Guide to Freely Branched (mostly pleurocarpous) Mosses of the West Coast

Revised through 30 April 2010

Reminder: A dagger (†) indicates that not all of the species within a given genus, or the genus containing a species listed, have the character(s) defining that Group. Abbreviations for the distribution of taxa are found at the end of the Concordance.

Group P1 - Shoots strongly flattened (complanate) or angular

Shoots angular with leaves folded (conduplicate); plants aquatic, submerged part of year.

Leaves ecostate (costa lacking); leaves keeled or flat; WS

Shoots complanate.

Leaves with a narrow, single costa.

Plants without both large and small leaves.

Leaf tip rounded-obtuse, leaves asymmetric, upper leaf cells >5:1; WS* Homalia trichomanoides

Leaf tip obtuse, leaves undulate, asymmetric; leaf cells 4-7:1; W Metaneckera menziesii

Leaf tips acuminata to acute.

Leaf margins coarsely serrate above; leaf tip not twisted; W Porotrichum

Leaf margins distinctly serrulate, leaf tip twisted at apex; E, WA Steerecleus serrulatus

Leaf margins entire, leaf tip not twisted, in wet swampy places; WS Leptodictyum riparium†

Leaves with a short & double costa, or none.

Leaf cells large, lax, hexagonal, often rhizoids and papillose gemmae on leaf tips; E, N, CA Hookeria

Leaf cells firm- to thick-walled, rounded to linear.

Leaves slenderly long decurrent; leaf margins entire, or serrulate at tip; WS Plagiothecium†

Leaves shortly decurrent, undulate or not; on vertical substrates; WS* Neckera

Leaves not decurrent.

Leaves secund; very shiny plants; margins sharply serrulate above; WS Brotherella recurvans

Leaves straight or slightly secund at tips.

Rhizoids axillary and papillose; stem hyalodermis well or moderately developed.

Leaves ±serrate throughout; alar cells quadrate; WS* Herzogiella turfacea†

Leaves ±entire; alar cells ±undifferentiated; WS* Isopterygiopsis muelleriana†

Rhizoids below leaf insertions and smooth; stem hyalodermis lacking.

Leaf apical cells long.

Alar cells quadrate, but neither particularly enlarged nor thick-walled.

Leaves acuminata; pseudoparaphyllia filamentous; E, CA Isopterygium tenerum

Alar cells ±undifferentiated; pseudoparaphyllia lacking; WS Pseudotaxiphyllum

Leaf apical cells short; pseudoparaphyllia foliose; E, SW Taxiphyllum†
**Group P2 – Shoots julaceous (especially when dry) – shoots smoothly cylindric with crowded, overlapping and appressed leaves**

Leaves with a narrow, single costa.

Leaf margins serrate and strongly revolute to near apex; alar cells differentiated; W

Leaf margins entire or slightly serrulate apically; paraphyllia lacking.

Median leaf cells long.

Branching pinnate and in one plane; lawns and disturbed areas; WC, NY

Branching irregular; wet soil and rocks; W

Median leaf cells intermediate; stems red; main stems not julaceous; A/A, W

Leaves with a short, double costa or none.

Leaves serrulate to dentate; cells prorulose.

Leaves acute to acuminate; alar cells numerous & strongly differentiated; WC

Leaves rounded-obtuse; alar cells indistinctly subquadrate; WS(N)

Leaves spinulose-serrate to serrulate at the apex.

Leaves spinulose-serrate & hyaline above; shoots julaceous; cells papillose; WS

Leaves entire; plants in very wet places, e.g., shallow water; alar cells short and wide; WS*

**Group P2**

*Antitrichia californica†*

*Pseudoscleropodium purum*

*Scleropodium†*

*Plagiobryum*

**Group P3 – Leaves spreading at right angles (squarrose) or squarrose-recurred; leaf tips often channeled**

Stems red; plants robust and loosely ascending; costa double (long or short) or lacking; WS*

Stems green; plants slender and creeping; costa long and single, short and double, or lacking; WS*

**Group P3**

*Rhytidiadelphus*

*Campylium*

**Group P4 – Plants with erect branches from a creeping stem**

Costa long and single.; alar cells quadrate to oblate.

