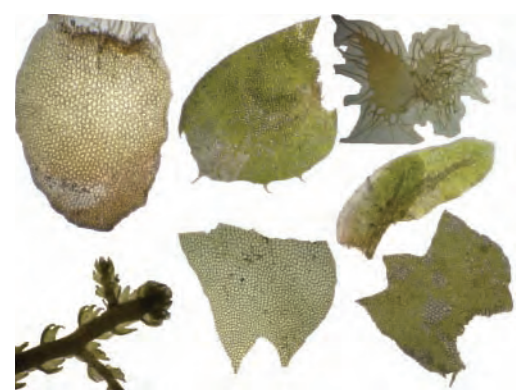


LIVERWORTS



Above - Left: a thallose liverwort, Overleaf Pellia (*Pellia epiphylla*) with fruits; right: a leafy liverwort with round leaves, Autumn Flapwort (*Jamesoniella autumnalis*).



Key features for identifying liverworts

Growth form. There are two sorts of liverworts; **leafy** liverworts have a stem and leaves and resemble a moss, whereas **thallose** or thalloid liverworts have a simple strap of tissue with no stem or leaves. Leafy liverworts can form erect cushions and turfs while some are creeping and closely appressed to rock or tree. The size of the plant is also important; a number of oceanic liverworts are very, very small.

Leaf shape. This is all-important in leafy liverworts and is much more variable than in mosses. Liverwort leaves can be simple and round, they can be deeply divided into filaments or into broader lobes, the lobes can be of different sizes and can be bent over or under each other and formed into flaps or pouches. Many liverworts also have pronounced teeth on the margin of the leaf, visible without a hand lens. Many leafy liverworts also have under-leaves, usually much smaller than the main leaves, and on the lower side of the stem.

Photoset Left - A variety of leafy liverwort leaves, clockwise from top left: Taylor's Flapwort (*Mylia taylori*), Prickly Featherwort (*Plagiochila spinulosa*), Ciliated Fringewort (*Ptilidium ciliare*), White earwort (*Diplophyllum albicans* - note upper lobe bent over the top of the lower and the line of longer cells), Common Paw-wort (*Barbilophozia floerkei*), Bifid Crestwort (*Lophocolea bidentata*), Creeping Fingerwort (*Lepidozia reptans*), part of stem with 'fingered' leaves.

LIVERWORTS

Greater Whipwort (*Bazzania trilobata*)



Leafy liverwort; Size: large and forming big cushions and patches; **branching:** branching shoots conspicuous with V-shaped split, thin branches from bottom of stem (flagellae) pale with tiny leaves; **colour:** mid-green; **leaves:** rectangular with a broad base narrowing to three shallow, blunt lobes, leaves very closely set and overlapping giving the stems a characteristic appearance; **habitat:** woodland floor, rocks and tree bases.

Prickly Featherwort (*Plagiochila spinulosa*)



Oceanic. Leafy liverwort; Size: medium-sized but often forming large cushions or extensive pure patches; **colour:** yellow- or mid-green; **leaves:** rounded but upper margin rather straight and running down the stem (decurent) in a slight curve, apex and lower margin with spine-like teeth, aromatic when crushed and inrolled when dry; **habitat:** on rocks and trees in shaded habitats; **note:** *Plagiochila bifaria* (Killarney Featherwort) is rather similar but usually forms neater cushions often with a brownish tinge and has leaves that are set at almost a right-angle to the stem, often on more base-rich rocks.

Spotty Featherwort (*Plagiochila punctata*)



Oceanic. Leafy liverwort; differs from Prickly Featherwort (*Plagiochila spinulosa*) in being smaller, forming more compact cushions with leaves that are not decurrent. On rocks and trees but can be particularly abundant on birch and alder, can often lose leaves leaving bare stems and also have depauperate leaves with few teeth; **note:** depauperate forms are easily confused with the much less common *Plagiochila exigua* (Petty Featherwort); this has all leaves with two or occasionally three teeth and a narrow insertion onto the stem and usually a rather dark green or brown colour.

Western Featherwort (*Plagiochila heterophylla* previously *Plagiochila atlantica*)



Oceanic. Leafy liverwort; differs from Prickly Featherwort (*Plagiochila spinulosa*) in being somewhat larger and with leaves that are rounded-rectangular, noticeably longer than wide giving the patches a characteristic look. The spiny teeth on the leaves have a broader base and so are more triangular in shape (lens). It seems to prefer less shaded sites to *Plagiochila spinulosa* and stands are often south-facing.

