

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.

Acknowledgements:

Many people have assisted in the preparation of these keys. In particular: Ann Allen, Ishpi Blatchley, Paul Cannon, Robin Crump, David Hawksworth, Barbara Hilton, Peter Lambley, Janet Simkin and the Publications Officer of the Field Studies Council Rebecca Farley. All these and many others have made valuable comments to improve the keys. Many members of the BLS have also tested the keys extensively and suggestions from all these people have been incorporated into this book.

© Frank S. Dobson 2010

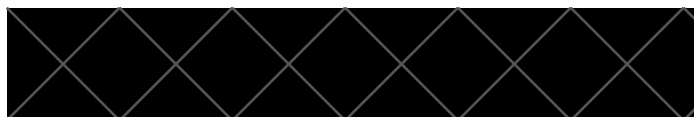
updated edition 2014

All rights reserved.

No part of the publication may be reproduced in any form
or by any means, electronically, mechanically, by
photocopying, recording or otherwise, without the prior
permission of the copyright owners.

ISBN 978 0 9542324 5 0

Published by Frank S. Dobson



Printed by

Intype Libra Ltd. Wimbledon SW19 4HE

Cover photograph: Gammon Head. S. Devon

Contents

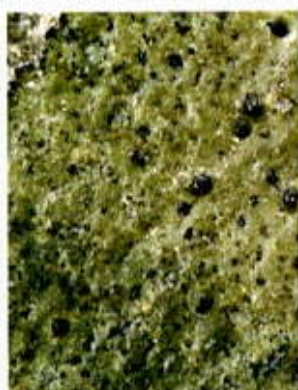
	Page
Millimetre scale	4
Photographic plates	5
Introduction and how to use the keys	11
Tables for identification using method 2	26
Synopsis to the keys using method 3	30
Key A: Fruticose lichens	32
Key B: Foliose lichens	35
Key C: Squamulose lichens	40
Key D: Crustose Lichens	42
SECTION 1: Occurs around or below high water mark	42
SECTION 2: With perithecia or lirellate apothecia	42
SECTION 3: With non lirellate apothecia (disc-like)	
or sterile	45
3(a) Placodioid	45
3(b) Thallus yellow, yellow-green or orange	46
3(c) Sorediate, isidiate or a granular crust	48
3(d) Not sorediate isidiate or a granular crust but may	
be absent or consist of scattered granules	51
3(d/i) Any part C+ orange, red or yellow	51
3(d/ii) Cortex, medulla, soredia or fruits	
K+ yellow, orange, red crimson or violet	53
3(d/iii) All parts K-, C-	56
Key E: Leprose or powdery lichens	61
Key F: Lichens on limestone, concrete and mortar	64
Key G: Lichens of soil, mosses and plant debris	74
Key H: Lichens on sawn wood	80
Notes on some rare species	88
Glossary	93
Lists of the species included in the keys	95
Bibliography	100



Plate 1. Lichens of the lower to middle zones



1. *Verrucaria mucosa* x2.



2. *Verrucaria halizoa* x4.



3. *Verrucaria striatula* x3.



4. *Collemopsisidium foveolatum* x6.



5. *Lichina pygmaea* x3.



6. *Verrucaria maura* x5.



7. *Lichina confinis* x3.



8. *Caloplaca marina* x4.



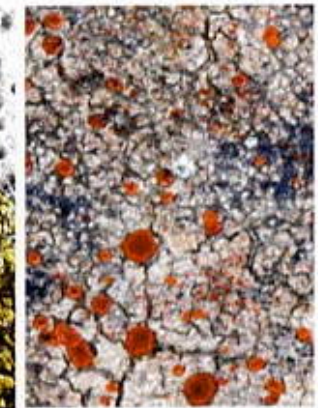
9. *Caloplaca microthallina* x6.



10. *Caloplaca thallincola* x3.



11. *Caloplaca citrina* x4.



12. *Caloplaca ceracea* x3.



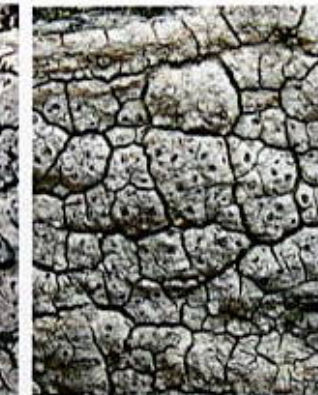
13. *Caloplaca verruculifera* x4.



14. *Caloplaca littorea* x3.



15. *Aspicilia caesiocinerea* x3.



16. *Diploschistes caesioplumbeus* x4.

Plate 2. Crustose lichens of the middle zones



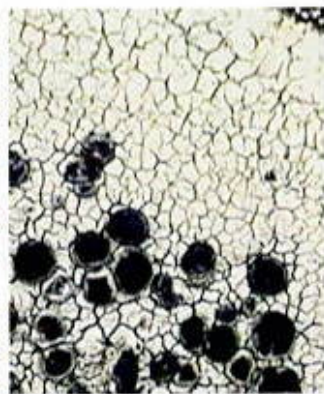
17. *Aspicilia leproscens* x4.



18. *Halecania ralfsii* x4.



19. *Buellia stellulata* x5.



20. *Buellia subdisciformis* x4.



21. *Lecanora actophila* x4.



22. *Lecanora helicopis* x4.



23. *Lecanora fugiens* x4.



24. *Lecidella asema* x4.



25. *Lecania aipospila* x4.



26. *Lecanora poliophaea* x4.



27. *Lecanora rupicola* x5.



28. *Lecanora gangaleoides* x4.



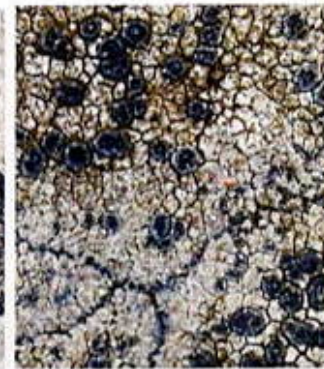
29. *Pertusaria corallina* x4.



30. *Pertusaria pseudocorallina* x4.

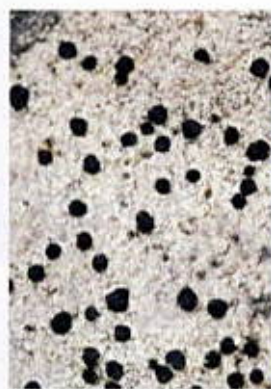


31. *Rhizocarpon richardii* x3.



32. *Rhizocarpon reductum* x4.

Plate 3. Crustose lichens of the middle to upper zones



33. *Catillaria chalybeia* x3.



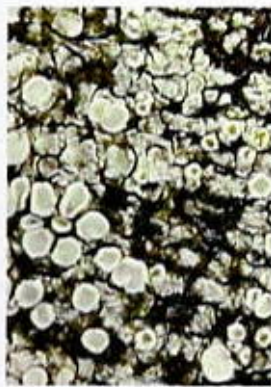
34. *Candelariella vitellina* x3.



35. *Lecanora sulphurea* x4.



36. *Rhizocarpon geographicum* x4.



37. *Lecanora polytropa* x4.



38. *Lecidella scabra* x4.



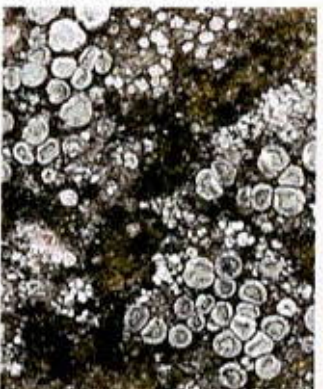
39. *Rinodina oleae* x3.



40. *Verrucaria fuscontigrescens* x3.



41. *Toninia aromatica* x3.



42. *Lecanora dispersa* x5.



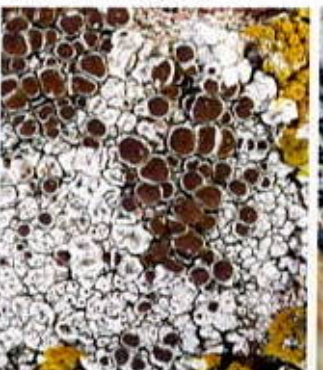
43. *Ochrolechia parella* x3.



44. *Fuscidia cyathoides* x3.



45. *Lecidea grisella* x3.



46. *Lecanora campestris* x3.



47. *Opegrapha calcarea* x3.



48. *Caloplaca maritima* x3.

Plate 4. Lobed, foliose and fruticose lichens of the middle and upper zones



49. *Lecanora muralis* x2.



50. *Physcia tenella* x4.



51. *Flavoparmelia caperata* x5.



52. *Anaptychia runcinata* x2.



53. *Ramalina siliquosa* x4.



54. *Ramalina subfarinacea* x3.



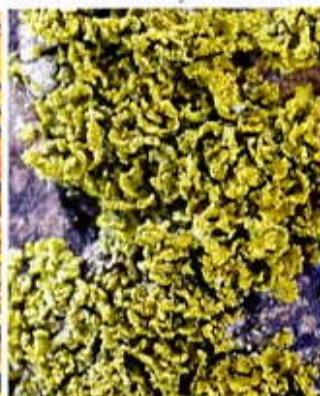
55. *Parmelia saxatilis* x4.



56. *Xanthoria parietina* x3.



57. *Xanthoria aureola* x5.



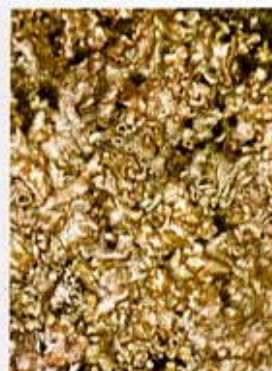
58. *Xanthoria ucrainica* x4.



59. *Xanthoparmelia loxodes* x5.



60. *Xanthoparmelia pulla* x3.



61. *Xanthoparmelia delisei* x3.



62. *Parmotrema perlatum* x3.



63. *Teloschistes flavicans* x2.



64. *Rocella phycopsis* x2.

Plate 5. Lichens of calcareous rocks



65. *Caloplaca cirrochroa* x5.



66. *Caloplaca flavescent* x4.



67. *Caloplaca aurantia* x4.



68. *Squamarina cartilaginea* x2.



69. *Dermatocarpon minutum* x3.



70. *Collema auriforme* x4.



71. *Collema tenax* x3.



72. *Cladonia foliacea* x3.