Branching pinnate to bipinnate (frondose); costa toothed at back; CA

**Group P4**

*Bestia longipes*
Group P5 – Plants with leaves sickle-shaped and turned to one side (falcate-secund)

Costa **long**, **single** and **narrow**.
Paraphyllia **abundant** and **filamentous**; stem leaves deeply plicate, not complanate; WS
Paraphyllia **lacking**.
Leaf cells **prorulose**; leaves plicate and **rugose**; WS*
Leaf cells **smooth**.
   Stems with a **hyalodermis** (thin-walled, hyaline cells on stem surface).
   Leaves **prorulose** and **denticulate** in upper portion; WS*
   Leaves **striolate** (finely ridged) to **plane**, and **entire** to slightly denticulate.
   Alar cells **inflated**; plants occurring in **streams** on rocks or wet places; WS*
   Alar cells **little** differentiated; plants in rich **fens**; N
   Stems **lacking** a hyalodermis (thick-walled cells on stem surface).
   Plants of **upland** habitats, leaves **plicate**; WS
   Plants of **wet** habitats, leaves **not** plicate.
   Leaves **keeled**, **3-ranked**; WS*
   Leaves **neither** keeled nor **3-ranked**.
   Costa **excurrent**, alar cells abruptly inflated or undifferentiated; WS*
   Costa **subpercurrent**; plants in **fens** and **seeps**.
   Leaf margins finely **denticulate**; WS*
   Leaf margins **entire**.
   Central strand (small cells) in stem; WS*
   Central strand **lacking**; N

Costa **short** and **double**, or none.
Arms of double costa **meeting** at the base, or **none**.
Shoots in **flat**, evenly **pinnate**, feather-like, **fronds**; plants **large**; WS*
Shoots **loosely complanate**; plants **very shiny**; leaves **very serrulate** above; E, NW
Shoots **julaceous**; found in wet places (often submerged); WS*
Shoots **falcate-secund** when **dry**, erect when moist; on trees; WS*
Shoots with many **brood bodies** at tips; usually on trees; WS*
Shoots **lacking** the above unique characters.
Leaves **rugose**; stems with **paraphyllia**; NW
Leaves **plane**.
   Leaf cells prorulose; leaves crowded & **spreading**; alar cells **subquadrate**; E, AK, BC
   Leaf cells **smooth**.
   Alar cells abruptly inflated as "**bubble**" cells; leaves **+homomallous**; E, CA
   Alar cells in **triangular** patches; leaves **+entire**.
   Plants on **wet rocks** in mountain streams; branching **+irregular**; WS
   Plants of **mesic** to wet habitats; branching regularly **pinnate**; WS

Groups P5

*Palustriella*

*Rhytidium rugosum*

*Sanonia*

*Hygrohypnum†*

*Brachythecium†*

*Dichelyma*

*Warnstorfia*

*Hematocaulis*

*Drepanocladius†*

*Limprichtia*

*Brachythecium†*

*Rhytiadiopsis robusta*

*Ctenidium*

*Sematophyllum*

*Hygrohypnum†*

*Hynum*
Group P6 – Plants with paraphyllia or tomentum on stem.

Stems with tomentum, calciphile in fens, swamps; WS*

Stems with paraphyllia.

- Leaves with a short, double costa or none; plants irregularly pinnate.
  - Leaves rugose and falcate-secund; NW, WA, OR
  - Leaves smooth, straight and imbricate when dry; WC

Leaves with a long, double costa.

- Plants 2-3-pinnate with stepwise flat fronds; upper leaf cells protrulose; WS*
- Plants irregularly to 1-2-pinnate; cells smooth or protrulose.
  - Leaves spinulose-serrate all around; NE, N

Leaves with a long, narrow costa.

- Plants dendroid; upper leaf cells short (2-5:1).
  - Plants little altered dry; leaf margins strongly serrate in upper half; on rich soil; WS
  - Plants curled dry, leaf margins serrate at tip; on trees primarily; NW, ID

- Plants irregular pinnate; cells linear (> 8:1); margins spinulose; NE, N
  - Plants complanate; stem leaves undulate; W
  - Plants lacking the above unique characters.
    - Stem leaves deeply plicate; paraphyllia filamentous and abundant; soil and rocks; WS
    - Stem leaves plane; paraphyllia foliose and few to many; wet areas; WS*
    - Alar cells mostly not differentiated, if so, not inflated.

Paraphyllia papillose.

- Plants large; stem leaves 1-1.9mm; branch leaf cells mostly unipapillose.
  - Plants 2-3-pinnate, mostly spreading and softer; E, NW

Paraphyllia smooth.