Deceptive Featherwort (*Adelanthus decipiens*)



Oceanic, NS. Leafy liverwort; size: small to medium-sized and usually forming small cushions; **colour:** dark green, brownish when dry; **leaves:** round and somewhat concave with two or three widely spaced teeth on the margin, the paler young leaves at the stem tips are often pressed vertically together giving a distinct pale band when viewed from a distance; **habitat:** on rocks and rarely on trees in shaded habitats; **note:** similar to Spotty Featherwort (*Plagiochila punctata*) but the dark colour and widely spaced teeth are good characters; one of the best indicators of good Atlantic woodland

Western Earwort (*Scapania gracilis*)



Oceanic. Leafy liverwort; size: medium to large but often forming swelling cushions or extensive pure patches; **colour:** a rather dull yellow- or brownish-green; **leaves:** two lobed but with the upper lobe bent over the lower with upper part bent back so it stands up from the stem, margin usually strongly toothed (lens); **habitat:** on acidic rocks and trees; **note:** the reflexed upper lobe is distinctive; the most common of the oceanic liverworts in the west.

Rock Fingerwort (*Lepidozia cupressina*)



Oceanic. Leafy liverwort; size: medium sized and forming dense cushions and large pure patches; **branching:** regular and pinnate **colour:** mid-green, whitish when dry; **leaves:** 'hand-like' with each leaf having four or five narrow lobes like fingers (lens); **habitat:** on acid rocks, trees and logs in shaded habitats.

Stragglng Pouchwort (*Saccogyna viticulosa*)



Oceanic. Leafy liverwort; Size: medium-sized but often forming large flat patches; **colour:** yellow- or mid-green; **leaves:** set opposite each other on the stem giving a characteristic appearance, rounded but elongate; **Underleaves:** reasonably conspicuous (lens) with two, pointed lobes; **habitat:** on rocks and banks, usually where it is damp for much of the time.

Wedge Flapwort (*Leptoscyphus cuneifolius*)



Oceanic, NS. Leafy liverwort; Size: very small and forming thin, untidy mats; **colour:** mostly brown with green shoot tips; **leaves:** tiny and wedge-shaped with a narrow base, stems often partly denuded; **habitat:** on trees, particularly birch and alder, occasionally on rocks in very humid places; **note:** very easily confused with depauperate forms of Spotty Featherwort (*Plagiochila punctata*) with which it usually grows but *Plagiochila punctata* always has some leaves with sharp teeth.

Sea Scalewort (*Frullania teneriffae*)



Oceanic. Leafy liverwort; size: medium-sized, forming thin flat patches; **branching:** irregular but frequent with branches often nearly at right-angles to the main stem; **colour:** usually a dark reddish or coppery brown with more green towards the shoot tips and in deep shade; **leaves:** complex, the leaf is lobed with the upper lobe much the larger and round, the much smaller lower lobe is formed into a pouch shaped like a helmet, hidden under the main leaves and often of a darker colour; **underleaves:** larger than the lower lobes and rounded-oblong; **habitat:** on rocks and trees, also on heather stems; **note:** there are two other much more common species of *Frullania* in these woodlands; Tamarisk Scalewort (*Frullania tamarisci*) is very similar but has a line of darker cells up the main leaf (lens); Dilated Scalewort (*Frullania dilatata*) has the lower lobes and underleaves of a similar size (lens) and is usually on trees.

Abbreviations

NR – nationally rare; **NS** – nationally scarce; **S8** – listed on Schedule 8 of the Wildlife and Countryside Act. **Oceanic** indicates that this is an oceanic species as defined by Hill and Preston (1998).

