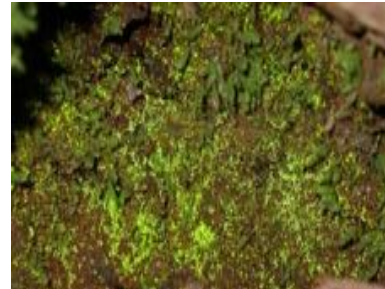


An Introduction to Bryophytes

Britain has one of the richest and most diverse bryophyte floras in Europe, due in part to a varied geology, geographical position and a generally mild, damp climate. Bryophytes fall into three groups: mosses, liverworts and hornworts, with over 760 species of moss and about 300 species of liverwort recorded in Britain. Only four species of hornwort occur, but these are seldom encountered. Wales supports almost three quarters of all British bryophyte species.

Mosses and liverworts come in a variety of colours, but most are shades of green or yellow-green, sometimes with brown or red pigmentation, especially in stems and fruits. Some appear to glow in the dark. They occur in a wide range of habitats such as woodland, moorland, boulders, cliffs, rivers, arable fields, marshy grassland, bog and urban areas. They can even colonise discarded plastic objects and unwashed cars.



Goblin Gold (*Schistostegia pennata*) appears to glow in the dark.

Most mosses and liverworts are rather small and inconspicuous, but where conditions are ideal they can be amongst the most abundant plants. Because leaves of most bryophytes are often only one cell thick, they are prone to drying and therefore the best place to find them is in damp or wet habitats, but moss species have evolved to occupy some of the most arid and environmentally harsh areas including the Antarctic and sand dunes or old tiled roofs can have a great abundance of mosses. Some mosses even specialise in growing on unusual substrates such as dung and decaying bones. In general, liverworts are more dependent on damp conditions and are most common in the western parts of Britain, with north Wales and north-western Scotland having the richest floras.



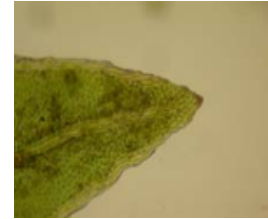
Slender Cruet-moss (*Tetraplodon mnioides*) grows on old bones and dung.

Bryophytes can have a significant influence on the environment. Sphagnum moss is often the dominant plant in bogs, with dead plants building up and forming deep layers of peat, locking up vast amounts of carbon from the atmosphere and storing reservoirs of water which is then slowly released,

helping reduce flood risks and keeping rivers running during periods of drought. Many bryophytes quickly establish on bare soil and help to reduce soil erosion. Bryophytes are not particularly nutritious and in general tend to be avoided by grazing animals, but they do provide a large surface area on which many small or microscopic animals live and which in turn support species higher up the food chain.



Bog-moss (*Sphagnum*) - there are 34 species in Britain.



Features seen through a hand-lens can aid identification.

Many mosses and liverworts can be easily identified with the naked eye, but to appreciate small features a hand-lens is useful. The vast majority of species can be identified in the field. The leaves of many moss species have a rib running down the middle and this can help distinguish mosses from leafy liverworts.

Mosses tend to be divided into two broad groups: Acrocarpous mosses, tend to be small, usually upright plants, producing small fruits at the top of the stem. They are often most obvious when colonising bare areas of soil and can be frequent on shaded tarmac.



Slender Smooth-cap (*Atrichum tenellum*) is known from only four sites in Wales.



Red-stemmed Feather-moss (*Pleurozium schreberi*) - common on moorland.

Pleurocarpous mosses tend to form sprawling mats with the fruits growing along the stem. The lush mats of moss on a woodland floor tend to be pleurocarpous mosses. In the uplands they are usually a very obvious component of heathy habitats.

Liverworts can also be split into two groupings: Leafy liverworts usually have three rows of leaves running down a central stem (two rows down the side of the stem and another row of different looking leaves underneath the stem). Many are small and are often found growing through tufts of other bryophytes.