- Leaf cells either protrulose or with short and simple papillae; leaves lanceolate.
  - Stem and branch leaves uniform.
    - Leaf cells elongate, oblong-rhombic to oblong-linear.
      - Paraphyllia linear-lanceolate and numerous.
        - Capsules inclined, asymmetric; W
        - Capsules erect, symmetric; W, CO
        - Paraphyllia filiform and abundant; capsules inclined to horizontal and curved; WS*
        - Leaf cells short (isodiametric or nearly so, hexagonal to short-rhombic); W
**Group P7 – Plants with red stems**

Costa **long** and **double**.
- Stems with **paraphyllia**.
  - Plants **dendroid** (tree-like) on soil in wet, shady places; WS
  - Plants 2-3-pinnate with **stepwise** flat fronds; upper leaf cells **prorulose**; WS*
  - Stems **without** paraphyllia and irregularly branched; WS*

Costa **long** and **single**.
- Leaf margins +**revolute** throughout; alar cells **oval** to transversely **elongate**; W, NL
- Leaf margins **plane**; alar cells +**undifferentiated**; A/A, W

Costa **short & double**, or none.
- Leaves distinctly **falcate-secund**; WS
- Leaves squarrose to **squamose-recurved**; WS*
- Leaves **straight**.
  - Leaves with a **hyaline** tip; shoots **whitish** and +**julaceous** when dry; cells **papillose**; WS
  - Leaves with a **green** tip; leaf cells **smooth**.
    - Alar cells **inflated**, **hyaline** and thin-walled in distinct **auricles**; WS (N)
    - Alar cells **short-oblong** with **thick orange** walls; WS

**Group P8 – Plants with shoots flat on top and appearing “braided”**

Costa **single** and **narrow**; pseudoparaphyllia present.
- Cells **prorulose** on leaf back; regularly 1-pinnate; leaves serrulate all around; E, AK, BC
- Cells **smooth**; closely 1-pinnate in feather-like fronds; leaf tips serrulate; WS*

Costa **short** and **double**, or none; pseudoparaphyllia usually present.
- Alar cells in transverse rows and inflated; leaves sharply serrulate above; E, BC, WA
- Alar cells in triangular areas, inflated or not; leaves entire to serrulate; WS

**Group P9 – Leaves undulate or rugose (irregular undulations)**

Leaves with a **double** costa of intermediate length; leaves **plicate** below, **rugose** above; NW

Leaves with a **narrow**, **single** costa.
- Leaves **undulate** and asymmetric; shoots **complanate**; **paraphyllia** on stems; W
- Leaves **rugose**; shoots **round**; paraphyllia lacking.
  - Leaf cells **prorulose**; WS*

Leaves with a **short & double** costa, or none.
- Plants **julaceous** and growing in wet (submerged) areas; WS
- Plants **not** julaceous; leaves **complanate & undulate**; on rocks or trees; WS*

**Group P10 – Leaves dimorphic (two forms on the same axis)**

Smaller leaves (amphigastria) on the **ventral** (lower) side of stem in a **single** row; FL, BC, AK
Group P11 – Leaves with awns, hair-points or hyaline apices

Leaves with a narrow, single costa.
- Leaf cells papillose; creeping on tree bark or rock; W, AK
- Leaf cells smooth.
  - Cell walls nodulose (wavy) throughout; WS
  - Cell walls straight.
    - Leaf apex flat, filiform and serrate; leaves abruptly acuminate; N* (S to NC)

Leaves with a short, double costa or none; apex hyaline or abruptly contracted to long setaceous point.
- Leaf cells papillose; leaf apex hyaline.
  - Leaf cells unipapillose on both sides; WC
  - Leaf cells with 1 or more, simple to forked papillae; WS
  - Leaf cells smooth, leaf apex hyaline or yellow.
    - Leaf apex yellow; alar cells inflated and hyaline; BC
    - Leaf apex hyaline; alar cells undifferentiated; leaves appressed, NW, OR

Claopodium†
Racomitrium†
Cirriphyllum
Pseudobraunia californica
Hedwigia ciliata
Wijkia carlottae
Iwatsukiella leucotricha

Group P12 – Plants thread-like (leaves <1mm)

Leaves to 1 mm; costa variable; cells rounded-elliptic; pseudoparaphyllia lanceolate; N,W
Leaves 0.15-0.5 mm; costa none or short and double; cells rhombic; paraphyllia none; WS

Pseudoleskeella
Platydictya

Group P13 – Costa double and more than 1/3 leaf length

Note: see Group 20 also for several of these mosses where costa form is variable within a single plant.