73. *Aspicilia calcarea* x3.



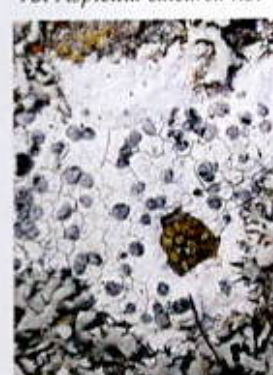
74. *Phaeophyscia orbicularis* x3.



75. *Solenopsora candicans* x3.



76. *Protoblastenia rupestris* x4.



77. *Diplotomma alboatrum* x3.



78. *Romjulardia lurida* x3.



79. *Physcia tribacia* x3.



80. *Verrucaria baldensis* x4.

Plate 6. Coastal lichens



81. *Porpidia cinereoatra* x5.



82. *Protoparmelia badia* x4.



83. *Rinodina beccariana* x5.



84. *Usnea flammea* x4.



85. *Hypogymnia physodes* x4.



86. *Hypotrachyna revoluta* x4.



87. *Solenopsora vulturienensis* x4.



88. *Verrucaria prominula* x4.



89. *Leprocaulon microscopicum* x4.



90. *Cladonia cervicornis* x4.



91. *Trapeliopsis wallrothii* x4.



92. *Cladonia floerkeana* x4.



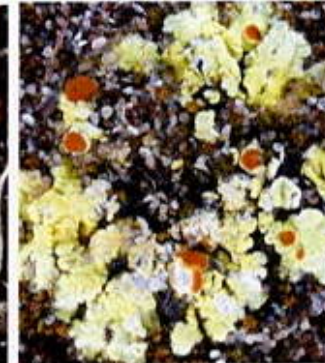
93. *Toninia sedifolia* x4.



94. *Cladonia pyxidata* x4.



95. *Cladonia furcata* x6.

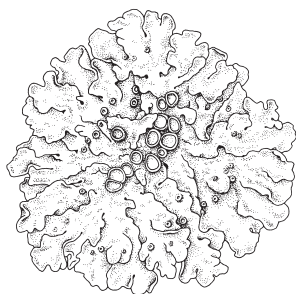


96. *Fulgensia fulgens* x4.

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.

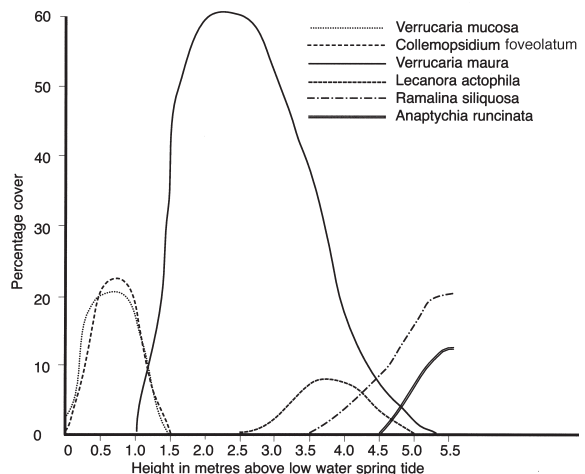
Only a limited number of species of algae can survive being incorporated into a lichen. Conversely, every lichen species consists of a different fungus and it is the name of this fungus that is used for the whole lichen. None of the fungi treated here are capable of being free-living. The fruiting bodies 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.

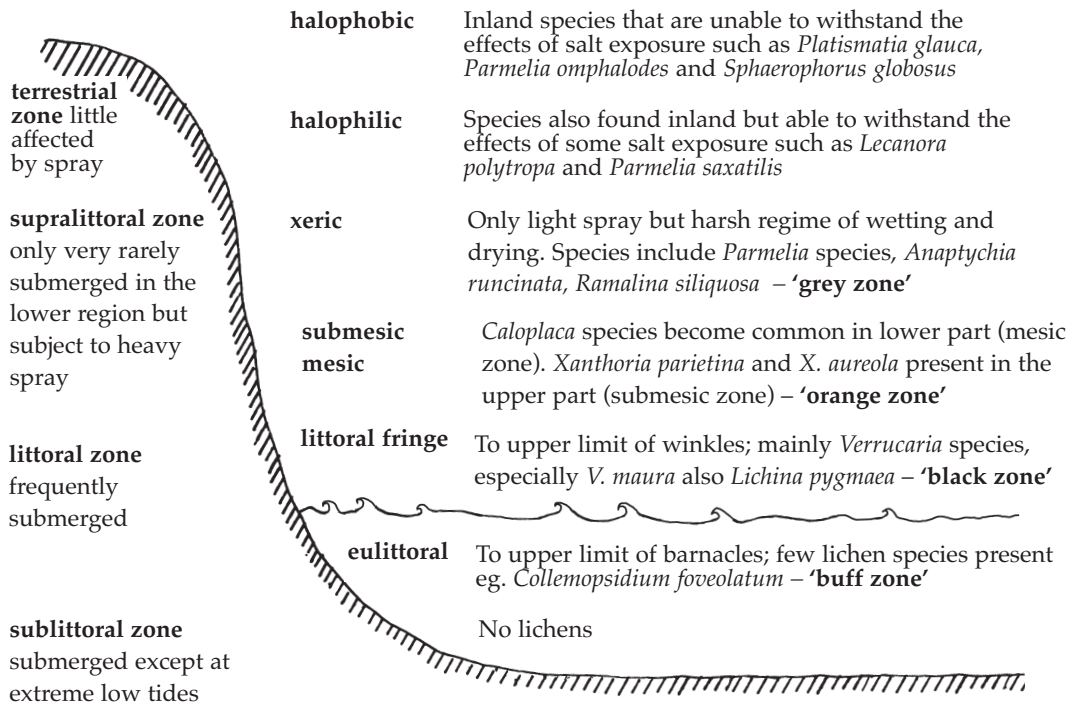
The seashore environment (Illus. 3)

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 Diagrammatic representation of the main lichen zonation occurring 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.

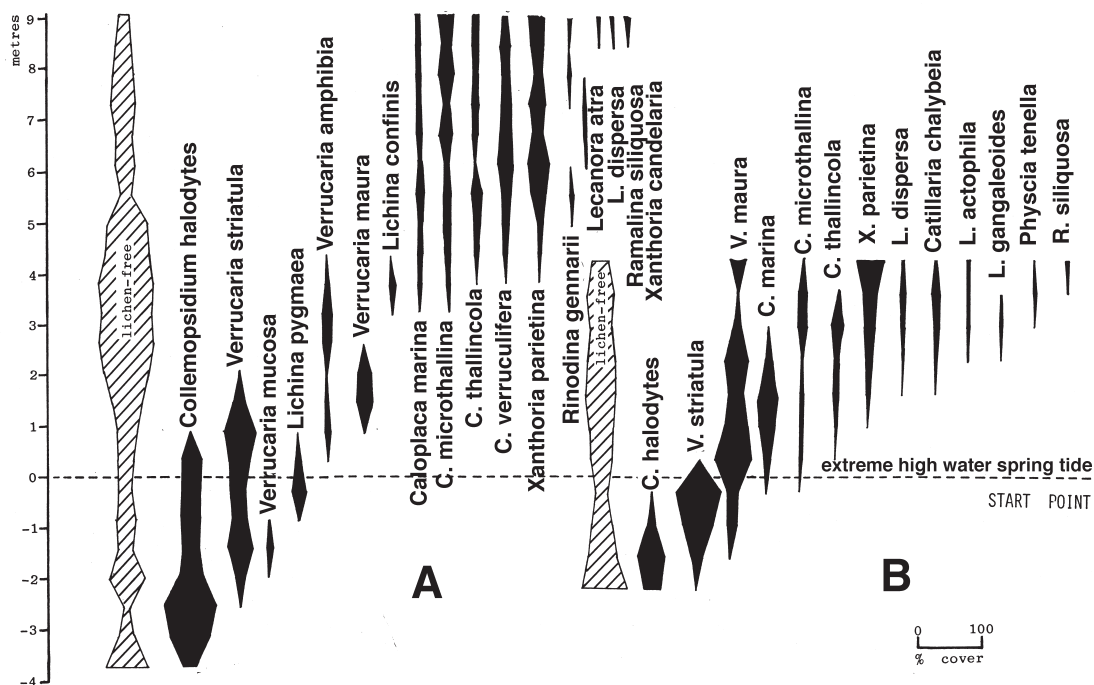
Littoral zone

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 *Collembosidium 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. helicopsis* 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 leproscens*. 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 progressively 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. helicopsis* 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 British Isles. These species include members of the genera *Roccella* and *Teloschistes*. Species from genera such as *Dirina* and *Roccellographa* 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 noticeable 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 *Xanthoria* 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*.

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 helicopsis* 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 helicopsis*. However, damp areas and mortar on walls often provide sites for *Collema* and *Leptogium* species. On limestone the coastal species



Alan Orange

Illus. 5 *Physcia adscendens* x12

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 occurred 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 occurred 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 footwear 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

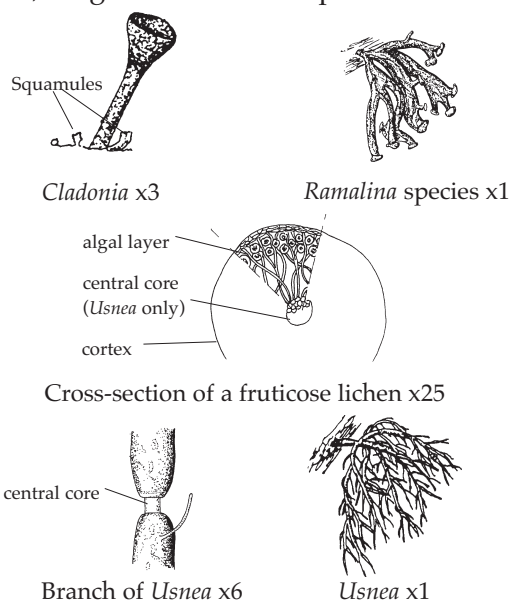
the result. Beware of air bubbles under the surface of the lemon juice. Unlike the reaction with lemon juice these will not grow in size or number. Plate 6 gives a selection of coastal lichens that occur out of the reach of the heavy spray such as on the top of cliffs or rocks near to the sea.

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.



Examples of fruticose lichens

The columns in the table are arranged as follows.

