A field key to Coastal and Seashore Lichens

Frank S. Dobson

This book is dedicated to Ivan Pedley who has done so much to help with this book and other projects.

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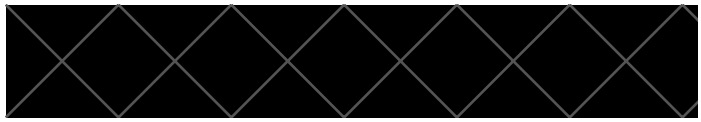

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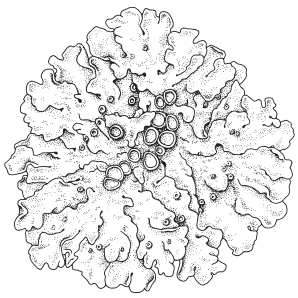
A Field Key to Coastal and Seashore Lichens

Contents and scope

This book contains illustrated keys to enable the identification of most of the lichens of the British Isles which are likely to be found on the seashore from the low tide mark up to the point where the sea ceases to be the main influence and heavy spray seldom reaches. It includes about 520 species which covers almost all the species that are likely to be found on the seashore and coastal strip that occurs at the top of sea cliffs. It includes those that occur on soil, humus and decaying plants, but not those that grow on trees and shrubs as these are usually the same species that grow inland. The keys also contain the lichens that occur on wooden fences and posts, including those that are partially exposed by the tide on mudflats and salt marshes. All these species are in the main keys and in addition there are supplementary keys that separate out the species on sawn wood, solid calcareous rock, and also those that normally occur on soil, mosses, plant debris or humus. Another nearly 100 very rare species are described in brief notes. Some lichenologists consider that the whole of the British Isles is exposed to marine influence; for example, the seashore lichen *Ramalina siliquosa* grows on Stonehenge, which is about as far from the sea as you are able to get in these islands! Other keys that can assist in identifying seashore lichens, especially those that occur on trees, may be found in the bibliography.



Illus. 1 ***Xanthoria parietina*** **x3.**

This book contains three methods of identification:

(Method 1) The simplest method is just to use the ***coloured photographs***.

(Method 2) The identification may be confirmed by using the ***table of characters*** describing 96 of the most common lichens (See page 19 for information on how to use these methods).

(Method 3) This uses more ***advanced keys*** to over 400 species, subspecies and varieties. These keys only use characters that are visible in the field, by eye, or under a x10 hand lens. Some information in this book is repeated in order to make the instructions to each type of key more or less independent. However, this information is often given in a slightly different form in each section. If a meaning is not clear, try looking it up in another section.

A minimal number of scientific words is used and these are explained in the text and glossary. An understanding of these words, together with use of the keys, should greatly assist in the ability to understand more complex books on lichens. The term 'shore' relates strictly to the area between the highest and lowest spring tides. In this book the term 'seashore' covers the area from just below the lowest 'shore' up to the point where the 'maritime' species merge with inland ones.

What is a lichen?

Despite their appearance, lichens are not a single organism but a mutual relationship (symbiosis) between a fungus and an alga (or rarely a blue-green alga also known as a cyanobacterium).

In most species the alga is located within a thallus (the body of the lichen), usually over 90% of which is composed of the fungus. The alga is positioned so that it is best able to obtain the light, moisture and other substances that it requires to produce sugars by photosynthesis. Within the lichen the alga is protected from extremes of climate so enabling it to thrive

in situations in which it would otherwise be impossible to survive. The fungal partner, like all fungi, is unable to photosynthesise and, in lichens, is entirely dependent on the alga for its survival and nourishment. It achieves this by causing the alga to leak much of the sugars that it makes. This weakens the alga and seems to render it almost incapable of sexual reproduction and it usually only increases through simple cell division. However, this allows the two partners to grow at a similar rate thus producing a stable relationship in which the lichen may live to a considerable age. It is the interaction between the partners that produces a consistent shape to a lichen species, thus enabling identification in the field.

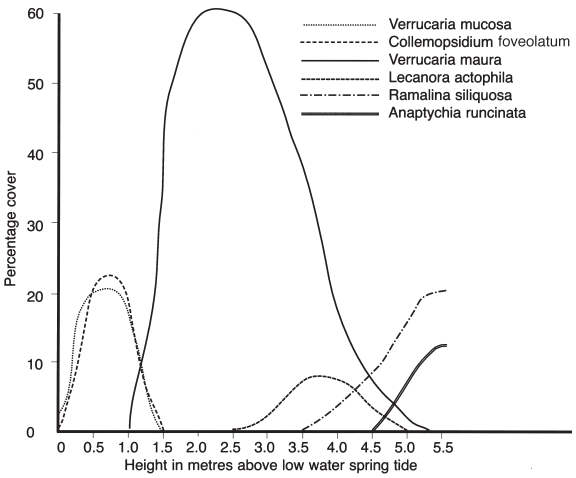
Only a limited number of species of algae can survive being incorporated into a lichen. Conversely, every lichen species consists of a different fungus and it is the name of this fungus that is used for the whole lichen. None of the fungi treated here are capable of being free-living. The fruiting bodies of a lichen are produced solely by the fungus and therefore only contain fungal spores. This means that when spores germinate they must quickly find a suitable algal partner, or die. An exception is that in a few species, very small algal cells may be found in the fruiting bodies. It is possible that some of these algal cells may adhere to the spores as they are discharged. In some species, if a suitable alga is not available, the lichen may survive by taking over the alga of an already existing lichen on which the spore has come to rest.

The problem of the availability of algae after dispersal is avoided in many species by the lichen producing structures that contain both partners. These can become detached and distributed to new potential sites by a number of agencies such as animals, wind or rain. Species that use this vegetative means of reproduction and dispersal usually have few or no fruiting bodies.

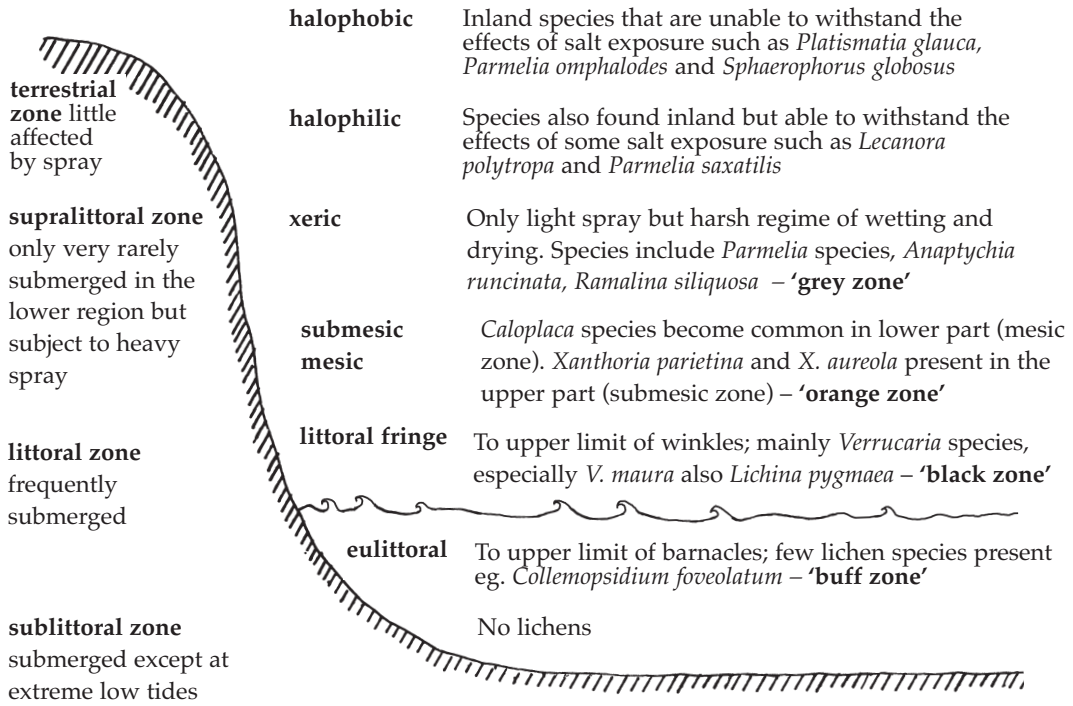
The seashore environment (Illus. 3)

The seashore environment can be very harsh, especially where lichens are periodically submerged, subject to waves or heavy spray. It is not fully known whether lichens that are restricted to the lower regions of the seashore are adapted to be able to survive in these difficult salty conditions or if some of them actually require the presence of the salt. It is thought that those species growing at the lower level are salt dependent, whilst those growing higher up the seashore are salt tolerant (Wolseley *et al*. 1996).

The type of seashore and the lichens present depend on many factors that include: exposure to wave action, sunlight, desiccation, aspect and the slope, pH and nutrient levels of the substratum. The physical nature of the seashore is equally important and may vary from mud through to hard rock. The finest grained mud, where it is disturbed by the sea, does not support lichens as there is no stable substratum on which they can attach and grow and any potential colonisers are smothered by the silt. In these circumstances the alga being deprived of light is unable to photosynthesise. Sand, classified on the 'Wentworth scale' (Wentworth 1922) as having a rock grain size between about



Illus. 2 Transect on a rocky shore showing typical distribution of some common species.



Illus. 3 Diagramatic representation of the main lichen zonation occuring on siliceous seashores. (After Hawksworth 1980)

0.075 mm and 2 mm, is also unstable and supports few lichens until it becomes stabilised by vegetation. Stabilised sand has better drainage than mud and often provides a more suitable substratum for lichens than a salt marsh formed from mud. Rock grains from about 2–70 mm diam. are termed gravels and in suitable situations are frequently well colonised. Cobbles vary between 71 to 256 mm diam. and above this rock fragments are called boulders and finally there is the solid rock. In situations where gravels and larger rocks are stabilised above the action of the waves they develop their own typical lichen communities. In some areas the action of winter storms brings salt and some extra gravel. This restricts the growth of flowering plants preventing them from smothering the lichens. A good example of this is at Slapton Ley in Devon. Up to the 1970s, the gravel bank behind the coast road was very rich in lichens. However, when a large, hard surfaced car park and sea wall were built on the seaward side of this road, it prevented the lichen site from being replenished each winter with a small amount of gravel. This allowed the flowering plants to flourish and they now form a dense mass and the lichen species have disappeared.

For most species of lichen, solid rock forms the most important substratum, hard acid rocks having the greatest variety of lichen species. Horizontal strata give vertical surfaces and also platforms which may be colonised by species that prefer well-lit situations. In contrast, upturned strata provide a wide variety of crevices caused by erosion of the rock by the sea. Hard, smooth, acid rocks are not easily colonised by foliose genera such as *Parmelia,* but fruticose *Ramalina* species seem to be able to colonise them more readily. Rough surfaced rocks usually have a much greater diversity of lichen species (Wolseley *et al*. 1996). On all these rocks, the species of lichen present is greatly affected by the elevation at which

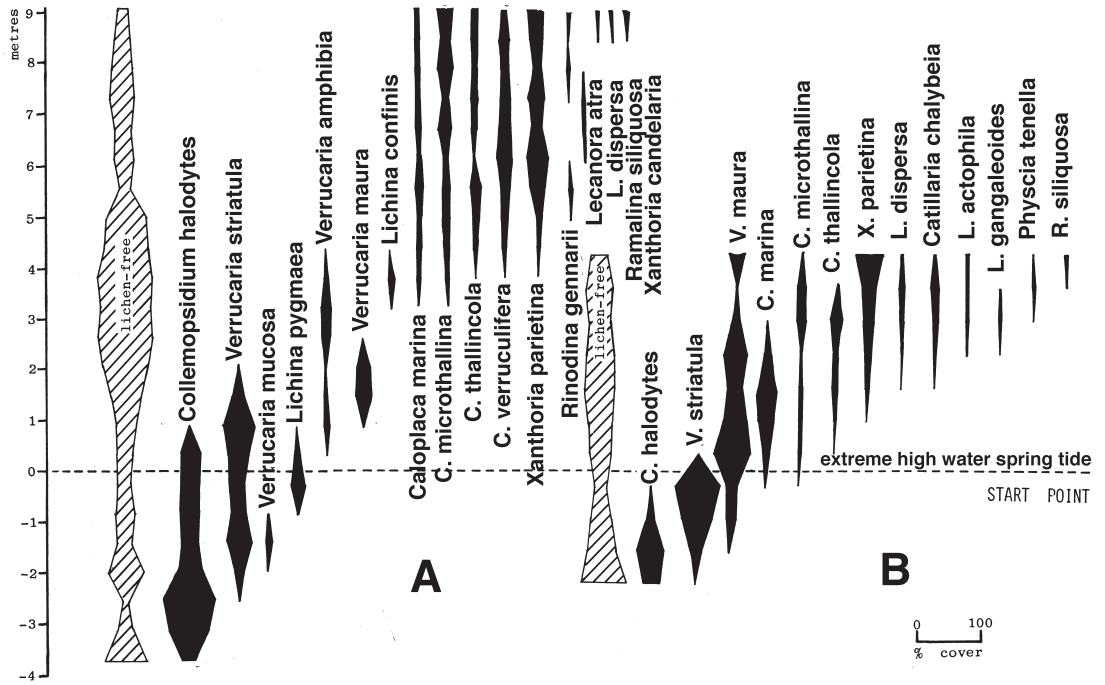
they are growing above the lowest tides (Illus. 2 and 4). The force of the waves and the amount of spray declines with increasing height above sea level. This leads to a range of conditions that are exploited by different lichens and has led people (e.g. Lewis 1964, Fletcher 1973, 1975, Hawksworth 1980) to propose a zonation of the seashore. A version of this zonation for an acid (siliceous) rock seashore is given in Illus. 3. On very exposed seashores, the lichen zones may be elevated several metres as compared with sheltered seashores (Illus.4). At the lower levels on exposed seashores, the lichen has to survive the full force of the waves and currents.

A lichen growing in the littoral zone is subjected to large fluctuations of salinity which give rise to rapid changes in the osmotic pressure in the lichen. For example; initially it may be submerged by the sea but, as the tide falls, it is exposed to the air and the surface salt water dries to leave a layer of salt on the lichen. It may then rain and the salt is washed off and replaced by freshwater. Later, the tide rises and the lichen is again submerged by the sea.

Sublittoral zone
Lichens depend upon light to enable the algae to photosynthesise. Therefore, lichens do not occur at depths where light levels are too low. Normally, no lichens occur in Britain below the level of the lowest spring tide.

Littoral zone
This zone is often divided into two regions. The lower '**eulittoral zone**' is normally submerged by the incoming tide. It is frequently covered in barnacles and it is their colour which gives it the name 'Buff zone'. Growing in the shells of these barnacles is *Collemopsidium foveolatum* (previously known as *Arthopyrenia halodytes*) with just the minute black fruits visible at the surface. It is in this region that *Verrucaria mucosa* occurs, encrusting the rocks with a smooth dark green layer. Above this is the '**littoral fringe**' which is only occasionally submerged by the tide but is still subject to heavy spray and waves. However, the erosion caused by the action of the waves constantly creates new sites and these are rapidly colonised by lichens, giving this region a very dynamic character. The fruticose lichen *Lichina pygmaea* is often present and is usually associated with a minute bivalve mollusc *Lasaea rubra* which is only about 1 mm diam. (Gilbert 2000). The 'littoral fringe' is the area where *hydropunctaria maura* becomes very common. On sheltered north-facing shores it may be almost the only lichen present and it gives the zone a black colour (the 'Black zone'). This lichen has an appearance rather like thick oil or tar and is frequently mistaken for heavy oil pollution.

Supralittoral zone
The rocks above the '**littoral fringe**' are rarely submerged and form the '**supra - littoral**' zone which can also be divided into three subzones. The lower is the '**mesic zone**' where *Caloplaca* species, especially *C. marina,* become abundant, giving the zone an orange colouration (the 'Orange zone'). This orange colour is much more noticeable on well-lit seashores. *Lichina confinis* which is smaller than *Lichina pygmaea* also grows in this zone. *Lecanora* species become frequent including *L. helicopis* in shaded areas and *L. actophila* in better lit situations. Next is the '**submesic zone**'. The amount of spray declines as you move up the seashore and the first foliose species, such as *Xanthoria,* appear in this zone as they are now able to survive without being washed off the rock. At the upper end of the zone where the rocks are nutrient-enriched by bird droppings a characteristic lichen flora develops which includes *Xanthoria parietina,* and such species as *Caloplaca verruculifera* and *Aspicilia leprosescens.* The area above the submesic zone experiences only a slight spray from the waves and the first fruticose species such



Illus. 4. Transects on Start Point Devon. A on the exposed side and B on the more sheltered side. (After Hawksworth 1980.)

as *Ramalina* appear. This is the **'xeric zone'**. Due to the colour of many species that occur here and further inland this is known as the 'grey zone'. Well-lit rocks may have species such as *Lecidella asema, Rhizocarpon richardii* and *Diploschistes caesioplumbeus* (this last species starts as a parasite on *Lecanora gangaleoides*). A number of grey or brown foliose species such as *Anaptychia runcinata* and *Parmelia* species are also often abundant.

Terrestrial zone

Above this region you enter the '**terrestrial zone**'. Here the influence of the sea progressivly declines until the maritime species disappear and are replaced by inland species. The lower part of this region contains a number of inland species, such as *Parmelia saxatilis,* which are able to survive on rocks that still have a moderate salt exposure. This is known as the **'halophilic zone'**. Still further up the seashore these species become more and more interspersed by others that are less able to survive in salty conditions until the level of salt on the rocks is that of inland areas and the lichens are identical to those that occur away from the seashore, this is the '**halophobic zone**'. The communities that occur in these various regions are well described in Wolseley et al. (1996).

The width of these zones varies greatly from site to site, with a less steeply inclined site having wider zones. However, probably the most important factor involved is exposure to the wind and waves. The more exposed it is, the higher up the seashore the waves and spray will reach and therefore the wider the zones. This is shown in Illus. 4 which illustrates two transects at Start Point, Devon. **A** is located on the exposed south side and it will be seen that the sites occupied by each of the various species is much higher than in **B** which is located on the more sheltered north side.

Although many species occur on both exposed and sheltered seashores, there are some which show a strong preference for one or the other. Sheltered seashores usually lack species such as *Verrucaria mucosa, V. amphibia* and *Lichina pygmaea*. *Lichina confinis* is more frequent on sheltered but well-lit seashores. Where it is more exposed, this species is often

restricted to crevices. Another factor influencing lichen distribution is the amount of available light. *Lecanora actophila,* for example, occurs on better lit rocks than *L. helicopis* or *Halecania ralfsii.*

The ameliorating effect of the sea in winter on temperature in the adjacent coastal regions enables a number of more Mediterranean species to survive on the southern and south-western coasts of the Brtish Isles. These species include members of the genera *Roccella* and *Teloschistes*. Species from genera such as *Dirina* and *Roccelographa* frequently obtain protection from the elements in crevices or under overhangs, often growing where they are sheltered from direct rain. They obtain moisture from the sea mists caused by the moist breeze from the sea being drawn onto the more rapidly cooling land in the evening. This effect reaches its maximum effect near the coast of Namibia where rain seldom falls and all the organisms growing on the coastal strip depend on this nightly fog for moisture. Flying over the coast of Namibia a wide band of orange coloration is the most noticable feature and is due to an abundant *Teloschistes* species.

Most of the species included in this key occur on hard rock and therefore the lichen communities of the seashore in the south-east are rather poor due to the lack of these hard rocks. In these areas, man-made structures such as concrete sea defences, walls, wooden posts, etc., are important habitats for lichens. Where nutrient-enriched by bird droppings they support a characteristic assemblage including *Physcia* and *Xanthori*a species. It should be noted that even on hard rock there is great variation in species numbers on different parts of the coast. In the west, such as a typical seashore in Wales, 150 species may be expected whilst in the east, for example, in Northumberland there may only be 40-50 species (Gilbert 2000). Much of the south coast consists of chalk or other soft rocks. Due to their rapid erosion by the action of the waves they support few lichens, but chalk and soft earth cliffs do have specialised species including rare ones such as *Endocarpon pusillum*.

Alan Orange

Illus. 5 *Physcia adscendens* x12

Many beaches in these regions consist of shingle which can have a rich lichen cover. The lower region is often barren of lichens but as the shingle becomes more stabilised and less salt is deposited on the pebbles, lichens begin to become more common. Eventually the stones become covered with lichens which are often similar to those that occur inland, such as *Lecanora campestris*, *Porpidia tuberculosa, Rhizocarpon reductum* and *Lecanora muralis*. Some surprising species such as *Evernia prunastri* and *Usnea articulata* may occasionally also occur on well stabilised shingle or sand dunes. Nearer the sea a number of seashore species such as *Rhizocarpon richardii*, *Diploschistes caesioplumbeus*, *Lecanora helicopis* and *Lecanora actophila* may be seen. On limestone pebbles, *Caloplaca* species may become abundant. More solid limestone on the seashore is relatively impoverished compared with acid rocks. This is different to inland limestone, which normally is much richer in lichen species than acid rock. The lichens present are usually similar to those on acid rock and include *Caloplaca marina* and *Lecanora helicopis*. However, damp areas and mortar on walls often provide sites for *Collema* and *Leptogium* species. On limestone the coastal species

of the grey zone are usually restricted or absent and the orange zone frequently merges directly into the terrestrial zone.

Sand dunes often have a strong calcareous element as a result of the ground-up sea shells present. This is most noticeable in the machair of Scotland where this shell-sand is blown over the wet, acid peat making it better drained and much less acid and giving it a rich lichen community with many *Bacidia, Cladonia* and *Peltigera* species. This area is protected on the seaward side by dunes of pure sand. Many dune systems such as those situated on the east coast are similar and become more stabilised as you move inland. The first protective barrier is very unstable, consisting of loose sand which is often only consolidated by the roots of marram grass (*Ammophila arenaria*). As well as being unstable, this sand has a high salt content and is unsuitable for lichen colonisation. Behind the protection of these rather mobile dunes, the organic content of the sand usually increases as you move inland. Away from the effects of heavy spray and on well-consolidated but quick draining dunes up to 30 species of *Cladonia* may occur. As you move inland the assemblages slowly change until they match that of the surrounding coastal region. In the South and West where there are calcareous, well-drained dunes of pH7-8, facing south and getting the maximum benefit of the sun you get the rare *Fulgensia fulgens* community containing other species such as *Squamarina cartilaginea* and *Toninia sedifolia*.

Another important habitat occurs where fresh water trickles over the rocks, especially if it has been filtered through the soil bringing nutrients with it. Here species such *Dermatocarpon miniatum* and *Solenopsora vulturiensis* frequently occur. A rather special community of lichens occurs on the west coast where the rock is sheltered by overhanging soil. This community includes *Degelia*, *Nephroma* and *Pannaria* species. Soft, sheltered rocks in the upper region of the seashore may be covered in a green layer of soredia on the tips of the minutely fruticose *Leprocaulon microscopicum*.

Oil Pollution

Although the 'black zone' is normally composed mainly of the lichen *Verrucaria maura*, sometimes the black colour is caused by oil and tars from pollution due to accidents or deliberate actions by ships at sea. One of the most serious incidents on the British coast occured on 18 March 1967 when the *Torrey Canyon* released 100,000 tons of crude oil into the sea off Cornwall (Richardson 1975). This polluted over 200 miles of the coast, in places up to the top of the spray zone. The very toxic, volatile components quickly evaporated and much of the subsequent death of lichens resulted from them being smothered by the residue and unable to photosynthesise. About 500,000 gallons of detergent were used to try and disperse the oil. Unfortunately, this detergent proved to have an even more deleterious effect on the lichens than the oil it was trying to disperse. Work in the laboratory on *Lichina pygmaea* showed that the effect of detergent was more toxic than the oil (Brown 1972). Another major incident occured on 15 February 1996 when the *Sea Empress* went aground off Pembroke and released about 72,000 tons of crude oil. Monitoring of the effects was conducted at West Angle Bay and Sawdern Point. At both sites, areas of the oil and the underlying lichens were removed by high pressure hoses while other areas were left untouched and still covered with the deposited oil. In West Angle Bay *Hydropunctaria maura* survived well in both the cleaned and oiled sites but *Caloplaca* species succumbed in both situations and no recolonisation of the bare rock was visible four years later. At the more sheltered Sawden Point, *Xanthoria parietina* and *Ramalina siliquosa* were damaged by contact with the oil and soon showed necrosis. Although initially, *Caloplaca marina* appeared more

resistant to the oil it also soon disappeared in the monitored quadrats. Possibly the most interesting finding was that after five years the pressure cleaned surfaces remained bare but those that were left to be cleaned naturally showed good recolonisation by both *Caloplaca marina* and *Xanthoria parietina* over the same period. This recolonisation appeared to come from small surviving thalli. (Fletcher & Crump 2000). The sunny south facing rocks recovered much more rapidly than the shaded north facing ones. After two years no traces of oil could be seen at any of the sites (R. Crump, pers. comm.). This recovery of the rock surface from oil pollution is probably due to the action of bacteria which break down the oil. It must be remembered that oil is a natural product that has been leaking out of the ground for millions of years and during all this time it has been broken down naturally by bacteria. In many instances of oil pollution, the best course for the environment would be to remove the thickest layer of oil and then leave it alone and let nature do the work, possibly assisted by adding nutrients to the oil spill that can be used by suitable bacteria. This was one of the methods used on the oil spill from the Exxon Valdez which ran aground in March 1989. Although care must be taken that the increased nutrient levels do not cause an algal bloom (U.S. E.P.A. 1989)

Fieldwork on the seashore

Safety must be the first consideration when working on the seashore. It can be a very dangerous place. The following rules, together with common sense, will help to ensure your safety:

1. Always inform someone about where you are going and at what time you will return. If possible, do not go alone.

2. Take a mobile phone with you and if you run into difficulties dial 999 and ask for the coastguard.

3. Rocks and seaweed can be very slippery so wear suitable footware and, especially when working on beaches consisting of large cobbles, proceed very carefully.

4. If working on the top of cliffs, do not go too close to the edge as grass can be very slippery and sometimes, unknown to you, the cliff edge may be undercut and your weight could be enough to cause it to collapse.

5. If working at the base of cliffs beware of falling stones.

6. Do not be tempted to climb up or down cliffs. It is very easy to become stuck and find that you are unable to climb further either up or down. What looks like an interesting patch of lichens usually turns out to be a common species when you reach it. It is never worth risking your life to examine a lichen.

7. Study the tide-tables before you set out. As you move around the seashore be very aware of the tide in relation to any headlands etc. that you may pass. In particular, caves can be very dangerous places and if you are trapped inside, your mobile phone will probably not be able to obtain a signal.

8. If you are collecting specimens ensure that you are wearing the correct safety equipment including goggles and gloves. You will find that some form of kneeling pad will make work on rough rocks more comfortable. Take a simple first-aid kit with you to deal with any minor injuries.

If you are making a list for the whole site, work in a systematic way around the seashore so that no area is overlooked. Do not forget to examine any wooden structures such as fences and gates and also walls and man-made sea defences as these often support interesting lichens.

The tides will greatly influence the extent of your survey. If possible, ensure that you are on the shore just before low tide. This will enable you to work up the seashore in a systematic manner from the lowest zone.

Collecting

This key has been written in such a way that collecting should not be required. It is obviously not permissible to damage buildings or private property in any way but if, for some important reason, a lichen must be collected, small portions of powdery, leafy and bushy lichens may be carefully scraped off the surface of the stone. It can be very difficult to collect crustose lichens but by using the point of a knife, and without damaging the stone, it is often possible to remove a small portion containing the fruiting body. This is all that is needed for microscopical examination. This minute piece can then be collected onto clear sticky tape which, in turn, can be stuck onto a piece of paper or card. This will enable the fragment to be checked through the clear tape and be safely taken away for later examination. Small samples may be taken from rocks on the seashore but never take the whole of a specimen. Always leave a small piece so that it may regrow.

Method 1. Quick start to the identification using the photographs

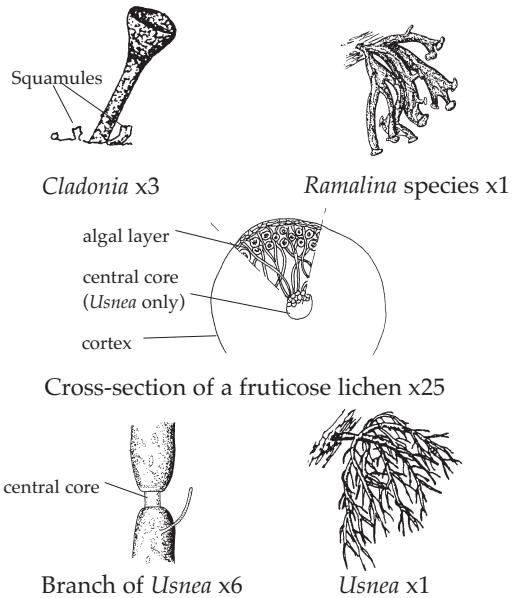
Lichens depicted in Plates 1–3 are arranged according to their usual position on the seashore, starting at the top of plate 1 with the lichens of the lowest level of the spring tide. With many of these lichens there is considerable overlap in the position in which they grow; therefore, if you cannot find a photograph at once, look in the zones above and below. Plate 4 covers the lobed, foliose and fruticose lichens that occur in the middle and upper zones. Plate 5 gives a selection of the species that are mainly restricted to calcareous rocks such as limestone. Calcareous stone may be identified as it fizzes slightly with lemon juice. Scratch the surface to obtain a clean surface and use a hand-lens to observe the result. Beware of air bubbles under the surface of the lemon juice. Unlike the reaction with lemon juice these will not grow in size or number. Plate 6 gives a selection of coastal lichens that occur out of the reach of the heavy spray such as on the top of cliffs or rocks near to the sea.

Confirmation of the identification may be assisted by use of the notes in the table of characters. Detailed information about the growth forms is also given in this section.

Method 2. Using the table of characters (pages 26 to 29).

Introduction to the table of characters

Before using the table it is intended that the first means of identification should be the coloured photographs. It is important that any tentative naming should be confirmed by using the additional details given in the tables. To assist this, the tables are arranged differently from the photographs and the initial separation is by growth form. This is shown down the left edge of the tables. To assist in the identification of lichen structures that are too small to be distinguished with a hand-lens, diagrams have been provided.



Cladonia x3 *Ramalina* species x1

Cross-section of a fruticose lichen x25

Branch of *Usnea* x6 *Usnea* x1

Examples of fruticose lichens

The columns in the table are arranged as follows.

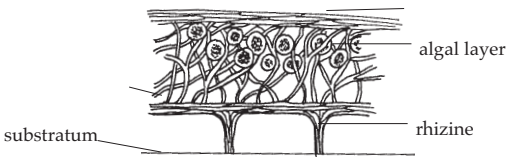
(1) Growth form: (on left edge of table)

Fruticose: Bushy lichens usually only attached at a single point and, in cross section, have a continuous ring of alga just under the surface. In many *Cladonia* species (Plate 6 Figs 92, 94 and 95) there

Foliose lichen x3

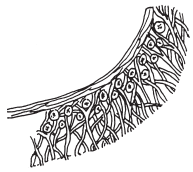
are fruticose fruiting bodies growing up from a minute leaf-like (squamule) or granular base. Other fruticose genera include *Ramalina,* with rather flattened lobes (Plate 4 Figs. 53, 54) and *Usnea* which is more rounded and has a central core that becomes visible if a main branch of the lichen is pulled apart (Plate 6 Fig 84).

Foliose: leafy lichens which have both an upper and lower skin-like cortex. These lichens are often attached by, in appearance, root-like rhizines. It is therefore possible to remove them easily from the substratum making the lower cortex visible (e.g. Plate 6 Fig 85, 86).

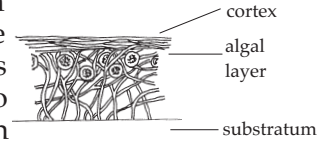


Cross-section of a foliose lichen x20

Squamulose: are actually crustose lichens that have peeled up from the substratum raising the tips of the lobes. Therefore, they differ from foliose lichens in the lack of a lower cortex. The lower surface is the exposed medulla and is most frequently white.


section through a squamulose lichen x8

Crustose: crusty lichens only have an upper cortex and from the lower surface the fungal threads grow directly into small cracks in the surface of the substratum. It is not easy to detach the lichen without removing some of the stone on which it is growing (e.g. Plate 1).



Crustose lichen x20

Placodioid: This term describes a crustose lichen in which the margin has finger-like or wider lobes (e.g. Plate 1 Fig. 13 and Plate 5 Fig. 75).


Placodioid lichen x1

Care must be taken not to confuse this form with foliose lichens. The lobes of placodioid lichens are not easily removed from the substratum.

Leprose: powdery lichens consisting of a loose mixture of fungal threads and algal cells. This growth form usually has very little structure and is either powdery or finely granular. Some species have a slightly lobed margin and/or a white centre, visible if the surface is scratched away. Most of these species do not produce fruiting bodies but rely on vegetative methods of distribution. Strictly speaking none of the lichens in the photographs are leprose. However, when well developed, some species may appear leprose. e.g. Plate 3 Fig. 38.


Leprose lichen viewed from above x 10


Cross-section of a leprose lichen x 25

Some species may appear to have several growth forms and in these cases they appear under both headings in the table.

(2) Name:

The Latin name of the lichen is used as, unfortunately, very few lichens have English names, but the Latin name is recognised internationally.

(3) Colour:

The colour of lichens can be very variable often depending on whether they are growing in bright sunlight or deep shadow. When they become wet, the cortex may become translucent and the green algae then become visible, tinting the lichens green. The colours given in the table are those that are normally present when dry.

(4) Seashore zone and substratum:

Seashore zone: The zones refer to the position on the seashore at which a lichen grows. Information on these zones is given on pages 14 and 15 and Illus. 3. It must be remembered that the width of the zones varies with the exposure to the weather and a particular lichen may often occur in several zones.

Substratum: This is the surface on which the lichen normally grows. Unlike many terrestrial lichens, the type of rock on which the lichen is growing often makes little difference to the successful colonisation by many species of seashore lichens (see also page 23). Only lichens that need a specific habitat are differentiated in this part of the key and the following abbreviations are used:

Calc: Indicates a species that normally grows on a calcareous substratum such as limestone. These fizz slightly when lemon juice is applied. It is easier to see these bubbles forming and swelling by looking at them through a hand lens.

Terr: Indicates a species that normally grows on soil or humus. However, other species of lichen may sometime be found to have spread onto this habitat.

(5) Soredia/isidia:

Many lichens do not produce any fruiting bodies but rely for distribution on small pieces breaking off and being transported to a suitable situation where the fragment can grow into another complete lichen. A number of lichens produce specialised structures to assist in this distribution and those used in the key are given below:

Soralia are splits in the surface of the lichen through which the mixture of fungal and algal cells escapes. **Soredia** is the name given to the minute powdery or granular pieces which are liberated from the soralia and then carried away by the wind, rain, insects, gravity etc.

Soralium with soredia x15


Isidia x10

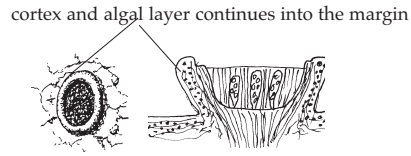
Isidia are firm, minute out-growths from the surface of the lichen where the cortex and algal layer remain unbroken. These break off and can grow into a fully formed lichen if they are deposited by wind, rain, insects etc. onto a suitable habitat. Isidia may sometimes break down into soredia.

(6) Fruits and fruit colour:

Both the colour and the type of fruiting body are important in the identification of lichens. The types are described below:

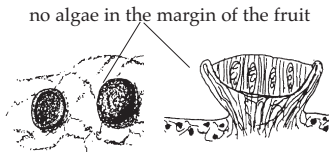
Apothecia are disc- or 'jam tart'-shaped fruits which may be sitting on the surface or sometimes within the thickness of the lichen. Apothecia are of two main kinds:

Lecanorine (Lecan. in the table), in these fruits the cortex and algal layer continue up into the margin of the fruit (the margin is like the pastry edge of a 'jam tart'). This means that the margin of the fruit is more or less the same colour as the surface of the lichen (e.g. Plate 1 Figs. 8-12).



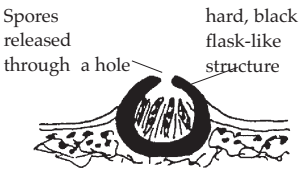
Lecanorine apothecia x5

Lecideine (Lecid. in the table), in these fruits the cortex and algal layer do not extend into the margin of the fruit. The margin is therefore a different colour from the surface of the lichen (e.g. Plate 2 Fig. 24 and 31).



Lecideine apothecia x5
cross-section x15

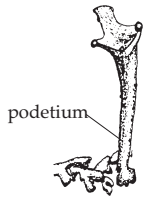
Perithecia (perith. in the table) are black, globose structures usually with a hard case forming the outer wall. They may be found almost sitting on the surface of the lichen or buried in its thickness so that only a small black swelling is visible (e.g. Plate 1 Figs 1-3 and 6).



Section through a perithecium x15

View of a perithecium from above x12

Podetia are found in *Cladonia* and some other genera. These are stalks or cup-shaped structures which carry the fruits on their tips (e.g. Plate 6 Figs. 92, 94 and 95).



Cladonia
podetium x2

Colour refers to the colour of the disc of the fruiting body. Sometimes the colour may be obscured by a pale powdery pruina making the disc look white or bluish grey.

(7) Notes:

These contain important additional information about the species and should always be consulted before a final identification is made.

Abbreviations used in the tables:

Calc: calcareous
Lecan: lecanorine
Lecid: lecideine
Perith: perithecium
Ph: photograph on colour plates
Terr: terrestrial
Squam: looks foliose correctly squamulose

Method 3. Using the main keys to identify seashore lichens

These keys includes over 400 lichen species which occur on seashores and clifftops, dunes and other situations near the sea. They include virtually all seashore species that occur on rock, soil, plant debris, humus and weathered wood and which may be identified without specialised knowledge. They do not cover species that grow on trees and shrubs. For these species see the bibliography on page 100. Sometimes a detail, such as colour, is included against a species to assist in its identification. Then, if the term 'colours various', is used in the other part of a couplet it does not exclude a colour that may be mentioned in the first part of the couplet.

Equipment required

1. A hand lens with a magnification of x8 to x15.
2. **C** = fresh domestic bleach (sodium hypochlorite). Some bleaches contain other substances. It should *not* give a reaction (yellow) if tested on the medulla of *Parmelia sulcata* or *P. saxatilis.* If it does, do not use it.
3. **K** = 5–10% solution of potassium hydroxide (half to one level teaspoon of caustic soda dissolved in 100mls of water gives a similar reaction but test it and it should give a red reaction on a *Xanthoria* species).
4. Lemon juice or dilute acid (e.g. 5% solution of hydrochloric acid).
5. A knife for removing foliose lichens, but care should be taken in its use. It should have a fixed blade or one that will lock open to prevent it closing on your fingers
6. A hammer and cold chisel may be needed to collect specimens from rock surfaces. If they are used care should be taken not to injure yourself or others and safety glasses and gloves should be worn.
7. A rule with 1/2 mm divisions.

Substratum

The type of substratum is often less important with seashore lichens than with many lichens growing further inland. However, on the seashore there are a number of species that only grow on a particular substratum. This is especially true of rocks that are basic. The two main types of rock, basic or acid, may be separated as follows:

Basic stone such as limestone, marble or mortar which contain calcium carbonate (or sometimes magnesium carbonate). These fizz slightly when lemon juice is applied. It is easier to see these bubbles forming and swelling by looking at them through a hand lens. Run-off from rain over these rocks, or from cement or mortar may affect the lichen community located beneath such run-off.

Acid stone such as granite, slate and many sandstones is unaffected by the application of lemon juice but do not be misled by air bubbles trapped under the juice. These will not increase in volume, and new bubbles will not form. They are nutrient poor and break down to give an acid soil. However, some, such as the serpentine rocks of Cornwall, contain magnesium giving rise to a specialised lichen community.