Costa 1/3-2/3 the leaf length with branches of +equal length.
- Leaf cells prorulose.
  - Stems red.
    - Plants regularly 2-3-pinnate with stepwise flat fronds; WS*
      - Plants irregularly branched; leaves plicate with broad flat tip; WS*
        - Stems green; plants loosely pinnate; leaves decurrent; costa variable; WS(N)
  - Leaf cells smooth.
    - Paraphyllia often few and inconspicuous; leaves decurrent and dimorphic; W
      - Paraphyllia lacking.
        - Leaves spinulose-serrate all around and decurrent; NE, N
        - Leaves entire to somewhat serrulate; costa often variable.
          - Leaves slenderly long decurrent; costa branches often unequal; WS
            - Leaves not distinctly decurrent.
              - Alar cells subquadrate and slightly porose; in rich, open fens; N
                - Alar cells quadrate or inflated; on rocks in mountain streams; WS
                  - Alar cells thick walled, porose; plants irregularly branched; AK

Hylocomium splendens
Hymenophyllum triquetrum†
Heterocladium dimorphum†
Heterocladium procurrens†
Hylocomiastrum umbratum†
Plagiothecium†
Pseudocalliergon turgescens
Hygrohypnum†
Rhytidiadelphus japonicus†
**Group P14 – Costa single and narrow; leaves with distinct decurrencies**

Leaf cells *pleuripapillose*; decurrencies broad to *auriculate*.

Costa to *mid*-leaf (forked/shorter); leaf margins *serrulate*; leaves *dimorphic*; W, SE  
*Heterocladium macounii*†

Leaf cells *smooth* or indistinctly ornamented.

Plants large and *dendroid*; leaf tips *rounded* and sometimes apiculate; NW  
*Pleuroziopsis ruthenica*

Plants *arching* and + regularly pinnate; leaf apical cells *shorter* than medial cells; W  
*Eurhynchium*†

Plants *neither* dendroid, arching-pinnate, nor complanate; apical cells *similar* in size to medial cells.

Leaves *smooth* with plane or twisted apices; cells mostly >4:1; WS  
*Brachythecium*†

---

**Group P15 – Costa single and narrow; leaves with a distinct marginal border**

Leaves bordered with *cilia* at leaf *base only*; paraphyllia *filiform* and abundant; WS*  
*Helodium*†

Leaves bordered with *linear* cells; leaf margins *serrulate* to *serrate*.

Leaf margins *serrulate* to *serrate*.

Shoots *round*; leaves *plane* with *multistratose* borders.

Leaves + *lanceolate* and acuminate with *serrate, unistratose* marginal cells; OR  
*Limella fryei*

Leaf margins *entire*; on rocks and tree trunks.

Border extends to near leaf *apex*; cells *intermediate* in length; BC, CA  
*Daltonia splachnoides*
Group P16 – Costa single and narrow; leaves with distinct alar cells

Alar cells inflated and hyaline, or yellow.
Paraphyllia present.
Stem leaves plicate; paraphyllia filamentous and abundant; WS
Stem leaves plane; paraphyllia foliose and either abundant or few; WS*
Paraphyllia lacking; leaves broadly rounded at tip.
Leaves with an apiculus; plants reddish; A/A
Leaves without an apiculus; alar cells thin-walled; in fens and swamps; N
Leaves acuminate or bluntly acute, falcate-second.

In fens or other nutrient rich waters.

Alar cells numerous in large conspicuous groups; WS*
On rocks in or along streams; alar cells subquadrate to oblong; WS
Leaves straight.

Leaves narrowed to long, channeled acumen; WS*
Leaves ovate-lanceolate and narrowed to an acumen; WS*
Leaves acuminate; alar cells often in broad decurrencies; WS

Group P16

Alar cells small and subquadrate.
Leaves +broadly oblong-ovate.
Shoots +julaceous.
Leaves abruptly apiculate; plants erect; in lawns and gardens; WC, NY
Leaves rounded to acute; plants prostrate; on rocks in or along streams; WS
Leaves ovate to ovate-lanceolate.