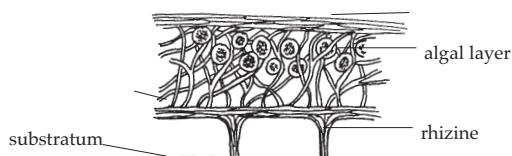
(1) Growth form: (on left edge of table)

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



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).



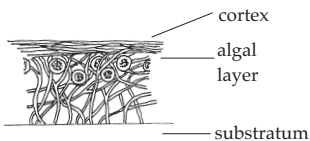
Cross-section of a foliose lichen x20

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.



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.



Leprose lichen viewed from above x 10



Cross-section of a leprose lichen x 25

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.

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:

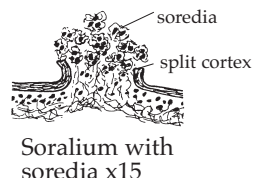
Calc: Indicates a species that normally grows on a calcareous substratum such as limestone. These fizz slightly when lemon juice is applied. It is easier to see these bubbles forming and swelling by looking at them through a hand lens.

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.



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.

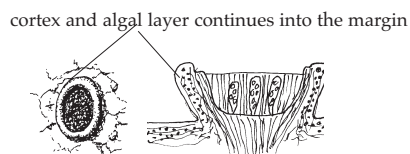


(6) Fruits and fruit colour:

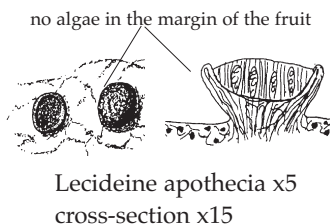
Both the colour and the type of fruiting body are important in the identification of lichens. The types are described below:

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:

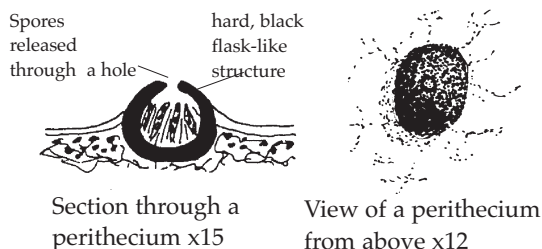
Lecanorine (Lecan. in the table), in these fruits the cortex and algal layer continue up into the margin of the fruit (the margin is like the pastry edge of a 'jam tart'). This means that the margin of the fruit is more or less the same colour as the surface of the lichen (e.g. Plate 1 Figs. 8-12).



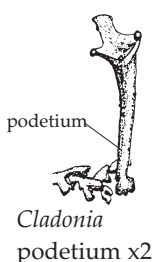
Lecideine (Lecid. in the table), in these fruits the cortex and algal layer do not extend into the margin of the fruit. The margin is therefore a different colour from the surface of the lichen (e.g. Plate 2 Fig. 24 and 31).



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).



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).



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.

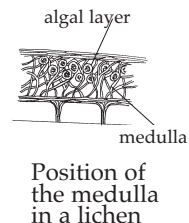
Chemical spot tests

'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.



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. Supplementary 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 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.

References

- Brown D.H. (1972) The effects of Kuwait oil and solvent emulsifier on the metabolism of the marine lichen *Lichina pygmaea*. *Marine Biology* **12**: 309-314.
- Fletcher A. (1973) The ecology of maritime (littoral and supralittoral) lichens on rocky shores of Anglesey. *The Lichenologist* **5**: 368-422.
- Fletcher A. (1975) Key for the identification of British marine and maritime lichens I. Siliceous rocky shore species. *The Lichenologist* **7**: 1-52.
- Fletcher A. (1975) Key for the identification of British marine and maritime lichens II. Calcareous and terricolous species. *The Lichenologist* **7**: 73-115. Academic Press.
- Fletcher A. (1980) Key for the identification of British marine and maritime lichens of rocky shores: their ecology, physiology, and biological interactions. In: Price J.H. et al. (a) *The shore environment. Vol 2. Ecosystems*. pp. 789-842. Academic Press.
- Fletcher A. & Crump R. (2000) Monitoring maritime habitats. In: Nimis P.L. et al. (editors) *Monitoring with lichens – monitoring lichens*, pp. 255-265. Kluwer Ac. Pub.
- Gilbert O. (2000) *Lichens* pp. 230–252. New Naturalist series. HarperCollins.
- Hale A. (1997) *Teloschistes flavicans* at Manorbier S. Pembroke. Countryside Council for Wales.
- Hawksworth D.L. (1980) Lichens of the South Devon coastal schists. *Field Studies* **5**: 195-227. Field Studies Council
- James P.W., Hawksworth D.L. & Rose F. (1977) Lichen communities in the British Isles: a preliminary conspectus. In: Seaward, M.R.D (ed.) *Lichen Ecology* 384-387. Academic Press.
- Lewis J.R. (1964) *The ecology of rocky shores*. London. English University Press.
- Richardson D. (1975) *The Vanishing Lichens*. David and Charles.
- U. S. Environmental Protection Agency (1989) *Bioremediation of Exxon Valdez oil spill*. EPA press release of July 31, 1989.
- Wentworth C.K. (1922) A scale of grade and class terms for clastic sediments. *J. Geology* **30**, pp 377-392.
- Wolseley P.A. et al. (1996) Lichens of Skomer Island, West Wales. *The Lichenologist* **28**: 543-570.

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

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

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

	Name	Colour	Zone	Soredia	Fruits	Notes
CRUSTOSE	<i>Halecania ralfsii</i>	Bluish grey to brown	Mesic	None	Lecan. Dark brown	Areoles domed and worm-like. Often with <i>L. actophila</i> . Ph. 18.
	<i>Lecania aiopospila</i>	Pale brown to purplish	Xeric to halophobic	None but granular	Lecan. Red-brown	Often with granular to isidiate surface to thallus. Ph. 25.
	<i>Diploschistes caesioplumbeus</i>	White to grey	Xeric	None	Lecan. Black	On well-lit, nutrient enriched rocks. Ph. 16.
	<i>Diplotomma alboattrum</i>	White	Terr. Calc.	None	Lecan./lecid. Black	If it is found near the coast often <i>D. chlorophaeum</i> . Ph. 77.
	<i>Porpidia cinereoatra</i>	White to grey	Halophobic to terr.	None	Lecan. Black	Large often pruinose fruits that become domed. Ph. 81.
	<i>Pertusaria corallina</i>	White to grey	Terr.	Isidia	Several in a wart	Grey, finger-like isidia may cover the thallus. Ph. 29.
	<i>Pertusaria pseudocorallina</i>	Creamy grey	Terr.	Isidia	Several in a wart	Stout, finger-like isidia are brown tipped. Ph. 30.
	<i>Ochrolechia parella</i>	White to cream	Xeric to terr.	None	Lecan. Pink	Fruits to 2mm diam. Sugar-like grains on fruit disc. Ph. 43.
	<i>Lecanora gangaleoides</i>	White/pale grey	Xeric to terr.	None	Lecan. Black	Often with white margin. Lichen lumpy. Ph. 28.
	<i>Rinodina beccariana</i>	Pale grey to greenish	Xeric to halophobic	None	Lecan. Black	On sheltered rocks and soil. Fruit magins contorted. Ph. 83.
	<i>Catillaria chalybeia</i>	Grey, brown to near black	Xeric to terr.	None	Lecid. Black	Very variable, mosaic forming. Domed fruits upto 0.4mm. Ph.33.
	<i>Lecanora campestris</i>	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.
	<i>Lecanora dispersa</i>	Absent or grey	Xeric to terr.	None	Lecan. Brown	Fruits scattered. Disc often greenish, pruinose. Ph. 42.
	<i>Trapeliopsis wallrothii</i>	White to grey	Terr. Soil	Isidia-like warts	Lecan. Brown	On sheltered soil, often under rocks and earth banks. Ph. 91.
	<i>Buellia stellulata</i>	Grey to brownish	Terr.	None	Lecid. Black	On well-lit rocks. Fruits numerous, to 0.4 mm diam. Ph. 19.
	<i>Buellia subdisciformis</i>	White to pale grey	Xeric	None	Lecid. Black	Fruits may appear lecanorine and up to 1.5 mm. diam. Ph. 20.
	<i>Lecanora actophila</i>	White to grey-green	Mesic	None	Lecan. Green-black	On sunny rocks. Fruit to 1mm diam. Ph. 21.
	<i>Lecanora helicopsis</i>	Grey to brown-grey	Mesic	None	Lecan. Dark brown	Occurs on slightly more shaded sites than <i>L. actophila</i> Ph. 22.
	<i>Lecanora fugiens</i>	Cream to tan	Mesic to xeric	None	Lecan. Yellow-brown	On well-lit rocks and often in cracks. Ph. 23.
	<i>Lecanora rupicola</i>	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	<i>Caloplaca citrina</i>	Yellow to orange	Xeric to terr.	Granular soredia	Lecan. Orange	Becomes covered in soredia. Frequently fertile. Ph. 11.
	<i>Candelariella vitellina</i>	Yellow, orange	Xeric to terr.	None	Lecan. Yellow	Thallus of clumped granules like the top of a cauliflower. Ph. 34.
	<i>Aspicilia leproscens</i>	Bluish grey	Xeric	None but granular	Lecan. Black	Granular to isidiate. On nutrient enriched sites. Ph. 17.
	<i>Lecidella scabra</i>	Green to grey	Terr.	Soredia	Lecid. Black	Rarely fertile. Soredia grey-green that become yellow-green when scratched. Ph. 38.
	<i>Leprocaulon microscopicum</i>	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) 7 *or* almost without structure and powdery (Fig. 6)



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

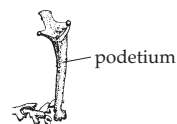


Fig. 2. *Cladonia* showing fruticose podetium x2



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

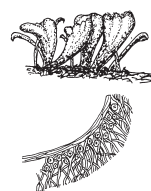


Fig. 4. Squamules x4 (top).
Section through squamule showing lack of lower cortex x25 (centre)
Squamules on *Agonimia tristicula* x10 (bottom)

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

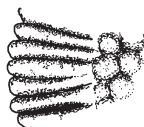


Fig. 7. Placodioid lichens
Above: Edge of wide-lobed placodioid lichen (*Diploicia canescens* x4)

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 fragiliscens***
 - 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

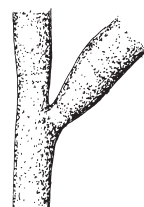


Fig. 11. Constriction at branch joint x7



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



Fig. 12a. *Bryoria fuscescens* x3



Fig. 13. Soredia on *Roccella phycopsis* x3

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 symphyrcarpia**
 – 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