The differences between these two types of stone will (after a little practice) soon become obvious; this knowledge will greatly assist in identification.

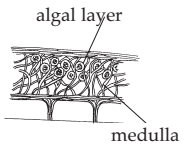
In addition, there is a specialised lichen community that occurs on metal-rich substrata such as mine spoil heaps and in the wash-down from rain over metal e.g. below wire fences and lightning conductors.

Chemical spot tests

'C' and 'K' chemicals are used in identification as they are able to produce colour changes in parts of the lichen. ***These chemicals should be handled with great care. Hands should always be washed after handling them. Carefully follow all the manufacturer's warnings on the packaging. The chemicals should be carried in small, clearly labelled bottles. Care should be taken to avoid spillage on to skin or clothes and they must not make contact with the eyes. They must not be swallowed and also must be kept out of reach of children. If any of these problems occur, you should consider getting medical advice.***

Only a minute drop is necessary and this should be placed *on the surface* of the lichen unless the couplet in the key indicates otherwise.

In some leafy lichens the reaction does not take place on the surface but in the medulla (the inner part below the algal layer). In order to test the medulla an area of the upper cortex should be scraped away with a finger-nail or knife to expose the pale medulla. The chemical should be dropped on to this pale area.



Position of the medulla in a lichen

A colour change obtained with K usually appears in a few seconds and then persists. In a few cases (clearly mentioned in the key) the colour changes over about 1 minute, usually starting as yellow and then slowly turning red.

Colours obtained with C may disappear after a few seconds. Bleach should be replenished after a few weeks as it quickly loses its active ingredient. If it does not have a strong 'bleach' smell, replace it.

Arrangement of the keys

These keys commence with a master key which then leads to the more detailed keys. These keys include growth form and substratum (explained above). It must be remembered that the influence of the sea can alter the substrata of many species, compared with where they grow inland. The main keys (A–E) include all the species included in this book, except those very rare ones for which notes are provided from page 88. Supplimentary keys (F–H): – On solid calcareous substrata above the level of heavy spray, try key F first but if you do not obtain an identification use the main key. Similarly with species growing on soil,

plant remains or humus try key G first. This key includes species growing on soil in crevices in calcareous rocks. The fruticose key includes those *Cladonia* species where the podetia are predominant. Finally there is key H to species growing directly on sawn wood such as fences, benches or posts. If none of these keys produces a result, refer to the notes on rare species from page 88. These rare species occur mainly on the Channel Islands, The Isles of Scilly, the extreme South Coast and in the West especially N.W. Scotland.

Both halves of a couplet must be carefully read and compared before deciding which is the more appropriate course to follow. Remember, every word is important and the decision has to be made by comparing each phrase in the couplet to see which contains the closest match with the lichen being examined. The more important characters are usually printed first. If you are unsuccessful go back to the last couplet where you are sure that you are correct and try the other half of the next couplet to which you are directed. Many species appear several times in the key so that there is still a good chance of an identification even if a wrong decision is made. Determining the colour of lichens can often be difficult and you may have to try both parts of a couplet.

The couplets in the crustose section of the main key run straight through from question one to the end. With experience, it is possible to go immediately to a subsection to shorten the identification process. Using the section headings given on page 31, go into the crustose key at the first section or subsection that agrees with your specimen:

When a species name is reached in the key, there is sometimes a comment in square brackets [ ]. This is only a confirmatory statement and, if the correct identification has been achieved, the bracketed statement should describe your specimen. However, it must not be used to exclude the other half of a couplet as later species in the key may also have some of these characters. The statements in square brackets, therefore, relate only to that species and are not used to compare two alternatives.

When you reach a name for for your specimen using the key, it is sensible to check the identification using a full description in a lichen flora.

Microscopic spore details

Microscopic details of spores are not necessary for the use of this key but, in some cases, for confirmation, they are given in round brackets ( ).

Making a squash

Instruction in the use of a microscope is beyond the scope of this field key but the 'squash' technique is described below as it is an important method for the examination of spores:

Dampen the specimen to be squashed in order to make it soft and pliable. Choose one of the largest fruiting bodies and using a razor blade or very sharp, thin bladed knife (taking great care not to cut yourself as this is easy to do whilst concentrating on making the squash), cut out as thin a vertical slice as possible from the centre of the fruit. This is then placed on a microscope slide in a drop of water. This is then left for a minute or two to be absorbed. K solution will often soften a specimen more easily and rapidly, however; K solution should not be allowed to come into contact with the microscope lens as it may erode the glass. A cover slip is then lowered gently on top and the blunt end of a pencil is dropped lightly but repeatedly onto it from a height of about one centimetre. This will usually squash the specimen sufficiently to show the detailed structure and release some of the spores. If needed, more pressure can be applied to the cover slip by thumb or forefinger (covered by a tissue to keep grease off) to spread the specimen on the slide. If the slide is prepared on a white surface it is possible to judge progress during this process more easily. The slide should be examined under the microscope as the squashing progresses, as it is a simple matter to continue the process but it cannot be reversed.The secret of a good squash is to take the thinnest vertical slice possible of

the fruit body and to use the least amount of liquid. In examining certain structures (e.g. perithecia) a very thin slice is vital as squashing will disturb the arrangement of the parts needed for identification. When examining spores several of them should be studied before deciding the spore type as some may have only developed septa or colour as they matured. Be aware that some brown spores look greenish in a K solution squash, and measure only those spores which have been discharged from the ascus. Always measure a number of spores and take the average size, excluding any that are unusually large or small. The K solution may cause some spores to swell slightly and therefore K should not be used if the spore size is critical.

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Under 'Notes' in this table: 'margin' refers to the edge of the lichen. 'Nutrient enriched' is caused by bird droppings etc. For abbreviation see page 22

	Name	Colour	Zone	Soredia	Fruits	Notes
FRUTICOSE	*Ramalina siliquosa*	Grey-green to yellow-grey	Xeric/Terr.	None	Lecan. Brown to greenish	Hard and brittle, rather variable, lobes flattened, to 5mm wide, surface often roughened. **Ph. 53.**
	Ramalina subfarinacea	Grey-green to yellow-grey	Terr.	Soredia on lobe edges	Lecan. Brown to greenish	Arises from multiple bases, may form swards. Powdery soredia on lobe edges . **Ph. 54.**
	Usnea flammea	Green to grey-green	Terr.	None	Lecan. v. rare	Tassel-like, stretch main branch to show central core. **Ph. 84**.
	Teloschistes flavicans	Orange	Terr.	Orange soredia	None	Bushy, branches round or flattened. Rare, do not collect. **Ph. 63.**
	Roccella phycopsis	Mauve-grey	Terr.	White soredia	Lecan v. rare	Round branches, if flat, *R. fuciformis*. Rare, do not collect. **Ph. 64.**
	Cladonia furcata	Grey to brown-green	Terr. Soil	None	Brown rare	Forms many forked, pointed podetia, very variable. **Ph. 95.**
	Cladonia floerkeana	Grey to green	Terr. Soil	Granules or soredia	Red	Bright red tip to podetia. Found on soil. Fruit body a podetium. **Ph. 92.**
	Cladonia pyxidata	Grey to green	Terr. Soil	Soredia to granules	Brown	Cup-shaped podetia. Commonest of the *C. pyxidata* group. **Ph. 94.**
	Lichina pygmaea	Brown to black	Littoral fringe	None	Brown	Beware similar seaweed. To 1cm tall. Fruits on branch tips. **Ph. 5.**
	Lichina confinis	Brown to black	Littoral fringe to mesic	None	Brown	Occurs higher up shore than *L. pygmaea*. To 5 cm tall. **Ph. 7**.
	Leprocaulon microscopicum	White to green	Terr. Soil	Sorediate tips	None	Rounded branches to 2mm high. Tipped with soredia. **Ph. 89.**
SQUAMULOSE	*Caloplaca microthallina*	Yellow to orange	Mesic	None	Lecan. Orange	Minute squamules to 2mm long. Often on *Verrucaria maura.* **Ph. 9.**
	Fulgensia fulgens	Egg-yellow to yellow-white	Terr. Calc. soil	Small lobes in centre	Lecan. Orange	On well-lit calcareous soils. Rare, do not collect. **Ph. 96.**
	Toninia sedifolia	Grey-brown to white	Terr. Calc. soil	None	Lecid. Black	On calc. soils and crevices. Squamules pruinose. **Ph. 93.**
	Toninia aromatica	Grey-brown to brown	Halophobic Calc.	None	Lecid. Black	If areolate not squamulose, it is probably *T. mesoidea*. **Ph. 41.**
	Squamarina cartilaginea	Yellow-green to brown-green	Terr. Soil	None	Lecan. Brown	White edges to lobes. Calcareous soils and crevices. **Ph. 68.**
	Cladonia foliacea	Yellowish green	Terr. Soil	None	Podetia Brown	Calcareous soils and dunes. Lower surface yellowish. **Ph. 72.**
	Romjularia (Psora) lurida	Brown greenish if wet	Terr Calc. soil	None	Lecid. Brown	Squamules to 5mm diam, overlapping. Often in crevices. **Ph. 78.**
	Cladonia cervicornis	Grey to green	Terr. Soil	None	Podetia Brown	Squamules to 4mm tall. Lower surface white/mauve. **Ph. 90.**
FOLIOSE	*Xanthoria parietina*	Yellow to orange. Greyer in shade	Mesic to terr.	None	Lecan. Orange	Usually very fertile. Mainly where nutrient enriched. **Ph. 56.**
	Xanthoria aureola	Yellow to orange	Mesic to terr.	None	Lecan. Orange	Lobes to 2mm wide. Long and separated. **Ph. 57.**
	Xanthoria ucrainica	Yellow to orange	Mesic to terr.	Soredia on lobe edges	Lecan. Orange	Lobes about 1mm wide, erect at tips. Rarely fertile. **Ph. 58.**
	Flavoparmelia caperata	Green to grey	Terr.	Coarse soredia	Lecan. Brown	Large. Apple green when wet. Lobes finely corrugated. **Ph. 51.**
	Squamarina cartilaginea	Yellow-green to brown-green	Terr. Soil	None	Lecan. Brown	White edges to lobes. calcareous soils and crevices Squam.**Ph. 68.**
	Cladonia foliacea	Yellowish green	Terr. Soil	None	Podetia Rare	Calcareous soils and dunes. Lower surface yellowish. Squam.**Ph. 72.**

	Name	Colour	Zone	Soredia	Fruits	Notes
FOLIOSE	*Cladonia cervicornis*	Grey to green	Terr.	None	Podetia	Lobes to 4mm tall. Lower surface white/mauve. **Ph. 90.**
	Xanthoparmelia loxodes	Brown	Terr.	Coarse isidia	Lecan. Brown	Cauliflower-like clumps of isidia. On well-lit acid rock. **Ph. 59.**
	Xanthoparmelia delisei	Yellowish brown	Terr.	Coarse isidia	Lecan. Brown	Paler in colour than *X. loxodes*. On well-lit acid rock. **Ph. 61.**
	Xanthoparmelia pulla	Grey-brown to brown	Terr.	None	Lecan. Brown	Apothecia usually abundant. On well-lit acid rock. **Ph. 60.**
	Phaeophyscia orbicularis	Brown to grey Green when wet.	Xeric to terr.	Soredia	Lecan. Black	Soredia in centre and on lobe margins. **Ph. 74.**
	Anaptychia runcinata	Brown	Xeric to terr.	None	Lecan. Brown	Long, thin, overlapping lobes. Often fertile. **Ph. 52.**
	Collema auriforme	Olive-green to brown	Terr. Calc.	Isidia, rare Globose	Lecan. Brown	Papery dry, swollen when wet Fruits rather rare. **Ph. 70.**
	Collema tenax	Olive-green to brown-black	Terr. Calc.	Isidia, rare Globose	Lecan. Brown	Papery dry, swollen when wet Fruits abundant. **Ph. 71.**
	Parmelia saxatilis	Grey	Terr.	Isidia	Lecan. Brown	Lobe tips with faint white marks. Minute finger-like isidia. **Ph. 55.**
	Dermatocarpon miniatum	Grey to grey-brown	Xeric to terr.	None	Perith. Black	Undersurface tan-brown. Fruits 0.2-0.5mm diam. **Ph. 69.**
	Parmotrema perlatum	Grey	Terr.	Soredia on lobe margin	Lecan. rare Brown	Loosely attached. Lower surface black with rhizines. **Ph. 62.**
	Physcia tribacia	Pale grey	Xeric to terr.	Soredia and lobules	Lecan. Black	On nutrient-enriched rock. Lobules become sorediate. **Ph. 79.**
	Physcia tenella	Grey	Xeric to terr.	Soredia	Lecan. Black	Lobe tips split to show soredia. Cilia on lobe edges. **Ph. 50.**
	Hypotrachyna revoluta	Grey	Xeric to terr.	Soredia on lobe tips	Lecan. Brown	Lower surface black, rhizines to edge. **Ph. 86.**
	Hypogymnia physodes	Grey	Terr.	Soredia	Lecan. Brown	Lobes hollow, rather erect. Soredia on tips. **Ph. 85.**
CRUSTOSE PLACODIOID	*Lecanora muralis*	Green to buff	Terr. Often man-made substrata	None	Lecan. Buff	Often on asphalt and concrete. Usually very fertile with fruits in centre only. Outer lobes with pale edges. **Ph. 49.**
	Solenopsora candicans	White to grey greenish when wet	Xeric to terr.	None	Lecan. Black	Usually fertile. Lobes wide, pruinose. On hard sunny rock. **Ph. 75.**
	Solenopsora vulturinsis	Grey. Green when wet	Mesic to terr.	Soredia at tips	Lecan. Brown	On shaded, damp nutrient enriched rocks and soil. **Ph. 87.**
	Caloplaca thallincola	Orange	Mesic to lower xeric	None	Lecan. Orange	Long lobes. Usually in more shelter than *C. marina.* **Ph. 10.**
	Caloplaca verruculifera	Yellow to orange	Xeric	Isidia	Lecan. Orange	Nutrient-enriched rocks. Lobes to 6mm long. **Ph. 13.**
	Caloplaca cirrochroa	Yellow to Orange	Xeric Calc.	Soredia yellow	Lecan. Orange	On inclined or vertical rock. Long narrow lobes. **Ph. 65.**
	Caloplaca aurantia	Creamy orange-yellow	Terr Calc.	None	Lecan. Orange	Lobes flat. Paler inside marginal lobes. Darker in centre. **Ph. 67.**
	Caloplaca flavescens	Orange	Terr, Calc.	None	Lecan. Orange	Often white ring just inside marginal lobes. **Ph. 66.**
CRUSTOSE	*Caloplaca marina*	Orange to red-orange	Mesic to xeric	None	Lecan. Orange	Warted thallus. often amongst *Verrucaria maura.* **Ph. 8.**
	Caloplaca maritima	Yellow to pale orange	Halophilic	None	Lecan. Orange	Convex, wax-like areoles. Occurs above *C. marina.* **Ph. 48.**
	Caloplaca citrina	Yellow to orange	Xeric to terr.	Granular soredia	Lecan. Orange	Becomes covered in soredia. Frequently fertile. **Ph. 11.**
	Caloplaca littorea	Yellow to orange	Xeric	Isidia	Lecan. Orange	In dry, sheltered areas. Numerous dull orange isidia. **Ph. 14.**

CRUSTOSE

Name	Colour	Zone	Soredia	Fruits	Notes
Candelariella vitellina	Yellow, orange	Xeric to terr.	None	Lecan. Yellow	Thallus of clumped granules like the top of a cauliflower. **Ph. 34.**
Caloplaca ceracea	Grey	Xeric to terr.	None	Lecan. Orange	Disc greenish orange. If pure orange it is *C. crenularia*. **Ph. 12.**
Protoblastenia rupestris	Greenish brown to grey	Terr. ± calc.	None	Lecan. Orange	Usually fertile. Apothecia domed and dirty orange. **Ph. 76.**
Rhizocarpon geographicum	Yellow to green	Terr.	None	Lecid. Black	Thallus intersected with black lines. The 'map lichen'. **Ph. 36.**
Lecanora sulphurea	Yellow to yellow-green	Terr.	None	Lecan. Green/black	On exposed nutrient-enriched rocks. Fruits immersed. **Ph. 35.**
Lecanora polytropa	Green to green-brown	Halophilic terr.	None	Lecan. Green to tan	Usually very fertile. Sometimes only fruits present. **Ph. 37.**
Lecidella asema	Pale brown to greenish	Halophilic Terr.	None (see note)	Lecid. Black	Often appears granular. Occurs on well-lit rocks. **Ph. 24.**
Rinodina oleae	Grey to greenish	Terr.	None	Lecan. Black	Often tinged green or brown. Fruits to 0.6mm diam. **Ph. 39.**
Lecidella scabra	Green to grey	Terr.	Soredia	Lecid. Black	Rarely fertile. Soredia grey-green that become yellow-green when scratched. **Ph. 38.**
Lecidea grisella	Grey to brownish	Terr.	None	Lecid. Black	Fruits to 2 mm diam, immersed in lichen, often pruinose. **Ph. 45.**
Rhizocarpon richardii	Brown with purplish tinge	Xeric to halophilic	None	Lecid. Black	Distinctive colour. Fruits immersed in thallus. **Ph. 31.**
Verrucaria fusconigrescens	Brown	Xeric to halophobic	None	Perith. Black	Margin black. Perithecia partially immersed in lichen. **Ph. 40.**
Fuscidea cyathoides	Brown to grey	Terr.	None	Lecid. Black	Forms mosaics with separating black lines. **Ph. 44.**
Rhizocarpon reductum	Grey to brownish	Terr.	None	Lecid. Black	Fruits to 0.8mm diam. immersed in lichen. **Ph. 32.**
Lecanora poliophaea	Brownish grey	Mesic	None (see note)	Lecan Red-brown	Often very granular. Nutrient-enriched rocks. **Ph. 26.**
Protoparmelia badia	Brown	Terr.	None	Lecan. Brown	On well-lit rocks. Fruits abundant with pale margins. **Ph. 82.**
Verrucaria mucosa	Green to grey-green	Littoral to sublittoral	None	Perith. Black	Thallus limited by a white margin. Often on well-lit rocks **Ph. 1.**
Verrucaria halizoa	Green to brown-green	Sublittoral	None	Perith. Black	On exposed shores, in crevices. Forms small patches. **Ph. 2.**
Verrucaria striatula	Green and translucent	Sublittoral	None	Perith. Black	Prominant black perithecia and black dots and ridges. **Ph. 3.**
Hydropunctaria maura	Black	Littoral fringe to xeric	None	Perith. Black	Abundant, forms black in 'black zone'. Cracked thallus. **Ph.6 .**
Verrucaria baldensis	None (in rock)	Terr.	None	Perith. Black	Fruits and empty pits in hard limestone. **Ph. 80.**
Verrucaria prominula	Grey or none	Mesic to xeric	None	Perith. Black	Shaded, dry crevices and under overhangs. **Ph. 88.**
Collemopsidium foveolatum	None	Eulittoral in shells	None	Perith. Black	In shells of barnacles, limpets etc. Only black fruits visible. **Ph. 4**
Opegrapha calcarea	White	Xeric to terr.	None	Lirellate Black	In shaded often damp situations. Fruits often in heaps. **Ph. 47.**
Aspicilia cinerea group	White, rusty or grey-brown	Terr.	None	Lecan. Black	On well-lit, nutrient-enriched rocks. **Ph. 15.**
Aspicilia calcarea	White	Terr. Calc.	None	Lecan. Black	Forms large white patches on hard limestone. **Ph. 73.**
Aspicilia leprosescens	Bluish grey	Xeric	None but granular	Lecan. Black	Granular to isidiate. On nutrient-enriched sites. **Ph. 17.**

	Name	Colour	Zone	Soredia	Fruits	Notes
CRUSTOSE	*Halecania ralfsii*	Bluish grey to brown	Mesic	None	Lecan. Dark brown	Areoles domed and worm-like. Often with *L. actophila*. **Ph. 18.**
	Lecania aipospila	Pale brown to purplish	Xeric to halophobic	None but granular	Lecan. Red-brown	Often with granular to isidiate surface to thallus. **Ph. 25.**
	Diploschistes caesioplumbeus	White to grey	Xeric	None	Lecan. Black	On well-lit, nutrient enriched rocks. **Ph. 16.**
	Diplotomma alboatrum	White	Terr. Calc.	None	Lecan./ lecid. Black	If it is found near the coast often *D. chlorophaeum*. **Ph. 77.**
	Porpidia cinereoatra	White to grey	Halophobic to terr.	None	Lecan. Black	Large often pruinose fruits that become domed. **Ph. 81.**
	Pertusaria corallina	White to grey	Terr.	Isidia	Several in a wart	Grey, finger-like isidia may cover the thallus. **Ph. 29.**
	Pertusaria pseudocorallina	Creamy grey	Terr.	Isidia	Several in a wart	Stout, finger-like isidia are brown tipped. **Ph. 30.**
	Ochrolechia parella	White to cream	Xeric to terr.	None	Lecan. Pink	Fruits to 2mm diam. Sugar-like grains on fruit disc. **Ph. 43.**
	Lecanora gangaleoides	White/ pale grey	Xeric to terr.	None	Lecan. Black	Often with white margin. Lichen lumpy. **Ph. 28.**
	Rinodina beccariana	Pale grey to greenish	Xeric to halophobic	None	Lecan. Black	On sheltered rocks and soil. Fruit magins contorted. **Ph. 83**.
	Catillaria chalybeia	Grey, brown to near black	Xeric to terr.	None	Lecid. Black	Very variable, mosaic forming. Domed fruits upto 0.4mm. **Ph.33.**
	Lecanora campestris	White/ pale grey	Xeric to terr.	None. (Soredia very rare)	Lecan. Dark brown	White margin. Lichen lumpy. Fruit discs almost black when very dry. **Ph. 46.**
	Lecanora dispersa	Absent or grey	Xeric to terr.	None	Lecan. Brown	Fruits scattered. Disc often greenish, pruinose. **Ph. 42.**
	Trapeliopsis wallrothii	White to grey	Terr. Soil	Isidia-like warts	Lecan. Brown	On sheltered soil, often under rocks and earth banks. **Ph. 91.**
	Buellia stellulata	Grey to brownish	Terr.	None	Lecid. Black	On well-lit rocks. Fruits numerous, to 0.4 mm diam. **Ph. 19.**
	Buellia subdisciformis	White to pale grey	Xeric	None	Lecid. Black	Fruits may appear lecanorine and up to 1.5 mm. diam. **Ph. 20.**
	Lecanora actophila	White to grey-green	Mesic	None	Lecan. Green-black	On sunny rocks. Fruit to 1mm diam. **Ph. 21.**
	Lecanora helicopis	Grey to brown-grey	Mesic	None	Lecan. Dark brown	Occurs on slightly more shaded sites than *L. actophila* **Ph. 22.**
	Lecanora fugiens	Cream to tan	Mesic to xeric	None	Lecan. Yellow-brown	On well-lit rocks and often in cracks. **Ph. 23.**
	Lecanora rupicola	White to grey	Xeric to Terr.	None. Rarely sorediate	Lecan. White/buff	Fruits often little above the thallus surface. **Ph. 27.**
APPEARS TO BE LEPROSE	*Caloplaca citrina*	Yellow to orange	Xeric to terr.	Granular soredia	Lecan. Orange	Becomes covered in soredia. Frequently fertile. **Ph. 11.**
	Candelariella vitellina	Yellow, orange	Xeric to terr.	None	Lecan. Yellow	Thallus of clumped granules like the top of a cauliflower. **Ph. 34.**
	Aspicilia leprosescens	Bluish grey	Xeric	None but granular	Lecan. Black	Granular to isidiate. On nutrient enriched sites. **Ph. 17.**
	Lecidella scabra	Green to grey	Terr.	Soredia	Lecid. Black	Rarely fertile. Soredia grey-green that become yellow-green when scratched. **Ph. 38.**
	Leprocaulon microscopicum	White to green	Terr. Rock or soil	Sorediate tips	None	Rounded branches to 2mm high. Tipped with soredia. **Ph. 89.**

The main keys include all the species in this book, except those very rare ones for which notes are provided. The fruticose section of the key includes those *Cladonia* species where the podetia are predominant. However, on solid calcareous substrata above the level of heavy spray, try key F (page 64) first but if you do not obtain an identification use the main keys (A to E) below. Similarly with species growing on soil, plant remains or humus, try key G (page 74) first. This second key includes species growing on soil in crevices in calcareous rocks. Finally there is key H (page 80) to species growing directly on sawn wood such as fences, benches or posts. If none of these keys produces a result, refer to the notes on rare species on page 88. These rare species occur mainly on the Channel Islands, Isles of Scilly, the extreme South and in the West, especially N.W. Scotland.

A Field Key to Seashore Lichens using method 3

Synopsis

1. On natural rock, concrete, mortar or weathered wood **2**

– On moss, soil, plant debris and humus, often in rock crevices **Key G** (page 74)
(Other species may rarely occur in these habitats and if no result is obtained, use the main key by going to couplet 4 of this synopsis)

2. On basic stone or mortar and above the tides and heavy spray. *(Substratum reacts to the application of weak acid. See introduction)* **Key F** (page 64)

– On any stone at any level of the shore or on wooden fences and posts. *(This key also includes the basic stone species in key F above and should be used if the stone is acid or cannot be determined or the above 'basic stone' key does not give a result)* **3**

3. . On wooden structures such as fences, seats, gates and wooden posts including those that may be partially immersed at times by the tide. **Key H** (page 80)
(If no result is obtained, use the main key by going to couplet 4 of this synopsis)

– On stone at any level of the shore **4**

Main Keys

4. *Fruticose*: bushy lichens (Fig. 1) or *Cladonia* species (Fig. 2) where the podetia predominate *or*
foliose: leafy lichens (Fig. 3) or squamulose (Fig. 4) **5**

– *Crustose*: firm crust-like lichens (Fig. 5)
or almost without structure and powdery (Fig. 6) **7**

Fig. 1. Fruticose lichen (*Ramalina* sp.) x1

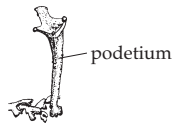


Fig. 2. *Cladonia* showing fruticose podetium x2

Fig. 3. Foliose lichen (*Parmelia* sp.) x2

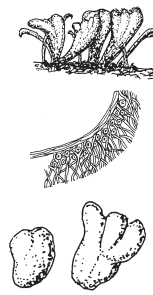


Fig. 4. Squamules x4 (top).
Section through squamule showing lack of lower cortex x25 (centre)
Squamules on *Agonimia tristicula* x10 (bottom)

5. *Fruticose*: bushy lichens, erect or pendent from base (Fig. 1)
No rhizines (Fig. 3)
Key A – Fruticose or fruiting *Cladonia* (page 32)

– *Foliose*: leafy lichens removable from the substratum.
Often with rhizines on underside *or*
Squamulose: lower surface lacking a cortex and which is white or very pale yellow, matt, never glossy, and usually without rhizines. Squamules 0.3–25 mm long (Fig. 4) **6**

Fig. 5. Crustose species x2. These lichens may, or may not, have a coloured margin.

6. **Key B – Foliose** (page 35)

– **Key C – Squamulose** including leaf-like *Cladonias* (page 40)

7. Crustose: crust-like and cannot be easily removed from the substratum (but may have lobe-like margins – Placodioid, Fig. 7) **Key D – Crustose** (page 42)

The crustose key starts on this page but it is possible to shorten the search process by going directly to the first section or subsection that fits your specimen.

SECTION 1: Occurs around or below high water mark (page 42)
SECTION 2: Above H.W.M. and with perithecia or lirellate apothecia (page 42)
SECTION 3: Above H.W.M. and with non lirellate apothecia (disc-like) or sterile (page 45)

- 3(a) Placodioid (page 45)
- 3(b) Thallus yellow, yellow-green or orange (page 46)
- 3(c) Sorediate, isidiate or a granular crust (page 48)
- 3(d) Not sorediate isidiate or a granular crust but may be absent or consist of scattered granules (page 51)
  - 3(d/i) Any part C+ orange, red or yellow (page 51)
  - C(d/ii) Cortex, medulla, soredia or fruits K+ yellow, orange, red crimson or violet (page 53)
  - C(d/iii) All parts K–, C– (page 56)

– *Leprose*: powdery lichens, more or less without any under-lying structure (Fig. 6)
Key E – Leprose or appear leprose (page 61)

Fig. 6. Leprose lichen (*Lepraria* sp.) x12

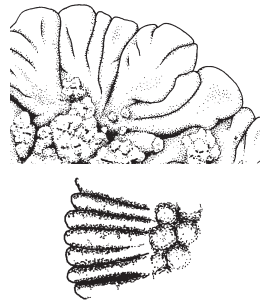


Fig. 7. Placodioid lichens
Above: Edge of wide-lobed placodioid lichen (*Diploicia canescens* x4)
Below: Part of the edge of a crustose, placodioid lichen (*Caloplaca* sp.) x4

Key A – Fruticose

1. Contains a central core if main stem or branch is pulled (*Usnea*) (Fig. 8) **2**
– No central core **7**

2. Thallus of very swollen 'sausages' between a visible core often unattached to substratum **Usnea articulata** (Figs.8 and 9)
– Thallus not very swollen, no visible core. Attached at base **3**

3. Black on and just above holdfast (Fig.10) **4**
– Not black at base **5**

4. Branches constricted where they join the main stem (Fig.11) **Usnea fragilescens**
– Branches not constricted at junction with main stem **Usnea subfloridana**

5. Main branches angular in section, ridged, pitted and covered in long, thin isidia **Usnea hirta**
– Main branches rounded, not covered in long isidia **6**

6. Branches constricted where they join the main stem (Fig.11) No pale annular rings (Fig. 12). Olive-green **Usnea cornuta**
– Branches not constricted at junction with main stem. Often with pale annular rings. Yellow-green to green **Usnea flammea** (Ph. 84)

7. Thallus completely orange, brown or black **8**
– Thallus green, yellow-green, grey, white or patchy brown **12**

8. Occurs below to just above high-tide mark **9**
– Occurs in halophilic region or above (Illus. 3) **10**

9. Thallus to 1 cm high, lobes flattened. Below High Water Mark **Lichina pygmaea** (Ph. 5)
– Thallus to 5 mm high, lobes rounded in section. Usually around high-tide mark **Lichina confinis** (Ph. 7)

10. Thallus orange (rare, no collecting) **Teloschistes flavicans** (Ph. 63)
– Thallus brown [branches to 1 mm diam.] **11**

11. Thallus matt, often smoky brown. Branches not flattened, up to 1 mm diam. Pale soredia in splits **Bryoria fuscescens** (Fig.12a)
– Thallus glossy rather flattened. Elongated white marks in depressions. Branches tipped with short spines **Cetraria aculeata**

12. Thallus mauvish grey (rare species, do not collect) **13**
– Thallus green, white to grey, may be brown in parts **14**

13. Thallus strap-like. Soredia C+ red **Roccella fuciformis**
– Thallus finger-like. Soredia C– **Roccella phycopsis** (Ph. 64 Fig.13)

14. Main stems brownish with numerous short, fine, finger-like, not flattened, side branches **Sphaerophorus globosus**
– Various colours. Not with numerous finger-like branches **15**

15. To 3 mm tall. Tips covered with green soredia (if tips brown fruited see also Couplet 46) **Leprocaulon microscopicum** (Ph. 89)
– Taller than 3 mm. With or without soredia **16**

16. Fruiting body stalks hollow, often growing from granules or squamules on the substratum or unattached (*Cladonia* group). **17**
– If present, fruiting body stalks solid (may be hollow just near the tip). Thallus attached to substratum **44**

Fig. 8. *Usnea* showing central core x4

Fig. 9. *Usnea articulata* x1

Fig. 10. Black holdfast x5

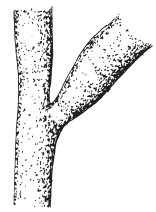


Fig. 11. Constriction at branch joint x7

Fig. 12. Annular rings on *U. flammea*

Fig. 12a. *Bryoria fuscescens* x3

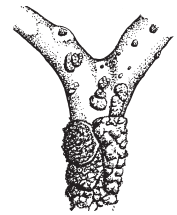


Fig. 13. Soredia on *Roccella phycopsis* x3

17. Red tipped podetia **18**
– Brown tipped or no coloured tips to podetia **20**

18. Podetia cup-shaped, yellow-green **Cladonia diversa** (Fig. 14)
– Podetia not cup-shaped, grey to green **19**

19. Podetia squamulose to granular, usually K–
C. floerkeana (Fig. 15, Ph. 92))
– Podetia partially sorediate, K+ yellow **C. macilenta**

20. Thallus not attached to substrata. Separate tubes or an interwoven mat of podetia, may be interwoven in plants **21**
– Thallus attached to ground at one end. Podetia, sparsely or not branched, may have a cup at tip **27**

21. Thallus cream to greenish. Little or not branched **C. uncialis.**
– Podetia white, grey, green or going greenish when wet. Richly branched **22**

22. Podetia white, grey or going slightly greenish when wet. **25**
– Podetia green, green-brown or grey-green. Colour frequently patchy on a white base colour **23**

23. Podetia with a cottony surface (use hand-lens), tips bent in one direction **Cladonia rangiferina**
– Podetia not cottony, tips not bent in one direction **24**

24. Podetia with 'islands' of green alga **C. rangiformis** (Fig. 24)
– Podetia with more or less continuous alga and white warts
C. furcata subsp. **subrangiformis**

25. White to pale grey. Branches not bent over in one direction
C. portentosa
– Grey to brown-grey. Branches bent over in one direction **26**

26. Tips purple tinged and with only the tips bent over **C. ciliata**
– Tips not purple and branches stongly bent over **C. arbuscula**

27. Podetia terminate in a wide cup **28**
– Podetia do not terminate in a definite cup **35**

28. Podetia antler-like with long extensions to cups (Fig. 16) **29**
– Podetia with no, or very short, extensions to cup rims **30**

29. Podetia, slender, yellowish to grey-green **C. subulata** (Fig. 16)
– Podetia in tiers, brown-grey to olive-green **C. crispata** (Fig.17)

30. Podetia narrow and may expand just below the tip (Fig.18) **31**
– Podetia expand from the base (Fig. 20) **32**

31. Podetia to 6 cm tall. Green-brown to brown **C. gracilis** (Fig. 18)
– Podetia to 1.5 cm tall. Green **C. fimbriata** (Fig. 19)

32. K+ yellow. Finely sorediate **C. humilis** (Fig. 20)
– K–. Granular soredia, corticate granules or squamules **33**

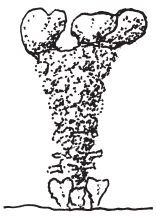


Fig. 14. *Cladonia diversa* x3

Fig. 15. *Cladona floerkeana* x3

Fig. 16. *Cladonia subulata* x3

Fig. 17. *Cladonia crispata* x3

Fig. 18. *Cladonia gracilis* x3

Fig. 19. *Cladonia fimbriata* x3

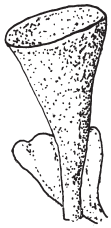


Fig. 20. *Cladonia humilis* x3

33. Podetia with medium soredia **C. chlorophaea**
– Podetia with corticate granules to squamules **34**

34. Basal squamules form rosettes. [Only calc. soils] **C. pocillum**
– Basal squamules not in rosettes **C. pyxidata** (Ph. 94)

35. Podetia with numerous squamules **36**
– Podetia not squamulose except sometimes near base **38**

36. Thallus K+ yellow **C. squamosa**
– Thallus K– (*C. gracilis* Fig. 18 may terminate in a point) **37**

37. Squamules break off easily when dry. No slit in side **C. ramulosa** (Fig.21)
– Squamules flexible. Podetia usually with slit in the side **C. glauca**

38. Thallus K– (but see also couplet 43) **39**
– Thallus K+ yellow or yellow turning red **40**

39. Podetia not sorediate and usually forked **C. furcata** (fig. 22, Ph. 95)
– Podetia sorediate, not forked **C. coniocraea** (Fig. 23)

40. K+ yellow turning red. To 1 cm tall **Cladonia symphycarpia**
– Persistently K+ yellow **41**

41. Podetia white or pale brown, tooth-like, fragile. To 1.5 cm tall, little branched. Granular basal thallus **Pycnothelia papillaria**
– Podetia pale grey, green, green-brown or grey-green. To 10 cm tall, much branched **42**

42. Podetia with a cottony surface (use hand-lens), tips bent in one direction **Cladonia rangiferina**
– Podetia not cottony, tips not bent in one direction **43**

43. Podetia with 'islands' of green alga **C. rangiformis** (Fig. 24)
– Podetia with more or less continuous alga and white warts (sometimes K–) **C. furcata** subsp. **subrangiformis**

44. Fruits pink to brown on short, white stalks or stalks with numerous flattened, button-shaped plates (phyllocladia) **45**
– Fruits absent or greenish. No phyllocladia (*Evernia*, *Ramalina*) **47**

45. To 3 cm high with phyllocladia **Stereocaulon vesuvianum**
– To 6 mm with no phyllocladia **46**

46. To 6 mm high with pink fruits on tip **Dibaeis baeomyces**
– To 4 mm high with brown fruits on tip **Baeomyces rufus** (Fig.25)

47. Sorediate or isidiate when mature, normally infertile **48**
– Lacking soredia but may have granules, frequently fertile **54**

48. Soralia marginal or laminal, not in inflated lobe tips **49**
– Lobe tips inflated and split to reveal soredia **Ramalina canariensis** (Fig. 26)

49. Undersurface green **50**
– Undersurface mainly white (actually foliose) **Evernia prunastri**

50. Soralia oval, marginal and ulcer-like **53**
– Soralia irregular, laminal and marginal **51**

51. Soredia small and fine **52**
– Coarse soredia on the surface of lobes **Ramalina polymorpha**

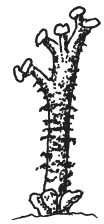


Fig. 21. *Cladonia ramulosa* x3

Fig. 22. *Cladonia furcata* x3

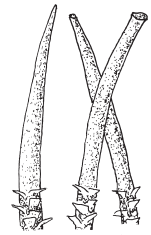


Fig. 23. *Cladonia coniocraea* x3

Fig. 24. *Cladonia rangiformis* x3

Fig. 25. *Baeomyces rufus* x4

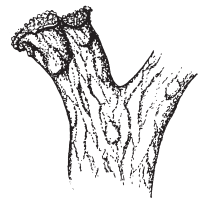


Fig. 26. Lobe tip of *Ramalina canariensis* x5

52. Lobes to 1 cm wide with ridges **Ramalina lacera** (Fig.27)
– Lobes to 0.5 cm wide without ridges **Ramalina pollinaria**

53. Grows from a single basal holdfast **Ramalina farinacea** (Fig. 28)
(*If lobes hollow probably* **Ramalina portuensis.** Rare. Occurs in west)
– Grows from a multiple base, forming swards
R. subfarinacea (Ph. 54)

54. Thallus medium to dark green with granules in and around pseudocyphellae. (Mainly S.W. Wales) **Ramalina polymorpha**
– Thallus grey-green to yellow-green, without granules **55**

55. Erect or slightly pendent. Branches flattened, seldom blackened at base and often ridged. Pycnidia tips pale
Ramalina siliquosa (Ph. 53)
(*S. W. England, lobes only 0.1–0.3 mm diam.* **R. chondrina)**
– Pendent, smooth and not much flattened. Pycnidia tips black
Ramalina cuspidata

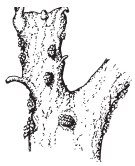


Fig. 27. Lobe tip of *Ramalina lacer*a x5

Fig. 28. *Ramalina farinacea* x5

Key B – Foliose Lichens

1. Thallus foliose (Fig. 3). Lower surface firm with a lower cortex which is frequently dark and may have rhizines (Fig. 29) **2**
– Thallus squamulose (Fig. 4). Lower surface matt, no lower cortex. Pale without rhizines. Thallus often fixed firmly to the substratum in the centre Key C page 40

