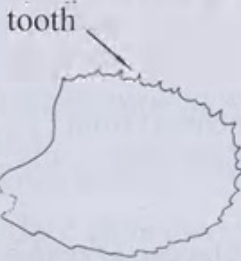


overlaps the one farther the stem apex (or would if they were close enough).

Tooth Small, tapering projection on margin of leaf or thallus, consisting of one or a few cells, or formed by an extension of a cell wall.



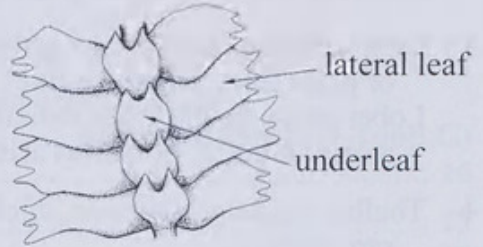
Transverse Having the join between the leaves and stem running sideways across the stem, not angled.

transverse leaves



Trigone Triangular to cordate thickening at the point where three cells join.

Underleaves Leaves of a different size (usually much smaller) and shape than the lateral leaves, and attached on the ventral side of the stem.



Ventral On the underside of the thallus or shoot, i.e. closest to the substratum.

Studies on Victorian bryophytes 6. Key to thallose liverworts and hornworts

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Abstract

A new key to the genera and many species of thallose liverworts and hornworts (except *Fossombronia* and *Riccia* species) in Victoria is provided. (*The Victorian Naturalist* 123 (4), 2006, 247-254)

Introduction

This artificial key complements the key to the genera of leafy liverworts in this volume. It is based on the key to southern Australian liverworts in Scott (1985), but is substantially updated and revised to take into account taxonomic changes and additions to the Victorian flora in the last 20 years. Common mistakes are allowed for in the main key and group keys.

The key can be used to identify specimens to species level, except for species of *Fossombronia* (which are very difficult to identify without detailed analysis) and *Riccia* (which is under review in Australia and is likely to undergo substantial changes). Also keep in mind that species and genera presently known only from

Tasmania, New Zealand or other parts of the world might still be found in Victoria. This key is not valid for other regions of Australia.

Most of the thallose liverworts and hornworts in Victoria are described and illustrated in Scott (1985) and Meagher and Fuhrer (2003).

Names of taxa follow the current national checklist (McCarthy 2006).

A basic glossary of terms used in this key is included in the key to leafy liverworts (*Studies* 5 in this issue). For a complete and beautifully illustrated glossary of bryological terms, see Malcolm and Malcolm (2000).