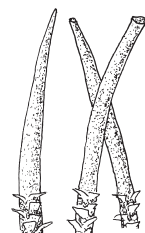


Fig. 23. *Cladonia coniocraea* x3



Fig. 24. *Cladonia rangiformis* x3



Fig. 25. *Baeomyces rufus* x4

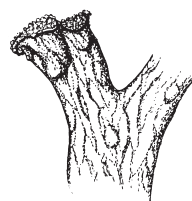


Fig. 26. Lobe tip of *Ramalina canariensis* x5

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 lacera* 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

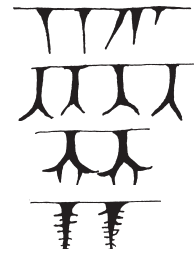


Fig. 29. Some types of rhizines

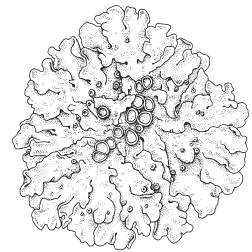


Fig. 30. *Xanthoria parietina* x1



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 flattened 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

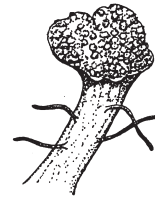


Fig. 33. Lobe tip of
Physcia tenella x6



Fig. 34. Globose isidia x15



Fig. 35. Flattened isidia
x 15



Fig. 36. Coralloid isidia x10

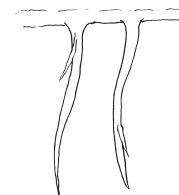


Fig. 37. Rhizines of
Peltigera praetextata x5

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 surface 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)

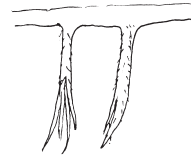


Fig. 38. Rhizine of *Peltigera didactyla* x5



Fig. 39. Vertical fruits x 4



Fig. 40. Bullate thallus showing bulges or depressions x5

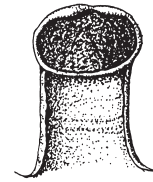


Fig. 41. Horizontal fruits x5

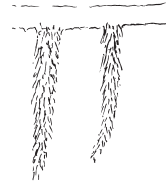


Fig. 42. Rhizines of *Peltigera membranacea* x5



Fig. 43. Rhizines of *Peltigera canina* x5

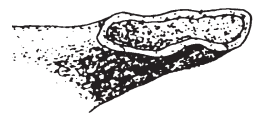


Fig. 44. Hollow lobe of *Hypogymnia*

- 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

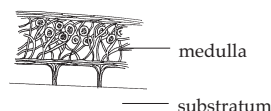


Fig. 49. Position of medulla



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 dots 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 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. glabrata)

- 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**

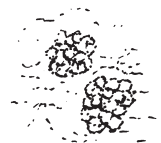


Fig. 53. *Xanthoparmelia loxodes* isidia x8

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**
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
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 symphyrcarpia**
8. K+ purple. Thallus yellow to bright orange 9
 - K+ red. Thallus cream-brown to yellow-green **Acarospora smaragdula**
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** 12
 - No black hypothallus.
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)

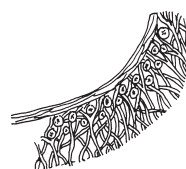


Fig. 54. Cross section of squamule x10



Fig. 55. *Cladonia* squamules x5



Fig. 55a. *Hypocenomyce scalaris* squamules x5

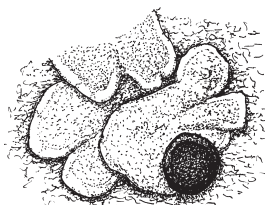


Fig. 55b. *Bilimbia lobulata* x8

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 **Placidopsis 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

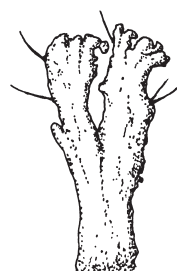


Fig. 55c. *Cladonia convoluta* x3

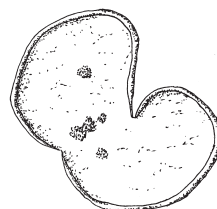


Fig. 55d. Squamule of *Normandina pulchella* x15

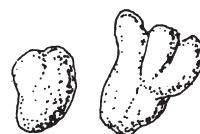


Fig. 56. Squamules of *Agonimia tristicula* x30

28. Squamules angular and interlocking. Dark red-brown
Acarospora impressula 29
 – 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

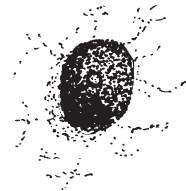


Fig. 57. Perithecium from above x10

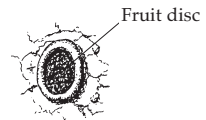


Fig. 58. Fruit disc in centre of fruit x5

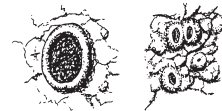


Fig. 59. Types of fruits (apothecia)



Fig.60a. Sections through superficial perithecia x12

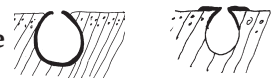


Fig. 60b. Perithecia in pits or immersed in thallus x12



Fig. 61. Section through *V. prominula* x12

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 $\pm$ immersed in thallus 13
5. Perithecia with depressed tips (Fig. 61) 6
- Perithecia with flat or rounded tips 7
6. Occurs in mesic-supralittoral
 - Verrucaria 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. $\pm$ immersed in the thallus (spores 28–40 μ m long) **Verrucaria viridula**
- Thallus mid-brown to black. Edge of lichen black. Perithecia to 0.6 mm diam. superficial to fully immersed in the thallus 15
15. Perithecia to half-immersed in the thallus (spores 17–25 μ m long) **Verrucaria fusconigrescens** (Ph. 40)
- Perithecia more than half immersed (Fig. 60b) 16
16. Thallus brown to olive-green, sometimes sorediate. [Terrestrial species]. (Spores 25–37 μ m 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 μ m long) **Verrucaria nigrescens**
- Thallus black. Perithecia over 0.4 mm diam. Littoral fringe to mesic. (spores less than 20 μ m long or thallus pale colour) 18

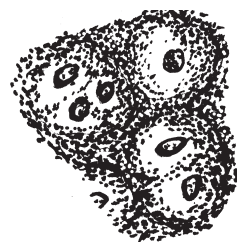


Fig. 62. Warted apothecia in *Petrusaria* x6



Fig. 63. *Opegrapha* species x6

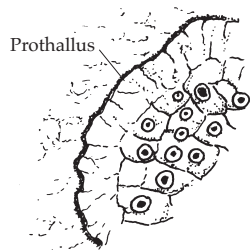


Fig. 64 Position of prothallus on the edge on thallus x2

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/depressed **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 strongly 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
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
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)

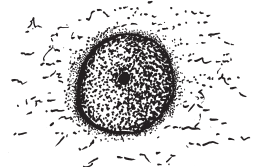


Fig. 65. Perithecium of *Thelidium decipiens* x10



Fig. 65a. *Opegrapha rupestris* x6

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**

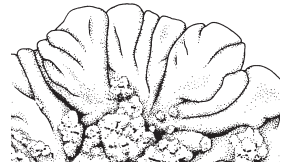


Fig. 66. Flattened and finger-like, rounded placodioid thallii x5

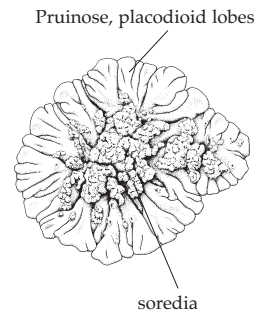


Fig. 67. *Diploicia canescens* x1

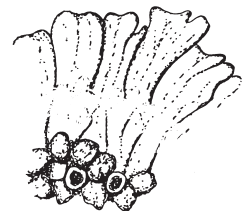


Fig. 68. *Caloplaca aurantia* x5

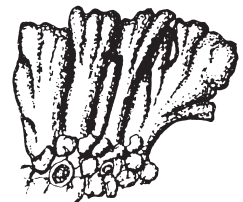


Fig. 69. *Caloplaca flavescens* x5



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)
Thallus other colours including fawn and brown or only the fruits are orange **Section 3. Subsection 3(d/iii) (Page 56)**
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**
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**
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**

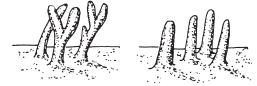


Fig. 71. Types of isidia x10



Fig. 72. Some possible positions of soredia x5

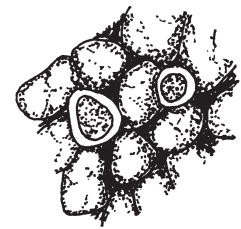


Fig. 73. *Caloplaca ruderum* x5

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)

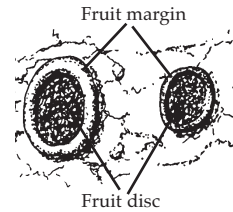


Fig. 74. Margin and disc
of fruit (apothecium) x5
left: lecanorine
right: lecideine



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

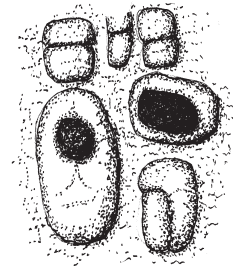


Fig 75a. *Cyphelium notarisii* x6

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)

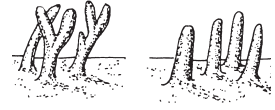


Fig. 76. Isidia x10

Key D – Section 3

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

1. Sorediate, isidiate (Fig. 76) or a granular 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

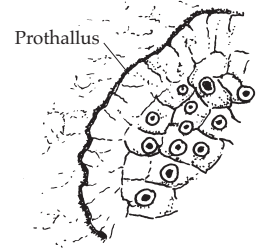


Fig. 77. Position of prothallus on the edge on thallus x2

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

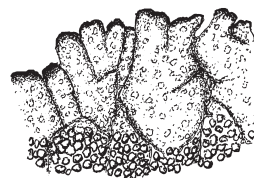


Fig. 77a. Part of the thallus of *Caloplaca teicholyta* x6

30. Thallus scratches orange [sheltered overhangs on acid rock]
 Roccellographa (Peterjamesia) soredata
 – 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**
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 schaeferi**
 – 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



Fig. 78. Peg-like, coralloid isidia x20

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 scopulicola**
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 leproscens** (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**

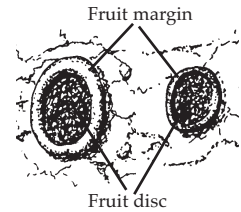


Fig. 79. Margin and disc of fruit (apothecium) x5
 left: lecanorine
 right: lecideine

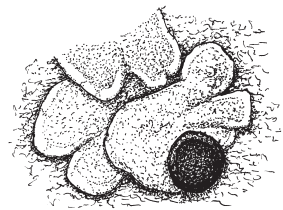


Fig. 79a. *Bilimbia lobulata* x8



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

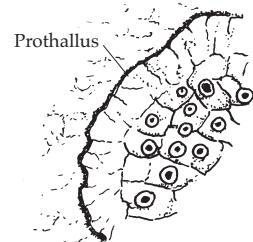


Fig. 81. Position of prothallus on the edge on thallus x2

Key D – Section 3

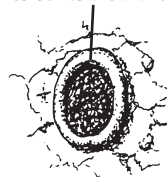
Subsection 3(d). Thallus not sorediate, isidiate or a granular crust but may be absent or consist of scattered granules.