Further information

Books

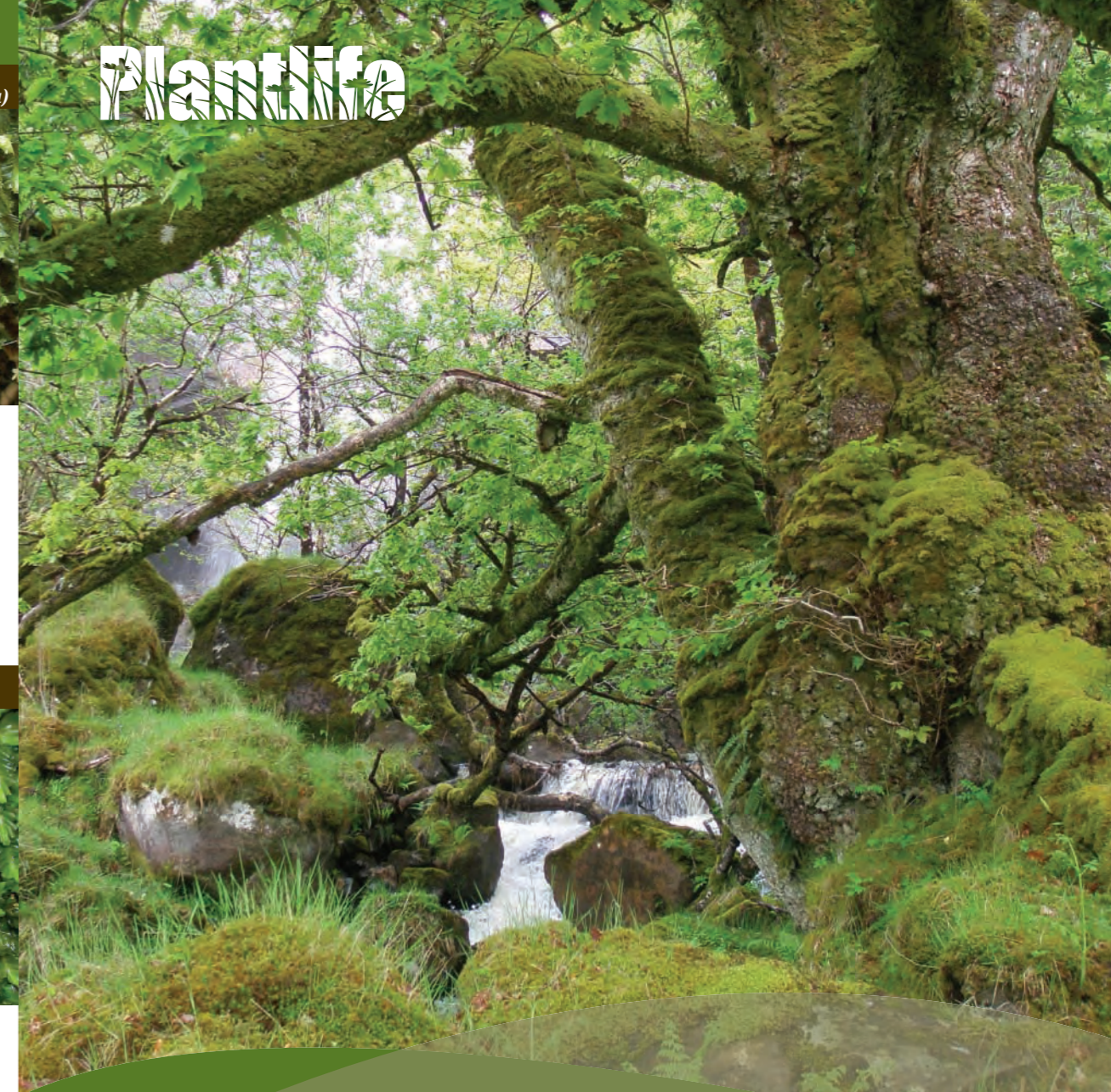
British Mosses and Liverworts: a field guide. British Bryological Society (2010).
The first comprehensive colour field guide to bryophytes with good keys and hundreds of photos.
Mosses and Liverworts; Gordon Rothero (2005). A brief, general introduction to Scottish bryophytes, part of the 'Naturally Scottish' series published by Scottish Natural Heritage, Battleby.
Bryophytes of native woods – a field guide to common mosses and liverworts of Scotland's native woods. Carol L Crawford (2002), Native Woodlands Discussion Group. A small booklet with good colour photos.
Mosses and Liverworts. New Naturalist 97, Porley RD & Hodgetts NG, (2005). Collins.
An accessible account of our bryophyte heritage with a good section on woodlands.
The geographical relationships of British and Irish bryophytes; Hill MO & Preston CD (1998). Journal of Bryology, 20: 127-226.

Information and advice

www.britishbryologicalsociety.org.uk. The British Bryological Society has an excellent website with useful information on publications, courses, field meetings and lots of pictures.
www.nwdg.org.uk. The Native Woodland Discussion Group runs courses on Atlantic mosses and liverworts.

