# TASMANIAN BRYOPHYTA.

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## HEPATICS.

The second class into which the Bryophyta are divided is a purely natural one. There are no intermediate forms through which the two groups are connected, though their close relationship is very apparent. There is always a natural distinction, requiring no arbitrary line to separate them.

The gametophyte is varied in structure; many have the form of a flat, green plate, while the greater number develop leaves; yet when leaves are present these have a distinction of insertion and structure quite different from those of Mosses. Leaves are always placed in two or three rows, two lateral and one ventral, the latter row occasionally being absent. They are usually of delicate consistence, never have a midrib, and are often divided. Most Hepatics live only under permanently moist conditions, but some few can survive even the drying conditions of bare rock at a high elevation.

The characteristic feature of Hepatics is that while they have the typical antheridia, archegonia and permanently attached sporophyte of the class, the sporophyte has attained a much further reduction than amongst Mosses. It is no longer a hard-tissued, persistent being, but is reduced to a comparatively evanescent organ. In most it is a simple globular or oblong dark capsule, which splits into four valves at maturity, borne on a long or short pellucid stalk. In Marchantia and its allies the stalk is almost absent. In Riccia reduction has reached its limit, and the sporophyte is reduced to a spherical spore sack, buried in the substance of its parent. One order of Hepatics, of which Anthoceros is the type, has a sporophyte of less reduced character than the rest, but still of a form not to be confused with that of a true moss; the shape is long and slender, and it splits from top to base into two valves. It is green, and still bears efficient stomata on its surface. Hepatics may be sorted into three perfectly natural Orders: —

Marchantiales,

Jungermanniales,

Anthocerotales.

Marchantiales.—The gametophyte is always a procumbent green thallus. This has in many genera attained a complex structure. In most species an efficient system of air-chambers is formed, communicating with the atmosphere through more or less developed pores. The under surface bears scales and copious rhizoids. The organs of reproduction may occur simply on the surface of the frond or may be borne on specially constructed, erect branches. In Riccia, at the one extreme the archegonia are buried in the upper tissue, with their necks just exposed; in Marchantia they grow on a special convex cushion. After fecundation in Riccia the archegonium, with its enclosed sporophyte, sinks into the substance of the frond, and assumes the form of a simple spore case. In Marchantia the branch grows erect, the top expanding into an umbrella-like body displacing the fertilised archegonia to the under surface. The sporophytes develop under the protection of this cap, and do not require and do not develop a long stalk. In all except Riccia spiral hygroscopic elators are mixed with the spores.

Jungermanniales.—To this order belong the greater number of Hepatics. The structure of the gametophyte is very varied. In some forms it is a flat green frond of simple outline, bearing the reproductive organs upon the dorsal or ventral surface or upon short special branches. Others develop marginal expansions, which are considered primitive leaves or lobes of the frond, according to the view taken by the observer, while the greater number of species have true leaves. When this is so these organs are inserted in three rows, two being lateral and one ventral. The ventral leaves are generally smaller than the others, and are in some species absent. They are generally referred to as underleaves, amphigastria, or stipules. In the region of the archegonia the leaves in most species are much enlarged; the last ones are often united in a sheath, called the perianth, round the fructification. Sometimes instead of the upper leaves uniting to form the perianth a special development grows up from the stem to form a perianth-like sheath, and is known as a pseudoperianth. The enlarged leaves outside the perianth are called the involucre, or in leafless forms, involucral scales may be formed at the base of the perianth. The lateral leaves of the involucre are often named bracts, and the corresponding underleaf the bracteole. After fertilisation the archegonium enlarges round the sporophyte, and forms the calyptra. Some species do not develop a perianth. When this is so the calyptra generally becomes thick and fleshy.

In this latter case the calyptra, instead of being formed entirely by the enlarged archegonium, may be a growth of a sack-like character from the stem. When this is so the barren archegonia are carried up on its apex. The sporophyte consists of a typical capsule of dark colour, which splits on maturity into four valves. It is borne on a long or short pellucid stalk; the base consists of a foot, which bores into the stem of the parent plant. In some instances the parent forms a descending fleshy sack, the marsupium, into the base of which the sporophyte is attached. The spores are intermixed with very hygroscopic, spiral elators. Jungermanniales is divided into two sub-orders, or families, the *Metzgeriaceae* or *Anacrogynae*, in which the sporophyte develops otherwise than at the apex of a shoot, and the gametophyte is seldom leafy, and the *Jungermanniaceae* or *Acrogynae*, where the sporophyte terminates, a shoot or branch, and the gametophyte is usually leafy.

Anthocerotales.—This is an Order of plants that departs in structure very materially from what may be considered the typical hepatic form, yet sufficiently close to warrant it being included in the Class. The gametophyte is a more or less flat, green thallus of simple structure. It has more the simple tissue of the *Anacrogyneae* than of the *Marchantiaceae*, but differs in its cell construction. Instead of numerous discoid chloroplasts, otherwise universal among Bryophytes, there is but one large flat or ringed chromatophore in each, cells recalling the condition present in many Algae. The reproductive organs are of the Bryophyte type, but sunk in the tissue on the dorsal surface. The sporophyte is peculiar. There is a well-developed foot and a short sterile portion, representing a stalk. The spore-bearing portion is very long, green, filiform, and continues to grow at the base long after the apex is mature. The spore producing tissue is a cylinder between the epidermis and a central sterile column. The epidermis usually possesses true stomata, and intermixed with the spores are degenerate elators, usually small and functionless. The sporophyte at maturity splits at the apex into two valves, away from the erect columella. These valves slowly curl away from the axis as the tissues below mature.

## MARCHANTIALES.

This Order includes two families:—

Ricciaceae.—The sporophyte has reached the limit of reduction, and appears as a spore-bearing sphere sunk in the tissue of the frond.

MARCHANTIACEAE.—The sporophytes are free and borne upon specially constructed branches. In the most advanced type these are erect, umbrella-shaped, and carry the sporophytes on the under surface of the head.

## RICCIACEAE.

The fronds usually form small dichotomously divided rosettes on damp earth, or more or less cordate bodies floating on water. The substance is thick in the middle, tapering to the margins with a median groove on the upper surface. The ventral surface bears one row of scales and numerous rhizoids. The upper surface is formed of closely packed columnar cells. There are usually no pores, but air cells are formed below the surface, which may remain small or may enlarge, become confluent, and eventually burst through the dorsal surface. The antheridia and archegonia are immersed. The sporophyte matures within the enlarged archegonium still sunk in the tissue of the frond. All the contained tissue of the sporophyte develops into spores; no elators are formed. The spore tetrads remain attached till mature; the exposed surface is variously sculptured; the rest is smooth. There are two genera:

RICCIA.—Epidermis without pores; antheridia scattered.

RICCIOCARPUS.—Epidermis with distinct pores; antheridia confined to the median furrow.

### RICCIA-MICH.

The character of the family.
In section as deep as broad ... ... ... *tasmanica*
In section much broader than deep.
Air spaces very narrow ... ... ... ... *crassa*
Air spaces broad ... ... ... ... *weymouthiana*

*Riccia tasmanica*, *St.*—Fronds about 1 cm. long, 2 mm. wide, simple or forked, apex retuse to nearly acute, upper surface concave, with slightly broad median furrow; surface crystalline, pale green, margin pellucid, rather acute, entire or nearly so; chlorophyllous stratum dense, the cells about 30 $\mu$. diameter, their exposed ends mamillate, but soon lost. Spores dark brown, 80 $\mu$. diameter; margin narrow, the convex face with about 9 areolae, flat faces with shallower areolae. Ventral surface very convex; in section as deep as broad.

Mt. Nelson, Domain, Hobart. Probably common

on grassy hills, but easily overlooked. Apparent only in winter and spring.

*Riccia crassa*, *St.*—Fronds 1-2 cm. long, 3 mm. wide, simple or forked, apex obcordate, upper surface concave, with a shallow acute median groove, wings becoming convex with age; margin acute undulate, often tinged with purple; chlorophyllous stratum rather dense, with narrow air spaces, cells about 40 $\mu$ diameter. Spores light brown, 70 $\mu$. diameter, convex surface with shallow reticulations, about 10 areolae, flat faces nodulose. Ventral surface convex. Three times as broad as deep.

Lindisfarne, Central Australia.

*Riccia weymouthiana*, *St.*—In general appearance and structure not differing from the last, only spores rather larger, 80-90 $\mu$., and the air spaces large and bursting through the upper surface. Doubtfully distinct.

Lindisfarne, Mt. Abrupt.

## Ricciocarpus Corda.

Obcordate seldom forming rosettes, upper surface with a median furrow, and furnished with pores; chlorophyll-layer not well defined, nearly the entire thickness occupied by air chambers; ventral surface, with numerous long, dentate, violet-coloured scales. Antheridia collected in the median furrow.

*Ricciocarpus natans* (*L.*), *Corda.*—Obcordate about 1 cm. long, flat, scales about 5 mm. long.

Floating on a lagoon, George Town; Cosmopolitan.

## Marchantiaceae.

Fronds flat, procumbent, dichotomously dividing, dorsal surface with well developed pores, opening into simple or compound air spaces; ventral surface with two or more lines of scales; reproductive organs grouped, usually on special branches. The branches bearing fertilised ova assuming a specialised character, usually in the form of an erect umbrella-shaped body (carpocephalum). Well developed elators always present.

Pores simple.

Targionia.—Sporophyte enclosed in a pair of large bracts, partly concealed beneath the edge of the frond.

Reboulia.—Sporophytes on a persistent carpocephalum. Not bearing gemmae.

Lunularia.—Sporophytes on a perishing carpocephalum. Gemmae always present in a crescent-shaped receptacle.

Fimbriaria.—Sporophytes on a persistent carpocephalum; each contained in a white, conspicuous fimbriated perianth.

Pores formed of a barrel-shaped arrangement of cells.

Marchantia.—Sporophytes on a persistent carpocephalum, alternating with the rays. Gemmae in fringed cups.

### Targionia, L.

Thallus tough, with small air chambers on the upper surface; pores simple, surrounded by several concentric rings of cells; ventral surface with two rows of large obliquely triangular scales, each with a broadly awl-shaped appendage. Antheridia on special branches arising from the under surface, cylindric, with an expanded terminal receptacle just emerging from the side of the frond. Archegonia in two rows on the ventral surface, just behind the growing point, enclosed in two large bracts. Sporophyte spherical, with a short stalk, enclosed in the enlarged purple bracts, slightly protruding at maturity.

*Targionia hypophylla, L.*—Fronds cuneate, 1-2 cm. long, apex bifid, sometimes dichotomous, but more often the branches arise from the ventral surface, which is purple to black. Mature involucre nearly black, about 4 mm. diameter, just protruding from beneath the apex.

McRobie's Gully, Colebrook, Launceston, etc. Mature about October.

Cosmopolitan.

### Reboulia Raddi.

Thallus dichotomously branched, flat; air chambers small on the dorsal surface, with simple pores, surrounded by several rings of concentric cells, ventral surface purple, with two rows of large oblique obovate scales, each with two linear appendages. Antheridia on a flat sessile receptacle placed on the dorsal surface close behind the apex. Carpocephalum persistent, hemispheric, with a more or less lobed margin, on a long stalk. Capsule globose on a short stalk, no perianth, contained each within an involucre placed on the ventral aspect of a lobe. The pores of the carpocephalum are barrel-shaped in longitudinal section; the stalk has a single furrow, with numerous rhizoids. No gemmae cups.

*Reboulia hemispherica (L.), Raddi.*—Fronds robust, fleshy. Much resembling a Marchantia, but readily distinguished by the absence of areolae, the pores in section being simple, not barrel-shaped, and the capsules being

borne on the lobes of the carpocephalum, and not alternating with them.

Very widely distributed, but not common. Cosmopolitan.

### Lunularia Adans.

Robust, flat, fleshy, bright green, dorsal surface areolate, each with a simple pore, surrounded by concentric rings of cells. Ventral surface green, with two rows of very tender, colourless, broadly lunate scales, each with a rotund appendage. Antheridia on flat, sessile, dorsal plates. Carpocephalum colourless, or pale green, tender, and soon wilting. Stalk without a groove, hairy, mostly 2-4 cm. long; head of four cruciate, horizontal, tubular involucres, each about 2 mm. long; perianth absent. Gemmae always present in lunate cups.

*Lunularia cruciata* (*L.*), *Dum.*—Very common in greenhouses and gardens. Introduced.

### Fimbriaria, Nees.

Fronds tough, flat or concave, linear rarely forked, with a thick midrib. Dorsal surface areolate, with small air chambers; pores conspicuous, simple, surrounded with concentric rings of cells. Ventral surface convex, with two rows of large purple scales, each with an appendage. Antheridia immersed in the frond. Carpocephalum persistent, purple, conic or hemispheric, on a long, slender stalk, four lobed, each containing a single capsule; involucre slender; perianth ovate, white, split into many linear sections. Capsule globose, with a very short stalk. The small size and conspicuous white fimbriated perianth makes the genus easily recognised.

Carpocephalum hemispheric, coarsely warted. Spores 150 $\mu$. diameter ... ... ... ... ... ... ... ... *drummondi*

Carpocephalum hemispheric, nearly smooth. Spores 60 $\mu$. diameter ... ... *tenera*

Carpocephalum conic ... ... ... ... ... *conocephala*

*Fimbriaria drummondi*, *Tayl.*—Fronds flat, about 1 cm. long, 3-4 mm. wide, dull green, purple beneath and on the margin, midrib thick, but not much produced on the ventral surface, wings broad, thin, margin acute, irregularly crenate, new shoots ventral from the midrib, pores large and prominent, ventral scales obliquely ovate, purple; appendage colourless, not constricted at the base, ligulate, with a shortly acuminate apex. Peduncle to 2 cm.; carpocephala hemispheric, coarsely warted, lobes

well developed; perianth partially exserted. Spores about 150 $\mu$. diameter, yellowish-brown, broadly winged.

Near Launceston, New Zealand, Australia.

*Fimbriaria tenera, Mitt.*—Fronds about 1 cm. long, 4 mm. wide, flat, green, with little or no purple beneath, midrib broad, ventrally convex; wings thin, with an obtuse margin, new shoots apical, rarely ventral; pores large, but not very prominent; ventral scales obliquely ovate, colourless, appendage narrow, shortly acuminate, sometimes tinged with purple. Peduncle 1.5 cm.; carpocephala hemispheric, nearly smooth; lobes well developed; perianth short. Spores 60 $\mu$. diameter, brown, reticulately winged.

New Zealand.

*Fimbriaria conocephala, St.*—Frond 1-2 cm. long, 3mm. wide, concave, and often dark purple throughout, sometimes green on the dorsal surface; midrib strongly convex on ventral aspect; wings as broad as the rib, strong, with an acute crenate margin; new shoots ventral or apical; pores large, prominent; ventral scales ovate, with a short, ligulate appendage. Peduncle 0.5-2 cm.; carpocephala conic, obtusely warted; lobes larger than the umbo; perianth very exserted; spores 100 $\mu$., with a very broad reticulate wing, yellow, wing entire.

*F. tasmanica, St.*, differs in the appendage, being long, with a slender bifid apex, but the character appears inconstant.

Knocklofty, Hobart; very common; Eastern Australia.

## Marchantia, L.

Large, fleshy, repeatedly forked, closely decumbent. Dorsal surface marked into lozenge-shaped areolae, each with a central pore opening into an air chamber; pores in perpendicular section barrel-shaped, formed of about four series of cells; external orifice surrounded by 4-6 concentric rings of narrow cells; internal orifice cruciate, or nearly quadrate in Tasmanian species. Carpocephalum with a long stalk, with two rhizoid-bearing grooves; head convex; margin lobed or entire, involucres alternating with the lobes, 2-valved fimbriate enclosing several sporophytes; perianth present, plain, capsule stalked. Antheridia on a pedunculate discoid, erect branch. Gemmae large, in cups, with a fimbriate margin.

Margin of carpocephalum deeply lobed ... ... 2

Margin of carpocephalum entire or with shallow lobes ... ... ... ... ... ... ... ... ... ... 3

2. Lobes terete. Scales broad, pale ... ... ... ... ... ... ... ... ... *cephaloscypha*
   Lobes flat. Scales narrow, purple ... ... ... ... ... ... ... ... ... ... *foliacea*
3. Carpocephalum margin shortly lobed... *pileata*
   Carpocephalum margin entire ... ... ... *fusca*

*Marchantia cephaloscypha, St.*—Midrib not defined. Scales pale, short, but very broad, extending nearly to the margin. Peduncle 5-10 cm., head nearly 1 cm.; lobes long, terete, 9, often recurring at maturity. Very close to *M. tabularis, Nees.*

Abundant, especially after fire. Australia, New Zealand, South America.

*Marchantia foliacea, Mitt.*—Midrib broad and usually well defined. Scales dark purple, as long as broad, not extending over the wings. Peduncle 5-10 cm., head nearly 1 cm. diameter, divided half-way into 9 broad flat lobes, one division much deeper than the others.

Common on banks of streams; New Zealand.

*Marchantia pileata, Mitt.*—Midrib narrow, ill-defined, under surface red. Scales obliquely ovate, not extending on the wings, dark purple. Peduncle about 1.5 cm.; head hemispheric, 4-5 mm. diameter, asymmetric, 5-6 short, broad lobes, insertion of peduncle almost lateral.

Mt. Wellington, Bruny Island, Meander River, New Zealand.

*Marchantia fusca, St.*—Midrib thick, insensibly attenuating into the wings. Peduncle about 7 mm. long; head hemispheric, 4-5mm. diameter, symmetric, margin quite entire. Other details as in *M. pileata.*

Slopes of Mt. Wellington. Rare. New Zealand.

## JUNGERMANNIALES.

This Order contains two families:—

METZGERIACEAE.

JUNGERMANNIACEAE.

The marked feature of the first is that the archegonia are developed upon special branches, which are never at the apex of a shoot. These branches are sometimes so much reduced that the organs appear to grow on the surface or side of a frond. The members of this family are mostly thalloid, but a few genera are leafy. In the second

family the sporophyte terminates the main axis, or a lateral branch, though in some genera this is obscure. In all cases the plant is leafy, only in one genus, *Zoopsis*, reduction has obscured this. The two families are quite distinct, though the dividing line is not easily defined.

### Metzgeriaceae.

Generally thalloid, rarely leafy. Tissue of the frond never with air-chambers or ventral scales; a midrib is generally well defined. Sporophyte solitary, on the side or surface of the frond, never borne on a special apparatus, having an involucre and often also a pseudo-perianth.

Plant thalloid, expanded.

Aneura.—Fleshy, thick, at least in the middle; no defined midrib. No perianth. Calyptra large, fleshy, papillate.

Metzgeria.—Membranous, wings thin, midrib very narrow, well marked. Frond forked, equal breadth throughout. No perianth. Calyptra hairy.

Hymenophytum.—Cylindric below, winged above. Fruit from the under surface. Perianth present.

Pallavicinius.—Cylindric below, winged above. Fruit on the upper surface. Perianth present.

Symphyogyna.—Cylindric below, winged above. Fruit from the upper surface. Perianth absent.

Plant leafy.

Treubia.—Leaves reduced to lateral lobes. Seta very long.

Fossombronia.—Leaves erect closely overlapping. Seta short.

### Aneura, Dum.

Leafless, decumbent, but often with ascending branches, vaguely branched, thick or membranous; no distinct midrib, but thick in the middle and thinner towards the margins; surface, or cortical layer of cells, usually much smaller than the inner cells, and chlorophyllous. Reproductive organs on short lateral branches on the lower part of the frond. Perianth absent. Calyptra large, clavate, fleshy. Capsule on a long seta, 4-valved, elators attached to the apex of the valves. Gemmae formed in the cortical cells, oblong, 2-celled.

The plants are very variable in general form, and it is necessary to study their structure. A transverse section is always desirable.

Branches, broad ... ... ... ... ... ... ... ... ... ... 2

At least ultimate branches less than 1 mm. wide ... ... ... ... ... ... ... ... ... ... ... 11

2. Marginal cells larger than those of the cortex, generally colourless ... ... ... ... 3
Marginal cells not distinct ... ... ... ... ... ... 7

3. Concave, thick, surface waxy... ... ... *pinguis*
Flat, marginal cells striate ... ... *stolonifera*
Condition otherwise ... ... ... ... ... ... ... ... 4

4. Branches pinnate ... ... ... ... ... ... ... ... 5
Branches erect, simple ... ... ... ... ... ... ... 6

5. Margin entire ... ... ... ... ... ... ... *alterniloba*
Margin dentate ... ... ... ... ... ... ... *dentata*

6. Margin of rectangular colourless cells, but often indistinct ... ... ... ... *erecta*
Margin with a conspicuous border of large quadrate cells ... ... ... ... ... *cochleata*

7. Surface conic-papillate ... ... ... ... *tasmanica*
Surface armed with small rough papillae ... ... ... ... ... ... ... ... ... *colensoi*
Surface smooth ... ... ... ... ... ... ... ... ... 8

8. Margin acute ... ... ... ... ... ... ... ... ... 9
Margin obtuse ... ... ... ... ... ... ... ... ... 10

9. Robust, about 12 cells thick ... ... *longiflora*
Broad, thin, about 5 cells thick... *polymorpha*

10. Concave to slightly convex ... ... *pinnatifida*
Strongly biconvex ... ... ... ... ... ... ... *crassa*

11. Main trunk and branches flat, pinnules linear biconvex ... ... ... ... ... ... *palmata*
All parts linear ... ... ... ... ... ... ... ... 12

12. Strongly biconvex, margin obtuse ... *alcicorne*
Margin acute ... ... ... ... ... ... ... ... ... 13

13. Margin not bordered ... ... ... ... ... ... ... 14
Margin bordered ... ... ... ... ... ... ... ... 15

14. Both surfaces slightly convex ... ... *gracilis*
Ventral surface flat ... ... ... ... ... *perpusilla*

15. Small, stem and branches similar ... *minima*
Robust, decumbent, hirsute, branches erect, bi-tripinnate ... ... ... ... ... *eriocaula*

*Aneura pinguis* (*L.*), *Dum.*—Decumbent, very concave, thick and of a greasy or waxy appearance, margins wavy, acute edged, with 1-2 series of larger colourless or purple cells, relatively thick in the middle, and very convex on the ventral side, branches few and irregular, often 2-3 cm. long, 5 mm. wide to much smaller. Calyptra often 7 mm. long, thick and coarsely papillate. Very variable in size, but the character always distinct.

Mt. Wellington, New Zealand, Cosmopolitan.

*Aneura alterniloba*, *Hf. et T.*—Robust, often 3-5 cm. long, and 5-10 mm. wide, procumbent, broad and tough, with short, broad, lateral branches or lobes, flat or slightly convex, 8-10 cells thick in the middle, margins acute of one series of large cells.

Common in wet gullies. New Zealand.

*f. robusta.*—Fronds 6-10 cm. long, 1 cm. wide, with few or no lateral branches, margins alternately lobed, lobes obtuse or retuse, 2 mm. long, 4 mm. broad at the base.

Russell Falls.

*Aneura crassa*, *Nees.*—Robust, rigid, tough, 3-6 cm. long, 2-3 mm. wide, bipinnate, branches very irregular, sometimes all short, biconvex, 12 cells thick in the middle, margin very obtuse, apex immarginate.

Mt. Wellington. New Zealand.

Distinguished from *A. pinnatifida* and *A. longiflora* by the obtuse margin, and from *A. alterniloba* by the absence of the enlarged marginal cells.

*Aneura pinnatifida*, *Nees.*—Dark green to black, densely pulvinate, generally 1-2 cm. long, 1.5 mm. wide, with few or many lateral branches, typically very concave dorsally, but varying to flat or slightly convex, 7-10 cells, thick in the middle, margin obtuse of small cells.

Cosmopolitan.

*Aneura longiflora*, *St.*—Very variable. Procumbent, but generally with numerous erect branches, irregularly bipinnate, flaccid, brownish, often 3-4 cm. long, branches with expanded crenulate apices, mostly 3 mm. wide, flat, about 12 cells thick in the middle, tapering to the acute margins. Calyptra 8 mm. long, cylindric.

Lottah. Slopes of Mt. Wellington.

Distinguished by its short, flat branches, with simple acute margins.

*f. submersa.*—Dark, 4-5 cm. long, linear, with numerous short lateral branches, most of which are divided into many short, decurved, subterete pinnules.

Adamson Peak, in pools.

*Aneura polymorpha, Col.*—Very variable in shape. Procumbent, flaccid, broad, thin, and dark green. Branching very varied in shape and breadth, procumbent or erect, often 5 cm. long, flat and thin, seldom more than 5 cells thick in the middle; margins thin, but not winged. Calyptra small.

About Hobart. Possibly introduced. New Zealand.

Readily distinguished by its flat, thin structure.

*Aneura dentata, St.*—Dark. Procumbent, flat or concave dorsally, robust, with many broad, short lobed branches, mostly 3-4 cm. long, 5-7 mm. wide, apices obtuse, with broad obtuse marginal lobes, 7-10 cells thick in the middle, margins acute, with one to many series of enlarged round or elongated, transparent cells. In the typical form the "margin everywhere, especially at apex, coarsely dentate, teeth remote, plano-conic, acuminate, 2-4 cells long."

Mt. Wellington. Blue Tier. New Zealand.

Very close to *A. colensoi*, but with a smooth surface and distinct margin.

*Aneura colensoi, St.*—Procumbent, robust, mostly 2-3 cm. long, tough, fleshy, with numerous short, broad branches, branches 2 mm. wide, bearing many rotund, rarely lengthened pinnules; margins obtuse, about 6 cells thick in the middle; surface thickened, covered with short, acute papillae.

