

FIELD NOTES ON PHYSICAL FACTORS AFFECTING LICHEN IN BUTE

by W. M. Boyd

INTRODUCTION

Lichens can be defined as Fungi in association with an Alga or Algae supplying food by Photosynthesis.

POLLUTION

They are increasing in importance because their predilection for absorbing pollutants, SO_2 in particular, make them excellent indicators. Mason Hale (in "The Biology of Lichens") states – "Lichen Thallus is a perennial, stable and long-lived structure. Airborne elements are absorbed very efficiently over the entire structure since there are no protective structures such as a waxy cuticle or stomates. These elements are bound in the heavily gelatinised hyphal walls and stored harmlessly or taken up by the metabolically active algae which die off or are damaged."

Thus, if the degree of pollution is sufficient, a "lichen desert" can be created around a particular area where the finer species of lichen will not grow.

Taking advantage of this, lichenologists have drawn up tables which equate specific lichen species with specific quantities of pollution expressed as $\mu\text{g}/\text{m}^3$ (1/1000 grams per cubic metre) mean winter SO_2 .

So where do we stand in Bute?

F. S. Dobson in his little handbook, "Common British Lichens," gives a table based on the zone scale for lichen species on trees by Hawksworth and Rose. The least polluted level given by him is Level H. This level is less than $35 \mu\text{g}/\text{m}^3$ and requires the presence of *Lobaria Pulmonaria*, *Usnea Florida*, *Parmelia Perlata* and *Teioschistes Flavicans*. The first three occur in Bute – the fourth does not. but we can discount this absence as *Teloschistes Flavicans* is a Southron and is not reported North of the border.

This indicates an atmosphere practically unpolluted.

The chief factors causing the relative purity of atmosphere in Bute are:

1. The lack of heavy industry on the Island.

2. The prevailing wind is South-West and blows from Northern Ireland and Kintyre, both areas lacking heavy industry.
3. The lack of widespread crop growing in Bute and hence the lesser use of crop spraying and dust fertiliser.
4. The economic decline of heavy industry on Clydeside and Northern Ayrshire. What the effect of the oil-fired power station at Inverkip and the Hunterston development will be cannot yet be assessed.

Finally, road traffic in Bute is light, car exhaust and diesel fumes are minimal.

Further corroboration of relative purity is shown by the existence in Bute in a number of places of *Normandina Pulchella*, whose delightful little shell-like thalli can be seen with a hand lens. Ursula Duncan states that this lichen will not survive above 35 µg/m³.

Lastly, that enigmatic species, *Lecanora Conizaeoides*, which thrives in polluted areas and shuns the purer airs is decidedly scarce in Bute.

HABITATS

As to the question of habitats – it would appear to be correct to state that the perfect habitat does not exist. Nevertheless, some exist in which there is a combination of favourable factors. These could be termed “Compound Habitats,” i.e., all factors reinforce each other. By contrast, one in which one or more factors are antagonistic should therefore be termed a “Complex Habitat.”

The West Kyle — A Compound Habitat

An excellent example of a Compound Habitat exists in the West Kyle. It lies between Port Glas and Kilmichael Farm Gate (below St. Michael's Chapel). Here the force of the prevailing SW wind is buffered by Ardlamont Peninsula. The reinforcing factors are – the curve of the shore with trees to the North and South and a steep hill and trees to the East. This again is reinforced by, on the shore, higher rock to windward, whereby the force of the already tempered SW wind is converted into harmless eddies, and in coves by a lateral deflection of the already tempered SW wind. A further compounding is gained by

rock overhangs and consequent shelter. On the landward side of the road, trees, gullies, rocks and banks give protection from frost and driving wind, and provide dappled and intermittent shade which so many of the corticolous lichens seem to appreciate and even to need.

As a result of this multiplication of favourable factors, we find a rich variety of saxicolous species on the shore and an equally rich variety of corticolous species on the immediate inland strip.

On the shore, perhaps the most notable colony is that of *Parmeliella Plumbea* on NW facing rocks. On trees overhanging the shore are the small upright clumps of *Ramalina Fastigiata*. There is a rich variety of *Lecidiaceae* and *Lecanoraceae* on the upper rocks of the shore and at one place *Parmelia Consersa* has spread for several metres down a damp rock runnel, the question here arising – did it spread by spore or detached fragment? Was the spread up or down? On a small grassy platform there is a wide variety of the *Cladonia* type of *Cladonia* – *Gracilis*, *Furcata*, *Tenuis*, *Uncialis* and all dominated by profuse *Impexa*. On the inland side of the road on rocks, ditches, walls and trees there are many of the cup-forming *Cladoniae*. Here there is further shelter and dappled shade by virtue of trees and eroded gullies, and richness is supplied by rotting vegetation for it is largely natural Highland woodland.

On trees, *Parmelia Caperata* is widespread along with *P Sulcata*, *P Perlata* and *P Subreducta*, although the last is not so frequent as the others; *Lobaria* and *Peltigera* occur, the latter in several species – all often growing on moss, on rocks and trees. In addition to the widespread *Usnea Subfloridana*, *Usnea Filipendula* hangs downwards from branches. This is a remarkably sheltered warm area – yet it is moisture retentive and supplies near ideal conditions for many lichen species.