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 atrocinnerea**
 – 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

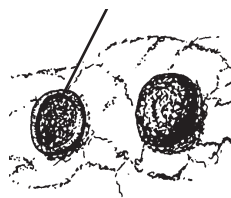


Fig. 82. a and b.
Types of fruit
margins x5
a: Lecanorine
b: Lecideine

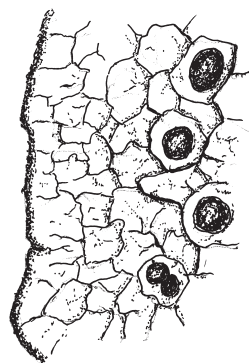


Fig. 83. *Lecidea grisella* x4

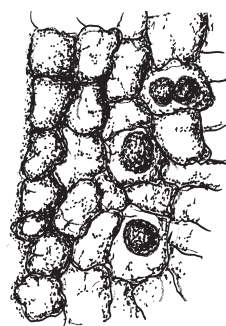


Fig. 84. *Lecidea fuscoatra* x4

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

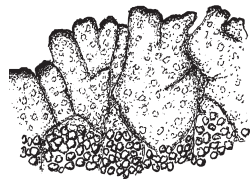


Fig.85. *Caloplaca teicholyta* x3

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)

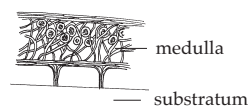
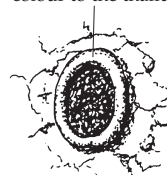


Fig. 86. Position of medulla

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

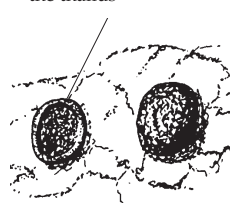


Fig. 87. a and b.
Types of fruit margins x5
a: Lecanorine
b: Lecideine

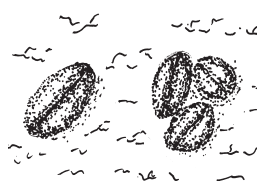


Fig. 88. *Lithographa tesserata* x6

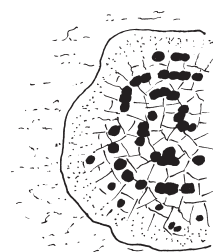


Fig. 89. *Rhizocarpon petraeum* x3

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 chiodectionoides**
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

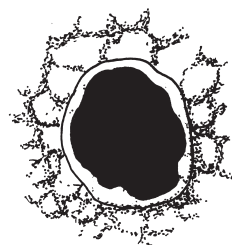


Fig. 91. *Tephromela atra* x10

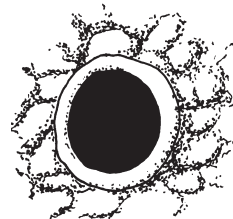


Fig. 92. *Lecanora gangaleoides* x10

Look at face of cut section to determine colour



orange layer often occurs at base of thallus in *Lecanora gangaleoides*

Fig. 92a. Section through a fruit of *Lecanora gangaleoides*/*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

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 schaeferi**
 – 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

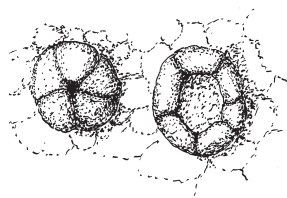
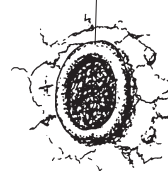


Fig. 92b. *Gyalecta jenensis* x10

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

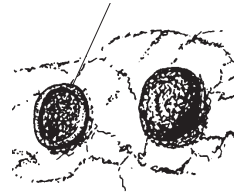


Fig. 93. Types of
fruit margins x5
a: Lecanorine
b: Lecideine

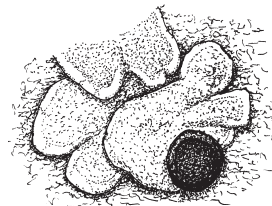


Fig. 93a. *Bilimba lobulata*
x8

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
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**
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



Fig. 93b. *Acarospora nitrophila* x8

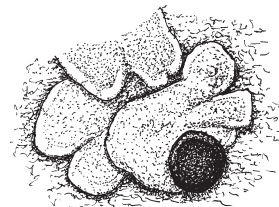


Fig. 93a. (repeat). *Bilimbia lobulata* x8

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 helicopsis**
 – 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**
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
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**



Fig. 94. *Aspicilia calcarea* x6



Fig. 95. *Aspicilia contorta* x6

70. In shaded underhangs [fruits very pruinose] 71
 – More exposed situations. Pruinoso 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 stigmatia** (pl 3)
 – Fruits red-black or red-brown when wet [calcareous rocks] 74
74. On hard acid rocks and walls **Sacogyne privigna** (rare) 75
 – On calcareous rocks
75. Disc grey-violet pruinose. (100 or more spores per ascus) **Sarcogyne regularis** 76
 – Disc not pruinose (8 spores per ascus)
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 1–2 μ m) **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. Pruinoso or not 80
 – On calcareous rocks and mortar. Fruits very pruinose (spores 3-septate becoming muriform) **Diplozomma albostrum**
 – (if spores do not become muriform, **Diplozomma 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**

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
 – On acid rocks and soil

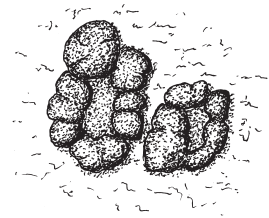


Fig. 95a. *Polysporina simplex* fruits x10



Fig 96. *Porpidia* fruits x5

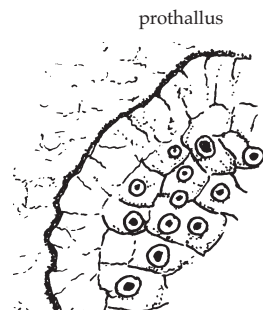


Fig. 97. Position of prothallus on the margin of a lichen

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 distinctly lobed. Granules lighter towards margin of thallus giving a zoned appearance **Lepraria caesiaalba**
 – 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 **Lecanora compallens**
except at thallus margin
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



rhizines on lower surface

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)

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– **Rocella phycopsis** (Ph. 64) (rare).
 (If lobes rather flattened. Cortex C–, soredia C+ red)
Rocella 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
4. Grows from single basal holdfast (Fig. 103) **Ramalina farinacea**
 – Grows from a multiple base, forming swards
Ramalina subfarinacea (Ph. 54)
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



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



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



Fig. 104. *Ramalina canariensis* x4

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**

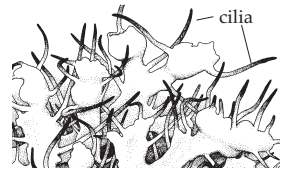


Fig. 105. *Physcia tenella* x1



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

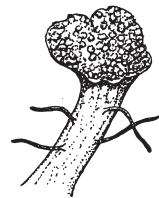


Fig. 107. Lobe tip of *Physcia tenella* x6



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

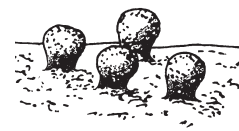


Fig. 108. Globose isidia x15



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

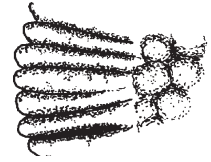


Fig. 111. Part of the edge of a crustose, placodioid lichen (*Caloplaca* sp.) x4

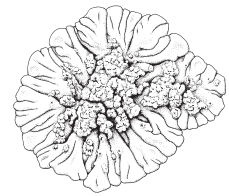


Fig. 112. *Diploicia canescens* x1



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



Fig. 114. *Caloplaca aurantia* x5

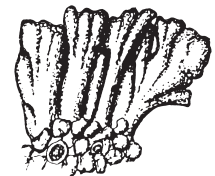


Fig. 115. *Caloplaca flavescens* x5



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

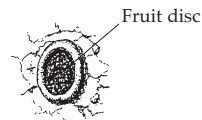


Fig. 118. Fruit disc in centre of fruit x5

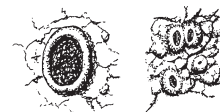


Fig. 119. Types of fruits (apothecia)



Fig. 120. Perithecium 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 fuscillum**
(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-green 53
53. Thallus green to brown, widely cracked. Areoles to 0.4 mm wide **Verrucaria viridula**
 – 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
56. Thallus pink-grey to brown-grey (spores 3-septate) **Porina linearis** 57
 – Thallus white to pale grey or absent
57. Perithecia leaving empty pits when old **Verrucaria muralis**
 – Perithecia mostly remaining in the pits when old (Fig. 122 left) **Verrucaria hochstetteri**

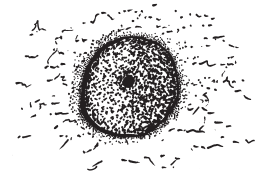


Fig. 125. *Thelidium decipiens* x15

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 slightly convex, not pruinose areoles 63
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**

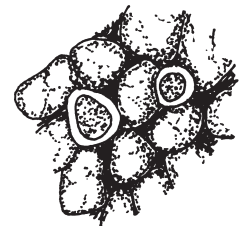


Fig. 126. *Caloplaca ruderum* x5

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 73
 – 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

