***Sub-Guide to "Leafy" Liverworts***

*Revised through 23 July 2012*

***Group L1 – Leaves with ciliate lobes or margins***

**Group L1**

Leaves ciliate to the **base**, **3-4** lobed & +**transversely** inserted.

Lobes **7-14** cells long & **uniseriate** to base; underleaves **also** 7-14 cells long; WS *Blepharostoma*

Lobes **5-8** cells long & +**2 cells** broad at base; underleaves **2-3** cells long; SE *Telaranea*

Leaves ciliate to a **lamina** 1-4 cells high, **4-7** lobed & **succubous**; plants **2-3** pinnate; E *Trichocolea*

Leaves with ciliate **margins**.

Cilia around **entire** **margin** of leaves.

Shoots **1-2** pinnate; leaves **3**-**5** lobed with **long** cilia; WS *Ptilidium*

Shoots **not** pinnate; leaves **complicate**-**bilobed** with **short** cilia; AK *Ascidiota*

Cilia **restricted** to leaf bases.

Leaves **complicate**-**bilobed**; lobule a **tongue-shaped** lamina (+**parallel** to the stem); WS *Porella*†

Leaves with **3**-**4** shallow, +**cuspidate** lobes; +**ciliate** underleaves; WS *Barbilophozia*

Leaves **bilobed** & **lacking** cuspidate apices; underleaves **lacking**; SA *Acrobolbus*

***Group L2 – Leaves 3-4 lobed and/or distinctly toothed***

**Group L2**

Leaves with **3**-**4** **lobes** of +**uniform** size & shape.

Leaf sinuses extending **deep** into **basal** half of leaf.

Leaves deeply **bilobed** with lobes deeply **incised** in turn; AK & NT *Pseudolepicolea*

Leaves **3**-**4 lobed** to near base; lobes **2-3** cells wide; branching **pinnate**; WS *Kurzia*

Leaf sinuses **restricted** to **apical** half of leaf.

Leaves **incubous**.

Branching **dichotomous**; underleaves **small**; ventral **flagella** common; WS *Bazzania*

Branching **pinnate**; lobes strongly **incurved**; underleaves **similar** to leaves; WS *Lepidozia*

Leaves **succubous**.

Leaves with bases & underleaves +**ciliate**; lobes (**4**x) +**cuspidate**; WS *Barbilophozia*

Leaves & underleaves **lacking** cilia; lobes (**3**-**4**x) **not** cuspidate; WS *Lophozia*†

Leaves with **3** lobes **unequal** in size (two smaller); underleaves **lacking**; WS *Tritomaria*

Leaves with few to many +**sharp** **marginal** **teeth** that may vary in size & shape.

Leaves **complicate**-**bilobed**.

Lobes **elongate**, **parallel**-sided & directed in strongly **different** directions from *Diplophyllum*†

lobules; perianths +**terete**, sharply **plicate** & **contracted** to mouth; WS

Lobes **rotund** to ligulate & directed in **same** direction as lobules; perianths strongly *Scapania*†

**flattened**, **smooth** & with a **truncate** mouth; WS

Leaves **not** complicate bilobed.

Leaves with teeth deeply **incised** **lobes**; **underleaves** present.

Shoots with +**profuse**, **pinnate** branching; trigones **large** & +**confluent**; BC *Mastigophora*

Shoots +**unbranched**; trigones +**indistinct**; BC & NE *Chandonanthus*

Leaves **lacking** deeply incised lobes & underleaves; leaves "**pleated**" (a dorsal fold); WS *Plagiochila*†

***Group L3 – Leaves complicate-bilobed; "incubous"; underleaves large***

**Group L3**

Underleaves **double** the normal **number** (equal to number of leaves); FL *Diplaisiolejeunea*

Underleaves with **ciliate** margins; AK *Ascidiota*

Underleaves distinctly **bilobed** (sinus >1/4 of underleaf length).

Lobule a **helmet**-like sac (+**parallel** to the stem) on a **stalk**.

perianths **trigonous** & **flattened**.