2. Thallus orange (at least in parts) or greenish orange **3**
– Thallus any other colour including shade of brown **8**

3. Lobe tips up to 7 mm wide. Thallus to 15 cm diam. **4**
– Lobe tips only up to 2 mm wide. Thallus to 6 cm diam. **5**

4. Knobby outgrowths 0.1–0.7 mm diam. near centre. Few or no fruits **Xanthoria calcicola**
– No knobby outgrowths. Usually very fertile with fruits to 4 mm diam. (Fig. 30) **Xanthoria parietina** (Ph. 56)

5. Lobes leaf-like, becoming upright, fan-like with powdery soredia on frilly tips. Not fertile **Xanthoria ucrainica** (Ph.58)
If lobes almost round in section, not fan shaped, probably **X. candelaria**
– Lobes adpressed, not sorediate. Often fertile **6**

6. Lobes small, overlapping, yellow-orange. Many fruits to 4 mm diam, usually covering the small thallus **Xanthoria polycarpa**
– Lobes long, radiating, little overlapping. Sometimes fertile **7**

7. Lobes flat, yellow to orange. Lobe tips to 2 mm wide. Infrequently fertile, fruits to 4 mm diam. **Xanthoria aureola** (Ph. 57)
– Lobes convex, bright, deep orange. Lobes 0.5–1 mm wide. Sometimes with fertile fruits to 1.5 mm diam. **Xanthoria elegans**

8. With marginal eyelash-like cilia (Fig. 31). Strap-like. Thallus pale grey to pale brownish grey. (Spores brown 1-septate) **9**
– No long marginal eyelash-like cilia. Strap-shaped or not **14**

9. Lobes 1–5 mm wide. Lobe tips not swollen. Sorediate or not **10**
– Lobes 0.3–1 mm wide. Swollen, sorediate lobe tips *or* the back of the lobe tips have powdery soredia **13**

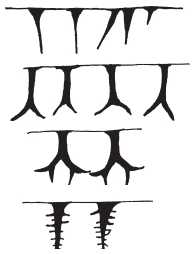


Fig. 29. Some types of rhizines

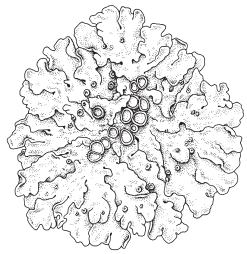


Fig. 30. *Xanthoria parietina* x1

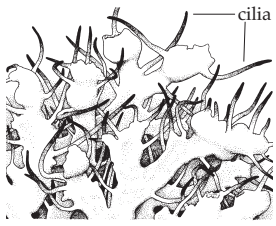


Fig. 31. *Physcia tenella* x1

10. Sorediate lobe tips [lower surface matt] **Heterodermia obscurata**
(*if lower surface smooth and often shiny [Occurs on The Lizard, Cornwall.] Both species rare. No collecting* **Heterodermia speciosa**)
– Not sorediate **11**

11. Thallus K+yellow, medulla K– [very fertile] **Physcia leptalea**
– Thallus K–, medulla K– or K+ yellow turning red **12**

12. Medulla K–. Thallus usually up to 5 cm diam. **Anaptychia ciliaris**
(*If darkish grey to brown-grey, occurs in xeric-supralittoral* **Anaptychia ciliaris** subsp. **mamillata**)
– Medulla K+ yellow turning red. Thallus up to 15 cm diam. **Heterodermia leucomela**

13. Lobe tips swollen, helmet-shaped, bursting open to reveal powdery soredia (Fig. 32) **Physcia adscendens**
– Lobe tips not swollen, lip-shaped with powdery soredia on back surface of lobe tip (Figs. 31 and 33) **Physcia tenella** (Ph. 50)

14. Thallus papery when dry, swollen when wet, dark brown to green-black **15**
– Thallus not swelling noticeably when wet, colours various **26**

15. Lobes with wart-like, globose (Fig. 34, but see also couplet 25), flattened (Fig. 35) or finger-like minute outgrowths (isidia), **16**
– Lobes without isidia or wart-like growths **23**

16. Wart-like outgrowths on lobe surfaces **17**
– Minute, finger-like or flatttened or globose isidia on lobes **18**

17. Lobes ridged and adpressed **Collema nigrescens**
– Lobes smooth, not adpressed **Collema cristatum** var. **cristatum**

18. Isidia become flattened when mature (Fig. 35) **Collema crispum**
– Finger-like (coralloid Fig. 36) or globose isidia **19**

19. Isidia coralloid **20**
– Isidia globose **22**

20. Lobes to 1.5 cm wide , grey-black with ridges **C. furfuraceum**
– lobes to 2 mm wide, dark red-brown, no ridges **21**

21. Thallus upright tufts to 5 mm high, 1 mm wide, dividing near the base. Often granular isidate **Leptogium schraderi**
(*If with rather globose isidia and fertile probably* **L. turgidum**)
– Thallus lobes to 1 mm long. Isidia to 0.1 mm diam. **L teretiusculum**

22. Lobes ridged, adpressed. Usually fertile **Collema nigrescens**
– Lobes not ridged, erect. Rarely fertile **Collema auriforme** (Ph. 70)
(*If lobes to 2 mm wide, concave and not wrinkled when dry, probably* **Collema cristatum** var. **marginale**)

23. Blue-grey when dry. Rarely fertile **Leptogium britannicum**
– Green-brown to brown or greenish black. Usually fertile **24**

24. Lobes convex and rounded. Richly and repeatedly branched and fragile, often fan shaped **Collema multipartitum**
– Lobes not repeatedly branched **25**

25. Lobes erect, dominant, often with ragged tips. Fruits with brown discs to 2 mm diam. **Leptogium gelatinosum**
– Lobes in rosettes (very rarely with globose isidia). Fruits numerous, orange discs to 3 mm diam. **Collema tenax** (Ph. 71)

Fig. 32. Lobe tip of *Physcia adscendens* x7

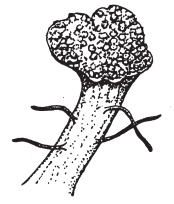


Fig. 33. Lobe tip of *Physcia tenella* x6

Fig. 34. Globose isidia x15

Fig. 35. Flattened isidia x 15

Fig. 36. Coralloid isidia x10

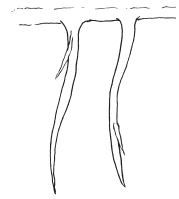


Fig. 37. Rhizines of *Peltigera praetextata* x5

26. Lower surface felt-like and/or with depressions or veins **27**
– Lower surface not felt-like and without prominent veins **38**

27. Medulla K+ yellow-orange **Lobaria pulmonaria**
– Medulla K– or K+ purple **28**

28. Lower surface felt-like all over and dark bluish grey **29**
– Lower surface with a coarse network of brown or white veins and rhizines (Fig. 29), not dark bluish grey. Fruits on upper surface of lobe tips **(*Peltigera*) 31**

29. Thallus with isidia **30**
– Thallus lacking isidia **Degelia plumbea**
(If with concentric ridges and dips. **Delelia cyanoloma)**

30. Globose (Fig. 34) to coralloid isidia (Fig. 36) **Degelia atlantica**
– Flattened (Fig. 35) to spoon shaped isidia **Degelia ligula**

31. Thallus with flattened isidia (Fig.36) on lobe margins or along cracks in the thallus. Rhizines as Fig. 37 **Peltigera praetextata**

– Thallus without isidia, with or without soredia **32**

32. Thallus with soredia. Rhizines as Fig. 38 **Peltigera didactyla**
– Thallus without soredia. Rhizines various **33**

33. Fruits longer than broad (Fig. 39). Thallus not bullate (Fig. 40) **34**
– Fruits wider than long (Fig. 41) (often absent). Thallus bullate **36**

34. Lobes to 1 cm wide. Upper surface tomentose **Peltigera didactyla**
– Lobes to 2 cm wide. Upper surface matt **35**

35. Thallus without cracks. Tan coloured veins **Peltigera hymenina**
– Thallus with cracks on upperside. Dark veins **Peltigera neckeri**

36. Lobes to 3 cm wide. Strongly bullate (Fig. 40) **37**
– Lobes to 1 cm wide. Slightly bullate (Usually on calcareous substrata) **Peltigera rufescens**

37. On mosses and rocks. Rhizines as Fig. 42 **Peltigera membranacea**
– Mainly on sandy soils. Rhizines as Fig. 43 **Peltigera canina**

38. Medulla yellow to orange, K+ purple (*Nephroma* species) **39**
– Medulla white, K– or K+ yellow to red **40**

39. No minute leaf-like outgrowths (folioles) **Nephroma laevigatum**
– Abundant folioles on lobes **Nephroma tangeriense**

40. Lobes hollow (visible if lobe is split) (Fig. 44 *Hypogymnia*) **41**
– Lobes solid **42**

41. Soredia on lower surface of upturned lobe tips (Fig. 45) that have split open **Hypogymnia physodes** (Ph. 85)
– Soredia on tips of finger-like lobes (Fig. 46) **Hypogymnia tubulosa**

42. Attached to substratum only by a single or central holdfast, or along the lower edge of erect lobes. No or very few rhizines **43**
– Attached to substratum over much of lower surface with or without rhizines **46**

43. Thallus leafy, wavy, erect, grey-green to brownish, lower suface brown and becoming white towards the lobe margin **Platismatia glauca**
– Thallus plate-like or strap-like, grey or green above **44**

44. Thallus, grey, rigid and plate-like (Fig. 47). Under-surface tan **Dermatocarpon miniatum** (Ph. 69)

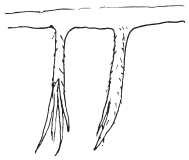


Fig. 38. Rhizine of *Peltigera didactyla* x5

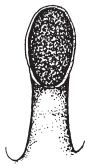


Fig. 39. Vertical fruits x 4

Fig. 40. Bullate thallus showing bulges or depressions x5

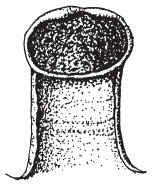


Fig. 41. Horizontal fruits x5

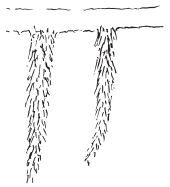


Fig. 42. Rhizines of *Peltigera membranacea* x5

Fig. 43. Rhizines of *Peltigera canina* x5

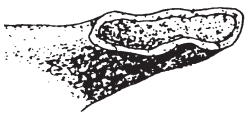


Fig. 44. Hollow lobe of *Hypogymnia*

– Thallus strap-like, not rigid. Under-surface white or black **45**

45. Thallus green, white to patchy green under-surface. No isidia but, in mature specimens, granular soredia **Evernia prunastri**
– Thallus grey, under-surface white or black. Dense coralloid isidia in mature specimens **Pseudevernia furfuracea**

46. Dry thallus grey, green, green-grey or yellow-grey **47**
– Dry thallus shades of yellow-brown, brown or brown-grey **70**
(If greenish yellow to brown-green with pruinose margins, it is the squamulose **Squamarina cartilaginea** (Ph. 68)

47. Dry thallus green, green-grey, apple-green or yellow-grey **48**
– Dry thallus grey **51**

48. Dry thallus yellow-grey. Lobe to 3 mm wide. Isidia or fine soredia present **49**
– Dry thallus apple-green to green-grey (almost grey in shade). Lobes to 1 cm wide. Coarse or fine soredia present **50**

49. Lobes overlapping, often shiny. Numerous coralloid isidia present (Fig. 48) **Xanthoparmelia conspersa**
– Lobes in radiating rosette darker in centre with globose soralia containing powdery soredia. **Xanthoparmelia mougeotii**

50. Medulla K+ yellow turning red (Fig.49) **Flavoparmelia soredians**
– Medulla K– **Flavoparmelia caperata** (Ph. 51)

51. Thallus with fine or coarse isidia or lobules (Fig. 50) **52**
– Thallus with or without soredia but no isidia or lobules **57**

52. Thallus with minute, black, bun-shaped isidia (Fig. 51) **Parmelina pastillifera**
– Isidia or lobules, if present, not black and bun-shaped **53**

53. Lobes with black cilia on surface *or* pale dots and lines (Fig. 52) **54**
– Lobes lacking black cilia or pale dots and lines **55**

54. Thallus surface with cilia and isidia **Parmotrema crinitum**
– Thallus surface with minute coralloid isidia (Fig. 48) often growing from cracks. No black cilia **Parmelia saxatilis** (Ph.55)

55. K–. With persistent small lobules on surface **Physconia distorta**
– K+ yellow. Isidia or lobules that may break down to soredia **56**

56. Lobes adpressed. Wart-like isidia in centre **Physcia clementei**
– Lobes rather erect. Globular isidia **Physcia tribacia** (Ph. 79)

57. Cortex and/or medulla (Fig. 49) K+ yellow, orange or red **58**
– Cortex and medulla K– **65**

58. Undersurface pale to tan **59**
– Undersurface brown to black **62**

59. Adpressed. Often with faint, pale dots on lobes when wet **60**
– lobe tips ascending. No pale dots **Physcia dubia**

60. Not sorediate. Usually very fertile **Physcia aipolia**
– Sorediate. Rarely fertile **61**

61. Blue-grey, often blue flecked soredia. Lobes with minute pale dots (more obvious when wet, use a hand-lens) **Physcia caesia**
– Pale grey soredia, never blue flecked. No pale dots. (Very rare. Do not collect) **Physcia tribacioides**

62. Lobes with white lines or dots (Fig. 52) *or* a very fine, faint, white network over the lobe (use hand-lens) **63**


Fig. 45. Lobe of *Hypogymnia physodes*


Fig. 46. Lobe of *Hypogymnia tubulosa*


Fig. 47. Central holdfast of *Dermatocarpon* x2


Fig. 48. Coralloid isidia x10

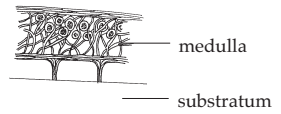


Fig. 49. Position of medulla


Fig. 50. Lobular isidia x10


Fig. 51. Isidia of *Parmelina pastillifera* x10


Fig. 52. Lobe tip showing white marks

– Lobes without distinct white marks **Parmotrema perlatum** (Ph. 62)

63. Not sorediate. Thallus brown but may look grey due to numerous pale pale dot and lines **Parmelia omphalodes**
– Sorediate. Thallus grey to green-grey **64**

64. Soredia arising from white lines and dots **Parmelia sulcata**
– Soredia on tips and edges of lobes **Parmotrema reticulatum**

65. Medulla C– **66**
– Medulla C+ orange to red **67**

66. Coarse pruina on lobes. Lower surface pale **Physconia grisea**
– No coarse pruina on lobes. Lower surface black **Phaeophyscia orbicularis** (Ph. 74)

67. Lobes with pinhead white areas on lobes that become sorediate **Punctelia subrudecta**
– Lobes without pinhead-like white areas becoming sorediate **68**

68. Medulla C+ orange **Hypotrachyna laevigata**
– Medulla C+ red **69**

69. Lobe tips turn up. Soredia blue-black **Hypotrachyna britannica**
– Lobe tips turn down. Soredia light or dark grey **Hypotrachyna revoluta** (Ph. 86)

70. No soredia or isidia (but may have lobules; couplet 72) **71**
– With soredia or isidia in mature specimens **75**

71. Lobes 0.3 to 2.5 mm wide **72**
– Lobes wider up to 6mm **73**

72. Thallus grey-brown, pruinose often with lobules in centre **Physconia distorta**
– Thallus brown, whitish in shade and green when wet, not pruinose nor with lobules **Anaptychia runcinata** (Ph. 52)

73. Thallus with numerous pale pale dots and lines (Fig. 52) **Parmelia omphalodes**
– Thallus without pale dots or lines **74**

74. Thallus yellow-brown to pale brown **Xanthoparmelia delisei** (Ph. 61)
– Thallus reddish brown to dark brown **Xanthoparmelia pulla** (Ph. 60)

75. Thallus rather erect. Lower surface paler towards the centre **Tuckermanopsis chlorophylla**
– Thallus adpressed. Lower surface not paler to the centre **76**

76. Lobes to 2 mm wide **77**
– Lobes wider to 6 mm **78**

77. Lobes only 0.05 mm to 0.3 mm wide with upturned tips. Underside pale **Phaeophyscia nigricans**
– Lobes 1–2 mm wide, rather flat and spread out. Underside dark **Phaeophyscia orbicularis** (Ph.74)

78. Isidia coralloid (Fig. 48), often covering the surface which can give it a velvety appearance **Melanelixia fuliginosa**

(M. fuliginosa *is very dark brown. If it is yellow-brown to green-brown it is probably* **M. glabratula**)

– Isidia coarse in clumps or spread out becoming sorediate **79**

79. Isidia breaking down to coarse soredia leaving white to pale yellow mark where abraded **Melanelixia subaurifera**
– Isidia persistent, in clumps or spread out, rarely abrading **80**

80. Isidia rather globose, in clumps (Fig. 53)
Xanthoparmelia loxodes (Ph. 59)
– Isidia coarse, spread out to cover the surface or in clusters
Xanthoparmelia verruculifera

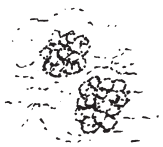


Fig. 53. *Xanthoparmelia loxodes* isidia x8

Key C – Squamulose lichens (Figs. 54 and 55)

1. Thallus C+ red or K+ purple or red or yellow **2**
– Thallus C– and K– **10**

2. Thallus C+ red **3**
– Thallus C– and K+ purple *or* red *or* yellow to deep orange **4**

3. Thallus of 1–2 mm diam. squamules often overlapping with sorediate margins. Brown-grey to green-brown
Hypocenomyce scalaris (Fig. 55a)
– Thallus crust-like, almost areolate and reddish brown
Acarospora fuscata

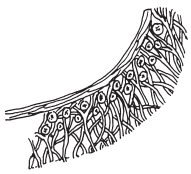


Fig. 54. Cross section of squamule x10

4. Thallus (upper or lower surface) K+ very pale yellow to deep orange. Thallus grey to green **5**
– Thallus K+ red/purple. Thallus cream-brown, yellow or orange **8**

5. Thallus K+ faint yellow. Thallus adpressed, of minute swollen squamules to 0.5 mm wide, usually with bluish grey sorediate tips **Solenopsora vulturiensis** (Ph. 87)
– Lower surface K+ yellow or yellow turning red. Lobes upright at least at tips, not sorediate (Fig. 55) **6**

Fig. 55. *Cladonia* squamules x5

6. Lower surface white **7**
– Lower surface pale grey-violet **Cladonia firma**

7. Lower surface K+ yellow **Cladonia subcervicornis**
– Lower surface K+ yellow turning red **Cladonia symphycarpia**

8. K+ purple. Thallus yellow to bright orange **9**
– K+ red. Thallus cream-brown to yellow-green
Acarospora smaragdula

Fig. 55a. *Hypocenomyce scalaris* squamules x5

9. Thallus of minute squamules to 2 mm long, often growing on *Verrucaria maura* **Caloplaca microthallina** (Ph. 9)
– Thallus to 3 cm diam. Often with white abraded patches on the thallus. On calcareous soils **Fulgensia fulgens** (Ph. 96)

10. Thallus grey, grey-green or almost black **11**
– Thallus white, creamy, yellow, green, green-brown, brown, pink-brown or red-brown **14**

11. Black felted layer (hypothallus) visible under and around squamules. Thallus grey to black
Vahliella (Fuscopannaria) leucophaea
– No black hypothallus. **12**

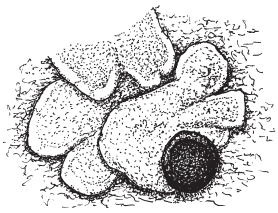


Fig. 55b. *Bilimbia lobulata* x8

12. Thallus of convex squamules to 4 mm diam., grey to greenish grey, not paler at edges but may be very white pruinose **13**
– Thallus of flattish, grey squamules 0.2–1 mm wide, with darker centres and paler edges **Bilimbia lobulata** (Fig.55b)

13. Squamules with paler dots and no regular fissures. Apothecia to 1.5 mm diam. **Toninia aromatica** (Ph. 41)
– Squamules without paler dots but with regular fissures. Apothecia to 3.0 mm diam. **Toninia sedifolia** (Ph. 93)

14. Thallus attached with rhizines or felted hyphae **15**
– Lower surface not attached by rhizines or felted hyphae **20**

15. Attached by rhizines. Thallus brown to red-brown **16**
– Attached directly to substratum. Various colours **17**

16. Perithecia 0.2–0.4 mm diam., immersed in thallus (spores muriform) **Endocarpon pusillum**
– Apothecia to 0.8 mm diam., sitting on the surface of the thallus (spores 1-septate) **Solenopsora holophaea**

17. Perithecia to 0.5 mm diam, immersed in thallus **18**
– Apothecia to 1.5 mm diam, not immersed in thallus **19**

18. Squamules to 2 mm wide. Brown with a dark margin and usually white pruinose. Undersurface dark **Catapyrenium cinereum**
– Squamules to 5 mm wide. Buff to brown with no dark margin, not pruinose. Undersurface pale **Placidium squamulosum**

19. Thallus pinkish brown with pale pruina **Psora decipiens**
– Coffee to dark brown, not pruinose **Romjularia lurida** (Ph. 78)

20. Thallus of more or less upright or detached squamules (*Cladonia* Figs. 54 and 55). Lower surface pale **21**
– Thallus of rather flattened squamules. Attached by lower surface. Colour of lower surface variable **23**

21. Thallus of clumps of grey-green squamules to 5 mm high **Cladonia cervicornis** (Ph. 90)
– Thallus of yellowish green squamules to 2 cm long **22**

22. Squamules to 2 cm long. (Fig. 55c) **Cladonia convoluta**
– Squamules to 1 cm long **Cladonia foliacea** (Ph. 72)

23. Thallus tan, yellow to yellow-green or green **24**
– Thallus brown, pinkish, red-brown, green-brown, grey, grey-green **25**

24. Thallus almost areolate, yellowish brown to creamy green. Not pruinose. Fruits to 0.3 mm diam. **Acarospora smaragdula**
– Thallus very squamulose, yellow-green to brownish. Lobe tips pruinose. Fruits to 3 mm diam. **Squamarina cartilaginea** (Ph. 68)

25. Thallus of grey to grey-green almost circular squamules 1–5 mm diam often sorediate. (Fig. 55d) **Normandina pulchella**
– Thallus brown to green- or red-brown. Never sorediate **26**

26. Thallus green-brown. Squamules to 2 mm wide. Up to 6 perithecia in each squamule **Placidiopsis custnanii**
– Thallus shades of brown from fawn to red-brown (much greener when wet) rather areolate or almost granular **27**

27. Squamules to 0.3 mm long (Fig.56). Perithecia rare but may be between the squamules (spores muriform) **Agonimia tristicula**
– Squamules to 5 mm long. Apothecia ± immersed in centre of squamules. (Spores minute, simple). (*Acarospora:* it is difficult to separate some of these species without experience) **28**

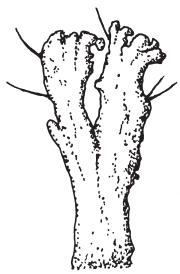


Fig. 55c. *Cladona convoluta* x3

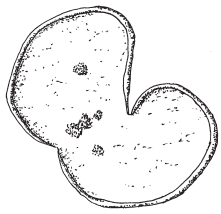


Fig. 55d. Squamule of *Normandina pulchella* x15

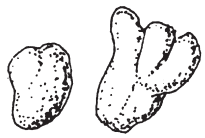


Fig. 56. Squamules of *Agonimia tristicula* x30

28. Squamules angular and interlocking. Dark red-brown **Acarospora impressula**
– Squamules more rounded pale brown to red-brown **29**

29. Thallus brown. Areoles form a smooth crust becoming thinner at the edge **Myriospora (Acarospora) rufescens**
– Thallus red-brown to dark brown areoles dispersed often following cracks in the substratum **Acarospora veronensis**

Key D – Crustose

Key D – Section 1. Occurs around or below high water mark

1. Occurs up to about High Water Mark or slightly above. Fruits are perithecia (Fig. 57, 60). The species at the top of this zone may vary. (If unsuccessful try Key D - Section 2, below) **2**
– Occurs above H.W.M. Fruit types various **Key D - Section 2**

2. Only minute black perithecia visible on barnacles, limpets etc. Spores (one-septate) **Collemopsidium foveolatum** (Ph. 4) (*There are other* ***Collemopsidium*** *species but these are difficult to separate in the field*)
– Thallus green, grey or black (*Verrucaria* simple spores) **3**

3. Thallus black, **4**
– Thallus grey-green, green, brown-green or brown **5**

4. Thallus, cracked, often looks like tar. Above and just below H.W.M. No, or black prothallus **Hydropunctaria maura** (Ph. 6)
– Thallus with fine ridges (use hand-lens), almost lobate, no, or brown prothallus, Around H.W.M. **Hydropunctaria amphibia**

5. Thallus to 1 mm thick grey-green to olive-green with a white prothallus **Verrucaria mucosa** (Ph. 1)
– Thallus thin, various colours, black or no prothallus **6**

6. Bright or dark green with numerous black dots and ridges. No prothallus. Perithecia often lop-sided **Verrucaria striatula** (Ph. 3)
– Olive to brown-green or brown. Few or no raised dots. No, or black prothallus. perithecia, regular and conical **7**

7. Dark brown, gelatinous, with tiny black, fragile isidia-like growths. (Spores kidney-shaped or with a flat side) **V. ditmarsica**
– Olive to brownish green. Few raised dots (spores oblong-ellipsoid) **Verrucaria halizoa** (Ph. 2) (*If spores 1-septate probably* **Collemopsidium elegans**)

Key D – Section 2. Above H.W.M. and with perithecia or lirellate apothecia

1. Fruits hard, black, flask-shaped (Figs. 57, 60, 61) and with minute central opening often visible *or* writing-like, much longer than wide, (Fig. 63) but may be in rounded heaps (Fig. 65a) **2**
– Fruits disc- or button-shaped (may be very small) (***apothecia*** Figs. 58, 59), various colours including black. No minute central opening unless in a wart-like swelling (Fig. 62), *if fruits are absent try this split first* **Key D - Section 3.** (page 45)

2. Fruits flask-shaped with small, central opening (use hand-lens) (***perithecia*** Figs. 57 and 60). May only be visible as small, dark swellings on the surface of the lichen **3**
– Fruits looking somewhat like lines made with a pen but may be piled in heaps (***lirellate***, Fig. 63, 65a) **Opegrapha** species **27**

Fig. 57. Perithecium from above x10

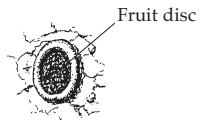


Fig. 58. Fruit disc in centre of fruit x5

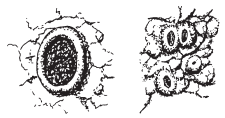


Fig. 59. Types of fruits (apothecia)

Fig.60a. Sections through superficial perithecia x12

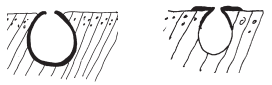


Fig. 60b. Perithecia in pits or immersed in thallus x12

Fig. 61. Section through *V. prominula x*12

3. Perithecia not in pits in the substratum (Fig. 60a) **4**
– Perithecia partially or fully in pits in substratum (Fig. 60b) **21**

4. Thallus thin, often only a stain on the surface. Perithecia not or slightly immersed in the thallus **5**
– Thallus thick with perithecia ± immersed in thallus **13**

5. Perithecia with depressed tips (Fig. 61) **6**
– Perithecia with flat or rounded tips **7**

6. Occurs in mesic-supralittoral **Verrrucaria prominula** (Ph. 88, Fig. 61)
– Occurs in terrestrial zone **Verrucaria dufourii**

7. Thallus brown to greenish black, smooth or cracked. Perithecia often in pairs (spores 3-septate) **Porina chlorotica**
– Colours various. Perithecia not paired (spores not 3-septate) **8**
This split may be difficult, if so, try both halves of the couplet

8. Hard limestone. Thallus pinkish grey, brown-grey or absent. Perithecia to 1 mm diam, immersed or conical **9**
– Mortar or soft limestone. Thallus pale brownish grey or absent. Perithecia to 1.5 mm diam, rather spherical (Fig. 60a left) **Acrocordia salweyi**

9. Perithecia less than 0.6 mm diam. **10**
– Perithecia 0.6–1.0 mm diam. **12**

10. Perithecia 0.1–0.2 mm diam., most perithecia up to two-thirds immersed in thallus (spores simple) **Polyblastia agraria**
– Perithecia 0.3–0.6 mm diam., immersed or not (spores muriform) **11**

11. Thallus membranous or areolate. Perithecia grey except for a dark tip **Thelenella muscorum**
– Thallus smooth but matt. Perithecia black **Agonimia gelatinosa**

12. Thallus brown-grey. Fruits conical (Fig. 60a right), tip not flattened. Not on hard limestone **Acrocordia macrospora**
– Thallus pinkish grey or absent. Fruits conical but with flattened tip and raised ostiole. Hard limestone **Acrocordia conoidea**

13. Thallus green, brown to chocolate-brown or black **14**
– Thallus white, grey, brown-grey or green-grey **19**

14. Thallus green to pale mid-brown, widely cracked. Edge of lichen (prothallus Fig. 64) brown. Perithecia to 1 mm diam. ± immersed in the thallus (spores 28–40 μm long) **Verrucaria viridul**a
– Thallus mid-brown to black. Edge of lichen black. Perithecia to 0.6 mm diam. superficial to fully immersed in the thallus **15**

15. Perithicia to half-immersed in the thallus (spores 17–25 μm long) **Verrucaria fusconigrescens** (Ph. 40)
– Perithicia more than half immersed (Fig. 60b) **16**

16. Thallus brown to olive-green, sometimes sorediate. [Terrestrial species]. (Spores 25–37 μm long) **Verrucaria macrostoma**
– Thallus dark brown to black, not sorediate **17**

17. Thallus dark brown to black. Perithecia less than 0.4 mm diam. Inland species. (Spores 20–28 μm long) **Verrucaria nigrescens**
– Thallus black. Perithecia over 0.4 mm diam. Littoral fringe to mesic. (spores less than 20 μm long *or* thallus pale colour) **18**

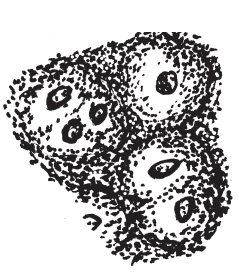


Fig. 62. Warted apothecia in *Petrusaria* x6

Fig. 63. *Opegrapha* species x6

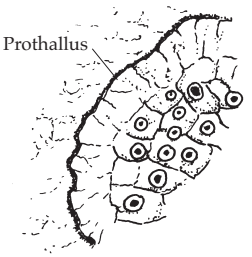


Fig. 64 Position of prothallus on the edge on thallus x2

18. Thallus, cracked, often looks like tar. Above and just below H.W.M. Perithecia conical **Hydropunctaria maura** (Ph. 6)
– Thallus with fine ridges (use hand-lens), almost lobate. Around H.W.M. Perithecia tips flat/depresed **Hydropunctaria amphibia**

19. Thallus leaden grey to 1 cm wide but forming mosaics. Edge of lichen and between the areoles outlined by black lines. Several perithecia to 0.1 mm diam. per areole **Verrucaria fuscella** (*If areoles not stongly outlined and perithecia about 1 per areole, and more pronounced to 0.25 mm diam, probably* **V. caerulea)**
– Thallus white, grey, grey-green to grey-brown or absent. Areoles not separated by a thin black line **20**

20. Tip of perithecia depressed. Terrestrial zone. Dark brown prothallus. Thallus grey to grey-brown **Verrucaria dufourii**
– Tip of perithecia not depressed. Supralittoral zone. Black prothallus. Thallus with black streaks **Verrucaria internigrescens**

21. Perithecia to 0.25 mm diam., numerous [leaving empty pits when dead and the black 'lids' fall off (Fig. 60b right). Thallus white, pale grey or absent] **Verrucaria baldensis** (Ph. 80)
– Perithecia 0.3–0.8 mm diam, widely dispersed leaving empty pits, or not **22**

22. Perithecia leaving empty pits or hollows when they die **23**
– Perithecia mostly remaining in the pits when they die (Fig. 60b left) **Verrucaria hochstetteri**

23. Thallus grey-green, granular. [On basic soil, spoil heaps, dunes and wall tops, often with mosses] **Verrucaria bryoctona**
– Thallus white to brown-grey, fairly smooth or absent **24**

24. Distinct narrow gap between perithecia and thallus (spores 1-septate) **Thelidium decipiens** (Fig. 65)
– No clear gap between perithecia and thallus (spores simple or 3-septate) **25**

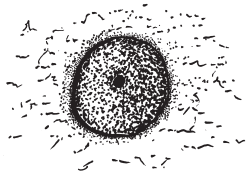


Fig. 65. Perithecium of *Thelidium decipiens* x10

25. Thallus white, pale grey, pale brown or absent **26**
– Thallus pink-grey to brown-grey (spores 3 septate) **Porina linearis**

26. Perithecia black. On limestone, mortar and pebbles (spores simple) **Verrucaria muralis**
– Perithecia pale brown to brown. On mosses, calcareous dunes and basic rocks (spores muriform) **Thelenella muscorum**

27. Apothecia short, rounded, often in knot-like clumps (Fig. 65a) **28**
– Apothecia long (Fig. 63), spread out or in groups **30**

Fig. 65a. *Opegrapha rupestris* x6

28. Thallus sorediate and chocolate-brown **29**
– Thallus not sorediate, Parasitic, mainly on *Verrucaria* species frequently *V. baldensis* **Opegrapha rupestris** (Fig. 65a)

29. Thallus tan to dark brown with yellowish-buff soredia. Apothecia in knot-like clumps **Opegrapha gyrocarpa**
– Thallus chocolate-brown with a violet tinge. Soredia dark brown. Apothecia not in knot-like clumps **Opegrapha zonata**

30. Thallus pale lilac-grey to lilac-brown **Opegrapha cesareensis**
– Thallus not lilac tinged, sometimes rust tinged **31**

31. Thallus membranous, grey to deep olive **Opegrapha lithyrga**
– Thallus smooth, cracked or immersed, white to grey **Opegrapha calcarea** (Ph. 47)

Key D - Section 3.Above H.W.M. Not lirellate. With apothecia or sterile. Subsection 3(a). Placodioid

1. Thallus placodioid (flat or rounded marginal lobes, Fig. 66) **2**
– Thallus not placodioid (may be slightly notched at margin) **Section 3. Subsection 3(b)** (Page 46)

2. Thallus white or grey **3**
– Thallus orange or yellow, greenish or brown-green **4**

3. Thallus white. Usually fertile with black discs. Not sorediate. K–. On limestone **Solenopsora candicans** (Ph. 75) (*If granular sorediate in centre,* **Caloplaca teicholyta**)
– Thallus white to pale grey. Rarely fertile. Usually sorediate. K+ yellow. Many substrata **Diploicia canescens** (Fig. 67)

4. Thallus greenish, grey-green or brown-green. Edges of lobes, white. Fruit discs green-buff to brown. **Lecanora muralis** (Ph. 49)
– Thallus yellow to orange. No distinct pale edges. Fruits orange **5**

5. Isidiate, sorediate or with minute lobules towards centre **6**
– Not isidiate, sorediate or lobulate **10**

6. Pale egg-yellow often with white patches on the thallus, not isidiate, may have minute lobules **Fulgensia fulgens** (Ph. 96)
– Yellow-green to orange thallus sorediate or very isidiate **7**

7. Thallus sorediate **8**
– Thallus isidiate **9**

8. Lobes long, finger-like and separated often with pruinose tips. Soredia bright yellow on lobes **Caloplaca cirrochroa** (Ph. 65)
– Lobes short and indistinct with densely pruinose tips. Soredia yellow in lip-shaped soralia on inner lobes **Caloplaca decipiens**

9. Weakly placodioid, usually with pale orange prothallus, deep orange isidia **Caloplaca littorea** (Ph. 14)
– Thallus very placodioid. No prothallus **C. verruculifera** (Ph. 13)

10. Occurs in littoral fringe and mesic zones. Bright to deep orange with long lobes **Caloplaca thallincola** (Ph. 10)
– Occurs above mesic zone. Yellow to orange. Lobes various **11**

11. Thallus K+ crimson/purple, yellow to orange **12**
– Thallus K–, egg-yellow, greyer in the centre **Candelariella medians**

12. Marginal lobes very flattened, bright, creamy orange often with a paler area inside the outer lobes, not pruinose (Fig. 68) **Caloplaca aurantia** (Ph. 67)
– Marginal lobes convex, yellow to orange, with or without a paler area at base of lobes, often pruinose **13**

13. Marginal lobes to 10 mm long. Orange, often a white ring inside lobes. Thallus not granular (Fig. 69) **Caloplaca flavescens** (Ph. 66)
– Marginal lobes to 3 mm long, lacking a white ring. Thallus rather granular towards centre **14**

14. On calcareous rock. Marginal lobes to 3 mm long. Yellow to brownish yellow, much wider at tips, (usually pruinose) and firmly attached. Thallus centre, often of large, smooth-surfaced granules, visible between the numerous fruits (Fig. 70) **Caloplaca saxicola**
– On acid rock. Lobes to 1 mm long, not pruinose. Tips of lobes not firmly attached to substratum **Caloplaca arnoldii**

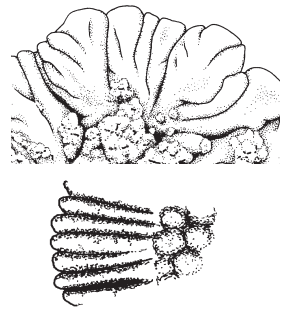


Fig. 66. Flattened and finger-like, rounded placodioid thallii x5

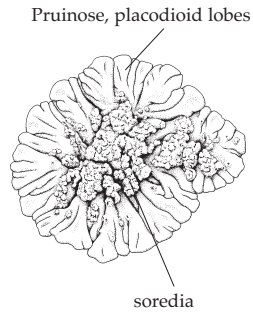


Fig. 67. *Diploicia canescens* x1

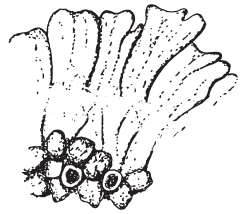


Fig. 68. *Caloplaca aurantia* x5

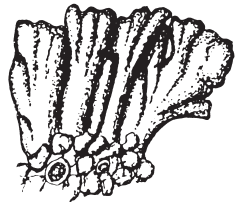


Fig. 69. *Caloplaca flavescens* x5

Fig. 70. *Caloplaca saxicola* x5

Key D – Section 3
Subsection 3(b) – Thallus yellow, yellow-green or orange

1. Thallus yellow, yellow-green, grey-yellow or orange. (Some authors have split the Caloplaca species into new genera, but these splits have not yet been accepted by most lichenologists)**2**
Thallus other colours including fawn and brown or only the fruits are orange **Section 3. Subsection 3(d/iii)** (Page 56)

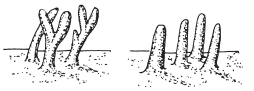


Fig. 71. Types of isidia x10

2. Thallus K+ crimson/purple **3**
– Thallus K+ yellow or negative **17**

3. Thallus isidiate (Fig. 71) **4**
– Thallus not isidiate, but may be sorediate (Fig. 72) **5**

Fig. 72. Some possible positions of soredia x5

4. Dull orange, finger-like isidia **Caloplaca littorea** (Ph. 14)
– Yellow to orange, granular isidia **Caloplaca britannica**

5. Not sorediate **6**
– Sorediate **13**

6. Thallus of minute lobes to 2 mm long. In littoral fringe, mostly on *Hydropunctaria maura* **Caloplaca microthallina** (Ph. 9)
– Thallus not of minute lobes but areolate, granular or scurfy **7**

7. Thallus very thin, weakly areolate, areoles up to 1 mm diam. **Caloplaca holocarpa** group
(If on limestone, mortar or concrete and/or on *Verrucaria* species and the fruits are deep orange, crowded and have a very narrow margin and do not exceed 0.4 mm diam. **Caloplaca oasis**)
– Thallus of distinct areoles *or* very granular *or* matt, scurfy **8**