Key to thallose liverworts and hornworts

- 1 Thallus leafy, or with leaf-like lobes on either side of a central axis2
Thallus lobed or unlobed, but not leafy5
- 2 Rhizoids crimson**Fossombroniaceae (Group A)**
Rhizoids not crimson, or absent, or not seen.....3
- 3 Lobes pinnate or alternate, arranged all along the central thallus;
or plant leafy or lettuce-like4
Lobes palmate, the lobes radiating or bifurcating (Y-branching) from
a central point; or thallus arising from a narrow, $\pm$ upright stalk11
- 4 Thallus bright grass-green, thick and fleshy, rather brittle;
rare plant..... **Treubiaceae (*Treubia tasmanica*)**
Thallus green or not; not thick and fleshy, not brittle;
common plants **Fossombroniaceae (Group A)**
- 5 Thallus one cell thick (except midrib) 6
Thallus mostly several cells thick in part 8
- 6 Thallus narrow throughout (< 3 mm), lobes pinnate, alternate or bifurcated 7
Thallus wide, at least in part (usually > 4 mm),
often palmately divided **Pallavicinaceae (Group C)**
- 7 Growing on wet or dried soil, commonly mud (either saline or fresh);
lobe pattern usually not obvious **Sphaerocarpaceae (Group D)**
Growing on trees or rocks, never on mud; lobes
bifurcating (Y-branching) **Metzgeriaceae (Group E)**
- 8 Chloroplasts usually 1 or 2 per cell; capsule erect, needle-like,
splitting gradually down from tip; large cavities containing dark
cyanobacteria often evident in thallus **Anthocerophyta (Group B)**
Chloroplasts several to many per cell; capsule ovoid to globose,
not needle-like; cavities in thallus (if present) not containing dark cyanobacteria . 9
- 9 Thallus half-buried in soil, firmly anchored by copious rhizoids;
capsule formed in marsupium buried in soil ***Enigmella thallina***
Thallus on or above soil, or not on soil, anchored or not by rhizoids;
capsule not formed in marsupium buried in soil 10
- 10 Thallus surface without pores, upper surface homogeneous, without pores;
rhizoids all smooth 11
Plants surface with pores, often opening to the upper surface by air pores;
rhizoids normally of two sorts: one smooth and the other with internal
peg-like thickenings 15
- 11 Midrib conspicuous; lamina 1 cell thick in outer parts 12
No midrib; lamina never 1 cell thick, except sometimes at the very edge 13
- 12 Plants on bark or rock, never on soil; pale yellow-green, never rose-tinted;
prostrate; fine hairs present on ventral surface and usually also on
thallus margins **Metzgeriaceae (Group E)**
Plants on soil or rotting logs, also epiphytic in humid habitats;
mid to dark green, often rose-tinted, often arising from a narrow,
 $\pm$ upright stalk; ventral surface and margins lacking hairs
(but may be toothed) **Hymenophytaceae / Pallavicinaceae (Group C)**

- 13 Plants with regular, few-celled lobes in the position of leaves and underleaves **miskeyed Zoopsis or eroded leafy liverwort**
Plants usually irregularly lobed; lobes many-celled 14
- 14 Sporophyte needle-like; chloroplasts usually 1 or 2 per cell; cavities in thallus containing dark cyanobacteria often present ... **Anthoceroephyta (Group B)**
Sporophyte not needle-like; chloroplasts usually several to many per cell; cavities in thallus containing dark cyanobacteria never present **Aneuraceae (Group F)**
- 15 Gemma cups circular or crescent-shaped, obvious on upper surface of thallus **Marchantiaceae (Group G)**
Gemma cups lacking 16
- 16 Upper surface of thallus spongy, often whitish 17
Upper surface of thallus firm, usually green 18
- 17 Plants usually forming complete or partial rosettes on the ground, or else free-floating; not in salt pans **Ricciaceae (Group H)**
Plants not forming rosettes; in salt pans or on compacted soil **Sphaerocarpaceae (Group D)**
- 18 Upper surface of thallus flat, not furrowed; sporophytes carried outside the thallus 19
Upper surface furrowed, V-shaped at least at apex; sporophytes embedded in thallus **Ricciaceae (Group H)**
- 19 Thallus usually > 7 mm wide; many long, free rhizoids on ventral surface **Marchantiaceae (Group G)**
Thallus usually < 6 mm wide; never with rhizoids as above **Aytoniaceae and Targioniaceae (Group I)**

Group A

Fossombroniaceae

- 1 Plants aquatic or semi-aquatic; thallus erect, up to 30 mm tall *Austrofossombronia australis*
Plants not aquatic or semiaquatic (but may be on drying mud); thallus prostrate, < 10 mm tall 2
- 2 Rhizoids hyaline or brown, never crimson; Thallus $\pm$ as long as wide, ruffled and lamellate on dorsal surface *Petalophyllum preissii*
Rhizoids usually crimson; thallus usually much longer than wide, not lamellate *Fossombronia*