Lobes +**apiculate**; stylus **lacking**; plants on **wet** rocks; a deep, **greasy** green; E *Jubula*

Lobes +**rounded**; **stylus** present; on **trees** & dry rocks; commonly **reddish**; WS *Frullania*

Lobule an inflated **pouch** (+**perpendicular** to the stem) along **posterior** edge of lobe;

stylus **lacking**; perianths **5**-**angled**.

Leaves with **marginal** **rhizoids**.

Leaves with scattered, laminal **ocelli**; trigones **lacking**; FL *Rectolejeunea*

Leaves **lacking** ocelli; walls with small **trigones** & intermediate **thickenings**; FL *Cheilolejeunea*

Leaves distinctly **acute** to **acuminate** to **apiculate**;

Leaves distinctly **falcate**; underleaf lobes **spreading** (divaricate).

Underleaf lobes **2-3** cells wide at base; ocelli **basal**; SE *Harpalejeunea*

Underleaf lobes **uniseriate**; ocelli **medial**; SE *Drepanolejeunea*

Leaves **not** falcate, but with **crenulate** margins; underleaf lobes **not** divaricate.

Underleaves **3**-**4**x the stem width; perianths **bluntly** keeled & **beak**-**less**; Fl *Taxilejeunea*

Underleaves **1.5**-**2**x the stem width; perianths **sharply** keeled with a **beak**; FL *Crossotolejeunea*

Leaves with +uniformly **rounded** apices.

Leaves with distinctive **ocelli**.

Leaves **elliptical** & **odiferous**; underleaf lobes **uniseriate** & **divaricate**; FL *Leptolejeunea*

Leaves with **brownish** cell walls & middle lamellae, and +**serrate** apices; GC *Ceratolejeunea*

Leaves **caducous** & with marginal **rhizoids**; ocelli **numerous**; FL *Rectolejeunea*

Leaves **lacking** any of the above unique characters; ocelli **few** (1-3); E *Lejeunea*

Leaves **lacking** ocelli.

Leaves strongly **convex** & **deflexed** apically; underleaves **3.5**-**4.5**x stem width *Hygrolejeunea*

& +**imbricate**; trigones **small**; oil bodies **numerous** & **small**; AK, NT

Leaves distinctly **crenulate**; underleaves **1.5**-**2**x stem width, **distant** & *Crossotolejeunea*

**crenulate**; trigones +**bulging**; oil bodies **few** & **large**; SE

Leaves +**olive/gray**-green & **opaque**; underleaves **3**-**5**x stem width; trigones *Cheilolejeunea*

+**bulging**; oil bodies **few** & **botryoidal**; lobular papillae **distal**; CP & SA

Leaves **lacking** the above unique characteristics; lobular papillae **proximal**.

Marginal cells +**17**-**19**µ; cell walls +**thin** & trigonous; lobular teeth +**one**-celled; *Lejeunea*

oil bodies + **numerous** & **small**; perianths **not** compressed; E

Marginal cells +**13**-**17**µ; cell walls +evenly **thick**; lobular teeth mostly *Rectolejeunea*

>**one**-celled; oil bodies +**few** & **large**; perianths **compressed**; CP & SA

Leaves commonly **broken** off(**caducous**) on normal or specialized stems.

*Continued below*

*Continued from Group L3 above*

Leaves commonly **broken** off(**caducous**) on normal or specialized stems.

Leaves +**olive**-green; lobules usually **inflated**; trigones usually **large**; *Cheilolejeunea*

lobular papillae **distal**; oil bodies **few** (1-4) & **large**; CP & SA

Leaves +**yellow**-green; lobules commonly **vestigial**; trigones **lacking**; *Rectolejeunea*

lobular papillae **proximal**; oil bodies **many** (4-8) & **small**; CP & SA

Lobules **not** inflated (**explanate**) or **reduced** to a small/minute basal fold (**vestigial**).