Leaf margins serrate above.
Branching pinnate to bipinnate (frondose); medial cells \( \leq 2:1 \) (±isodiametric); CA
Branching irregular to sub-pinnate; medial cells >2:1; WS(WC & SA)

Leaf margins entire to serrulate.
Leaves +lanceolate; shoots not julaceous; plants prostrate.
Leaves narrowed to long, channeled acumen and +squarrose-recurved; WS*
Leaves and cells lacking any of the above unique characters.

Alar cells symmetrically arranged; WS

Group P17 – Costa short and double, or none; leaves with distinct decurrencies

Leaf cells 1-4 papillose; costa variable, usually single/forked; leaves dimorphic; W, SE
Leaf cells smooth; costa short and double, or about 1/2 leaf length

Leaf margins serrulate to serrate all around; alar cells abruptly inflated; WS*
Leaf margins entire or with serrulate tips.
Alar cells abruptly inflated; AK
Alar cells poorly differentiated; WS

Group P17

Heterocladium macounii†
Herzogiella striatella†
Herzogiella adscendens†
Plagiothecium
Group P18 – Costa short and double, or none; leaves bordered

No relevant genera on the West Coast.

Group P19 – Costa short and double, or none; leaves with distinct alar cells

Alar cells inflated, and hyaline or yellow.

Leaves distinctly falcate-secund.

- Plants regularly pinnate, feather like; flat oblong, triangular fronds; WS* Ptilium crista-castrensis
- Plants irregularly pinnate to unbranched. Ptilium crista-castrensis
- Plants in calcareous wet areas; leaves concave and apiculate; WS* Scorpidium scorpioides
- Plants on rocks in mountain streams or wet places; leaves ovate and concave; WS Hygrohypnum
- Plants in other habitats.
  - Stems with a hyalodermis; alar cells in large, almost decurrent areas; WS Hypnum
  - Stems lacking a hyalodermis; leaf apices serrate to serrulate.
    - Alar cells subquadrate and in +triangular group; apices serrate; SE Heterophyllium
    - Alar cells oblong and in +triangular group; apices serrulate; E, NW Brotherella
    - Alar cells few with short-oblong cells above; apices serrulate; WS Hypnum

Leaves homomallous; alar cells abruptly and strongly inflated as "bubble" cells; E, CA Sematophyllum

Leaves neither falcate-secund nor homomallous.

- Stem leaves contracted to a long, yellow, setaceous point; BC Wijkia carlottae
- Stem leaves without a setaceous point, acute, acuminate or apiculate.
  - Leaves squarrose-recurved; alar cells oblong and +inflated; WS* Rhytidiadelphus squarrosus†
  - Leaves erect to spreading; alar cells hyaline.
    - Plants erect; stems with a hyalodermis; alar cells in auricles; WS Calliergonella cuspidata
    - Plants prostrate; alar cells not in auricles.
      - Cells at leaf insertion enlarged in 1 or 2 distinctive rows.
        - Alar cells not rounded to the insertion.
          - Alar cells strongly inflated as "bubble" cells; setae ~3 cm; E Sematophyllum
          - Cells at leaf insertion not in a distinctive row; leaves >1mm.
            - Leaves serrulate throughout and decurrent; alar cells thin-walled; WS* Herzogiella

Alar cells quadrate to short oblong.

Continued below at left margin
Alar cells **quadrate** to **short** oblong.

Leaves distinctly **secund** or **falcate-secund**; leaf cells **smooth**.

Plants with clusters of axillary **brood branchlets** at tips of erect branches; WS*  
**Platygyrium**

Plants **without** brood bodies.

Leaves **ovate** and **concave**; plants of wet places and in mountain streams; WS  
**Hygrohypnum**

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

Costa **shorter** with branches **joining** at the base; pseudoparaphyllia common; WS  
**Hypnum**

Leaves **straight** or indistinctly falcate-secund.

Leaves **wide-spreading** to squarrose-recurved and with a long, **channeled acumen**; WS*  
**Campylium**†

Leaves **flattened** into one plane, i.e., shoots **complanate**.

Leaves serrulate **throughout**; stem **hyalodermis** present; WS*  
**Herzogiella turfacea**

Leaves serrulate in **upper half**; stem hyalodermis **lacking**; E, CA  
**Isopterygium tenerum**

Leaves **+concave** and **imbricate**, i.e., shoots **+julaceous**.

Stems **red**; leaf apical cells **undifferentiated**; alar cell walls **thick** and **orange**; WS  
**Pleurozium schreberi**

Stems **green**; leaf apical cells **short**; alar cell walls **thin** and **colorless**; SE  
**Taxiphyllum cuspidifolium**†

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

Branches strongly **curved** when dry; straight when moist.