Group B

Anthoceroephyta

- 1 Chloroplasts 2 or more per cell; capsule with spirally thickened and unsegmented elaters 2
Chloroplasts usually 1 per cell; capsule with irregular segmented pseudo-elaters 3
- 2 Thallus < 25 mm long *Megaceros gracilis*
Thallus 35–50 mm long *Megaceros pellucidus*
- 3 Thallus with a rough and cavernous surface, usually pale green with crisped margins; spores blackish *Anthoceros punctatus*
Thallus with smooth upper surface, usually dark green with margins rarely crisped; spores yellowish 4
- 4 Plants dioecious *Phaeoceros laevis*
Plants monoecious *Anthoceros brotheri*

Group C

Hymenophytaceae and Pallavicinaceae

- 1 Plants with sex organs 2
Sex organs lacking or not visible 8
- 2 Sex organs on specialised short branches at base or on underside of frond 3
Sex organs on upper side of frond, not on specialised branches 4
- 3 Sexual branches at base of frond; thallus simple or sparsely branched,
not palmate *Podomitrium phyllanthus*
Sexual branches on underside of frond; thallus palmately
divided above *Hymenophyton flabellatum*
- 4 Sporophyte base encased in a thick, fleshy tube bearing archegonia near apex;
male plants with scales overlapping midrib dorsally 5
Sporophyte base surrounded by a long tubular pseudoperianth, not fleshy;
male plants with scales in 2 rows down each side of midrib 6
- 5 Thallus branched, margins coarsely toothed *Symphyogyna podophylla*
Thallus unbranched, consisting of broad and narrow sections,
margins entire *Symphyogyna interrupta*
- 6 Margins strongly toothed with conspicuous teeth,
several cells long *Pallavicinia xiphoides*
Margins generally entire or with teeth of only 1 or 2 cells 7
- 7 Thallus $\pm$ flat, the margins rarely if ever flexed upwards* *Pallavicinia lyelli*
Thallus commonly concave, the margins flexed upwards *Pallavicinia rubristipa*
- 8 Frond margins toothed, at least near apex 9
Frond margins entire or nearly so 10
- 9 Margins with teeth of only 1 or 2 cells** *Pallavicinia lyelli*
Margins with teeth several cells long *P. lyelli* / *S. interrupta* (inseparable)
- 10 Thallus, commonly concave, the margins flexed upwards *Pallavicinia rubristipa*
Thallus $\pm$ flat, the margins rarely if ever flexed upwards 11
- 11 Fronds borne on erect stalks; plant completely green *Hymenophyton flabellatum*
Fronds prostrate; plant may have a rose-pink tinge 12
- 12 Stalk rose-pink, at least near base *Pallavicinia lyelli*
Stalk completely green *Podomitrium phyllanthus*

* Schuster (1991) gave the name *Pallavicinia pseudolyellii* to Australasian material of 'P. lyelli' and gave a Latin diagnosis, but did not validate the name by nominating a type.

** *Jensenia connivens*, discounted from the Australian flora by Schaumann *et al.* (2004), would key to couplet 9; it has fronds borne on erect stalks but is tinged rose red below.

Group D
Sphaerocarpaceae

- 1 Thallus ± circular, usually almost covered by inflated, bottle-like involucre 2
Thallus elongated, consisting of a stem with a wing along one side,
spore-bearing involucre at the edge and tip 3
- 2 Thallus bubble-like, with a single pore on top;
in saline habitats *Monocarpus sphaerocarpus*
Thallus flat, with several involucre together;
not in saline habitats *Sphaerocarpos texanus*
- 3 Monoicous; on freshwater mud; spines on spores 12 µm long *Riella spiculata*
Dioicous; on saline mud; spines on spores 4–5 µm long *Riella halophila*