Lobules **explanate** &+**parallel** to the stem; on **trees** & rocks; commonly **reddish**; WS *Frullania*

Lobules **vestigial**, but tooth **elaborated** as a slender appendage +**parallel** to the stem; FL *Rectolejeunea*

Lobules **vestigial**, but tooth **not** elaborated as above.

Leaves obtusely angular to **apiculate** & **shiny** (dry); underleaves **3**-**4**x the *Taxilejeunea*

stem width & +**chordate**; perianths **bluntly** keeled & **beak**-**less**; Fl

Leaves with +uniformly **rounded** apices; underleaves **1**-**3.5**x the stem width &

**not** chordate; perianths **sharply** keeled with a **beak**.

Marginal cells +**17**-**19**µ; cell walls +**thin** & **trigonous**; lobular teeth +**one**-celled; *Lejeunea*

oil bodies +**numerous** & **small**; perianths **not** compressed; E

Marginal cells +**13**-**17**µ; cells +**opaque** with +evenly **thick** walls; lobular teeth *Rectolejeunea*

mostly >**one**-celled; oil bodies +**few** & **large**; perianths **compressed**; leaves

often **caducous**; CP & SA

Underleaves +**unlobed** (sinus <1/4 of underleaf length).

Lobule a **tongue-shaped** lamina (+**parallel** to the stem); WS *Porella*

Lobule an inflated **pouch** (+**perpendicular** to the stem) along **posterior** edge of lobe.

Leaves mostly **purplish** to **brownish** **black** from well-developed secondary pigments.

Leaves **squarrose** (wet) & **convolute** (dry); underleaves +**orbicular** & +**retuse**.

Secondary stems +**arching**; lobules **lacking** long marginal teeth; trigones*Mastigolejeunea*

**bulging**; **2**-**3** large **botryoidal** oil bodies/cell; GC

Secondary stems **not** +arching; lobules with **3**-**10 long**, marginal teeth; *Brachiolejeunea*

trigones **bulging**; oil bodies **numerous** & minute; FL

Leaves distinctly **falcate**; underleaves +**orbicular**; lobules with a **long**, **sharp** *Neurolejeunea*

apical tooth; trigones **distinct**; **2**-**4 large** oil bodies/cell; CP

Leaves **neither** squarrose, convolute **nor** distinctly falcate; underleaves +**reniform**; *Lopholejeunea*

lobules with a **minute** apical tooth; oil bodies **numerous** & small; CP

Leaves mostly **yellow** **brown**, +**squarrose** (wet) & **caducous**; underleaves +**orbicular**; *Acrolejeunea*

lobules with 3-8 **marginal** **teeth**; trigones **bulging**; oil bodies **numerous** & small; FL

Leaves mostly **green**; 2˚ stems +**arching**; underleaves +**retuse**; lobules with 2-3(6) *Caudalejeunea*

**marginal** **teeth**; trigones **bulging**; oil bodies **numerous** & minute; FL

Leaves **whitish** green; underleaves **reniform**; apical **lobular** **tooth** minute to *Leucolejeunea*

very long; **trigones** small to bulging; **one** large **botryoidal** oil body/cell; E

***Group L4 – Complicate-bilobed; "incubous"; underleaves lacking***

**Group L4**

Lobules >**1/3** the size of the lobes, **inflated** & **enclosed** by the **denticulate** lobes; orangish-red; NW *Pleurozia*

Lobules <**1/3** the size of the lobes; lobes **neither** enclosing **nor** denticulate.