Mt. Wellington. New Zealand.

The non-bordered obtuse margin and armed cuticle distinguishes the species.

*Aneura stolonifera, St.*—Very variable, robust, 6-8 cm. long to small, densely caespitose and under 1 cm. Base stoloniferous and terete, branches long or short, ascending or erect, flat, thick, and expanding to a broad, crenate apex, middle 10 cells thick, margin acute, marginal cells large, minutely lamellate, and often also minutely papillate. Calyptra narrow, clavate, 6 mm. long, inserted on the terete base.

Very common. Also throughout the Southern Hemisphere.

Distinguished by the enlarged striate marginal cells.

*Aneura tasmanica*, *St.*—Rather small, decumbent, seldom exceeding 1 cm., flat, much divided into short branches, 1-2 mm. wide, rarely suberect, and with expanded tips, very narrow, almost terete at the base, apex obtuse in section plano-convex, 8 cells thick in the middle, margin acute, but not winged, surface coarsely papillate. Calyptra large, broadly cylindric, coarsely papillose. Corticular cells 20 $\mu$., medullaries 60 $\mu$.

Slopes of Mount Wellington.

*Aneura erecta*, *St.*—Procumbent, widely spreading, vaguely branched, yellowish-green or more or less brown, 1-2 cm. long, numerous branches, ascending or erect, about 5-10 mm. long, flat or concave, simple or seldom branched, 1-2 mm. wide, with obtuse apices, about 5 cells thick in the middle; dorsal cortical cells hexagonal and brown walled, ventrals longer, marginal cells often colourless, rectangular, but variable. Cortical cells 40 $\mu$., medullaries very large.

Very common.

*Aneura cochleata*, *Hf. et T.*—Medium size, densely pulvinate, the branches erect, and usually strongly concave at the tips. Branches simple, or with few lobes, erect, 2-3 mm. wide, broader and concave at the apex, 4-5 cells thick in the middle, margin acute, with one or two series of large quadrate hyaline cells, cortical cells rather large, those of the ventral surface of very irregular shape. Calyptra oblong, 2 mm., coarsely papillate.

Slopes of Mt. Wellington. New Zealand.

*f. lichenoides.*—Branches more lobed, flatter, and less erect.

Mt. Wellington.

*Aneura alcicorne*, *Mitt.*—Small, slender in dense, pulvinate masses or singly amongst moss, pale green or when exposed very dark, with green tips. Ascending, linear, or almost terete, to 1 cm long, 0.3-0.6 mm. diameter, branches few, short or long, similar, biconvex, with obtuse margins, cortical cells, little smaller than the medullaries. Calyptra half-way up the branch, clavate 3 mm. long.

Small forms are very similar to *A. gracilis*, but the margins are obtuse, and the apex of the calyptra without the ring of pilose hairs of that species.

Mt. Wellington. Mt. Styx. Adamson Peak. Common in many localities. S. America.

*Aneura palmata* (*Hedw.*), *Dum.*—Bright green, transparent, in pulvinate masses. Primary shoot decumbent, flat, 2-3 cm. long, 2-3 mm. wide, alternately pinnate, pinnae very short, obtusely lobed, branches erect, simple, linear, 5-10 mm. long; ultimate pinnules 0.3 mm. wide and generally numerous and equal, margin obtuse, about 8 cells thick in the middle; cortical cells 50 x 33 $\mu$., medullaries 80-120 $\mu$. Organs of reproduction on the sides of the expanded branches. Antheridial ovate-cylindric, pedunculate. Calyptra stout, papillate, 3 mm. long.

Common. Cosmopolitan.

*Aneura minima* (*Carr et Pear*), *St.*—Very small, in dense cushions. Trunk stoloniferous, much branched, branches ascending pinnate, about 5-10 mm. long, 0.3 mm. wide, linear, biconvex, 4 cells thick in the middle, margin acute of 2-3 series of colourless cells, more or less crenate. Calyptra clavate, 1.3 mm. long, apex with a ring of long pilose hairs. Cortical cells not smaller than the medullaries.

Mt. Wellington. East Australia.

*Aneura gracilis*, *St.*—Very small, in dense cushions, under 1 cm., the branches mostly about 5 mm. long and 0.4 mm. wide, trunk and branches linear, nearly flat, all similar, 3-5 cells thick in the middle, margins subacute, not winged, cells all equal. Calyptra 2 mm. long, with a ring of pilose hairs at the apex.

Very common.

*Aneura perpusilla*, *Col.*—Minute, appearing like a layer of green plush. Shoots 2-5 mm. long, 0.4 mm. wide, convex on the dorsal, flat on the ventral surface, 3-5 cells thick in the middle, margins acute, but not winged, cells all similar. Calyptra cylindric, 1-2 mm. apex with a ring of pilose hairs.

Probably Stephani's *A. gracilis* is but a rather larger form of this.

Mt. Wellington. New Zealand.

### Metzgeria, Raddi.

Membranous, linear, dichotomously dividing; midrib slender, very distinct, of narrow elongated cells, within a large celled sheath; wings broad, one cell thick; margins, under surface and midrib, more or less bearing single or geminate bold hairs. Reproductive organs on small, special branches, arising from the ventral surface of the midrib. Perianth absent; calyptra thick, clavate or pyriform,

clothed with straight bristles. Gemmae on the ventral surface of the midrib, discoid, large, many-celled, smooth.

Marginal hairs always single ... ... ... ... ... ... 2

Marginal hairs mostly in pairs ... ... ... ... ... 3

2. Frond nearly flat, simple ... ... ... ... *furcata*
   Wings split into involute lobes ... ... *saccata*

3. Midrib hairless ... ... ... ... ... *atrichoneura*
   Midrib with hairs ... ... ... ... ... ... ... ... 4

4. Nerve sheath 2-celled on both sides ... *nitida*
   Nerve sheath 2-celled dorsally, 4-celled ventrally ... ... ... ... ... ... ... ... *conjugata*

*Metzgeria furcata* (*L.*), *Dum.*—Variable in size, mostly 1-3 cm. long, repeatedly forked, from under 1 to nearly 2 mm. diameter, flat, procumbent. Midrib prominent on the ventral surface and 4 cells broad, flat and 2-celled dorsally. Cells of the wings hexagonal, about 32 $\mu$. diameter. Under surface more or less clothed with simple, straight hairs, usually numerous on the midrib, often absent from the wings, except a few just within the margin. Calyptra broadly clavate, covered with stiff hairs. Spores light brown, granular, about 25 $\mu$., diameter.

Very common. Mostly on bark. Cosmopolitan.

*Metzgeria saccata*, *Mitt.*—Seldom exceeding 1 cm. in length and 1 mm. in breadth, wings regularly segmented into reflexed saccate lobes, each about 2 mm. long; midrib flat and 2 cells wide on the dorsal surface, prominent, and 4-celled on the ventral, a few bold hairs on the margin between the lobes, none on the midrib, cells of the wing 32 $\mu$., Calyptra pyriform, 2.5 mm., coarsely strigose.

Mt. Wellington, Mt. Hartz, Adamson Peak, Freycinet Peninsula, etc. New Zealand.

*Metzgeria nitida*, *Mitt.*—Slender, ascending, often 3 cm. long, 1.5 mm. wide, margins recurved, midrib nearly flat, and 2-celled on both sides, hairs bold, few or copious on midrib and margin, those of the latter mostly in pairs; cells 45 $\mu$.

Mt. Wellington, Russell Falls, West Coast, etc. New Zealand. S. America.

*Metzgeria atrichoneura*, *Spruce.*—Small and repeatedly branched, margin revolute, midrib flat and 2-celled dorsally, prominent, 2-3-celled ventrally; hairs in pairs, short, and confined to the margin; cells 45 $\mu$.

Tasman Peninsula. New Zealand.

*Metzgeria conjugata, Lindb.*—Slender, often 3 cm. long, 1.5-2 mm. wide, margin recurved, midrib flat, 2-celled on the dorsal surface, produced, and 4-celled on the ventral; wings nude, but margin and midrib bearing many straight hairs, mostly in pairs; cells 45-60 $\mu$. long; cuticle smooth.

East Coast. Cosmopolitan.

## Hymenophytum, Dum.

Frond from a cylindric base, broadly membranous, decumbent or erect, simple to several times forked and fan-shaped above, midrib narrow. Archegonia on very short branches, arising from the ventral surface just below the membranous expansion, or at the lower fork; involucre bilobed; perianth clavate, with a fimbriate mouth; calyptra membranous. Antheridia on short, special branches on the ventral aspect of the midrib, or reduced to rotund cushions on the surface.

Frond fan-shaped ... ... ... ... ... ... *flabellatum*

Frond simple or once forked ... ... ... *phyllanthus*

*Hymenophytum flabellatum (Hook), St.*—Fronds from a creeping cylindrnc stolon, erect, a long stalk and a 2-3 forked membranous fan-shaped head; midrib thin. Perianth arising on the ventral surface of primary or secondary forks, about 1 cm. long, surrounded at the base by a short bilobed involucre; lobes reniform to oblong; margin entire, obscurely toothed or irregularly spinous. Antheridia on discoid cushions on the ventral surface.

Stephani makes the typical form with more than two primary divisions to the fan, stalk not at all winged, midrib lost below the apex, and the involucre spinous.

He adopts Taylor's *H. leptopodum* as a good species. This is generally less robust, with the primary division simply dichotomous, stipes winged above, midrib percurrent, and involucre entire.

Tasmanian forms, whether small or very robust, seldom have more than two divisions in the first fork; the stipes is winged, but the midrib vanishes at a distance from the apex, and the involucre is seldom entire.

Abundant. Australia. New Zealand.

*Hymenophytum phyllanthus (Hook), St.*—Fronds ascending, 2 cm., simple or once furcate, shortly stipitate, with broad wings above; midrib rather slender; wings thin, undulate; margin entire. Perianth on ventral aspect close below the expanded portion of the frond, cylindric,

6 mm., mouth fimbriate, calyptra delicate, shorter; involucre cupshaped, fimbriate. Antheridia on short ventral branches.

Common in shaded places. Australia. New Zealand.

### Pallavicinius, Gray.

Frond cylindric below, expanding above into a decumbent or erect, simple or forked expansion; midrib bold, with a central strand of small cells. Archegonia in groups on the upper surface, surrounded by a short, cup-shaped fimbriate involucre; perianth cylindric, with a fimbriate mouth; calyptra about as long, membranous. Antheridia solitary, globose, biseriate on dorsal aspect of the midrib, each covered by a dentate scale.

*Pallavicinius lyellii* (*Hook*), *Gray*.—Decumbent, simple, or with branches arising from the midrib, sometimes forked, 3-4 cm. long, about 4 mm. wide; wings undulate, ascending; margin entire; midrib slender. Fruit about the middle of the frond; involucre short, fimbriate above; perianth 6 mm. long, cylindric, mouth fimbriate, calyptra often protruding beyond the perianth. Spores brown 26 $\mu$., finely reticulated.

Cosmopolitan.

*Pallavicinius connivens* (*Col.*), *St.*—Erect from a cylindric rhizome, 1-2 cm., lower portion slender, cylindric, above 2-3 times forked, broadly winged, flabellate, edges involute, margin strongly dentate. Fruit towards the base of the primary fork, or on the dorsal surface of the midrib; involucre short, cup-shaped, with a fimbriate mouth; perianth broadly cylindric, 3-4 mm., mouth fimbriate; calyptra shorter than the perianth. Spores yellow, marked with short, sinuous, shallow ridges or irregular papillae, 30 $\mu$.

Mt. Wellington Plateau. New Zealand.

### Symphyogyna, Mont. et Nees.

Fronds cylindric below, expanded and membranous above, simple or forked; midrib narrow, wings broad, membranous. Archegonia in small groups on the dorsal aspect of the midrib, involucre consisting of a single bract; perianth absent; calyptra bold, cylindric, membranous. Antheridia single, but many in rows on each side of the midrib, each contained in a small bract.

Margin entire ... ... ... ... ... ... ... ... *interrupta*

Margin dentate ... ... ... ... ... ... ... ... ... ... 2

2. Closely decumbent, midrib very prominent on ventral surface ... ... ... *rhodina*
   Midrib rather flat ... ... ... ... ... ... ... ... 3
3. Midrib slender, wings decurrent, usually twice forked ... ... ... *hymenophylla*
   Midrib bold, base of wings bluff, simple or once forked ... ... ... ... ... ... *obovata*

*Symphyogyna interrupta*, *C. et P.*—Delicate, procumbent or ascending, fronds to 2 cm., stipitate below abruptly expanded, with broad wings above, simple, or with few branches; midrib slender; wings in some instances interrupted; margin entire. Calyptra 5-7 mm. long; bract narrow, oblong, laciniate above; capsule cylindric. Spores 20 $\mu$., asperate.

Closely resembling Podomitrium phyllanthus, Mitt.

Slopes of Mt. Wellington. Eastern Australia.

*Symphyogyna rhodina*, *Tayl.*—Rosy, closely decumbent, about 1 cm. long, 2-3 mm. diameter, forked; dorsal surface concave, ventral with a deeply produced bold midrib; wings ascending, more or less dentate. Calyptra about 6 mm. long, bract deeply lobed; spores 20 $\mu$., asperate.

On clay bank, Huon-road. New Zealand.

*Symphyogyna hymenophylla* (*Hook*), *St.*—Frond suberect, forked into a broadly obconic fan, membranous wings, broad, coalescing and decurrent below, margin coarsely dentate, midrib slender, vanishing in or below the obtuse apex. Calyptra slender, often exceeding 1 cm., apex fimbriate, and carrying sterile archegonia; bract oblong or quadrate, margin strongly dentate or fimbriate. Spores 18 $\mu$., papillate.

Apex occasionally with a flagellate rooting tip.

Very common. Australia. New Zealand.

*Symphyogyna obovata*, *Tayl.*—Fronds decumbent or ascending, about 2-3 cm. long, abruptly expanding, with broad, crisped membranous wings, simple or with few branches, midrib strong, attenuated towards the apex, margin rather regularly dentate. Calyptra about 1 cm. long, usually rosy, cylindric; bract deeply divided once or twice, fimbriate. Spores 22 $\mu$, yellow, with fine brown reticulations.

Very common. Australia. New Zealand.

### Treubia, Goebel.

Frond procumbent, simple, or rarely with few lateral branches; midrib broad, passing imperceptibly into the wings. Wings sectioned off into lobular leaves, nearly horizontal, slightly succubous, large and with a short lobe towards the anterior base. Archegonia in a small group on the dorsal surface of the midrib, near the apex, surrounded by an involucre of numerous small scales. Perianth, none. Calyptra thick, clavate, about 1 cm. long.

*Treubia insignis*, *Goebel*.—About 3-6 cm. long, 1.5 cm. broad, fleshy, midrib prominent on the ventral surface, copiously covered with mucous.

Slopes of Mt. Wellington. Rare. New Zealand, Java, Samoa, Tahiti.

### Fossombronia, Raddi.

Stem slender, closely creeping on ground, simple or forked. Leaves in two rows, succubous, imbricate, erect. Archegonia on the dorsal surface of the midrib near the apex. Perianth large, more or less plicate, with a widely open mouth. Calyptra tender, pyriform.

Leaves entire ... ... ... ... ... ... ... ... ... ... 2
Leaves dentate ... ... ... ... ... ... ... ... *dentata*

2. Leaves green, closely imbricate ... *perpusilla*
   Leaves reddish, loosely imbricate ... *intestinalis*

*Fossombronia perpusilla* (*Col.*), *St.*—Small, about 5 mm. closely procumbent. Leaves ascending, closely imbricate, quadrate, truncate to 3-4 lobed, undulate, cells 50-70 $\mu$. Perianth erect, close to the apex, 2 mm. long, plicate, mouth wide, crisped. Spores 40 $\mu$., brown, surface armed with short, sinuous, bold lamellae, appearing in section as crowded blunt spines.

Very common on ground. New Zealand.

*Fossombronia intestinalis*, *Tayl.*—Small, but often 1-2 cm long, closely procumbent. Leaves imbricate, ascending, quadrate, undulate, broader than long, about 2 mm. long, cells mostly 50-70 $\mu$. Perianth turbinate, about 2 mm. long, plicate, mouth broad, lobed. Spores black, 46-50 $\mu$, surface reticulate, with bold, truncate papillae at the junction of the lamellae.

Distinguished by longer growth, looser foliage, and dark, rough spores.

Common in grassy places. East Australia. New Zealand.

*Fossombronia dentata*, *St.*—Closely creeping, mostly 1-2 cm., often reddish. Leaves closely imbricate, ascending, broadly ovate to retuse, 1.5-3 mm. long, margin usually armed with about 12 bold spines, sometimes fewer or much reduced, cells 40 x 50 $\mu$. to 50 x 100 $\mu$. Rest not seen.

Common on heaths.

## JUNGERMANNIACEAE.

Archegonia terminating the main stem or lateral branch; sometimes the lateral branch basal, and so reduced as to break down the technical distinction from *Metzgeriaceae*. Leaves always present (reduced to small lateral lobes in *Zoopsis*), flat and expanded, entire or variously armed, or divided, always arranged in two lateral rows, generally a third ventral row of smaller leaves is present. Sporophyte surrounded at the base by a membranous perianth, and an enlarged calyptra; perianth rarely absent. The base of the sporophyte, with its accompanying envelopes, often more or less sunk in the substance of the gametophyte shoot. When this tendency is great this part of the stem develops a ventral, descending, fleshy bag, the marsupium.

The family is very large. A few natural subfamilies may be separated out, but the bulk of the genera do not present workable distinctions. Efforts have been made to group them in accordance with differences in structure of the perianth, but without a satisfying result. The following treatment is almost upon these lines, but depends more on leaf-shape. It is advanced not as being more natural, but as a more workable key to help the student.

Sub-family Juncermannioideae.—Leaves succubous rarely, almost transverse, under-leaves absent, except sometimes in the vicinity of the archegonia.

1. Leaves entire, rarely retuse ... ... ... ... ... 2
   Leaves bifid ... ... ... ... ... ... ... ... ... ... 12
2. Sporophyte with a simple perianth or calyptra ... ... ... ... ... ... ... ... ... ... 3
   Sporophyte inserted in a descending marsupium ... ... ... ... ... ... ... ... ... ... 9
3. Perianth absent... ... ... ... ... *Gymnomitrium*
   Perianth present ... ... ... ... ... ... ... ... 4
4. Perianth 2-lipped, flat, terminal... *Plagiochila*
   Perianth tubular ... ... ... ... ... ... ... ... 5

5. Perianth towards the base ... ... *Adelanthus*
Perianth terminal ... ... ... ... ... ... ... ... 6
6. Leaves with an acute apex ... ... *Cuspidatula*
Leaf apex obtuse... ... ... ... ... ... ... ... ... 7
7. Leaves strongly succubous ... ... *Jamesoniella*
Leaves nearly transverse ... ... ... ... ... ... 8
8. Leaves entire ... ... ... ... ... ... ... ... *Aplozia*
Leaves retuse ... ... ... ... ... ... *Sphenolobus*
9. Plant procumbent ... ... ... ... ... ... ... ... 10
Plant ascending or erect ... ... ... ... ... ... 11
10. Marsupium cylindric ... ... ... *Symphyomitra*
Marsupium, short, broad ... ... ... *Alicularia*
11. Marsupium apical ... ... ... ... ... *Tylimanthus*
Marsupium basal ... ... ... ... *Marsupidium*
12. Small, green ... ... ... ... ... ... ... ... ... 13
Robust, rigid, reddish ... ... *Anastrophyllum*
13. Cuticle smooth ... ... ... ... ... *Sphenolobus*
Cuticle papillose ... ... ... ... ... *Acrobolbus*

Sub-family Lophocoleoidae.—Leaves succubous, relatively large, entire or dentate or sometimes 2-lobed; underleaves always present, nearly always much smaller than and very dissimilar to the leaves.

1. Sporophyte inserted in a perianth ... ... 2
Sporophyte in a marsupium ... ... *Saccogyna*
2. Perianth at a distance from the apex ... ... ... ... ... ... ... ... *Chiloscyphus*
Perianth apical ... ... ... ... ... ... ... ... 3
3. Perianth triquetrous or cylindric, mouth 3-lobed... ... ... ... ... ... *Lophocolea*
Perianth flattened and bilobed at the mouth ... ... ... ... ... ... ... *Leptoscyphus*
Perianth trigonous, mouth dentate, leaves with a thick margin ... *Odontoschisma*

Sub-family Ptilidioideae.—Leaves usually small, incubous to transverse, rarely slightly succubous, bilobed to many lobed, lobes acute often spinous; underleaves present (except in some Cephalozia), similar to the leaves and often nearly as large. One species of *Lembidium* has entire leaves.

1. Leaves reduced to small lateral lobes; underleaves rudimentary ... ... ... *Zoopsis*
Leaves not so reduced ... ... ... ... ... ... 2
2. Leaves bilobed ... ... ... ... ... ... ... ... 3
Leaves with more than 2 lobes rarely bilobed in Lepidozia ... ... ... ... ... ... 6

3. Leaves divided below the middle ... ... ... 4
   Leaves divided to above the middle ... ... 5
4. Leaves robust strongly secund...*Chandonanthus*
   Leaves very small, erect ... ... ... ... *Herberta*
5. Underleaves small or absent; leaves minute ... ... ... ... ... ... ... ... *Cephalozia*
   Underleaves nearly as large as the leaves ... ... ... ... ... ... ... ... *Isotachis*
6. Perianth smooth ... ... ... ... ... ... ... ... 7
   Perianth hairy or scaly ... ... ... ... ... ... 8
7. Leaves incubous ... ... ... ... ... ... *Lepidozia*
   Leaves transverse. Stem erect and dendroid ... ... ... ... ... ... ... *Lembidium*
   Leaves succubous or transverse. Stem procumbent ... ... ... ... ... ... *Psiloclada*
8. Leaves with many spiney divisions; perianth with spiney hairs at the mouth ... ... ... ... ... ... ... *Blepharostoma*
   Leaves with numerous hair-like divisions; perianth scaley ... ... ... *Trichocolea*
   Leaves twice bifid, long acute, middle cells elongated ... ... ... ... ... ... *Lepicolea*

Sub-family Bazzanioideae.—Leaves incubous, entire or with 2-3 small terminal lobes, or margin ciliated; underleaves always present, not similar to the leaves.

Leaves 2-3 dentate or lobed ... ... ... ... *Bazzania*
Leaves entire or a few bilobed ... ... *Calypogeia*
Plant with numerous water-sacks on ventral aspect ... ... ... ... ... ... *Lepidolaena*

Sub-family Scapanioideae.—Leaves deeply divided into two lobes, the dorsal smaller than and closely pressed against the ventral lobe, in *Diplophyllum densifolium* the lobes are linear and equal.

Underleaves absent; leaf margin entire; perianth present ... ... ... ... *Diplophyllum*
Underleaves usually present; fruit terminal sunk in the hollowed apex of the stem ... ... ... ... ... ... ... *Schistochila*
Underleaves bifid; fruit in a descending fleshy bag ... ... ... ... ... ... *Balantiopsis*

Sub-family Raduloideae.—Leaves incubous, very unequally 2-lobed, ventral lobe very small, and closely pressed against the large dorsal lobe; underleaves absent. Perianth long, tubular below, with a broad, flattened mouth.

Contains but one genus ... ... ... ... *Radula*

Sub-family Jubuloideae.—Leaves incubous, very unequally 2-lobed, ventral lobe small, and more or less pressed against the larger dorsal lobe, rarely both lobes nearly equal; underleaves usually present. Perianth saccate with a very small often tubular mouth. Capsule not splitting to the base; many elators attached to the apex of each valve.

1. Ventral lobe convoluted to form a water sack ... ... ... ... ... ... ... *Frullania*
   Ventral lobe an involution on the ventral margin ... ... ... ... *Lejeunia group*

### Gymnomitrium Corda.

Small, growing in dense masses. Leaves imbricate, concave, entire or bifid, apex usually colourless. Underleaves none. Perianth none; calyptra terminal; capsule globose on a short seta; upper leaves enlarged, bracts smaller and colourless.

*Gymnomitrium concinnatum* (*Lightf*) *Corda.*—Stems small, slender, about 5 mm. long, pale green tinged with red or yellow. Leaves closely imbricate in two opposite rows closely appressed to the stem, oblong, 1 mm. mostly $\frac{1}{4}$ bilobed, sometimes notched or entire, margin hyaline; cells about 20 $\mu$., cuticle minutely verruculose. Bracts many deeply lobed; inner ones laciniate.

Our plant has been referred to *Acolia stygia*, but that has entire less crowded leaves.

Mt. Wellington Plateau.

Cosmopolitan.

In exposed situations on mountains the leaves are more closely appressed and entire; marginal cells elongated and irregular, forming an erose colourless border.—*Cesia erosa C. et P.*

### Plagiochila, Dum.

Large to medium, never very small, green or more or less tinged with brown, shoots ascending from a leafless rhizome, simple or more often with lateral branches. Leaves succubous, base narrow, oblique with the dorsal margin reflexed; underleaves absent. Perianth terminal, with a broad, laterally flattened, bilobed or truncate mouth; floral leaves large. Antheridia in terminal spikes.

Plants of the deltoid group vary in habit and structure. It is very difficult to define specific limits, and numerous species have been described from limited herbarium material. In all the species the dentition of the margins and size of trigones vary greatly.