Advice and Support

Plantlife Scotland can help you in your quest for information and support.
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This guide has been written and illustrated for Plantlife Scotland by Gordon Rothero
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Bryophytes of Atlantic Woodlands Guide 1: Woodland



Introduction

This Plantlife field guide will help those who want to go a little further in identifying the carpets of mosses and liverworts that make our Atlantic woodlands such special places. This guide deals with species in woodland while Guide 2 deals with burns and ravines although there is much overlap between the two habitats. What are mosses and liverworts? Mosses and liverworts (collectively known as bryophytes) are two of the oldest groups of land plants and have had millions of years to evolve a variety of species that have colonised almost all habitats apart from the sea. Most have a simple structure with a main stem and more or less frequent branches covered in leaves. They do not have roots but absorb water and minerals directly into the (usually) single layer of cells in the leaves. Though some bryophytes are strongly coloured, often red or purple, most are some shade of green and an appreciation of the many shades of green is a useful quality in anyone wishing to identify these small plants. What are Atlantic woodlands? They are semi-natural broadleaf woodlands, typically oak and birch woods, growing on the western side of Britain and Ireland and they owe their special character to the proximity of the relatively warm Atlantic Ocean and to the abundant rainfall spread throughout the year. These conditions produce a ‘temperate rain-forest’, a globally rare woodland habitat.

Why do these woodlands have so many mosses and liverworts?

A number of factors come together to produce such a favourable habitat for bryophytes on our west coast. The most important of these are probably the copious rainfall with few dry spells, the infrequency of frosts and the tree canopy. However, the recently glaciated landscape with lots of crags, ravines and boulders providing the hard substrates that many of the special species need, is probably vital as well. In addition, the location on the extreme edge of the continent away from centres of population has limited the effects of pollution and the rugged landscape has restricted intensive management so that some woodland has persisted for centuries.

Why are the mosses and liverworts of Atlantic woodland so important?

Bryophytes in woodland are an excellent indicator of habitat quality and contribute much to the functioning of the woodland ecosystem, as well as giving the woodlands character and aesthetic appeal. The UK has some 1,100 species of bryophyte, approximately 65% of the European flora; in comparison our vascular plants total only 15%. Our remnants of Atlantic woodland have as great a diversity of bryophytes as almost anywhere else on the planet and this diversity includes a number of species that are rare, both in Europe and globally. And, of course, they are beautiful in their own right.

Bryophyte communities

A number of the plants illustrated in these two guides are very precise as to the habitat they need but it is possible to group species into broad communities. It needs to be emphasised that there will be an overlap

as large woodland floor species can cover rocks and the species on rocks and the trunks of trees are often the same.

Woodland floor: on the soil of the woodland floor, bryophytes have to compete with flowering plants and with the accumulation of leaf litter and so the mosses here tend to be large and relatively fast-growing. This community often consists of the large acrocarp Greater Fork-moss (*Dicranum majus*) and the bigger pleurocarps like Little Shaggy-moss (*Rhytidiadelphus loreus*), Glittering Wood-moss (*Hylocomium splendens*), Common tamarisk-moss (*Thuidium tamariscinum*), Shaded Wood-moss (*Hylocomiastrum umbratum*) and, on more base rich soils, Common Striated Feather-moss (*Eurhynchium striatum*), Big Shaggy-moss (*Rhytidiadelphus triquetrus*) and Short-beaked Wood-moss (*Loeskeobryum brevirostre*).

Rocks and crags: this is where the truly oceanic community is usually best developed with deep mats of the moss Slender Mouse-tail Moss (*Isoetium myosuroides* var. *myosuroides*) and the Atlantic liverworts Western Earwort (*Scapania gracilis*), Prickly Featherwort (*Plagiochila spinulosa*), Spotty Featherwort (*Plagiochila punctata*) and occasionally Western Featherwort (*Plagiochila heterophylla*) and Deceptive Featherwort (*Adelanthus decipiens*), often with filmy ferns. Where the rocks are more base rich there are likely to be stands of Killarney Featherwort (*Plagiochila bifaria*) and Petty Featherwort (*Plagiochila exigua*).

