

Sporophytes **terminal**; stem **round**; WS *Gymnostomum*

Costa **lacking** stereid bands; peristome **present**.

Basal marginal cells with **thickened** cross-walls; WS *Ulota*†

Basal marginal cells +**undifferentiated**; WS *Orthotrichum*†

Cells **unipapillose**.

Leaves **serrulate** at apex; stems **tomentose**; **gemmae** on stem extensions; WS *Aulacomnium*†

Leaves **entire**.

Capsules **exserted**; peristome of **32 twisted** **teeth**; plants on **soil** & rocks; **2\***; WS *Barbula*†

Capsules +**emergent** & **valvate** (4x); **blackish** plants on **rocks**; **0\***; N\* *Andreaea*†

Capsules +**immersed** with **16** +**reflexed** teeth; plants on **trees** & rocks; **0\***.

Basal marginal cells with **thickened** cross-walls; WS *Ulota*†

Basal marginal cells +**undifferentiated**; WS *Orthotrichum*†

***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 *Hyophila*

Leaf margins usually **revolute**, at least in part; cells **flat**.

Leaves +**bordered** with **longer** cells; peristome teeth **short** & **erect**; **1\***; WS *Desmatodon*†

Leaves +**bordered** with **shorter** cells; peristome teeth **long** & **twisted**; **1\***; WS *Tortula*†

Leaves **unbordered**.

Propagula **axillary**; peristome of **32** spirally **twisted** **teeth**; **2\***; WS *Barbula*†

Leaf margins **plane**; cells **flat** & **large** (**>**15µ); peristome **none** or rudimentary; **1\***; WS *Pottia*†

Leaves +oblong-**lingulate** (tongue shaped)or oblong-**ligulate** (strap shaped); E & BC *Diphyscium*

Leaves +**ovate** (broadest in lower third; egg-shaped) & **revolute**; peristome of **32** teeth; **2\***; WS *Barbula*†

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 *Timmia*

Cells **smooth**; capsules **asymmetric** & **strumose** (goiter-like swelling); WS *Oncophorus*

Leaves with **paired** **teeth** on **bistratose** margins.

Margins **revolute** below; cells with cuticular **ridges**; perichaetia **terminal**; N\* *Plagiopus*

Leaves **bistratose**, at least in part;

Leaves **curved** to **crisped** (dry); cells bulging or flat.

Calyptrae **mitrate**, **lobed** & **plicate**; **2\***; WS *Ptychomitrium*

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\* *Andreaea*†

Capsules with **4**, **massive** teeth; leaves **pellucid**; terminal gemmae **cups**; WS *Tetraphis*

Capsules with 8, **16** or 32 **lanceolate** teeth.

Plants in **tufts** on **tree** trunks (rarely on rocks); **diplolepideous**.

Leaves **crisped** when dry; basal cells **yellow**, **thick**-walled; WC *Ulota*†

Leaves **not** crisped when dry; basal cells +**undifferentiated**; WS\* *Orthotrichum*†

Plants in **tufts**, **cushions** or mats on **rocks**.

Peristomes **diplolepideous**.

Basal cells **very** **thick**-walled, **yellow** & **radiating** from costa; WS *Ulota*†

Basal cells **+thick**-walled, **neither** yellow & **nor** radiating; WS *Orthotrichum*†

Peristomes **haplolepideous**.

Capsules **systylious**; calyptrae **short**; in **wetter** habitats; WS *Schistidium*†

Capsules **not** systylious; calyptrae **longer**; in **dryer** habitats; WS *Grimmia*†

Plants on **soil** primarily.

Setae **cygneous**; capsules yellowish & **smooth**; calyptrae **mitrate**; N\* *Campylostelium*

Setae **bent** at capsule base; capsules strumose & **purple-red**; leaves **revolute**

throughout & **serrate** apically; upper cells +**square**; WS *Ceratodon*

Setae **straight**.

Capsules **ribbed**; in **crevices** of cliffs & boulders.

Peristome teeth **divided** to half their length; N *Cynodontium*†

Peristome teeth **undivided**; E *Rhabdoweisia*

Capsules **smooth** (or wrinkled when dry); calyptrae **cucullate**.

Setae very **long**; capsules **inclined**; peristome **double**; in **fens**; N *Meesia*

Setae **shorter**; capsules **erect**; peristome **single**; on mineral **soils**.

Basal cells **hyaline**; peristome teeth **twisted**; WS *Barbula*†

Basal cells **green**; peristome teeth +**oblique**; WS *Didymodon*†

\*: 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.