8. Thallus thin, matt and scurfy, pale yellow **Caloplaca ochracea**
(*If finely areolate but not matt and the areoles are distinct and separated by dark lines* **Caloplaca dalmatica**)
– Thallus thick, not scurfy, shades of yellow and orange **9**

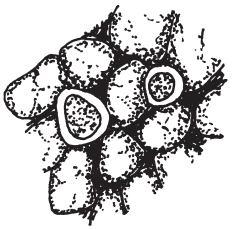


Fig. 73. *Caloplaca ruderum* x5

9. Thallus of thick, very convex, pruinose areoles **C. ruderum** (Fig. 73)
– Thallus of flat or slightly convex, not pruinose lobes **10**

10. Thallus whitish to yellow-green, often a large isolated single thalli. Often in the xeric-supralittoral **Caloplaca flavovirescens**
– Thallus bright yellow to orange-red **11**

11. Thallus grey-yellow to greenish tan, no prothallus (frequently on horizontal concrete and mortar) **Caloplaca crenulatella**
– Thallus yellow to orange-red. Often pale orange prothallus **12**

12. Thallus bright orange to orange red, usually in mesic and xeric zones. Often with marginal lobules **Caloplaca marina** (Ph. 8)
– Thallus bright yellow to yellow-orange. Always above the mesic zone. No marginal lobules **Caloplaca maritima** (Ph. 48)

13. Thallus deep mustard to yellow-brown, completely finely granular sorediate **Caloplaca chrysodeta**
– Thallus yellow to yellow-green, completely sorediate or not **14**

14. Thallus bright yellow completely sorediate with slight marginal lobes. White prothallus **Caloplaca xantholyta**
– Completely sorediate or not with no marginal lobes. No, or yellow to orange prothallus **15**

15. Thallus yellow, areoles ringed with brighter yellow soredia-like granules (blastidia) **Caloplaca arcis**
– Thallus yellow to yellow-green. Areoles become covered in pale fine soredia **16**

16. Soredia rather granular, the same colour as the convex areoles Fruit margins sorediate **Caloplaca citrina** (Ph. 11)
– Soredia fine and paler than the minutely squamulose thallus. Fruit margins not sorediate **Caloplaca flavocitrina**

17. Thallus or soredia C+ orange **18**
– Thallus and soredia C– **23**

18. Thallus sorediate or rather granular **19**
– Thallus not sorediate or granular **21**

19. Thallus granular to granular-areolate. Normally fertile. Fruit margins paler than disc **Lecanora confusa**
– Thallus sorediate. Very rarely fertile. Margins not paler **20**

20. Thallus greenish grey which becomes covered in dark soredia that scratch yellowish green . K+y **Lecidella scabra** (Ph. 38)
– Thallus dull yellow to greenish grey with yellowish soredia forming on edges of areoles. K– **Pertusaria flavicans**

21. Thallus thin or almost absent. Fruits lecanorine with brownish disks (Fig. 74) **Lecanora fugiens** (Ph. 23)
– Thallus thick. Fruits black, lecideine **22**

22. Thallus deeply channelled, pale prothallus **Pertusaria pluripuncta**
– Thallus smooth or cracked. Black prothallus **Buellia ocellata**

23. Thallus sorediate **24**
– Thallus not sorediate **26**

24. Thallus finely granular, bright sulphur-yellow **Psilolechia lucida**
– Thallus not or slightly areolate with pale yellow soredia **25**

25. Soredia forming on margins of the areoles **Lecanora orosthea**
– Thallus of separate areoles that may form a crust. Soredia form in the centre of the areoles (Fig. 75) **Lecanora soralifera**

26. Fruits yellow to brownish orange *or absent* **27**
– Fruits green, tan, brown or blackish **29**

27. Thallus of scattered granules on a black prothallus (spores 8 per ascus) **Candelariella aurella**
– Thallus of clumped granules not on strong black prothallus (spores more than 8 per ascus) **28**

28. Thallus golden-yellow, thick, deeply cracked rounded granules. On hard acid rocks [bird perches] **Candelariella coralliza**
– Thallus of orange-yellow flat to oval granules in a cracked crust. On various substrata **Candelariella vitellina** (Ph. 34)

29. Discs dirty green becoming blackish or a pure black **30**
– Discs pale green to emerald or brown **32**

30. Discs clean black. Thallus yellow to yellow-green. (Spores 1-septate to muriform) **31**
– Discs yellowish or dirty green becoming blackish. Thallus yellow/green-grey. (Spores simple) **Lecanora sulphurea** (Ph. 35)

31. Thallus warted. Fruits immersed in thalline warts. On weathered wood (spores submuriform)**Cyphelium notarisii** (Fig. 75a)
– Thallus flattish, fruits flat and in thickness of thallus. On rock (Spores muriform) **Rhizocarpon geographicum** (Ph. 36)

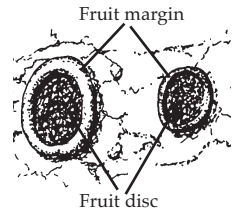


Fig. 74. Margin and disc of fruit (apothecium) x5
left: lecanorine
right: lecideine


Fig. 75. Showing position of soredia on *Lecanora soralifera* x10

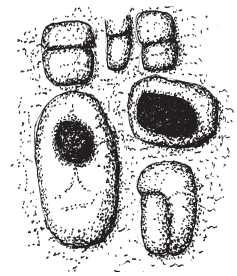


Fig 75a. *Cyphelium notarisii* x6

32. Fruit discs dark green-brown to emerald **Lecanora intricata**
– Fruit discs pale green to pale brown or grey-brown **33**

33. Fruit discs yellowish to yellow-green or green and jade-like **Lecanora polytropa** (Ph. 37)
– Fruit discs brownish to grey-brown **Lecanora stenotropa** (*This couplet may be difficult to separate*)

Key D – Section 3
Subsection 3(c) – Thallus sorediate, isidiate or a granular crust

1. Sorediate, isidiate (Fig. 76) or a granulular crust **2**
– Not sorediate, isidiate or a granular crust but may consist of scattered granules **Section 3. Subsection 3(d)** (Page 51)**.**

2. Sorediate (both sorediate and isidiate species may be granular) **3**
– Isidiate or coarsely granular. (This separation may be difficult so some species are included in both halves) **32**

3. Thallus, fruits or soredia C+ red, rose-red or orange **4**
– All parts C– **17**

4. Thallus scratches orange. C+ rose-red or red. On shaded calcareous rocks **5**
– Scratches green not orange. Thallus, fruits and/or soredia C+ red or orange. Various habitats **6**

5. C+ rose-red. Very dark brown to black prothallus (Fig. 77). Pale but noticeably pinkish thallus, very fine soredia **Llimonaea sorediata**
– C+ rose-red. Prothallus brown. Thallus pale brown, often very pale violet tinge. Soredia coarsely granular **Dirina massiliensis** f. **sorediata.** If abundantly fertile **D. massiliensis** f. **massiliensis** (rare) (*if C+ red with a thick thallus with large (to 1 mm diam.) often eroded soralia, probably* **Arthonia endlicheri**.)

6. Thallus white. Disc pinkish but covered in powdery, white pruina (looks like soredia). Discs only C+ yellow/orange. [Fruits ± immersed in thallus]. **Lecanora rupicola** (Ph. 27)
– Thallus of various colours and C+ yellow to red. Fruits not covered in a *thick* white pruina **7**

7. Thallus and/or soredia C+ orange or yellow (sometimes faint) **8**
– Thallus and/or soredia C+ red **12**

8. Thallus grey to grey-green **9**
– Thallus tan to brown-grey, grey-buff or yellow-green **11**

9. Thallus K+ yellow turning red **Buellia griseovirens**
– Thallus persistently K+ yellow **10**

10. Soredia rather coarse, grey-green becoming paler green or whitish when rubbed **Lecidella scabra** (Ph. 38)
– Soredia fine, yellow-green. Does not rub much paler **Lecanora expallens**

11. Fawn to grey-buff or yellow-green. Coarsely granular, normally with numerous black convex fruits **Lecidella asema** (Ph. 24)
– Grey-buff, finely granular (blastidiate), scurfy surface rarely fertile **Lecidella meiococca**

12. White prothallus. White or yellow-grey soredia **13**
– No prothallus. Soredia green to yellow-green or brownish **14**

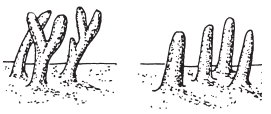


Fig. 76. Isidia x10

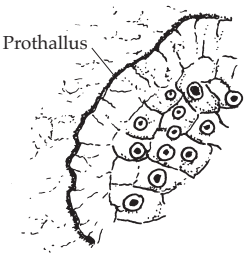


Fig. 77. Position of prothallus on the edge on thallus x2

13. Thallus forming thick, warted crust. Soredia yellow to yellow-grey in mounds to several mm wide **Ochrolechia androgyna**
– Thallus smooth to slightly warted. Pin-head shaped white soralia **Pertusaria lactea**

14. Thallus pale grey to greenish grey. Yellowish soredia, soralia to 1.5 mm diam. Fruits to 1.5 mm diam. **Trapeliopsis granulosa** (If the thallus has K+ purple patches – **Trapeliopsis pseudogranulosa**)
– Thallus bluish, green, white to brownish. Greenish or yellow-brown soredia, soralia to 1 mm diam. Fruits to 0.8 mm diam. **15**

15. On weathered wood. Thallus bluish green to bluish grey. Bluish to green soredia **Trapeliopsis flexuosa**
– On acid rocks and walls, rarely over plant debris. Thallus and soredia not bluish tinged **16**

16. Thallus grey, pale green to brownish, of scattered areoles with greenish buff soredia. Fruits 0.2–0.5 mm diam. **Trapelia obtegens**
– Thallus white or pinkish, forms large crusts, soredia greenish or yellowish green. Fruits 0.2–0.8 mm diam. **Trapelia placodioides**

17. Thallus and soredia K– **18**
– Thallus and/or soredia K+ yellow, orange or yellow turning red **26**

18. Soredia central, not on marginal lobes **Caloplaca teicholyta** (Fig. 77a)
– Soredia not just central and may cover the whole thallus **19**

19. Soredia grey-green or yellow-green or brownish **20**
– Soredia white, pale grey to almost black **22**

20. Thallus brown to green-brown. Brown or greenish soredia. Fruit disc dark brown. On wood or soil **Placynthiella dasaea**
– Thallus grey, grey-green or yellow-green. On wood or rock **21**

21. Soredia grey-green, coarsely granular **Lecanora conizaeoides**
– Soredia yellow-green, powdery **Lecanora compallens**

22. Thallus scratches orange [sheltered overhangs on acid rock] **Roccellographa sorediata**
– Thallus does not show orange colour when scratched **23**

23. Soredia (strictly blastidia) grey, brownish or grey-green on the margins of the areoles **Lecania erysibe**
– Soredia in separated, rounded soralia or covering surface, white, pale to dark grey or blue-black **24**

24. Soredia whitish [thallus often along rock cracks] **Porpidia rugosa**
– Soredia grey, speckled blue or indigo **25**

25. Soredia speckled bluish. Exposed habitats **Porpidia tuberculosa**
– Soredia speckled indigo. Sheltered habitats **Lecania baeomma**

26. Thallus K–. Soredia K+ yellow turning red **Pertusaria excludens**
– Thallus and/or soredia K+ persistently yellow to yellow-brown **27**

27. Soredia green to green-grey **Dibaeis baeomyces**
– Soredia white to yellow-green or dark grey **28**

28. Soredia grey in separated, oval soralia **Porpidia soredizodes**
– Soredia covers surface, white, pale grey or yellow-grey or are white and scattered **29**

29. Soredia white and in scattered pinheads **Pertusaria aspergilla**
– Soredia white, grey to yellow-grey often covering the thallus **30**

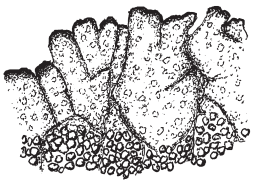


Fig. 77a. Part of the thallus of *Caloplaca teicholyta* x6

30. Thallus scratches orange [sheltered overhangs on acid rock] **Roccellographa (Peterjamesia) sorediata**
– Thallus does not show orange colour when scratched **31**

31. Thallus pale grey **Haematomma ochroleucum** var. **porphyrium**
– Thallus yellow-green or yellow-grey **H. ochroleucum** var. **ochroleucum**

32. Thallus C+ red or orange (*Placynthiella dasaea* is C+ red in a squash under the microscope) **33**
– Thallus C– **36**

33. Thallus of dark chocolate-brown to red-brown, coralloid granules/isidia (to 0.4 mm) forming a crust on acid soil or on weathered wood **Placynthiella icmalea**
– Thallus white, grey or brownish, solid thallus or almost squamulose on soil or acid rock **34**

34. Thallus fawn to grey-buff, rough or granular. On acid rock **35**
– Thallus pale grey with coarse isidia that erode leaving white marks. On well-drained soil **Trapeliopsis wallrothii** (Ph. 91)

35. Fawn to grey-buff or yellow-green. Coarsely granular, normally with numerous black convex fruits **Lecidella asema** (Ph. 24)
– Grey-buff, finely granular (blastidiate), scurfy surface rarely fertile **Lecidella meiococca**

Fig. 78. Peg-like, coralloid isidia x20

36. Thallus or fruits K+ yellow (may be rather faint), red or crimson/purple **37**
– Thallus and fruits K– **44**

37. Thallus and or fruit disc K+ purple. Fruits not stalked **38**
– Thallus K+ yellow, orange or red. Fruits stalked or not **39**

38. Thallus K+ pale purple, fruit disc K+ purple (fruits rare). Thallus dark grey often slightly blue-green. Fine isidia form first on edges of areoles then cover the thallus. **Caloplaca chlorina**
– Thallus K–, fruit disc K+ purple. Thallus white to grey almost lobed. Granular in centre **Caloplaca teicholyta** (Fig.77a)

39. Thallus K+ orange, pale grey to green-grey. Pinkish isidia-like structures 0.1 mm diam. [Fruits stalked] **Dibaeis baeomyces**
– Thallus K+ yellow or yellow turning red **40**

40. Smooth or granular. K+ yellow, sometimes faint **41**
– Thallus grey with peg-like isidia. K+ yellow or turning red **43**

41. Fruits abundant with wavy margins **Lecanora varia**
– Fruits absent or on short stalks **42**

42. Thallus white or pale grey granules **Lepraria borealis/ caesioalba**
– Thallus grey-green to green or brownish. Smooth or granular to 1 mm diam. Fruits on short stalks **Baeomyces rufus**

43. Thallus persistently K+ yellow. Grey coralloid isidia (Fig.78) **Pertusaria corallina** (Ph. 29)
– Thallus K+ yellow turning red. Brown tipped, grey coralloid isidia **Pertusaria pseudocorallina** (Ph. 30)

44. Dark green to brown-black. Minute isidia **Psorotichia schaereri**
– Grey, green or brownish. Granular, warted or peg-like isidia **45**

45. On acid rocks in moist overhangs, crevices or humus-rich soils, *or* fence posts and wood **46**
– On exposed basic or acid rocks or exposed soil on wall tops etc. **47**

46. Thallus brown-black to red-brown. Finely granular/isidiate to about 0.2 mm diam. **Placynthiella icmalea**
– Thallus fawn to yellow-green or olive, thick, warted and coarsely granular **Bacidia scopulicula**

47. Fruits lecanorine (Fig.79) **48**
– Fruits lecideine (if not fertile try both halves of this couplet) **52**

48. Thallus white, grey to brown-grey. Fruit disc greenish to black **49**
– Thallus green to green-grey. Fruit disc grey-green to grey-brown **Lecanora conizaeiodes**

49. Fruits on tips of mauvish grey, isidia-like warts. Fruit margins smooth disappearing early. On nutrient-enriched rocks, often in seepage tracks (spores 1-septate) **Lecania aipospila** (Ph. 25)
– Fruits with granular margins, almost immersed in thallus **50**

50. Thallus blue-grey. On disturbed soil especially wall tops. No prothallus (spores 3-septate) **Moelleropsis nebulosa**
– Thallus white to brown, blue-grey. On flat tops of bird perches **51**

51. Thallus granular to warted. Prothallus fimbriate and alternately black and white. Fruit discs red-brown. Occurs in the mesic-supralittoral (spores 1-septate**)** **Lecanora poliophaea** (Ph. 26)
– Thallus scurfy, granular isidiate, edges of areoles raised. Prothallus dark grey-green. Fruit discs, if present, black. Occurs in the xeric-supralittoral (spores simple) **Aspicilia leprosescens** (Ph. 17)

52. Fruits pale brown to brown-black. On basic soils and rocks **53**
– Fruits white, grey or black or absent. On acid soil and wood **54**

53. Thallus granular, scurfy. Fruits often pruinose, margin wide when young **Bilimbia sabuletorum**
– Thallus of pale edged squamules. Fruits often with a pruinose margin which is excluded early **Bilimbia lobulata** (Fig. 79a)

54. Thallus light to dark green, granular. Fruit disc pale grey to dark grey-black. On wood and tree stumps **Micaria prasina** group
– Thallus brown to green-brown of minute granules. Fruit disc dark brown. On wood and soil **Placynthiella dasaea**

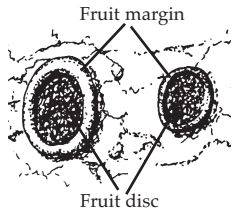


Fig. 79. Margin and disc of fruit (apothecium) x5
left: lecanorine
right: lecideine

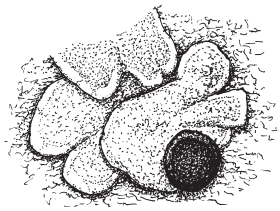


Fig. 79a. *Bilimbia lobulata* x8

Fig. 80. Section through fruit of *Diploschistes* showing overarching margin x8

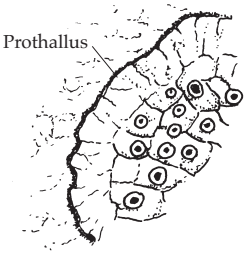


Fig. 81. Position of prothallus on the edge on thallus x2

Key D – Section 3

Subsection 3(d). Thallus not sorediate, isidiate or a granular crust but may be absent or consist of scattered granules.
Subsection 3(d/i). Any part C+ yellow, red or orange

1. Thallus and/or fruits C+ yellow, orange or red **2**
– Thallus and fruits C– **Subsection 3(d/ii) page 53**

2. Thallus C+ orange or fruits only C+ yellow **3**
– Thallus, fruits or disc pruina C+ deep orange-red to red **12**

3. Fruits white to pink, immersed, very pruinose and C+ yellow. Thallus C–, pale grey, [K+yellow] **Lecanora rupicola** (Ph. 27)
– Thallus C+ orange. Fruit and thallus colour various **4**

4. Fruit discs yellow-green to brown, lecanorine (Fig. 79) **5**
– Fruit discs brown-black to black, mainly lecideine species **8**

5. On weathered timber **6**
– On rock in xeric-supralittoral **7**

6. Persistent, pale margins in mature fruits **Lecanora confusa**
– Fruit margins very soon excluded **Lecanora symmicta**

7. Thallus white to pale greenish grey, absent or of scattered, rounded granules of various sizes **Lecanora andrewii**
– Thallus cream to fawn with yellowish tinge, absent or of rounded granules or an areolate crust **Lecanora fugiens** (Ph. 23)

8. Thallus K+ yellow **9**
– Thallus K– **10**

9. Thallus yellowish grey to green-grey, deeply channelled. Pale prothallus. Occurs in South West **Pertusaria pluripuncta**
– Thallus light brown to brown-grey, rough **Lecidella asema** (Ph. 24)

10. Thallus thin, scurfy. Scattered in crevices **Lecidella viridans**
– Thallus continuous. Occurs in exposed situations **11**

11. Thallus pale to mid-grey, usually with a grey prothallus. Fruits to 0.2 mm diam. (Fig. 80) **Diploschistes caesioplumbeus** (Ph. 16)
– Thallus yellowish grey, always with a black prothallus (Fig. 81). Fruits to 0.5 mm **Buellia ocellata**

12. Thallus K+ yellow. Fruits lecanorine **13**
– Thallus K–. Fruits various **15**

13. Fruit disc brown-black not pruinose. Black prothallus **Rinodina atrocinerea**
– Fruit disc black, Margin overarching (Fig 80), usually pruinose. No prothallus (Fig. 81) **14**

14. On acid rocks and walls **Diploschistes scruposus**
– On calc. soils often on *Cladonia* species **Diploschistes muscorum**

15. Disc pruina only C+ red. Thallus sometimes slightly C+ yellow **Ochrolechia parella** (Ph. 43)
– Thallus, fruit or fruit margin C+ deep orange-red to red **16**

16. Fruits lecideine or appear to be lecideine(Fig. 82b) **17**
– Fruits lecanorine (Fig. 82a). If no fruits or unsure, try both halves **21**

17. Thallus of dispersed granules, absent or mainly just black prothallus. Fruit margin C+ rose-red **Lecidea diducens**
– Thallus continuous and C+ red **18**

18. No dark prothallus. Thallus grey, grey-green or pinkish **19**
– Dark prothallus. Thallus grey-brown to brown **20**

19. Thallus sometimes pinkish. Yellowish soredia, soralia to 0.6 mm diam. **Trapeliopsis granulosa**
– Thallus has orange patches that are K+ purple. Pale green soredia. Soralia to 1.5 mm diam. **Trapeliopsis pseudogranulosa**

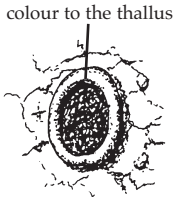
20. Thallus cracked and the edge of lichen becomes thin. (The more frequent of the two species) **Lecidea grisella** (Ph. 45, Fig. 83)
– Areolate and the thick areoles continue right to edge of thallus. (Occurs more often in the North) **Lecidea fuscoatra** (Fig. 84)

21. Fruit disc black or grey **22**
– Fruit disc pink to dark brown, brown-black or *absent* **25**

22. On wood. Numerous pycnidia up to 0.2 mm diam. with white tips **Micaria denigrata**
– On rock. No white-tipped pycnidia **23**

23. Thallus pale grey to pale brown. Fruits grey, very abundant **Dirina massiliensis** f. **massiliensis**
– Thallus dark grey to dark brown-grey. Fruits black **24**

a) Thalline margin: Margin is a similar colour to the thallus



b) Proper margin: Margin is dark and not the same colour as the thallus

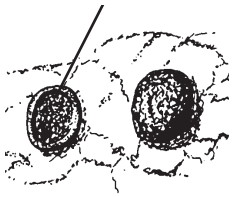


Fig. 82. a and b. Types of fruit margins x5
a: Lecanorine
b: Lecideine

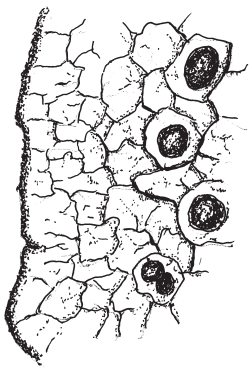


Fig. 83. *Lecidea grisella* x 4

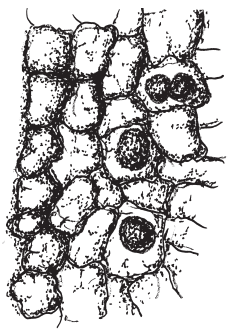


Fig. 84. *Lecidea fuscoatra* x4

24. Thallus brown-grey to almost black consisting of sharp-angled areoles **Schaereria fuscocinerea**
– Thallus dark grey or dark brown and with a purple tinge, cracked or slightly warted **Rinodina luridescens**

25. Thallus pale to mid brown **Protoparmelia montagnei**
– Thallus red-brown, yellow-brown, pinkish, grey, cream, grey-green or slightly yellowish **26**

26. Thallus yellow-brown to mid brown **Acarospora fuscata**
– Thallus grey, cream, grey-green, pinkish or slightly yellowish **27**

27. Thallus cream to yellowish, pale prothallus. Fruits 2-6 mm diam. **Ochrolechia tartarea**
– Thallus white, pale grey or pinkish, rarely with a pale prothallus, fruits under 2 mm diam. **28**

28. Thallus with warted surface. Warts detach leaving white scars. No prothallus. On sheltered soil **Trapeliopsis wallrothii** (Ph. 91)
– Thallus cracked or scattered areoles. Sometimes with pale prothallus. On acid rocks and bricks or fibrous soil **29**

29. Almost squamulose or overlapping areoles **Trapelia glebulosa**
– Cracked or areolate never subsquamulose **Trapelia coarctata**

Key D – Section 3 Thallus not sorediate, isidiate or granular.
Subsection 3(d/ii). Cortex, medulla or fruit C–, K+ yellow, orange, red, crimson or violet. If all parts K– go to subsection 3(d/iii) page 56

1. Fruits only K+ purple/crimson, and/or thallus K+ violet **2**
– Fruits, thallus or medulla K+ yellow, orange or red **12**

2. Fruit disc black. Fruit or thallus K+ violet **3**
– Fruit disc orange to red. Fruit K+ purple/crimson **4**

3. Thallus K+ violet. Thallus whitish or almost only a black prothallus. On crystalline granite. S.W. Britain **Lecidia sarcogynoides**
– Fruit only K+ violet. Disc black, pale pruinose. Thallus grey to grey-brown. On nutrient enriched limestone **Caloplaca variabilis**

4. Thallus warted, isidiate or granular at least in centre **5**
– Thallus smooth or cracked, not noticeably warted/granular **6**

5. Thallus pale grey with granular centre **Caloplaca teicholyta** (Fig. 85)
– Thallus bluish grey-green. Very isidiate **Caloplaca chlorina**

6. Mature fruits to 0.6 mm diam. Clear to bright orange **7**
– Mature fruits to 2 mm diam. Dull orange, yellow-orange or rust-red **8**

7. Fruits very convex not translucent when wet. Thallus usually grey to black **Caloplaca holocarpa** group
Two other members of the group are:
If on limestone, mortar or concrete and/or on *Verrucaria* species and the fruits are deep orange, crowded and have a very narrow margin and do not exceed 0.4 mm diam. **Caloplaca oasis**
If thallus grey-green and on decaying stems of shrubby seablight, mainly Dorset and N. Norfolk **Caloplaca suaedae**
– Fruits concave to slightly convex. Translucent when wet. Thallus white or absent **Caloplaca marmorata (lactea)**

8. Fruits rust-red or green/yellow orange, flat to slightly convex **9**
– Fruits dull orange becoming very convex **11**

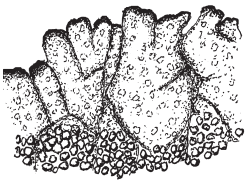


Fig.85. *Caloplaca teicholyta* x3

9. Fruit margin grey **Caloplaca cerina**
– Fruit margins orange to rust-red **10**

10. Fruits unchanged when wet **Caloplaca crenularia**
– Fruits greener when wet **Caloplaca ceracea** (Ph. 12)

11. Thallus pale grey or absent. Fruits to 1.5 mm diam, globose. On hard limestone **Protoblastenia calva**
– Thallus brownish to green-grey. Fruits to 0.9 mm. On a range of basic or semibasic substrata **Protoblastenia rupestris** (Ph. 76)

12. Thallus K+ red. [Zoned margin to 15 mm wide. Fruits 2-3 per wart. Fruits 0.2-0.6mm diam. Sunny acid rocks] **Aspicilia intermutans** (*very similar species include* **A. cinerea** *and* **A. epiglypta**)
– Thallus K+ yellow, orange or yellow slowly turning red **13**

13. K+ yellow turning red **14**
– K+ persistent yellow, brownish or orange **23**

14. Medulla only (Fig. 86) K+ y turning red, [thallus pale grey. Fruits large to 3 mm diam. often pruinose] **Porpidia platycarpoides**
– Whole thallus or soredia K+ yellow turning red **15**

15. Fruits lecanorine (Fig. 87a) **16**
– Fruits lecideine (Fig. 87b) **18**

16. Fruits 1–4 immersed in warts (asci 1-spored)**Pertusaria monogona**
– Fruits not multiple and in warts (asci 4-8 spored) **17**

17. Fruits very convex, pinkish, very pruinose **Lecanora ochroidea**
– Fruits flat, tan to black or piebald **Lecanora praepostera**

18. Fruits elongated often clumped **Lithographa tesserata** (Fig. 88)
– Fruits rounded not clumped **19**

19. Fruits to 1.5 mm diam. [Black prothallus] **20**
– Fruits up to 0.5 mm diam. **21**

20. Fruits between areoles. Not pruinose. Thallus whitish often rusty in patches (spores simple) **Lecidea lactea**
– Fruits sessile. Margin and disc usually pruinose. Thallus very pale grey (spores brown, 1-septate) **Buellia subdisciformis** (Ph. 20)

21. Thallus immersed. Apothecia often in lines. [On acid rocks in extreme South and also West Scotland] **Buellia sequax**
– Thallus white or grey. Apothecia scattered **22**

22. Thallus white. Fruits convex **Diplotomma chlorophaeum**
– Thallus grey, grey-brown. Fruits flat **Buellia aethalea**

23. Thallus K+ orange **Dibaeis baeomyces**
– Cortex or medulla K+ yellow (may be brownish or faint) **24**

24. Thallus yellowish grey, cracked [to 5 cm diam. on acid rocks in xeric-supralittoral, often in crevices] **Buellia leptoclinoides**
– Thallus white, grey, green-grey or brown to black **25**

25. Medulla only K+ yellow (spores 3-septate to muriform) **26**
– Cortex K+ yellow (spores various) **27**

26. Thallus grey to dark brown. Black prothallus. Fruits scattered (Spores brown, 3-septate to muriform) **Rhizocarpon distinctum**
– Thallus chalky white. Weak, grey prothallus. Fruits often in concentric rings. (Spores colourless, muriform) **Rhizocarpon petraeum** (Fig. 89)

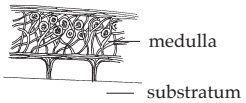
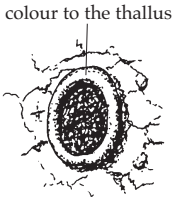


Fig. 86. Position of medulla

a) Thalline margin: Margin is a similar colour to the thallus



b) Proper margin: Margin is dark and not the same colour as the thallus

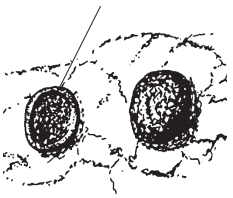


Fig. 87. a and b. Types of fruit margins x5
a: Lecanorine
b: Lecideine

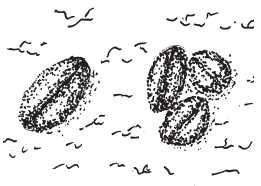


Fig. 88. *Lithograpa tesserata* x6

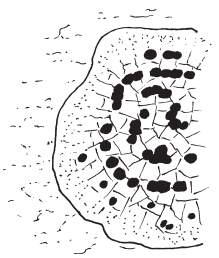


Fig. 89. *Rhizocarpon petraeum* x3

27. Thallus of convex, warted areoles with a greasy shine. Very rarely fertile. On old wooden structures. Rare **Cliostomum corrugatum**
– Thallus various, not with a greasy shine. Frequently abundantly fertile. Habitats various **28**

28. Fruits up to 0.5 mm diam. **29**
– Fruits 0.5–3 mm diam. **33**

29. Thallus white, pale to mid grey or slightly greenish **30**
– Thallus slate-grey, dark grey or brown-grey **32**

30. Fruit discs black, not pruinose, immersed. Broad prothallus, dark grey to black. On well-lit acid rocks **Buellia stellulata** (Ph. 19)
– Fruit discs buff to dark brown, sessile. No, or pale prothallus. occurs on wood or shaded rock **31**

31. Thallus scattered or continuous areoles. Fruit discs white to pale brown. Prothallus white. Occurs in shade **Cliostomum tenerum**
– Thallus continuous. Numerous minute black pycnidia 0.1–0.2 mm diam. present. Prothallus rare, On wood **Cliostomum griffithii**

32. Thallus slate grey/brownish, waxy, wormcast-like appearance. Apothecia 0.2–0.5 mm diam. **Halecania ralfsii** (Ph. 18)
– Thallus dark-grey, areoles flat. Fertile warts to 1 mm diam. with 1–5 fruits, each 0.1–0.5 mm diam. **Pertusaria chiodectonoides**

33. Fruit disc pinkish, very white pruinose **Lecanora subcarnea**
– Fruit disc buff, green-brown to brown to black. Not, or faint pruinose **34**

34. Fruits lecanorine (Fig. 87a) **35**
– Fruits lecideine (Fig. 87b) **42**

35. Disc pale brown, chestnut to very dark brown to almost black **36**
– Disc black **39**

36. Almost placodioid. White fimbriate prothallus. [Fruits chestnut to almost black]**Lecanora campestris** (Ph. 46, Fig. 90)
– Neat often delimited patches. No prothallus or it is not fimbriate. On wood. (*L campestris* extremely rarely on wood) **37**

37. Discs buff to greenish **Lecanora varia**
– Fruits brown to red-brown **38**

38. Fruits pale brown to chestnut **Lecanora chlarotera**
– Fruits red-brown to almost black **Lecanora pulicaris**

39. Thallus warted with indented edges or granular. (Spores brown, 1-septate) **40**
– Thallus cracked to very areolate. (Spores simple, colourless) **41**

40. Thallus wart-like with indented edges, pale grey often with a creamy to yellowish tinge **Rinodina confragosa**
– Thallus coarsely granular, pale grey often with a greenish tinge sometimes with a black prothallus **Rinodina beccariana** (Ph. 83)

41. Thallus white to pale grey, knobbly. Many fruits have a thin, wavy pale margin (Fig. 91) **Tephromela atra**
Cut through a fruit vertically. Cut edge has a dark purple-red tinge, especially when wet (Fig. 93). *Base of thallus next to substratum not orange and not K+ purple* (Fig. 93)
– Thallus white to greenish grey. Fruits neat, with thick, pale, smooth margin (Fig. 92) **Lecanora gangaleoides** (Ph. 28)
Cut edge of vertical fruit section has a greenish tinge (Fig. 92a). *Base of thallus next to substratum* ***often*** *orange and K+ purple* (Fig. 92a)

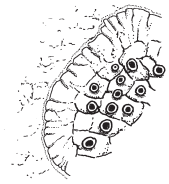


Fig.90. *Lecanora campestris* x2

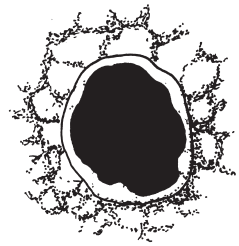


Fig. 91. *Tephromela atra* x10

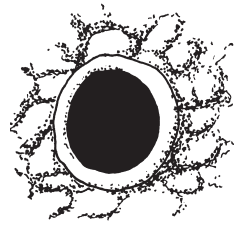


Fig. 92. *Lecanora gangaleoides* x10

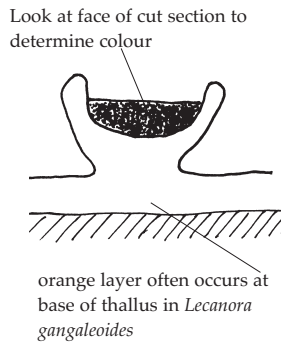


Fig. 92a. Section through a fruit of *Lecanora gangalioides/Tephromela atra*

42. Thallus grey-green, brownish grey or brown **43**
– Thallus pale grey to almost black **46**

43. Thallus dark brown with pink tinge **Rhizocarpon polycarpon**
– Thallus mousey brown, or grey-green **44**

44. Thallus smooth and cracked. Thallus mousey brown or especially in shade maybe almost grey or have a greenish tinge. **45**
– Thallus almost granular. Green-grey to green **Baeomyces rufus**

45. Fruits to 1.5 mm diam. with a persistent usually paler margin. (Spores kidney shaped, simple) **Fuscidea cyathoides** (Ph. 44)
– Fruits to 0.7 mm diam. with a concolourous margin which becomes excluded. (Spores muriform) **Rhizocarpon reductum** (Ph. 32)

46. Young fruit margins glossy, green-black **Lecidella stigmatea**
– Young fruit margins not green-black or noticeably glossy **47**

47. Spore mass black and loose in fruits and rubs off on fingers. On old fence posts etc. **Cyphelium inquinans**
– Spores do not rub off. On acid rock, asbestos cement etc. **48**

48. Fruit margins thin, wavy becoming absent **Lecidella carpathica**
– Fruit margin persistent, fruits abundant **Lecidea lapicida**

Key D – Section 3 Thallus not sorediate, isidiate or granular.
Subsection 3(d/iii) – All Parts K– and C–
If leprose or appears leprose go to key E page 61

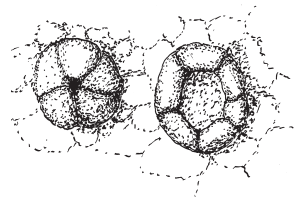


Fig. 92b. *Gyalecta jenensis* x10

1. Fruit discs orange to pinkish often with notched margins, immature fruits flat or cone-shaped and almost covered by the margin. [Mainly shaded, damp rock] **2**
– Fruit discs not orange but other colours including fawn **5**

2. Fruits leave pits in the substratum when they fall out **3**
– Fruits immersed in thallus, not leaving pits in the substratum 4

3. Fruit margins radially fissured. Hard limestone **Petractis clausa**
– Fruit margins not fissured. Limestone and mortar. A recently named species only known from S. Wales **Petractis nodispora**

4. Calcareous rocks. Fruits flat to slightly convex. (Spores 11–25 x 6–10 μm 3-septate to muriform) **Gyalecta jenensis** (Fig. 92b)
– Mainly on granite, influenced by run-off of rain from calcareous substrata. Fruits conical. S.W. England. (Spores larger, 27–40 x 10–16 μm) **Gyalecta jenensis** var. **macrospora**

5. Thallus green-grey, dark green, brown-black to black or if brown of large convex areoles to 4 mm diam. **6**
– Thallus other colours including dark grey and shades of brown **14**

6. Thallus mainly a black fimbriate prothallus (thallus grey). Black fruit discs [often on pebbles] (spores simple) **Micarea erratica** (*If spores muriform probably* **Rhizocarpon reductum**)
– Thallus predominates, not mainly a black prothallus **7**

7. Thallus almost squamulose, areoles 0.3–0.7 mm diam., rather gelatinous, calcareous substrata **Psorotichia schaereri**
– Thallus cracked, areolate or rather granular. Various substrata **8**

8. Thallus rather granular to almost isidiate or areolate **9**
– Thallus smooth or cracked or convex squamule-like **11**

9. On wood. Numerous pycnidia up to 0.2 mm diam. with white tips. [Thallus greenish white to black] **Micaria denigrata**
– On limestone or soil. No white-tipped pycnidia **10**

10. On hard limestone. Blue-black prothallus. Fruits to 1 mm diam. not gelatinous when wet **Placynthium nigrum**
– On soil. No prothallus. Fruits 0.1–0.4 mm diam. Rather gelatinous when wet **Placynthiella uliginosa**

11. Thallus of convex, squamule-like areoles to 4 mm diam. **12**
– Thallus flat, scurfy or areoles less than 1.5 mm diam. **13**

12. Squamules with paler dots and no regular fissures. Apothecia to 1.5 mm diam. **Toninia aromatica** (Ph. 41)
– Squamules without paler dots but with regular fissures. Apothecia to 3.0 mm diam. **Toninia sedifolia** (Ph. 93)

13. Fruits immersed in bumps with wide thalline margin. Damp acid rocks in W. Scotland. (Spores simple) **Porocyphus coccodes**
– Fruits on surface with thin, paler margin. Substrata include stone, rusty metal and wood. (Spores 7-septate, spirally twisted) **Scoliciosporum umbrinum**

14. Thallus shades of brown, including fawn and cream. It may have a purple or mauve tinge **15**
– Thallus white to dark grey or yellowish (some species may look rusty) and yellow-grey **34**