1. Leaves deltoid; dorsal margin nearly straight, ventral strongly curved ... ... ... 2
   Leaves subovate to rotund ... ... ... ... ... 6
   Leaves obcuneate to narrowly obovate ... ... 13
2. Leaves broader than long ... ... ... ... ... ... 3
   Leaves longer than broad ... ... ... ... ... 4
3. Leaves 3-4 mm. strongly dentate ... *deltoidea*
   Leaves 2 mm. margin undulate, seldom with a few teeth ... ... *microdictyum*
4. Leaves obliquely ovate, apex narrow ... ... 5
   Leaves obliquely oblong, apex broad *fasciculata*
5. Dorsal margin nearly straight and plain ... ... ... ... ... ... ... ... ... *strombifolia*
   Dorsal margin curved, usually with a few bold teeth ... ... ... ... ... ... ... *lyallii*
6. Margin many dentate ... ... ... ... ... ... 7
   Margin plain or few dentate ... ... ... ... ... 10
7. Teeth minute ... ... ... ... ... ... ... ... ... 8
   Teeth bold ... ... ... ... ... ... ... ... ... ... 9
8. Dorsal base abruptly inserted ... ... *fuscella*
   Dorsal base decurrent ... ... ... ... ... *taylori*
9. Both margins armed ... ... ... ... *retrospectans*
   Dorsal margin nude ... ... ... ... ... *biserialis*
10. Leaves rotund ... ... ... ... ... ... ... *circinalis*
    Ventral margin much expanded ... ... ... 11
11. Leaves rigid, strongly decurved... *decurvifolia*
    Leaves erect appressed ... ... ... ... ... ... ... 12
12. Leaves brownish ... ... ... ... ... ... ... *pusilla*
    Leaves pale green flaccid ... ... ... *radiculosa*
13. Leaves 1.5 mm., surface obtusely papillate ... ... ... ... ... ... ... ... ... *pleurata*
    Leaves much smaller, surface smooth ... ... ... ... ... ... ... *incurvicolla*

*Plagiochila deltoidea*, *Lindb.*—Robust, short and simple to 10 cm., and branched. Leaves crowded, imbricate, deltoid, 3-4 mm. long, very oblique and a similar breadth, dorsal margin strongly reflexed, lightly curved and mostly nude, base shortly decurrent, ventral margin very expanded from apex to base, often conniving with the opposite leaves to form a crest, apex and ventral margin variously armed with few to many bold teeth; cells averaging 24 $\mu$., walls thick, trigones large. Perianth immersed in large floral leaves, mouth broadly truncate, spinulose, dorsal margin with a narrow dentate wing above.

Very common.

East Australia. New Zealand.

*Plagiochila microdictyum, Mitt.*—Small, simple, rarely exceeding 5 cm. Leaves crowded, shaped as in *P. deltoidea*, about 2.5 mm. long and rather broader, apex and ventral margin undulate, nude or rarely a few irregular or many very small teeth; cells 20 $\mu$, trigones as large as the cells, walls sinuous.

Mt. Wellington. Adamson Peak. New Zealand.

*Plagiochila fasciculata, Lindb.*—Usually tall, slender, and freely branched. Leaves imbricate, obliquely ovate; trigonous or rather oblong, 2-3 mm. long, dorsal margin nearly straight and nude below, ventral margin boldly curved from apex to base, and armed with few or many spinous teeth; cells averaging 20 $\mu$, trigones rather small. Perianth hardly exserted, mouth truncate, coarsely spinous.

Distinguished from *P. deltoidea* by the smaller, narrower leaves.

Very common.

New Zealand. Auckland Island. East Australia.

*Plagiochila strombifolia (Taylor), Lehm.*—Usually robust and branched. Leaves obliquely ovate, with an obtuse apex, about 2.5 mm. long, dorsal margin nearly straight, lightly reflexed, nude, ventral margin expanded, but not extremely so, armed with short, broad acute teeth; cells 27 $\mu$, walls rather thick, trigones medium. Perianth shortly exserted, mouth rotund, armed with spinous teeth.

The straight dorsal margin distinguishes it from the last; the smaller more ovate leaves from *P. deltoidea*.

Very common.

*Plagiochila lyallii, Mitt.*—Usually tall and branched. Leaves not crowded, obliquely ovate, 1.5-2 mm., dorsal margin lightly curved, usually with a few bold teeth, ventral margin more strongly curved, but not ampliate, armed with strong, broad spinous teeth; cells about 16 $\mu$; trigones small or none. Perianth shortly exserted, mouth very broad and armed with spinous teeth.

Less crowded leaves, narrower apex and fewer teeth mark its distinction from *P. fasciculata*.

Very common.

New Zealand.

*Plagiochila fuscella, Hf. et T.*—Rather small for the genus, seldom exceeding 3 cm., usually many branched. Leaves with a nearly transverse very narrow insertion, subrotund, 3 mm. long, dorsal margin curved, slightly deflexed, nude, apex and ventral margin very broadly

curved, ampliate below, armed with numerous minute teeth; cells 12-16 $\mu$., walls thick, trigones none, marginal cells strongly incrassate.

Near Emu Bay.

Auckland Islands.

*Plagiochila taylori*, *St.*—Slender, many branched, to 7 cm. long. Leaves not crowded, obliquely ovate to nearly rotund, 2-3 mm., base narrow, apex obtuse, dorsal margin lightly reflexed, nude, base rather decurrent, ventral margin strongly curved from apex to base, armed with numerous or few minute teeth; cells 18 $\mu$., trigones small, walls straight or slightly sinuous. Perianth long exserted, oblong, mouth truncate spinulose.

Very close to *P. fuscella*, with a more ovate leaf and decurrent dorsal base.

Mt. Wellington, West Coast.

*Plagiochila retrospectans*, *Nees.*—About 5-7 cm., many branched. Leaves erect, appressed, broadly ovate, 3 mm., everywhere armed with numerous teeth of mixed sizes, rarely all small, and usually an apical tooth larger than the rest, ventral more curved than the dorsal margin; cells very irregular, 10-20 $\mu$, trigones large, rotund, walls more or less sinuous, several series of cells at the margin with strongly thickened walls. Perianth half exserted, mouth with long fimbriae.

Very common.

Eastern Australia.

*Plagiochila biserialis*, *L. et L.*—Usually about 4 cm. and unbranched. Leaves crowded, erect, closely appressed, nearly rotund, 1-1.5 mm. long, dorsal margin strongly curved, nude below and slightly deflexed, terminating in a bold apical tooth, ventral margin more curved, armed with about 10 unequal, bold teeth, getting smaller from above downwards; cells 25 $\mu$., trigones very large, walls sinuous. Perianth exserted, very flat, mouth rotund armed with few teeth.

West Coast, Adamson Peak, Mt. Hartz, Cradle Mt., etc.

*Plagiochila circinalis*, *L. et L.*—Rigid, simple or few branched, about 3 cm. Leaves erect, obliquely ovate-rotund, 2 mm., dorsal margin curved with a rather decurrent base, ventral margin rotund, margins nude, undulate or with a few irregular teeth; cells 18 $\mu$., trigones very

large. Perianth long, narrow, not much flattened, mouth rotund, armed with short spines.

Mt. Wellington, Cradle Mt., etc.

New Zealand, Campbell Islands.

*Plagiochila decurrifolia*, *St.*—Seldom branched, up to 6 cm. long. Leaves crowded, erect, and closely imbricate, broadly obliquely ovate, very obtuse, about 2 mm. long, dorsal margin nearly straight, strongly reflexed, base subdecurrent, ventral margin deeply rotund undulate occasionally with a few irregular teeth towards the apex; cells about 20 $\mu$., trigones as large as the cells. Perianth oblong freely exserted. Very close to *P. magellanica*, *Lindb.*

West Coast. Hartz Mts.

New Zealand.

*Plagiochila pusilla*, *Mont.*—Usually 1-2 cm., sometimes longer, dull green, generally with descending stolons. Lower leaves small, entire, obliquely reniform; upper leaves about 2 mm. long, nearly rotund but the ventral side ampliate, margin more or less dentate, dorsal margin slightly reflexed, insertion abrupt; cells 30 $\mu$., walls thick, trigones large confluent.

Mt. Faulkner. West Coast.

Auckland Islands.

*Plagiochila radiculosa*, *Mitt.*—Flaccid, many branched. Leaves pale green, crowded erect, appressed broadly ovate-trigonous up to 4 mm. long, much smaller below, dorsal margin nearly straight, entire, ventral margin broadly expanded entire, apex rotund or narrow truncate with two small teeth; cells mostly 30-35 $\mu$., trigones medium acute to convex, sometimes larger and rotund.

Mt. Wellington. Adamson Peak.

*Plagiochila pleurata*, *Hf. et T.*—Usually under 2 cm., simple or with few branches, rather rigid. Leaves narrow obovate from a narrow base, slightly asymmetric, 1.5 mm. long, dorsal margin slightly curved, nude, apex truncate with 2-3 bold teeth, ventral margin more curved with few short broad obtuse teeth; cells 18 $\mu$; surface with many very short rotund papillae.

It has a resemblance to small forms of *P. lyallii*.

Mt. Wellington. West Coast.

*Plagiochila incurvicolla*, *Hf. et T.*—Small, seldom exceeding 2 cm. rigid, usually simple. Leaves small, seldom

exceeding 0.6 mm., narrow obovate from a narrow base, dorsal margin lightly curved, nude, ventral margin more strongly curved, apex and ventral margin armed with about 7 bold broad teeth; cells 18 $\mu$., walls thick, trigones none, cuticle smooth.

Very close to *P. pleurata*, but smaller with a smooth cuticle.

Mt. Wellington.

New Zealand.

### Adelanthus, Mitt.

Stems erect from a creeping rhizome, simple or with few long branches, apex usually circinate. Leaves succubous, rotund, margins incurved, entire or minutely dentate; cells rotund, walls thick; underleaves none or rudimentary. Perianth fusiform on a short branch towards the base of the stem, mouth contracted. Calyptra fleshy.

Distinguished from rotund leaved *Plagiochilae* by the margin being inflexed not reflexed. From *Jamesoniella* by the different habit and dentate upper leaves.

*Adelanthus falcatus*, *Mitt.*—Usually 2-4 cm. Leaves erect appressed rotund, 0.8-1.2 mm. diameter, dorsal base decurrent, ventral rotund, lower leaves entire, upper ones often dentate; cells quadrate with thick walls, lower cells longer with thinner walls. Perianth 2-3 mm. long.

Very common.

New Zealand.

### Cuspidatula, St.

Small, decumbent simple or with few branches. Leaves crowded, secund on the dorsal aspect, ovate with a broad base and acute apex, succubous; cells rotund, walls thick, trigones large confluent; underleaves none. Perianth terminal large, ovate-cylindric, plicate, mouth narrow lobed also with numerous filiform fimbriae; bracts and bracteole larger than the leaves, deeply bifid and dentate.

Very close to *Anastrophyllum*.

*Cuspidatula monodon* (*Hf. et T.*), *St.*—Leaves 1.3 mm. broadly ovate, imbricate, apex spinous, ventral margin often with a rudimentary lobe.

On most mountains.

Australia. New Zealand.

### Jamesoniella, Schiffn.

Decumbent or erect, generally rigid few branches. Leaves succubous, entire rotund to oblong, imbricate, margins inflexed or flat; cells rotund with thick walls seldom with apparent trigones; underleaves absent except in the floral region. Perianth terminal, cylindric, plicate, mouth rather contracted; bracts as short as or shorter than the leaves more or less divided into linear lobes.

1. Cuticle verrucose ... ... ... ... ... ... ... *colorata*
   Cuticle smooth ... ... ... ... ... ... ... ... 2
2. Leaves under 1 mm. appressed ... ... ... *teres*
   Leaves larger ... ... ... ... ... ... ... ... 3
3. Leaf base constricted ... ... ... ... ... ... 4
   Leaf base broad ... ... ... ... ... ... *tasmanica*
4. Leaves erect or nearly so ... ... ... *grandiflora*
   Lower leaves squarrose ... ... ... ... *sonderi*

*Jamesoniella colorata* (*Lehm.*), *Spruce.*—Decumbent, matted, wiry, tinged with yellowish-red. Leaves closely imbricate, rotund, margins slightly inflexed, base narrow, dorsal base straight but not decurrent, ventral rather more rounded, 1 mm.; cells 27 $\mu$., walls thick continuous with the trigones, cuticle coarsely verrucose. Perianth narrow cylindric irregularly grooved, mouth narrowed with short, broad irregular fimbriae; bracts about as long as the leaves, quadrate, shortly fimbriate, bracteole broadly lanceolate.

Very common.

Southern Hemisphere, widely distributed.

*Jamesoniella grandiflora* (*L. et G.*), *Spruce.*—Decumbent, wiry, matted, nearly black. Leaves imbricate but often more or less recurved, broadly oblong, 1-1.7 mm. margin slightly inflexed, both bases rather acute; cells subquadrate mostly about 14 $\mu$., becoming very much larger towards the centre and base, walls rather thick, trigones none, cuticle smooth. Perianth narrow-cylindric grooved, about 4 mm., mouth irregularly lobed; bracts rather longer than the leaves, very variable in armature, sometimes with only a few fimbriae towards the dorsal apex, at others variously laciniate; bracteole long, and very slender, with few slender laciniae.

Mountain plateaux.

South America.

*Jamesoniella teres*, *C. et P.*—Small, wiry, green tinged with red. Leaves imbricate, closely appressed oblong 0.5 mm., base broad, apex obtuse soon weathering; cells 18 $\mu$., walls rather thin, trigones not apparent. Perianth

terminal but usually thrown to the side by a ventral innovation, oblong, grooved, mouth not much constricted, with many short irregular lobes.

Mt. Wellington. Mt. Field. Mt. Hartz, Etc.

*Jamesoniella tasmanica (Tayl.)*.—Decumbent, not wiry, green or tinged with red. Leaves imbricate, erect on the young, spreading and decurved on the older shoots, ovate-rotund, base not at all constricted, flat, up to 2 mm. long; cells 24 $\mu$., trigones small, concave. Much confusion has occurred by some authorities having confused *J. colorata* with this.

Mt. Hartz. St. Mary's.

*Jamesoniella sonderi (G.), St.*—Stems rigid generally simple and erect in dense mats. Upper leaves erect, imbricate, obovate 2 mm. long, lower ones squarrose almost transverse; cells quadrate 18 $\mu$., walls thick, trigones none. Perianth oblong, 6-12 deep plaits, mouth contracted irregularly dentate; inner bracts shorter than the leaves with many laciniae; bracteoles oblong, laciniate.

West Coast. Western Tiers.

## Aplozia, Dum.

Small, ascending or slightly branched. Leaves oblong to rotund, succubous, obliquely inserted entire. Underleaves generally absent. Floral leaves similar to the stem leaves but larger. Perianth free or slightly combined with the bracts pyriform to fusiform, plicate, mouth contracted. Cells mostly about 30-35 $\mu$. with thin walls.

1. Perianth suddenly contracted to form a small tubular mouth ... ... ... ... *rotata*
   Perianth gradually contracted ... ... ... ... 2
2. Perianth with a deep broad ventral groove, mouth shortly lobed ... ... ... *alpina*
   Perianth 3 plicate, mouth deeply lobed, usually torn ... ... ... ... ... *lacerata*

*Aplozia rotata (Mitt.)*.—Stems mostly 5-10 cm., simple. Leaves rotund to broadly oblong, nearly transversely inserted, not closely overlapping, 0.5-0.7 mm., bracts rather larger. Perianth about 2 mm., pyriform deeply 4 plicate above, apex abrupt with a small tubular mouth. All parts more or less red.

In shade the bracts are little larger than the leaves. In exposed places at a high altitude they are often as long as the perianth.

Mt. Wellington. Longley.

New Zealand.

*Aplozia alpina*, *Rod.*—Stem weak slender, often 2-3 cm., green. Leaves mostly distant rotund, concave, nearly transverse, mostly 0.7 mm.; cells 17 $\mu$.; bracts similar to and about the size of the other leaves, free from the perianth. Perianth fusiform tapering to a shortly 3-lobed or nearly entire mouth, dorsal surface with an obtuse keel, ventral surface with a broad deep groove, 2 mm. long. Stunted forms have a shorter perianth with a wider 3-lobed mouth and often a shortly bifid bracteole.

Mt. Wellington Plateau. Cradle Mt.

*Forma stipulata.*—In dense cushions, more robust, branches often stoloniferous. Underleaves present, oblong, rudimentary to half as long as the leaves.

Cradle Mt.

*Aplozia lacerata*, *Rod.*—Stems short in cushions, but often hidden amongst moss or buried in humus bearing only a few leaves in the upper portion, tender and pale, sage-green. Leaves almost transverse oblong to nearly rotund, concave 0.7 mm.; cells 27 $\mu$., walls thin. Bracts much longer than the leaves, narrow oblong, apex slightly fimbriate, bracteole nearly as long as the bracts, ovate obtuse, all adnate to the base of the perianth. Perianth cylindric with three shallow plaits little longer than the bracts, mouth narrow to little constricted, deeply 3-lobed, lobes narrow laciniate.

Mt. Wellington Plateau.

### Sphenolobus (Lindb.), St.

Plants usually small, decumbent to erect; branches few from the ventral angles of the leaves. Leaves small, transversely inserted, 2-lobed or nearly entire, base decurrent or sheathing; cells rotund; underleaves absent or rudimentary. Perianth terminal, ovate to cylindric, more or less contracted at the apex.

Very close to *Lophozia*, but the leaves more concave and transversely inserted.

*Sphenolobus perigonialis* (*Tayl.*), *St.*—Very slender, usually about 1 cm. long, dark livid green. Leaves oblong, not crowded, decurving above, base broad stem-clasping, apex to $\frac{1}{4}$ bifid, lobes broad obtuse, 0.6 mm. long; cells 14 $\mu$., cuticle irregularly nodulose. Bracts usually broad, shortly 3-lobed 1.3 mm.; perianth broadly oblong, 2 mm., 3-5 plicate, mouth contracted with 3-5 short irregular lobes, but perianth varies much in length, and is often quite cylindric, with a very small contracted mouth.

Mt. Wellington. Mt. Field. Western Tiers.

New Zealand. Auckland Islands.

*Forma submersus.*—Leaflobes shorter, cuticle smooth. Bracts not enlarged; perianth wholly exserted oblong, not plicate, 3 mm., mouth suddenly contracted, shortly fimbriate.

Lake Leila, Cradle Mt.

*Sphenolobus nigrus, Rod.*—Small densely clustered in blackish cushions, the shoots simple or with few branches, about 1 cm. long. Leaves obcuneate from a narrow base, spreading, to $\frac{1}{3}$ bifid, lobes broad, apex rather acute 1 mm. long; cells 14 $\mu$., with very thick walls, cuticle smooth. Bracts similar to the leaves only larger, connate with an oblong bracteole. Perianth broadly cylindric, deeply 5-grooved, 2 mm. long, mouth closely contracted with a few short fimbriae.

On rocks in rivulet, Cradle Mt.

### Alicularia, Corda.

Small, ascending or procumbent, little branched with numerous ventral rhizoids. Leaves succubous obliquely inserted, rotund to oblong, entire; underleaves rudimentary, lanceolate or none. Bracts enlarged round the thickened apex, which forms a short broad marsupium; perianth tender, more or less connate with the bracts and wall of the marsupium.

*Alicularia tenella, Rod.*—Decumbent or ascending, dispersed amongst other small plants rarely forming mats. Leaves ascending, flat or slightly concave, oblong to rotund, rather delicate and flaccid, 1 mm. base subdecurrent; cells 32 m., trigones small or none, cuticle smooth. Marsupium short and broad, bracts very large.

Mt. Hartz. Adamson Peak. St. Patrick's Head. Cradle Mt., Etc.

### Acrobolbus, Nees.

Stems prostrate with bunches of rhizoids from the under surface. Leaves succubous, bilobed with unequal lobes, erecto-connivent near the inflorescences. Underleaves absent or rudimentary. Sporophyte inserted in the base of a terminal marsupium; perianth absent; calyptra adnate with the inner wall of the marsupium.

*Acrobolbus cinerascens* (*L. et L.*), *Schffn.*—Small, usually matted, pale green. Leaves plano-distichous, oblong about 1-3rd bifid, lobes unequal, 1-1.3 mm., margin plain; cells 35 $\mu$., trigones rather large, convex, cuticle coarsely papillose.

Mt. Wellington. West Coast.

Australia. New Caledonia. New Zealand.

*Forma attenuata.*—Elongated to 6 cm. amongst moss; leaves 0.5 mm., cells 15-20 $\mu$., trigones very small concave; cuticle intensely papillose.

Mt. Wellington.

*Acrobolbus unguiculatus* (*Tayl.*), *Mitt.*—Closely creeping on ground, pallid green, often to 4 cm. Leaves reniform, symmetric, ventral base rotund, dorsal nearly decurrent, to 1-3rd emarginate-bilobed, deeply spinulose with 8-10 large teeth; underleaves present very small; cells 26 $\mu$., lower ones much larger, trigones large subnodulose. Marsupium cylindric.

Huon River.

Australia. New Caledonia. New Zealand.

### Symphyomitra, Spruce.

Decumbent, simple or with innovations from the upper leaf axils. Leaves succubous, alternate entire; underleaves none. Sporophyte terminal in a descending cylindric marsupium.

*Symphyomitra drummondi* (*Mitt.*), *St.*—Closely decumbent on the ground, stems simple, mostly under 1 cm., flagella arising from the ventral surface. Leaves distichous, convex, broadly ovate-triangular from a very broad base 0.7-2 mm. long; cells 32 $\mu$., cuticle smooth. Marsupium very long.

Very common on ground.

Australia. New Zealand.

*Forma papillosa.*—Cuticle covered with very short obtuse dome-like papillae. Every condition between this and the smooth cuticle of the type occurs on damp heaths.

*Symphyomitra concinna* (*Mitt.*), *St.*—Yellow rigid, prostrate, bearing radicles on the ventral surface. Leaves reniform concave imbricate rigid and brittle, margin hyaline, 1.5 mm., both bases abruptly inserted rotund; cells 18-24 $\mu$., trigones large convex to huge and confluent, cuticle asperate or sometimes smooth.

Recherche. Mt. Hartz.

Campbell Islands.

### Tylimanthus, Mitten.

Stems simple or with few branches, erect or decumbent from a creeping rhizome. Leaves succubous, obliquely inserted, distichous, remote, apex truncate to shortly and unequally bilobed, otherwise entire or irregularly dentate; cells rather large, thickened at the angles, cuticle generally

rough, in few species smooth. Underleaves none. Archegonia in a terminal group. Sporophyte-base sunk in an oblong fleshy marsupium. Capsule oblong on a long seta.

When sterile readily distinguished by the pale bright green colour as well as the structure.

Robust. Cuticle smooth ... ... ... ... ... *saccatus*
Medium. Cuticle asperate ... ... ... ... ... ... 2
Small. Cuticle papillose ... ... ... ... ... *viridis*
2. Leaves obovate ... ... ... ... ... ... *flaccidus*
Leaves rectangular ... ... ... ... ... ... ... 3
3. Basal cells asperate ... ... ... ... ... ... *tenellus*
Basal cells striate ... ... ... ... *angustifolius*

*Tylimanthus saccatus* (*Hook.*), *Mitt.*—Stems mostly erect, 5 cm., forming mats. Leaves from broadly rectangular and little truncate to reniform or oblong and unequally bilobed, margin from closely dentate to entire, to 4 mm. long; cuticle smooth or some cells minutely asperate. Marsupium nearly 1 cm. long clothed with coarse hairs.

Very common.

Australia. New Zealand.

*Tylimanthus tenellus* (*Tayl.*), *Mitt.*—Slender decumbent. Leaves rectangular, 1.5 mm., sometimes much smaller, dorsal base decurrent, ventral abrupt or with an upward curving, apex unequally bilobed, variable, entire or with few teeth; cuticle with minute obtuse asperities. Marsupium covered with villous hairs.

Very common.

Australia. New Zealand.

*Tylimanthus flaccidus*, *Berg.*—Slender, decumbent. Leaves narrow obovate, decurved 1.5-3 mm., base hardly decurrent, dorsal straight, ventral constricted, apex unequally bilobed, more or less dentate; cuticle covered with minute obtuse asperities. Marsupium 4 mm., coarsely setose.

Very close to *T. tenellus*.

Hartz Mts. Mt. Field. West Coast, Etc.

Australia. New Zealand.

*Tylimanthus angustifolius*, *St.*—Stems about 5 cm., long, decumbent. Leaves oblong-rectangular, base not constricted, up to 4 mm. hardly decurrent, sides parallel, nude, apex unequally bilobed, with few teeth. Cuticle of upper cells very slightly asperate, lower ones striate verrucose.

Tasmanian specimens referred to this by Stephani are not typical, and are probably strong plants of *T. tenellus*.

Recherche.

Blue Mountains.

*Tylimanthus viridis, Mitt.*—Very slender, decumbent amongst other small plants. Leaves nearly quadrate, 1-3rd unequally bifid, 1 mm., cuticle coarsely papillate.

Adamson Peak. Hartz Mts. West Coast. Trowutta, etc.

South America.

### Marsupidium, Mitten.

Stems short erect from a creeping rhizome. Leaves succubous, relatively large, crowded, obliquely inserted, very concave, dorsal bases connivent, margin entire or variously armed; cells large, angles thickened, cuticle smooth to coarsely verrucose. Underleaves none. Archegonia in a terminal group on a short basal branch. Sporophyte inserted in a fleshy marsupium. Marsupium pendulous on a short lateral stalk placed at the base. Capsule oblong on a long thick seta.

