

Skeleton to Freely Branched (mostly pleurocarpous) Mosses

Revised through 16 November 2009

Reminder: a dagger (†) indicates that not all of the species within the given genus have the character(s) defining that Group.

Group P1 – Shoots strongly flattened (complanate) or angular

<i>Brachelyma</i>	<i>Homalia</i>	<i>Neckera</i>	Group P1
<i>Brotherella</i>	<i>Homaliadelphus</i>	<i>Neckeropsis</i>	
<i>Callicladium</i>	<i>Hookeria</i>	<i>Plagiothecium</i> †	
<i>Callicostella</i>	<i>Isopterygiopsis</i>	<i>Porotrichum</i>	
<i>Cyclodictyon</i>	<i>Isopterygium</i>	<i>Pseudotaxiphyllum</i>	
<i>Entodon</i> †	<i>Lepidopilum</i>	<i>Racopilum</i>	
<i>Fontinalis</i> †	<i>Leptodictyum</i> †	<i>Stereocleus</i>	
<i>Herzogiella</i> †	<i>Metaneckera</i>	<i>Taxiphyllum</i>	

Group P2 – Shoots julaceous (especially when dry) - shoots round with crowded, overlapping and appressed leaves

<i>Antitrichia</i> †	<i>Leucodon</i> †	<i>Pterogonium</i>	Group P2
<i>Bryoandersonia</i>	<i>Myurella</i> †	<i>Scleropodium</i> †	
<i>Cryphaea</i>	<i>Plagiobryum</i>	<i>Scorpidium</i>	
<i>Entodon</i> †	<i>Pseudoscleropodium</i>	<i>Thelia</i>	
<i>Hedwigia</i>			

Group P3 – Leaves spreading at right angles (suarrose) or squarrose-recurved

<i>Campylium</i> †	<i>Rhytidiadelphus</i>	Group P3
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Group P4 – Plants with erect branches from a creeping stem

<i>Bestia</i>	<i>Groutiella</i>	<i>Macromitrium</i>	Group P4
<i>Drummondia</i>	<i>Jaegerina</i>	<i>Neomacounia</i>	
<i>Forsstroemia</i>	<i>Macrocoma</i>	<i>Schlotheimia</i>	

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

Group P5

<i>Brachythecium</i> [†]	<i>Hygrohypnum</i> [†]	<i>Pylaisiadelpha</i>
<i>Brotherella</i>	<i>Hypnum</i>	<i>Rhytidiopsis</i>
<i>Ctenidium</i>	<i>Limprichtia</i>	<i>Rhytidium</i>
<i>Dichelyma</i>	<i>Loeskypnum</i> [†]	<i>Sanionia</i>
<i>Drepanocladus</i> [†]	<i>Palustriella</i>	<i>Scorpidium</i>
<i>Gollania</i>	<i>Platygyrium</i>	<i>Sematophyllum</i>
<i>Hamatocaulis</i>	<i>Ptilium</i>	<i>Warnstorfia</i>
<i>Heterophyllum</i>	<i>Pylaisiella</i>	

Group P6 – Plants with paraphyllia or tomentum on stem

Group P6

<i>Abietinella</i>	<i>Helodium</i>	<i>Pseudoleskea</i>
<i>Alsia</i>	<i>Hylocomiastrum</i>	<i>Rauiaella</i>
<i>Bryohaplocladium</i>	<i>Hylocomium</i>	<i>Rhytidiopsis</i>
<i>Climacium</i>	<i>Lescuraea</i>	<i>Thelia</i>
<i>Cratoneuron</i>	<i>Loeskeobryum</i>	<i>Thuidium</i>
<i>Cyrto-hypnum</i>	<i>Metaneckera</i>	<i>Tomentypnum</i>
<i>Dendroalsia</i>	<i>Palustriella</i>	

Group P7 – Plants with red stems

Group P7

<i>Antitrichia</i>	<i>Hylocomium</i>	<i>Plagiobryum</i>
<i>Calliergonella</i>	<i>Hypnum</i>	<i>Pleurozium</i>
<i>Climacium</i>	<i>Loeskeobryum</i>	<i>Rhytidiadelphus</i>
<i>Hedwigia</i>		