15. Thallus with a tinge of purple/mauve **16**
– Thallus lacks purple/mauve tinge **17**

16. Purplish tinge to thallus. Fruits to 1 mm diam, black, flat. Black prothallus **Rhizocarpon richardii** (Ph. 31)
Rhizocarpon polycarpon *is difficult to separate in the field but has a K+ purple epithecium (the top layer of the disc)*
– Mauve tinge. Fruits 0.16-0.3 mm diam. brown-black to black slightly convex. No prothallus **Arthonia phaeobaea** (*if on limestone* **Catillaria lenticularis**)

17. Fruits lecideine (Fig. 93) **18**
– Fruits lecanorine **23**

18. Calc. soil. Thallus warted-granular **Bilimba lobulata** (Fig. 93a)
– Not on calcareous soils. Thallus cracked, areolate or absent **19**

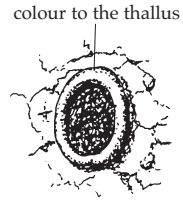
19. Fruits 0.3-0.6 diam. black not pruinose **Amandinea pelidna (lecideina).** (*A thick warted thallus on bird-perching sites in the West probably* ***Amandinea coniops****. If in a sheltered site, slightly orange with fruits to 1.5 mm diam. with pruinose disc and black margin* ***Lecanactis dilleniana.*** *If on wood, grey to green-grey probably* ***Amandinea punctata***)
– Fruits larger or orange to red-brown, pruinose. [Exposed rocks] **20**

20. On calcareous rocks but *not* on limestone. Thallus brown to olive-brown. S.W. England **Toninia mesoidea**
– On exposed acid rocks. **21**

21. Thallus grey-brown to red-brown **Rhizocarpon hochstetteri**
– Thallus absent or almost grey **22**

22. Fruit disc pale to dark red-brown **Sarcogyne privigna** (rare)
– Fruit disc black **Lecidea auriculata** group

a) Thalline margin: Margin is a similar colour to the thallus



b) Proper margin: Margin is dark and not the same colour as the thallus

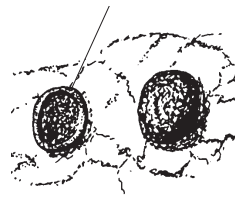


Fig. 93. Types of fruit margins x5
a: Lecanorine
b: Lecideine

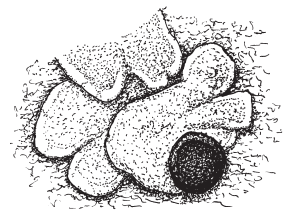


Fig. 93a. *Bilimbia lobulata* x8

23. Thallus leaden to slate-grey with brown tips, waxy and like worm-casts. On hard acid rocks **Halecania ralfsii** (Ph. 18)
– Thallus colour the same throughout and not brown tipped. Not waxy or like worm-casts. Various substrata **24**

24. Occurs on soil, mosses plant debris.[Thallus warm brown-grey, usually thin. Little prothallus] **Rinodina conradii**
– Occurs on rocks and boulders and wood. **25**

25. Thallus greyish brown, fawn to chestnut. Thallus and fruit disc rather glossy **Protoparmelia badia** (Ph. 82)
– Thallus grey-green, yellow-grey or brown, not glossy **26**

26. On acid rocks and boulders **27**
– On wood, nutrient-enriched basic stone, cement etc **30**

27. Thallus dirty grey tinged with brown and with pale edges. Fruits sessile, [disc pale pink to dark brown] (spores 8 per ascus 1-septate) **Lecania hutchinsiae**
– Thallus yellow-brown to red brown. Fruits immersed (spores 50+ per ascus, simple). See also squamulose key C. **28**

28. Thallus dull brown. Areoles convex, almost nodular with slightly lobate margins **Acarospora nitrophila** (Fig. 93b)
– Thallus shades of brown. Areoles flat not slightly lobate **29**

Fig. 93b. *Acarospora nitrophila* x8

29. Thallus dull to dark brown. Areoles form a smooth crust becoming thinner at the edge**Myriospora (Acarospora) rufescens**
– Thallus red-brown to very dark brown. Areoles dispersed often following cracks in the substratum **Acarospora veronensis**

30. Fruit margin granular **Lecania erysibe**
– Fruit margin smooth but may be notched or excluded **31**

31. On weathered wood **32**
– On rock or concrete especially nutrient-enriched **33**

32. Thallus creamy white. Fruit disc very convex, greenish, brown to almost black. Fruit margin soon excluded **Lecanora aitema**
– Thallus yellowish grey to grey. Fruit disc pale red-brown not strongly convex. Fruit margin wavy, persistent **Lecanora saligna**

33. Thallus grey to green-grey with a brown tinge, rather flat. Nutrient enriched sites including concrete **Rinodina oleae**
– Thallus yellowish grey-brown, lumpy often scattered. Pruinose fruits. Calcareous rocks including limestone **Lecania rabenhorstii**

34. On soils, mosses, plant debris or humus, often in rock crevices **35**
– On rocks and boulders or wood **41**

35. Fruits lecanorine, up to 3.5 mm diam. **36**
– Fruits lecideine, up to 1.0 mm diam. **37**

36. Thallus grey. Fruit discs red-brown to black. Mainly on decaying thrift and grass **Lecanora zosterae**
– Thallus grey-green. Fruit disc orange. On decaying stems of shrubby seablight (Dorset and N. Norfolk) **Caloplaca suaedae**

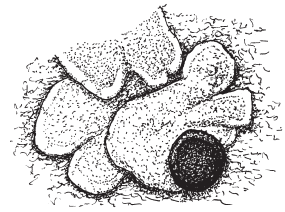


Fig. 93a. (repeat). *Bilimbia lobulata* x8

37. Thallus almost squamulose. Squamules with pale edges. Fruits black and convex **Bilimbia lobulata** (Fig. 93a)
– Thallus warted to granular or varnish-like. Fruits pink to black **38**

38. Acid sites **Micaria lignaria**
– Calcareous sites **39**

39. Mature fruits globose. Pink to brown-black, margin excluded early **Bilimbia sabuletorum**
– Fruits flat to convex, red-brown to black, margin persistent **40**

40. Fruits black. Thallus granular to warted **Bacidia bagliettoana**
– Fruits red-brown, persistently flat. Thallus varnish-like or minutely granular **Bacidia herbarum**

41. Fruits lecanorine. Thalline margin present at least in young fruits but sometimes not very visible where the fruits are immersed in the thallus (Fig. 93 left) **42**
– Fruits lecideine (Fig. 93 right) **63**

42. Fruit discs fawn, pink, brown, yellow-green or piebald **43**
– Fruit discs green-black, brown-black or black (may be pale if very pruinose) **53**

43. Thallus thick, smooth to warted, creamy white to deep cream. Fruits with very wide margins, discs covered in granular white pruina. Pruina only C+ red **Ochrolechia parella** (Ph. 43)
– Thallus white, grey, grey-green or yellowish. No C+ red granular pruina **44**

44. Thalline margin excluded early **45**
– Thalline margin persistent except in a few over-mature fruits **47**

45. On shaded rocks. Thallus grey to brownish **Lecania hutchinsiae**
– On weathered wood. Thallus yellow-green or creamy white **46**

46. Thallus creamy white. Fruit disc often becoming very convex, brown to almost black often mottled **Lecanora aitema**
– Thallus yellow-green to green-grey. Fruit disc cream, pinkish, greenish to brown, flat to convex **Lecanora symmicta**

47. In mesic-supralittoral zone (with *Caloplaca marina* and *Hydropunctaria maura*) **48**
– Above the mesic-supralittoral zone **49**

48. Thallus leaden grey to yellow-grey. Disc brown. Sheltered or shaded sites. Margin may be almost excluded **Lecanora helicopis**
– Thallus creamy white to grey. Disc greenish. Exposed sites. Fruit margin not excluded **Lecanora actophila**

49. On weathered wood **50**
– On rock or concrete **51**

50. Disc margin thin and distorted, overarching young fruits. Not usually with pycnidia **Lecanora varia**
– Disc margin crenulate, not overarching young fruits. Usually with dark, minute pycnidia **Lecanora saligna**

51. Thallus thick to 1 cm diam., white or pale grey. Fruits abundant and crowded. **Lecanora albescens**
– Thallus immersed or thin. White or black. Fruits scattered **52**

52. Fruit margins very crenulate. Disc very white or blue-grey pruinose **Lecanora crenulata**
– Fruit margins smooth or slightly crenulate. Not or slightly white pruinose **Lecanora dispersa** (Ph. 42)
(*Fruits not scattered, but in groups, probably* **Lecanora semipallida**)

53. Fruits immersed in thallus (Fig. 94) **54**
– Fruits more or less sitting on surface or partially immersed in pits in the substratum **56**

54. Thallus bluish grey or brownish grey. Fruits with a thin, grey margin. (Spores 8 per ascus) **Aspicilia caesiocinerea** (Ph. 15)
– Thallus white to pale greenish grey (spores 4 per ascus) **55**

55. Thallus white or grey, cracked, continuous, rather flat, large, frequently has dark prothallus (Fig. 94) **Aspicilia calcarea** (Ph. 73)
– Thallus formed of rounded, separate, pale greenish grey areoles with a fruit in the centre of each, remaining separate at the thallus margin (Fig. 95) **Aspicilia contorta** subsp. **contorta**
If the marginal areoles are flattened and pressed together to form a crust **Aspicilia contorta** subsp. **hoffmanniana**

Fig. 94. *Aspicilia calcarea* x6

56. Fruits partially immersed in the substratum [Black and pruinose to 0.5 mm diam.] **Caloplaca alociza**
– Fruits more or less sitting on the surface of the thallus **57**

57. Fruits dark bluish green [exposed rocks] **Lecanora actophila**
– Fruits brown to black **58**

58. Thallus bluish grey, worm-cast like, waxy. [Fruit disc dark brown, 0.2-0.5 mm diam. Spores 1-septate] **Halecania ralfsii** (Ph. 18)
– Thallus white to shades of grey, not worm-cast like or waxy **59**

Fig. 95. *Aspicilia contorta* x6

59. Fruits to 1.25 mm diam., wavy margin **Rinodina beccariana** (Ph. 83)
– Fruits to 0.6 mm diam., neat or excluded margin **60**

60. On wood. Thallus greenish white to black. Numerous pycnidia up to 0.2 mm diam. with white tips **Micaria denigrata**
– No white tipped pycnidia **61**

61. Thallus, scurfy, ± areolate, [grey to brownish. Thalline margin narrow]. (Spores 1-septate) **Lecania erysibe**
– Thallus absent, dispersed to areolate, not scurfy **62**

62. On basic substrata. Thallus areolate or almost absent, greenish to grey (Spores brown, polarilocular) **Rinodina oleae** (Ph. 39)
– On acidic bark and timber. Thallus in patches, creamy white. Fruit disc often mottled (spores simple) **Lecanora aitema**

63. Spreading onto rock from soil, plant debris or mosses **64**
– Directly on rocks, pebbles, mortar or wood **67**

64. Thallus almost squamulose. Squamules with pale edges. Fruits black and convex **Bilimbia lobulata** (Fig. 93a)
– Thallus granular or varnish-like. Fruits pink to black **65**

65. Mature fruits globose. Pink to brown **Bilimbia sabuletorum**
– Mature fruits flat to convex. Red-brown to black **66**

66. Fruits black. Thallus granular to warted **Bacidia bagliettoana**
– Fruits red-brown. Thallus usually varnish-like **Bacidia herbarum**

67. Fruits at least partially in pits or depressions in the substratum **68**
– Fruits not in pits or depressions in the substratum **70**

68. Fruits pruinose **69**
– Fruits not pruinose, scattered or in lines along cracks. [Fruits red-brown to black] **Clauzadea metzleri**

69. Fruits to 0.6 mm diam. Often more or less regularly arranged. On hard limestone (ascus 8-spored) **Clauzadea immersa**
– Fruits to 1.5 mm diam. not regularly arranged. Basic rock walls, shells, old mortar etc. (100- to 200-spored) **Sarcogyne regularis**

70. In shaded underhangs [fruits very pruinose] **71**
– More exposed situations. Pruinose or not **72**

71. Thallus grey (may have slight orange or mauve tinge). Fruits 0.4–2 mm diam. Disc only, white pruinose **Lecanactis dilleniana**
– Thallus grey or mottled grey. Fruits 0.1 mm diam. in groups and lines. Fruits grey-black pruinose **Roccellographa circumscripta**

72. Wet or dry, fruits black but may be white pruinose **77**
– Fruits green-black, red-brown or red-black, especially when wet **73**

73. Fruits green-black when wet **Lecidella stigmatea** (pl 3)
– Fruits red-black or red-brown when wet [calcareous rocks] **74**

74. On hard acid rocks and walls **Sacogyne privigna** (rare)
– On calcareous rocks **75**

75. Disc grey-violet pruinose. (100 or more spores per ascus) **Sarcogyne regularis**
– Disc not pruinose (8 spores per ascus) **76**

76. Fruits 0.4–1 mm diam. **Clauzadea monticola**
– Fruits 0.15–0.4 mm diam. **Catillaria lenticularis**

77. Fruit margin very contorted, notched, disc ridged. [Thallus grey scurfy to areolate or not visible. Fruits to 0.6 mm diam.] (Spores minute 3–5 x 1–2μm) **Polysporina simplex** (Fig. 95a)
– Fruit margin not very notched and contorted neither is the disc ridged. (Spores larger) **78**

78. Thallus white, cream or pale grey, cracked, areolate or absent. (Spores simple or 3-septate to muriform) **79**
– Thallus mid to dark grey or grey-green, thin to areolate, often forming mosaics. (Spores 1-septate) **Catillaria chalybeia**

79. On acid rock and pebbles. Pruinose or not **80**
– On calcareous rocks and mortar. Fruits very pruinose (spores 3-septate becoming muriform) **Diplotomma alboatrum**
– (*if spores do not become muriform,* **Diplotomma hedinii**)

80. Thallus grey, thin. Fruits 0.2–0.5 mm diam. **Micarea erratica**
– Thallus white to grey, cracked, areolate or absent. Fruits 0.6–1.5 mm diam. **81**

81. Disc flat, narrow but margin persistent. Thallus often almost absent. Usually coarse grained rock **Lecidea auriculata** group
– Disc becoming convex, wide margins. On hard rocks. *Porpidia* species, can be difficult to separate in the field (Fig. 96) **82**

82. Fruits usually very pruinose **Porpidia cinereoatra** (Ph. 81)
– Fruit not or slight pruinose **Porpidia crustulata**

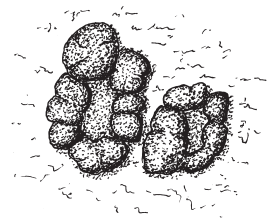


Fig. 95a. *Polysporina simplex* fruits x10

Fig 96. *Porpidia* fruits x5

Key E – Leprose or powdery

This key contains species growing on rocks, wood or soil that appear to be, or are, powdery or granular in appearance. The genus *Lepraria* is included of which many of the species can be very difficult to separate. The key includes only those species that may be reasonably easily separated in the field.

1. On wood, calcareous rocks and soil **2**
– On acid rocks and soil **10**

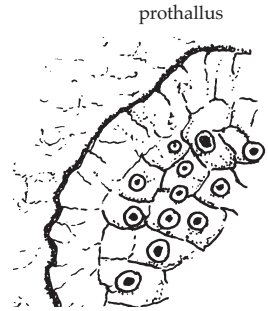


Fig. 97. Position of prothallus on the margin of a lichen

2. On calcareous rocks and soil **3**
– On wood **31**

3. Thallus orange, yellow or red **4**
– Thallus white, grey or greenish **6**

4. Thallus deep orange, pink to red, often with white flecks. Occurs in shade especially on north walls **Gyalecta nidarosiensis**
– Thallus yellow to orange **5**

5. Thallus deep mustard to yellow-brown, completely granular sorediate. Not lobed at the margin **Caloplaca chrysodeta**
– Thallus bright yellow completely sorediate but with slight marginal lobes. White prothallus **Caloplaca xantholyta**

6. Thallus C+ red **7**
– Thallus C– **9**

7. Greenish to yellowish grey. In copper wash-down such as below lightning conductors. No prothallus **Psilolechia leprosa**
– White, cream or pinkish. Vertical rock. Dark prothallus (Fig. 97) **8**

8. White to pale pink thallus and soredia **Llimonaea sorediata**
– Brownish cream thallus and soredia **Dirina massiliensis** f. **sorediata**

9. Thallus green, thick, minutely granular, without lobes and covered in minute projecting hyphae **Botryolepraria lesdainii**
– Thallus white to greenish grey, powdery with weak lobes and often showing white areas of medulla **Lepraria vouauxii**

10. Thallus and/or soredia K+ yellow, orange or purple **11**
– Thallus and/or soredia K– **20**

11. Orange areas of thallus K+ purple **Trapeliopsis pseudogranulosa**
– Thallus and/or soredia K+ yellow, orange or brownish yellow **12**

12. Soredia C+ yellow-orange. Shaded, often vertical acid rock **13**
– Thallus and soredia C–. Various habitats **14**

13. Thallus thin, grey, not lobed or yellowish at margin. Becoming covered in yellow-green powdery soredia. **Lecanora expallens**
– Thallus thick, grey to creamy, yellowish at the lobed margin. Covered in granules **Lepraria membranacea**

14. Thallus green-grey, thick, coarsely granular. K+ pale yellow. [Occurs in polluted areas] **Lecanora conizaeoides**
– Thallus yellowish green, apple-green, powdery in centre. K+ yellow, orange or brownish yellow **15**

15. Thallus apple green (rarely blue-grey tinged) Almost lobed at the margin. White medulla **Lepraria lobificans**
– Thallus yellow-green, yellow or white or grey **16**

16. Membranous crust and/or with a well-delimited margin. Covered in soft or hard granules. White to pale grey **17**
– Not membranous. Powdery soredia. Yellow, yellow-green white or grey **18**

17. Not distictly lobed. Granules lighter towards margin of thallus giving a zoned appearance **Lepraria caesioalba**
– Lobed margin not clearly colour zoned **Lepraria nivalis**

18. Edge of thallus (prothallus) wide, pale, fringed and cottony. Thallus yellow-green or grey powdery. K+ yellow **19**
– No wide, fringed, cottony edge to thallus. Bright, yellowish green. K+ yellow-brown. Powdery soredia **Lecanora orosthea**

19. Thallus yellow-green to yellow-grey
Haematomma ochroleucum var. **ochroleucum**
Thallus pale grey to greenish grey
Haematomma ochroleucum var. **porphyrium**

20. Thallus and soredia C+ orange, red or rose-red **21**
– Thallus and/or soredia C– **24**

21. Thallus and soredia C+ red or orange. Thallus scratches green **22**
– Thallus and soredia C+ rose-red. Thallus scratches orange **23**

22. Thallus and soredia C+ orange. Thallus thin, scratches green, becoming covered in coarse grey soredia. Soredia become pale green when lightly scratched **Lecidella scabra** (Ph. 38)
– Thallus/soredia C+ red. Thallus granular **Trapeliopsis granulosa** (If the thallus has K+ purple patches – **Trapeliopsis pseudogranulosa**)

23. White to pale pink thallus and soredia **Llimonaea sorediata**
– Brownish cream thallus and soredia
Dirina massiliensis f. **sorediata**

24. Thallus vivid yellow to bright greenish yellow
Psilolechia lucida
– Thallus green, green-grey, bluish grey, pale yellowish green or yellow to brownish yellow **25**

25. Thallus smooth-surfaced granules, yellow to brownish yellow. (Rarely green-yellow f. **flavovirella**) **Candelariella vitellina**
– Thallus finely sorediate or with rough, coarse granules **26**

26. Thallus of smooth, flat topped areoles, yellowish green. Soredia, at first in centre of areole. (Fig.98) **Lecanora soralifera**
– Thallus granular or of minute fluffy spheres **27**

27. Thallus pale yellow-green (greyish in deep shade). Below overhangs and in crevices **Lepraria ecorticata**
– Thallus grey, green to grey-green. Habitats various **28**

28. Thallus covered in grey-green granules which become green when *lightly* scratched **Lecania erysibe** f. **sorediata**
– Thallus green or does not become green when *lightly* scratched **29**

29. Thallus green-grey, thick, coarsely granular. [Occurs mainly in polluted areas] **Lecanora conizaeoides**
– Thallus green to bluish grey **30**

30. Clumped granules (on the tips of minute white stalks). On damp acid rock and soil **Leprocaulon microscopicum** (Ph. 89)
– Fluffy spheres 0.1 mm diam. Occurs in all areas **Lepraria incana**

31. Thallus and/soredia K+ yellow, brownish or yellow-red **32**
– Thallus and/soredia K- **35**

32. Thallus grey-green, granular [becoming covered in coarse soredia which scratch to a paler colour] **Lecidella scabra** (Ph. 38)
– Thallus grey to yellow-green, smooth wrinkled or cracked **33**

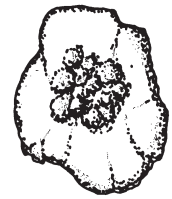


Fig. 98. Areole of *Lecanora soralifera* x6

33. Soralia to 0.4 mm. Soredia grey to green-grey [pale yellow when scratched] **Buellia griseovirens**
– Soralia less than 0.4 mm. Soredia pale yellow to yellow-green **34**

34. Thallus yellowish green, C– **Lecanora orosthea**
– Thallus grey. C+ yellow, orange or red **Lecanora expallens**

35. Thallus C– **36**
– Thallus C+ orange to red, thallus of various types **38**

36. Thallus greenish white to black, thin or scurfy. Frequently with white-tipped minute pycnidia **Micaria denigrata**
– Thallus grey to yellow-green. No white-tipped pycnidia **37**

37. Coarse grey-green granules. [Polluted areas] **Lecanora conizaeiodes**
– Pale grey thallus becoming covered with yellow-green soredia *except* at thallus margin **Lecanora compallens**

38. Thallus bluish green to green-grey of flattened granules **Trapeliopsis flexuosa**
– Thallus grey to pinkish, ***or*** thin, scurfy and white or black **39**

39. Thallus of rounded granules, grey to green-grey or pinkish, becoming yellow with soredia **Trapeliopsis granulosa**
– Thallus greenish white to black, thin or scurfy. Frequently with white-tipped minute pycnidia **Micarea denigrata**

Fig. 99. Fruticose lichen (*Ramalina* sp.) x1

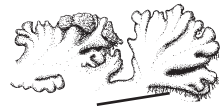


Fig. 100. Foliose lichen (*Parmelia* sp.) x2

Fig. 101. Crustose species x2. These lichens may, or may not, have a coloured margin.

Supplementary Keys

Key F

Species that frequently occur on calcareous substrata such as limestone, concrete and mortar

(If the substratum is very nutrient enriched, it may support a number of other species. For lichens growing on calcareous soil or humus in limestone crevices, go to Key G, page 74)

Fig. 102. Leprose (powdery) lichen (*Lepraria* sp.) x12

1. **Thallus fruticose** (Fig. 99) **2**
– Thallus foliose, crustose or powdery (Figs. 100-102) **5**

2. Thallus bluish grey. Lobes rounded in section. Whitish soredia [sheltered, ± vertical, rocks] Cortex C+ red and soredia C– **Roccella phycopsis** (Ph. 64) (rare).
(*If lobes rather flattened. Cortex C–, soredia C+ red* **Roccella fuciformis** (very rare)
– Thallus green to green-grey. Flattish lobes. Soredia greenish **3**

3. Not swollen towards tips. Oval-shaped splits on sides of branches containing fine powdery soredia (Fig. 103) **4**
– Swollen areas towards tips burst to reveal internal soredia (Fig. 104) **Ramalina canariensis**

Fig.103. *Ramalina farinacea* showing oval shaped soralia x4

4. Grows from single basal holdfast (Fig. 103) **Ramalina farinacea**
– Grows from a multiple base, forming swards **Ramalina subfarinacea** (Ph. 54)

Fig. 104. *Ramalina canariensis* x4

5. Thallus foliose or crustose (may be very sorediate) **6**
– Thallus completely powdery **126**

6. **Thallus foliose** (Fig. 100) (including gelatinous species eg. *Collema* and *Leptogium*) **7**
– Crustose, placodioid, squamulose or powdery **31**

7. Thallus orange (at least in parts) or greenish orange **8**
– Thallus any other colour **12**

8. Lobe tips up to 7 mm wide. Thallus to 15 cm diam. **9**
– Lobe tips only up to 2 mm wide. Thallus to 6 cm diam. **10**

9. Knobby outgrowths 0.1–0.7 mm diam. near centre. Few or no fruits **Xanthoria calcicola**
– No knobby outgrowths. Usually very fertile with fruits to 4 mm diam. **Xanthoria parietina** (Ph. 56)

10. Lobes leaf-like to 1 mm long, becoming upright with powdery soredia on frilly tips. Not fertile **Xanthoria ucrainica** (Ph.58)
– Lobes adpressed, to 2 cm long, not sorediate. May be fertile **11**

11. Lobes flat, yellow to orange. Lobe tips to 2 mm wide. Rarely fertile, fruits to 4 mm diam. **Xanthoria aureola** (Ph. 57)
– Lobes convex, bright, deep orange. Lobes 0.5-1 mm wide. Sometimes fertile, fruits to 1.5 mm diam. **Xanthoria elegans**

12. With marginal eyelash-like cilia (Fig. 105). Strap-like. Thallus pale grey to pale brownish grey. (Spores brown, 1-septate) **13**
– No long marginal eyelash-like cilia. Rarely strap-shaped **15**

13. Lobes 1–5 mm wide. Lobe tips not swollen. No soredia. Thallus K–. Fawn-grey lobes **Anaptychia ciliaris subsp. ciliaris** (*if lobes dark grey to brown* **Anaptychia ciliaris subsp. mamillata**)
– Lobes 0.3–1 mm wide. The swollen lobe tips or the back of the lobes with powdery soredia **14**

14. Lobe tips swollen, helmet-shaped, bursting open to reveal powdery soredia (Fig.106) **Physcia adscendens**
– Lobe tips not swollen, lip-shaped with powdery soredia on back surface of lobe tip (Figs. 105, 107) **Physcia tenella** (Ph. 50)

15. Thallus grey above, tan below. Rigid, plate-like. Attached at centre only. **Dermatocarpon miniatum** (Ph. 69, Fig. 107a)
– Thallus colour various. Not rigid and plate-like **16**

16. Thallus not swelling noticeably when wet but sometimes becoming green. Dry thallus grey to brown or almost black **17** (*If thallus is yellow-green to brown-grey and pruinose, especially on the lobe margins, it is the squamulose* **Squamarina cartilaginea**)
– Thallus papery when dry, swollen when wet, dark brown to green-black **22**

17. Underside whitish to tan but may have dark rhizines **18**
– Underside black, at least in centre **21**

18. Lobes to 0.3 mm wide **Phaeophyscia nigricans**
– Lobes to 2 mm wide **19**

19. Granular sorediate or fine isidia in centre and on lobe margins. Thallus grey, grey-brown to brown **Physconia grisea**
– No isidia. Soralia fine not granular.Thallus pale grey **20**

20. Soredia on ascending lobe tips **Physcia tribacia**
– Soredia on adpressed lobe tips and sides **Physcia caesia**

21. Thallus to 10 cm diam., pruinose tips. Often with lobules in centre. Rhizines dark and bottle-brush shape in centre **Physconia distorta**
– Thallus to 3 cm diam., not pruinose. No lobules. Rhizines all simple, black **Phaeophyscia orbicularis**

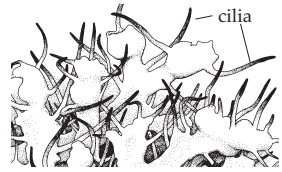


Fig. 105. *Physcia tenella* x1

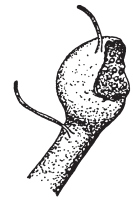


Fig.106. Lobe tip of *Physcia adscendens* x7

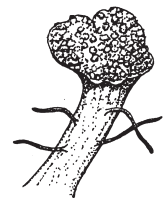


Fig. 107. Lobe tip of *Physcia tenella* x6


Fig. 107a. Central holdfast of *Dermatocarpon miniatum* x2


Fig. 108. Globose isidia x15


Fig.109. Flattened isidia x 15


Fig. 110. Coralloid isidia x10

22. Lobes with wart-like, globose (Fig. 108), flattened (Fig. 109) or finger-like, minute (Fig. 110) outgrowths (isidia), (but see also couplet 30 as isidia may rarely occur) **23**
– Lobes without isidia or wart-like growths **28**

23. Wart-like or lobe-like outgrowths on lobe surfaces or tips **24**
– Flattened, minutely finger-like or globose isidia on lobes **25**

24. Lobes ridged and adpressed **Collema nigrescens**
– Lobes smooth, margins raised **Collema cristatum** var. **cristatum**

25. Isidia become flattened when mature **Collema crispum**
– Finger-like (coralloid Fig. 110) or globose (Fig. 108) isidia **26**

26. Lobes to 2 mm wide, dark red-brown **27**
– Lobes to 10 mm wide, green-brown to black, ear-like, wrinkled when dry [Erect. Rarely fertile] **Collema auriforme** (Ph. 70)
(If lobes to 2 mm wide, concave and not wrinkled when dry, probably **Collema cristatum** var. **marginale**)

27. Thallus upright tufts to 5 mm high, 1 mm wide, dividing near the base. Often granular isidiate **Leptogium schraderi**
(*if with rather more globose isidia and fertile probably* **L. turgidum**)
– Thallus lobes to 1 mm long. Isidia to 0.1 mm diam **L. teretiusculum**

28. Blue-grey when dry. Rarely fertile **Leptogium britannicum**
– Green-brown to brown or greenish black. Usually fertile **29**

29. Lobes convex and rounded. Richly and repeatedly branched and fragile, often fan-shaped **Collema multipartitum**
– Lobes not repeatedly branched, not fan-shaped **30**

30. Lobes erect, dominant, often with ragged tips. Fruits brown-centred to 2 mm diam. **Leptogium gelatinosum**
– Lobes in rosettes (very rarely with globose isidia). Thallus with numerous orange fruits to 3 mm diam. **Collema tenax** (Ph. 71)

31. **Thallus squamulose** (if originating on soil try page 75) **32**
– Thallus crustose including placodioid or powdery **34**

32. Thallus of yellowish to brownish green squamules, leaf-like Fruits with brown discs **Squamarina cartilaginea** (Ph. 68)
– Thallus of grey to brownish or greenish grey convex squamules, almost areolate. Fruits black **33**

33. Squamules with paler dots and no regular fissures. Apothecia to 1.5 mm diam. **Toninia aromatica** (Ph. 41)
– Squamules without paler dots, often with shallow regular fissures. Apothecia to 3.0 mm diam. **Toninia sedifolia** (Ph. 93)

34. **Thallus crustose-placodioid** (flat or rounded lobes, Fig. 111-112) **35**
– Thallus crustose but not placodioid (may be very slightly notched at the margin) or powdery **43**

35. Thallus white or grey. Fruits black **36**
– Thallus and fruits orange or yellow, greenish or brown-green **37**

36. K–. Thallus chalky white. Usually fertile. Not sorediate **Solenopsora candicans** (Ph. 75)
– K+ yellow, Thallus white to pale grey. Rarely fertile, usually yellowish sorediate **Diploicia canescens** (Fig. 112)

37. Thallus greenish, grey-green or brown green. Edges of lobes white. Fruit discs tan to brown **Lecanora muralis** (Ph. 49)
– Thallus yellow to orange. No pale edges. Fruits orange **38**

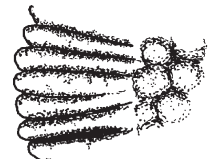


Fig. 111. Part of the edge of a crustose, placodioid lichen (*Caloplaca* sp.) x4

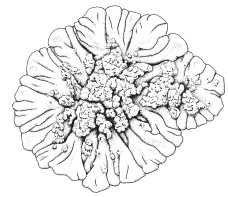


Fig. 112. *Diploicia canescens* x1

Fig. 113. Central holdfast of *Dermatocarpon miniatum* x2

Fig. 114. *Caloplaca aurantia* x5

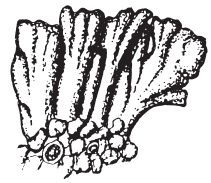


Fig. 115. *Caloplaca flavescens* x5

Fig. 116. *Caloplaca saxicola* x5

38. Thallus sorediate **39**
– Thallus not sorediate **40**

39. Lobes long and finger-like. Soredia bright yellow on lobes in round soralia **Caloplaca cirrochroa** (Ph. 65)
– Lobes short. Soredia yellow in lip-shaped marginal soralia on the tips of the inner lobes **Caloplaca decipiens**

40. Thallus K–. Thallus egg-yellow, greyer in the centre **Candelariella medians**
– Thallus K+ crimson/purple or yellow to orange **41**

41. Marginal lobes very flattened, bright, creamy orange often with a paler area inside the outer lobes, frequently not pruinose (Fig. 114) **Caloplaca aurantia** (Ph. 67)
– Marginal lobes convex, clear yellow to orange, with or without paler area at base of lobes, often pruinose **42**

42. Marginal lobes to 10 mm long. Orange, often a white ring inside lobes. Thallus not granular (Fig. 115) **Caloplaca flavescens** (Ph. 66)
– Marginal lobes to 3 mm long. Yellow to brownish yellow, much wider at tips, (usually pruinose) and firmly attached. Thallus centre, often of large, smooth-surfaced granules that are visible between the numerous fruits (Fig. 116) **Caloplaca saxicola**

43. Fruits hard, black, flask-shaped (Figs. 117, 120–123) and with minute central opening often visible *or* writing-like (lirellate), longer than wide,(Figs. 123, 124) but may be in rounded heaps **44**
– Fruits disc- or button-shaped (may be very small) (apothecia Fig.118, 119), various colours including black. No minute central opening *or absent* **58**

44. **Lirellate**. Fruits often looking like lines made with a pen (Fig. 123) or more rounded and sometimes in knot-like heaps **45**
– Fruits flask-shaped with small, central opening (use hand-lens) (perithecia). (Figs. 117, 120–122). May only be visible as small, dark swellings on the surface of the lichen **46**

45. Thallus not parasitic on other lichens, smooth, cracked or immersed, white to grey **Opegrapha calcarea** (Ph. 47)
– Thallus parasitic, mainly on *Verrucaria* species usually *V. baldensis.* Fruits with a very narrow slit (Fig. 123a) **Opegrapha rupestris**

46. **Perithecia** not or slightly in pits in the substratum (Fig. 121) **47**
– Perithecia partially or fully in pits in substratum (Fig. 122). (mainly *Verrucaria* species with simple spores) **54**

47. Thallus thin, often only a stain on the surface. Perithecia not or slightly immersed in the thallus **48**
– Thallus thick with perithecia ± fully immersed in thallus **51**

48. Perithecia with depressed tips (Fig. 124) **Verrucaria dufourii**
– Perithecia with flat or rounded tips (spores 1–3 septate) **49**

49. Hard limestone. Thallus pinkish grey, brown-grey or absent. Perithecia to 1 mm diam., conical and/or flat tipped **50**
– Mortar or soft limestone. Thallus pale brownish grey or absent. Perithecia to 1.5 mm diam., rather spherical (Fig. 121 left) **Acrocordia salweyi**

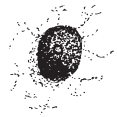


Fig.117. Perithecium from above x8

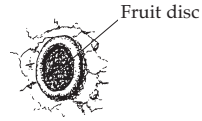


Fig. 118. Fruit disc in centre of fruit x5

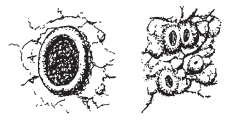


Fig. 119. Types of fruits (apothecia)

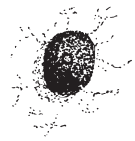


Fig. 120. Peritheciuam from above x8

Fig.121. Sections through superficial perithecia x12

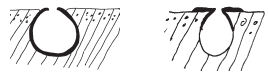


Fig. 122. Perithecia in pits or immersed in thallus x12

Fig. 123. *Opegrapha* species x6

Fig. 123a. *Opegrapha rupestris* x6

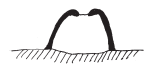


Fig. 124. Section through *Verrucaria dufourii* x6

50. Thallus brown-grey. Fruits conical, tip not flattened (Fig. 121 right) **Acrocordia macrospora**
– Thallus pinkish grey or absent. Fruits conical with a flattened tip (Fig. 121 right) **Acrocordia conoidea**

51. Thallus green, brown to chocolate-brown or black **52**
– Thallus leaden grey to 1 cm wide but forming mosaics. Edge of lichen and between areoles outlined by black lines. Perithecia to 0.1 mm, several per areole **Placopyrenium fuscellum** (*If areoles not strongly outlined and perithecia about 1 per areole, and more pronounced, up to 0.25 mm diam., probably* **V. caerulea)**

52. Thallus very dark brown to black **Verrucaria nigrescens**
Thallus green-brown, brown or olive-greeen **53**

53. Thallus green to brown, widely cracked. Areoles to 0.4 mm wide **Verrucaria viridul**a
– Thallus brown to olive-green. Areoles to 1.5 mm wide, often sorediate around the edges **Verrucaria macrostoma**

54. Perithecia to 0.25 mm diam., closely dispersed [leaving empty pits when old and the black 'lids' fall off (Fig. 122 right). Thallus white, pale grey or absent] **Verrucaria baldensis** (Ph. 80)
– Perithecia 0.3–0.8 mm diam., widely dispersed leaving empty pits, or not **55**

55. Distinct narrow gap between perithecia and thallus (spores 1-septate) **Thelidium decipiens** (Fig. 125)
– No clear gap between perithecia and thallus (spores simple or 3-septate) **56**

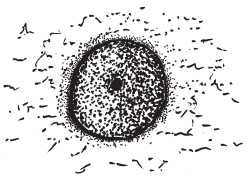


Fig. 125. *Thelidium decipiens* x15

56. Thallus pink-grey to brown-grey (spores 3-septate) **Porina linearis**
– Thallus white to pale grey or absent **57**

57. Perithecia leaving empty pits when old **Verrucaria muralis**
– Perithecia mostly remaining in the pits when old (Fig. 122 left) **Verrucaria hochstetteri**

Thallus crustose – with apothecia *or* fruits absent

58. Thallus crustose, yellow, yellow-green or orange **59**
Thallus crustose or powdery. Other colours including white, grey, fawn and brown. Fruits only may be yellow to orange **69**

59. Thallus K+ crimson-purple **60**
– Thallus K – but fruits may be K+ crimson-purple **68**

60. Not sorediate but may be scurfy **61**
– Sorediate **64**

61. Thallus very thin and scurfy, pale yellow **Caloplaca ochracea** (*If finely areolate but not matt and the areoles are distinct and separated by dark lines* **Caloplaca dalmatica**)
– Thallus thick and not scurfy, shades of yellow and orange **62**

62. Thallus thick, very convex, pruinose areoles **C. ruderum** (Fig. 126)
– Thallus of flat or slighty convex, not pruinose areoles **63**

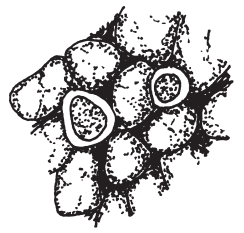


Fig. 126. *Caloplaca ruderum* x5

63. Thallus whitish to yellow-green, often large (to 15 cm diam.) isolated single thalli **Caloplaca flavovirescens**
– Thallus greenish fawn to grey-yellow, no prothallus (mainly on horizontal concrete and mortar) **Caloplaca crenulatella**

64. Thallus deep mustard to yellow-brown, completely granular sorediate **Caloplaca chrysodeta**
– Thallus yellow to yellow green, completely sorediate or not **65**

65. Thallus bright yellow completely sorediate but with slight marginal lobes. White prothallus **Caloplaca xantholyta**
– Completely sorediate or not, with no marginal lobes. No, or yellow to orange, prothallus **66**

66. Thallus yellow. Minutely lobate at the margin. Areoles ringed with brighter yellow soredia-like granules **Caloplaca arcis**
– Thallus yellow to yellow-green. Not at all lobate. Areoles become covered in pale fine soredia **67**