Margin entire or nearly so ... ... ... ... ... ... 2
Margin armed ... ... ... ... ... ... ... ... ... ... 3
2. Plant flaccid, dark green ... ... ... *abbreviatum*
Plant rigid, light green ... ... ... ... *surculosum*
3. Margin lobed; cuticle papillose ... *setulosum*
Apex bispinous; cuticle smooth ... *piliferum*

*Marsupidium abbreviatum (Tayl.).*—Flaccid, dark green, simple, 1-2 cm. Leaves rotund or reniform from a narrow subdecurrent base 2-3 mm., margin entire or with a slight apical truncation; cuticle smooth.

Adamson Peak; West Coast; Trowutta, Etc.

Auckland Islands.

*Marsupidium surculosum (Nees), Schiff.*—Stem about 2 cm. rigid. Leaves concave, imbricate, rotund to reniform 1.5 x 2.5 mm., margin armed with a few short teeth or entire; cuticle smooth. Marsupium 4 mm., seta nearly as long as the stem, thick.

West Coast. Mt. Hartz.

Eastern Australia.

*Marsupidium setulosum, Mitt.*—Flaccid, densely caespitose 2-3 cm., stem thick covered with papillose hairs. Leaves concave, broadly ovate 2.5 mm., margin irregularly lobed and dentate; cuticle coarsely papillose.

Mt. Faulkner.

New Zealand.

*Marsupidium piliferum*, *St.*—Small, rigid, erect. Leaves crowded, closely imbricate, concave, 1-1.5 mm., rotund to oblong with 2 filiform spines towards the apex otherwise entire; cuticle smooth.

Adamson Peak. Trowutta. Cradle Mt.
Eastern Australia. Chile.

### Anastrophyllum (Spruce). St.

Robust and rigid, simple or with few branches arising from the ventral angles of the leaves. Leaves succubous or nearly transversely inserted, strongly secund, base stem-clasping, apex unequally bifid; cells with sinuous walls and large trigones. Underleaves none. Bracts rather larger, usually armed; perianth terminal cylindric, plicate above, mouth constricted laciniate.

*Anastrophyllum schismoides* (*Mont.*), *St.*—Dark red, usually 3-6 cm. Leaves crowded, imbricate, conduplicate, asymmetric, ventral margin longer and more strongly curved than the dorsal, 1-3rd bifid, lobes broad not very acute, sinus broad, 1.3 mm.; cells 16 $\mu$, trigones as large as the cells, cuticle smooth, bracts similar to and not much larger than the leaves; perianth 3 mm.

Adamson Peak. Hartz Mts. Blue Tier, Etc.
New Zealand. South America.

*Anastrophyllum tasmanicum*, *Rod.*—Robust, pale olive green, branching 3-4 cm. Leaves not strongly secund, almost squarrose nearly symmetric, to 1-3rd bilobed, lobes nearly equal, broad, usually with a very acute apex, margin just above the ventral base armed with a few acute teeth, 1.4 mm.; cells 20 $\mu$, cuticle coarsely verrucose. Perianth narrow ovate, 3 mm., with about 8 deep plaits.

Adamson Peak. Mt. Hartz.

Very like *Chandonanthus squarrosus*, but the complete absence of underleaves and paraphylls distinguishes it.

### Saccogyna, Dum.

Robust, decumbent, with few branches from the ventral surface. Leaves succubous, nearly opposite, entire or with two unequal and irregular teeth, dorsal base decurrent; underleaves large, bifid. Sporophyte inserted in a fleshy marsupium remote from the apex.

General appearance strongly resembles *Chiloscyphus* of the *Ch. coalitus* type.

*Saccogyna australis*, *Mitt.*—Long slender, yellowish green. Leaves plane, squarrose, ovate-triangular, slightly

decurved, base very broad, dorsally strongly decurrent, ventrally abrupt, 2.5 mm., apex narrow-rotund to shortly bidentate; cells 27-32 $\mu$., trigones small, cuticle covered with small short subacute papillae. Underleaves large, erect, concave, 1-3rd bidentate, broadly oblong, usually free.

Described by Mitten as *Lophocolea decurva*.
Longley.
New Zealand.

*Saccogyna asperrima*, *St.*—Decumbent branching 1-2 cm., reddish-green. Leaves crowded erecto-homomallous imbricate ovate asymmetric, 1.5 mm., dorsal margin substrict, ventral ampliate, apex subacute entire or bidentate; cells 27-36 $\mu$., trigones medium convex, cuticle covered with large acute asperities; underleaves half as large as the leaves, rotund imbricate free, apex with a shallow sinus to $\frac{1}{2}$ bidentate.

The leaves are smaller than in *S. australis*, the apex more often entire, and the underleaves not so closely appressed.

Cradle Mt. West Coast.

## Lophocolea, Dum.

Generally large to medium, rarely small, procumbent; branches few, ventral. Leaves tender, succubous, entire, retuse or bidentate, rarely with marginal teeth. Underleaves always present, small, generally bifid, margins plain to more or less dentate, the marginal teeth sometimes as long as the terminal lobes, rarely reniform with 4-6 spinous teeth; free or connate with the leaves on one or both sides. Cells rotund, mostly 20-30 $\mu$. diameter, walls generally thin with small or no trigones, rarely the trigones are rather large and rotund. Bracts similar to the leaves, only larger and often more dentate. Perianth usually terminating main shoots, rarely on lateral branches, generally long and triquetrous with a 3-lobed mouth, angles rarely winged, occasionally cylindric. Calyptra delicate. Capsule spherical on a long stalk. Antheridia in a fold at the dorsal insertion of the stem leaves.

A very large genus. The species vary considerably, and are correspondingly difficult to determine. It is seldom that any character can be received as constant. Most of Stephani's new species are here described from specimens determined by him, but some of these appear more as extreme forms than good species.

Group A. Leaves small, rigid, erect, entire or emarginate, *not decurved when fresh nor crumpled when dry.*

1. Trigones large ... ... ... ... ... ... ... ... ... 2
   Trigones minute ... ... ... ... ... ... ... ... ... 4
2. Underleaves relatively large free ... ... ... 3
   Underleaves very small connate ... *crcipulata*
3. Very small green, underleaves bifid ... ... ... ... ... ... ... ... ... ... *angulistipula*
   Leaves 2 mm., underleaves subcucullate, regularly denticulate ... ... ... *tumida*
4. Underleaves nearly as large as the leaves, 1-3rd bifid ... ... ... *novae-zelandiae*
   Underleaves very small ... ... ... ... ... ... 5
5. Underleaves free ... ... ... ... ... ... *dargonia*
   Underleaves connate with leaves ... *crcipulata*

Group B. Leaves medium to large, *erect with a more or less decurved apex*, rotund to triangular, entire or rarely retuse, or some leaves slightly bidentate, or in some species the margin slightly armed.

1. Leaf margin always plain strongly decurved ... ... ... ... ... ... ... ... ... ... 2
   Leaf margin often armed, apex not strongly decurved ... ... ... ... ... ... ... 6
2. Leaf at least as long as its base ... ... ... 3
   Base of leaf exceeding its length ... ... ... 4
3. Underleaves narrow, deeply bifid *canaliculata*
   Underleaves mostly 4-fid. ... *heterophylloides*
   Underleaves oblong-rotund, shortly bifid ... ... ... ... ... ... ... ... ... *cordifolius*
4. Leaf ovate-rotund ... ... ... ... ... *gunniana*
   Leaf more or less retuse ... ... ... ... ... ... 5
5. Trigones none ... ... ... ... ... ... *forsythiana*
   Trigones medium acute ... ... ... ... *geheebii*
6. Leaves mostly under 1 mm. long... *lauterbachii*
   Leaves exceeding 2 mm. ... ... ... ... ... ... 7
7. Leaves reniform erect crowded ... ... *rupicola*
   Leaves ovate-triangular subplano-distichous ... ... ... ... ... ... *fissistipula*

Group C. Leaves mostly ovate-triangular, apex more or less retuse, sometimes rotund or a few leaves bifid, medium to large, erect or decurved, but *flaccid and crumpled when dry.*

1. Underleaves relatively large, seldom deeply bifid, margin with small teeth or entire ... ... ... ... ... ... ... ... ... 2

Underleaves seldom twice as broad as stem 2-3rd bifid, margin usually armed with 1-2 acute teeth ... ... ... ... 6
2. Leaves 1-1.5 mm. ... ... ... ... ... ... ... ... ... 3
Leaves mostly exceeding 2 mm. ... ... ... ... ... 4
3. Dorsal base decurrent ... ... ... ... ... ... *bridelii*
Dorsal base abrupt ... ... ... ... ... ... *oldfieldiana*
4. Leaves ovate ... ... ... ... ... ... ... *macrostipula*
Leaves rotund ... ... ... ... ... ... ... ... ... 5
5. Underleaves entire ... ... ... ... ... *austrigena*
Underleaves rotund to oblong, shortly bifid with broad lobes ... ... ... ... *cordifolia*
Underleaves 1-3rd bifid, lobes acute ... ... ... ... ... ... ... ... *planiuscula*
Underleaves absent ... ... ... ... ... *paucistipula*
6. Leaves 1-1.5 mm., broadly ovate ... ... ... 7
Leaves exceeding 2 mm. ... ... ... ... ... ... 8
7. Underleaves oblong, ventral base of leaf not much expanded ... ... *subemarginata*
Underleaf nearly reniform, lobes dentate, ventral margin of leaf ampliate at base ... ... ... ... ... *variabilis*
8. Leaves broader than long, often with marginal teeth, cells 15-18 $\mu$. ... ... *spongiosa*
Leaves not broader than long, margin entire, cells 36-45 $\mu$. ... ... ... ... ... ... 9
9. Leaves plane brownish ... ... ... *pallide-virens*
Leaves suberect, pale to dark green ... ... ... ... ... ... ... ... *longistipula*

Group D. Apex of all or most leaves with two teeth or lobes, otherwise plain.

1. Leaves mostly 1 mm. or under ... ... ... 2
Leaves 1.5 mm. or longer ... ... ... ... ... ... 5
2. Underleaves 4-fid, lower leaf-margin straight ... ... ... ... ... ... ... ... *erectifolia*
Underleaves 2-fid, leaf-margins curved below ... ... ... ... ... ... ... ... ... ... ... 3
3. Leaf rigid, 0.6 mm. ... ... ... ... *amplectens*
Leaf mostly 1 mm., flaccid ... ... ... ... ... 4
4. Leaf symmetric, lobes acute ... ... ... ... *lenta*
Leaf asymmetric, lobes of some leaves obtuse ... ... ... ... ... ... *macroloba*
5. Both margins nearly straight ... ... ... ... 6
At least ventral margin curved ... ... ... ... 8
6. Lobes minute, underleaves bifid ... ... *allodonta*
Lobes larger, underleaves 4-6-fid ... ... ... ... 7

7. Cells 27-43 $\mu$., perianth angled ... *biciliata*
   Cells 18 $\mu$., perianth winged ... ... ... *trialata*
8. Underleaf bifid, with small or no marginal lobes ... ... ... ... ... ... ... ... 9
   Underleaf with acute marginal lobes ... ... 12
9. Underleaves much broader than the stem ... ... ... ... ... ... ... ... ... ... ... 10
   Underleaves about as broad as the stem ... ... ... ... ... ... ... ... ... ... ... 11
10. Underleaves 1-3rd bifid ... ... ... *macrostipula*
    Underleaves deeply bifid ... ... ... ... *argentea*
11. Margins equally curved ... ... *austro-alpina*
    Ventral more curved than dorsal margin ... ... ... ... ... ... ... ... *decolorata*
12. Margins nearly equally curved ... ... *bidentata*
    Ventral broader than dorsal margin ... ... 13
13. Underleaves about as broad as the stem ... ... ... ... ... ... ... ... ... *bispinosa*
    Underleaves twice as broad ... ... ... *moorcana*

Group E. Margins of leaves armed with many spines, surface papillate.

1. Leaves triangular broadly connate with underleaves ... ... ... ... *leucophylla*
   Leaves ovate or bifid; underleaves nearly free ... ... ... ... ... ... ... ... ... 2
2. Leaves mostly ovate-triangular, 2 mm. long ... ... ... ... ... ... ... ... ... *fissistipula*
   Leaves 1-3rd bilobed under 1 mm. ... *muricata*

*Lophocolea angulistipula*, *St.*—Small, rigid. Leaves erect, rotund, entire, about 0.6 mm.; trigones very large, walls subnodulose. Underleaves rectangular to rotund, apex broadly truncate with a short lobe at each angle tipped with a single large cell, sinus broad, nearly straight, margin generally with a single small tooth. Perianth long exserted pyriform, triquetrous above, mouth narrow 5-lobed.

Mt. Wellington.

*Lophocolea excipulata*, *St.*—Rigid, brown. Leaves at first erect then spreading, rotund entire, base broad but not decurrent, mostly opposite, 1.5-2 mm., trigones rather large. Underleaves very small, broadly connate on both sides, bifid to the middle, lobes acute, with a similar tooth on each margin. Perianth broadly cylindric, mouth armed with short broad irregular teeth, terminal but often appearing dorsal through the extension of a single ventral innovation.

*Form. minor.*—Leaves under 1 mm., rigid alternate, trigones small.

*Form. humilior.*—Flaccid green, leaves alternate, the dorsal base decurrent, apex generally retuse, trigones none.

Very common on mountains.

*Lophocolea dargonia* (*G.*), *St.*—Small, green. Leaves alternate, rotund, often retuse, erect, 0.7-1 mm., entire, base broad, trigones small, acute. Underleaves small, free, little broader than the stem to $\frac{3}{4}$ bifid, lobes acute, shortly unidentate on each margin or plain. Perianth rather large, cylindric below, triquetrous above.

Mt. Wellington. King River. Launceston.

Eastern Australia.

*Lophocolea novae-zelandiae*, *Nees.*—Small, much branched, yellow, rather rigid. Leaves rotund to retuse from a narrow base, erect, mostly under 1 mm., dorsal base abruptly inserted, ventral rotund, cell-walls thin, trigones small, concave. Underleaves free, oblong, nearly as long as the leaf, base narrow, apex 1-3rd bifid, lobes acute, incurved, sinus lunate. Perianth short cylindric, strongly triquetrous above.

Adamson Peak.

New Zealand.

*Lophocolea tumida*, *St.*—Robust, flaccid, brown. Leaves crowded, erect, rotund from a broad base, 2 mm., margins incurved, dorsal base slightly decurrent, ventral rotund, trigones large confluent. Underleaves large, subcucullate, free, margin regularly remotely toothed.

The above is from Stephani's Spec. Hep.

See *Chiloscyphus cordifolius*, *Rod.*

Mt. La Perouse.

*Lophocolea heterophylloides*, *Nees.*—Long, slender, closely procumbent. Leaves with a suberect base, but regularly decurved above, broadly ovate-rotund, entire or some retuse or even bidentate, 1.5 mm. long, base not broader than middle of leaf, trigones very small acute. Underleaves twice as broad as the stem, broader than long, deeply bifid, margins uni-bidentate, teeth short or long; connate on one or both sides with the leaf.

Very common.

Australia. New Zealand.

*Lophocolea canaliculata* (*Tayl.*), *St.*—Very close to and probably a form of *L. heterophylloides*. Smaller and leaves less crowded. Leaves ovate-oblong from a rather

narrow base, about 1 mm., entire or sometimes with 1-2 small teeth. Underleaves narrow, divided nearly to the base into two slender lobes, margin armed with one or two slender teeth.

Very common on ground.

New Zealand.

*Lophocolea gunniana*, *Nees.*—Medium size pale, rigid. Leaves crowded, erect with the apex slightly decurved, broadly ovate-rotund from a broad base, 1.7-2 mm., apex very obtuse, entire or with a few minute teeth, trigones small, generally convex. Underleaves hardly broader than the stem, $\frac{3}{4}$ bifid, lobes diverging slender, toothed on each side, margin 1-2 dentate. Perianth long triquetrous, angles narrowly winged.

Slopes of Mt. Wellington. Gordon River.

*Lophocolea forsythiana*, *St.*—Robust, many branched, branches about 1 cm. long. Leaves not crowded, suberect base and regularly decurved above, broadly triangular-rotund from a very broad base, apex obliquely emarginate to entire, 1.7 mm., dorsal base subdecurrent. Cells 18-24 $\mu$., trigones none. Underleaves broader than the stem, deeply bifid, lobes slender, margin uni-bidentate. Perianth short and broad, angles acute not winged.

Very common.

Eastern Australia.

*Lophocolea gcheebii*, *St.*—Robust, closely decumbent, elongating, simple or with few branches. Leaves strongly decurved, broadly obliquely triangular-rotund from a very broad base, 1 mm. long, 2 mm. wide, entire or undulate. Cells 27 $\mu$., trigones acute. Underleaves rather broader than the stem, generally deeply bifid, margin unidentate, sometimes nearly 4-fid. Perianth oblong.

Doubtfully distinct from the last.

Launceston.

Eastern Australia.

*Lophocolea rupicola*, *St.*—Robust but short, shoots seldom exceeding 3 cm. Leaves rigid, very crowded erect, with deflexed tips, obliquely ovate-rotund to reniform, 2 mm. long, 3 mm. broad, often with a slightly truncate bidentate apex, and often one or two small teeth along the margin; underleaves rather large, 2-3rd bifid, lobes acute dentate, marginal teeth long acute; bracts and bracteole large, dentate. Perianth long, mouth truncate, armed, angles with narrow dentate wings.

Mt. Wellington. Dromedary. Bischoff.

*Lophocolea lauterbachii*, *St.*—Pale, short, and branched, but sometimes on bark with very long simple shoots. Leaves obliquely rotund from a very broad base, mostly 1 mm. long, 1.7 mm. broad, crowded erect to almost flat, more or less deflexed, margin undulate with few very short teeth or sometimes with more spinous teeth, lower leaves truncate to obtusely bidentate. Underleaves broader than the stem free, deeply bifid lobes long slender, sinus broad, margin dentate.

Mt. Wellington. Mt. Field.

*Lophocolea spongiosa*, *St.*—Robust but flaccid and tender, pale. Leaves ovate to reniform, oblique, 2 mm. long, 3 mm broad at the base, crowded, slightly deflexed, much crumpled when dry, margin nude or with a few short broad teeth. Underleaves twice as broad as the stem, deeply bifid, lobes long slender, sinus not broad, margin dentate, when large lobes and lateral lobes armed with acute teeth; floral leaves very large. Perianth cylindric or obtusely triquetrous, angles not winged. Leaves are much more flaccid than those of *L. rupicola*, much larger than *L. lauterbachii*. Underleaf very different to *L. macrostipula*.

Mt. Wellington.

*Lophocolea fissistipula*, *St.*—Robust to very small, closely creeping on bark, many branched. Leaves nearly plano-distichous, strongly decurved, obliquely ovate-triangular from a broad base, apex entire or truncate, upper ones even bidentate, 2 mm. long, but branch leaves sometimes under 1 mm., margin usually irregularly dentate, sometimes in shade somewhat papillate on the surface, resembling *L. muricata*. Underleaves rather large, deeply bifid, lobes slender, marginal lobes slender, all armed with spinous teeth.

Mt. Wellington. Near Launceston.

*Lophocolea variabilis*, *St.*—Rather small, fragile and very pale. Leaves plano-distichous, variable, mostly obliquely quadrate to broadly ovate-truncate or obtusely bidentate, or one lobe very reduced, dorsal margin nearly straight with a slightly decurrent base, ventral deeply curved, about 1 mm. Underleaves as broad as the stem, deeply bifid, lobes slender diverging, margin dentate.

Very close to *L. bispinosa*, differs in smaller size and variable foliage.

Mt. Wellington.

New Zealand.

*Lophocolea bridelii*, *Nees.*—Rather small, pale, delicate. Leaves nearly plano-distichous, obliquely quadrate from a broad base, 1-1.3 mm. long, apex truncato-rotund to retuse, dorsal base decurrent, ventral margin slightly expanded. Underleaves free, rectangular, apex broadly truncate or shortly bilobed, sinus very broad and shallow, margin plain or with a minute tooth.

Mt. Wellington.

Eastern Australia.

*Lophocolea subemarginata*, *Tayl.*—Short with many short branches. Leaves crowded, upper ones erect, lower ones plane, ovate. 1.3 mm., apex rotund, retuse or shortly bidentate. Underleaves little broader than the stem, bifid, lobes acute, margin unidentate or plain. Floral leaves dentate. Perianth strongly 3 angled, not winged.

Leaves more symmetric than in *L. bridelii* and a different underleaf.

Mt. Wellington.

*Lophocolea oldfieldiana*, *St.*—Medium size, pale dull green. Leaves when moist regularly decurved, when dry crumpled, ovate to nearly rotund from a very broad base, 1.5 mm., apex rotund or slightly emarginate, insertion of both margins abrupt, underleaves twice as broad as the stem, broadly connate on one side, $\frac{1}{2}$ bilobed, lobes broad with acute apex, usually one margin unidentate.

Mt. Wellington.

*Lophocolea macrostipula*, *St.*—Robust, pale yellow freely branched, forming dense mats. Leaves erect obliquely ovate-rotund from a very broad base, apex bidentate or retuse, or on some shoots quite entire, 1.2-2 mm. long. Underleaves broader than the stem, oblong-rectangular, upper ones very large, sinus obtuse, 1-3rd bifid, lobes lanceolate, margin entire or with one small tooth.

Mt. Wellington.

*Lophocolea austrigena*, *Tayl.*—Shoots mostly 3 cm. long. Leaves closely imbricate, rotund or rather broader than long, 1.8 mm. diameter, undulate-concave, insertion narrow, cells 27 $\mu$., trigones small, concave; underleaves similar to the leaves, $\frac{3}{4}$ as large, entire, sinuately inserted free, in the upper portion of the shoot more oblong, and apex emarginate. Perianth broadly cylindric, strongly triquetrous, angles not winged or very minutely so, mouth broad.

Length of shoot and size of leaf variable.

Adamson Peak.

Fuegia. Falkland Is.

*Form. bifida.*—Leaves with a very narrow subdecurrent insertion as in the type, but the underleaves all shortly bifid with an obtuse sinus.

Cradle Mt.

*Lophocolea cordifolia, St.*—Shoots 3-6 cm. Leaves closely imbricate, ovate to rotund, 2-3 mm long, entire, insertion broad, one or both sides generally cordate, cells 27 $\mu$., trigones small, concave; underleaves $\frac{3}{4}$ size of leaves, upper ones oblong, lower ones subrotund, apex shortly bifid, sinus very broad, margin entire or armed with few small teeth, base sinuate free. Perianth as in *L. austrigena.*

Forms connect with *L. austrigena.*

Mt. Hartz. Adamson Peak. Cradle Mt., Etc.

*Form. disticha.*—Leaves more plano-distichous than erect, apex decurved.

Approaching *L. macrostipula.*

Cradle Mt.

*Lophocolea paucistipula, Rod.*—Robust, simple or with few vague branches, 2-4 cm. Leaves crowded, imbricate, rotund 1.3 mm., margin entire, dorsal base subdecurrent, ventral ampliate; marginal cells 20 $\mu$., trigones small, intermediate cells 35 $\mu$., trigones small, basals 60 x 25 $\mu$., trigones none; underleaves absent except in the region of reproduction, sometimes only a narrow dentate bracteole present, at others 2-3 large oblong stipules with recurved margins very like those of *L. austrigena*, and below these 2-3 reduced to vanishing spines. Bracts oblong, twice as long as leaves, often with a filiform process near the ventral base, bracteole narrow oblong, shortly bidentate, margin often dentate; perianth narrow campanulate $\frac{1}{2}$ exserted, trigonous, median keel dorsal, mouth broad with 3 broad unarmed lobes.

Allied to *L. austrigena* and *L. cordifolia.*

Bank of Creek near Cradle Mt.

*Lophocolea planiuscula, Tayl.*—Medium sized, tender, flaccid, livid-green. Leaves alternate, rotund from a slightly constricted base, middle ones about 2 mm., smaller below, larger above, erect, entire, no trigones. Underleaves rather large, free, 1-3rd bifid, lobes acute, margin unidentate.

St. Mary's.

Auckland Islands.

*Lophocolea longistipula*, *St.*—Robust, pale often brownish. Leaves rather rigid to flaccid, erect in the younger plane in older parts, quadrate rotund to ovate-ligulate, 2-2.5 mm. long, apex retuse to obtusely bidentate, dorsal margin substrict shortly decurrent, ventral more strongly arcuate; cells 36-50 $\mu$., hexagonal, trigones in some specimens rather large, in others small, walls thin. Underleaves free, narrower than the stem, longer than broad, 2-3rd bifid, margin dentate.

*Form. atro-virida.* Very flaccid; dark green.

Mt. Wellington.

*Lophocolea pallide-virens* (*Tayl.*), *St.*—Robust, rather rigid, pale green to brownish. Leaves plano-distichous, ovate, 3 mm. long, apex rotund, retuse, or bidentate with short, acute unequal lobes; cells 36 $\mu$., trigones small acute. Underleaves little broader than the stem, connate on one side, deeply bifid, sinus broad, lobes lanceolate diverging. Perianth terminating a short lateral branch, oblong-triquetrous, mouth 3-lobed, lobes rotund armed with long laciniae.

Mt. Wellington. West Coast.
South America.