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

Group P8

<i>Brotherella</i>	<i>Hypnum</i> [†]	<i>Ptilium</i>
<i>Ctenidium</i>		

Group P9 – Leaves undulate or rugose (irregular undulations)

Group P9

<i>Metaneckera</i>	<i>Rhytidiopsis</i>	<i>Schlotheimia</i> [†]
<i>Neckera</i> [†]	<i>Rhytidium</i>	<i>Scorpidium</i>

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

Group P10

<i>Hypopterygium</i>	<i>Racopilum</i>	
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Group P11 – Leaves with awns, hair-points, or hyaline apices

		Group P11
<i>Braunia</i>	<i>Hedwigia</i>	<i>Racomitrium</i> [†]
<i>Cirriphyllum</i>	<i>Iwatsukiella</i>	<i>Wijkia</i>
<i>Claopodium</i> [†]	<i>Pseudobraunia</i>	<i>Zelometeorium</i>

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

		Group P12
<i>Homomallium</i>	<i>Platydictya</i>	<i>Pseudoleskeella</i>

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

		Group P13
<i>Callicostella</i>	<i>Hylocomiastrum</i> [†]	<i>Plagiothecium</i> [†]
<i>Cyclodictyon</i>	<i>Hylocomium</i>	<i>Pseudocalliergon</i>
<i>Heterocladium</i> [†]	<i>Lepidopilum</i>	<i>Rhytidiadelphus</i> [†]
<i>Hygrohypnum</i> [†]	<i>Loeskeobryum</i>	<i>Trachyxiphium</i>

Group P14 – Costa single and narrow; leaves with distinct decurrencies

		Group P14
<i>Anomodon</i> [†]	<i>Bryhnia</i>	<i>Heterocladium</i> [†]
<i>Brachythecium</i> [†]	<i>Eurhynchium</i> [†]	<i>Pleuroziopsis</i>

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

		Group P15
<i>Brachelyma</i>	<i>Helodium</i> [†]	<i>Platylomella</i>
<i>Daltonia</i>	<i>Limbella</i>	<i>Thelia</i>
<i>Groutiella</i>		

Group P16 – Costa single and narrow; leaves with distinct alar cells

		Group P16
<i>Bestia</i>	<i>Drepanocladus</i>	<i>Loeskypnum</i>
<i>Brachythecium</i>	<i>Entodontopsis</i>	<i>Palamocladium</i>
<i>Calliergon</i>	<i>Forsstroemia</i> [†]	<i>Palustriella</i>
<i>Campylium</i> [†]	<i>Hygrohypnum</i>	<i>Pseudoscleropodium</i>
<i>Clasmatodon</i>	<i>Isothecium</i>	<i>Sarmenthypnum</i>
<i>Cratoneuron</i>	<i>Lindbergia</i>	<i>Stereophyllum</i>

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

		Group P17
<i>Herzogiella</i> [†]	<i>Heterocladium</i> [†]	<i>Plagiothecium</i>

Group P18 – Costa short and double, or none; leaves bordered

		Group P18
<i>Groutiella</i>	<i>Thelia</i>	

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

Group P19

<i>Acroporium</i>	<i>Herzogiella</i> †	<i>Ptilium</i>
<i>Alsia</i>	<i>Heterophyllum</i>	<i>Pylaisiadelpha</i>
<i>Brotherella</i>	<i>Hygrohypnum</i>	<i>Pylaisiella</i>
<i>Callicladium</i>	<i>Hypnum</i>	<i>Rhytidiadelphus</i> †
<i>Calliergonella</i>	<i>Isopterygium</i>	<i>Scorpidium</i>
<i>Campylium</i> †	<i>Leptopterigynandrum</i>	<i>Sematophyllum</i>
<i>Donnellia</i>	<i>Leucodon</i>	<i>Taxiphyllum</i> †
<i>Entodon</i>	<i>Platygyrium</i>	<i>Tripterocladium</i>
<i>Forsstroemia</i> †	<i>Pleurozium</i>	<i>Wijkia</i>
<i>Gollania</i>	<i>Pterogonium</i>	