67. Soredia originate on margins of the convex areoles and are the same colour as the areoles **Caloplaca citrina** (Ph. 11)
– Soredia originate at the tips of the minute squamulose areoles and are paler than the areoles **Caloplaca flavocitrina**

68. Pale grey rim to brownish to grey-brown disc. Thallus of granules or a crust. No, or white, prothallus **Lecanora stenotropa**
– Yellow rim to brownish orange disc. Thallus of scattered granules on a black prothallus **Candelariella aurella**

69. Sorediate, isidiate, granular or completely powdery **70**
– Not sorediate or isidiate nor with a thallus of granules **78**

70. **Sorediate** or completely powdery **71**
– **Isidiate** or with a thallus of rough or smooth-surfaced (corticate) granules or warts. (The separation of these types may be difficult. In this case try both halves of the couplet) **77**

71. Sorediate **72**
– Thallus completely powdery (leprose or looks leprose) **126**

72. Thallus K+ yellow (fruits K+ crimson) **Haematomma ochroleucum**
– Thallus K– (fruits only may be K+ crimson) **73**

73. Thallus, fruits or soredia C+ red. Thallus scratches orange. [On shaded calcareous rocks] **74**
– All parts C– or C+ beetroot red. Scratches green not orange. **75**

74. Very dark brown to black prothallus (Fig.127). Pale but noticeably pinkish thallus, **Llimonaea sorediata**
– Prothallus brown. Thallus creamy pale brown, often with a very pale violet tinge. C+ red **Dirina massiliensis** f. **sorediata**

75. Soredia and thallus C+ beetroot-red, soredia pale greenish to yellowish grey **Psilolechia leprosa**
– Soredia and thallus C–. Soredia white, cream, orange or pink **76**

76. Soredia cover the thallus, pink to orange **Gyalecta** (**Belonia**) **nidarosiensis**
– Soredia central, white granular **Caloplaca teicholyta** (Fig. 127a)

77. Thallus dark grey often slightly bluish. Fine isidia form first on edges of areoles but spread to cover thallus **Caloplaca chlorina**
– Thallus white to grey almost lobed margin. Only granular in centre **Caloplaca teicholyta** (Fig. 127a)

Thallus not sorediate, isidiate or granular.
Cortex, medulla or fruits K+ yellow, orange, red crimson or violet

78. Fruits only K+ purple-crimson, or violet (may be hard to see)**79**
– Fruits, thallus and medulla K– or K+ yellow, orange or red **85**

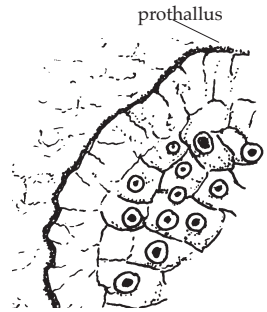


Fig. 127. Position of prothallus on the margin of a lichen

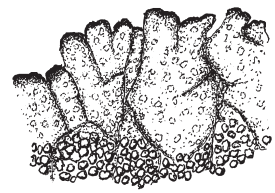


Fig. 127a. *Caloplaca teicholyta* x3

79. Fruit disc black. Fruit only K+ violet. Disc black but pale pruinose. Thallus grey to grey-brown. On nutrient enriched limestone **Caloplaca variabilis**
– Fruit disc orange to red, K+ purple-crimson **80**

80. Thallus warted or granular at least in centre **81**
– Thallus smooth or cracked, not noticeably warted/granular **82**

81. Thallus pale grey, granular centre **Caloplaca teicholyta** (Fig. 127a)
– Thallus bluish grey almost isidiate **Caloplaca chlorina**

82. Mature fruits to 0.5 mm diam. Clear to bright orange **83**
– Mature fruits larger up to 2 mm diam. Dull, dirty orange **84**

83. Fruits very convex not translucent when wet. Thallus usually grey to black **Caloplaca holocarpa** group
(If on limestone, mortar or concrete and/or growing on Verrucaria species and the fruits are deep orange, crowded and have a very narrow margin and do not exceed 0.4 mm diam. **Caloplaca oasis**)
– Fruits concave to slightly convex. Translucent when wet. Thallus white or absent **Caloplaca marmorata (lactea)**

84. Thallus pale grey or absent. Fruits up to 1.5 mm diam., globose. On hard limestone **Protoblastenia calva**
– Thallus brownish to green-grey. Fruits to 0.9 mm. On a range of basic or semibasic substrata **Protoblastenia rupestris** (Ph. 76)

85. Thallus C+ red **86**
– Thallus C– **87**

86. Thallus K–. Open disc to fruit **Dirina massiliensis** f. **massiliensis**
– Thallus K+ yellow. Fruits margin overarching. (Fig. 127b). **Diploschistes scruposus**

87. Thallus/medulla K+ yellow, yellow turning red, or orange **88**
– All parts K– **90**

88. K+ yellow turning red. Fruits convex. (Spores 3-septate to muriform) **Diplotomma chlorophaeum**
– Thallus or medulla K+ persistent yellow **89**

89. Thallus K+ yellow. Fruits disc chestnut to very dark brown or almost black. White prothallus. (Spores simple) **Lecanora campestris** (Ph. 46, Fig. 128)
– Medulla K+ yellow. Fruits black, often arranged in rings. Prothallus if any, black (spores muriform) **Rhizocarpon petraeum** (Fig. 129)

Fig. 127b. Section through fruit of *Diploschistes* showing overarching margin x8

Fig. 128. *Lecanora campestris* x2

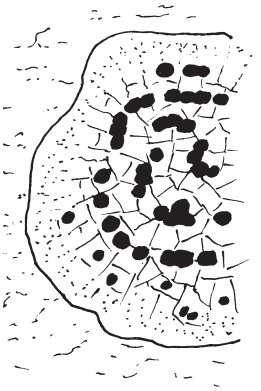


Fig. 129. *Rhizocarpon petraeum* x3

Thallus not sorediate, isidiate or granular.
All Parts K–, C–

90. Fruit discs orange to pinkish often with notched margins, immature fruits flat or cone shaped and almost covered by the margin. [Mainly shaded, damp calcareous substrata] **91**
– Fruit discs not orange but other colours including fawn **93**

91. Fruits leave pits in the substratum when they fall out.(Spores 11–25 x 6-10 μm 3-septate to muriform) **Gyalecta jenensis** (Fig. 130)
– Fruits immersed in thallus, not leaving pits in the substratum **92**

92. Fruit margins radially fissured. Hard limestone **Petractis clausa**
– Fruit margins not fissured. Limestone and mortar. A recently named species only known from S. Wales **Petractis nodispora**

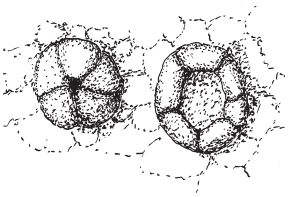


Fig. 130. *Gyalecta jenensis* x10

93. Thallus dark green/brown-black to black. May be white pruinose and therefore look much paler **94**
– Thallus other colours including dark grey **97**

94. Thallus often white pruinose but where rubbed off greenish olive-green, brown or brownish grey **95**
– Thallus not pruinose, dark brown to black **96**

95. Squamules with faint irregular paler dots and lines. Fruits to 1.5 mm diam., margin persistent **Toninia aromatica** (Ph. 41)
– Squamules without pale dots lines and dots. Fruits to 3 mm diam., often becoming excluded **Toninia sedifolia** (Ph. 93)

96. Thallus almost squamulose, areoles 0.3–0.7 mm diam., rather gelatinous. No prothallus. Many substrata **Psorotichia schaereri**
– Thallus rather granular/isidiate. On hard limestone. Blue-black prothallus. Fruits to 1 mm diam. **Placynthium nigrum**

97. Thallus shades of brown, including fawn. [Calcareous substrata] **98**
– Thallus white to dark grey (some species may look rusty) **102**

98. Fruits lecideine **99**
– Fruits lecanorine **100**

99. Thallus pale brown, rarely dark brown. Basic rock and mortar . **Catillaria lenticularis**
– Thallus olive-brown to grey-green. On calcareous rocks but not on limestone. S.W. England **Toninia mesoidea**

100. Disc pruinose.Thallus yellowish grey-brown, lumpy, thick. On calcareous rocks including limestone **Lecania rabenhorstii**
– Disc not pruinose. Thallus thin or scurfy **101**

101. Thallus areolate to absent, greenish to brown-grey. Fruit margin smooth (Spores brown, polarilocular) **Rinodina oleae** (Ph. 39)
– Thallus, scurfy, ± areolate, grey to brown. Fruit margin granular. (Spores colourless, 1-septate) **Lecania erysibe**

102. Growing over mosses, often in rock crevices **103**
– On rocks and boulders **106**

103. Thallus almost squamulose. Squamules with pale edges. [Fruits black and convex] **Bilimbia lobulata** (Fig. 130a)
– Thallus granular or varnish-like. Fruits pink to black **104**

104. Mature fruits globose. Pink to brown **Bilimbia sabuletorum**
– Mature fruits flat to convex. Red-brown to black **105**

105. Fruits black. Thallus granular to warted **Bacidia bagliettoana**
– Fruits red-brown. Thallus varnish-like **Bacidia herbarum**

106. Fruit discs fawn, pink, brown or piebald **107**
– Fruit discs green-black, brown-black or black (may look almost white if very pruinose, scratch the disc to check) **109**

107. Thallus thick to 1 cm diam. white or pale grey. Fruits abundant and crowded. **Lecanora albescens**
– Thallus immersed or thin. White or black. Fruits scattered **108**

108. Fruit margins very crenulate. Disc yellowish to red-brown, very white or blue-grey pruinose **Lecanora crenulata**
– Fruit margins smooth or slightly crenulate. Disc pinkish to grey-green. Not or slightly white pruinose **Lecanora dispersa** (Ph. 42) (*Fruits in groups on dark thallus probably* **Lecanora semipallida**)

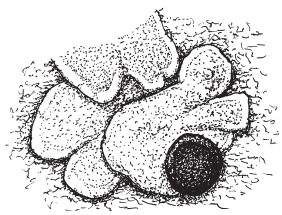


Fig. 130a. *Bilimbia lobulata* x8

109. Fruits immersed in thallus **110**
– Fruits more or less sitting on surface of the thallus or partially immersed in pits in the substratum **111**

110. Thallus white or grey, cracked, continuous, rather flat, large, often has dark prothallus (Fig. 131) **Aspicilia calcarea** (Ph. 73)
– Thallus formed of rounded, separate, pale greenish grey areoles with a fruit in the centre of each, remaining separate at the thallus margin (Fig. 132)**Aspicilia contorta** subsp. **contorta** (*If the marginal areoles are flattened and pressed together to form a crust* **Aspicilia contorta** subsp. **hoffmanniana**)

Fig. 131. *Aspicilia calcarea* x6

111. On plant debris or overgrowing mosses **112**
– On rocks pebbles or mortar **115**

112. Thallus almost squamulose. Squamules with pale edges. [Fruits black and convex] **Bilimbia lobulata** (Fig. 130a)
– Thallus granular or varnish-like. Fruits pink to black **113**

Fig. 132. *Aspicilia contorta* x6

113. Mature fruits globose. Pink to brown **Bilimbia sabuletorum**
– Mature fruits flat to convex. Red-brown to black **114**

114. Fruits black. Thallus granular to warted **Bacidia bagliettoana**
– Fruits red-brown. Thallus varnish-like **Bacidia herbarum**

115. Fruits at least partially in pits or depressions in substratum **116**
– Fruits not in pits or depressions in the substratum **119**

116. Fruits pruinose **117**
– Fruits not pruinose. scattered or in lines along cracks. [Fruits red-brown to black] **Clauzadea metzleri**

117. Fruits to 0.6 mm diam. (Ascus 8-spored). **118**
– Fruits to 1.5 mm diam. [not regularly arranged. Basic rock walls, shells, old mortar etc]. (100- to 200-spored) **Sarcogyne regularis**

118. Fruits often more or less regularly arranged (spores simple) **Clauzadea immersa**
– Fruits numerous but scattered (spores polarilocular). *This couplet may be difficult to separate in the field* **Caloplaca alociza**

119. Wet or dry fruits black but may be white pruinose **123**
– Especially when wet, fruits green-black, red-brown or red-black. When dry may look almost black **120**

120. Fruits green-black when wet **Lecidella stigmatea**
– Fruits red-black or red-brown when wet **121**

121. Disc and especially fruit margin grey-violet pruinose. (100 or more spores per ascus) **Sarcogyne regularis**
– Disc not pruinose. (8 spores per ascus) **122**

122. Fruits 0.4–1 mm diam. **Clauzadea monticola**
– Fruits 0.15–0.4 mm diam. **Catillaria lenticularis**

123. Fruit margin very contorted, notched, disc ridged. [Thallus grey scurfy to areolate or not visible]. Fruits to 0.6 mm diam. (Spores minute 3–5 x 1-2μm) **Polysporina simplex** (Fig. 132a)
– Fruit margin not very notched and contorted nor the disc ridged (Spores larger 8–40 x 3-8μm) **124**

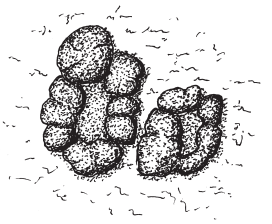


Fig. 132a. Fruits of *Polysporina simplex* x10

124. Thallus white, cream or very pale grey. No dark prothallus [cracked, areolate or absent. Fruits large to 1.5 mm.] (Spores brown, 3-septate to muriform). **125**
– Thallus mid to dark grey or grey-green, thin to areolate. Usually with a dark edge to thallus. (Spores colourless, 1-septate) **Catillaria chalybeia** (Ph. 33)

125. Fruits very pruinose (spores 3-septate becoming muriform) **Diplotomma alboatrum** (Ph. 77)
(*If spores remain 3 septate* **Diplotomma hedinii**)

Leprose or powdery or appears powdery

This part of the key contains species that are just powdery or granular. It includes the genus *Lepraria* of which many of the species can be very difficult to separate. The key includes only those species that may be reasonably easily separated in the field.

126. Thallus orange, yellow or red when often flecked white **127**
– Thallus white, pink, grey or greenish **130**

127. Thallus deep orange, pink or red, often with white flecks. Occurs in shade especially on north walls. K– **Gyalecta** (**Belonia**) **nidarosiensis**
– Thallus yellow to orange. K+ crimson **128**

128. Soredia granular. Thallus becoming areolate **Caloplaca citrina**
– Soredia powdery. Thallus not becoming areolate **129**

129. Thallus not lobed at margin. Dull orange-yellow to brownish yellow. No white medulla **Caloplaca chrysodeta**
– Thallus weakly lobed at margin. Thallus bright yellow to yellow-green. White medulla **Caloplaca xantholyta**

130. Thallus C+ red **131**
– Thallus C– or C+ yellow **133**

131. Greenish to yellowish grey. On copper or zinc metal-rich rocks or in copper wash-down from rain e.g. below lightning conductors. No prothallus **Psilolechia leprosa**
– White, cream or pinkish. Vertical rock. Dark prothallus (Fig. 133) **132**

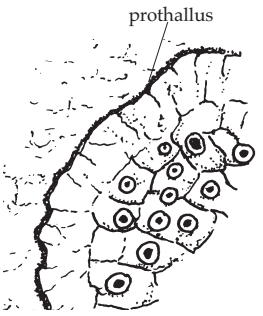


Fig. 133. Position of prothallus on the margin of a lichen

132. Very dark brown to black prothallus (Fig.133). Pale but noticeably pinkish thallus **Llimonaea sorediata**
– Prothallus brown. Thallus creamy pale brown, often with a very pale violet tinge. C+ red **Dirina massiliensis** f. **sorediata**

133. Edge of thallus wide, pale, fringed and cottony. Thallus grey. [K+ yellow]. **Haematomma ochroleucum** var. **porphyrium**
(*If thallus yellow-green* **H. ochroleucum** var. **ochroleucum**)
– No fringed, cottony margin. Thallus colours various **134**

134. Edges of thallus membranous or weakly lobed. K+ yellow **135**
– Edges of thallus not membranous or lobed. K–. [Thallus green, thick, minutely granular, without lobes and covered in projecting, minute fungal hyphae] **Botryolepraria lesdainii**

135. Thallus apple-green (rarely blue-grey tinged) Almost lobed at the margins. White medulla **Lepraria lobificans**
– Thallus white, grey or greenish grey. Medulla absent or weak **136**

136. Membranous crust with a well-delimited margin. Covered in soft granules. [White to pale grey]. C– K+ yellow **Lepraria nivalis**
– Thallus white to greenish grey, powdery with weak lobes. C+ yellow, K+ dirty yellow/orange **Lepraria vouauxii**

Key G – Lichens that occur on soil and mosses and plant debris

1. Thallus of green to grey or yellowish, leaf-like scales to 1 cm wide (Fig. 135a). Often with stalked (to 6 cm high), hollow, fruit-bearing bodies (podetia, Fig.134). The leaf-like scales or granules may disappear to leave just the podetia (*Cladonia* species) **40**

– Thallus various but not of small, separate, leaf-like scales or hollow podetia but may be fruticose (bushy Fig. 135) with solid branches *or* foliose *or* crustose **2**

2. Thallus of minute areoles to 0.3 mm wide, or globules to 0.1 mm, green to brown. Perithecia black up to 0.5 mm diam. **3**

– Thallus not of minute globules/areoles. Fruits if present, apothecia **4**

3. Thallus of minute areoles to 0.3 mm wide, green when wet to green-brown when dry (Fig. 136) **Agonimia tristicula**

– Thallus of minute globules to 0.1 mm wide, dark brown with a dark prothallus **Agonimia gelatinosa**

4. Thallus fruticose or appears fruticose (For *Cladonia* see 46) **5**

– Thallus leafy, crustose or powdery **13**

5. Small solid stalked fruits to 1 cm high *or* stalked to 4 mm high tipped with green soredia, both arising from a granular crust **6**

– Not fertile nor as above. Whole thallus fruticose or looks fruticose **8**

6. Green-grey basal granules with white stalks to 4 mm high topped with green soredia **Leprocaulon microscopicum** (Ph. 89)

– Similar basal granules but white stalks tipped pink or brown **7**

7. Mushroom-like with rounded brown to pink-brown, cap-like tips **Baeomyces rufus** (Fig. 137)

– Drumstick-like with pink rounded tips **Dibaeis baeomyces**

8. Contains a central core, seen if main stem is stretched (*Usnea*) (Fig. 138). Thallus of swollen 'sausages' between a visible core often loosely attached to substratum **Usnea articulata** (Fig. 138)

– No central core **9**

9. Thallus green with greenish soredia in splits along the edges of the lobes **10**

– Thallus orange, brown or green with white underside. Soredia yellow or green and on surface of lobes **11**

10. Grows from single basal holdfast (Fig. 103) **Ramalina farinacea**

– Grows from a multiple base, forming swards **Ramalina subfarinacea** (Ph. 54)

11. Thallus rounded, yellow to orange or chestnut brown **12**

– Thallus of flattened lobes. Upper side grey-green becoming ridged and sorediate. Lower side mainly white **Evernia prunastri**

12. Thallus orange (rare, no collecting) **Teloschistes flavicans** (Ph. 63)

– Thallus brown and glossy somewhat flattened. Elongated white marks in depressions **Cetraria aculeata**
(if densely branched, more rounded with lateral spines and flat circular pesudocyphellae **Cetraria muricata**)

13. Thallus granular to minutely squamulose pale grey to fawn **14**

– Thallus leaf-like, or squamules larger than 1 mm wide *or* crustose *or* powdery. Colours various **17**

Fig. 134. *Cladonia* showing fruticose podetium x2

Fig. 135. Fruticose lichen (*Ramalina* sp.) x1

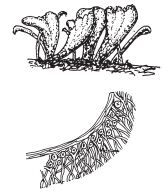


Fig. 135a. Squamules x4 (above).
Section through squamule showing lack of lower cortex (below)

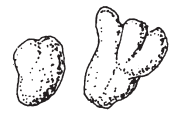


Fig. 136. Squamules on *Agonimia tristicula* x30

Fig. 137. Fruiting body of *Baeomyces rufus* x10

Fig.138. *Usnea articulata* x1

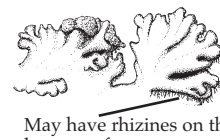


Fig. 139. Foliose lichen (*Parmelia* sp.) x2

14. Thallus almost squamulose. Squamules to 1mm wide, with pale edges.[Fruits black, convex] **Bilimbia lobulata** (Fig.130a)
– Thallus granular or varnish-like. Fruits pink to black **15**

15. Mature fruits globose. Pink to brown **Bilimbia sabuletorum**
– Mature fruits flat to somewhat convex. Red-brown to black **16**

16. Fruits black. Thallus granular to warted **Bacidia bagliettoana**
– Fruits red-brown. Thallus varnish-like **Bacidia herbarum**

17. **Thallus foliose** (leafy Fig. 139) **18**
– Thallus crustose *or* squamulose (excluding *Cladonia* for these go to couplet 40. If in doubt, try both 18 and 40) **70**

18. Lobes hollow if split open (Fig. 140-1) **Hypogymnia physodes**
– Lobes solid in cross section **19**

19. Thallus papery when dry, swollen when wet. Dark brown to green-black **20**
– Thallus not swelling noticeably when wet. Colours various **28**

20. Lobes with wart-like, globose (Fig. 142), flattened (Fig. 143) or finger-like minute outgrowths (isidia) **21**
– Lobes without isidia or wart-like growths **26**

21. Wart-like outgrowths on lobe surfaces. [Lobe margins wavy, notched].Centre of thallus dies leaving an arc **Collema cristatum**
– Flattened, minutely finger-like or with globose isidia on lobes **22**

22. Isidia become flattened when mature **Collema crispum**
– Finger-like (Fig. 144) or globose isidia (Fig. 142) **23**

23. Isidia coralloid *or* thallus mainly cylindrical, granular isidia **24**
– Isidia globose (but see also couplet 27) **25**

24. Thallus upright tufts to 5 mm high, 1 mm wide, dividing near the base. Often granular isidate **Leptogium schraderi** (*if with rather globose isidia and fertile probably* **L. turgidum**)
– Thallus lobes to 1 mm long. Isidia to 0.1 mm diam.**L teretiusculum**

25. Lobes ridged, adpressed. Usually fertile **Collema nigrescens**
– Lobes not ridged, erect. Rarely fertile **Collema auriforme** (Ph. 70)

26. Blue-grey when dry. Rarely fertile **Leptogium britannicum**
– Green-brown to brown or greenish black. Usually fertile **27**

27. Lobes erect, dominant, often with ragged tips. Fruits brown centred to 2 mm diam. **Leptogium gelatinosum**
– Lobes in rosettes (very rarely with globose isidia). Thallus with many orange-centred fruits to 3 mm diam.**Collema tenax** (Ph. 71)

28. With marginal eyelash-like cilia. Strap-like. Thallus pale grey to pale brownish grey. (Spores brown 1-septate) **29**
– No long marginal eyelash-like cilia. Strap-shaped or not **31**

29. Sorediate lobe tips [lower surface matt] **Heterodermia obscurata** (*if lower surface smooth and often shiny [Occurs on The Lizard, Cornwall.] Both species rare. No collecting* **Heterodermia speciosa**)
– Not sorediate **30**

30. Medulla K–. Thallus usually up to 5 cm diam. **Anaptychia ciliaris** (*if darkish grey to brown-grey, occurs in xeric-supralittoral* **Anaptychia ciliaris** subsp. **mamillata**)
– Medulla K+ yellow turning red. Thallus up to 15 cm diam. Rare, no collecting **Heterodermia leucomela**


Fig. 140. Lobe of *Hypogymnia physodes*


Fig. 141. Hollow lobe of *Hypogymnia*

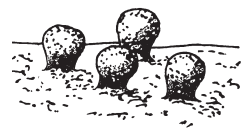


Fig. 142. Globose isidia x15


Fig. 143. Flattened isidia x 15


Fig. 144. 'Finger-like' coralloid isidia x10

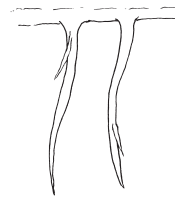


Fig. 145. Rhizines of *Peltigera praetextata* x5

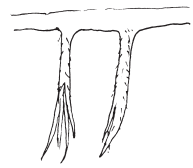


Fig. 146. Rhizines of *Peltigera didactyla* x5


Fig. 147. Vertical fruits x 4

31. Lower surface with a coarse network of brown or white veins and rhizines (Figs. 145, 146). Fruits on upper surface of lobe tips. Medulla white and K– **(Peltigera) 32**
– Lower surface without network of veins, no rhizines. Fruits on lower surface of lobe tips. Medulla yellow to orange, K+ purple **(Nephroma) 39**

32. Thallus with flattened isidia (Fig.143). Rhizines as Fig. 145 **Peltigera praetextata**
– Thallus without isidia, with or without soredia **33**

33. Thallus with soredia. Rhizines as Fig. 146 **Peltigera didactyla**
– Thallus without soredia. Rhizines various **34**

34. Fruits longer than broad (Fig. 147). Thallus not bullate (Fig. 148)**35**
– Fruits wider than long (Fig. 149) (often absent). Thallus bullate **37**

35. Lobes to 1 cm wide, looking frost covered **Peltigera didactyla**
– Lobes to 2 cm wide. Matt **36**

36. Thallus without cracks. Tan coloured veins **Peltigera hymenina**
– Thallus with cracks on upper side. Dark veins **Peltigera neckeri**

37. Lobes to 3 cm wide. Strongly bullate (Fig. 148). Seldom on calcareous substrata **38**
– Lobes to 1 cm wide. Slightly bullate. (Usually on calcareous substrata) **Peltigera rufescens**

38. On mosses and rocks. Rhizines as Fig. 150 **Peltigera membranacea**
– Mainly on sandy soils. Rhizines as Fig. 151 **Peltigera canina**

39. No minute leaf-like outgrowths (folioles) **Nephroma laevigatum**
– Abundant folioles on lobes **Nephroma tangeriense**

40. Thallus consists of leaf-like squamules, pale underside **41**
– Basal thallus granular, squamulose or absent. Hollow fruiting bodies (podetia) present **46**

41. Lower surface K+ yellow or K+ yellow turning red **42**
– Lower and/or upper surface K– **44**

42. Lower surface white or pale grey, may be black at base **43**
– Lower surface pale grey-violet. [K+ yellow] **Cladonia firma**

43. Lower surface K+ yellow **Cladonia subcervicornis**
– Lower surface K+ yellow turning red **Cladonia symphycarpia**

44. Thallus of grey-green squamules that may be brownish or violet tinged to 5 mm high **Cladonia cervicornis** (Ph. 90)
– Thallus of yellowish green squamules to 2 cm long **45**

45. Squamules to 2 cm long **Cladonia convoluta** (rare, Fig. 151a)
– Squamules to 1 cm long **Cladonia foliacea** (Ph. 72)

46. Red-tipped podetia **47**
– Brown or no coloured tips. May be an interwoven mat **49**

47. Podetia cup-shaped, yellow-green **Cladonia diversa** (Fig. 152)
– Podetia not cup-shaped but straight or branched, grey to green **48**

48. Podetia squamulose to granular, usually K–, very rarely K+ yellow **C. floerkeana** (Fig. 153, Ph. 92)
– Podetia partially sorediate, K+ yellow **C. macilenta**


Fig. 148. Bullate thallus x5


Fig. 149. horizontal fruits x4

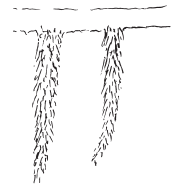


Fig. 150. Rhizines of *Peltigera membranacea* x5


Fig. 151. Rhizines of *Peltigera canina* x5


Fig. 151a. *Cladonia convoluta* x2

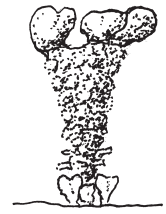


Fig. 152. *Cladonia. diversa* x3


Fig. 153. *Cladona floerkeana* x3

49. Thallus not attached to substratum. Separate tubes or a dense mat of podetia, may be interwoven in plants **50**
– Thallus attached to ground at one end. Podetia, sparsely or not branched, may be pointed or be wine glass-shaped. **53**

50. Thallus cream to greenish. Little or not branched. **C. uncialis**
– Podetia white, grey, greenish when wet. Richly branched **51**

51. White to pale grey. Branches not strongly bent over. Often forming broccoli-like heads to main branches **C. portentosa**
– Grey to brown-grey. Branches bent over in one direction **52**

52. Tips purple tinged and only tips bent over **C. ciliata**
– Tips not purplish, branches stongly bent over **C. arbuscula**

53. Podetia terminate in a wide cup **54**
– Podetia do not terminate in a cup **61**

54. Podetia antler-like with long extensions to cups (Fig. 154) **55**
– Podetia with no, or very short, extensions to cup rims **56**

55. Podetia, slender, yellowish to grey-green **C. subulata** (Fig. 154)
– Podetia in tiers, brown-grey to olive-green **C. crispata** (Fig.155)

56. Podetia narrow but expand near the tip (Figs.156, 157) **57**
– Podetia expand from the base (Fig. 158) **58**

57. Podetia to 6 cm tall. Green-brown to brown **C. gracilis** (Fig. 156)
– Podetia to 1.5 cm tall. Green **C. fimbriata** (Fig. 157)

58. K+ yellow. Finely sorediate **C. humilis** (Fig. 158)
– K–. Granular soredia, corticate granules or squamules **59**

59. Podetia with medium soredia **C. chlorophaea**
– Podetia with corticate granules to squamules **60**

60. Basal squamules form rosettes. Only calc. soils **C. pocillum**
– Basal squamules not in rosettes. Acid soils **C. pyxidata** (Ph. 94)

61. Podetia with numerous squamules **62**
– Podetia not squamulose except sometimes near base **64**

62. K+ yellow **C. squamosa**
– K– **63**

63. Squamules break off easily when dry. No slit in side **C. ramulosa** (Fig.159)
– Squamules flexible. Podetia usually with slit in side **C. glauca**

64. K–. All soils but especially acid soils **65**
– K+ yellow or yellow turning red. Mainly basic soils **66**

65. Podetia mainly smooth and usually forked **C. furcata** (Fig. 160, Ph. 95)
– Podetia sorediate, not forked **C. coniocraea** (Fig. 161)

66. K+ yellow turning red. To 1 cm tall **Cladonia symphycarpia**
– Persistently K+ yellow **67**

Fig. 154. *Cladonia subulata* x3

Fig. 155. *Cladonia crispata* x3

Fig. 156. *Cladonia gracilis* x3

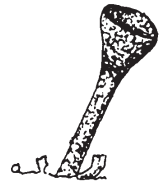


Fig. 157. *Cladonia fimbriata* x3

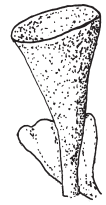


Fig. 158. *Cladonia humilis* x3

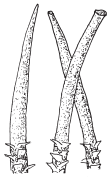


Fig. 161. *Cladonia coniocraea* x3

Fig. 160. *Cladonia furcata* x3

Fig. 159. *Cladonia ramulosa* x3

67. Podetia white or pale brown usually with brown tips. To 1.5 cm tall, little branched **Pycnothelia papillaria**
– Podetia pale grey, green, green-brown or grey-green. To 10 cm tall, much branched **68**

68. Podetia with a cottony surface (use hand-lens), tips bent in one direction [Northern species] **Cladonia rangiferina**
– Podetia not cottony, tips not bent in one direction **69**

69. Podetia with 'islands' of green alga **C. rangiformis** (Fig. 161a)
– Podetia with more or less continuous alga and white warts **C. furcata** subsp. **subrangiformis**

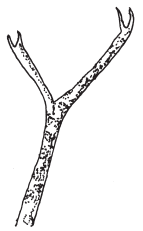


Fig. 161a. *Cladonia rangiformis* x4

70. Thallus squamulose **71**
– Thallus crustose **85**

71. Thallus or fruits K+ yellow or crimson/purple **72**
– Thallus or fruits K– **73**

72. Thallus K+ purple. Yellow usually with abraded white patches,, to 3 cm diam. [On calcareous soils]**Fulgensia fulgens** (Ph. 96)
– Thallus K+ yellow. Grey, green when wet, of adpressed minute squamules to 0.5 mm diam. **Solenopsora vulturiensis**

73. Apothecia black and flat. Thallus grey, grey-green or brown **74**
– Perithecia or apothecia brown or if black, convex. Thallus white, creamy, yellow-green or green-brown, brown or red-brown **75**

74. Squamules with paler dots and no regular fissures. Apothecia to 1.5 mm diam. **Toninia aromatica** (Ph. 41)
– Squamules without paler dots, often with shallow regular fissures. Apothecia to 3.0 mm diam. **Toninia sedifolia** (Ph. 93)

75. Thallus attached with rhizines or felted fungal hyphae **76**
– Lower surface not attached by rhizines or felted hyphae **81**

76. Attached by rhizines. Dry thallus brown to red-brown **77**
– Attached by mat of hyphae. Various colours **78**

77. Perithecia 0.2–0.4 mm diam. Rhizines conspicuous, branched (spores muriform) **Endocarpon pusillum**
– Apothecia to 0.8 mm diam. Rhizines scattered and mainly simple (spores 1-septate) **Solenopsora holophaea**

78. Perithecia minute, immersed in thallus **79**
– Apothecia to 1.5 mm diam, not immersed in the thallus **80**

79. Squamules to 2 mm wide. Brown with a dark margin but usually very white pruinose **Catapyrenium cinerum**
– Squamules to 5 cm wide. Buff to brown with no dark margin. Not pruinose **Placidium squamulosum**

80. Thallus pinkish brown, pale pruinose **Psora decipiens**
– Coffee to dark brown, not pruinose **Romjularia lurida** (Ph. 78)

81. Thallus tan, yellow to yellow-green or green **82**
– Thallus brown, pinkish, red-brown, green-brown, grey, grey-green **83**

82. Thallus yellowish brown to creamy green, not pruinose. Looks areolate. Minute immersed perithecia **Acarospora smaragdula**
– Thallus leaf-like, yellow-green to brownish green. Lobe edges pruinose. Apothecia on lobes **Squamarina cartilaginea** (Ph. 68)

83. Thallus of grey to grey-green almost circular squamules to 2 mm diam. often sorediate **Normandina pulchella** (Fig. 162)
– Thallus brown to green- or red-brown. Never sorediate **84**

84. Thallus green-brown. Squamules to 2 mm wide. Up to 6 perithecia in each squamule **Placidiopsis custnanii**
– Thallus shades of brown from fawn to red brown (greener when wet) rather areolate or almost granular. Squamules to 0.3 mm long (Fig. 163). Perithecia rare, barrel-shaped, between the squamules **Agonimia tristicula**

Thallus crustose

85. C+ red **86**
– C– (some *Placynthiella* species are C+ red in a squash under the microscope and are included here) **92**

86. With yellowish to grey-green soredia **87**
– No soredia but may have isidia **88**

87. Pale prothallus. Thallus thick and warted. **Ochrolechia androgyna**
– No prothallus. Thallus granular to areolate often with orange areas which are K+ purple. **Trapeliopsis granulosa**

88. Thallus thick and warted in the centre with isidia-like warts that erode leaving white patches **Trapeliosis wallrothii**
– Thallus without eroding warts **89**

89. Thallus brown-black to red-brown. Thallus of coralloid granules/isidia about 0.2 mm tall **Placynthiella icmalea**
– Thallus grey to creamy **90**

90. Thallus very warted. Fruit margins overarching (Fig. 163a.) Disc black and very pruinose **Diploschistes muscorum**
– Thallus almost squamulose to areolate. Fruit margins not overarching, disc not pruinose **91**

91. Thallus almost squamulose. Not usually fertile **Trapelia glebulosa**
– Thallus crustose areolate. Often fertile with a pink to dark red-brown disc **Trapelia coarctata**

92. Fruits perithecia (Fig. 164) **93**
– Fruits apothecia (Fig. 165) **95**

93. Thallus thin, pale brown. perithecia 0.3–0.6 mm diam. Immersed with pale to dark brown tips **Thelenella muscorum**
– Thallus grey-green to green-brown. Perithecia black **94**

94. Thallus green to green-brown, film-like. Perithecia 0.15–0.23 mm diam. Often on disturbed soil **Polyblastia agraria**
– Thallus grey-green, warted. Perithecia 0.3–0.7 mm diam. On dunes, wall tops, rather basic soil **Verrucaria bryoctona**

95. Thallus of large rounded areoles (squamules) to 4 mm diam. **96**
– Areoles much smaller or granular to warted **97**

96. Squamules with paler dots and no regular fissures. Apothecia to 1.5 mm diam. **Toninia aromatica** (Ph. 41)
– Squamules without paler dots, often with shallow, regular fissures. Apothecia to 3.0 mm diam. **Toninia sedifolia** (Ph. 93)

97. Thallus blue-grey to blue-black. Fruit margins granular. A pioneer species of open habitats such as wall tops **Moelleropsis nebulosa**
– Thallus colour not blue-grey to blue-black. Fruit margins smooth **98**

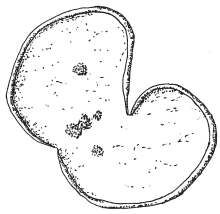


Fig. 162. squamule of *Normandina pulchella* x15

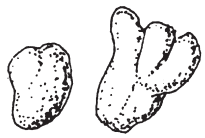


Fig. 163. squamules of *Agonimia tristicula* x30

Fig. 163a. Section through fruit of *Diploschistes* showing overarching margin x8

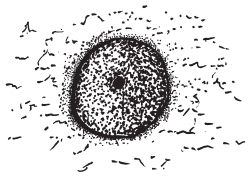


Fig. 164. Perithecium from above x10

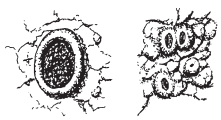


Fig. 165. Types of fruits (apothecia)

98. In moist overhangs and crevices. [Thallus fawn to yellow-green or olive, thick, warted and coarsely granular]**Bacidia scopulicola**
– Not in moist overhangs and crevices, more exposed situations **99**

99. Fruits up to 3.5 mm diam. Lecanorine **100**
– Fruits up to 1.0 mm diam. Mostly lecideine **101**

100. Thallus grey. Fruit discs red-brown to black. Mainly on decaying thrift and grass **Lecanora zosterae**
– Thallus grey-green. Fruit disc orange. On decaying stems of shrubby seablight (Dorset and N. Norfolk) **Caloplaca suaedae**

101. Thallus [pale grey] thin, disappearing or of separate warts. On soil, decaying plants, rabbit droppings. Lecanorine **Rinodina conradii**
– Thallus continuous smooth, granular or isidiate. Various habitats **102**

102. Thallus pale to dark green, whitish or grey-green **103**
– Thallus yellow-brown, green-brown or red-brown to black **104**

103. Thallus of white to grey-green granules up to 0.3 mm diam. Fruits very globose, black **Micarea lignaria**
– Thallus of very small globose granules to 0.06 mm, green, olive-green or straw coloured. Fruits pink-buff to dark grey **Micarea prasina**

104. Thallus greenish or pale to dark yellow-brown of scattered granules with yellow-green soredia **Placynthiella dasaea**
– Thallus dark brown to brown-black, not sorediate **105**

105. Thallus of chocolate-brown coralloid granules/isidia about 0.2 mm tall **Placynthiella icmalea**
– Thallus dark green to brown-green, slightly gelatinous, of rounded globules to 0.1 mm diam. **Placynthiella uliginosa**

Key H – Lichens growing directly on sawn wood (e.g. fences, gates and benches)

(When wood is becoming well rotted it may often support the species found on soil and humus)

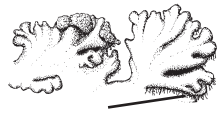
1. Fruticose (Fig. 166) and Cladonia or foliose (Fig. 167) **2**
– Crustose (Fig. 168), placodioid (Fig. 169) or squamulose (Fig. 170) **60**

2. **Fruticose or erect to pendent foliose** **3**
– Foliose, more or less flat attached over whole lower surface **34**

3. Contains a central core if main stem or branch is pulled (*Usnea*) (Fig. 171) **4**
– No central core **7**

4. Black just above holdfast (Fig. 172) [Branches not constricted at junction with main stem] **Usnea subfloridana**
– Not black at basal holdfast **5**

Fig. 166. Fruticose lichen (*Ramalina* sp.) x1



rhizines on lower surface

Fig. 167. Foliose lichen (*Parmelia* sp.) x2

Fig. 168. Crustose species x2. These may, or may not, have a coloured margin.