Trees: in the best woodlands, similar species to the rocks clothe the lower parts of the trees. On acid barked trees like oak, birch and alder the typical community has Western Earwort (*Scapania gracilis*) and Spotty Featherwort (*Plagiochila punctata*) and occasionally Wedge Flapwort (*Leptoscyphus cuneifolius*). On more base-rich barked trees like Hazel, Ash and Elm there will be cushions of Frizzled Pincushion (*Ulota phyllantha*) and Lesser Yoke-moss (*Zygodon conoideus*) and liverworts like Tamarisk Scalewort (*Frullania tamarisci*), Even Scalewort (*Radula complanata*), Pearl Pouncewort (*Lejeunea patens*), Pointed Pouncewort (*Harpalejeunea mollerii*), and Toothed Pouncewort (*Drepanolejeunea hamatifolia*).

‘Bryologising’

Although identifying species initially needs a modicum of determination, it is possible to become familiar quite quickly with the common mosses and liverworts in the Atlantic woodlands. They have the virtue of being available all the year round and grow in really nice places. Though some of the species are very distinct, even from some metres away, the process and the enjoyment will be enhanced if you get used to using a hand-lens (at least x10) to reveal the finer features on which identification sometimes depends. In the descriptions, where a lens is necessary, it is indicated by (lens); remember, hand-lens to the eye and move the plant into focus.

In these guides, English names have been used alongside the Latin; these are not ‘common names’ in the same sense as those for flowers because they are all recent inventions and as yet are hardly used except in publications like this! Latin names should always be used for recording purposes to avoid any ambiguity.

MOSSES



Above - Left: acrocarpous Scott's Fork moss (*Dicranum scottianum*); right: pleurocarpous Larger Mouse-tail Moss (*Isoetium alopecuroides*).



Above - Irregular branching in Red-stemmed Feather-moss (*Pleurozium schreberi*) on the left and regular tri-pinnate branching in Glittering Wood-moss (*Hylocomium splendens*) on the right; note the red stems.



Photoset above - A variety of moss-leaf shapes, clockwise from top left: Dotted Thyme-moss (*Rhizomnium punctatum*), Catherine's Moss (*Atrichum undulatum*), Little Shaggy-moss (*Rhytidiadelphus loreus*), Yellow Fringe-moss (*Racomitrium aciculare*), Common Striated Feather-moss (*Eurhynchium striatum*), Cypress-leaved Plait-moss (*Hypnum cupressiforme*).

Moss or liverwort?

Initially this is a tricky question but with a little experience it ceases to be a problem. Thallose liverworts are easy but leafy liverworts can be passed over as mosses by the uninitiated. In most mosses the leaves grow all around the stem but in most liverworts the main leaves are in two ranks down each side of the stem, sometimes with a line of smaller under-leaves below. Most moss leaves are roughly triangular, wide at the base and narrow to the apex; few liverworts are like that. Moss leaves never have lobes whereas many leafy liverworts do. Most mosses with round leaves have a nerve; no leafy liverworts have a nerve but a few have lines of cells running up the centre of the leaf.

Key features for identifying Mosses

Growth form. Leaving aside the very distinctive **bog-mosses** (*Sphagnum*), mosses can be split into two groups, **acrocarpous** and **pleurocarpous**. There is a technical difference between these two forms but in practical terms, acrocarps usually have erect stems and grow in cushions or turfs while pleurocarps tend to grow with main stems parallel to the ground (or rock or tree trunk) and form wefts. The often dense growth form of acrocarps means that their sparse branches are obscured while in pleurocarps the branches are usually many and easily seen.

Branching. For some of the pleurocarps it is useful to note what the pattern of branching looks like. Is it regular with branches more or less opposite each other on the main stem (pinnate) or irregular? Are the regular branches branched again (bi-pinnate) and again (tri-pinnate) giving a fern-like structure?

Colour. Colour and texture are all-important field characters. Many species have a particular shade, admittedly usually of green, which coupled with the structure of stem and leaf, gives a texture which is what the eye picks up from a distance. Another important colour is that of the main stem; when the leaves are dry they become opaque and it may be necessary to scrape away some leaves with your fingernail to see the stem colour.

Leaf shape. Moss leaves have a variety of shapes but they tend to be variations on the same theme, with a relatively broad base tapering to a narrower apex. Some leaves are long and narrow and taper to a fine point, others have a broad triangular shape tapering shortly to a sharp point. Other mosses have leaves with a blunt apex and a few species have round leaves. Another useful character is whether or not the leaves are all curved in the same direction (falcate) or bent back from the stem (reflexed or squarrose). Some leaves also have teeth on the margin, usually visible only with a hand lens.

