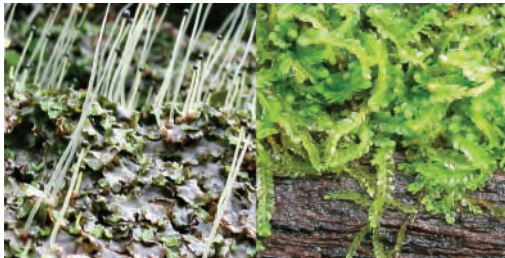
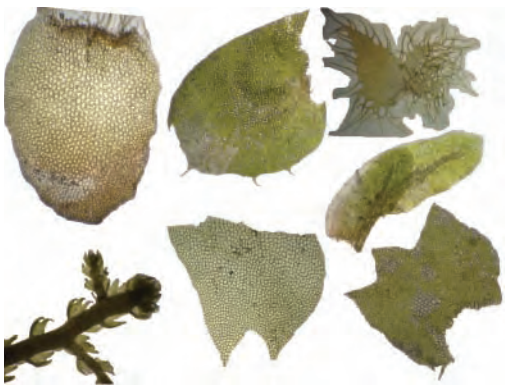


LIVERWORTS



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 apressed 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.

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.

Plantlife Scotland, Balallan House, Allan Park, Stirling, FK8 2QG

Tel: +44 (0) 1786 478509 www.plantlife.org.uk Scotland@plantlife.org.uk

© March 2010 ISBN 978-1-907141-20-1

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This guide has been written and illustrated for Plantlife Scotland by Gordon Rothero

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LIVERWORTS

Toothed Pouncewort (<i>Drepanolejeunea hamatifolia</i>)	Pointed Pouncewort (<i>Harpalejeunea molleri</i>)	Fingered Cowlwort (<i>Colura calyptrifolia</i>)	Pearl Pouncewort (<i>Lejeunea patens</i>)	Wilson's Pouchwort (<i>Acrobolbus wilsonii</i>)
Oceanic. Leafy liverwort; size: minute, sometimes forming patches, often a network of single stems; colour: yellow-green; leaves: complex, upper lobe rounded at base and elongated into a toothed, pointed apex, the smaller lower lobe forming a pouch under the upper; Under-leaves: present, narrowly two lobed with a crescent shaped gap between, but hard to see even with a lens; habitat: on vertical faces of very humid rocks, often in burns, and also on hazel and ash.	Oceanic. Leafy liverwort; size: minute, often forming patches or a network of single stems or creeping through other bryophytes; colour: yellow-green; leaves: complex, upper lobe rounded at base and tapering shortly to a pointed apex which is usually turned down, the smaller lower lobe forming a pouch under the upper; Under-leaves: present, two blunt lobes with a shallow gap between, but hard to see even with a lens; habitat: on vertical faces of very humid rocks, often in burns, and also on hazel and ash.	Oceanic, NS. Leafy liverwort; size: minute, sometimes tiny patches, often a network of single stems; colour: bright yellow-green; leaves: complex, essentially an elongated sac with an erect beak sticking up from the stem; Under-leaves: present, two lobed but hard to see even with a lens; habitat: on vertical faces of very humid rocks, often in burns, and also on willow, hazel and ash; note: tiny but unmistakeable once spotted.	Oceanic. Leafy liverwort; size: small, often forming patches or creeping through other bryophytes colour: whitish-green; leaves: complex, upper lobe rounded, lower lobe bent up under the upper to form a pouch, the angle between the two often a right angle or even more acute; Underleaves: present, two lobed, usually smaller than the pouch; habitat: on vertical faces of very humid rocks, often in burns, and also on hazel and ash; note: the most common of the oceanic Lejeuneas but may be difficult to distinguish from Western Pouncewort (<i>Lejeunea lamacerina</i>) and Micheli's Least Pouncewort (<i>Lejeunea cavifolia</i>) in the field.	Oceanic, NS. Leafy liverwort; size: small, forming small, untidy patches and often creeping over other bryophytes; colour: yellow-green; leaves: a broad base and divided above into two pointed lobes which are usually asymmetric with the leaf margin nearest the stem-apex often curved; habitat: on vertical faces of sheltered, very humid rocks but usually where well-illuminated.
Brown Scalewort (<i>Radula aquilegia</i>)	Hutchins' Hollywort (<i>Jubula hutchinsiae</i>)	Long-leaved Pouncewort (<i>Aphanolejeunea microscopica</i>)	Hooked Veilwort (<i>Metzgeria leptoneura</i>)	Pale Scalewort (<i>Radula voluta</i>)
Oceanic. Leafy liverwort; size: small, usually forming small patches closely pressed to the substrate; colour: Olive-brown, occasionally coppery or green; leaves: complex, upper lobe rounded, the smaller lower lobe bent up under the upper forming a rectangular pouch, both are concave giving the stems a 'puffed-up' appearance; habitat: on faces of very humid rocks which are at least periodically irrigated and rarely on trees in very humid ravines.	Oceanic. Leafy liverwort; size: small, sometimes forming large patches; colour: dark green; leaves: complex, upper lobe rounded and sharply toothed like a holly leaf, lower lobe very small and bent up under the upper forming a helmet shaped pouch; Underleaves: present, two lobed and toothed; habitat: on faces of very humid rocks in ravines, often near the waterline and tolerant of heavy shading; note: beautiful and unmistakeable.	Oceanic. Leafy liverwort; size: minute, usually forming tiny patches, rarely a network of single stems; colour: bright yellow-green; leaves: complex, upper and lower lobes nearly equal in size so the leaf is essentially a pouch which looks like an elongate oval from above; habitat: on vertical faces of very humid rocks, often in burns; note: the smallest of the tiny <i>Lejeunea</i> species but often forming bright-green patches which are quite easily spotted.	Oceanic. Thallose liverwort; size: medium sized and often forming large patches; colour: yellow-green; thallus: narrow and parallel-sided with a single layer of cells and a narrow darker midrib, the edge of the thallus is often inrolled and has many pairs of hooked hairs (lens); habitat: usually amongst other bryophytes on vegetated crags, usually where somewhat base-rich; note: may be confused with another more common species, Rock Veilwort (<i>Metzgeria conjugata</i>), but this is smaller, usually a darker colour and has straight hairs on the margin.	Oceanic, NS. Leafy liverwort; size: medium sized, usually forming patches closely pressed to the substrate; colour: a bright, pale green with greasy appearance; leaves: complex, upper lobe rounded, the smaller lower lobe bent up under the upper forming a rounded pouch, which extends across the underside of the stem; habitat: on faces of very humid, usually base-rich rocks which are at least periodically irrigated; note: the bright-green appearance and the distinctive under-lobe, crossing the stem, make this scarce liverwort an easy plant to recognise.
Even Scalewort (<i>Radula complanata</i>)				