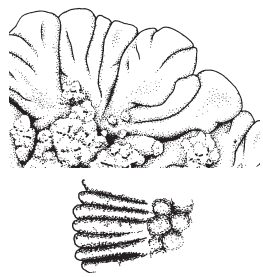


Fig. 169. Placodioid lichens
Above: Edge of wide lobed placodioid lichen (*Diploicia canescens* x4)
Below: Part of the edge of a crustose, placodioid lichen (*Caloplaca* sp.) x4

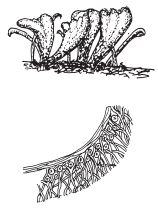


Fig. 170. Squamules x4 (above).
Section through squamule showing lack of lower cortex (below)

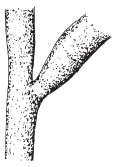


Fig. 173. constriction at branch joint x7

Fig. 172. Black holdfast x5

Fig. 171. *Usnea* with central core x4

5. Main branches angular in section, ridged, pitted and covered in long, thin isidia **Usnea hirta**
– Main branches rounded, not covered in long isidia **6**

6. Branches constricted where they join the main stem (Fig. 173) No pale annular rings (Fig. 174). Olive-green **Usnea cornuta**
– Branches not strongly constricted at junction with main stem. Often with pale annular rings. Yellow-green to green **Usnea flammea** (Ph. 84)

7. Main stems brownish with numerous short, finger-like side branches [all branches solid] **Sphaerophorus globosus**
– Various colours. Not with short, finger-like branches **8**

8. Fruiting bodies hollow often growing from granules or squamules on the substratum (*Cladonia* species Fig. 175) **9**
– Strap-like or hair-like lobes, fruiting bodies (if present) solid but the lobes may be hollow especially near the tip. **20**

9. Red-tipped podetia **10**
– Brown-tipped or no coloured tips to podetia or lobes **12**

10. Podetia cup-shaped, yellow-green **Cladonia diversa** (Fig. 176)
– Podetia not cup-shaped, grey to green **11**

11. Podetia squamulose to granular, usually K–, very rarely K+ yellow **Cladonia floerkeana** (Fig. 177, Ph. 92))
– Podetia partially sorediate, K+ yellow **Cladonia macilenta**

12. Podetia [slender, yellowish to grey-green] antler-like with long extensions to cups **Cladonia subulata** (Fig. 178)
– Podetia with no, or very short, extensions to cup rims **13**

13. Podetia with no cup or may expand only towards the tip into a cup (Fig.179) **14**
– Podetia expand from the base (Fig. 176) **19**

14. Podetia with numerous squamules throughout **15**
– Podetia not squamulose except sometimes near base **17**

15. K+ yellow **Cladonia squamosa**
– K– **16**

16. Squamules break off easily when dry. No slit in side **Cladonia ramulosa** (Fig.182)
– Squamules flexible. Podetia usually with slit **Cladonia glauca**

17. Podetia not sorediate. Up to 6 cm tall. Green-brown to brown. often without any cup at the tip **C. gracilis** (Fig. 180)
– Podetia sorediate, at least in upper half **18**

18. Podetia widen into a cup near tip **Cladonia fimbriata** (Fig. 179)
– Poditia rarely may have a very narrow cup**C. coniocraea** (Fig. 181)

19. Podetia with medium soredia **Cladonia chlorophaea**
– Podetia with corticate granules **Cladonia pyxidata**

Fig. 174. Annular rings on *U. flammea* x7

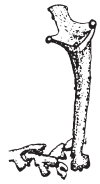


Fig. 175. *Cladonia* showing fruticose podetium x3

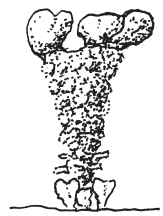


Fig. 176. *Cladonia diversa* x3

Fig. 177. *Cladona floerkeana* x3

Fig. 178. *Cladonia subulata* x3

Fig. 179. *Cladonia fimbriata* x3

Fig. 182. *Cladonia ramulosa* x3

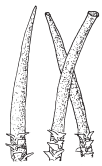


Fig. 181. *Cladonia coniocraea* x3

Fig. 180. *Cladonia gracilis* x2

20. Grey with white or black under-surface. Upper surface with finger-like isidia when mature **Pseudevernia furfuracea**
– Yellowish to grey-green, green, brown or mauvish. Not isidiate **21**

21. C+ red. Mauve-grey thallus. White soredia (Fig. 183) **Roccella phycopsis** (rare, do not collect) (Ph. 64)
– C–. Yellowish to grey-green, green or brown thallus. **22**

22. Strap-shaped at least near the base. Thallus yellow-green to grey-green or green **23**
– Not strap-shaped. Thallus brown, hair-like to 1mm diam. pale soredia in splits **Bryoria fuscescens** (Fig. 184)

23. Numerous marginal, eyelash-like cilia (pale with dark tips, Fig. 185). Thallus pale grey to pale brownish grey. (Spores brown 1-septate) **24**
– No cilia. Thallus yellowish to grey-green, green. (Spores simple)**27**

24. Lobes 1–5 mm wide. Lobe tips not swollen. No soredia **25**
– Lobes 0.3–1 mm wide. The swollen lobe tips or the back of the lobes with powdery soredia **26**

25. Thallus K–. Fawn-grey lobes **Anaptychia ciliaris** subsp. **ciliaris** (*if lobes dark grey to brown* **Anaptychia ciliaris** subsp. **mamillata**)
– Thallus K+ yellow. Grey lobes **Physcia leptalea**

26. Lobe tips swollen, helmet-shaped, bursting open to reveal powdery soredia (Fig. 186) **Physcia adscendens**
– Lobe tips not swollen, lip-shaped with powdery soredia on under surface (Fig. 185, 187) **Physcia tenella** (Ph. 50)

27. Under surface white often with green patches. When mature, upper surface with soredia on ridges **Evernia prunastri**
– Green to yellow-green or grey-green, colour continuous on under surface. Upper surface without soredia on ridges **28**

28. Often fertile, not powdery sorediate **Ramalina siliquosa** (Ph. 53)
– Rarely fertile. Powdery soredia in swollen tips or in oval splits in sides of the branches (Figs. 184, 185, 186) **29**

29. Swollen areas towards tips of branches which open to reveal soredia (Fig. 184) **30**
– Not swollen towards tips of branches. Soredia in splits on the edges of branches (Fig. 186) **32**

30. Towards the tips of the lobes the upper and lower cortex splits to show the soredia **Ramalina canariensis** (Fig.188)
– Soredia not in splits in cortex but discrete soralia **31**

31. Lobes to 1 cm wide with ridges **Ramalina lacera** (Fig.189)
– Lobes to 0.5 cm wide without ridges **Ramalina pollinaria**

32. Lobes flattened towards the base, becoming rounded above and hollow, lobes shiny, to 1 mm wide, splitting to show soredia [K+ yellow turning red]. Very rare, SW and W **Ramalina portuensis**
– Lobes not hollow **33**

Fig. 189. Lobe tip of *Ramalina lacer*a x5

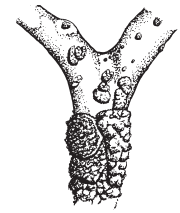


Fig. 183. Soralia on *Roccella phycopsis* x3

Fig.184. *Bryoria fuscescens* x2

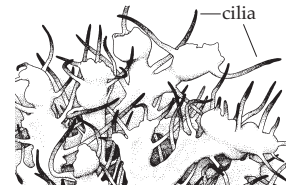


Fig. 185. *Physcia tenella* x1

Fig.186. Lobe tip of *Physcia adscendens* x6

Fig. 187. Lobe tip of *Physcia tenella* x5

Fig. 188. Lobe tip of *Ramalina canariensis* x5

33. Grows from single basal holdfast **Ramalina farinacea (**Fig. 190)
– Grows from a multiple base, forming swards
Ramalina subfarinacea (Ph. 54)

Fig. 190. *Ramalina farinacea* x5

Foliose

34. Sorediate or isidiate **35**
– Not sorediate or isidiate **57**

35. Isidiate **36**
– Sorediate **41**

36. Upper surface orange-yellow, pale yellow-grey or shades of brown to near black **37**
– Upper surface grey. White lines and dots on lobes (Fig. 191) develop into coralloid isidia (Fig. 192) **Parmelia saxatilis** (Ph. 55)

Fig.191. Lobe tip showing white marks

37. Upper surface orange-yellow. Knobby outgrowths 0.1–0.7 mm diam. towards the centre, few or no fruits **Xanthoria calcicola**
– Upper surface pale yellow-grey or brown or near black **38**

38. Upper surface pale yellow-grey to green. Lobes shiny. Coralloid isidia. [Medulla K+ yellow-orange. Lobes overlapping to 2 mm wide] **Xanthoparmelia conspersa**
– Upper surface brown to near black **39**

Fig. 192. Coralloid isidia x10

39. Dark brown. Lobes transversely wrinkled. Isidiate clusters (like broccoli). Medulla C– or C+ pink
Xanthoparmelia verruculifera
– Reddish to green-brown or near black. Lobes not transversely wrinkled. Coralloid isidia (Fig. 192). Medulla C+ red (Fig. 193) **40**

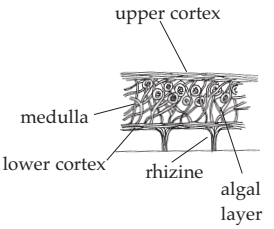


Fig. 193. Cross-section of foliose thallus x20

40. Reddish to green-brown. Numerous coralloid isidia
Melanelixia glabratula
(If lobe surface matt not glossy and the isidia coarse and rather globose and erode to pale areas, ***Melanelixia subaurifera*** *is probable. These two species are difficult to separate without experience).*
– Dark brown to near black. Densely coralloid isidiate, can look almost like velvet **Melanelixia fuliginosa**

41. Upper surface grey, brown or black when dry. Often greener when wet **42**
Upper surface yellowish green to green (at least near the margin. Centre may be blackish), yellow or orange. Usually little changed when wet **54**

42. Under surface pale but may be darker towards centre **43**
– Under surface dark brown to black almost to the edge **47**

43. Thallus K+yellow **44**
– Thallus K– **46**

44. Globose masses of soredia (often blue-flecked) in centre and apex of the lobes. Lobes adpressed **Physcia caesia**
– Soredia towards the tips. Lobes erect towards the tips **45**

45. Lobe tips swollen, helmet-shaped, bursting open to reveal powdery soredia (Fig. 186) **Physcia adscendens**
– Lobe tips not swollen, lip-shaped with powdery soredia on back surface of lobe tip (Fig. 187) **Physcia tenella** (Ph. 50)

46. Medulla (Fig. 193) C+ red (fleetingly). Lobes up to 1 cm wide. Grey to grey-green. Distinct pinhead, white markings on upper surface that become sorediate **Punctelia subrudecta**
– Medulla C–. Lobes with pruinose tips, to 2 mm wide. Thallus grey to brown, adpressed. Marginal and/or central coarse soredia, grey when dry, greenish when wet. **Physconia grisea**

47. Lobes hollow in cross section (Fig. 194). Attached to substrata by patches of fungal hairs **48**
– Lobes solid in cross section. Attached to substrata by root-like rhizines (Fig.193) **49**

48. Lobes flat with tips splitting to show powdery soredia on back of upper surface (Fig. 195) **Hypogymnia physodes** (Ph. 85)
– Lobes finger-like with soredia on tips (Fig. 196) **Hypogymnia tubulosa**

49. Interior of thallus (medulla, Fig. 193) C+ red **50**
– Medulla C– **51**

50. Soredia somewhat darker than lobes, not in pustules. Extreme lobe tips down-turned. **Hypotrachyna revoluta** (Ph. 86)
– Soredia blue-black and in rather pustular soralia. Lobe tips usually ascending **Hypotrachyna britannica**

51. Lobes to 1.5 mm wide, grey, grey-brown to almost black when dry, bright green when wet **Phaeophyscia orbicularis**
Lobes larger than 1.5 mm wide, grey to green when dry **52**

52. Medulla K+ yellow-orange. **53**
– Medulla K–. [Towards the centre it is finely wrinkled across the lobes. Coarsely sorediate] **Flavoparmelia caperata** (Ph. 51)

53. No white lines or marks on lobes. Lobe tips turned up, sometimes with black 'eye lash' cilia on edges. Sorediate margins on lobes **Parmotrema perlatum** (Ph. 62)
– White lines and dots on lobes that develop powdery soredia along them. No cilia **Parmelia sulcata**

54. Thallus yellow to yellow-green, apple-green, yellow-grey or green, at least towards the margin. More or less flat **55**
– Thallus yellow-orange to orange. Lobes leaf-like to 2 mm long, becoming upright with powdery soredia on frilly tips **Xanthoria ucrainica** group inc. **X. candelaria** (Ph. 58)

55. Lobes separate to 3 mm wide, radiating, yellow-grey to green. Thallus darker to almost black in centre, globose piles of powdery soredia. Medulla K+ orange **Xanthoparmelia mougeotii**
– Lobes overlapping to 15 mm wide. Thallus not much darker in centre. Granular soredia. Medulla K– or K+ yellow to red **56**

56. Medulla K–. Lobes to 15 mm wide, finely wrinkled towards centre **Flavoparmelia caperata** ((Ph. 51)
– Medulla K+ yellow slowly turning to red. Lobes to 7 mm wide, rather flattened, as if ironed **Flavoparmelia soredians**

57. Thallus grey to dark brown **58**
– Thallus orange **59**

58. Lower surface dark. Attached by many dark, 'bottle-brush' rhizines (Fig. 197). Pruinose lobe tips. K– **Physconia distorta**
– Lower surface pale. Attached by simple or branched rhizines (Figs. 198, 199). Lobe tips not pruinose. K+ yellow **Physcia aipolia**

Fig. 194. Hollow lobe of *Hypogymnia* x4

Fig. 195. Lobe of *Hypogymnia physodes* x4

Fig. 196. Lobe of *Hypogymnia tubulosa* x4

Fig. 197. Bottle-brush rhizines

Fig. 198. Simple rhizines

Fig. 199. Branched or forked rhizines

59. Knobby outgrowths 0.1–0.7 mm diam. towards the centre. Few or no fruits **Xanthoria calcicola**
– No knobby outgrowths. Usually very fertile with fruits to 4 mm diam **Xanthoria parietina** (Ph. 56)

60. Lobed (placodioid Fig. 200) or scale-like (squamulose Fig. 201) **61**
– Crustose **63**

61. **Squamulose**. Squamules to 2 mm diam, brown to green-grey, numerous and often overlapping, sorediate margins. Thallus C+ red. [Black fruits] **Hypocenomyce scalaris** (Fig. 202)
– **Placodioid**. Thallus C– **62**

62. White to pale grey lobes. Cream to yellow soredia. Fruits black but rare. (Fig. 200 upper) **Diploicia canescens**
– Grey to green lobes with pale edges. No soredia. Yellow to reddish brown fruits **Lecanora muralis**

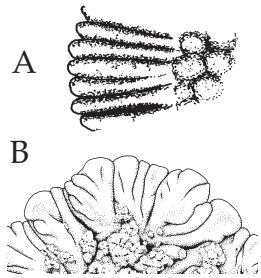


Fig. 200. Placodioid lichens
A: Part of the edge of a crustose, placodioid lichen (*Caloplaca* sp.) x4
B: Edge of wide lobed placodioid lichen (*Diploicia canescens* x3)

Crustose, not placodioid

63. Without fruits, may have minute pycnidia 0.1-0.2 mm diam. (commonly infertile species) **64**
– With fruits **74**

64. Thallus brown, minutely finger-like. Often on tops of posts [Thallus C+ red, best seen in a squash] **Placynthiella icmalea**
– Thallus not brown or finger-like **65**

65. Thallus and/or soredia K+ yellow or yellowish red **66**
– Thallus and/or soredia K- **70**

66. Thallus not sorediate, [pale grey] numerous black 'fruits' 0.1-0.2 mm diam (actually pycnidia) **Cliostomum griffithii**
(*If pycnidia 0.2–0.5, in E. Anglia, possibly* **C. corrugatum.** V. rare)
– Thallus sorediate **67**

67. Thallus grey-green, granular [becoming covered in coarse soredia which scratch to a paler colour] **Lecidella scabra** (Ph. 38)
– Thallus grey to yellow-green, smooth wrinkled or cracked **68**

68. Soralia to 0.4 mm. Soredia grey to green-grey [pale yellow when scratched] **Buellia griseovirens**
– Soralia less than 0.4 mm. Soredia pale yellow to yellow-green **69**

69. Thallus yellowish green, C– **Lecanora orosthea**
– Thallus grey. C+ yellow, orange or red **Lecanora expallens**

70. Thallus C– **71**
– Thallus C+ orange to red. [Frequently on slightly decayed wood] **72**

71. Coarse grey-green granules. [Polluted areas] **Lecanora conizaeiodes**
– Pale grey thallus becoming covered with yellow-green soredia except at thallus margin **Lecanora compallens**

72. Thallus blue-grey to green-grey of flattened granules. **Trapeliopsis flexuosa**
– Thallus grey to pinkish, or thin and black. **73**

73. Thallus grey to pinkish, of rounded granules. Yellowish clumps of soredia frequently present **Trapeliopsis granulosa**
– Thallus white to black, thin or just a dark stain. Frequently with white-tipped minute pycnidia. No soredia **Micarea denigrata**

74. Thallus brown or black **75**
– Thallus white, grey, yellow, orange, yellow-green or green **76**

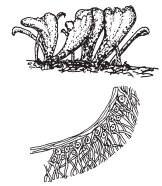


Fig. 201. Squamules x4 (above).
Section through squamule showing lack of lower cortex (below)


Fig. 202. *Hypocenomyce scalaris* x6


Fig. 203. Perithecium viewed from above x10

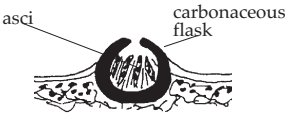


Fig. 204. Cross-section of perithecium x10

75. Thallus black. Fruits perithecia (Fig. 203) **Hydropunctaria maura** (Ph.6)
– Thallus and fruits brown to almost black. Thallus rather coralloid. Fruits apothecia (Figs. 205-6) **Placynthiella icmalea**

76. Fruits yellow or orange **77**
– Fruit colours various not yellow or orange **80**

77. Thallus and fruits K– **Candelariella vitellina** (Ph. 34)
– Thallus and/or fruits K+ crimson/purple **78**

78. Disc margin grey. Fruit disc K+ crimson **Caloplaca cerina**
– Disc margin yellow-grey to deep orange. Thallus K+ crimson **79**

79. Thallus deep orange, granular **Caloplaca marina**
– Thallus whitish to yellow-green, areolate. Often a large isolated single thallus **Caloplaca flavovirescens**

80. Fruits black, without a thalline margin (Fig. 206) **81**
– Fruits colour various, with a thalline margin (Fig. 205) **86**

81. Sorediate. C+ orange **82**
– Not sorediate. Reactions various **83**

82. Densely sorediate. thallus grey-green **Lecidella scabra** (Ph. 38)
– Soredia in discrete patches. Thallus yellow-grey to yellow-green to grey-green **Lecidella elaeochroma** forma **sorediata**

83. Spores loose in fruit. (Usually rubs off as a black mark on the finger) **84**
Fruits firm, young fruits with a margin. Spores not loose **85**

84. Thallus white to pale grey **Cyphelium inquinans**
– Thallus bright yellow-green **Cyphelium notarisii** (Fig. 206a)

85. Thallus yellow-grey to yellow-green more grey-green in shade. C+ orange, K+ yellow **Lecidella elaeochroma**
– Thallus grey, brownish or green-grey. All spot reactions negative **Amandinea punctata**

86. With granular or fine, powdery soredia **87**
– Not sorediate *or thallus absent* **90**

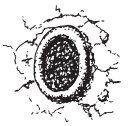
87. Thallus green-grey covered in granular soredia. Fruits with granular, persistent margins **Lecanora conizaeoides**
– Thallus grey or yellowish green with powdery soredia. Fruit margins smooth or becoming excluded by the disc **88**

88. Thallus/soredia K+ yellow to orange or yellow-brown **89**
– Thallus/soredia K–. Thallus yellowish green of flat-topped, often separate, areoles with powdery soredia in centre of each. (Fig. 207) **Lecanora soralifera**

89. Thallus continously areolate with sorediate yellow margins, the soredia spreading out over the surface. K+ yellow turning brownish **Lecanora orosthea**
– Thallus grey becoming covered with with yellow-green soredia. K+ orange-yellow **Lecanora expallens**

90. Fruit disc brown, emerald, bluish green or brownish green or yellow turning blackish or black **91**
– Fruit disc persistently yellow to green **98**

91. Fruit disc green-brown to brown. Fruit margin persistent **92**
– Fruit disc bluish green, emerald, yellowish green turning



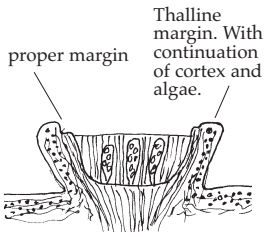


Fig. 205. Lecanorine apothecium x5 and cross-section x20

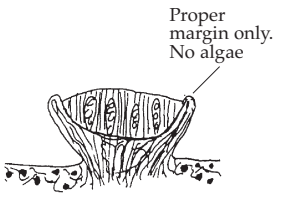


Fig. 206. Lecideine apothecia x5 and cross-section x20

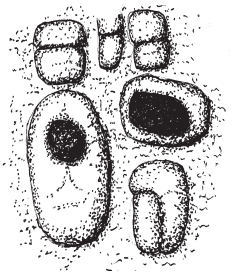


Fig 206a. *Cyphelium notarisii* x6

Fig. 207. Areole of *Lecanora soralifera* x6

blackish or black. Fruit margin persistent or not **96**

92. Thallus absent or yellowish to grey-green **Lecanora polytropa**
– Thallus white to creamy or fawn to grey **93**

93. Thallus with a white fimbriate, cottony margin
Lecanora campestris (Fig. 208)
– No white fimbriate, cottony margin **94**

94. Thallus continuous, smooth to rough. Fruit margin circular except where distorted by pressure from other fruits.
Lecanora pulicaris/chlarotera (not separable in this key)
– Thallus granular but may form a crust. Fruit margin wavy, crenulate or excluded **95**

95. Discs pink to greenish brown.
Fruits scattered to abundant **Lecanora varia**
– Discs pale reddish brown.
Fruits usually cover the thallus **Lecanora saligna**

96. Thallus creamy white to grey or absent. Fruit disc green-black to black **Lecanora aitema**
– Thallus yellow to yellow-green, or grey-green. Discs various **97**

97. Thallus areoles with notched edges. Fruits rather immersed in thallus. Disc brown-green to emerald-green**Lecanora intricata**
– Thallus cracked. Fruits immersed. Disc yellowish to green-black, grey pruinose (Fig. 207) **Lecanora sulphurea** (Ph. 35)

98. Fruit margin persistent, except in mature fruits **99**
– Fruit margin absent or disappears very early in all fruits
Lecanora symmicta

99. Fruits and thallus C– **Lecanora polytropa** (Ph. 37)
– Fruits and thallus C+ yellow to orange-red **100**

100. Fruit margin rarely excluded, paler than disc **Lecanora confusa**
– Fruit margin becomes excluded, not paler **Lecanora expallens**

Fig. 208. *Lecanora campestris* x3

Notes on some rare species

Except where a site is given, the following species are listed as: infrequent, rare or very rare. It should be noted that a species that is rare in the context of the whole British Isles may be very abundant locally. This abundance scale only applies to the presence of that species in coastal regions.

Fruticose including *Cladonia* with predominant podetia

Thallus in dense clumps to 5 cm long, grey-green. lobes much divided, thread-like 0.1–0.3 mm wide, hook tipped often black at base. Medulla solid. *Very rare* **Ramalina chondrina**

Similar to *Cladonia arbuscula* (probably just a subspecies) but more slender and paler with less bent tips. Acid dunes and stabilized shingle e.g. Dungeness. *Very rare* **Cladonia mitis**

Podetia brownish grey-green, to 1 cm tall, often fissured. Large brown apothecium on the tip. Basal sqamules mainly a crust with dark pycnidia. Peaty soils. *Very rare* **Cladonia peziziformis**

Primary thallus persistent, grey. K+ yellow with dark brown cephalodia. Pseudopodetia simple or forked to 2 cm tall. Acid heathland. *Rare* **Stereocaulon condensatum**

Podetia simple or forked to 5 cm tall by 1–2 mm diam., white. Often scattered. K+ pale yellow. Shingle/acid heathland, N Scotland. *Infrequent*

Thamnolia vermicularis var. **subuliformis**

Foliose

Like *Parmotrema perlatum* but lobes to 15 mm wide, incised and inrolled, often with soralia on short lobe tip extensions. Mossy rocks and heathland. *Very rare* **Parmotrema robustum**

Lobes dark red-brown, 2 mm wide, twisted, with ascending and divided margins and forming a rough rosette. In seepage tracks on calcareous rocks. *Infrequent* **Leptogium plicatile**

Cortex K+ yellow, medulla C+ orange. Thallus grey to yellow-grey. Medulla yellow. Lobes are coarsely sorediate at tips. On mossy rocks and heaths. *Rare* **Hypotrachyna endochlora**

Cortex K+ yellow, medulla C+ red. Thallus pale grey. Lobe surface with abraded areas to show white medulla. On mossy rocks. *Rare* **Hypotrachyna taylorensis**

Cortex K+ yellow. Resembles *Hypogymnia physodes* but with perforations up to 1 mm diam. on the upper surface. On mossy rocks in humid sites. *Rare* **Menegazzia terebrata**

Cortex K– or rarely K+ yellow. Grey to brown soredia around lobe margins. Lower surface naked or felt-like. Fruits on lower surface of lobe extensions **Nephroma parile**

Forms cushions to 1.5 cm diam. of much branched, dark green to black lobes. Isidia globose or foliose. Occurs on vertical serpentine rock in the S.W. *Very rare* **Collema latzelii**

Dark patches to 5 cm diam. of squamules becoming cylindrical, branched lobes 2 x 0.2 mm with tips that swell and burst. On damp mainly calcareous rock. *Rare* **Lempholemma cladodes**

Medulla and soredia K+ yellow. Lobes to 15 mm wide, grey to red-brown. Yellow soredia on a network of ridges. On damp, mossy boulders. *Rare*. **Pseudocyphellaria crocata**

Medulla and soredia K+ yellow. Lobes to 10 mm wide, wavy, grey to red-brown. White to blue-grey soredia on lobe margins On damp, mossy boulders. *Rare*. **Pseudocyphellaria intricata**

Thallus only a narrow green band around very concave dark brown apothecia to 5 mm diam. On a grey-black cushion of cephalodia. Damp, calcareous dunes. *Rare* **Solorina spongiosa**

Thallus single lobed, grey to brownish to 8 cm diam. attached at the centre. Medulla C+ red. Sorediate at margin. Seepage tracks on acid rocks on Jersey **Umbilicaria grisea**

Thallus single lobed, pale grey to brownish to 5 cm diam. attached at the centre. Thallus C+ red. Apothecia frequent. Seepage tracks on acid rocks in Sutherland **Umbilicaria spodochroa**

Thallus yellowish grey. Differs from *Xanthoparmelia conspersa* in the K+ yellow turning red medulla and the globose isidia. Occurs in S. W. *Very rare*. **Xanthoparmelia tinctina**

Squamulose

Squamules to 6 mm diam. Brown. Young squamules with pale hairs on the margins. On soil, humus or growing over mosses. South West and Scotland *Rare* **Placidium pilosellum**

Thallus of squamules to 2 mm diam. Grey, brown or black, on a black hypothallus. Apothecia to 1 mm diam. disc dark brown. moist shaded rocks. *Rare* **Vahliella leucophaea**

Thallus to 6 cm diam. white to brownish green. Squamules overlapping with wavy upturned margins. Apothecia to 2 mm diam. On dunes *Very rare* **Squamarina lentigera**

Crustose – Fruits perithecia

Brown to dark brown granules 0.1 mm diam. Perithecia in pits in the substratum. (Spores muriform). Calcareous soils and plant debris. Western. *Very rare* **Atla wheldonii**

Thallus thick, grey to dark brown, deeply and regularly cracked. Perithecia immersed in thallus. In very wet seepage tracks or very near water. *Very rare* **Verrucaria aethiobola**

Thallus immersed or thin and pale grey-brown. Perithecia in pits to 0.6 mm diam. On calcareous rocks. *Infrequent* **Thelidium incavatum**

Thallus immersed or pale grey. Perithecia to 0.6 mm diam. with a flat or depressed ostiole. On limestone, soil or slightly calcareous rock. *Rare* **Polyblastia cupularis**

Thallus white, grey or brownish. Perithecia to 0.8 mm diam. Ostiole often pale. On usually shaded limestone or calcareous sandstone. *Rare* **Thelidium papulare**

Thallus immersed, or grey-brown, often just brown specks. Perithecia to 0.5 mm diam. in pits. On exposed limestone and mortar. *Rare* **Staurothele caesia**

Thallus pale grey, immersed, Perithecia to 0.2 mm diam. Forms crusts on calcareous wet sand. Ephemeral. S. and W. England *Rare* **Collemopsidium arenisedum**

(*Similar but with smaller spores 15–20x5–7 µm against 26–37x8–10 µm* **C. subarenisedum**)

Like a dark brown *Verrucaria striatula* and grows amongst that species (but has 1-septate spores). Irregular black warts and ridges In the West (Ireland) *Rare* **Collemopsidium elegans**

Similar to *Collemopsidium foveolatum* but the perithecia are clustered. On calcareous rock and shells. Galway. *Very rare* **Collemopsidium ostrearum**

Similar to *Collemopsidium foveolatum* but the perithecia are sessile to 1.5 mm diam. On calcareous rock and shells. *Infrequent* **Collemopsidium sublitorale**

Thallus dark brown on the branches of the seaweed *Pelvetia caniculata*. Perithecia to 3.5 mm diam., often clustered. Sheltered sea shores *Infrequent* **Collemopsidium pelvetiae**

Thallus grey-brown, Perithecia black and prominent to 0.5 mm diam.. On sheltered, damp acid rock in the South West. *Rare* **Porina curnowii**

Thallus yellowish green to rusty coloured. K+ orange in patches. Perithecia to 0.5 mm diam., immersed. W. Inverness and SW Ireland. *Very rare* **Pyrenula dermatodes**

Thallus yellow-green to grey-green subgelatinous film. Perithecia in pits. 0.25–0.4 mm diam. On disturbed neutral to acidic soil. *Rare* **Thrombium epigaeum**

Thallus green-black, differs from *V. mucosa* in the cracked,with raised black-edged areoles. White prothallus. Sheltered littoral rocks in Cathness. N. Scotland. *Rare* **Verrucaria degelii**

Thallus thin, dark brown without any ridges. Perithecia to 0.15 mm diam. On sheltered acid rocks amongst barnacles. *Rare* **Verrucaria sandstedei**

Crustose – Fruits apothecia

Crustose – gelatinous when wet or membranous

Thallus gelatinous, thin and green to brown-black. Fruits barrel-shaped, 0.1 – 0.4 mm diam, dark red-brown. Appears in autumn on soil and plant debris. *Rare*
Sarcosagium campestre

Thallus membranous grey to dark green. Apothecia to 0.6 mm diam. brown-black and very convex. On flints, stable dunes and decaying wood. Probably ephemeral
Steinia geophana

Thallus a thin subgelatinous film. Apothecia 0.1–0.3 mm diam. black. On acid soil often where there has been a landslip. Devon and Wales. *Rare* **Arthonia ligniaria**

Thallus membranous or slightly cracked, grey to brown-black. Apothecia very abundant, to 0.5 mm diam. Disc brown-black. Acid, nutrient-enriched rocks. *Rare*
Rinodina orculariopsis

Crustose – Sorediate

Soredia C+ orange-red. Thallus greyish scattered areoles on a black prothallus. On stabilised shingle beaches, Kent, Wales and Angus. *Rare* **Rinodina aspersa**

C+ red. Thallus very thick, white to pale brown, usually with a powdery surface, looks sorediate. Sheltered areas and overhangs on calcareous rocks and mortar. *Rare* **Lecanographa grumulosa**

Thallus yellow-green to greyish, powdery or granular becoming *Lepraria*-like. K+ pale yellow. Occurs on mossy rocks and soil in the South and West. *Rare* **Megalospora tuberculosa**

Crustose – Isidiate or granular

Scattered, rounded, shiny granules on a grey-black prothallus. On flint nodules in the South. Reported as C+ white. *May be extinct* **Aspicilia tuberculosa**

Thallus grey to pale brown, normally of granules. Apothecia to 0.6 mm diam. with a margin which darkens and becomes excluded, disc black. On calcareous rocks. *Rare* **Rinodina bischoffii**

Irregular patches of granules, grey to grey-white usually pruinose. Apothecia to 1.5 mm diam. in thalline warts. On calcareous soils, dunes and plant remains. *Rare* **Megaspora verrucosa**

Thallus dark grey and very similar to *C. chlorina* often with a granular surface but having an orange-brown disc (K+ purple). Occurs on shingle. *Infrequent* **Caloplaca soralifera**

Thallus K+pale yellow. Yellow-green, powdery or granular, occurs on mossy rocks and soil in the South and West. *Rare* **Megalospora tuberculosa**

Thallus grey to grey-green almost granular. Flatter apothecia with a better defined margin than in *Micarea lignaria*. On hard, acid rocks. *Infrequent* **Micarea ternaria**

Thallus of dark olive-green granules. Apothecia 0.3–1 mm grey to red-brown, ± immersed in thallus. On mosses and plant debris and ± calcareous rock. *Infrequent* **Vezdaea aestivalis**

Thallus of green granules. Apothecia 0.3–1 mm pink to brown, sessile or stalked. On disturbed soil in open habitats usually metal-rich (often under wires). *Infrequent* **Vezdaea leprosa**

Crustose not isidiate or granular

K+ yellow *and* C+ red

Thallus thick, cracked, white to yellow grey with a black prothallus. Apothecia to 1mm diam., mainly flat. On exposed, hard, acid rock. *Rare* **Buellia saxorum**

Any part K+ yellow, orange, crimson or red *and* C–

K+ yellow. Thallus effuse, often in mosaics, white or pale grey. Apothecia immersed numerous, irregular in shape to 1.2 x 0.16 mm. Sheltered acid rock. *Rare* **Arthonia atlantica**

K+ yellow. Thallus thin, grey or pale brown. Black prothallus. Apothecia to 0.4 mm diam., abundant. On shaded, hard, acid rocks, especially metal-rich. *Rare* **Rinodina oxydata**

K+ yellow. Thallus uneven dark grey or brown. Apothecia large, immersed,persistent margin. On acid or slightly calcareous rocks. Mainly easterly. *Infrequent* **Rinodina teichophila**

K+ yellow. Thallus white or greenish. Prothallus white. Apothecia lecideine, immersed to 0.5 mm diam. On damp shaded crevices on acid rock. occurs in West. *Rare* **Lecidea phaeops**

Thallus K+ yellow. Grey-white but often completely covered in grey-green or yellowish soredia. On acid rocks and soil. *Rare* **Megalaria pulverea**

K+ pale yellow. Thallus yellow-green to greyish, powdery or granular becoming *Lepraria*-like. Occurs on mossy rocks and soil in the South and West. *Rare* **Megalospora tuberculosa**

K+ red. Thallus a brown crust that follows minute cracks. Apothecia numerous 1-3 per areole, rather curved, red-brown. On sunny exposed acid rocks. *Rare* **Acarospora subrufula**

Thallus K+ crimson, orange, placodioid, Similar to *C. arnoldii* but lobes widen at tips. Occurs on more or less horizontal surfaces in Wales and Scotland. *Rare* **Caloplaca scopularis**

Disc of apothecia orange-brown, K+ crimson, margin grey. Thallus dark grey to black with a black prothallus. On Lizard peninsula in mesic-supralittoral. *Very rare* **Caloplaca aractina**

Disc of apothecia orange-brown, K+ crimson, margin bright orange. Thallus dark grey to black with a black prothallus. On flint pebbles and shingle. *Rare* **Caloplaca atroflava**

Disc of apothecia red-brown, slightly paler margin, K+ crimson. Thallus white. occurs on rotting posts. Looks like a *Lecanora*. In Shetland. *Very rare* **Caloplaca caesiorufella**

Disc of apothecia, convex, black, red-brown when wet, K+ crimson. Thallus almost black. The only black fruited *Caloplaca* in acid rock. *Very rare* **Caloplaca concilians**

Thallus dark grey and very similar to *C. chlorina* often with a granular surface but having an orange-brown disc (K+ purple). Occurs on shingle. *Infrequent* **Caloplaca soralifera**

K+ yellow or yellow turning red. Thallus blue-grey. Apothecia 1–2.5 mm diam., disc yellow-white to dark brown. On sheltered, coarse, acid rock. S. and W. *Rare* **Lecanora cenisia**

K+ orange or red. Thallus pale grey. Apothecia black, almost flat, 0.3–0.6 mm diam. On exposed acid rocks in heathland. Wales and Scotland. *Rare* **Rhizocarpon cinereovirens**

Medulla K ± yellow. Thallus dark brown with pink tinge. Black prothallus. Apothecia black, to 0.7 mm diam. Hard acid rock. N. and W. *Rare* **Rhizocarpon polycarpum**

Medulla ± yellow. Thallus grey-brown. Areoles convex. Apothecia 0.2–0.5 mm diam. Disc almost flat and usually wrinkled. Pembroke. *Rare* **Rimularia gyrizans**

K+ yellow. Primary thallus persistent, grey with dark brown cephalodia. Pseudopodetia rare. Apothecia to 1 mm diam. Acid and metal-rich heathland. *Rare* **Stereocaulon condensatum**

K ± yellow. Thallus grey-green, warted and very cracked. Apothecia 0.4–0.8 mm diam., thick wavy margin. On dry shaded acid rocks and walls. *Rare* **Tylothallia biformigera**

C+orange or red *and* K–

C+ orange. Thallus white to yellowish. Similar to *B. ocellata* but with larger areoles and slightly placodioid. On exposed pebbles and shingle in N E Scotland. *Rare* **Buellia jugorum**

C+ orange. Thallus yellow-green, placodioid. Apothecia 2–3 mm diam. with red-brown disc. On bird perching sites in Scottish Islands. *Rare* **Lecanora straminea**

C+ red. Thallus a pale grey crust with spine-like extensions, looking like a pile of fish bones. On acid heaths, mainly in the North. *Rare* **Ochrolechia frigida**

Spot reactions negative

Thallus immersed or a grey stain. Apothecia lecideine. Disc dark red-brown to 5 mm diam. On acid rocks in Channel Islands, Isles of Scilly and West Britain. *Rare* **Sarcogyne clavus**

Thallus rust coloured. Prothallus grey-black. Apothecia numerous between areoles to 0.6 mm diam. concave and shiny. Metal-rich acid rocks *Rare* **Tremolecia atrata**

Thallus grey usually partially rusty. Prothallus weak. Apothecia to 2 mm diam., mainly flat. On exposed acid rocks and pebbles. *Infrequent* **Lecidea lithophila**

Thallus flat to warted, grey or brownish, rather glossy. Apothecia to 1.2 mm diam. dark brown, glossy. On acid, often metal-rich rocks. *Infrequent* **Miriquidica leucophaea**

Thallus grey to yellow-brown. Apothecia immersed in thallus 0.15–0.3 mm diam., black, concave disc. Calcareous pebbles/shingle. Mid Wales, Northern Britain. *Rare* **Eiglera flavida**