Plants >**1** mm wide; cells **smooth**; rhizoids on **lobules**; perianths **flat** & **truncate**; WS *Radula*

Plants <**1** mm wide; cells often **papillose**; rhizoids on **stem**; perianths **5-angled**; WS *Cololejeunea*

***Group L5 – Complicate-bilobed; "succubous"***

**Group L5**

Lobes & lobules sharply **tapered** to a **pointed** apex; margins **irregular**; cuticle **waxy** (dull); *Douinia*

perianth **plicate** with a **contracted**, **whitish** & **ciliate** mouth; NW, WC

Lobes **elongate**, **parallel**-sided & directed in strongly **different** directions from lobules; *Diplophyllum*

perianths +**terete**, sharply **plicate** & **contracted** to mouth; WS

Lobes **rotund** to ligulate & directed in **same** direction as lobules; perianths strongly *Scapania*

**flattened**, **smooth** & with a **truncate** mouth; WS

***Group L6 – Leaves bilobed & succubous; underleaves clearly evident***

**Group L6**

Underleaves **bifid** & **ciliate**; plants **purplish**; leaves +**emarginate**; **perigynium** present; AC *Mesoptychia*†

Underleaves distinctly **bifid**.

Plants +**yellow**-**green** & **large** (>1 mm); leaf lobes +**equal** in size.

Underleaves with **lateral** **teeth**; rhizoids **restricted**; **perianth** present; WS *Lophocolea*

Underleaves **lacking** lateral teeth; rhizoids **scattered**; **marsupium** present; WS *Geocalyx*

Plants +**reddish** & **small** (<0.7 mm); leaf lobes **unequal** in size & **rounded** (“mittens”); NE *Cladopodiella*†

Underleaves +**lanceolate**; trigones +**bulging**.

Leaves distinctly **bilobed** & +**joined** to underleaves; WS *Harpanthus*

Leaves +**emarginate** & **free** from underleaves; WS *Nardia*†

Underleaves **flap**-**like** & irregularly **lobed**; leaf bases +**multistratose**; oil bodies **lacking**; A/A(NW) *Schofieldia*

***Group L7 – Leaves bilobed; succubous;***

***underleaves obscured by rhizoids, minute or lacking***

**Group L7**

Shoots **wide** (1.5-2mm); leaves with **marginal** **rhizoids**; trigones **large** to bulging; SA *Acrobolbus*

Shoots **intermediate** in width (0.5-1.5 mm); trigones various.

Underleaves **obscured** by abundant, scattered rhizoids; **marsupium** present; WS *Geocalyx*

Underleaves **minute** or **lacking**; **perianth** present.

Trigones large to **bulging**.

Leaf insertion oblique **throughout**; leaves **rarely** canaliculate (grooved); WS *Lophozia*

Leaf insertion transverse **above**; leaves commonly **canaliculate**; WS *Anastrophyllum*

Trigones **lacking**.

Underleaves **minute**; leaf lobes **unequal** in size & **rounded** (“mittens”); WS *Cladopodiella*†

Underleaves **lacking**; leaf lobes +**equal** in size.

Leaves **purplish**-**black** with **rounded** lobes; hyalodermis **lacking**; WS *Gymnocolea*

Leaves with **connivent** lobes; **hyalodermis** present; oil bodies **lacking**; WS *Cephalozia*

Shoots **narrow** (600-800µ); trigones **lacking**.

Underleaves **minute**; perianths **cylindrical** & **deeply** plicate; on various trees; SE *Cylindrocolea*

Underleaves **lacking**; perianths **campanulate** & **shallowly** plicate; on cabbage palm; FL *Chonecolea*

***Group L8 – Leaves bilobed with transverse insertion\****

**Group L8**

Plants **small** to **moderate** in size (shoots >**0.5** mm wide).

Leaves strongly **concave** & +**imbricate**; shoots +**julaceous**.

Underleaves similar to leaves in size & shape (+**isophyllous**); clear **green**; A/A *Pleurocladula*

Underleaves vestigial to **lacking**; **whitish** in color; A/A, WC, TN *Gymnomitrion*

Leaves like "**billowing** **sails**" (strongly inflated base with a **water sac** & **ciliate** **lobes**); E *Nowellia*

Leaves with a **midrib** (vitta) of elongated cells; underleaves large (**isophyllous**); A/A; W, AP *Herbertus*

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

Underleaves similar to leaves in size & shape (+**isophyllous**); cells **elongate**; A/A, WC *Hygrobiella*

Underleaves vestigial to **lacking**; leaf cells **trigonous**; WS *Marsupella*

Plants **minute** (shoots <**0.5** mm wide).