Even Scalewort (*Radula complanata*)



Leafy liverwort; size: medium sized, usually forming patches closely pressed to the substrate; **colour:** whitish or pale green; **leaves:** complex, upper lobe rounded, the smaller lower lobe bent up under the upper forming a rounded pouch; **fruit:** common, produced from a distinctive flat perianth; **habitat:** on base-rich barked trees like hazel and ash and also occasionally on humid rocks; **note:** the pale green colour, flat patches and the frequent perianths are characteristic.



Bryophytes of Atlantic Woodlands Guide 2: Ravines



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 burns and ravines while Guide I deals with the woodland 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 many of the species described in Guide I are also common in ravines.

Riparian flora: on rocks in and alongside burns there are a number of common mosses; on acid rocks Yellow Fringe-moss (*Racomitrium aciculare*) is almost ubiquitous, often with Rusty Feather-moss (*Sciuro-hypnum plumosum*) and Flagellate Feather-moss (*Hyocomium armoricum*), the latter just above normal water levels. Where the rocks are more base-rich there are often large stands of Long-beaked Water Feather-moss (*Platyhypnidium riparioides*) and Fox-tail Feather-moss (*Thamnobryum alopecurum*).

Periodically irrigated rocks: this is where the truly oceanic ravine community is usually best developed. The most common of the oceanic species on sheltered rock faces is the small liverwort Pearl Pouncewort (*Lejeunea patens*) and in the best sites this is joined by its tiny cousins Toothed Pouncewort (*Drepanolejeunea hamatifolia*), Pointed Pouncewort (*Harpalejeunea mollerii*), Fingered Cowlwort (*Colura calyptrifolia*) and Long-leaved Pouncewort (*Aphanolejeunea microscopica*). The wettest and most shaded sites may have Hutchins’ Hollywort (*Jubula hutchinsiae*) and other oceanic species include Brown Scalewort (*Radula aquilegia*) and, in a few places, the globally rare Wilson’s Pouchwort (*Acrobolbus wilsonii*).

Trees: in the best ravine 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 Even Scalewort (*Radula complanata*), Pearl Pouncewort (*Lejeunea patens*), Pointed Pouncewort (*Harpalejeunea mollerii*) and Toothed Poucewort (*Drepanolejeunea hamatifolia*).

‘Bryogolising’

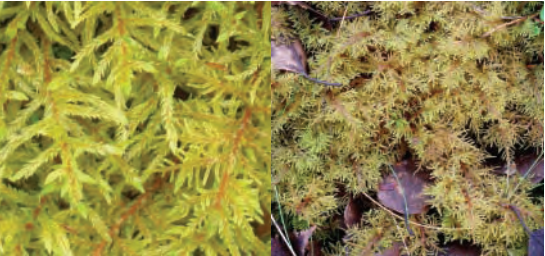
Although identifying species initially needs a modicum of determination, it is possible to become familiar quite quickly with the common mosses and liverworts in the Atlantic woodlands. They have the virtue of being available all the year round and grow in really nice places. Though some of the species 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.

MOSSSES



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

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.

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.