Group E
Metzgeriaceae

- 1 Thallus with hairs on both dorsal and ventral surfaces* *Metzgeria* sp. A
Thallus without hairs on dorsal surface 2
- 2 Thallus lobed and saccate *Metzgeria saccata*
Thallus flat, not lobed or saccate 3
- 3 Hairs weakly to distinctly falcate, mostly paired; midrib covered
by 2–3 cells on dorsal side *Metzgeria leptoneura*
Hairs not falcate, paired and/or single; midrib covered by 2–4 cells on dorsal side ... 4
- 4 Thallus tapered to a narrow apex on most lobes *Metzgeria consanguinea*
Thallus rarely if at all tapered, most lobes with an obtuse, rounded apex 5
- 5 Midrib covered by 3(–4) cells on dorsal side, 4–6 on ventral side..... *Metzgeria rigida*
Midrib covered by 2(–3) cells on dorsal side, 2–4 on ventral side 6
- 6 Midrib covered by 2 cells on ventral side** *Metzgeria decipiens*
Midrib covered by (3–)4 cells on ventral side *Metzgeria furcata*

Notes:
Cells covering the costa should be counted about half way between one thallus branch and the next.

* *Metzgeria* sp. A from Carlisle State Park seems closest to *M. follicola* of Melanesia.

** So (2002) followed Grolle (2002) in reducing *M. decipiens* to a synonym of *M. furcata*, based on the variability in the number of cells covering the midrib on the dorsal side of the thallus. However, the number of cells on the ventral side seems to distinguish the two clearly. Until a full assessment of the two taxa is made, I prefer to maintain them as separate entities.

Group F
Aneuraceae

- 1 Thallus U-shaped in cross-section, at least near lobe tips 2
Thallus flat or slightly curved in cross-section, never U-shaped 4
- 2 Thallus margins plane; lobe apices spoon-shaped, often yellowish
and bearing gemmae *Riccardia cochleata*
Thallus lobes flexuose to crispate; lobe apices not as above 3
- 3 Thallus > 7 mm wide; margins strongly crisped; aquatic plant of alpine
or subalpine streams *Aneura* sp. A
Thallus < 6 mm wide; margins flexuose to slightly crisped;
not aquatic *Aneura rodwayi*
- 4 Apex of thallus not dissected 5
Apex of thallus dissected 8
- 5 Plant dendroid or semi-dendroid; thallus differentiated into a central
stem and branches; lateral branches with evident central strands;
cuticle papillose *Riccardia eriocaula*
Thallus without an erect stem; lateral branches without a central strand;
cuticle smooth 6
- 6 Thallus branches with a wing 1 cell thick; mucilage papillae lateral
and ventral only, persisting; shoot calyptra smooth *Riccardia minima*
Thallus branches not winged; mucilage papillae dorsal as well as lateral
and ventral, not persisting; shoot calyptra crowned with hyaline hairs 7
- 7 Thallus lens-shaped in cross-section *Riccardia aequicellularis*
Thallus circular in cross-section *Riccardia alcicornis*
- 8 Cuticle striolate or papillose 9
Cuticle smooth 10
- 9 Cuticle striolate *Riccardia crassa*
Cuticle papillose *Riccardia colensoi*
- 10 Thallus mean width > 2 mm (usually 3–6 mm);
apex deeply dissected *Aneura alterniloba*
Thallus mean width < 2 mm; apex shallowly divided 11
- 11 Thallus mean width < 1 mm; often with prostrate main branches
and erect, pinnately branched (almost palmate) secondary branches;
monoecious *Riccardia wattsiana*
Thallus mean width > 1 mm; branches prostrate; dioecious 12
- 12 Branching often appearing palmate; mucilage papillae not persisting;
stolons present *Riccardia rupicola*
Branching always clearly pinnate; mucilage papillae persisting;
stolons absent *Riccardia bipinnatifida*

Note:

Aneura sp. A is an undescribed species known from the Bogong High Plains, Baw Baw Plateau and Kosciuszko National Park. It is probably also present in New Zealand.