*Lophocolea amplectens*, *Mitt.*—Very small, generally under 1 cm. long. Leaves ascending, concave, broadly ovate, base broad apex, 1-3rd bifid, seldom exceeding 0.6 mm., lobes broadly lanceolate, subacute, sinus broad, cells rotund 15-20 $\mu$., trigones rather small, acute. Underleaves narrow, connate on both sides 2-3rd bifid, lobes slender acute, erect or spreading, margin with one small tooth. Perianth short, cylindric, very slightly angled, mouth with 3 short dentate lobes.

Mt. Wellington.

*Lophocolea allodonta*, *Tayl.*—Medium size, pale. Leaves plano-distichous, flat, alternate and not crowded, obliquely quadrate to ligulate, 2 mm. long, apex with two very small acute lobes at the angles but sometimes one or both lobes absent; cells 30-36 $\mu$., trigones minute. Underleaves very small, not broader than the stem, deeply bifid, lobes slender, erect, margin with one basal spine.

Mt. Wellington.
Auckland Islands.

*Lophocolea erectifolia*, *St.*—Medium size, pale. Leaves opposite, crowded, erect then somewhat decurved, broadly ovate-triangular hardly longer than broad, margins nearly straight, apex to 1-3rd emarginato-bilobed, sinus nearly

straight, lobes triangular acute, unequal, anterior commonly the larger; cells 27 $\mu$., trigones nodulose. Underleaves twice as broad as the stem, reniform, broadly connate on each side, armed with 4 spinous teeth. Bracts large, perianth partially immersed, oblong, strongly triquetrous, angles with dentate wings.

Very close to *L. trialata*, *G.*

Mt. Wellington.

New Zealand.

*Lophocolea biciliata*, *Tayl.*—Robust, pale. Leaves opposite, crowded, erect towards the apex, plane when mature; broadly triangular-truncate with slightly curved margins, 2 mm. long or shorter in starved plants, apex with 2 short acute diverging lobes, generally 4-5 cells broad at the base 8-9 cells long, sinus broad straight; cells 27-43 $\mu$., trigones none. Underleaves rotund, broader than the stem, base deeply sinuate, broadly connate on both sides, margin usually with 6 acute spines and no apical fissure.

Near *L. trialata*, but lobes smaller and margins more curved.

Mt. Wellington. West Coast.

New Zealand.

*Lophocolea trialata*, *G.*—Medium size, pale. Leaves rather rigid, opposite, crowded, plano-distichous with a tendency to decurve, broadly triangular-truncate, 1.5 mm., apex with two short or long acute diverging lobes, sinus straight, margins straight; cells 18 $\mu$., walls thick, trigones minute acute. Underleaves rotund with a sinuous base, broadly connate on both sides, 4-8 spined sometimes with an apical fissure. Perianth narrow-oblong, 5 mm., strongly triquetrous, angles extended into narrow dentate wings.

Very common.

Australia. New Zealand.

*Lophocolea macroloba*, *St.*—Rather small, seldom exceeding 1 cm., pale. Leaves erect then plane, nearly symmetric, subrectangular-truncate, 1 mm., bidentate lobes bold, broad obtuse, sometimes acute, erect, sinus narrow and deep, margins equally curved, insertion abrupt; cells 27 $\mu$., walls thin, trigones minute. Underleaves as broad or rather broader than the stem, deeply bifid, lobes erect acute, margin with one small tooth. Perianth campanulate triquetrous, mouth broad.

Close to *L. lenta*.

Mt. Wellington.

*Lophocolea argentea*, *St.*—Small, pale yellow, branches short. Lower leaves small, middle ones about 1 mm. Upper ones 2 mm., crowded, erect, ovate from a rather narrow base, apex truncate strongly bidentate, lobes erect, sinus narrow deep, margins curved, insertion abrupt. Underleaves broader than stem, deeply bifid, margins unidentate.

Very near *L. bispinosa*, but with a different habit and narrower leaf-base.

Mt. Wellington.

*Lophocolea lenta*, *Tayl.*—Slender, pale. Leaves alternate, spreading, broadly ovate nearly symmetric, 1-1.5 mm., but sometimes very small, margins curved, apex bidentate, sinus narrow; cells 27-36 $\mu$., trigones none. Underleaves twice as broad as the stem, shortly connate, bifid nearly to the base, lobes slender, margins unidentate, sometimes more armed. Perianth long cylindric, strongly triquetrous.

Very common.

New Zealand. Australia. South America.

*Lophocolea bidentata* (*L.*), *Dum.*—Robust, pale, flaccid. Leaves spreading ovate, 1-3rd bilobed, nearly symmetric, 1.5-2 mm., dorsal margin slightly decurrent, ventral abrupt, lobes long, very slender; cells 38-40 $\mu$., walls slender, trigones minute. Underleaves 1-3rd as large as leaves free, 2-3rd bifid, lobes slender, margin 1-2 dentate. Perianth narrow-oblong strongly triquetrous.

Common.

Cosmopolitan.

*Lophocolea bispinosa*, *Tayl.*—Slender, closely creeping. Leaves plane when mature, narrowly to broadly ovate-truncate, 2 mm., shortly bilobed, sinus broad, lunate, lobes from a broad base acute, ventral lobe or both sometimes wanting, dorsal margin nearly straight, ventral strongly curved below; cells 27 $\mu$., walls thin, trigones none. Underleaves little broader than the stem, free or shortly connate, deeply bifid, margin unidentate, sometimes more armed.

Mt. Wellington.

Campbell Islands.

*Lophocolea austro-alpina*, *St.*—Medium pale. Leaves more erect than plane, obliquely triangular, 1.4-2 mm., apex truncate, bidentate, base 2 mm., broad lobes short, slender diverging, both margins curved; cells 20 $\mu$., trigones none. Underleaves hardly broader than the stem,

½ bifid, lobes slender, margins unidentate. Perianth cylindric, strongly triquetrous.

Mt. Wellington.

*Lophocolea decolorata*, *St.*—Rather robust, pale. Leaves crowded, erect then more plane in older parts, obliquely ovate from a very broad base, truncate with a narrow bidentate apex, 1-2 mm., dorsal margin curved, ventral strongly curved below, lobes broad or narrow erect or spreading, sinus deep. Cell-walls rather thick. Underleaves hardly broader than the stem, very deeply bifid, lobes slender, margin unidentate. Inner floral leaves little larger, ovate, apex deeply bifid, lobes narrow long attenuated.

Very close to *L. bispinosa* and *L. austro-alpina*.

Mt. Bischoff.

*Lophocolea mooreana*, *St.*—Robust, pale. Leaves ovate from a broad base, 2-5 long and wide, apex truncate boldly bispinous, lobes broad at the base, acute, sinus deep, dorsal margin nearly straight, shortly decurrent, ventral strongly curved below; cell walls thin. Underleaves twice as broad as the stem, deeply bifid, lobes acute, margin with one bold spine. Inner floral leaves 4 mm. long, oblong-elliptic, apex bifid, lobes triangular, attenuated.

Doubtfully distinct.

St. Patrick's Head.

*Lophocolea leucophylla*, *Tayl.*—Pale green or yellow, much branched and rather rigid. Leaves crowded, concave, distichous, triangular from a broad base, 1-2 mm. long, dorsal base decurrent, apex narrow boldly bispinous, margin armed with few or many bold unequal spines. Cells 18-27 $\mu$., trigones small rotund, each cell with one convex papilla, but sometimes reduced to a mere convexity. Underleaves rather large and broadly connate on both sides, reniform, margin armed with about 6 bold spines. Perianth long exserted, large, usually acutely triquetrous, but in some specimens even in the same mass narrowly fusiform.

*L. verrucosa*, *St.*, appears not distinct.

Common, chiefly on mountains.

*Lophocolea muricata*, *Nees.*—Very small. Leaves plane, about 1 mm., ovate-triangular to 1-3rd bifid, lobes broad, sinus narrow, margin armed with a few spines. Cells 18 $\mu$., surface armed with prominent papillae. Underleaves deeply bifid, each margin with a spinous lobe, all lobes acutely dentate. Perianth oblong, triquetrous, mouth copiously armed, surface setulose.

Common throughout the Southern Hemisphere.

### Chiloscyphus, Corda.

Plants from very robust to very small. Stems simple or with few irregular lateral branches. Leaves succubous, opposite or alternate entire or with a dentate margin seldom bilobed. Cells medium sized; trigones from very large to none. Underleaves well developed, bifid with acute lobes to reniform. Sporophyte terminating a very short branch placed low down on the stem. Calyptra well developed. Perianth oblong to campanulate cylindric, mouth generally lobed, not constricted.

The genus is indistinguishable from *Lophocolea* except in the position of the sporophyte.

1. Underleaves reniform ... ... ... ... ... ... ... 2
   Underleaves not broader than long ... ... ... 8
2. Leaves entire or with few very small teeth 3
   Margins of leaves and underleaves dentate... 4
3. Dorsal bases connate, cuticle smooth ... ... ... ... ... ... ... ... *conjugatus*
   Dorsal bases free, cuticle papillate ... *kirkii*
   Leaves undulate ... ... ... ... ... ... ... *sinuosus*
   Leaves and underleaves with saccate appendages ... ... ... ... ... ... ... *cymbaliferus*
4. Underleaves with short simple teeth ... ... 5
   Underleaves with 4 bifid lobes and spinous teeth ... ... ... ... ... ... ... ... ... ... 7
5. Trigones large confluent ... ... ... *billardieri*
   Trigones small ... ... ... ... ... ... ... ... 6
6. Underleaf concave; cells 30 $\mu$. ... *gunnianus*
   Underleaf flat; cells 40-50 $\mu$. ... *tasmanicus*
7. Leaf apex bi-tridentate ... ... ... ... *fissistipus*
   Leaf pluridentate ... ... ... ... ... *multifidus*
8. Dorsal base of leaf abrupt ... ... ... ... ... 9
   Dorsal base decurrent ... ... ... ... ... ... 13
9. Underleaf rotund, entire or shortly bifid ... 10
   Underleaf oblong, deeply bifid ... ... ... ... 12
10. Underleaf broadly connate with the leaves ... ... ... ... ... ... ... ... ... ... ... *levieri*
    Underleaves free or nearly so ... ... ... ... 11
11. Trigones small acute ... ... ... *weymouthianus*
    Trigones large confluent ... ... ... ... *cordifolius*
12. Leaves smooth, cells large ... ... ... ... *laxus*
    Leaves spinous and papillose ... ... *echinellus*
13. Leaves with a truncate bifid apex ... ... ... 14
    Leaves entire or irregularly bi-tridentate ... 15
14. Underleaf rotund 3-4 times as broad as the stem ... ... ... ... ... ... ... *coalitus*
    Underleaf oblong, not broader than the stem ... ... ... ... ... ... ... ... *filicicolus*

15. Leaf entire rarely a few bifid ... ... *limosus*
Leaf with 3 short oblique lobes ... *tridentatus*

*Chiloscyphus conjugatus, Mitt.*—Very robust and often 10 cm. long. Leaves opposite crowded imbricate erect, broadly ovate-triangular from a broad base, 3 mm. long, dorsal bases united across the stem, margin entire dorsally substrict, reflexed, ventral margin more curved, shortly united to the underleaf; cells 36-44 $\mu$.; trigones large and very convex. Underleaves reniform concave, 1.5 mm. long, twice as broad, margin entire or armed with few very small teeth.

Mt. Wellington. Adamson Peak. Zeehan. Cradle Mt., Etc.

*Form. dentatus* (*Ch. moorei, St.*).—Leaf margin usually bearing a few small teeth. Margin of underleaf more distinctly armed. Not consistently distinct from type.

Common in forests.

*Chiloscyphus kirkii, St.*—Pale green to yellow, mostly 3-4 cm. long. Leaves plane in damp localities, more erect in dry ones, crowded, closely imbricate ovate obtuse, 1.5-2 mm. long, alternate, dorsal base expanded into a dentate appendage, margin otherwise entire or with a few small serrations; cells 28-32 $\mu$., trigones huge and confluent, cuticle papillose. Underleaf reniform nearly as broad as the leaf, very short closely imbricate, margin entire or armed with minute teeth, slightly united with the leaves.

Adamson Peak. Mt. Field.

New Zealand.

*Chiloscyphus billardieri* (*Schw.*), *Nees.*—Robust, rather rigid, brownish. Leaves opposite crowded, erect, asymmetric, broadly ovate-triangular from a broad base, 2 mm., dorsal margin substrict and combining at the base with the opposite leaf, margin variously armed with spinous teeth usually two conspicuous ones at apex; cells 20-30 m.; trigones very large confluent. Underleaves broadly reniform, not very concave, more or less armed with short spinous teeth.

Mt. Wellington. Adamson Peak. West Coast.

*Form. integrifolia.*—Leaf and underleaf margin entire or with very small teeth. Resembling *Ch. conjugatus, Mitt.*, only of much smaller size.

Mt. Hartz. Adamson Peak.

*Form. ciliatus* (*Ch. ciliatus*, *St.*).—Armature of leaves and underleaves of longer spines.

West Coast.
New Zealand.

*Chiloscyphus gunnianus*, *Mitt.*—Flaccid, livid green to brownish. Leaves opposite, broadly ovate from a broad base, 2-2.5 mm. long, dorsal bases uniting, margin armed with few or many spinous teeth; cells 30 $\mu$, walls thin; trigones from none to small. Underleaves broadly reniform, armed on the margin with few small spinous teeth.

Differs from *Ch. billardieri* only in the more tender substance of the leaf. The development of trigones very variable. Probably only a shade form of the last.

Recherche. West Coast. Trowutta.

*Chiloscyphus tasmanicus*, *St.*—Medium size, seldom exceeding 2 cm., pale green and of delicate consistence. Leaves opposite ovate-rectangular to ovate from a broad base, plane in damp situations, otherwise erect, 2 mm. long, dorsal bases shortly joined, margin armed all round with slender spines; cells 35-50 $\mu$.; trigones small concave. Underleaf reniform flat, 2 mm. wide, armed with about 12 spines.

Armature more pronounced than in *Ch. gunnianus*. Underleaf relatively larger, cells larger.

West Coast.

*Chiloscyphus fissistipus*, *Tayl.*—Robust, 2-3 cm. long. Leaves asymmetric, opposite, plane, oblong, 2.5 mm., dorsal margin substrict, the base decurrent, free or slightly connate with opposite leaf, apex bi or more often tridentate, rarely pluridentate, ventral margin strongly curved; cells mostly 25-35 $\mu$., walls rather strong, trigones small concave. Underleaf reniform, 2 mm. broad, apex usually with a deep median sinus, margin armed with many long spinous teeth.

Mt. Wellington. Mt. Dromedary. Cradle Mt., Etc.
East Australia. Auckland Islands.

*Form. integrifolius.*—Leaves broadly ovate entire or with one or two apical teeth. Underleaf broadly reniform armed with long and short spines, often more or less lobed as in *Ch. multifidus*.

Mt. Wellington.

*Chiloscyphus multifidus*, *St.*—Very similar to and possibly a robust form of the last. Leaves broadly ovate-triangular subsymmetric, 3 mm., dorsal base free decur-

rent, ventral margin more curved armed with few bold teeth, apex truncate rotund armed with 2-4 bold spines; cells 36 $\mu$., trigones small or none. Underleaf large reniform very broad, with 6-8 shallow lobes armed with bold spines, lower underleaves small and simpler.

Blue Tier. Mt. Field.

*Chiloscyphus cordifolius, Rod.*—Robust, 4-6 cm. long, densely pulvinate, rigid, yellow. Leaves erecto-homomallous, closely imbricate, alternate, rotund, 1 mm. long, rather broader than long, both bases cordate and free, margin entire, cells towards the margin 16 $\mu$, lower ones 33 $\mu$., trigones as large as the cells confluent, surface smooth. Underleaves rotund, concave, imbricate, free, 0.7 mm. long, margin entire or with about 6 obtuse angles. No perianths present, but a group of archegonia terminating the shoot, thus bearing the character of *Lophocolea*, but habit and leaf structuree is typically of *Chiloscyphus*. Possibly it is this plant that Stephani describes as *Lophocolea tumida*.

Adamson Peak.

*Chiloscyphus sinuosus* (*Hook.*), *Nees.*—Robust, often 5 cm. long. Leaves opposite crowded, plane to erect, broadly triangular, 3 mm. long, dorsal base free, very decurrent or slightly connate with opposite leaf, margin substrict undulate, apex rather acute, ventral margin broadly curved undulate entire; cells 27 $\mu$,, trigones large convex. Underleaves very broadly connate with the leaves, short, broadly reniform armed with many irregular spines.

Mt. Wellington. Mt. Hartz.

New Zealand. Auckland Islands.

*Chiloscyphus cymbaliferus* (*Hook.*), *Nees.*—Medium size generally about 4 cm. long. Leaves opposite densely crowded erect imbricate, giving the shoot a terete appearance, subrotund, asymmetric, about 1 mm. long, dorsal base rotund shortly joined to the opposite leaf, apex obtuse often with a few short obtuse teeth, ventral margin bearing a saccate appendage; cells about 30 $\mu$., trigones large often confluent. Underleaves short very broad, apex shortly dentate, each margin bearing a large saccate appendage.

Common on mountains.

New Zealand. Auckland Islands.

*Form. submersa.*—Leaves larger, less erect, ovate-rotund, appendage very reduced. Underleaves rotund entire with reduced appendages.

In wet ground. Adamson Peak.

*Chiloscyphus levieri*, *St.*—Closely creeping on bark, about 3 cm. long. Leaves opposite crowded, suberect broadly ovate-triangular about 2.5 mm., dorsal base abrupt meeting or joining with the opposite leaf, margin nude or with a few teeth above, apex and ventral margin armed with slender spines; cells 30-36 $\mu$., trigones large rotund. Underleaves orbicular about 2 mm. diameter, broadly joined to the leaves, armed with about 8 slender spines.

West Coast.

*Chiloscyphus coalitus (Hook.)*, *Dum.*—Robust, often 10 cm. long, closely decumbent dark green. Leaves not crowded opposite or alternate, plane ovate-triangular, truncate with two acute apical teeth or the upper leaves more or less entire, 3 mm. long, dorsal margin strict base decurrent free or joining with the opposite leaf, ventral margin strict base connate with the underleaf; cells irregular in size, mostly 30 $\mu$., walls rather thick, trigones minute or none. Underleaves small, 2-3 times as broad as the stem, subrotund truncate, sinus broad margin armed with 1-4 slender teeth.

Very common.

East Australia. New Zealand. Auckland Islands.

*Chiloscyphus tridentatus*, *Mitt.*—Small and slender generally 1-3 cm., dark green. Leaves alternate with a nearly vertical insertion plane, ovate-rectangular 1 mm., apex with three short unequal lobes, dorsal base free very shortly decurrent, ventral base very shortly connate with the underleaf; cells mostly 20 x 27 $\mu$., trigones none. Underleaves small, as broad as the stem bifid to below the middle, lobes slender, each margin with one bold slender tooth.

Common in shade on banks.

*Chiloscyphus filicicolus*, *St.*—Stems decumbent, 1-2 cm. long. Leaves alternate plane ovate-rectangular 2 mm., dorsal margin strict base decurrent free, apex abruptly truncate, a filiform tooth arising from each angle, ventral margin strict, very shortly connate with the underleaf; cells 30-40 $\mu$., walls thick, trigones none; underleaf oblong not broader than the stem, deeply bifid, lobes acute, margin unidentate, sometimes unarmed or bidentate.

Very close to *Ch. coalitus*, differing mainly in size and smaller underleaf. Doubtful species.

On fern-stem, East Coast.

New Zealand.

*Chiloscyphus weymouthianus*, *St.*—Medium size, but seldom exceeding 2 cm., freely branched. Leaves opposite plane to suberect, broadly ovate from a broad base 1.5-2.5

mm., dorsal base rounded and shortly connate with the opposite leaf to free and decurrent, margin entire or with 1-2 small apical teeth to armed with 10-12 short teeth; cells 18-30 $\mu$., trigones very small concave; underleaf broadly oblong to subrotund little broader than the stem, apex with 2 slender lobes, margin usually 1-2 dentate.

West Coast.

*Chiloscyphus limosus*, *C. et P.*—Very variable in size and some details, often up to 10 cm., but sometimes small, dark green. Leaves alternate plane, broadly ovate obtuse or rarely with 1-2 apical teeth 2-3 mm., dorsal base free shortly decurrent, ventral base shortly connate with the underleaf; cells 25-35 $\mu$., trigones small, concave rarely convex; underleaf rotundo-quadrate 2-3 times as broad as the stem, equally quadrifid or rather bifid with 1-2 marginal teeth rarely very small and shortly bifid.

Very common on banks of streams.

Australia.

*Chiloscyphus laxus*, *Mitt.*—Small and delicate, usually about 2 cm. long. Leaves alternate plane with a nearly vertical insertion ovate-triangular 1-1.5 mm., very thin texture, usually irregularly trilobed, sometimes quadrilobed, lobes short broad acute, dorsal base free not decurrent, ventral base shortly connate with the underleaf; cells irregular mostly 40-50 $\mu$., walls equally thickened, cuticle thin, trigones none. Underleaf rather broader than the stem, deeply bifid, lobes slender, margins often unispinous.

In shade the ultimate branches often very attenuated, and the leaves reduced to subulate processes, 5 cells long and 1 cell diameter. Also described in Stephani's Sp. Hep. as *Lophocolea weymouthiana*.

Common in damp shade.

New Zealand.

*Chiloscyphus echinellus* (*L. et G.*), *Mitt.*—Small and slender, under 2 cm., stem covered with prominent papillae. Leaves alternate plane broadly ovate, 0.7-1 mm., margin armed with unequal spines, dorsal base free, ventral shortly connate with the underleaf, surface covered with acute papillae; cells 16 $\mu$., walls thick, trigones none; underleaves oblong twice as broad as the stem, lobes slender armed with spines, margin similarly armed.

Very like *Lophocolea muricata*, only leaves not bifid. Perianth on a short basal branch, and cylindric not trigonous as in that plant.

Common in damp forests.

New Zealand.

### Leptoscyphus, Mitt.

Simple or sparingly branched; decumbent with numerous rhizoids on the ventral surface. Leaves succubous, entire, rotund, rarely bilobed or ovate. Underleaves present, entire or bifid, margins sometimes armed. Perianth terminal, often appearing lateral from the growth of subfloral branches, inflated below, laterally compressed above the mouth truncate and bilabiate, entire or denticulate.

Mitten subsequently changed the name to *Leioscyphus*. This is still maintained by Stephani.

*Leptoscyphus chiloscyphoides* (*Lindb.*).—Stems usually 2-3 cm. long. Leaves rotund or quadrate-rotund, erect, opposite, 2 mm., base not constricted; cells about 36 $\mu$., walls medium, trigones small concave or none; underleaves small, connate on both sides, deeply bifid lobes acute, margins unidentate. Bracts similar to the leaves but larger; perianth 3-4 mm., immersed in the leaves, very flat above with two broad entire lips.

Very like *Lophocolea novae-zelandiae*, but the larger cells and very different perianth distinguish it.

Mt. Wellington. Western Tiers.

### Odontoschisma, Dum.

Robust, simple or with few branches, decumbent to suberect. Leaves succubous, erect, crowded, rotund, entire. Underleaves oblong and well developed to obsolete. Perianth terminal, short and broad, obscurely 3-angled; bracts bi-trifid.

Very near *Jamesoniella*, but the bracts not fimbriate, the mouth not as contracted nor plicate, and underleaves present.

*Odontoschisma marginata* (*Mitt.*), *St.*—Stems slender, elongating often to 10 cm., dark green. Leaves rotund erect crowded, 1-2 mm., margin with a narrow thick edge; cells mostly 36 $\mu$., walls slightly thickened; underleaves often nearly as long as the leaves, ovate, free with a shortly bifid apex. Bracts little enlarged, entire; perianth broadly campanulate, shorter to longer than the leaves, one dorsal and two ventral shallow keels, mouth broad, erose.

Mt. Wellington. Mt. Field. Cradle Mt., Etc.

### Cephalozia, Dum.

Small, simple or with few branches, the branches usually arising from the ventral surface. Leaves succubous

to nearly transverse, bilobed. Underleaves none or rudimentary except in the region of reproductive organs. Fruit terminal or on short lateral branches, bracts large, bracteole free or united to the bracts; perianth tapering to a constricted dentate mouth, trigonous, the third angle ventral.

Leaf margin entire or nearly so.

Underleaves absent.

Pale green leaves appressed ... ... ... *bastovii*
Livid green leaves spreading ... ... ... *levieri*
Black, long wiry ... ... ... ... ... ... *aterrima*

Underleaves present small.

Leaves red remote spreading ... ... *exiliflora*
Leaves brown erect imbricate ... ... *preissiana*

Margin dentate.

Marginal teeth few simple ... ... ... ... *verrucosa*
Marginal teeth many acute ... ... *squarrosula*
Marginal teeth compound ... ... ... ... ... *hirta*

*Cephalozia bastovii*, *C. et P.*—Pale glaucous green, usually with many lateral as well as ventral branches, sometimes simple, about 1 cm. long, rather bare below, copiously leaved above. Leaves appressed rather imbricate, ovate stem clasping below, apex 1-3rd bifid, lobes broad below, acute, sinus acute, 0.4 mm. long; cells variable in size, mostly 12-15 $\mu$., walls thick. Underleaves none.

Mt. Wellington Plateau.

*Cephalozia exiliflora* (*Tayl.*), *Spr.*—Dark red-brown in dense mats, usually on burnt wood, stems about 5 mm., simple or branched. Leaves remote, patent, transverse, broadly oblong 0.3 mm., 2-3rd bifid, sinus very broad, lobes acute; cells 12 $\mu$., walls thick. Underleaves minute entire or bifid. Perianth terminal oblong, 3-5 plicate, 1 mm. long, dark red below, hyaline above, mouth crenulate.