MOSSSES

Yellow Fringe-moss (<i>Racomitrium aciculare</i>)	Rusty Feather-moss (<i>Sciuro-hypnum plumosum</i>)	Western Brook-moss (<i>Hygrohypnum eugyrium</i>)	Flagellate Feather-moss (<i>Hyocomium armoricum</i>)
Acrocarpous; size: medium-sized forming untidy cushions and patches; branching: irregular; colour: dark or blackish-green, occasionally with a tinge of yellow; stem: green; leaves: stem leaves triangular widest near base and tapering to blunt or rounded toothed apex (lens) and with a strong nerve; habitat: on rocks and tree roots by burns where it will be regularly flooded; note: Usually the most abundant species in burns in Atlantic woodland.	Pleurocarpous; size: medium sized and often forming untidy prostrate patches; branching: irregular; colour: mid- to dark-green but can have a brownish tinge; stem: green; leaves: rounded-triangular and tapering to a fine point; fruit: frequent, the stalk has papillae near the capsule but is smooth below (lens). habitat: on rocks and tree roots by burns where it will be regularly flooded; note: rather nondescript but often the common species with Yellow Fringe-moss (<i>Racomitrium aciculare</i>) on tops of rocks in base-poor burns in Atlantic woodland.	Pleurocarpous; size: small to medium sized, forming flat patches; branching: irregular but branches tend to lie in the same direction as the main stem; colour: green often with a brown or coppery tinge; stem: green; leaves: rounded-triangular and tapering quickly to sharp point, all turned in one direction but not strongly so, no nerve; habitat: boulders and bedrock in and by burns where it will be regularly irrigated; note: Claw Brook-moss (<i>Hygrohypnum ochraceum</i>) is also quite frequent and has a double nerve and Drab Brook-moss (<i>Hygrohypnum luridum</i>) has a strong nerve and occurs in base-rich burns.	Oceanic. Pleurocarpous; size: medium to large and usually forming large patches; branching: regular and closely set giving a neat feather-like appearance; colour: a whitish-green, often with a golden-brown tinge; stem: green; leaves: triangular, broadest at the base and tapering quickly but with a drawn out point, often rather crumpled in appearance, strongly toothed margin and no nerve; habitat: on rocks and tree roots by burns where it will be regularly flooded.
Holt’s Mouse-tail Moss (<i>Isoetecium holtii</i>)	Fox-tail Feather-moss (<i>Thamnobryum alopecurum</i>)	Long-beaked Water Feather-moss (<i>Platyhypnidium riparioides</i> previously <i>Rhynchostegium riparioides</i>)	Frizzled Pincushion (<i>Ulota phyllantha</i>)
Oceanic. Pleurocarpous; size: large and often forming extensive pure patches; branching: lower part of main stem un-branched with most branches crowded near the top giving a somewhat ‘tree-like’ appearance; colour: yellow-green and often with a characteristic golden-brown tinge; stem: green; leaves: stem leaves triangular widest near base and tapering to a long fine point and have a nerve; habitat: on rocks and tree roots by burns where it will be regularly flooded, often by waterfalls on larger watercourses.	Pleurocarpous; size: very large and often forming extensive pure patches; branching: lower part of main stem un-branched with most branches crowded near the top giving a ‘tree-like’ appearance; colour: mid to dark green; stem: dark green; leaves: stem leaves small, triangular and scale-like, branch leaves are rounded-triangular tapering to a short point, strongly toothed and with a nerve; habitat: on rocks and tree roots by burns where it will be regularly flooded, often by waterfalls on larger watercourses, usually where the water is at least somewhat base-rich; note: the large size and tree-like appearance of the shoots are distinctive.	Pleurocarpous; size: medium-sized and often forming extensive pure patches; branching: sparse and irregular but all pointing in the same direction as the main stem; colour: dark green but lighter at the stem apex; stem: green; leaves: broad, rounded-triangular tapering to a short apex, toothed (lens) and with a nerve, leaves usually standing out from the stem giving the shoots a fat appearance; habitat: on rocks in burns where it will be submerged for much of the time, usually where the water is at least somewhat base-rich.	Oceanic. Acrocarpous; size: small to medium, forming neat cushions or occasionally large, spreading patches; branching: obscured; colour: yellow- or mid-green; stem: green and terminating in adapted leaves each with a cluster of small brown propagules (bud-like gemmae); leaves: narrowly triangular, tapering gradually to a point and strongly contorted (crisped) when dry; habitat: on trees and coastal rocks.
Lesser Yoke-moss (<i>Zygodon conoideus</i>)			
Oceanic. Acrocarpous; size: small, forming neat, small cushions or occasionally large, spreading patches; branching: obscured; colour: bright mid-green; stem: green; leaves: small, rounded-triangular, tapering in the upper part to a short point; with a nerve; Fruit: the capsule often has curved stalk; habitat: trees, usually with base-rich bark, like hazel or ash; note: two other species Green Yoke-moss (<i>Zygodon viridissimus</i>) and Park Yoke-moss (<i>Zygodon rupestris</i>) are also common but tend to fruit less frequently and the fruits have straight stalks			