Nerve (or costa). A very useful character is whether the moss leaf has a nerve or not. The nerve (or costa) is a thickened rib of tissue running up the centre of the leaf which looks like a dark line if the leaf is held against the light and viewed with the hand-lens. It usually extends beyond halfway up the leaf and may reach the apex.



Pleurocarpous; size: robust and usually forming large patches; **branching:** irregular; **colour:** mid to yellow-green; **stem:** red, springy; **leaves:** broadly triangular, no nerve; curved in one direction so that the stem ends look hooked; **habitat:** woodland floor, ledges, boulder tops.

Acrocarpous; size: robust and usually forming large, erect turfs; **branching:** obscured; **colour:** mid-green; **stem:** green, stout; **leaves:** very long, very narrowly triangular with a fine, toothed apex; leaves all curved in one direction; **habitat:** woodland floor, ledges, boulder tops; **note:** the related Broom Fork-moss (*Dicranum scoparium*) is also very common; it is smaller and the leaves shorter and not so regularly curved.

Pleurocarpous; size: robust and usually forming large patches; **branching:** regular with branches branched again, like a small fern; **colour:** mid to yellow-green, often ‘chaffy’ when dry; **stem:** red, springy; new growth emerging from old frond and may form several layers of fronds, hence the American name ‘step-stair moss’; **leaves:** broadly triangular, no nerve; **habitat:** woodland floor, ledges, boulder tops.

Pleurocarpous; size: robust and usually forming large patches; **branching:** regular with branches branched again, like a small fern; **colour:** mid-green, a mat colour, not at all glossy; **stem:** green, with a covering of paraphyllia, like a green felt covering the stem; **leaves:** broadly triangular, long nerve; branch leaves small; **habitat:** woodland floor, ledges, boulder tops; **note:** often initially confused with the similarly fern-like Glittering Wood-moss (*Hylocomium splendens*) but this has a red stem and is never mid-green in colour.



Pleurocarpous; size: robust and usually forming large patches; **branching:** irregular; **colour:** mid to yellow-green; **stem:** red, springy; **leaves:** broadly triangular, no nerve; curved in one direction so that the stem ends look hooked; **habitat:** woodland floor, ledges, boulder tops.

Pleurocarpous; size: medium sized but often forming large pure patches; **branching:** irregular but with many branches some of which are branched again; **colour:** mid to yellow-green; **stem:** red, furry with green filaments under the lens; **leaves:** stem leaves broadly triangular, branch leaves small so that the branches look ‘skinny’, no nerve; **habitat:** woodland floor, boulder tops, logs; **note:** similar in habit to Glittering Wood-moss (*Hylocomium splendens*) but lacking the regular fern-like branching.

Pleurocarpous; size: medium sized and often forming large pure patches; **branching:** lower part of main stem un-branched with most branches crowded near the top giving a somewhat ‘tree-like’ appearance; **colour:** mid to yellow-green; **stem:** green; **leaves:** stem leaves triangular widest near base and tapering to a long fine point and have a nerve; **habitat:** rocks and trees; **note:** the characteristic species of rocky Atlantic woodland.

Pleurocarpous; size: robust and springy, often forming large patches; **branching:** irregular; **colour:** a bright mid- or yellow-green; **stem:** green; **leaves:** triangular, very broad at base tapering to a sharp point, sharply toothed and with a nerve, always with folds running up the length of the leaf; **habitat:** woodland floor, ledges, boulder tops, usually in more base-rich, Atlantic woodland; **note:** can resemble Short-beaked Wood-moss (*Loeskeobryum brevirostre*) but this has a red stem.



Oceanic. Acrocarpous; size: medium sized and forming dense cushions; **branching:** obscured; **colour:** usually dark-green but occasionally mid-green or yellowish above; **stem:** green; **leaves:** very narrowly triangular, tapering to a long fine apex, un-toothed but with a strong nerve; **fruit:** capsule more or less erect; **habitat:** shaded, acid rocks and occasionally trees; **note:** similar to Dusky Fork-moss (*Dicranum fuscescens*) which has toothed leaves (lens) and a curved capsule.

Oceanic. NS. Pleurocarpous; size: small and forming flat patches; **branching:** irregular but branches tend to lie in the same direction as the main stem; **colour:** mid- or yellow-green; **stem:** green; **leaves:** small, rounded-triangular, tapering quickly to a short point, with a nerve but this can be hard to see; **habitat:** a very precise habitat on the open faces of low, easy-angled, slabby rocks close to the ground surface in shaded places.