Very common.

Australia. New Zealand.

*Cephalozia preissiana* (*Lehm.*), *St.*—Very small, brown, amongst small plants on logs. Leaves suberect, imbricate, 0.1-0.2 mm. long, broadly oblong bifid to the middle, sinus rather acute, lobes very broad, apex acute; cells 10 $\mu$.; underleaves similar to the leaves only smaller.

On wood. West Coast. Trowutta.

*Cephalozia levieri*, *St.*—Small, the shoots seldom exceeding 5 mm., usually simple pale livid green. Leaves spreading obcuneate conduplicate transverse, 0.2 mm.,

2-3rd bifid, sinus acute, lobes broad, apex acute; cells irregular mostly 10 × 15 μ., walls thick; underleaves absent. Perianth long narrow linear, triplicate above, mouth narrow.

West Coast.

*Cephalozia verrucosa*, *St.*—Small, the shoots usually simple and under 5 mm. long, more or less red-brown. Leaves spreading broadly oblong transverse conduplicate 0.1 mm., to ½ bifid, lobes ovate obtuse or acute, margin often with a few prominent teeth; cells 12-15 μ., walls thick, dorsal cuticle verrucose; underleaves small bifid. Perianth large oblong to fusiform, acute trigonous, dark below, hyaline above.

West Coast. Trowutta.

Fuegia.

*Cephalozia aterrima*, *St.*—Black in tangled masses on rocks in pools and streams, stems very slender and long wiry devoid of leaves except towards the ends. Leaves transverse closely appressed cordate, 0.2 mm. long, shortly bifid, lobes broad obtuse; cells 12-18 μ., walls dark rather thin; underleaves absent. Perianth terminal narrow oblong strongly triplicate, 1.2 mm., mouth contracted.

Mt. Wellington. Western Tiers. Cradle Mt., Etc.

At a considerable altitude.

*Cephalozia squarrosula* (*Tayl.*), *St.* (*Jung. divaricata*, *Mitt.*).—Very small, pale green stems under 5 mm. Leaves patent, nearly rotund, conduplicate, transverse 0.1 mm. long, ½ bilobed, lobes broadly triangular acute, margin regularly denticulate; cells 15 μ., walls thick; underleaves similar to leaves and but slightly smaller. Perianth oblong 0.7 mm., pluriplicate delicate, mouth lacerate, bracts half as long, strongly dentate.

On heath near Kingston.

W. Australia. New South Wales.

*Cephalozia hirta*, *St.* (*C. dentata*, *Mitt.*).—Small pallid green. Leaves remote, spreading broadly obcuneate, conduplicate, 0.1 mm., deeply bifid, lobes ovate acute, margin armed with numerous compound spinous teeth, a large spine conspicuous near the base of each margin; underleaves similar, little smaller. Perianth terminal oblong, pluriplicate delicate.

Numerous localities. On bark and fern stems.

East Australia.

### Zoopsis, Hook. f. et Tayl.

Stems slender decumbent with few irregular ventral branches, a narrow central strand of elongated narrow cells surrounded by a cortex of large inflated cells. Leaves more or less rudimentary, reduced to the base or deeply bifid. Underleaves rudimentary. Fertile branch short arising from the ventral surface; perianth terminal oblong to fusiform, smooth or plicate, mouth tapering lobed.

Colour always pale watery green. The genus is most closely allied to *Lepidozia*. *Z. leitgebiana* might readily be referred to that genus.

Leaves reduced to 2 celled lobes ... ... *argentea*
Leaves rudimentary with 2 spinous lobes... *setulosa*
Leaves with 2 unequal lobes ... ... ... *leitgebiana*

*Zoopsis argentea, Hf. et Tayl.*—Shoot a flat linear frond. Leaves reduced to alternate lobes each of two inflated cells; underleaves rudimentary formed of two oblong cells and two much smaller apical ones. Bracts and bracteole small bifid: perianth narrow pyriform-cylindric, divided above to a third of its length into six lanceolate acute lobes.

Common on dead wood.

Australia. New Zealand. Indian Archipelago.

*Zoopsis setulosa, Leitg.*—Shoot a flat linear frond. Leaves reduced to alternate lobes of two large inflated cells, each cell tipped with a linear two-celled lobe; underleaves rudimentary of two short basal and two linear upper cells. Bracts bifid, apex setulose, bracteole similar, perianth ovate plicate, mouth deeply six lobed, lobes setulose.

Mt. Wellington. Cradle Mt. West Coast.

*Zoopsis leitgebiana, C. et P.*—Shoots slender. Leaves remote, unequally bifid, base 1 cell deep, 4 cells wide, dorsal lobe 3 cells in one series, ventral lobe 5 cells long, 2 cells wide at base; underleaves of 2 oblong cells, tipped each with a small cell. Bracts and bracteole 1-3rd bifid, lobes acute; perianth linear triplicate, apex shortly 6 lobed.

Kingston. West Coast.

East Australia. New Zealand.

### Isotachis, Mitten.

Decumbent, stem elongating with few irregular branches. Leaves incubous to transverse, squarrose to decurvo-homomallous, conduplicate concave, asymmetric, apex usually truncato-bilobed, lobes broad short unequal, dorsal margin more expanded than the ventral, insertion

contracted. Underleaves similar to the leaves, rarely much smaller. Perianth terminal, fleshy, oblong-fusiform; foot of the sporophyte deeply sunk in the expanded shoot.

1. Leaves squarrose ... ... ... ... ... ... ... 2
   Leaves erect or decurved ... ... ... ... ... ... 5
2. Leaves crowded base stem clasping ... ... ... 3
   Leaves free base narrow ... ... ... ... ... ... 4
3. Leaves 1-1.5 mm. long ... ... ... ... ... *inflexa*
   Leaves 2.5-3 mm. long ... ... ... ... ... *grandis*
4. Leaves 2 mm. Underleaves similar... *gunniana*
   Leaves 0.6 mm. Underleaves minute ... *pusilla*
5. Underleaves armed with acute teeth ... ... ... ... ... ... ... ... *intortifolia*
   Underleaves bifid or trifid unarmed ... ... ... 6
6. Leaves minute remote ... ... ... ... *attenuatus*
   Leaves crowded decurved ... ... ... *subtrifida*
   Leaves large black erect crowded ... ... *riparia*

*Isotachis gunniana, Mitt.*—Stems often 4 cm. long, reddish-brown or green. Leaves squarrose, ovate-rotund, 2 mm. long, apex shortly to 1-3rd bilobed, sinus obtuse, lobes broadly triangular, acute or obtuse, margins entire or sometimes the ventral with one or two small teeth; upper cells rectangular 21 $\mu$., lower ones 21 x 60 $\mu$., cuticle asperate. Underleaves nearly as long as leaves, oblong; sometimes only half as large and $\frac{1}{2}$ bifid.

Mt. Wellington. Mt. Field. Adamson Peak, Etc.

*Isotachis inflexa, Gott.*—Stems about 4 cm. long, yellowish green often the apex reddish. Leaves imbricate to recurved from an appressed base, subrotund to broadly rectangular, 1-1.8 mm., apex shortly to 1-3rd bilobed, lobes equal, broadly triangular acute, margin usually acutely bidentate, sometimes entire; upper cells 21 $\mu$., lower 21 x 60 $\mu$., cuticle asperate to papillate above, striolate below. Underleaves similar to the leaves.

Very close to *I. gunniana*, distinct chiefly by smaller crowded leaves.

Longley.
Australia.

*Isotachis grandis, C. et P.*—Robust, usually 7-10 cm. long, green or reddish. Leaves closely imbricate recurved, broadly ovate-rotund, 2.4 mm., 1-3rd bifid, lobes acute, sinus acute, margins armed with spinous teeth to entire; upper cells 21-35 $\mu$., asperate, lower 21-54 $\mu$. striolate. Underleaves similar to the leaves, sometimes rather smaller, usually less armed. Perianth cylindric, 6

mm. long, mouth shortly 3 lobed, lobes narrow acute fimbriate. Close to *I. gunniana* only more robust, leaves imbricate and generally acutely armed.

Mt. Wellington. Western Tiers.
Victoria.

*Isotachis intortifolia* (*Tayl.*), *Gott.*—Robust, stems to 10 cm., yellow. Leaves closely imbricate decurved towards the ventral aspect, asymmetric, the dorsal margin broader than the ventral, broadly ovate 2.5-3 mm. long, apex shortly bi-trilobed, lobes broadly triangular acute, margin with few small teeth or entire; upper cells asperate or papillate rotund 20 $\mu$. lower striate very long. Underleaves nearly as long as the leaves, broadly oblong $\frac{1}{4}$ bilobed, lobes acute, margin armed with few acute teeth. Perianth narrow ovate 4 mm., tapering to a slender mouth.

Mt. Wellington. Mt. Hartz. Blue Tier, Etc.
Australia. Campbell Islands.

*Isotachis subtrifida* (*Tayl.*), *Mitt.*—Small, 2-4 cm., livid green. Leaves remote below, more imbricate above, decurved towards the ventral aspect, oblong slightly asymmetric, 1.4 mm., 1-3rd-$\frac{1}{2}$ bilobed, rarely trilobed, lobes triangular acute, sinus acute, margin entire seldom with few rudimentary teeth; upper and marginal cells 25 $\mu$., minutely asperate, central basal ones longer striolate. Underleaves oblong, 2-3rd as long as leaves. In some robust forms the leaves are longer and looser, more often trifid, and the underleaves as long as the leaves. Perianth broadly oblong, 4 mm., but little exceeding the bracts, mouth deeply fimbriate.

Mt. Wellington.

*Isotachis pusilla*, *St.*—Very small, under 1 cm. long, pale green. Leaves squarrose, subrotund 0.6 mm. long, 1-3rd-$\frac{1}{2}$ bifid, lobes oblong, obtuse or acute, margin plain to armed with many obtuse or acute teeth; cells mostly 20 $\mu$., cuticle smooth. Underleaves small, hardly broader than the stem, margin many dentate, 1-3rd bifid, lobes acute.

Longley.

*Isotachis attenuatus*, *Rod.*—Stems 1-2 cm. long, very slender, growing amongst moss in wet situations. Leaves rather remote erecto patent narrow oblong from a narrow base, dark brown, $\frac{1}{2}$ bifid, lobes lanceolate acute, 0.5 mm.; outer cells 18 $\mu$., inner ones 18 x 24 $\mu$., walls thick; underleaves similar. Bracts many, similar to the leaves but

larger. Perianth terminal, 1 mm. long, ovate strongly triquetrous, keels obtuse, mouth obtuse, shortly fimbriate.

Mt. Wellington Plateau.

*Isotachis riparia*, *Rod.*—Robust, almost black, stems 5-8 cm. Leaves erect closely imbricate broadly ovate to almost rotund, 3 mm. long, apex shortly bifid, lobes short broad subacute, margin entire or with 1-2 small teeth; upper cells 27 $\mu$., walls thick, lower cells 40 x 18 $\mu$., walls thin, cuticle smooth; underleaves to 3 mm. long, 2 mm. broad oblong, apex shortly bifid, margin entire or armed with about 3 small teeth.

Quite dissimilar to any other Tasmanian species. It is near *I. gigantea* of New Zealand.

Cradle Mt.

## Lepidozia, Dum.

Plants from small to medium size, pinnate or bipinnate, the branches lateral frequently with flagellate tips. Leaves incubous obliquely to subtransversely inserted, small, mostly quadrifid, rarely with fewer or more divisions, which extend usually to the middle, sometimes less deep, rarely to the base; underleaves similar to the leaves but often much smaller. Perianth terminating a short branch low down the stem, cylindric or fusiform, mouth entire or more or less fimbriate.

*Section symmetricae.*—Leaves symmetric.

1. Leaves 2-lobed ... ... ... ... ... ... *tasmanica*
   Leaves 3-lobed ... ... ... ... ... ... ... ... 2
   Leaves 4-lobed ... ... ... ... ... ... ... ... 4
   Leaves many lobed ... ... ... ... ... *mooreana*
2. Leaves divided to middle ... ... ... ... *vastiloba*
   Leaves divided to base ... ... ... ... ... ... ... 3
3. Leaflobes setaceous ... ... ... ... *longiscypha*
   Leaflobes moniliform ... ... ... *chaetophylla*
4. Leaflobes lanceolate generally incurved 4 to many celled at the base ... ... 5
   Leaflobes setaceous divergent generally 2-celled at base ... ... ... ... ... ... ... ... 8
5. Leaves subvertical, lobes widely divergent ... ... ... ... ... ... ... *praenitens*
   Leaves subtransverse, lobes incurved ... ... 6
6. Cells of lobes not larger than those of disk ... ... ... ... ... ... ... ... *cucullifolia*
   Cells of lobes longer than those of disk ... 7

7. Green or yellow ... ... ... ... ... *appressifolia*
   Brown to black ... ... ... ... ... ... *saddlensis*
   Each margin with a short supplementary lobe ... ... ... ... ... ... ... *serfida*
8. Plant glaucous, small ... ... ... ... ... *centipes*
   Green, lobes acute spreading ... ... *capilligera*
   Dark brownish, lobes setaceous divergent ... ... ... ... ... ... ... ... ... *setiformis*
   Green robust lobes erect ... ... ... ... *grossiseta*

*Section asymmetricae.*—Leaves asymmetric, the dorsal margin much longer and more curved than the ventral.

9. Margin nude or 1-2 teeth ... ... ... ... ... 10
   Margin armed ... ... ... ... ... ... ... ... 15
10. Plant green or yellow ... ... ... ... ... ... 11
    Plant glaucous ... ... ... ... ... ... *glaucophylla*
11. Leaves patent concave, lobes incurved ... 12
    Leaves of main stem at least closely appressed ... ... ... ... ... ... ... ... 14
12. Margin with 1-2 short acute teeth *chordulifera*
    Margin nude ... ... ... ... ... ... ... ... ... 13
13. Leaves 0.3 mm. with short lobes ... *levifolia*
    Leaves 0.9 mm. divided to the middle ... ... ... ... ... ... ... ... *asymmetrica*
14. Branch leaves close patent ... ... ... *procera*
    All leaves closely appressed remote... *parvitexta*
15. Leaf-margin armed with cellular teeth or cilia ... ... ... ... ... ... ... ... ... *albula*
    Leaf-margin armed with simple or forked unicellular spines ... ... *appendiculata*

*Lepidozia tasmanica, St.*—Small, yellow-green, with many capillary branches. Leaves remote patent incurved, nearly transversely inserted oblong, 2-3rd bifid, rarely the lower ones 3-4 lobed, 0.4 mm., base 2 cells high, lobes lanceolate erect or incurved, cells rectangular, mostly 60 x 22 $\mu$.; underleaves similar but only 1-3rd as large. Perianth narrow cylindric 2-3 mm., mouth fimbriate.

Longley. West Coast.

*Lepidozia vastiloba, St.*—Very small, densely caespitose, irregularly branched. Leaves obcuneate nearly transversely inserted very concave, symmetric trilobed to the middle, 0.5 mm. long, lobes incurved oblong-triangular obtuse 4 cells wide at the base; cells 27 $\mu$.; underleaves small appressed, 2-3rd trilobed.

West Coast.
East Australia.

*Lepidozia longiseypha, Tayl.*—Small and slender, irregularly branched. Leaves nearly transverse remote, spreading trifid to the base, 0.35 mm. long, base 1 cell high and 6 broad, lobes diverging setaceous, 2 cells broad at the base, 7 cells long; underleaves similar but smaller; cells of lobes 45 x 15 $\mu$

West Coast. East Australia.

*Lepidozia chaetophylla, Spruce.*—Small and very pale. Leaves remote transverse, bifid or trifid to the base, lobes setaceous, 0.3 mm. long, 1 cell wide, 4 cells long, rarely more; cells rather inflated 60-100 x 30 $\mu$.; underleaves smaller, generally 3 cells long.

Mt. Wellington Plateau. Tasman Peninsula.

South Africa. South America.

*Lepidozia praenitens, L. et L.*—Small, branches mostly with flagellate tips. Leaves remote on stems, crowded on branches, symmetric very obliquely inserted, quadrifid to the middle, 0.4 mm. long and broad, lobes lanceolate 4-6 cells broad at the base; underleaves smaller, more deeply divided, appressed.

Variable but distinguished by the very oblique spreading symmetric leaves.

Very common.

New Zealand.

*Lepidozia appressifolia, St.*—Small and slender, pale green. Leaves obcuneate 0.4 mm. long, very concave, the lobes sharply incurved, transversely inserted, quadrifid below the middle, base rather narrow usually unidentate on the margin, lobes slender 4-5 cells broad at the base, cuticle verrucose; underleaves about the same size but more deeply divided, trifid rarely quadrifid.

Very common.

*Form. armata.*—Leaves crowded, 2-3rd quadrifid, lobes lanceolate acute, 4-6 cells broad at the base, base 8 cells high 16 cells broad, margin 1-2 dentate.

Intermediate between this and *L. serfida.*

*Lepidozia saddlensis, B. et Mass.*—Small and densely massed, very dark. Leaves remote below, crowded above, closely overlapping, and usually leaving a well-marked dorsal groove, concave, transverse symmetric obcuneate, 0.4 mm. long, 2-3rd quadrilobed, lobes lanceolate sometimes armed with a lateral tooth, 4 cells broad at base; cell wall thick, cuticle verrucose; underleaves similar and little

smaller. Differs from *L. appressifolia* only in colour and more compact habit.

Cradle Mt. West Coast.
Fuegia.

*Lepidozia serfida, St.*—Very small, not usually flagellate. Leaves symmetric transverse subrotund, 0.3 mm., suberect concave, 2-3rd sexfid, the four middle lobes lanceolate, 4 cells broad at base, lateral lobes shorter and narrower; cuticle minutely asperate; underleaves smaller with a shorter base, lobes 4 or 5. Very near *L. appressifolia.*

Common on wet, sandy heaths.

Eastern Australia.

*Lepidozia cucullifolia, St.*—Small, intricately branched with flagellate tips, very dark olive green. Leaves symmetric remote suberect very concave, subrotund 0.6 mm. broad and long, quadrilobed to or below the middle, lobes lanceolate, 6-10 celled at the base subacute; cells 17 $\mu$., only the basal ones larger; underleaves quadrate smaller deeply quadrifid. Variable in colour and often with smaller lobes.

Adamson Peak.

*Lepidozia centipes, Tayl.*—Small glaucous. Leaves symmetric, very obliquely inserted, remote on stem, crowded on the branches, broadly obcuneate, divided to the middle into 3-4 diverging acute lobes 0.3-0.6 mm., base about 6 cells high, lobes 4-6 cells long, 2 cells wide at the base; cells 36-50 $\mu$., underleaves very much smaller with a very short base and slender lobes.

Distinguished by the glaucous symmetric leaves and large cells.

Mt. Wellington. Castra. Freycinet Peninsula.
Australia.

*Lepidozia capilligera, Lindb.*—Small and slender with few irregular branches, generally ending with flagellate tips, green. Leaves obliquely inserted remote, quadrifid to the middle, obcuneate, symmetric mostly 0.4 mm. long, those of the branches often trifid and more crowded, cells 17-27 $\mu$., lobes lanceolate acute widely diverging, cells larger, 2 cells broad at the base; underleaves similar but smaller.

Variable. A small condition referred by Stephani to a separate species as *Lepidozia oldfieldiana.*

Very common.

Australia. New Zealand.

*Lepidozia setiformis*, *De Not.*—Dark brown, slender lower branches often long and flagellate. Leaves symmetric remote squarrose broadly obcuneate from a narrow subtransverse insertion, mostly 0.5 mm. long, quadrifid to or below the middle, lobes widely diverging often a short spinous tooth on the margin, base of the lobes 2-4 cells wide rapidly narrowing to a 1-celled spinous apex 4-5 cells long; cells of base 18 $\mu$., verrucose, those of the lobes mostly 60 x 20 $\mu$., minutely striate. Underleaves similar.

Mt. Wellington. West Coast.

S. America.

*Lepidozia grossiseta*, *St.*—Robust, bright green, in dense mats. Leaves imbricate plano-distichous rather decurved, quadrifid to the middle, subvertically inserted 1.4 mm. long, basal disk nearly quadrate, lobes erect setaceous and uniseriate above, the inner ones 4-celled at base, the outer ones often 2-celled, sometimes all 2 or all 4-celled; cells of the disk 75 x 40 $\mu$., those of the lobes up to 120 $\mu$.; underleaves smaller, lobes very slender, usually uniseriate to the base.

West Coast. Trowutta.

*Lepidozia mooreana*, *St.*—Pale green or almost colourless, closely resembling a *Trichocolea*, stems often 4-6 cm. long, regularly pinnate. Stem leaves symmetric rather crowded transverse, disk broadly obcuneate, 0.6 mm. broad, 0.3 mm. high, cells 70 x 30 $\mu$.; lobes usually 9-10 setaceous, 0.8 mm. long, uniseriate from a 2-celled base, cells 120 x 30 $\mu$.; underleaves smaller, usually 5-6 lobed, otherwise similar. Perianth 6 mm. cylindric, mouth fimbriate.

West Coast. Hartz Mt. Cradle Mt.

*Lepidozia levifolia*, *Tayl.*—Seldom exceeding 5 mm., irregularly branched. Leaves nearly transversely inserted, asymmetric imbricate spreading strongly incurved, 0.3 long and broad, 1-3rd-$\frac{1}{2}$ quadrifid, dorsal margin three times as long as the ventral, dorsal lobe small, middle ones 0.1 mm. long, broad, but acute, 7-8 cells broad at the base, 10-12 cells long; cells 16-20 $\mu$.; underleaves shorter, twice as broad as the stem, quadrifid to the middle. Variable but distinguishable from the other asymmetricae by the smaller concave leaves.

Very common.

*Lepidozia procera*, *Mitt.*—Stems 1-3 cm., branches decurved with long slender tips. Leaves remote and closely appressed on the main stem, closer and patent on the

branches, asymmetric 0.6 mm. shortly quadrifid, lobes nearly equal triangular mostly 6 cells broad at the base; cells 17 $\mu$.; underleaves small quadrate not broader than the stem, deeply quadrifid.

Common.

New Zealand.

*Lepidozia parvitexta, St.*—Slender elongated often to 6 cm., branches long flagellate. Leaves asymmetric, obliquely obcuneate, all remote and closely appressed, 0.5 mm., dorsal border curved more than twice as broad as the ventral quadrifid to the middle, lobes broadly lanceolate 4-8 cells broad at the base; cells 18-27 $\mu$. long; underleaves as broad as the stem, very short quadrifid to the middle.

Very close to *L. procera*, and probably only a form of it.

Very common.

New Zealand.

*Lepidozia chordulifera, Tayl.*—Small slender generally densely massed. Leaves subtransverse asymmetric 0.6 mm. long, quadrifid to the middle, disk oblique, dorsal margin twice as long as the ventral 1-2 dentate, lobes diverging lanceolate very acute 8-9 cells broad at the base, usually one or more armed with a lateral tooth; cells 17 $\mu$.; underleaves nearly as large as the leaves, broader than long, deeply quadrifid.

Mt. Wellington. Mt. Field. West Coast.

South America.

*Lepidozia asymmetrica, St.*—Rather robust, many branched and densely massed, lower branches sometimes with flagellate tips, upper ones terminating abruptly. Leaves imbricate asymmetric, concave, the lobes incurved 0.9 mm. long, 0.8 mm. wide, quadrifid to the middle, dorsal margin broadly expanded, lobes broad 4-12 celled at base acute; cells 27 $\mu$.; underleaves less than half as large, 2-3rd quadrifid, lobes very acute.

Very common.

*Form. parva.*—Habit and appearance of the type only smaller in all details. Leaves 0.5 mm., 1-3rd quadrifid, lobes about 12 celled at the base. Approaching *L. chordulifera*, but lobes not spreading and without the lateral teeth.

The species has a distinct habit, but no clearly defined characters marking it from its relatives.

*Lepidozia glaucophylla, Tayl.*—Robust and glaucous, freely branched, the lower ones flagellate. Leaves oblique asymmetric ovate-truncate, 1-3rd quadrifid, but some tri or bifid, 0.9 mm. long, those on branches smaller often minute; lobes lanceolate, inner ones usually 7-9 cells at base, outer ones 2-3 celled but variable; cells 15-20 $\mu$.; underleaves half as large as leaves, rather broader than the stem, quadrifid to the middle. Cuticle minutely asperate.

Mt. Wellington. Adamson Peak.

Australia. New Zealand.

*Lepidozia albula (Tayl.), L. ulothrix (Lindb.).*—Very variable in habit, often forming yellow mats, branches often with flagellate tips. Leaves crowded imbricate asymmetric quadrifid below the middle, 1.4 mm., dorsal margin strongly curved armed with generally 5-6 unequal spines, lobes acute simple or armed; cells unequal thick walled 20-30 $\mu$.; underleaves broader than long, half as large as leaves, deeply cleft into 4 slender deeply bifid lobes, but varying from 2-6 lobed, armed or not.

Very variable in habit, size, shape of lobes, and armature, but always distinguishable by the deeply bifid lobes of underleaves.

Very common.

Auckland Islands.