Leaf cells **>5:1**; **5-20** quadrate alar cells at the **basal angles**; WS*  
**Pylaisiella**

Branches **loosely curved** when dry.

Plants with clusters of axillary **brood branchlets** at tips of erect branches; WS*  
**Platygyrium**

Plants **lacking** brood branchlets; stems with numerous **paraphyllia**; WC  
**Alsia californica**

Branches **+straight** when dry.

Stems with numerous **paraphyllia**; WC  
**Alsia californica**

Stems **without paraphyllia**.

Leaves **<1 mm**; minutely **pleuripapillose**; CO, AK, CA  
**Leptopterigynandrum austro-alpinum**

Leaves **>1 mm**.

Leaf cells **prorulose**; alar cells **transversely** elongate; WC  
**Pterogonium gracile**

Leaf cells **smooth**.

Alar cells extending up the margins for **<1/6** of leaf length.

Leaves **acuminate**.

Stem leaves **serrulate** throughout; WS*  
**Herzogiella seligeri**

Stem leaves **entire** and somewhat decurrent; WC  
**Tripterocladium**
Group P20 – Costa of uncommon or variable form

Costa of **uncommon** form.
- Costa **single** with several minor basal, **supplementary** costae; stems **red**; W, NL  
  **Antitrichia**
- Costa **single** with a **forked** tip (Y-shaped); CO, AK, CA  
  **Leptopterigynandrum austro-alpinum**

Costa **variable** on **same plant** (single or double or variations of these in different leaves).
- Costa **usually variable** (double, double with a long branch, Y-shaped, single, forked or short and double).
  - Found on **rocks** or **wet** places in **mountain** streams; WS  
    **Hygrohypnum**
  - Found on **trees** near coast; plants with many paraphyllia; WC  
    **Alsia californica**
- Costa **mostly double** (1/3-2/3 leaf length), but sometimes single or short and double.
  - Stems loosely **pinnate**; leaves **dimorphic** and **decurrent**; on soil, rock and trees; WS(N)  
    **Heterocladium**
  - Stems **scarce**ly branched; leaves **neither** **dimorphic** nor **decurrent**; fens; N  
    **Pseudocalliergon turgescens**

Costa **mostly single** within the genus or the given species.
- Costa rarely to often **forked** (with or without a spine), Y-shaped or with lateral **spurs**.
  - Plants **large** and ±robust; stem leaves typically >2 mm.
    - Leaves **serrulate** to near base with **short** and **broad** apical cells; WS  
      **Platyhypnidium riparioides**
    - Leaves **entire**, broad, concave and with apical cells **similar** to medial cells.
      - Leaves abruptly **apiculate** (reflexed); **weedy** habitats; WC, NY  
        **Pseudoscleropodium purum**
      - Leaves **rounded** to bluntly acute; plants of **fens** and **swamps**; N  
        **Calliergon**
  - Plants **medium** in size; stem leaves typically 1-2 mm.
    - Leaf margins strongly **serrate**; alar cells distinct and **quadrat**e; E, WC  
      **Isothecium**
    - Leaf margins **entire**; costa occasionally Y-shaped; in bogs; WS*  
      **Drepanoclados simplicissimus**
  - Plants **small** and **slender**; stem leaves <1 mm; W, SE
    **Heterocladium macounii**
- Costa occasionally to frequently **short** and **double**.
  - Leaf margins **serrulate**; leaves **decurrent**; W, SE
  - Costa **mostly short** and **double** within the genus or the given species.
  - Costa often **double** with one or both branches to 1/2 leaf length.
    - Leaves **decurrent**; leaf margins mostly entire; WS  
      **Plagiothecium**
    - Leaves **not decurrent**.
      - Leaf margins **serrulate** to **dentate**; branches **terete** (round); E  
        **Myurella siberica**
  - Costa occasionally to often **single**.
    - Plants **thread-like**; leaves to 1 mm; N, W
      **Pseudoleskeella tectorum**

**Note:** Only the genera in **normal** type (NOT in brackets) in the Skeleton to Freely Branched Mosses are included in the following Groups.