Thallus grey to pale brown. Apothecia in heaps with black, pruinose disc and a pale, persistent margin. On vertical or overhanging calcareous rock. *Rare* **Lecania nylanderiana**

Thallus yellow-grey to brown. Areoles to 3 mm diam. Apothecia 1–5 per areole, concave, red-brown. On compacted soil that is sheep trampled. *Rare* **Acarospora benedarensis**

White to greenish grey crust on heather stems. Thallus scratches orange. Apothecia 0.3–0.6 mm diam., black discs. Occurs in W. Scotland and W. Ireland. *Rare* **Arthothelium norvegicum**

A thick, warted, blue-grey to brown thallus often almost obscured by black apothecia which crack when old. Occurs in the West and Scotland. *Very rare* **Aspicilia recedens**

Thallus grey-green. Usually infertile (pinkish disc) but with slightly hairy pycnidia. On dry acid rocks in overhangs in N. W. Britain and W. Ireland. *Rare* **Bacidia carneoglauca**

Thallus creamy grey, following cracks in the rock. Apothecia 0.2–0.5 mm diam., very dark brown but often piebald. On calcareous rock in the West. *Rare* **Catillaria aphana**

Thallus thin, green-grey to brown. Apothecia 0.1–0.3 mm diam., black. On nutrient-enriched rocks often with *Hydropunctaria maura*. Isles of Scilly, Channel Islands. *Rare* **Catillaria subviridis**

Thallus dark grey and similar to *C. chlorina* often with a granular surface but having an orange-brown disc (which is K+ purple). Occurs on shingle. *Infrequent* **Caloplaca soralifera**

Thallus dark grey to green, forming mosaics, areoles separated by black lines. Apothecia comma shaped or lines. On vertical faces of damp acid rocks. *Rare*.**Enterographa hutchinsiae**

Thallus pale grey to grey-green, thin and scurfy. Apothecia 0.2–0.4 mm diam. pink to grey brown. On mossy sheltered rocks. Mainly in the South. *Rare* **Fellhaneropsis vezdae**

Thallus thin to warted, white or black. Apothecia 0.3–0.6 mm diam. very dark brown. On rocks such as granite above the supralittoral zone in S. and W. *Rare* **Halecania spodomela**

Thallus white to pale brown, rather indeterminate. Apothecia in pits 0.2–0.5 mm diam. Disc dark brown, pruinose. Hard calcareous rocks. *Rare* **Lecanora agardhiana**

Thallus thin, white to buff, no prothallus. Apothecia in crowded heaps. Discs nearly black with pruinose margin. On vertical or overhanging calcareous rocks. *Rare* **Lecania nylanderiana**

Thallus pale grey to almost black, of warted areoles. Dark brown cephalodia between some areoles. Apothecia to 1 mm diam., black. Soil on acid heaths. *Infrequent* **Micarea incrassata**

Thallus grey to grey-green almost granular. Flatter apothecia with a better defined margin than in *Micarea lignaria*. On hard, acid rocks. *Infrequent* **Micarea ternaria**

Thallus thin, stain-like, pale grey to pale brown. Apothecia 0.2–0.5 mm diam. Red-brown to grey-white, pale pruinose margin.Calcareous rock, shells, concrete. *Rar*e **Caerulium (Myriospora) heppii**

Thallus grey or immersed. Apothecia 1–2 x 0.1–0.3 mm brown. Prominant black pycnidia. On soil/consolidated dunes, rarely wooden posts or rock. *Infrequent* **Opegrapha areniseda**

Thallus white, placodioid. Like *Solenopsora candicans* but with rounded lobes and occurs on exposed serpentine rocks on the Lizard not on calcareous rocks. *Very rare* **Solenopsora liparina**

Thallus white to grey. Apothecia minute in clusters under a thick white pruina. On rocks and mosses under dry overhangs. W. and S.W. *Rare* **Syncesia myrticola**

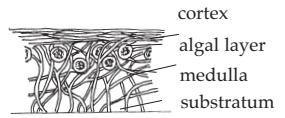
Leprose or powdery or may appear completely powdery

Thallus K+ yellow. Grey-white but often completely covered in grey-green or yellowish soredia . On acid rocks and soil. *Rare* **Megalaria pulverea**

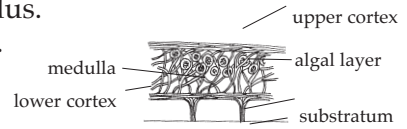
C+ red. Thallus very thick, white to pale brown, usually with a powdery surface, looks sorediate. Sheltered areas and overhangs on calcareous rocks and mortar. *Rare* **Lecanographa grumulosa**

Thallus yellow-green to greyish, powdery or granular becoming *Lepraria*-like. K+ pale yellow. Occurs on mossy rocks and soil in the South and West. *Rare* **Megalospora tuberculosa**

Glossary



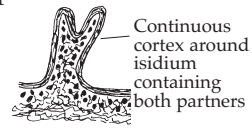
Cross-section of crustose thallus x20



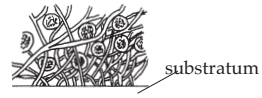
Cross-section of foliose thallus x20

Acid rock (siliceous), does not react to acid such as lemon juice.
Adpressed, flattened; usually to the surface of the substratum.
Apothecium (pl. **-ia)**, disc-shaped fruiting body.
Areoles, **(areolate)**, paving-like islands forming the thallus.
Ascus (pl. **asci)**, bag-shaped body containing the spores.
Basic rock (calcareous), fizzes slightly with lemon juice.
Blastidium (pl. -ia), minute rounded bodies containing both partners whch are budded off the lichen.
Bullate, with blister-like bumps on the upper surface, that often appear as depressions on the lower surface.
Calcareous (calc.), chalky, alkaline rock or soil
Cephalodium, a body containing blue-green cyano-bacteria in a lichen that normaly has a green alga.
Cilia, 'eye lash'-like hairs, usually on the margin of lobes.
Conidia, spores produced asexually from fungal cells.
Cortex, outer layer of a thallus.
Corticate, having a cortex.
Crustose, lichen having no lower cortex, and is not easily removed from the substrate (see diagram).
Disc, the central area of an apothecium.
Excluded, disappearing at maturity.
Fertile, having fruiting bodies e.g. apothecia or perithecia.
Fimbriate, cottony, like a fringe on a rug
Foliose, leaf-like with both an upper and lower cortex, easily removed from the substrate (see diagram).
Fruit, the fruiting body of the fungus containing the spores.
Fruticose, bushy, with a continuous ring of algae (see diagram).
Holdfast, structure that attaches the lichen to the substratum.
Hypha (pl. **-ae)**, very thin fungal filament.
Hypothallus, a felted layer of fungal hyphae under the thallus.
Isidium (pl. **-ia)**, detachable outgrowth of the thallus (see diagram).
Laminal, on the surface of a lobe not the edges.
Lecanorine, apothecium with a thalline margin (see diagram). This margin is of similar colour to the thallus.
Lichenicolous, growing on another lichen.
Lecideine, apothecium lacking a thalline margin (see diagram). The margin is a different in colour from the thallus.
Lirellate, long, thin black fruits like strange writing.
Leprose, a more or less unstructured mixture of fungal strands and algal cells (see diagram). *Note that this key includes other lichens that appear to be powdery or granular.*
Lobules, small secondary lobes.

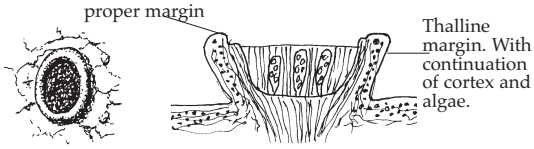
Fruticose thallus x15



Cross-section of isidium x30



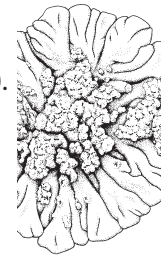
Cross-section of leprose thallus x20



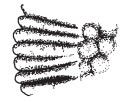
Lecanorine apothecium x5 and cross-section x20

Lecideine apothecia x5 and cross-section x20

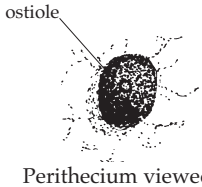
Margin, may refer to the edge of a fruit or the edge of the whole lichen.
Medulla, inner part of a thallus below the algae.
Mosaic, forming a community growing together but with each thallus clearly defined.
Osmotic pressure, the water pressure created by differing concentrations of salt solutions, inside and outside the cell membrane.
Ostiole, opening in top of perithecium for the escape of spores (see diagram).
Palmate, speading outwards at the top like a palm and wrist.
Perithecium (pl. **-ia)**, flask-shaped fruiting body (see diagram).
pH, a meaure of acidity. 7 is neutral, higher is alkaline and lower acid.
Photobiont, photosynthetic partner i.e. the algae or cyanobacteria.
Placodioid, crustose with marginal lobes (see diagram).
Podetium (pl. **-ia)**, hollow, stalk-like structure bearing the fruiting body e.g. *Cladonia.*
Prothallus, area lacking algae at the edge of a crustose lichen.
Pseudocyphella (pl. -**ae**), pale patch, dot or line where the cortex is thin or absent.
Pseudopodetium (pl. -**a**), solid stalk-like structures that arise from a basal thallus.
Pruina, **pruinose**, powdery substance like the bloom on a plum.
Pycnidia, small bodies in the thallus that produce conidia.
Rhizine, root-like outgrowth of fungal threads used for attachment.
Septum (pl. -**a**), internal wall dividing cells or parts of cells or spores.
Sessile, more or less sitting on the surface.
Siliceous, see acid rock.
Soralium (pl. -**ia**), structure producing soredia (see diagram).
Soredium (pl. -i**a**), small powdery granules containing both fungus and algae (see diagram).
Spore, a reproductive structure produced by the fungus. For a similar purpose to a seed in flowering plants (see diagram).
Squamule, small leaf-like forms often occurring in *Cladonia*.
Submuriform, a spore having only one or two longitudinal septa.
Subsp., subspecies.
Substratum (pl. -**a**), the surface on which the lichen is growing.
Thalline margin, margin of a fruit containing alga (see diagram).
Thallus, the body of a lichen.
Tomentum, covered in very fine, short hairs, like felt.



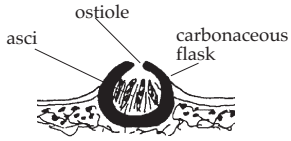
Palmate placodioid crustose thallus x3



Finger-like placodioid crustose thallus x3



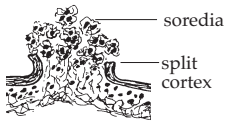
Perithecium viewed from above x10



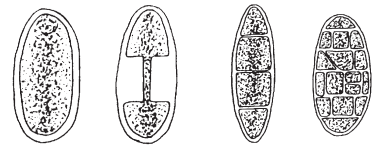
Cross-section of perithecium x10

Podetium x3

Spore types x1000 approx.



Cross-section of a soralium showing soredia being released x15



Simple Polarilocular Septate Muriform

Species included in the main key

Abbreviations (see Illus. 3): eu = eulittoral, lf = littoral fringe, mesic = mesic, x = xerix, T = terrestrial, hi = halophilic, ho = halophobic, cal = calcareous substrata. Numbers indicate the plates with a photograph.

Fruticose

Bryoria fuscescens T
Cetraria aculeata T
Cetraria muricata T
Cladonia arbuscula T
Cladonia chlorophaea T
Cladonia ciliata T
Cladonia coniocraea T
Cladonia crispata T
Cladonia diversa T
Cladonia fimbriata T
Cladonia floerkeana T, **6**
Cladonia furcata T, **6**
Cladonia furcata subsp. subrangiformis T, cal
Cladonia glauca T
Cladonia gracilis T
Cladonia humilis T
Cladonia macilenta T
Cladonia pocillum T, cal
Cladonia portentosa T
Cladonia pyxidata T, **6**
Cladonia ramulosa T
Cladonia rangiferina T
Cladonia rangiformis T, cal
Cladonia squamosa T
Cladonia subulata T
Cladonia uncialis T
Dibaeis baeomyces T
Leprocaulon microscopicum ho, T
Lichina confinis lf, m, **1**
Lichina pygmaea eu, lf, **1**
Pycnothelia papillaria T
Ramalina canariensis ho, T
Ramalina cuspidata x, hi
Ramalina farinacea ho, T
Ramalina lacera T
Ramalina pollinaria h, T
Ramalina polymorpha x, hi
Ramalina portuensis T
Ramalina siliquosa x, hi, **4**
Ramalina subfarinacea ho, T, **4**
Roccella fuciformis x, T
Roccella phycopsis x, T **4**
Sphaerophorus globosus ho
Stereocaulon vesuvianum ho
Teloschistes flavicans ho, T, **4**
Usnea articulata ho, T
Usnea cornuta T
Usnea flammea ho, T, **6**
Usnea fragilescens ho, T
Usnea hirta T
Usnea subfloridana ho, T

Foliose

Anaptychia ciliaris x, hi, T
Anaptychia runcinata x, hi, **4**
Collema auriforme x, T, **5**
Collema crispum x, T
Collema cristatum T
Collema furfuraceum x, T
Collema multipartitum T, cal
Collema nigrescens x, T
Collema tenax x, T, **5**
Degelia atlantica T
Degelia cyanoloma T
Degalia ligulata T
Degelia plumbea T
Dermatocarpon miniatum x, T, **5**
Evernia prunastri T
Flavoparmelia caperata hi, T, **4**
Flavoparmelia soredians ho, T
Heterodermia obscurata ho ,T
Heterodermia leucomela ho, T
Heterodermia speciosa ho, T
Hypogymnia physodes ho , T, **6**
Hypogymnia tubulosa ho, T
Hypotrachyna britannica x, T
Hypotrachyna laevigata x, T
Hypotrachyna revoluta x, T, **6**
Leptogium britannicum T
Leptogium gelatinosum m, T
Leptogium schraderi m, T
Leptogium teretiusculum T
Leptogium turgidum T
Lobaria pulmonaria T
Melanelixia fuliginosa T
Melanelixia glabratula T
Nephroma laevigatum T
Nephroma tangeriense T
Parmelia omphalodes T
Parmelia saxatilis ho, T, **4**
Parmelia sulcata ho, T
Parmelina pastillifera ho, T
Parmotrema crinitum x, T
Parmotrema perlatum x, T, **4**
Parmotrema reticulatum x, T
Peltigera canina T
Peltigera didactyla T
Peltigera hymenina T
Peltigera membranacea T
Peltigera neckeri T
Peltigera praetextata T
Peltigera rufescens T
Phaeophyscia nigricans x,T
Phaeophyscia orbicularis x,T, **5**
Physcia adscendens x, T
Physcia aipolia T
Physcia caesia T
Physcia clementei T
Physcia dubia T
Physcia leptalea T
Physcia tenella x,T, **4**
Physcia tribacia hi, ho, **5**
Physcia tribacioides hi, ho
Physconia distorta ho,T
Physconia grisea ho,T
Platismatia glauca T
Pseudevernia furfuracea T
Punctelia subrudecta T
Tuckermanopsis chlorophylla T
Xanthoparmelia conspersa T
Xanthoparmelia delisei x, T, **4**
Xanthoparmelia loxodes x, T, **4**
Xanthoparmelia mougeotii T
Xanthoparmelia pulla x, T, **4**
Xanthoparmelia verruculifera T
Xanthoria aureola m, hi, **4**
Xanthoria candelaria xs T
Xanthoria calcicola xs, T
Xanthoria elegans ho, T
Xanthoria parietina m, T, **4**
Xanthoria polycarpa T
Xanthoria ucrainica ho, T, **4**

Squamulose

Acarospora fuscata ho, T
Acarospora impressula m, T
Acarospora smaragdula x, T
Acarospora veronensis ho
Agonimia tristicula T
Bilimbia lobulata T, cal
Caloplaca microthallina m
Catapyrenium cinerum T
Cladonia cervicornis T, **6**
Cladonia convoluta T
Cladonia firma T
Cladonia foliacea T, **5**
Cladonia subcervicornis T
Cladonia symphycarpia T, cal
Endocarpon pusillum hi, T
Fulgensia fulgens T, **6**
Hypocenomyce scalaris x T
Myriospora rufescens ho, T
Normandina pulchella T
Placidiopsis custnanii T, cal
Placidium squamulosum T, cal
Psora decipiens T, cal
Romjularia lurida T, cal, **5**
Solenopsora holophaea x, T
Solenopsora vulturiensis T, **6**
Squamarina cartilaginea Hi, T, cal, **5**
Toninia sedifolia m, T cal, **6**
Toninia aromatica Hi, T, **3**
Vahliella leucophaea T

Crustose

Acarospora nitrophila T
Acrocordia conoidea T
Acrocordia macrospora T
Acrocordia salweyi T
Agonimia gelatinosa T cal
Amandinea coniops T
Amandinea pelidna x, T
Amandinea punctata T
Arthonia endlicheri T
Arthonia phaeobaea m
Aspicilia caesiocinerea ho, T, **1**
Aspicilia calcarea T, **5**
Aspicilia cinerea hi, ho
Aspicilia contorta T
Aspicilia epiglypta hi, ho
Aspicilia intermutans hi, ho
Aspicilia leprosescens x, **2**
Bacidia bagliettoana T, cal
Bacidia herbarum T
Bacidia scopulicola T
Baeomyces rufus T
Bilimbia lobulata T, cal
Bilimbia sabuletorum T, cal
Botryolepraria lesdainii ho,T cal
Buellia aethalea x, T
Buellia griseovirens T
Buellia leptoclinoides x
Buellia ocellata x, T
Buellia sequax T
Buellia stellulata x, T, **2**
Buellia subdisciformis x, **2**
Caloplaca arnoldii m
Caloplaca aloiza T
Caloplaca arcis T
Caloplaca aurantia x, T, **5**
Caloplaca britannica x, T
Caloplaca ceracea x, T, **1**
Caloplaca cerina T
Caloplaca chlorina ho, T
Caloplaca chrysodeta x, T
Caloplaca cirrochroa m, T, **5**
Caloplaca citrina m, x, T, **1**
Caloplaca crenularia x, T

Caloplaca crenulatella T
Caloplaca dalmatica T
Caloplaca decipiens T
Caloplaca flavescens x, T, **5**
Caloplaca flavocitrina x, T
Caloplaca flavovirescens, m, T
Caloplaca holocarpa x, T
Caloplaca littorea m, **1**
Caloplaca marina m, **1**
Caloplaca maritima x, ho, **3**
Caloplaca marmorata T
Caloplaca microthallina m, **1**
Caloplaca oasis T
Caloplaca ochracea T
Caloplaca ruderum T
Caloplaca saxicola x,T
Caloplaca suaedae T
Caloplaca teicholyta T
Caloplaca thallincola m, **1**
Caloplaca variabilis x, T
Caloplaca verruculifera m, T, **1**
Caloplaca xantholyta x,T
Candelariella aurella ho, T
Candelarella coralliza x, T
Candelariella medians ho, T
Candelariella vitellina x, T, **3**
Candelariella vitellina
form flavovirella x, T
Catillaria chalybeia m, T, **3**
Catillaria lenticularis T
Clauzadea immersa T
Clauzadea metzleri T
Clauzadea monticola T
Cliostomum corrugatum x, T
Cliostomum griffithi x, T
Cliostomum tenerum x
Collemopsidium elegans eu, lf
Collemopsidium foveolatum eu, lf, **1**
Cyphelium inquinans T
Cyphelium notarisii T
Dibaeis baeomyces T
Diploicia canescens ho
Diploschistes caesioplumbeus x, **1**
Diploschistes muscorum T, cal
Diploschistes scruposus T, cal
Diplotomma alboatrum m, T, **5**
Diplotomma chlorophaeum x, T
Diplotomma hedinii T
Dirina massiliensis x, T
Fuscidea cyathoides ho, T, **3**
Gyalecta jenensis ho, T, cal
Gyalecta jenensis
var. macrospora ho, T
Gyalecta nidarosiensis T
Haematomma ochroleucum
var. ochroleucum hi, T
Haematomma ochroleucum
var. porphyrium hi, T
Halecania ralfsii x, T, **2**
Hydropunctaria amphibia lf, m
Hydropunctaria maura lf, **1**
Lecanactis dilleniana x
Lecania aipospila m, **2**
Lecania baeomma x
Lecania erysibe m T
Lecania erysibe
form soridiata T
Lecania hutchinsiae hi, T
Lecania rabenhorstii hi, T
Lecanora actophila m, **2**
Lecanora aitema T
Lecanora albescens T
Lecanora andrewii x
Lecanora campestris ho, T, **3**
Lecanora chlarotera T
Lecanora compallens T
Lecanora confusa T
Lecanora conizaeoides ho, T
Lecanora crenulata T
Lecanora dispersa m ,T, **3**
Lecanora expallens T
Lecanora fugiens x, **2**
Lecanora gangaleoides hi, T, **2**
Lecanora helicopis m, **2**
Lecanora intricata ho, T
Lecanora muralis ho, **4**
Lecanora ochroidea ho, T
Lecanora orosthea ho, T
Lecanora poliophaea m, **2**
Lecanora polytropa x, T, **3**
Lecanora praepostera x, T
Lecanora pulicaris T
Lecanora rupicola x, T, **2**
Lecanora saligna T
Lecanora semipallida T
Lecanora soralifera T
Lecanora stenotropa T
Lecanora subcarnea ho, T
Lecanora sulphurea x, T, **3**
Lecanora symmicta T
Lecanora varia T
Lecanora zosterae ho, T
Lecidea auriculata T
Lecidea diducens ho, T
Lecidea fuscoatra ho, T
Lecidea grisella T, **3**
Lecidea lactea x, T
Lecidea lapicida x, T
Lecidea sarcogynoides ho, T
Lecidella asema x, T, **2**
Lecidella carpathica T
Lecidella elaeochroma T
Lecidella meiococca x, T
Lecidella scabra ho, T, **3**
Lecidella stigmatea ho, T
Lecidella viridans T
Lepraria borealis T
Lepraria caesioalba ho, T
Lepraria ecorticata T
Lepraria incana m, T
Lepraria lobificans T
Lepraria nivalis ho, T
Lepraria membanacea ho
Lepraria vouauxii ho
Leprocaulon microscopicum ho, T, **6**
Lithographa tesserata ho, T
Llimonaea sorediata T
Micarea denigrata T
Micarea erratica x, T
Micarea lignaria T
Micarea prasina T
Moelleropsis nebulosa T
Ochrolechia androgyna ho, T
Ochrolechia parella x, T, **3**
Ochrolechia tartarea ho, T
Opegrapha calcarea x. T, **3**
Opegrapha cesareensis m, hi
Opegrapha gyrocarpa ho, T
Opegrapha lithyrga ho, T
Opegrapha rupestris T
Opegrapha zonata ho, T
Pertusaria aspergilla ho, T
Pertusaria chiodectonoides ho
Pertusaria corallina hi, T, **2**
Pertusaria excludens T
Pertusaria flavicans ho
Pertusaria lactea x, ho
Pertusaria monogona x
Pertusaria pluripuncta x
Pertusaria pseudocorallina x, T, **2**
Petractis clausa T cal
Petractis nodispora T cal
Placopyrenium fucellum T
Placynthiella dasaea T
Placynthiella icmalea T
Placynthiella uliginosa T
Placynthium nigum T
Polyblastia agraria T, cal
Polysporina simplex ho, T
Porina chlorotica ho, T
Porina linearis T
Porocyphus coccodes hi, ho
Porpidia cinereoatra hi, T, **6**
Porpidia crustulata ho, T
Porpidia platycarpoides hi, T
Porpidia rugosa hi, T
Porpidia soredizodes ho, T
Porpidia tuberculosa ho, T
Protoblastenia calva T
Protoblastenia rupestris T, **5**
Protoparmelia badia T, **6**
Protoparmelia montagnei T
Psilolechia leprosa T
Psilolechia lucida x, T
Psorotichia schaereri hi, ho
Rhizocarpon distinctum T
Rhizocarpon geographicum ho,T, **3**
Rhizocarpon hochstetteri ho, T
Rhizocarpon petraeum T
Rhizocarpon polycarpon x, T
Rhizocarpon reductum x, T, **2**
Rhizocarpon richardii x, T, **2**
Rinodina atrocinerea x
Rinodina beccariana hi, T, **6**
Rinodina confragosa T
Rinodina conradii T
Rinodina luridescens x
Rinodina oleae m,T, **3**
Roccellographa circumscripta x, hi
Roccellographa sorediata x, hi T
Sarcogyne privigna ho, T
Sarcogyne regularis x, T
Schaereria fuscocinerea T
Scoliciosporum umbrinum x,T
Solenopsora candicans ho, T, **5**
Tephromela atra x, T
Thelenella muscorum T, cal.
Thelidium decipiens x,T cal
Toninia mesoidea m, T
Trapelia coarctata T
Trapelia glebulosa ho, T
Trapelia obtegens ho, T
Trapelia placodioides ho, T
Trapeliopsis flexuosa T
Trapeliopsis granulosa ho, T
Trapeliopsis pseudogranulosa ho, T
Trapeliopsis wallrothii hi, ho, T, **6**
Verrucaria baldensis T, **5**
Verrucaria caerulea T
Verrucaria bryoctona T, cal
Verrucaria ditmarsica eu, lf
Verrucaria dufourii T
Verrucaria fusconigrescens x, hi, **3**
Verrucaria halizoa eu, **1**
Verrucaria hochstetteri T
Verrucaria internigrescens x
Verrucaria macrostoma T
Verrucaria mucosa eu,l f, **1**
Verrucaria muralis T
Verrucaria nigrescens x, T
Verrucaria prominula ho, T, **6**
Verrucaria striatula lf, **1**
Verrucaria viridula T

Species included in the supplementary keys (F–H)

These three keys can help to shorten the time taken to identify specimens on calcareous substrata, on soils, mosses, plant debris or humus or growing on sawn wood. These keys contain most of the species that occur in these situations. If after using them you do not obtain a result, use the main key which also contains all the species listed below.

Key F – Species that frequently occur on solid calcareous substrata such as limestone, concrete and mortar (above the lower supralittoral zone)

Anaptychia ciliaris x, hi, T
Acrocordia conoidea T
Acrocordia macrospora T
Acrocordia salweyi T
Agonimia tristicula T
Aspicilia calcarea T
Aspicilia contorta T
Bacidia bagliettoana T
Bacidia herbarum T
Bilimbia lobulata T
Bilimbia sabuletorum T
Botryolepraria lesdainii ho,T
Caloplaca alociza T
Caloplaca arcis T
Caloplaca aurantia x, T
Caloplaca chlorina T
Caloplaca chrysodeta x, T
Caloplaca cirrochroa m, T
Caloplaca citrina m, x, T
Caloplaca crenulatella T
Caloplaca dalmatica T
Caloplaca decipiens T
Caloplaca flavescens x, T,
Caloplaca flavocitrina x, T
Caloplaca flavovirescens, m, T
Caloplaca holocarpa x, T
Caloplaca marmorata T
Caloplaca oasis T
Caloplaca ochracea T
Caloplaca ruderum T
Caloplaca saxicola x, T
Caloplaca teicholyta T
Caloplace variabilis x, T
Caloplaca xantholyta x,T
Candelariella aurella ho, T
Candelariella medians ho, T
Catillaria chalybeia T
Catillaria lenticularis T
Clauzadea immersa T
Clauzadea metzleri T
Clauzadea monticola T
Collema auriforme x, T
Collema crispum x, T
Collema cristatum T
Collema multipartitum T
Collema nigrescens T
Collema tenax x, T
Dermatocarpon miniatum x, T
Diploicia canescens x, T
Diploschistes scruposus T
Diplotomma alboatrum m, T
Diplotomma chlorophaeum x, T
Diplotomma hedini Ti
Dirina massiliensis x, T
Gyalecta jenensis ho., T
Gyalecta nidarosiensis T
Haematomma ochroleucum T
Lecania erysibe T
Lecania rabenhorstii T
Lecanora albescens T
Lecanora campestris T
Lecanora crenulata T
Lecanora dispersa T
Lecanora muralis T
Lecanora semipallida T
Lecanora stenotropa T
Lecidella stigmatea T
Lepraria lobificans T
Lepraria nivalis T
Lepraria vouauxii T
Leptogium britannicum T
Leptogium gelatinosum m, T
Leptogium schraderi m, T
Leptogium teretiusculum T
Leptogium turgidum T
Llimonaea sorediata T
Opegrapha calcarea T
Opegrapha rupestris T
Petractis clausa T
Petractis nodispora T
Phaeophyscia nigricans T
Phaeophyscia orbicularis T
Physcia adscendens T
Physcia caesia x, T
Physcia tenella T
Physcia tribacia x, T
Physconia distorta T
Physconia grisea T
Placopyrenium fucellum T
Placynthium nigrum T
Polysporina simplex T
Porina linearis T
Protoblastenia calva T
Protoblastenia rupestris T
Psilolechia leprosa T
Psorotichia schaereri hi, ho
Ramalina canariensis T
Ramalina farinacea T
Ramalina subfarinacea T
Rhizocarpon petraeum T
Rinodina oleae T
Rocella fuciformis T
Roccella phycopsis T
Sarcogyne regularis x, T
Solenopsora candicans ho, T
Squamarina cartilaginea x T
Thelidium decipiens x,T
Toninia aromatica Hi,T
Toninia mesoidea T
Toninia sedifolia T
Verrucaria baldensis T
Verrucaria caerulea T
Verrucaria dufourii T
Verrucaria hochstetteri T
Verrucaria macrostoma T
Verrucaria muralis T
Verrucaria nigrescens x, T
Verrucaria viridula T
Xanthoria aureola m, hi
Xanthoria calcicola xs, t
Xanthoria elegans ho, T
Xanthoria parietina m, T
Xanthoria ucrainica x, T

Key G – Species that normally occur on soils, mosses, plant debris or humus, often in rock crevices. Species primarily on calcareous substrata = cal

Acarospora smaragdula T
Agonimia gelatinosa T, cal
Agonimia tristicula T
Anaptychia ciliaris x T
Bacidia bagliettoana T, cal
Bacidia herbarum T, cal
Bacidia scopulicola x
Baeomyces rufus T
Bilimbia lobulata T, cal
Bilimbia sabuletorum T, cal
Caloplaca suaedae T
Catapyrenium cinerum T
Cetraria aculeata T
Cetraria muricata T
Cladonia arbuscula T
Cladonia cervicornis T
Cladonia chlorophaea T
Cladonia ciliata T
Cladonia coniocraea T
Cladonia convoluta T
Cladonia crispata T
Cladonia diversa T
Cladonia fimbriata T
Cladonia firma T
Cladonia floerkeana T
Cladonia foliacea T
Cladonia furcata T
Cladonia furcata subsp. subrangiformis T, cal
Cladonia glauca T

Cladonia gracilis T
Cladonia humilis T
Cladonia macilenta T
Cladonia pocillum T, cal
Cladonia portentosa T
Cladonia pyxidata T
Cladonia ramulosa T
Cladonia rangiferina T
Cladonia rangiformis T, cal
Cladonia squamosa T
Cladonia subcervicornis T
Cladonia subulata T
Cladonia symphycarpia T, cal
Cladonia uncialis T
Collema auriforme x,T
Collema crispum x, T
Collema cristatum T
Collema nigrescens T
Collema tenax x, T
Dibaeis baeomyces T
Diploschistes muscorum T, cal
Endocarpon pusillum hi, T
Evernia prunastri T
Fulgensia fulgens ho, T, cal
Heterodermia leucomela ho, T
Heterodermia obscurata ho, T
Heterodermia speciosa ho, T
Hypogymnia physodes ho
Lecanora zosterae ho, T
Leprocaulon microscopicum T
Leptogium britannicum T
Leptogium gelatinosum m, T
Leptogium schraderi m, T
Leptogium teretiusculum T
Leptogium turgidum T
Micarea lignaria T
Micarea prasina T
Moelleropsis nebulosa T
Nephroma laevigatum T
Nephroma tangeriense T
Normandina pulchella T
Ochrolechia androgyna T
Peltigera canina T
Peltigera didactyla T
Peltigera hymenina T
Peltigera membranacea T
Peltigera neckeri T
Peltigera praetextata T
Peltigera rufescens T
Placidiopsis custnanii T, cal
Placidium squamulosum T, cal
Placynthiella dasaea T
Placynthiella icmalea T
Placynthiella uliginosa T
Polyblastia agraria T, cal
Psora decipiens T, cal
Pycnothelia papillaria T
Ramalina farinacea T
Ramalina subfarinacea T
Rinodina conradii T
Romjularia lurida T, cal
Solenopsora holophaea x, T
Solenopsora vulturiensis x, T
Squamarina cartilaginea hi,T, cal
Teloschistes flavicans T
Thelenella muscorum T, cal.
Toninia aromatica T, cal
Toninia sedifolia m,T, cal
Trapelia coarctata T
Trapelia glebulosa T
Trapeliopsis granulosa ho, T
Trapeliopsis wallrothii hi, ho, T
Verrucaria bryoctona T, cal
Usnea articulata ho, T

Key H – Lichens growing directly on sawn wood (e.g. fences, gates and benches)

When wood becomes well rotted it may often support the species that occur on soil and humus

Amandinea punctata
Anaptychia ciliaris
Bryoria fuscescens
Buellia griseovirens
Caloplaca cerina
Caloplaca marina
Caloplaca flavovirescens
Candelariella vitellina
Cladonia chlorophaea
Cladonia coniocraea
Cladonia diversa
Cladonia fimbriata
Cladonia floerkeana
Cladonia glauca
Cladonia gracilis
Cladonia macilenta
Cladonia pyxidata
Cladonia ramulosa
Cladonia squamosa
Cladonia subulata
Cliostomum corrugatum
Cliostomum griffithii
Cyphelium inquinans
Cyphelium notarisii
Diploicia canescens
Evernia prunastri
Flavoparmelia caperata
Flavoparmelia soredians
Hydropunctaria maura
Hypocenomyce scalaris
Hypogymnia physodes
Hypogymnia tubulosa
Hypotrachyna britannica
Hypotrachyna revoluta
Lecanora aitema
Lecanora campestris
Lecanora chlarotera
Lecanora compallens
Lecanora confusa
Lecanora conizaeoides
Lecanora expallens
Lecanora intricata
Lecanora muralis
Lecanora orosthea
Lecanora polytropa
Lecanora pulicaris
Lecanora saligna
Lecanora soralifera
Lecanora sulphurea
Lecanora symmicta
Lecanora varia
Lecidella elaeochroma
Lecidella scabra
Melanelixia fuliginosa
Melanelixia subaurifera
Micarea denigrata
Parmelia saxatilis
Parmelia sulcata
Parmotrema perlatum
Phaeophyscia orbicularis
Physcia adscendens
Physcia aipolia
Physcia caesia
Physcia leptalea
Physcia tenella
Physconia distorta
Physconia grisea
Placynthiella icmalea
Pseudevernia furfuracea
Punctelia subrudecta
Ramalina canariensis
Ramalina farinacea
Ramalina lacera
Ramalina pollinaria
Ramalina portuensis
Ramalina siliquosa
Ramalina subfarinacea
Roccella phycopsis
Trapeliopsis flexuosa
Trapeliopsis granulosa
Sphaerophorus globosus
Usnea cornuta
Usnea flammea
Usnea hirta
Usnea subfloridana
Xanthoria calcicola
Xanthoria candelaria
Xanthoria parietina
Xanthoparmelia conspersa
Xanthoparmelia mougeotii
Xanthoparmelia verruculifera
Xanthoria calcicola
Xanthoria ucrainica

Species included in 'notes on some rare species'

(These species are not included in the main key)

Acarospora benedarensis
Acarospora subrufula
Arthonia atlantica
Arthonia ligniaria
Arthothelium norvegicum
Aspicilia tuberculosa
Aspicilia recedens
Atla wheldonii
Bacidia carneoglauca
Buellia jugorum
Buellia saxorum
Caerulium heppii
Caloplaca aractina
Caloplaca atroflava
Caloplaca caesiorufella
Caloplaca concilians
Caloplaca scopularis
Caloplaca soralifera
Catillaria aphana
Catillaria subviridis
Cladonia mitis
Cladonia peziziformis
Collema latzelii
Collemopsidium arenisedum
Collemopsidium elegans
Collemopsidium ostrearum
Collemopsidium pelvetiae
Collemopsidium subarenisedum
Collemopsidium sublitorale
Eiglera flavida
Enterographa hutchinsiae
Fellhaneropsis vezdae
Halecania spodomela
Hypotrachyna endochlora
Hypotrachyna taylorensis
Lecania atrynoides
Lecania nylanderiana
Lecanographa grumulosa
Lecanora agardhiana
Lecanora cenisia
Lecanora straminea
Lecidea lithophila
Lecidea phaeops
Lempholemma cladodes
Leptogium plicatile
Megalaria pulverea
Megalospora tuberculosa
Megaspora verrucosa
Menegazzia terebrata
Micarea incrassata
Micarea ternaria
Miriquidica leucophaea
Nephroma parile
Ochrolechia frigida
Opegrapha areniseda
Parmotrema robustum
Placidium pilosellum
Polyblastia cupularis
Porina curnowii
Pseudocyphellaria crocata
Pseudocyphellaria intricata
Pyrenula dermatodes
Ramalina chondrina
Rhizocarpon cinereovirens
Rhizocarpon polycarpum
Rimularia gyrizans
Rinodina aspersa
Rinodina bischoffii
Rinodina oxydata
Rinodina orculariopsis
Rinodina teichophila
Sarcogyne clavus
Sarcosagium campestre
Solenopsora liparina
Solorina spongiosa
Squamarina lentigera
Staurothele caesia
Steinia geophana
Stereocaulon condensatum
Syncesia myrticola
Thamnolia vermicularis
Thelidium incavatum
Thelidium papulare
Thrombium epigaeum
Tremolecia atrata
Tylothallia biformigera
Umbilicaria grisea
Umbilicaria spodochroa
Vahliella leucophaea
Verrucaria aethiobola
Verrucaria degelii
Verrucaria sandstedei
Vezdaea aestivalis
Vezdaea leprosa
Xanthoparmelia tinctina

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BARON G. *Understanding Lichens* (1999) The Richmond Publishing Co. Ltd.

This book covers most areas of lichenology including lichen communities, uses, botanical classification and has an extensive bibliography.

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Generic and species keys, distribution maps, many line drawings and over 1,000 species described and illustrated with colour photographs.

DOBSON Frank S. *A field key to common churchyard lichens and the commoner species elsewhere on stone, fences and gates.* (3rd ed. 2009) Frank S. Dobson

This book contains colour plates to over 50 lichens and field keys to nearly 190 species of lichen that occur in churchyards.

DOBSON Frank S. *A Field Guide to Lichens on Trees*. (2013) Frank S. Dobson. 57 Acacia Grove, New Malden, Surrey, KT3 3BU.

It contains a larger selection of tree lichens and this guide will help you identify them. It includes 128 colour photographs and keys to over 500 species.

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A very readable account that covers many aspects of the biology of lichens. It is especially strong on lichen habitats.

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A popular guide to lichen biology, biodiversity, ecological and economic importance etc. Contains 150 colour photographs and diagrams.

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The Lichens of Great Britain and Ireland (2009). The British Lichen Society.

The definitive flora that includes all the British and Irish species

WOLSELEY P., JAMES P., & ALEXANDER D. *A key to lichens on twigs* (2002) The Field Studies Council.

A folded card illustrating, in colour, 60 species of lichen occuring on twigs. It also includes a key to the species. A useful guide to lichens on trees on the seashore.

The British Lichen Society

The British Lichen Society is the main lichenological organisation in Britain and has many overseas members. Membership is open to all and it particularly welcomes newcomers to lichenology. Information regarding the Society and membership may be obtained from: The Secretary, The British Lichen Society, c/o The Natural History Museum, Cromwell Road, London SW7 5BD.

The BLS website is at http://www.britishlichensociety.org.uk. This website contains information about the Society including a prospectus and a printable application form and much other lichen information including links to other sites that, between them, cover most aspects of lichenology catering for all levels of knowledge.