Leaves **glaucous** from secreted filaments; **isophyllous** (underleaves like leaves); A/A *Anthelia*

Leaves with a +**striate** cuticle; cells with thick **brownish** walls & an **occasional** oil body; NW *Eremonotus*

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

Branching predominantly **terminal** & **furcate** (forking); NW, SA *Sphenolobopsis*

Branching predominantly **intercalary**; WS *Cephaloziella*

\*Lower leaves may show trend towards succubous insertion, except for *Herbertus*, which may show trend towards incubous insertion.

***Group L9 – Leaves unlobed & incubous***

**Group L9**

Leaves **opaque**, +**yellow**-green, +**pointed** & occasionally bidentate; cells strongly **trigonous**; *Metacalypogeia*

oil bodies **granular**; AK, NF.

Leaves **translucent**, +gray to **blue**-green & **rounded** apically; cells **not** trigonous; *Calypogeia*

oil bodies **botryoidal**; WS

***Group L10 – Leaves unlobed & succubous; underleaves clearly evident***

**Group L10**

Underleaves **ciliate**, **purplish** & bilobed; leaves **shallowly** bilobed; **marsupium** present; AC *Mesoptychia*†

Underleaves **bilobed**.

**Purplish** pads on underside of stems; sporangia open along **helical** lines; NW, WC *Gyrothyra*

Purplish pads **lacking**; sporangia open along **longitudinal** lines; WS *Chiloscyphus*

Underleaves **lanceolate**.

Leaves **opposite** & **fused** at the base; underleaves **small**; **marsupium** present; A/A *Arnellia*

Leaves **cuneate** (wedge-shaped) & +**deciduous**; plants **minute**; bark of **fir** trees; SA *Leptoscyphus*

Leaves +**orbicular**; trigones **bulging**.

Rhizoids densely **matted**; perianths **laterally** compressed; **gemmae** often present; WS *Mylia*

Rhizoids **scattered**; perianths on a **fleshy** perigynium & **plicate**; gemmae **lacking** WS *Nardia*†

***Group L11 – Leaves unlobed and succubous;***

***underleaves obscured by rhizoids, minute or lacking***

**Group L11**

Leaves "**pleated**" (dorsal fold) & decurrent to **midline**; perianths **laterally** compressed; WS *Plagiochila*†

Leaves with dorsal margin strongly **revolute** & +**notched**; AK, BC *Anastrepta*

Leaves **neither** "pleated" **nor** strongly revolute.

Leaves +**longer** than broad; rhizoids **numerous**; +**distinct** trigones; oil bodies *Jungermannia*

**numerous** (7-11/cell) & **moderate** in size; perianth **smooth** with a **sunken** beak.

Leaves +**orbicular**; perianth **not** as above.

Trigones moderate to **large** & +**bulging**.

Ventral **flagella** abundant; oil bodies **few** (2-4) & **large**; perianth *Odontoschisma*

+**plicate** above with a +**denticulate** mouth; WS

Ventral flagella **lacking**; oil bodies **numerous** (7-15) & **small**; perianth *Jamesoniella*

**plicate** above with a distinctly **ciliate** mouth; WS

Trigones +**small**, but distinct; oil bodies mostly **4**-**8** per cell & **large**.

Leaves strongly **concave**; "perianth" a **compressed**, **rounded**, **bilabiate** *Cryptocolea*

structure formed from **mussel**-like perichaetial bracts; A/A, MI, MN

Leaves +**flat** to weakly convex; perianth a **compressed**, **truncate**, & *Pedinophyllum*

**bilabiate** sheath; CT, MA, OH

***Group L12 – Leaves unlobed/emarginate with transverse insertion***

**Group L12**

Shoots**creeping**; leaves **whitish**; **concave** & **imbricate**; underleaves **minute**; GL *Prasanthus*

End.