**Reminder:** Definitions for cell length to breadth ratios are found in the Introduction, the Overview and at the end of this section. An expanded explanation of the difference between "Distinct" and "Indistinct" surface ornamentation is found in the Introduction.
Group P21 – Cells long (>8:1), distinctly papillose or prorulose

Leaf cells prorulose; WS*

Group P21

Homalothecium†

Group P22 – Cells long, smooth or indistinctly ornamented#; costa single (long and narrow)

Shoots curved-ascending when dry; leaves plicate; WS*

Shoots julaceous; leaves obtuse or acute; plants in or near streams; W

Shoots complanate.

Leaves serrulate throughout with twisted tips; in mesic habitats; WS*

Leaves entire and wide spreading.

Leaves distant; alar cells few and short-to-long rectangular; WS

Shoots triangular; leaves keeled, 3-ranked and slenderly acuminate; in wet places; WS*

Shoots lacking any of the above unique characteristics.

Plants large and pinnately branched; basal cells porose.

Shoots erect; leaves deeply plicate; W

Shoots prostrate to arching; leaves plane; W

Plants with irregular branching; leaves spreading and lanceolate.

Cells at branch leaf apex much shorter than median cells; costa ending in spine.

Plants aquatic (on rocks in flowing water); branch leaves 1.2 mm or longer; WS

Plants on moist humic soil; branch leaves <1.2 mm; WS

Cells at apex similar to medial cells; costal spine or tooth present or absent.

Costa distinct; brood bodies lacking; WS

Costa indistinct at mid-leaf; gemmae or rhizoids often at back of costa; WS

# Cells with low papillae or short projections.

Group P23 – Cells long, smooth or indistinctly ornamented#; costa double (long or short) or none

Leaves with a short, double costa or none.

Plants aquatic, submerged part of year; cells not porose; leaves keeled or flat; WS

Plants not aquatic.

Rhizoids papillose; stem hyalodermis well or moderately developed.

Alar cells inflated or quadrate; leaves serrate throughout; WS*

Alar cells undifferentiated; leaves entire; WS*

Rhizoids smooth; stem hyalodermis lacking.

Leaf apical cells shorter than medial cells; pseudoparaphyllia foliaceous; E, SW

Leaf apical cells similar to medial cells in length.

Alar cells quadrate; pseudoparaphyllia filamentous; E, CA

Alar cells undifferentiated; pseudoparaphyllia lacking.

Leaves complanate and serrate above; brood bodies often present; WS

# Cells with low papillae or short projections.
Group P24 – Cells intermediate (3-8:1), distinctly papillose or prorulose

Leaf cells prorulose.

Costa long and single; paraphyllia abundant; on rocks in mountains; W, CO
Costa short and double; plants small and creeping.

Plants dull; axillary brood bodies present; cells thick-walled; WS*

Lescuraea†

Group P24

Group P25 – Cells intermediate, smooth or indistinctly ornamented#; costa single and narrow

Leaves falcate-secund.

Leaves keeled, 3-ranked, slenderly acuminate; plants periodically submerged; WS*

Leaves plicate; capsules short and asymmetric; plants of upland habitats; WS

Dichelyma

Group P25

Plants dull; axillary brood bodies present; cells thick-walled; WS*

Lescuraea†

Group P24

Plants on tree trunks; plants small to very small.

Plants with serrulate margins and long-acuminate apices; branches julaceous; WS

Fabronia

Plants on soil in mesic to wet habitats.

Plants with julaceous shoots; leaves broadly ovate and concave.

Plants reddish; stem tips cuspidate; leaf tips often apiculate; A/A

Sarmenthypnum sarmentosum

Stems red; main stems not julaceous; leaf margins revolute throughout; W, NL

Antitrichia

Stems green; leaf margins plane or recurred below; median leaf cells <8:1; W

Scleropodium

Plants not julaceous.

Leaves broadly oblong to ovate, concave and with rounded to cuculate apices.

Leaves with serrulate margins and long-acuminate apices; branches julaceous; WS

Scleropodium

Apical cells much shorter than median cells; costa ending in a spine; WS

Eurhynchium†

Costa percurent to excurrent.

Costa very wide (75-140µ); leaf margins entire; WS

Hygroamblystegium†

Costa narrow (<35µ); leaf margins serrulate to serrate above; WS

Brachythecium†

Costa 1/2 to 3/4 leaf length.

Leaf margins serrulate above to throughout.

Cells 3-5:1; capsules cylindric and yellowish; WS

Amblystegium serpens†

Cells >5:1; capsules oblong-ovoid and reddish; WS

Brachythecium†

Leaf margins entire.