The scarce Hutchin's Hollywort (*Jubula hutchinisia*) grows on rocks by streams.

Thallose liverworts are flat and strap-like, often several cell layers thick and quite leathery. They have no leaves and tend to grow flattened to the ground. Some species form large colonies on streamsides, just above average water levels and others can be abundant in greenhouses.



Common Liverwort (*Marchantia*) can be abundant in plant-pots in gardens and nurseries.

Bryophytes reproduce by a variety of methods. In some species there are separate male and female plants, whilst in others, plants may be both male and female. Reproductive features can be a very useful aid for identification purposes. They may have root tubers (like small potatoes), bulbils or buds often growing where a leaf joins the stem, granular growths (gemmae) on leaves, and some species can propagate from fragments of stems. The most obvious reproductive feature though are fruits (sporophytes), which are often held above the plants on a long stalk (seta). The fruits contain microscopic spores which may drift long distances in the air. If a spore germinates it produces an algal-like growth from which the more recognisable plant will form (often small leaves will be noticed growing on a green fuzzy mat). Many of our rarer bryophytes have a poor ability to reproduce or have very exacting requirements for growth.



Common Haircap (*Polytrichum commune*) usually has abundant fruits.

The British Bryological Society was formed to promote the study of mosses and liverworts. The society organises field meetings all over Britain and maintains a website www.britishbryologicalsociety.org.uk, which is full of information for people at all skill levels. Recently it published an inexpensive full colour Field Guide, which features the majority of the bryophyte species found in Britain. The individual pages from the book can be viewed at www.bbsfieldguide.org.uk, and these include simple identification keys as well as the individual species accounts.

Text and photographs by G S Motley

Bryophytes on front cover: Bamberger's Crisp-moss (*Tortella bambergeri*), Recurved Rock-bristle (*Seligeria recurvata*), Varnished Hook-moss (*Hamatocaulis vernicosus*), Handsome Woollywort (*Trichocolea tomentella*), Crescent-cup Liverwort (*Lunularia cruciata*), Red Leskea (*Orthothecium rufescens*), Greater Pincushion (*Ptychomitrium polyphyllum*), Spiky Bog-moss (*Sphagnum squarrosum*), Alpine Thread-moss (*Bryum alpinum*)



Lichen Reproduction. Although some lichens can reproduce by fragmentation – a small piece breaking off to make a new plant - most produce special reproductive structures and these can help with identification.

The following structures produce fungal spores:

Pin-heads – thin wiry stems with a tiny cup or ball on top - typically less than about 3 mm tall. These are mainly found on bark or dead wood, especially on old trees, and because they are small are generally difficult to spot without deliberate searching.



Mushroom-shaped outgrowths (Podetia) – chunkier and usually larger than Pin-heads, often looking like a small mushroom. Many of the *Cladonia* lichens (common in moorland habitats and on rotting wood) produce these, with some resembling golf-tees and others sometimes tipped with bright red 'fruits'.



Unstalked 'fruits' usually round, but sometimes elongated (Apothecia and Perithecia) – these are embedded in the main part of the lichen or sit proud of the surface. They are often darker than the surrounding tissue and may have splits or pin-holes, with some having an obvious rim and looking like small 'jam tarts'.

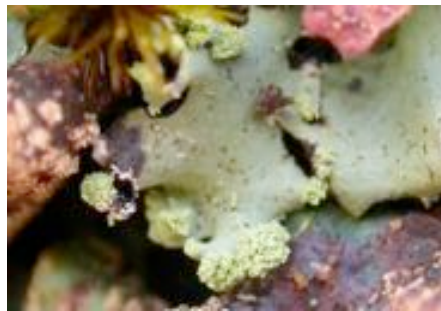


These structures are vegetative growths which contain both fungal filaments and algae and which drop off to form new plants:

Peg-like growths (Isidia)



Ruptures (Soralia) with powdery propagules (Soredia)



An Introduction To Lichens



What is a lichen? - A lichen is a symbiotic relationship between two, sometimes more, different life-forms. The main partner is a fungus and this comprises about 95% of the lichen, with the other partner a green or blue-green alga or sometimes both. The alga is usually present in a thin layer inside the lichen and provides essential foods to the fungal partner (fungi are unable to photosynthesise). The alga are in turn protected by the fungus from environmental extremes such as temperature and moisture. In a lichen, the fungal partner is always a different species, but the algal species can be present in many different lichens. As a result, lichens are named after the fungal partner.