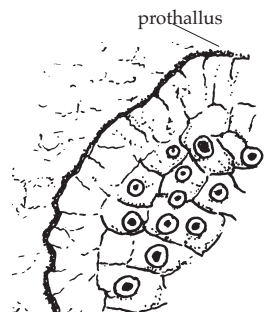


Fig. 127. Position of prothallus on the margin of a lichen

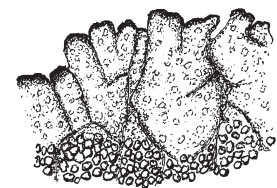


Fig. 127a. *Caloplaca teicholyta* x3

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

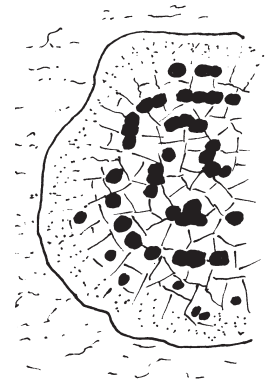


Fig. 129. *Rhizocarpon petraeum* x3

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 μ m 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**

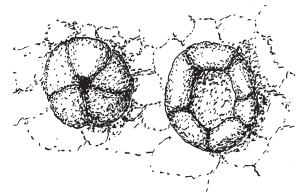


Fig. 130. *Gyalecta jenensis* x10

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 schaeferi**
 – 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**)

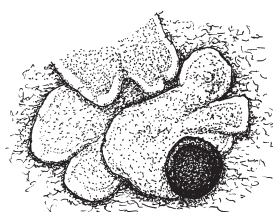


Fig. 130a. *Bilimbia lobulata*
 x8

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**)
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
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 stigmathea**
 – 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 1–2 µm) **Polysporina simplex** (Fig. 132a)
 – Fruit margin not very notched and contorted nor the disc ridged (Spores larger 8–40 x 3–8 µm) 124



Fig. 131. *Aspicilia calcarea* x6



Fig. 132. *Aspicilia contorta* x6

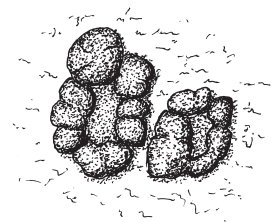


Fig. 132a. Fruits of *Polysporina simplex* x10

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**
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**

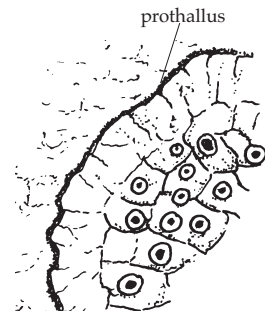


Fig. 133. Position of prothallus on the margin of a lichen

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) 9
 - No central core
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 pseudocyphellae **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)

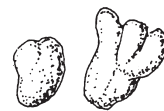


Fig. 136. Squamules on *Agonimia tristicula* x30



Fig. 137. Fruiting body of *Baeomyces rufus* x10



Fig. 138. *Usnea articulata* x1



May have rhizines on the lower surface

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

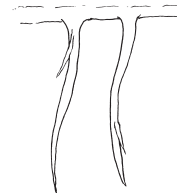


Fig. 145. Rhizines of *Peltigera praetextata* x5



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 33
- Thallus without isidia, with or without soredia 33
33. Thallus with soredia. Rhizines as Fig. 146 Peltigera didactyla 34
- 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 36
- 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 symphylicarpa
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

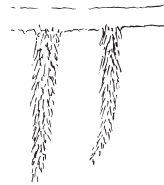


Fig. 150. Rhizines of Peltigera membranacea x5



Fig. 151. Rhizines of Peltigera canina x5



Fig. 151a. Cladonia convoluta x2



Fig. 152. Cladonia diversa x3



Fig. 153. Cladonia 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 strongly 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 soresiate **C. humilis** (Fig. 158)
 – K-. Granular soresia, corticate granules or squamules 59
59. Podetia with medium soresia **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 soresiate, not forked **C. coniocraea** (Fig. 161)
66. K+ yellow turning red. To 1 cm tall **Cladonia symphyrcarpia**
 – 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**
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)

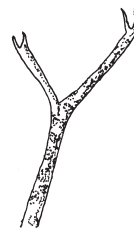


Fig. 161a. *Cladonia rangiformis* x4

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** 89
 – Thallus without eroding warts
89. Thallus brown-black to red-brown. Thallus of coralloid granules/isidia about 0.2 mm tall **Placynthiella icmalea** 90
 – Thallus grey to creamy
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

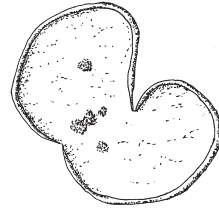


Fig. 162. squamule of *Normandina pulchella* x15

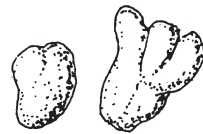


Fig. 163. squamules of *Agonimia tristicula* x30



Fig. 163a. Section through fruit of *Diploschistes* showing overarching margin x8

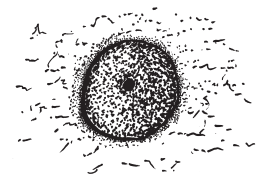


Fig. 164. Perithecium from above x10

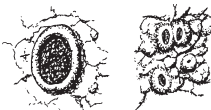


Fig. 165. Types of fruits (apothecia)

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** 5
 – Not black at basal holdfast 5



Fig. 173. constriction at branch joint x7



Fig. 171. *Usnea* with central core x4



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)

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)
– Podetia 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. *Cladonia floerkeana* x3



Fig. 178. *Cladonia subulata* x3



Fig. 179. *Cladonia fimbriata* x3



Fig. 182. *Cladonia ramulosa* x3

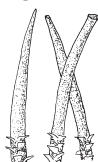


Fig. 181. *Cladonia coniocraea* x3



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

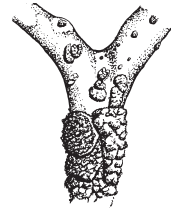


Fig. 183. Soralia on *Roccella phycopsis* x3



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

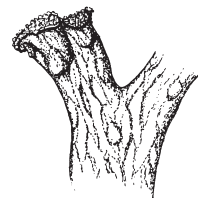


Fig. 188. Lobe tip of *Ramalina canariensis* x5



Fig. 189. Lobe tip of *Ramalina lacera* 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)
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** 39
 – Upper surface brown to near black
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
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)

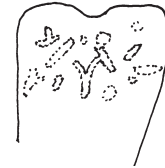


Fig. 191. Lobe tip showing white marks



Fig. 192. Coralloid isidia x10

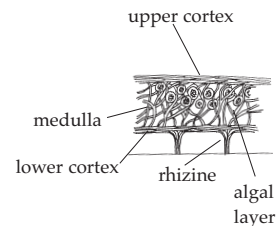


Fig. 193. Cross-section of foliose thallus x20

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 soresiate **Punctelia subrudecta**
 – Medulla C–. Lobes with pruinose tips, to 2 mm wide. Thallus grey to brown, adpressed. Marginal and/or central coarse soresia, 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 soresia on back of upper surface (Fig. 195) **Hypogymnia physodes** (Ph. 85)
 – Lobes finger-like with soresia on tips (Fig. 196)
Hypogymnia tubulosa
49. Interior of thallus (medulla, Fig. 193) C+ red 50
 – Medulla C– 51
50. Soresia somewhat darker than lobes, not in pustules. Extreme lobe tips down-turned. **Hypotrachyna revoluta** (Ph. 86)
 – Soresia 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 soresiate] **Flavoparmelia caperata** (Ph. 51)
53. No white lines or marks on lobes. Lobe tips turned up, sometimes with black 'eye lash' cilia on edges. Soresiate margins on lobes **Parmotrema perlatum** (Ph. 62)
 – White lines and dots on lobes that develop powdery soresia 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 soresia 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 soresia. Medulla K+ orange **Xanthoparmelia mougeotii**
 – Lobes overlapping to 15 mm wide. Thallus not much darker in centre. Granular soresia. 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 soresians**
57. Thallus grey to dark brown 58
 – Thallus orange 59
58. Lower surface dark. Attached by many dark, 'bottle-brush' rhizines (Fig. 197). Pruinoso 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**
- 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

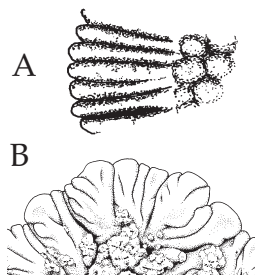


Fig. 200. Placodioid lichens
 A: Part of the edge of a crustose, placodioid lichen (*Caloplaca* sp.) x4
 B: Edge of wide lobed placodioid lichen (*Diploicia canescens* x3)

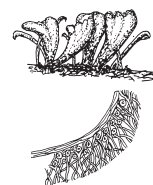


Fig. 201. Squamules x4 (above).
 Section through squamule showing lack of lower cortex (below)



Fig. 202. *Hypocenomyce scalaris* x6

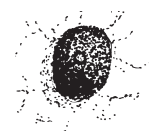


Fig. 203. Perithecium viewed from above x10



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 continuously 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

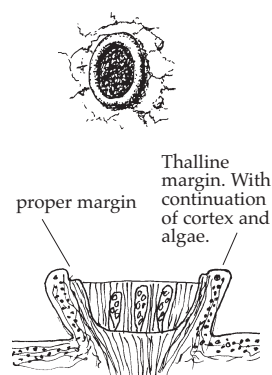


Fig. 205. Lecanorine apothecium x5 and cross-section x20

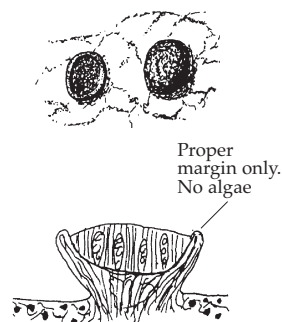


Fig. 206. Lecideine apothecia x5 and cross-section x20

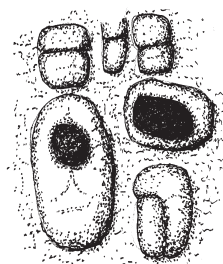


Fig 206a. *Cyphelium notarisii* x6



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 squamules 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 spodochoa**

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*

Megalospora 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 carneoglaucia**

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. *Rare* **Caerulium (Myriospora) heppii**

Thallus grey or immersed. Apothecia 1–2 x 0.1–0.3 mm brown. Prominent 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* **Synnesia 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* **Megalania 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

Acid rock (siliceous), does not react to acid such as lemon juice.

Addressed, 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 which 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 cyanobacteria in a lichen that normally 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.