Leaves wide-spreading; capsules cylindric and yellowish; WS

Leptodictyum†

Leaves erect; capsules oblong-ovoid and reddish; WS

Brachythecium†

Plants erect on forest litter, large and pinnately branched; leaves deeply plicate; W

Trachybryum megaptilum

# Cells with low papillae or short projections.
**Group P26 – Cells intermediate (3-8:1), smooth or indistinctly ornamented**

---

**Group P26**

Plants growing in *aquatic* habitats.
- Plants **trailing** from a single attachment point in flowing water; leaves keeled or flat; WS

Plants **not** trailing from a single attachment point.
- Plants **large** and **sparsely** branched; foliose *pseudoparaphyllia*; in fens; N
- Plants **medium & freely** branched; cells lax, **translucent & empty** looking; FL, CA

Plants growing in *terrestrial* habitats; plants small to medium in size.
- Leaves **dimorphic** (stem vs. branch) and **decurrent**; costa 1/3-1/2 leaf length; W
- Leaves of stem **straight**, with a long **setaceous** point; on trees; AK, BC

---

**Group P27 – Cells short (<3:1) and distinctly papillose or prorulose**

---

**Group P27**

Leaf cells **pleuripapillose** (1-5 papillae per cell).
- Cells **nodulose** (wavy) throughout the leaf; WS
- Cells **neither nodulose nor** porose.
  - Leaf margins **entire** to **serrulate** throughout; basal, interior cells **not** pellucid.
    - Stems **papillose**; costa **variable**; W, SE
    - Stems **smooth**; costa **not** variable; W, AK

Leaf cells strictly **unipapillose**.
- Costa **long and single**.
  - Leaf margins **serrulate to serrate** throughout; costa **pellucid**; W, AK
  - Leaf margins **entire** to subserrulate above; costa **opaque** and often **flexuose** above; E, OR
  - Costa **short and double** or none; leaf margins dentate to **spinulose-dentate**; E

Leaf cells **prorulose** at back, especially at upper ends of leaves.
- Leaves strongly **dimorphic** (stem and branch leaves dissimilar); WS(N)
- Leaves **not** dimorphic; costa **short and double or none**.
  - Branches **junaceous**; leaves **rounded-ovate** and **obtuse**; WS(N)
**Group P28 – Cells short (≤3:1) and smooth or indistinctly ornamented**

Costa long and **single**.

Shoots usually with dense **clusters** of axillary brood **branchlets**; often on bark; WS

Shoots **lacking** brood branchlets.

Leaf apices **acute** to **acuminate**.

Leaf cell walls **sinuose to nodulose** (wavy edges); WS

Leaf cell walls **straight**.

Upper leaf cells **>2:1**; basal cells at insertion usually **enlarged** and **yellowish**.

Costa **>35μ** at base; yellowish cells usually in 2-3 rows; WS

Costa **<35μ** at base; yellowish cells usually in a **single** row; WS

Upper leaf cells **1-2:1**.

Costa **subpercurrent** (>2/3 the leaf length).

Costa stout & **toothed** at back; leaves **serrate** above; shoots **+bipinnate**; CA

Costa **+straight**; leaves **+entire**; cells **obscurely papillose**; E, OR

Costa **shorter** (1/3 – 2/3 the leaf length).

Leaf apex **obliquely asymmetric**; periodically **flooded** bark; NW, NB

Costa **short** and **double** or none.

Shoot **+julaceous**; leaves **ovate** with an **apiculus**; arctic-alpine; NW

Shoots usually **+complanate**; leaves **+acuminate**; cells **lax** and **translucent**; FL, CA

Shoots **neither** julaceous **nor** complanate; stem leaves with a **setaceous** point; NW

**Leskeella nervosa**

**Racomitrium**

**Hygroamblystegium tenax**†

**Amblystegium varium**†

**Bestia longipes**

**Leskea**†

**Myrinia pulvinata**

**Myurella tenerrima**†

**Vesicularia vesicularis**

**Iwatsukiella leucotricha**

# Cells with low papillae or short projections.

---

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

Length to breadth **ratios** of medial, laminal cells:

**Long** cells: >8:1; commonly termed linear or linear-flexuose.

**Intermediate** cells: 3-8:1; commonly termed elongated, oblong-rhomboidal, fusiform., or elliptical.

**Short** cells: <3:1; commonly termed isodiometric, square, rounded-square, or rhombic.