Group P20 – Costa of uncommon or variable form

Group P20

<i>Alsia</i>	<i>Hygrohypnum</i>	<i>Platyhypnidium</i> †
<i>Antitrichia</i>	<i>Isothecium</i>	<i>Pseudocalliergon</i>
<i>Calliergon</i>	<i>Jaegerina</i>	<i>Pseudoleskeella</i> †
<i>Drepanocladus</i> †	<i>Leptopterigynandrum</i>	<i>Pseudoscleropodium</i>
<i>Donrichardsia</i>	<i>Myurella</i> †	<i>Taxiphyllum</i>
<i>Forsstroemia</i> †	<i>Neomacounia</i>	<i>Thelia</i> †
<i>Heterocladium</i> †	<i>Plagiothecium</i>	

Note: In the following Groups, all possible genera are listed to give perspective on the Freely branched mosses. Only the genera **NOT in brackets** [--] are keyed out in Groups P21-P28; the genera in brackets should be identifiable using the criteria characteristic of the previous Groups.

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

Group P21 – Cells long (>8:1); distinctly papillose or prorulose

Group P21

<i>Bryhnia</i> †	<i>Chryso-hypnum</i>	<i>Homalothecium</i> †
[<i>Hylocomium</i>]	[<i>Rhytidium</i>]	[<i>Taxiphyllum</i>]

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

		Group P22
<i>Brachythecium</i> [†]	<i>Homalotheciella</i>	<i>Scleropodium</i> [†]
<i>Conardia</i>	<i>Homalothecium</i> [†]	<i>Stereocleus</i>
<i>Dichelyma</i>	<i>Leptodictyum</i> [†]	<i>Stereophyllum</i> [†]
<i>Eurhynchium</i>	<i>Platyhypnidium</i>	<i>Trachybryum</i>
[<i>Bryoandersonia</i>]	[<i>Entodontopsis</i>]	[<i>Pleuroziopsis</i>]
[<i>Calliargon</i>]	[<i>Hamatocaulis</i>]	[<i>Pseudoscleropodium</i>]
[<i>Campylium</i>]	[<i>Hygrohypnum</i>]	[<i>Sanionia</i>]
[<i>Cirriphyllum</i>]	[<i>Limbella</i>]	[<i>Sarmenthypnum</i>]
[<i>Drepanocladus</i>]	[<i>Limprichtia</i>]	[<i>Warnstorfia</i>]
[<i>Entodon</i>]	[<i>Loeskypnum</i>]	

Cells indistinctly papillose, i.e., low papillae or projections.

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

		Group P23
Costa long and double		
<i>Loeskeobryum</i>		
[<i>Hylocomiastrum</i>]	[<i>Rhytidiadelphus</i>]	[<i>Trachyxiphium</i>]
Costa short and double, or none		
<i>Fontinalis</i>	<i>Isopterygium</i>	<i>Pseudotaxiphyllum</i>
<i>Herzogiella</i>	<i>Orthothecium</i>	<i>Taxiphyllum</i>
<i>Isopterygiopsis</i>		
[<i>Brotherella</i>]	[<i>Hylocomium</i>]	[<i>Pylaisiadelpha</i>]
[<i>Callicladium</i>]	[<i>Hypnum</i>]	[<i>Rhytidiadelphus</i>]
[<i>Calliargonella</i>]	[<i>Plagiothecium</i>]	[<i>Rhytidiopsis</i>]
[<i>Campylium</i>]	[<i>Pleurozium</i>]	[<i>Scorpidium</i>]
[<i>Gollania</i>]	[<i>Ptilium</i>]	[<i>Sematophyllum</i>]
[<i>Hygrohypnum</i>]		

Cells indistinctly papillose, i.e., low papillae or projections.