Almost all the fungi and a few of the algae present in lichens have never been found living on their own. Indeed, when a fungal spore germinates it must quickly find a suitable partner or it will die. About 1800 different lichens have been found in Britain.

Where do lichens live? - Lichens can be found almost anywhere there is a reasonably stable surface such as on rocks, trees, amongst heathland, on soil and in and by streams. They can be very obvious on tree trunks and branches, roofs, old gravestones and are particularly abundant in sea-spray zones on rocky coasts and on rock outcrops in the mountains (the photograph on the right shows the effects of a moorland fire which has destroyed all the lichens in the lower part of the image).



They are able to inhabit some of the most extreme environments on earth. In Antarctica, over 300 lichens are known, but in comparison only two flowering plants can survive the cold climate. Many lichens, particularly those of rocky substrates, are slow-growing and it has been estimated that some may grow as little as 1 mm every 10 years or so. Some individual lichens are likely to be many hundreds of years old.

Uses of lichens - Lichens are early colonisers and have a role in soil production, helping break down rock into smaller particles. They have been harvested for use as dye and some are used as food by animals such as reindeer and humans sometimes eat them. Slugs and snails seem particularly fond of them. Birds, such as long-tailed tit, use lichens as nesting material and some invertebrates build protective cases out of them. Lichens are a source of antibiotics and other medicines and are even used in perfumes. As many lichens are slow growing and often dependant on rainfall for water, they are sensitive to air pollutants that dissolve in rain water and therefore are very good indicators of air quality. The blue-green algae in lichens can fix atmospheric nitrogen, which can then be used by other organisms. Some lichens are useful indicators of habitats that have had a long continuous history - e.g. ancient woodland.

Identifying lichens - Although some lichens can only be identified using chemical and microscopical techniques, many can be recognised using habitat preference, growth form, reproductive features and colour.

Lichens have a variety of growth forms:

Powdery – the whole lichen appears to be formed of tiny granules. This type of lichen is common and often seen on shady walls and in crevices in tree trunks and rocky outcrops.



Filamentous – forming a fine hair-like mat. May be confused with some of the shrubby lichens found on tree branches and in heathland, but filamentous lichens are rather uncommon in south Wales.



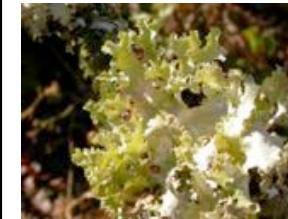
Shrubby – branched outgrowths, often fixed to the substrate at one point. These are common on deciduous shrubs, larch trees and in heathland.



Squamulose – many small plates less than 1cm wide and often much smaller. These are common in peaty habitats and on tree bark and decaying trees.



Leaf-like – formed of large lobes, easily detached from the substrate. Very common on trees and shrubs.



Crustose – a crust which is firmly attached to the substrate. Very common on tree trunks, rocks and in urban areas.



To help with identification there are several good field guides to UK lichens, identification cards covering specific habitats and web sites with abundant photographs.

Further information about lichens can be found at The British Lichen Society www.thebls.org.uk and Lichens of Wales www.wales-lichens.org.uk web sites. The Field Studies Council has produced a series of pocket-sized identification charts covering a wide range of natural history topics, including Lichens on Twigs and Urban Lichens.

Additional resources and information on Mosses, Liverworts and Bryophytes which are relevant to many of the activities in the Sychryd gorge please visit the Environmental Charter section of the SWOAPG website:

www.swoapg.org.uk