*Lepidozia appendiculata, St.*—Medium size, the branches sometimes 3 cm. long. Leaves closely overlapping asymmetric deeply 6-lobed, 1 mm. long, 1.4 mm. broad, lobes narrow-lanceolate diverging, margin armed with many long simple or compound 1-cell spines, and surface at least when young covered with small-celled proliferation. Underleaves similar but smaller. "Perianth large to 1 cm. long, base fleshy, mouth spinulose."

A very distinct and rare species. Only found hitherto in swampy land near Kingston. The above description is partly adapted from Stephani, as only one or two scraps are present in the author's collection.

## Lembidium, Mitten.

Branches erect from a stoloniferous base; stems thick with numerous slender more or less circinate pinnate or bipinnate branches. Leaves transverse, stem-clasping appressed to patulous, deeply divided into linear incurved lobes to entire concave, branch leaves smaller; underleaves similar nearly as large to rudimentary; cells medium size

with thick walls. Archegonia on short ventral branches; perianth long, narrow trigonous, mouth constricted.

The *commoner* Tasmanian plant differs from *Lepidozia* in little but habit.

*Lembidium tenax* (*Grev.*), *St.*—Branches 1-2 cm. Stem leaves closely appressed, reniform divided to the middle into 6-8 slender lobes, margin of disk dentate, leaves of branches more spreading quadrifid, ultimate leaves very small trifid.

Placed by Lindberg in *Lepidozia*, to which it appears to have at least equal affinity.

Common.

East Australia. New Zealand. Auckland Islands.

*Lembidium anomalum*, *Rod.*—Stems pinnately branched ascending from a creeping stoloniferous base, dark livid green. Leaves imbricate to distant incubous or subtransverse, rotund very concave erect, 0.9 mm., margin entire; cells unequal mostly 18 $\mu$., sometimes a band of pale cells on the margin, walls rather thick, trigones large to small, cuticle smooth; underleaves similar in size and shape to the leaves. Bracts oblong 2 mm. adherent to the perianth; perianth terminating a short lateral branch, narrow cylindric, 8 mm. long, mouth tapering fimbriate, capsule oblong.

Cradle Mt. West Coast.

### Psiloclada, Mitten.

Plants small, dark, usually creeping amongst more robust mosses. Stems small, slender, branched. Leaves succubous remote, patulous 4-6 lobed, lobes slender, cells rather small with thick walls; underleaves transverse, little smaller than the leaves, deeply 4 or 3-lobed. Perianth on short lateral branch cylindric curved apex split into numerous slender laciniae, bracts numerous deeply 3-4 lobed, lobes many dentate.

Very like *Lepidozia*, only leaves succubous and perianth and bracts different.

*Psiloclada clandestina*, *Mitt.*—Very small, bipinnate. Leaves 0.3 mm., base patent, lobes erect, lobes 4-6 slender, cells 17 $\mu$.; underleaves as broad as the stem, sinuately inserted, 2-3rd quadrilobed.

West Coast.

New Zealand. New Guinea. South Africa.

### Blepharostoma, Dum.

Small and slender with few lateral branches. Leaves succubous to nearly transverse more or less remote, patent, 4-8 lobed, lobes with setaceous apices and armed with spinous teeth; cells rather large with equally thickened walls; underleaves similar. Perianth terminal cylindric, mouth lobed and armed with spinous processes.

*Blepharostoma pulchella (Hook.), St.*—Stems from very short to 2 cm. Leaves reniform concave mostly divided half-way into 4 broad lobes, lower leaves often 8-upper 12-lobed, tip of each lobe elongated into a spine about 6 cells long 1 cell wide, 0.5 mm. long without the spinous apex, each lobe armed with about 4 spines; cells of base mostly 50 x 22 $\mu$., those of the spines mostly 60-90 x 17 $\mu$, cuticle of upper cells asperate, lower ones striate. Perianth 1.2 mm.

Mt. Wellington. Mt. Hartz. West Coast, Etc.

New Zealand.

### Trichocolea, Dum.

Robust pale flaccid densely caespitose; stems usually bearing numerous paraphylls, copiously bipinnate. Leaves succubous crowded patent concave, deeply 3-5 lobed, incisions acute and lobes rapidly tapering to a long spine, lobes armed with numerous simple or compound spines; all cells large; underleaves smaller but similar. Perianth absent; calyptra terminal oblong densely covered with coarsely spinous paraphylls.

*Trichocolea australis, St.*—Robust, often 10 cm. long, pale, copiously branched. Leaves crowded the disk rather narrow gradually separating into the lobes; cells of disk 50 x 21 $\mu$., those of the spines longer and narrower, cuticle striate. Calyptra obovate, 3 mm. long. Spores ferruginous spherical coarsely asperate 15 $\mu$. diameter.

Differing from *T. tomentella (Ehrh.), Dum.*, in the leaf, being less deeply divided as well as in the asperate spores.

Very common.

New Zealand.

### Chandonanthus, Mitten.

Stems rigid, robust, simple or with few lateral branches. Leaves transverse or slightly oblique, imbricate, deeply 2-4 lobed, base usually armed with few spinous teeth, lobes broad acute entire or lobed; underleaves smaller, deeply 2-lobed, lobes slender. Perianth terminal

often thrown to one side by a robust innovation, campanulate, deeply plicate, mouth slightly contracted coarsely dentate.

*Chandonanthus squarrosus* (*Hook.*), *Mitt.*—Robust, reddish-yellow often 5 cm. long, more or less covered with paraphylls. Leaves broad undulate, squarrose, bilobed to the middle, lobes very broad, apex acute, 2.5 mm. long, margin generally entire; cells 21 $\mu$., walls sinuous, trigones as large as the cells. Perianth 5 mm., mouth strongly ciliate-dentate.

Slender creeping forms often have leaves only 1 mm. long and underleaves very reduced.

Mt. Wellington. Hartz Mt. Adamson Peak. Cradle Mt. Blue Tier, Etc.

New Zealand.

### Herberta, S. F. Gray.

Stems long slender simple or with sub-floral innovations generally depressed amongst undergrowth. Leaves transverse divided below the middle into two equal acute lobes, secund; cells rotund about 21 $\mu$., walls sinuous, trigones about as large as cells; cells of the middle base and lobes much larger; underleaves as large as and similar to the leaves. Perianth terminal usually in the fork of branches, immersed in the bracts, slender, 3-keeled, mouth plicate and deeply laciniate.

Referred by Stephani to *Schisma*. By Nees to *Sendtnera*.

*Herberta oldfieldiana* (*St.*).—Stems long slender, wiry rigid. Leaves narrow oblong, 1.5 mm. long, divided below the middle into two lanceolate acute lobes, margins mostly entire, sometimes a few irregular dentitions present.

Also known as *Schisma juniperina*, etc.

Mt. Wellington. Mt. Field, Etc.

### Lepicolea, Dum.

Robust erect to pendulous, yellowish, pinnate, the branches with flagellate tips. Leaves closely imbricate bisbifid, lobes narrow with long slender tips; underleaves as large as and similar to the leaves: cells oblong 15 x 27 $\mu$., basal centre cells much larger, apical cells very long single series, trigones huge confluent. Perianth generally terminating lateral branches oblong densely covered with paraphylls.

Leaves divided below middle ... ... *scolopendra*

Leaves 1-3rd divided ... ... ... ... ... *ochroleuca*

*Lepicolea scolopendra* (*Hook.*), *Dum.*—Leaves erect imbricate tips decurved primary division 2-3rd, division of the lobes nearly as deep, ventral margin with few subulate teeth, 2 mm. long.

Very common.

Asia to New Zealand.

*Lepicolea ochroleuca* (*Sprng.*), *Spruce.*—Leaves with a rather broad stem-clasping base, divisions not extending below the middle, otherwise as in *L. scolopendra.*

A doubtful species with many connecting forms.

Common in woods.

South Africa. South America. New Zealand.

## Bazzania, S. F. Gray.

Plants mostly robust, stems repeatedly forked and producing long small leaved flagella from the ventral surface. Leaves incubous, plano-distichous, crowded and imbricate commonly ovate with a three toothed apex, rarely bifid with unequal lobes; cells usually rather small with thick walls; underleaves always present, roundish quadrate 4-lobed or with an erose apex. Perianth on a short basal branch, linear to fusiform, mouth usually fimbriate.

Stephani in his Species Hepaticarum has adopted the name *Mastigobryum*, but Bazzania is a prior name, and is now the one more commonly used.

1. Leaves 3 dentate ... ... ... ... ... ... ... ... 2
   Leaves 2 lobed ... ... ... ... ... ... ... ... 5
2. Leaves linear-ovate ... ... ... ... ... ... *accreta*
   Leaves ovate ... ... ... ... ... ... ... ... ... 3
   Leaves with a middle series of long cells ... ... ... ... ... ... ... ... ... *monilinerve*
3. Leaf margin entire or with few serrations ... ... ... ... ... ... ... ... ... *involuta*
   Margin and lobes with many serrations ... 4
4. Underleaves much broader than long ... *adnexa*
   Underleaves nearly rotund ... ... ... *baileyana*
5. Lobes rather obtuse nearly equal ... ... *colensoi*
   Lobes acute very unequal ... ... ... *anisostoma*

*Bazzania accreta* (*L. et L.*).—Leaves closely imbricate slightly decurved, strongly so when dry, linear ovate, falcate, 1.7 mm. long, apex narrow with 3 short unequal broad diverging teeth, margin otherwise plain or with one or two minute serrations on each side below the apex, cells 20-30 x 15 $\mu$., walls thick, trigones convex; underleaves rather broader than the stem, shortly connate on

both sides with the leaves reflexed oblong-quadrate, rather longer than broad apex irregularly dentate.

Very common.

East Australia.

*Bazzania involuta* (*Mont.*).—Leaves broadly ovate falcate decurved, 1.5-2 mm. long, apex narrow with 3 short acute diverging teeth, sometimes with a few serrations intermixed, upper cells 15-18 $\mu$., walls thick, lower 30-45 $\mu$., trigones rotund; underleaves nearly reniform 2-3 times as broad as long, apex erose-dentate, reflexed, shortly connate on both sides, upper cells often larger and hyaline.

Very common in forests.

New Zealand. Fuegia.

*Form. elegans*, *B. elegans*, *Col.*—Regularly forked; leaves very close and regularly spreading.

Hartz Mt.

*Bazzania adnexa* (*L. et L.*).—Leaves not as strongly deflexed as in allied species, broadly ovate, falcate 2 mm. long, dorsal base broadly overlapping the stem, apex truncate tridentate, teeth acute, they and the upper portions of the margins armed with few small acute serrations, when growing in deep shade the leaves are shorter and serrations less marked; when growing on firm bark the flagella creeping and bearing leaves similar to those of the stem only smaller and nearly entire; cells 18 $\mu$., with thick walls, trigones large acute; underleaves quadrate broader than long, apex erose-dentate, upper cells large hyaline, base shortly connate with the leaves, slightly reflexed.

Some forms approximate to *B. involuta*.

Very common.

New Zealand. South Africa.

*Bazzania baileyana*, *St.*—Very similar in habit to *B. adnexa*, but leaves still less decurved, less rigid and narrower, dorsal base less expanded, 1.5-1.7 mm. long, apex truncate with three sharp diverging teeth more or less armed with short sharp serrations; underleaves nearly free reflexed, more rotund than quadrate, twice as broad as the stem.

Very close to *B. adnexa* and probably not always separable.

Adamson Peak.

East Australia.

*Bazzania monilinerve, Nees.*—Small with few forks 1-3 cm. long. Leaves slightly deflexed imbricate, but not very crowded, nearly rectangular but with an expanded dorsal base, 1.2 mm. long, apex truncate with three acute diverging teeth, a broad band of long cells between the dorsal margin and the centre; cells of the wing very irregular, 10.15 $\mu$., walls thick trigones none, cells of the vitta 35-45 $\mu$., trigones large convex; underleaves rotund, nearly half as long as the leaves, erect, free.

Common in forests.

Eastern Australia.

*Bazzania colensoi* (*Mitt.*)—Small. Leaves imbricate, slightly deflexed 0.7 mm. long, almost rectangular, the dorsal margin convex near the base, ventral margin straight, apex $\frac{1}{4}$-1-3rd bifid, lobes ligulate slightly acute, dorsal lobe about 9 cells wide at base, ventral lobe about same length but only 3-5 cells wide; cells 18-25 $\mu$., walls thick trigones none, cuticle granular; underleaves free as narrow as the stem, about as long as broad, 3 lobed, lobes obtuse. Perianth fusiform, apex tapering, 3.5 mm. long.

Tasman Peninsula. Trowutta.

East Australia. New Zealand.

*Bazzania anisostoma* (*L. et L.*)—Stems slender erect in dense mass, or when few develop procumbent. Leaves imbricate linear-ovate, sharply deflexed, 0.7 mm. long to 1-3rd bifid, dorsal lobe broad, acute, ventral much longer, narrow and very acute; cells of the dorsal wing 10 $\mu$., others 35 $\mu$., walls thick trigones none; underleaves free quadrate rotund, not broader than the stem trilobed, lobes very obtuse.

*B. mooreana, St.*, is the robust form of the plant.

West Coast. Hartz Mt. Cradle Mt., etc.

East Australia. New Zealand. Fuegia.

### Calypogeia, Raddi.

Slender branches, few arising from the ventral surface. Leaves incubous alternate, generally ovate with an obtuse apex, rarely bidentate; underleaves present much smaller than the leaves, usually bifid. Calyptra sunk in a relatively large descending fleshy marsupium situated on a short ventral branch remote from the apex.

*Calypogeia tasmanica, Rod.*—Slender in loose mats, often 3-5 cm. long. Leaves not crowded but little overlapping, rotundo-ovate, apex entire or rarely shortly bilobed 1 mm. long; cells hexagonal, walls rather thin,

trigones none, 30-45 $\mu$.; underleaves free, bifid or trifid divided to the middle, lobes obtuse, half as long as the leaves. Sterile.

Adamson Peak.

### Lepidolaena, Dum.

Decumbent with many lateral pinnate branches, more or less purple. Leaves incubous imbricate concave bilobed, dorsal lobe large rotund, ventral lobe a small clavate water-sack, closely attached to the ventral base of the larger lobe; underleaf broad sub-rotund, bifid or quadrifid; leaf and underleaf often bearing water-sacks similar to the lesser lobe. Perianth terminal or thrust aside, large oblong covered with numerous broad ciliated scales.

Underleaf bifid ... ... ... ... ... ... *magellanica*
Underleaf quadrifid ... ... ... ... ... *brachyclada*

*Lepidolaena magellanica* (*Lam.*)—*Schiffn.* Robust with wide spreading pinnate branches to linear with short branches. Leaves broadly ovate to rotund, margin armed with spines, about 1 mm. long; cells rotund 22 $\mu$.; trigones large convex; underleaves nearly as large as the leaves reniform to rotund with a shortly bifid apex, margin with few or many cilia. Perianth up to 1 cm. long membranous, calyptra adnate to the perianth with a free apex bearing sterile archegonia above, capsule narrow oblong on a short stalk quadrivalved to the base.

Very common.

Australia. New Zealand. Fuegia.

*Lepidolaena brachyclada* (*Lehm.*), *St.*—Stems very long; lateral branches very short distant, yellowish-green to more or less purple. Leaves broadly ovate up to 1 mm. long, margin armed with filiform spines, ventral lobe nearly half as long as the leaf, lanceolate, very acute, with about four spines on the ventral and a dark clavate sack on the dorsal margin; cells 22 $\mu$., walls irregularly thickened, trigones medium convex; underleaves broad quadrifid to the middle more or less armed with slender spines.

Mt. Wellington. West Coast. Not common.

*Form. alpina.*—Short with numerous bold lateral branches, dark purple. Leaves entire or with few small spines; ventral lobe rudimentary on the main stem, on the branches well developed, but the ventral section entire; cells with equally thickened walls; underleaves deeply divided, lobes armed.

Mt. Wellington. Hartz Mt. Adamson Peak.

### Diplophyllum, Dum.

Stems suberect to decumbent from a creeping rhizome. Leaves bilobed, complicate, keeled, dorsal lobe smaller than the ventral and flattened upon it, rarely both equal; underleaves none. Perianth terminal oblong, irregularly plicate, mouth rather contracted fimbriate.

Lobes unequal, nude ... ... ... ... ... *domesticum*

Lobes equal, ciliate ... ... ... ... ... *densifolium*

*Diplophyllum domesticum* (*G.*), *St.*—Stems thick fleshy with rhizoids on the ventral surface. Leaves plano-distichous slightly ascending, oblong falcate obtuse, 0.8-1 mm. long, margin serrulate, dorsal lobe half as large closely appressed, the junction curved not winged, cells 12 $\mu$., walls thick, basals much larger, cuticle loosely verrucose. Bracts similar to the leaves only larger; perianth 3 mm. long, apex colourless.

Mt. Wellington. Adamson Peak. Western Tiers, etc.

East Australia.

*Diplophyllum densifolium* (*Hook.*), *St.*, *D. vertibralis* (*Tayl.*), *St.*—Decumbent simple, often 5-6 cm. long, reddish green. Leaves plano-distichous, closely imbricate, sheathing base, bilobed very low down, lobes equal oblong, apex bifid, 2.5 mm. long, margin ciliate; cells 22 $\mu$., trigones small convex, cuticle papillate.

Mt. Wellington. Adamson Peak. Cradle Mt., etc. Auckland Is. Fuegia.

*Form. decurvum.*—Leaves decurved; apex of each lobe very shortly or not at all bifid; cells 27 x 9 $\mu$., walls very thick continuous.

West Coast.

### Balantiopsis, Mitten.

Closely decumbent. Leaves succubous, plano-distichous, deeply bilobed, dorsal lobe the smaller and closely appressed to the ventral, lobes rotund and always armed on the margin; underleaves closely appressed with a deeply sinuate insertion and a bi- or quadrifid apex, always armed. Sporophyte in a large descending apical marsupium.

*Balantiopsis diplophylla* (*Tayl.*), *Mitt.*—Green or reddish, usually in dense decumbent masses. Leaves crowded, imbricate, ventral lobe ovate rotund asymmetric, 1.5 mm., nearly vertically inserted, armed with few

or many cilia chiefly along the ventral margin, dorsal lobe similar two-thirds as large; cells rectangular 24 x 45 $\mu$., walls equal thin, trigones none, lower cells much larger; underleaves half as large as the ventral lobe, reniform, deeply quadrifid, armed with long cilia.

Very common on clay banks.

Australia. New Zealand.

*Form. paucidentata.*—Leaves entire or with few broad irregular teeth, dorsal lobe $\frac{1}{4}$ ventral; underleaf oblong one-fifth bifid with few lateral broad teeth.

*Balantiopsis aequiloba, Berg.*—Very close to the last in all details. Dorsal lobe as broad as the ventral but shorter; underleaves oblong, 1-3rd bilobed armed with numerous cilia to deeply 4-lobed. Both species as found in Tasmania vary and run into one another. This description applies to a plant determined by Stephani. It is doubtful if we possess the typical form.

Common.

New Zealand.

### Schistochila, Dum.

Plants robust, stems simple or with few irregular branches, thick fleshy, often bearing paraphylls between the leaves. Leaves two lobed, the dorsal smaller than, or often nearly equal to, the ventral, attached by nearly the whole of its length to and within the margin of the ventral lobe, the dorsal margin of the ventral lobe then forming a single wing, or joined by a commissure from the adjacent surfaces, and then both margins free, forming a double wing. Sporophyte terminal deeply sunk in the axis, the calyptra immersed in large bracts, some of which are attached to it. No perianth.

1. Underleaves absent ... ... ... ... ... ... ... ... 2
   Underleaves present ... ... ... ... ... ... ... 4
2. Margin ciliate ... ... ... ... ... ... ... *ciliigera*
   Margin entire or nearly to ... ... ... ... ... 3
3. Lobes subacute ... ... ... ... ... ... ... *fragilis*
   Lobes obtuse ... ... ... ... ... ... *spegazziniana*
4. Margin ciliate ... ... ... ... ... ... ... ... ... 6
   Margin dentate ... ... ... ... ... ... ... ... 5
   Margin entire ... ... ... ... ... ... *parvistipula*
5. Underleaf 4-lobed ... ... ... ... *lehmanniana*
   Underleaf subrotund bifid ... ... ... ... *pachyla*
6. Cilia 1 celled ... ... ... ... ... ... ... ... *tasmanica*
   Cilia 2-3 celled ... ... ... ... ... ... ... ... *ciliata*

*Schistochila ciliigera* (*Tayl.*), *St.*—Robust, often 6 cm. long, yellow. Leaves ovate-cordate, acute, crowded, 4 mm. long, squarrose, the two lobes almost equal united for five-sixth of length, margin bearing numerous slender cilia; wing at junction of the lobes narrow also ciliate; underleaves absent. Bracts enlarged, calyptra cylindric, 2 mm., mouth fimbriate completely immersed, upper bracts adnate to the calyptra.

West Coast. Hartz Mountains. Cradle Mountain, etc.

Stewart Island.

*Schistochila tasmanica*, *St.*—Robust, often 4 cm. long. Leaves broadly ovate cordate, apex obtuse, crowded squarrose, 5 mm long; lobes almost equal united beyond the middle, wing narrow double, margin and wing armed with numerous single-celled cilia; underleaves 2-3 mm. long, deeply divided into two spathulate lobes, copiously ciliate. Bracts not much larger than leaves, calyptra deeply immersed. Trigones small concave. Very close to *S. ciliata*, differing principally in the cilia being one-celled.

Mt. Wellington. Adamson Peak. West Coast, etc.

*Schistochila ciliata* (*Mitt.*), *St.*—Robust. Leaves closely imbricate, oblong, obtuse, 4-5 mm. long, lobes equal, 2-3rd combined, margin armed with long cilia each 2-3 celled, wing double narrow usually entire; underleaves half as large as leaves divided to the middle into two spathulate lobes armed with many cilia. Calyptra very small, deeply immersed. Trigones medium convex.

Mt. Hartz. West Coast.

New Zealand.

*Schistochila lehmanniana* (*Lindb.*), *Nees.*—Very robust often 10 cm. long, pale greenish or yellow, stem thick with paraphylls amongst the leaves. Leaves ovate acute, the dorsal lobe rather shorter than the ventral, 6 mm. long, crowded squarrose, margin armed with numerous short, sharp teeth, lobes $\frac{3}{4}$ adherent with a double wing, wings narrow entire or nearly so, the ventral wing the broader and also a small supplementary wing towards the apex of the ventral lobe; underleaf 2 mm. long, 4 mm. wide, 4-lobed to middle, lobes and basal margin armed with a few cilia.

Very common in forests.

Stewart Island.

*Schistochila fragilis*, *St.*—Robust but short, closely procumbent. Leaves oblong, obtuse, 3-4 mm. long, imbricate squarrose entire or with a few small teeth at the apex, dorsal lobe smaller, adnate to the ventral about one-third within the margin, shortly free at the apex, margin entire. Underleaves none.

Mt. Hartz. Cradle Mt. West Coast. Trowutta.

*Schistochila pachyla* (*Tayl.*), *St.*—Robust, often elongating to 10 cm. Leaves crowded ovate-cordate, 5 mm., margin armed with few short broad teeth, dorsal lobe same size entire, wing double narrow linear, entire. Underleaves large rotund, apex bilobed, margin entire or lobed, often armed with a few cilia. Distinguished from *S. lehmanniana* by the entire wings and different underleaf and usual absence of paraphylls, but some forms appear intermediate.

West Coast. Adamson Peak.

Fuegia.

*Schistochila parvistipula*, *Rod.*—Stems mostly about 3 cm., decumbent, copiously radiculose, thick, fleshy. Leaves squarrose, loosely imbricate, broadly ovate obtuse, 4 mm. long, lobes nearly equal and united to the apex, dorsal lobe attached by the margin, wing single relatively broad, margins entire but often an obscure tooth near the apex of the dorsal lobe; cells rotund 35-50 $\mu$., walls rather thin, trigones small concave; underleaves oblong, rather narrower than the stem, 1.3 mm. long, bifid below the middle, lobes lanceolate acute, margin with few ill-defined teeth.

Cradle Mt.

*Schistochila speyazziniana* (*Massal*), *St.*—Robust, rigid, decumbent, reddish brown, often 10 cm. long. Leaves crowded, squarrose, ovate, 5 mm. long, obtuse, entire; dorsal lobe the same size or little shorter, apex rotund, entire; underleaves none.

A few scraps on Button Grass Plains, West Coast. Stephani marks its determination as uncertain.

Fuegia.

### Radula, Dum.

Prostrate, pinnate or bipinnate branches, pale green. Leaves incubous, plano-distichous, patent, obliquely oblong entire; ventral lobe very small appressed, base broadly attached to the stem, inner margin free, outer margin attached by at least most of its length to the leaf, apex usually short, straight, with usually an obtuse

or more or less acute inner angle, often much inflated within the outer margin. Antheridia in some species, single within the ventral lobes, which are then much enlarged, in other species within the small leaves of short clavate axillary amenta. Perianth terminal terete, usually flattened above with a wide mouth, 2-4 mm. long.

A large genus of closely graded forms. Some of the latter are doubtful as species.