Group P24 – Cells intermediate (3-8:1); distinctly papillose or prorulose

Group P24

Papillose

Barbella
Henicodium

*Papillaria**Taxithelium*[*Antitrichia*][*Helodium*]**Prorulose**

Leptohyemium
Lescuraea[†]

*Pirella**Pterigynandrum*

[*Bryhnia*]
[*Ctenidium*]
[*Dendroalsia*]
[*Helodium*]

[*Hylocomium*]
[*Isothecium*]
[*Porotrichum*]

[*Pterogonium*]
[*Rhytidiadelphus*]
[*Rhytidium*]

**Group P25 – Cells intermediate; smooth or indistinctly ornamented[#];
costa single (wide or narrow)**

Group P25

Costa wide[*Donrichardsia*]**Costa narrow**

Amblystegium[†]
Anacamptodon
Brachythecium[†]
Dichelyma
Eurhynchium

Fabronia
Hygroamblystegium[†]
Leptodictyum[†]
Myuroclada
Pirella

Pseudocryphaea
Sarmenthyllum
Scleropodium
Trachybryum

[*Brachelyma*]
[*Callierygon*]
[*Campylium*]
[*Climacium*]
[*Conardia*]
[*Cratoneuron*]
[*Daltonia*]
[*Drepanocladus*]
[*Forsstroemia*]

[*Hamatocaulis*]
[*Homalia*]
[*Hygrohypnum*]
[*Jaegerina*]
[*Limprichtia*]
[*Metaneckera*]
[*Palamocladium*]
[*Palustriella*]

[*Plagiobryum*]
[*Porotrichum*]
[*Pseudoleskeella*]
[*Sanionia*]
[*Tomentypnum*]
[*Warnstorfia*]
[*Wijkia*]
[*Zelometeorium*]

[#] Cells indistinctly papillose, i.e., low papillae or projections.

**Group P26 – Cells intermediate; smooth or indistinctly ornamented[#];
costa double (long or short) or none**

Group P26

Costa long and double*Heterocladium*[†]*[Hylocomiastrum]***Costa short and double, or none***Acroporium**Iwatsukiella**Pseudocalliergon**Bryocrumia**Orthothecium**Vesicularia**Fontinalis**[Alsia]**[Homomallium]**[Platygyrium]**[Campylium]**[Hygrohypnum]**[Pseudoleskeella]**[Donnellia]**[Hypnum]**[Pylaisiella]**[Entodon]**[Neckera]**[Sematophyllum]**[Forsstroemia]**[Neomacounia]**[Tripterocladium]**[Heterocladium]**[Plagiothecium]**[Zelometeorium]**[Heterophyllum]**[Platydictya]*

Cells indistinctly papillose, i.e., low papillae or projections.

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

Group P27

Papillose*Anomodon**Haplohymenium**Lindbergia*[†]*Braunia**Heterocladium*[†]*Myurella*[†]*Claopodium**Leskea*[†]*Racomitrium**[Abietinella]**[Cyclodictyon]**[Pseudoleskea]**[Hedwigia]**[Cyrto-hypnum]**[Raiiella]**[Bryohaplocladium]**[Leptopterigynandrum]**[Thelia]**[Callicostella]**[Pseudobraunia]**[Thuidium]***Prorulose***Heterocladium*[†]*Schwetschkeopsis**[Dendroalsia]**[Porotrichum]*

Group P28 – Cells short; smooth or indistinctly ornamented[#]

Group P28

Costa single, long and narrow.

Amblystegium[†]
Bestia
Clasmatodon
Cryphaea[†]
Herpetineuron

Hygroamblystegium[†]
Leptodon
Leskea[†]
Leskeella

Lindbergia[†]
Myrinia
Racomitrium
Stereophyllum

[*Forsstroemia*]
 [*Groutiella*]
 [*Heterocladium*]
 [*Hypopterygium*]
 [*Isothecium*]

[*Macrocoma*]
 [*Macromitrium*]
 [*Neckeropsis*]
 [*Platylomella*]
 [*Porotrichum*]

[*Pseudoleskeella*]
 [*Racopilum*]
 [*Schlotheimia*]
 [*Thamnobryum*]

Costa short and double, or none.

Iwatsukiella

Myurella[†]

Vesicularia

[*Donnellia*]
 [*Drummondia*]
 [*Forsstroemia*]
 [*Homaliadelphus*]

[*Hookeria*]
 [*Lepidopilum*]
 [*Leucodon*]
 [*Neckeropsis*]

[*Platydictya*]
 [*Pseudoleskeella*]
 [*Sematophyllum*]

[#] Cells indistinctly papillose, i.e., low papillae or 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 isodiametric, quadrate, rounded-quadrate, or rhombic.

End.