Group G

Marchantiaceae

- 1 Gemma cups (if present) crescent-shaped; pores on upper surface of thallus not surrounded by polygonal shapes *Lunularia cruciata*
 Gemma cups (if present) circular; pores on upper surface surrounded by polygonal shapes 2
- 2 Ventral scales forming a narrow crimson stripe down the centre of the underside of the thallus; archegoniophore lobes flat, rectangular *Marchantia foliacea*
 Ventral scales colourless, covering underside of thallus; archegoniophore lobes rod-like 3
- 3 Colour of upper surface of thallus evenly green; surface with a glossy sheen; marginal scales not projecting beyond thallus edge *Marchantia berteroana*
 Colour of upper surface of thallus uneven, with a dark zone down the middle; surface without a glossy sheen; marginal scales projecting slightly beyond thallus edge *Marchantia polymorpha* var. *aquatica*

Group H

Ricciaceae

- 1 Plants free-floating 2
 Plants on soil or mud 3
- 2 Ventral scales conspicuous, purplish *Ricciocarpos natans*
 Ventral scales not evident, not coloured *Riccia duplex* var. *duplex*
- 3 Thallus heart-shaped; on drying mud; ventral scales purplish, in bunches *Ricciocarpos natans*
 Thallus heart-shaped or not; on various substrates; ventral scales variously coloured but not in bunches 4
- 4 Dorsal surface of thallus with compact tissues forming narrow vertical air chambers, without specialised pores; epidermal cells hyaline *Riccia* subgenus *Riccia*
 Dorsal surface of thallus with loosely arranged (often spongy) tissues forming polyhedral or large and irregular air chambers with well-defined pores; epidermal cells chlorophyllose except around pores *Riccia* subgenus *Ricciella*

Group I

Aytoniaceae and Targoniaceae

- 1 Side branches originating from underside of thallus; capsules formed in black spherical pouches beneath apices of thallus *Targionia hypophylla*
Side branches originating from margin or upper surface of thallus; capsules formed in umbrella-like structures (archegoniophores) ... (Aytoniaceae) 2
- 2 Sex organs always present, in 2 or more receptacles down the midline of the thallus *Plagiochasma rupestre*
Sex organs absent, or scattered receptacles usually on the margin or apex of the thallus 3
- 3 Epidermal pores surrounded by 4 or more rings of cells; perianth (involucre) hemispherical, with one slit beneath *Reboulia queenslandica*
Epidermal pores surrounded by 1–3 rings of cells; perianth conical, opening with numerous vertical slits *Asterella* 4
- 4 Thallus crimson underneath, generally 5–7 mm wide; perianth with 12–14 slits* *Asterella drummondii*
Thallus green underneath, generally 3–4 mm wide; perianth with about 8 slits *Asterella tenera*

**Asterella conocephala*, *A. tasmanica* and *A. whiteleggeana* are almost certainly conspecific with *A. drummondii* or *A. tenera*.

Acknowledgements

Many thanks are due to two anonymous referees who pointed out errors in the manuscript and made some valuable comments and suggestions.

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Received 13 April 2006; accepted 1 June 2006

One hundred and nineteen years ago

MOSSSES OF VICTORIA, WITH BRIEF NOTES BY D. SULLIVAN

'Where to look for them. – On and in the crevices of rocks, on logs, about the bases and roots of trees, on banks of watercourses, lakes, lagoons, and waterholes, on the ground, from the low lands to the summits of our highest mountains – both in wet and dry localities, but more especially in the former. ... I would recommend Melbourne collectors to search well about the Yarra, Dandenong, You Yangs, Mount Macedon, Riddle's Creek, Lancefield (Deep Creek), Sunbury, Gisborne, etc. September, October, and November are the best months for the dry localities, and December, January, and February for the higher mountains and moist forest country. Mosses may be found in certain localities throughout the year, but in winter, except in rare cases, they are not in a fit state for detailed examination, having lost both the calyptras and operculums parts, which are sometimes of great value in deciding specific distinctions.'

From *The Victorian Naturalist* **IV** (1887–8), pp. 109–110



Meagher, David. 2006. "Studies on Victorian Bryophytes 6. Key to Thallose Liverworts and Hornworts." *The Victorian Naturalist* 123(4), 247–254.

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