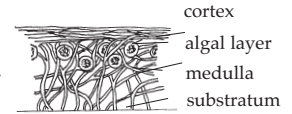
Lecideine, apothecium lacking a thalline margin (see diagram).

The margin is a different in colour from the thallus.

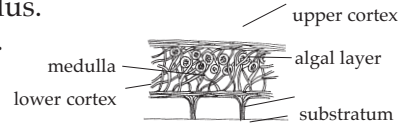
Lirellate, long, thin black fruits like strange writing.

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.*

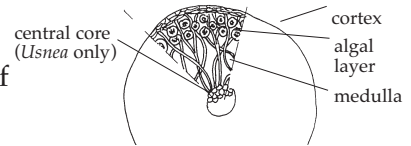
Lobules, small secondary lobes.



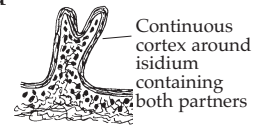
Cross-section of crustose thallus x20



Cross-section of foliose thallus x20



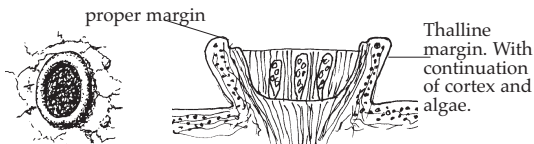
Fruticose thallus x15



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, spreading outwards at the top like a palm and wrist.

Perithecium (pl. **-ia**), flask-shaped fruiting body (see diagram).

pH, a measure 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. **-ia**), 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.

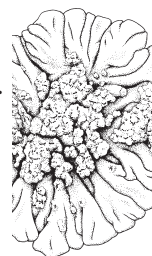
Subsp., subspecies.

Substratum (pl. **-a**), the surface on which the lichen is growing.

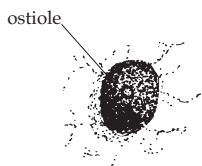
Thalline margin, margin of a fruit containing alga (see diagram).

Thallus, the body of a lichen.

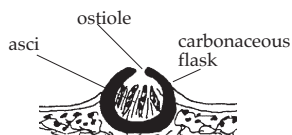
Tomentum, covered in very fine, short hairs, like felt.



Palmate placodioid crustose thallus x3



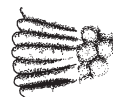
Perithecium viewed from above x10



Cross-section of perithecium x10



Podetium x3

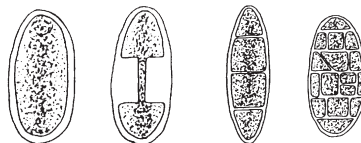


Finger-like placodioid crustose thallus x3



Cross-section of a soralium showing soredia being released x15

Spore types x1000 approx.



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
Rocella fuciformis x, T
Rocella 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 fragilesceus 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
Degelia 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 glabrata 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

Crustose

Acarospora nitrophila T
Acrocordia conoidea T
Acrocordia macrospora T
Acrocordia salweyi T
Agonimia gelatinosa T, cal
Amandinea conioips 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 leproscens 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 allocia 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

Squamulose

Acarospora fuscata ho, T
Acarospora impressula m, T
Acarospora smaragdula x, T
Acarospora veronensis ho

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 rudenum 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 notarisi 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 hedini 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 dilleni 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 albenscens T
Lecanora andrewii x
Lecanora campestris ho, T, 3
Lecanora chlorotera 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 helicopsis m, 2
Lecanora intricata ho, T
Lecanora muralis ho, 4
Lecanora ochroidea ho, T
Lecanora orosthea ho, T
Lecanora poliophaea m, 2
Lecanora polytropia 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 lapidica 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 stigmata ho, T
Lecidella viridans T
Lepraria borealis T
Lepraria caesioalba ho, T
Lepraria corticata T
Lepraria incana m, T
Lepraria lobificans T
Lepraria nivalis ho, T
Lepraria membranacea ho
Lepraria vouauxii ho
Leprocaulon microscopicum ho, T, 6
Lithographa tessarata ho, T
Llimonaea soorediata 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 nigrum 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 sooredizodes 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 schaeeri 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 atrocinnerea 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 soorediata x, hi, T
Sarcogyne privigna ho, T
Sarcogyne regularis x, T
Schaereria fuscocinnerea T
Scoliciosporum umbrinum x, T
Solenopsis 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 obtogens 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 bryoetona T, cal
Verrucaria difmarsica 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, lf, 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	Collema auriforme x, T	Physcia adscendens T
Acrocordia conoidea T	Collema crispum x, T	Physcia caesia x, T
Acrocordia macrospora T	Collema cristatum T	Physcia tenella T
Acrocordia salweyi T	Collema multipartitum T	Physcia tribacia x, T
Agonimia tristicula T	Collema nigrescens T	Physconia distorta T
Aspicilia calcarea T	Collema tenax x, T	Physconia grisea T
Aspicilia contorta T	Dermatocarpon minutum x, T	Placopyrenium fucellum T
Bacidia bagliettoana T	Diploicia canescens x, T	Placynthium nigrum T
Bacidia herbarum T	Diploschistes scruposus T	Polysporina simplex T
Bilimbia lobulata T	Diplotomma alboatrum m, T	Porina linearis T
Bilimbia sabuletorum T	Diplotomma chlorophaeum x, T	Protoblastenia calva T
Botryolepraria lesdainii ho, T	Diplotomma hedinii Ti	Protoblastenia rupestris T
Caloplaca alociza T	Dirina massiliensis x, T	Psilolechia leprosa T
Caloplaca arcis T	Gyalecta jenensis ho., T	Psorotichia schaeferi hi, ho
Caloplaca aurantia x, T	Gyalecta nidarosiensis T	Ramalina canariensis T
Caloplaca chlorina T	Haematomma ochroleucum T	Ramalina farinacea T
Caloplaca chrysodeta x, T	Lecania erysibe T	Ramalina subfarinacea T
Caloplaca cirrochroa m, T	Lecania rabenhorstii T	Rhizocarpon petraeum T
Caloplaca citrina m, x, T	Lecanora albescens T	Rinodina oleae T
Caloplaca crenulatella T	Lecanora campestris T	Rocella fuciformis T
Caloplaca dalmatica T	Lecanora crenulata T	Rocella phycopsis T
Caloplaca decipiens T	Lecanora dispersa T	Sarcogyne regularis x, T
Caloplaca flavescens x, T	Lecanora muralis T	Solenopora candicans ho, T
Caloplaca flavocitrina x, T	Lecanora semipallida T	Squamarina cartilaginea x T
Caloplaca flavovirescens, m, T	Lecanora stenotropa T	Thelidium decipiens x, T
Caloplaca holocarpa x, T	Lecidella stigmatia T	Toninia aromatica Hi, T
Caloplaca marmorata T	Lepraria lobificans T	Toninia mesoidea T
Caloplaca oasis T	Lepraria nivalis T	Toninia sedifolia T
Caloplaca ochracea T	Lepraria vouauxii T	Verrucaria baldensis T
Caloplaca rudenum T	Leptogium britannicum T	Verrucaria caerulea T
Caloplaca saxicola x, T	Leptogium gelatinosum m, T	Verrucaria dufourii T
Caloplaca teicholyta T	Leptogium schraderi m, T	Verrucaria hochstetteri T
Caloplaca variabilis x, T	Leptogium teretiusculum T	Verrucaria macrostoma T
Caloplaca xantholyta x, T	Leptogium turgidum T	Verrucaria muralis T
Candelariella aurella ho, T	Llimonaea soledadii T	Verrucaria nigrescens x, T
Candelariella mediana ho, T	Opegrapha calcarea T	Verrucaria viridula T
Catillaria chalybeia T	Opegrapha rupestris T	Xanthoria aureola m, hi
Catillaria lenticularis T	Petractis clausa T	Xanthoria calcicola xs, t
Clauzadea immersa T	Petractis nodispora T	Xanthoria elegans ho, T
Clauzadea metzleri T	Phaeophyscia nigricans T	Xanthoria parietina m, T
Clauzadea monticola T	Phaeophyscia orbicularis 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	Caloplaca suaedae T	Cladonia crispata T
Agonimia gelatinosa T, cal	Catapyrenium cinerum T	Cladonia diversa T
Agonimia tristicula T	Cetraria aculeata T	Cladonia fimbriata T
Anaptychia ciliaris x T	Cetraria muricata T	Cladonia firma T
Bacidia bagliettoana T, cal	Cladonia arbuscula T	Cladonia floerkeana T
Bacidia herbarum T, cal	Cladonia cervicornis T	Cladonia foliacea T
Bacidia scopulicola x	Cladonia chlorophaea T	Cladonia furcata T
Baeomyces rufus T	Cladonia ciliata T	Cladonia furcata subsp.
Bilimbia lobulata T, cal	Cladonia coniocraea T	subrangiformis T, cal
Bilimbia sabuletorum T, cal	Cladonia convoluta T	Cladonia glauca T