1. Lobule closely appressed ... ... ... ... ... ... 2
   Lobule not closely appressed ... ... ... ... ... 7
2. Lobule under one-fifth size of leaf ... ... ... 3
   Lobule one-third or more size of leaf ... ... 5
3. Leaves remote, lobule hardly inflated ... ... ... ... ... ... ... ... ... *buccinifera*
   Leaves contiguous, lobule inflated ... ... ... 4
4. Trigones well developed ... ... ... ... *mittenii*
   Trigones obsolete ... ... ... ... ... ... *wattsiana*
5. Lobule nearly retund, little inflated .. *uvifera*
   Lobule rhomboid ... ... ... ... ... ... ... ... 6
6. Leaves nearly flat ... ... ... ... ... ... *physoloba*
   Leaves strongly decurved ... ... ... *tasmanica*
7. Lobule erect ... ... ... ... ... ... ... ... ... 8
   Plant minute, lobule nearly as large as leaf ... ... ... ... ... ... ... ... *aneurysmalis*
8. Reddish, leaves strongly decurved ... *plicata*
   Green, leaves nearly flat ... ... *weymouthiana*

*Radula buccinifera, Tayl.*—Leaves rather remote, obliquely oblong, very obtuse, 0.8 mm. long, 0.5 mm. wide, slightly concave; ventral lobe very small quadrate with a very decurrent base, closely appressed, hardly inflated, apex with a very obtuse angle; cells 9-18 $\mu$., cuticle minutely asperate. Perianth 2-3 mm. long, mouth not much compressed, crenulate.

Very common.

Australia. New Zealand.

*Radula physoloba, Mont.*—Leaves imbricate, concave, overlapping the stem, obliquely ovate, very obtuse, 1.2 mm. long, 0.8 mm. wide; ventral lobe large inflated oblong; stem insertion very short, apex very short, angle obtuse; cells 10 $\mu$., convex to papillate, walls rather thick, trigones small, concave. Perianth 3 mm. long, narrow, mouth entire.

Common.

Auckland Is.

*Radula plicata*, *Mitt.*—Reddish. Leaves obliquely oblong, very obtuse, imbricate, decurved, 0.8 mm. long, 0.4 mm. wide, dorsal margin overlapping the stem; ventral lobe quadrate half as large as the leaf to smaller, little inflated below, not closely appressed, apex broadly concave-truncate, angles obtuse; cells 10 $\mu$., walls thick, trigones not apparent, middle and lower cells much larger, margins with small irregular serrulations, cuticle coarsely verrucose. Perianth 1.7 mm., little flattened, 8-10 plicate, mouth more or less fimbriate.

Mt. Field.
New Zealand.

*Radula urifera*, *Tayl.*—Leaves closely imbricate, overlapping the stem broadly ovate, oblique, apex obtuse, decurved, 1.2 mm. long, 0.8 mm. broad; ventral lobe 1-3rd as large, closely appressed, base very short, inner margin broadly expanded, outer margin little curved connate throughout, inflation slight, apex short straight, angle small obtuse. Antheridia on amenta. Cells 10-12 $\mu$., trigones large, cuticle convex to papillate.

Mt. Hartz. West Coast.
New Zealand. Auckland Is.

*Radula tasmanica*, *St.*—Leaves broadly ovate, obtuse, imbricate, strongly decurved, 1.2 mm. long, 0.6 mm. wide, ventral lobe 1-3rd as large, ovate truncate to rhomboid longer than wide, strongly inflated, apex short, angle obtuse, base rather broad; cells 18 $\mu$., trigones small, acute. Antheridia on amenta. Perianth 4 mm., clavate, mouth broad, entire.

Though much the appearance of R. *physoloba*, it is readily distinguished by the strongly decurved leaves. This is not a distinct species, it is the form assumed by *R. aneurysmatis* under favourable conditions. I have specimens in which the ends of the shoots of typical *R. aneurysmatis* have grown into the typical form of *R. tasmanica*. As the student will seldom find this condition, the descriptions are here still maintained separate.

Mt. Hartz. Adamson Peak. Cradle Mt., etc.

*Radula mittenii*, *St.*—Leaves contiguous but not imbricate, broadly oblong, obtuse, slightly falcate and concave; 1.5 mm. long, 1 mm. wide, slightly overlapping the stem; ventral lobe small quadrate, slightly inflated below, appressed above, angle obtuse; cells 18 $\mu$., trigones hardly apparent, walls convex. Perianth slender clavate 3 mm. long, mouth crenate.

Doubtfully distinct from *R. buccinifera*. Probably only a robust form.

Mt. Wellington. Tasman Peninsula.
New Zealand. Norfolk Is.

*Radula weymouthiana*, *St.*—Very pale. Leaves nearly rotundo-reniform to ovate, very obtuse, patent, overlapping the stem, imbricate, 0.8 mm. long, 0.7-1.0 mm. wide, ventral angle very decurrent; ventral lobe half as large as the leaf, taller than broad, quadrate rotund, little inflated below, angle obtuse but often elongated and recurved, more or less undulate; cells 10-18 $\mu$., trigones none, cuticle smooth. Perianth about 2 mm. long, flat above mouth, broad entire.

Very distinct from other Tasmanian species in the shape of the lobule.

Tasman Peninsula.

*Radula wattsiana*, *St.*—Leaves ovate-elliptic with a very obtuse apex, little imbricate, the dorsal margin only slightly overlapping the stem, 1.2 mm. long, 0.8 mm. wide, ventral angle decurrent; ventral lobe small quadrate inflated and convex, below angle very obtuse; cells 18 $\mu$., surface convex, trigones none. Perianth linear below, very flat and broad above, 3 mm., mouth crenate.

Very like *R. buccinifera*, but the leaves larger and closer and the lobule more inflated and convex; strongly approaching *R. physoloba*.

Slopes of Mt. Field.
East Australia.

*Radula aneurysmalis*, *Tayl.*—Very small, amongst other bryophytes on bark. Leaves nearly rotund, 0.3-0.5 mm. long, very concave; ventral lobe rhomboid, inflated nearly as large as the leaf, not appressed, angle acute; cells 18 $\mu$., walls thin, trigones none, surface convex.

Common.

## Frullania, Raddi.

Closely creeping on bark or rock, pinnately branched, often dark, sometimes green. Leaves closely imbricate, incubous, rotund to reniform, entire, bearing near the ventral base an appressed lobule in the form of a water-sack with the mouth pointing downwards, strongly curved with a very oblique mouth to saccate with a straight mouth. Underleaves rotund to obcuneate, apex more or less deeply bifid. Bracts enlarged. Perianth oblong, dorsally flattened to nearly cylindric, often with a strong

ventral keel, apex obtuse with a very small tubular mouth. Capsule spherical, not split to the base, elators attached to the apex of the lobes.

Sub-genus *Calciloba falcata*. Lobule strongly curved with a very oblique mouth, base swollen, apex acute.

1. Perianth smooth with a ventral keel ... ... 2
   Perianth smooth without a keel ... *deplanata*
   Perianth hairy when young ... ... ... ... ... 4
2. Trigones concave, walls straight ... ... ... 3
   Trigones convex, walls sinuous ... ... *scandens*
3. Most underleaves dentate ... ... *proboscifera*
   Underleaves entire ... ... ... ... ... ... *falciloba*
4. Lobule with a spinous apex... ... ... *monocera*
   Lobule obtuse ... ... ... ... ... ... ... *rostellata*

Sub-genus *Calciloba cucullata*. Lobule straight, helmet shaped to nearly hemispheric, placed close to and parallel to the stem, often a minute style intervening.

Perianth smooth ... ... ... ... ... ... ... ... *cranialis*

Perianth ribbed ... ... ... ... ... ... *pentapleura*

Perianth hairy ... ... ... ... ... ... ... *pycnantha*

Sub-genus *Diastaloba*. Lobule pitcher-shaped, remote from the stem and placed obliquely, a short broad style intervening.

Plant small, red or yellow ... ... ... ... ... *diplota*

*Frullania falciloba, Tayl.*—Rather robust, livid brown to dull green. Leaves 0.8 mm. long, 1.2 mm. broad; cells 18 $\mu$., trigones rather large, walls nearly straight; lobule large, strongly curved, mouth elongated beyond the leaf-margin; underleaves rotund, three times as broad as the stem, 1-3rd bifid, margin entire or protuberant in the middle; bracts large, oblong, obtuse; margin generally with 1-2 short teeth, otherwise plain, lobule lanceolate laciniate; bracteole bifid with 2 lateral lobes all acute and laciniate. Perianth smooth, dorsally convex, ventrally concave with a narrow keel.

Distinguished from *Fr. proboscifera* by smaller size and larger trigones.

Occasionally in forests.

Eastern Australia.

*Frullania deplanata, Mitt.*—Medium size, dull green. Leaves nearly flat, obliquely ovate with an expanded dorsal base, 0.8 mm. long, 0.5 mm. broad; cells 18-24 $\mu$., trigones medium, walls nearly straight; lobule curved short and broad; underleaves ovate-rotund, twice as broad

as the stem, 1-3rd-$\frac{1}{2}$ bifid, margins entire; bracts large, ovate, subacute, entire; lobule lanceolate, acute, bearing 1-2 laciniae; bracteole deeply bifid, often laciniate. Perianth nearly flat, smooth without a ventral keel.

Very common.

New Zealand.

*Frullania proboscifera, Tayl.*—Robust, pale green, often tinged with light brown. Leaves concave, 1.3 mm. long, 1.5-2 mm. broad; cells 16-20 $\mu$., trigones small, concave, walls straight; lobule large, strongly curved, base swollen, apex acute; underleaves three times as broad as stem, rotund, apex shortly bifid, margin with a few small serrations or entire. Bracts large, ovate or subacute; margin entire; lobule large, lanceolate, acute, the ventral margin armed with dentate laciniae; bracteole as long as and joined to the bracts, deeply bifid, lobes very acute, margins laciniate-dentate. Perianth immersed, smooth, convex dorsally, concave ventrally, with a sharp keel, margins acute. Taylor's description is rather vague, and in a note he alludes to the perianth being longitudinally plaited. His type was gathered in Tasmania, and the form here described, which is very common, is the only Tasmanian species which can be referred to it. *Fr. cinnamomea, C. et P.*, is a form of this with tinted leaves and entire underleaves. *Fr. kirkii, St.*, is a form with green leaves and slightly larger lobule and underleaf.

Very common.

Eastern Australia.

*Frullania monocera, Tayl.*—Medium, pale green, rarely rufescent. Leaves flat or slightly concave, the margin usually slightly reflexed obliquely ovate, obtuse, dorsal base expanded, 1 mm. long; lobule curved, base swollen, apex prolonged into a slender recurved spine, cells 16-18 $\mu$., trigones concave, walls straight; underleaves rotund, three times as broad as stem, 1-3rd bifid, margin with 2-3 bold teeth; bracts large, ovate, acute; margin dentate, lobule large, from a broad base, tapering to a slender apex, margin dentate; bracteole free bifid to middle, acute, dentate. Perianth at first immersed and covered with broad hairs, with a dorsal sulcus and broad obtuse ventral keel, becoming smooth and more exserted when old. In deep shade the lobule is very small and is often reduced to an erect lanceolate form, as figured by Mitten under *Fr. spinifera.*

Mt. Wellington. Meander, etc.

Australia. New Zealand.

*Frullania rostellata*, *Mitt.*—Medium, light reddish-brown. Leaves obliquely ovate-rotund, 1 mm., dorsal base little expanded, cells 18 $\mu$., trigones small concave, walls slightly sinuous; lobule close to the stem, curved, short, inflated; underleaves about four times as broad as stem, lower ones obcuneate, upper ones rotund, shortly bifid, margin entire or subdentate. "Perianth obovate-oblong with a ventral keel, hispid rostrum large utriculate."—(Stephani.)

Specimen sterile, but determined by Franz Stephani. West Coast.

New Zealand.

*Frullania scandens*, *Mont.*—Medium but forming large dark purple-brown to green patches on bark or rock. Leaves concave, obliquely rotund, from a narrow more or less deeply cordate insertion, 1.2 mm. long, cells 16-20 $\mu$., trigones small rotund, walls sinuous; lobule rather large, curved; mouth slender, extending beyond the leaf margin; underleaves rather large, rotund to reniform, shortly bifid, margins entire, deeply keeled and often recurved; bracts short, broad, ovate, obtuse; margin entire, lobule narrow-oblong, ventral margin armed with about 4 lesser lobes; bracteole nearly as long as the bracts, deeply bifid, lobes slender, margin armed. Perianth clavate smooth with a strong ventral keel.

*Fr. mooreana*, *St.*, is a deep red form with very cordate leaf bases.

Common.

Auckland Is.

*Frullania cranialis*, *Tayl.*—Red and closely creeping on wood. Leaves obovate, lower ones often subacute with an incurved apex, upper ones more rotund, mostly 0.9 mm. long, dorsal base shortly expanded, cells about 18 $\mu$., trigones small, walls strongly sinuous; lobule nearly half as large as the leaf, helmet-shaped, as broad as long with a straight mouth placed close to and parallel to the stem; underleaves obcuneate, little broader than the stem, with a shortly bifid apex. Perianth obovate, smooth, with a very broad ventral keel.

Mt. Wellington. Adamson Peak. Hartz Mt., etc.

Eastern Australia.

*Frullania pycnantha*, *Tayl.*—Dark olive-green or purplish. Leaves not closely imbricate, generally diverging from the stem when moist, obliquely ovate-rotund, 0.5-

0.8 mm. long, dorsal base with a large ligulate expansion overlapping the stem; cells 15 $\mu$., trigones small, walls straight; lobule broadly helmet-shaped, close to the stem, less than 1-3rd as large as leaf, as broad as long with a straight mouth; underleaves obcuneate, little broader than the stem to 1-3rd bifid, upper margin with an obtuse angle or tooth, a minute style interposed between the lobule and the stem. "Perianth large obovate with a broad ventral keel, coarsely strigose."—(Stephani.)

Specimen sterile determined by Franz Stephani.

Near Launceston.

New Zealand.

*Frullania pentapleura, Tayl.*—Small, nearly black on rocks, dark green in shade. Leaves rotund not closely imbricate, diverging when moist, about 0.5 mm. long, apex incurved, dorsal base rotund, cells 15 $\mu$., trigones small, walls straight; lobule helmet-shaped, as broad as long, nearly half as large as leaf, mouth broad, straight, a minute style interposed; underleaves obcuneate, little broader than the stem, $\frac{1}{4}$ bifid; margin unidentate; bracts ovate with an entire margin, lobule lanceolate; bracteole narrow and deeply bifid. Perianth clavate convex and 3-5 ribbed on both surfaces.

*Fr. reptans, Mitt.*, is rather more robust, growing on damp bark. *Fr. falsa, St.*, a depauperated form growing on dry rock.

Very common.

Eastern Australia. New Zealand.

*Frullania diplota, Tayl.*—Small in mats on bark or rocks. Leaves concave ovate-rotund, apex mostly subacute incurved, 0.5 mm. long; cells 18 $\mu$. but variable, trigones large confluent or in marginal cells small, lobule pitcher-shaped, longer than broad, remote from the stem and not parallel to it, a short broad style intervening; underleaves little broader than the stem, obcuneate angled above 1-3rd bifid. Perianth oblong smooth, with a broad ventral keel.

*Fr. congesta, H. et T.*, is a small dark red form, growing amongst moss. *Fr. weymouthiana, St.*, is a small elongating form growing on bark.

Very common.

Eastern Australia. New Zealand.

### Lejeunia Group.

Medium to minute, pinnate or irregularly branched, decumbent or ascending. Leaves incubous, erecto-patent, bilobed, dorsal lobe the largest and assuming the character of the leaf, ventral lobe or lobule inflated from small and closely appressed to the leaf to nearly as large; underleaves nearly always present, rotund to bifid to the base with erect or widely diverging lobes, rarely absent or with double the normal, namely, being one to each leaf. Bracts similar to leaves and little larger; perianth terminal but thrust aside by one or two innovations, pyriform slightly flattened, 5 plicate, rarely quite smooth, mouth minute, tubular. Capsule oblong on a short seta, valves separating to the middle, elators attached to the apex of the valve.

An enormous group now divided into many genera upon inessential distinctions.

1. Underleaves rotund or obovate ... ... ... ... 2
   Underleaves bifid with diverging lobes ... 4
2. Underleaves rotund ... ... ... ... ... ... ... 3
   Underleaves broadly obovate ... *Cheilolejeunia*
3. Lobule small ... ... ... ... ... ... ... *Eulejeunia*
   Lobule nearly as large as leaf ... *Microlejeunia*
4. Underleaf to every other leaf . *Drepanolejeunia*
   Underleaf to every leaf ... ... *Diplasiolejeunia*

Stephani has determined a Tasmanian specimen as *Strepsilejeunia australina, Spr.* An error appears to have crept in as the portion of the gathering retained does not agree at all with that plant as described.

### Eulejeunia, Spruce.

Medium size; leaves imbricate, ovate to obovate with a rotund apex, symmetric, lobule small; underleaves rotund, shortly bifid, 2-3 times as broad as the stem. Perianth in Tasmanian specimens with 5 bold keels above, smooth below.

Variable, and the species are established on unstable forms. Many are very doubtful.

1. Lobule less than $\frac{1}{4}$ size of leaf ... ... ... *tumida*
   Lobule about 1-3rd size of leaf ... ... ... ... 2
2. Underleaf 1-3rd size of leaf ... ... ... ... 3
   Underleaf nearly size of leaf ... ... *drummondi*
3. Lobes of underleaf obtuse ... ... ... *tasmanica*
   Lobes of underleaf very acute . *cuspidistipula*

*Eulejeunia tumida, Mitt.*—Leaves dull olive, obovate, imbricate, slightly concave, 0.6 mm., obtuse; cells 27 μ.; lobule nearly triangular, usually about 1-5th size of leaf, carina arcuate, apex very short truncate, angle obsolete or shortly apiculate.

Mitten's original description is of a form with a very small lobule. Stephani describes as this species a plant with a large lobule, which must be erroneous.

Common in woods.

New Zealand.

*Form. parvilobula.*—Lobule very small, formed of about 8-10 cells, angle with a prominent cusp.

Mt. Field.

*Eulejeunia tasmanica, Gott.*—Leaves ovate, slightly concave, little imbricate, 0.6 mm., apex obtuse; cells 18 μ.; lobule 1-3rd size of leaf, ovate, apex obliquely truncate, angle apiculate, carina deeply arcuate, outer surface of cells of leaf convex; underleaves 2-3 times as broad as stem, bilobed to the middle, lobes narrow, triangular, obtuse.

Common in woods.

*Eulejeunia cuspidistipula, St.*—Leaves pallid green, contiguous, ovate, nearly flat, 0.5 mm., obtuse; cells 18 μ.; lobule 1-3rd as large as leaf, broadly ovate-triangular, carina strongly arcuate, apex emarginate, angle very acute; underleaves half as large as the leaf, deeply bifid, sinus obtuse, lobes narrow lanceolate, acute.

West Coast.

East Australia.

*Eulejeunia drummondi, Tayl.*—Leaves crowded, brownish, ovate, concave, obtuse, 0.9 mm.; cells 27 μ.; trigones rather large; lobule 1-3rd as large as the leaf, ovate-oblong, apex obliquely truncate, angle acute, free, margin irregular with protruding cells. Underleaves very large, 0.7 mm. diameter, nearly orbicular, bilobed to the middle, lobes broadly triangular, obtuse.

Near Latrobe.

West Australia.

### Cheilolejeunia, Spruce.

Medium size. Leaves imbricate, plane or recurved, obtuse or rotund, often asymmetric; lobule ovate or oblong, truncate, angle acute; underleaves rather large obovate to rotund, deeply bifid. Perianth obovate compressed, 5

plicate, ventral plait narrow, long, decurrent, dorsal plait commonly obsolete.

Not differing from *Eulejeunia* in any positive character. The two Tasmanian species may be distinguished by the decurrent base of the lobule, the asymmetric leaves, and the obovate underleaves.

*Cheilolejeunia gunniana* (*Gott.*), *St.*—Dull dark to light livid green. Leaves little imbricate divaricate, 0.4 mm., broadly ovate, asymmetric, obtuse to subacute, the apex incurved; lobule 1-3rd as large as the leaf, inflated, carina slightly arcuate, base decurrent, angle obtuse; underleaves broadly obovate, hardly twice as broad as the stem, shortly bifid, lobes very obtuse, oblong.

Close to *L. patens, Lindb.*

Florentine Valley. West Coast.

*Cheilolejeunia weymouthiana*, *St.*—Pallid green. Leaves imbricate, very concave, broadly ovate, obtuse, asymmetric, 1 mm., lobule 1-3rd as large as the leaf, narrow ovate, carina little arcuate, base decurrent; underleaves broadly obovate, three times as broad as the stem, 1-3rd bifid.

Slopes of Mt. Wellington.

### Microlejeunia (Spruce) Jack. et St.

Small, slender, vaguely branched, forming dense mats. Leaves small remote, lobule half to nearly as large as the leaf inflated; underleaves small rotund, deeply bifid. Perianth pyriform, 5 keeled.

The genus is very close to *Eulejeunia*, and often included.

*Microlejeunia primordialis* (*Tayl.*), *St.*—Leaves ovate obtuse distant patent, 0.2-0.4 mm.; lobule half as large as the larger leaves, nearly as large as the smaller ones strongly inflated; underleaves little broader than the stem deeply bifid.

Slopes of Mt. Wellington. Ida Bay.

New Zealand. S. America.

### Drepanolejeunia (Spr.), Schiffn.

Plants usually minute. Leaves distant erecto-patent, lanceolate with an incurved acute apex, margin often dentate; lobule half as long as the leaf or more, ovate inflated; underleaves bifid nearly to the base, lobes acute widely spreading. Perianth pyriform, 5 keeled above, keels broad, usually armed.

*Drepanolejeunia latitans* (*Tayl.*), *St.*—Yellow-brown, growing amongst moss and other hepatics on bark. Leaves lanceolate acute, 0.4 mm., margin crenulate, cells 18 $\mu$.; lobule ovate, obtuse, inflated $\frac{1}{2}$-$\frac{3}{4}$ as long as the leaf; underleaves small, $\frac{3}{4}$ bifid, one to each alternate leaf.

Common in forests.

New Zealand.

### Diplasiolejeunia, Spruce.

Minute. Leaves small rotund, very obtuse, distant; lobule nearly as large, very obtuse inflated; underleaves double the normal number, that is one to each leaf, bifid to the base, lobes widely spreading, slender. Perianth pyriform, smooth, 5 keeled above.

*Diplasiolejeunia lyratifolia* (*H. et. T.*), *St.*—Very slender, creeping amongst other hepatics, yellow. Leaves remote, orbicular, concave, 0.3 mm.; lobule broadly oblong, inflated; upper margin bifid.

Mt. Field. Mt. Hartz. Cradle Mt., etc.

## ORDER ANTHOCEROTALES.

Gametophyte a decumbent branching dark green, membranous or fleshy thallus, with irregular pores on the under surface, sometimes also on the upper; cuticular cells mostly small, those of the medulla much larger, each cell with a single large simple chloroplast. Sporophyte enclosed in a cylindric involucre, filiform, forming spores continuously in basipital succession, opening in two valves from above downwards, a persistent columnella is present; the wall often possesses well-formed stomata. Spores globose, variously sculptured on the free surface; rudimentary elators of 1-3 geniculate cells present or in few instances perfect spiral elators.

### Anthoceros, L.

Character sufficiently described above.

1. Elators long spiral ... ... ... ... ... ... ... ... 2
   Elators rudimentary ... ... ... ... ... ... ... 3
2. Plant membranous ... ... ... ... *longispirus*
   Plant fleshy ... ... ... ... ... ... ... *carnosus*
3. Spores black echinulate ... ... ... ... *brotheri*
   Spores yellowish papillate ... ... ... ... *laevis*

*Anthoceros longispirus, Carr. et Pears.*—Large, fleshy, dark green, forming a flat, irregular plate, often 5-10 cm. diameter, irregularly lobed, lobes mostly flabelliform with thin irregular margins; in the middle 8-12 cells thick, margin 1-2 cells; surface sometimes with few prominent glands, otherwise smooth. Involucre 8-15 mm. long, 1 mm. diam., fleshy, mouth irregularly lobed. Capsule 2.5-4 cm. long. Spores 30 $\mu$., green, verruculose; elators flat, spirally coiled, 300 $\mu$., not septate. Wall of capsule without stomata.

Slopes of Mt. Wellington.

*Anthoceros carnosus, St.*—Large, fleshy, livid to dark green. Lobes flabelliform, numerous,, imbricate on surface and margin, 2-6 mm. diam., margin obtuse, very irregular, younger portions covered with prominent irregular glands; 8-10 cells thick. Involucre about 3 mm. long, very thick and glandular below, tapering to an irregularly oblique apex. Capsule 1-2 cm. Spores and elators as in *A. longispirus*.

On rotten wood in forests.

*Anthoceros brotheri, St.*—Large, often extending to 5 cm., thin, margin divided into numerous small rotund lobes, upper surface with numerous erect plates, surface smooth; middle about 5 cells thick, lobes 2-3 cells, cells large, surface smooth. Involucre about 3 mm. long, membranous; mouth truncate; capsule 1-3 cm., bearing stomata; spores black, coarsely echinulate, 48 $\mu$.; elators 1-3 celled, 50-150 $\mu$., geniculate, but not spiral.

Kingston. Colebrook. Patrick's Head.

Mt. Field, etc.

*Anthoceros laevis, L.*—Dark green, 5-15 mm. diam., smooth, divided into broad obovate lobes, margin crenulate; about 8 cells thick in the middle; margin acute. Involucre about 3 mm. long, tapering from a rather broad base; capsule 1-3 cm., bearing stomata; spores greenish-yellow, 48 $\mu$., surface papillate; elators 1-3 celled, 50-150 $\mu$., geniculate not spiral.

Stephani considers our form to be distinct and names it *A. crassus*.

Kingston. Huon-road.

Cosmopolitan.

## Index to Genera.