<i>Cladonia gracilis</i> T	<i>Heterodermia obscurata</i> ho, T	<i>Placidium squamulosum</i> T, cal
<i>Cladonia humilis</i> T	<i>Heterodermia speciosa</i> ho, T	<i>Placynthiella dasaea</i> T
<i>Cladonia macilenta</i> T	<i>Hypogymnia physodes</i> ho	<i>Placynthiella icmalea</i> T
<i>Cladonia pocillum</i> T, cal	<i>Lecanora zosteræ</i> ho, T	<i>Placynthiella uliginosa</i> T
<i>Cladonia portentosa</i> T	<i>Leprocaulon microscopicum</i> T	<i>Polyblastia agraria</i> T, cal
<i>Cladonia pyxidata</i> T	<i>Leptogium britannicum</i> T	<i>Psora decipiens</i> T, cal
<i>Cladonia ramulosa</i> T	<i>Leptogium gelatinosum</i> m, T	<i>Pycnothelia papillaria</i> T
<i>Cladonia rangiferina</i> T	<i>Leptogium schraderi</i> m, T	<i>Ramalina farinacea</i> T
<i>Cladonia rangiformis</i> T, cal	<i>Leptogium teretiusculum</i> T	<i>Ramalina subfarinacea</i> T
<i>Cladonia squamosa</i> T	<i>Leptogium turgidum</i> T	<i>Rinodina conradii</i> T
<i>Cladonia subcervicornis</i> T	<i>Micarea lignaria</i> T	<i>Romularia lurida</i> T, cal
<i>Cladonia subulata</i> T	<i>Micarea prasina</i> T	<i>Solenopsora holophaea</i> x, T
<i>Cladonia symphyrcarpia</i> T, cal	<i>Moelleropsis nebulosa</i> T	<i>Solenopsora vulturienensis</i> x, T
<i>Cladonia uncialis</i> T	<i>Nephroma laevigatum</i> T	<i>Squamarina cartilaginea</i> hi, T, cal
<i>Collema auriforme</i> x, T	<i>Nephroma tangeriense</i> T	<i>Teloschistes flavicans</i> T
<i>Collema crispum</i> x, T	<i>Normandina pulchella</i> T	<i>Thelenella muscorum</i> T, cal.
<i>Collema cristatum</i> T	<i>Ochrolechia androgyna</i> T	<i>Toninia aromatica</i> T, cal
<i>Collema nigrescens</i> T	<i>Peltigera canina</i> T	<i>Toninia sedifolia</i> m, T, cal
<i>Collema tenax</i> x, T	<i>Peltigera didactyla</i> T	<i>Trapelia coarctata</i> T
<i>Dibaeis baeomyces</i> T	<i>Peltigera hymenina</i> T	<i>Trapelia glebulosa</i> T
<i>Diploschistes muscorum</i> T, cal	<i>Peltigera membranacea</i> T	<i>Trapeliopsis granulosa</i> ho, T
<i>Endocarpon pusillum</i> hi, T	<i>Peltigera neckeri</i> T	<i>Trapeliopsis wallrothii</i> hi, ho, T
<i>Evernia prunastri</i> T	<i>Peltigera praetextata</i> T	<i>Verrucaria bryoctona</i> T, cal
<i>Fulgensia fulgens</i> ho, T, cal	<i>Peltigera rufescens</i> T	<i>Usnea articulata</i> ho, T
<i>Heterodermia leucomela</i> ho, T	<i>Placidopsis custnanii</i> T, cal	

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

<i>Amandinea punctata</i>	<i>Hypogymnia tubulosa</i>	<i>Physcia caesia</i>
<i>Anaptychia ciliaris</i>	<i>Hypotrachyna britannica</i>	<i>Physcia leptalea</i>
<i>Bryoria fuscescens</i>	<i>Hypotrachyna revoluta</i>	<i>Physcia tenella</i>
<i>Buellia griseovirens</i>	<i>Lecanora aitema</i>	<i>Physconia distorta</i>
<i>Caloplaca cerina</i>	<i>Lecanora campestris</i>	<i>Physconia grisea</i>
<i>Caloplaca marina</i>	<i>Lecanora chlarotera</i>	<i>Placynthiella icmalea</i>
<i>Caloplaca flavovirescens</i>	<i>Lecanora compallens</i>	<i>Pseudevernia furfuracea</i>
<i>Candelariella vitellina</i>	<i>Lecanora confusa</i>	<i>Punctelia subrudecta</i>
<i>Cladonia chlorophaea</i>	<i>Lecanora conizaeoides</i>	<i>Ramalina canariensis</i>
<i>Cladonia coniocraea</i>	<i>Lecanora expallens</i>	<i>Ramalina farinacea</i>
<i>Cladonia diversa</i>	<i>Lecanora intricata</i>	<i>Ramalina lacera</i>
<i>Cladonia fimbriata</i>	<i>Lecanora muralis</i>	<i>Ramalina pollinaria</i>
<i>Cladonia floerkeana</i>	<i>Lecanora orosthea</i>	<i>Ramalina portuensis</i>
<i>Cladonia glauca</i>	<i>Lecanora polytropia</i>	<i>Ramalina siliquosa</i>
<i>Cladonia gracilis</i>	<i>Lecanora pulcaris</i>	<i>Ramalina subfarinacea</i>
<i>Cladonia macilenta</i>	<i>Lecanora saligna</i>	<i>Rocella phycopsis</i>
<i>Cladonia pyxidata</i>	<i>Lecanora soralifera</i>	<i>Trapeliopsis flexuosa</i>
<i>Cladonia ramulosa</i>	<i>Lecanora sulphurea</i>	<i>Trapeliopsis granulosa</i>
<i>Cladonia squamosa</i>	<i>Lecanora symmicta</i>	<i>Sphaerophorus globosus</i>
<i>Cladonia subulata</i>	<i>Lecanora varia</i>	<i>Usnea cornuta</i>
<i>Cliostomum corrugatum</i>	<i>Lecidella elaeochroma</i>	<i>Usnea flammea</i>
<i>Cliostomum griffithii</i>	<i>Lecidella scabra</i>	<i>Usnea hirta</i>
<i>Cyphelium inquinans</i>	<i>Melanelixia fuliginosa</i>	<i>Usnea subfloridana</i>
<i>Cyphelium notarisii</i>	<i>Melanelixia subaurifera</i>	<i>Xanthoria calcicola</i>
<i>Diploicia canescens</i>	<i>Micarea denigrata</i>	<i>Xanthoria candelaria</i>
<i>Evernia prunastri</i>	<i>Parmelia saxatilis</i>	<i>Xanthoria parietina</i>
<i>Flavoparmelia caperata</i>	<i>Parmelia sulcata</i>	<i>Xanthoparmelia conspersa</i>
<i>Flavoparmelia soredians</i>	<i>Parmotrema perlatum</i>	<i>Xanthoparmelia mougeotii</i>
<i>Hydropunctaria maura</i>	<i>Phaeophyscia orbicularis</i>	<i>Xanthoparmelia verruculifera</i>
<i>Hypocenomyce scalaris</i>	<i>Physcia adscendens</i>	<i>Xanthoria calcicola</i>
<i>Hypogymnia physodes</i>	<i>Physcia aipolia</i>	<i>Xanthoria ucrainica</i>

Species included in ‘notes on some rare species’

(These species are not included in the main key)

<i>Acarospora benedarensis</i>	<i>Halecania spodomela</i>	<i>Rimularia gyrizans</i>
<i>Acarospora subrufula</i>	<i>Hypotrachyna endochlora</i>	<i>Rinodina aspersa</i>
<i>Arthonia atlantica</i>	<i>Hypotrachyna taylorensis</i>	<i>Rinodina bischoffii</i>
<i>Arthonia ligniaria</i>	<i>Lecania atrynoides</i>	<i>Rinodina oxydata</i>
<i>Arthothelium norvegicum</i>	<i>Lecania nylanderiana</i>	<i>Rinodina orculariopsis</i>
<i>Aspicilia tuberculosa</i>	<i>Lecanographa grumulosa</i>	<i>Rinodina teichophila</i>
<i>Aspicilia recedens</i>	<i>Lecanora agardhiana</i>	<i>Sarcogyne clavus</i>
<i>Atla wheldonii</i>	<i>Lecanora cenisia</i>	<i>Sarcosagium campestre</i>
<i>Bacidia carneoglauca</i>	<i>Lecanora straminea</i>	<i>Solenopsora liparina</i>
<i>Buellia jugorum</i>	<i>Lecidea lithophila</i>	<i>Solorina spongiosa</i>
<i>Buellia saxorum</i>	<i>Lecidea phaeops</i>	<i>Squamarina lentigera</i>
<i>Caerulium heppii</i>	<i>Lempholemma cladodes</i>	<i>Staurothele caesia</i>
<i>Caloplaca aractina</i>	<i>Leptogium plicatile</i>	<i>Steinia geophana</i>
<i>Caloplaca atroflava</i>	<i>Megalaria pulverea</i>	<i>Stereocaulon condensatum</i>
<i>Caloplaca caesiorufella</i>	<i>Megalospora tuberculosa</i>	<i>Synnesia myrticola</i>
<i>Caloplaca concilians</i>	<i>Megasporea verrucosa</i>	<i>Thamnolia vermicularis</i>
<i>Caloplaca scopularis</i>	<i>Menegazzia terebrata</i>	<i>Thelidium incavatum</i>
<i>Caloplaca soralifera</i>	<i>Micarea incrassata</i>	<i>Thelidium papulare</i>
<i>Catillaria apha</i>	<i>Micarea ternaria</i>	<i>Thrombium epigaeum</i>
<i>Catillaria subviridis</i>	<i>Miriquidica leucophaea</i>	<i>Tremolecia atrata</i>
<i>Cladonia mitis</i>	<i>Nephroma parile</i>	<i>Tylothallia biformigera</i>
<i>Cladonia peziziformis</i>	<i>Ochrolechia frigida</i>	<i>Umbilicaria grisea</i>
<i>Collema latzelii</i>	<i>Opegrapha areniseda</i>	<i>Umbilicaria spodochoa</i>
<i>Collemopsidium arenisedum</i>	<i>Parmotrema robustum</i>	<i>Vahliella leucophaea</i>
<i>Collemopsidium elegans</i>	<i>Placidium pilosellum</i>	<i>Verrucaria aethiobola</i>
<i>Collemopsidium ostrearum</i>	<i>Polyblastia cupularis</i>	<i>Verrucaria degelii</i>
<i>Collemopsidium pelvetiae</i>	<i>Porina curnowii</i>	<i>Verrucaria sandstedei</i>
<i>Collemopsidium subarenisedum</i>	<i>Pseudocyphellaria crocata</i>	<i>Vezdaea aestivalis</i>
<i>Collemopsidium sublitorale</i>	<i>Pseudocyphellaria intricata</i>	<i>Vezdaea leprosa</i>
<i>Eiglera flavida</i>	<i>Pyrenula dermatodes</i>	<i>Xanthoparmelia tinctina</i>
<i>Enterographa hutchinsiae</i>	<i>Ramalina chondrina</i>	
<i>Fellhaneropsis vezdae</i>	<i>Rhizocarpon cinereovirens</i>	
	<i>Rhizocarpon polycarpum</i>	

SELECTED BIBLIOGRAPHY

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.

DOBSON Frank S. *Lichens – An Illustrated guide* (6th ed. 2011) The Richmond Publishing Co. Ltd.

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.

GILBERT O. *Lichens* (The New Naturalist Library) (2000) Harper Collins.

A very readable account that covers many aspects of the biology of lichens. It is especially strong on lichen habitats.

PURVIS O.W. *Lichens* (2000) The Natural History Museum & Smithsonian Institution.

A popular guide to lichen biology, biodiversity, ecological and economic importance etc. Contains 150 colour photographs and diagrams.

SMITH C.W., APTROOT A., COPPINS B.J., FLETCHER A., GILBERT O.L., JAMES P.W., WOLSELEY P.A.

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 occurring 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.