Barr Point and Dunagoil

Further South down the West coast we find the more exposed rocky habitats, and here the most noticeable feature is that several of the rocky headlands such as Barr Point and Dunagoil have rocky SW and NW faces. On the SW faces *Ramalina Siliquosa* (Sea Ivory) struggles and survives sparsely. On the NW faces it luxuriates in a thick continuum, resembling in many places a hanging hearth rug.

Lubas Bay

On the North side of Barr Point a mass of jumbled rocks and even the rocks on the South shore of Lubas Bay have a rich coating of lichens. This is undoubtedly due to the deflection of the SW wind by the Point. Even on Barr Point itself where rocks create a lee, lichens abound.

Lepraria in a Cave

On 5th June, 1982, what appeared to be a light was observed coming from a cave at Dunagoil from a considerable distance away, possibly 30 metres. It appeared to be phosphorescent. Closer inspection showed it to be a patch of *Lepraria Incana*. It was situated more than 12 metres in from the mouth of the cave. It was photographed with a modern light sensitive camera and closed the shutter set at full aperture (f/1.8) in 4 seconds. Pointing the camera away from the *Lepraria* failed entirely to operate the shutter. Was it reflected light or a phosphorescent lichen substance? The weather was hot and dry, the cave was cool and damp.

Visits in successive summers and winters since then have failed to repeat the phenomenon.

Dunagoil to Runnaneon

Observation of the cliffs and rocks from Dunagoil to Garroch Head and on to Runnaneon does not reveal a large variety of lichen although this area has not been adequately covered yet. Obviously an excess of sun and wind is unfavourable to many lichen.

Looking North up the coast to Dunagoil – a slope of rock all the way – the three Coastal lichen zones can be clearly seen, black, yellow and grey. The black zone so often popularly thought to be oil is in fact an inter-tidal lichen, *Verrucaria*.

Endolithic Lichen

Many lichens growing on rock are embedded 3 or 4 mm. into the rock. These are termed "Endolithic." The term "Epilithic" on the other hand means growing on rock by suckers or other attachments. The Endolithic lichen is slow growing – perhaps as little as 1 mm. per year. But it is very durable, exposing only one surface to the elements. It literally "has its back to the wall." Its rear is invulnerable and wind cannot tear it off. Some of the sizeable patches of endolithic lichen we see in Bute today must be centuries old.

Tor Mor

On the gentle Western slopes of Tor Mor (485 feet) a little valley runs down to Loch-na-leighe. This valley is sheltered from the persistent SW wind by the crinanite North facing cliffs dominating Loch-na-leighe, by Tor Mor to the East and a grassy ridge to the North. On the face of this ridge is a flat very friable rock, the home of a colony of *Rhizocarpon Lecanorinum*, the not so common first cousin of

Rhizocarpon Geographicum so rife on our shores. The thalli are recognised with a hand lens by their crescent shapes.

Unfortunately, this rock, some 10 or 12 square metres is breaking up rapidly. This little valley contains numerous rocks fallen from the cliffs many years ago and even up to today, and they are rich in lichen. From Tor Mor, a ridge extends NNW and here at a height of over 400 feet on the very crest is a large colony of *Haematomma Ventosum* whose red discocarps can sometimes be seen in summer from quite a distance away shining like tiny rubies.

Kilchattan Bay

North Eastwards across upper Glencallum, a ruined croft overlooks Kilchattan Water-Works (Upper). From this croft, itself rich in lichen, a long wall runs downwards. This wall is very rich in lichen – the North side much richer in numbers and species than the South. Moreover many of those on the North side have a strong green tinge very noticeable on *Lecanora Atra*.

Below this, at Kilchattan Bay road-end, runs a short wall from the gateway to the bank, built of whinstone but capped with red and white sandstone, the sandstone is rich in lichen and is a significant demonstration of the effect of shelter. This little wall is sheltered by a high bank running from North through West to South, and the wall has its back to a wood on the North and East. It is very snug. But on the frequent red sandstone and conglomerate outcrops on the shore of the East coast of Bute, lichens are notably sparse, almost absent.

Creag A Chlaidheimh

Another notable habitat is that lying between the upper margin of Suidhe Plantation and the base of Creag A Chlaidheimh cliffs. Here many fallen rocks house a large colony of *Sphaerophorus Fragilis* – some display 10 to 20 or more plants of this cushion-like lichen. These plants seem to show a semi-deciduous character, for in winter they lose much top growth and in spring and summer can be seen to put on new growth quite rapidly.

Blackpark Hill

Far to the North on Blackpark Hill (420 feet) above the Dhu Loch, is a large colony of *Pseudevernia Furfuracea*, on large flat boulders in an Easterly exposure. This lichen is an upland type in Bute.

Calicoles

With a maximum height of 911 feet (Windy Hill) Bute cannot boast of Alpine types; it is also somewhat deficient in calicoles as there is very little limestone. Some calicoles do however occur on basic rich rocks.

Walls

Bute has no "laid" hedges as in England. Instead, as compensation, it has very ancient dry stone dykes, many of which are magnificently rich in lichen. The wall, on B 8000, below Stuck Farm, contains a fine colony of *Physcia* plants. Further up this road, just North of Shalunt Wood, there is an old abandoned by-passed loop, the wall of which is falling into disrepair. This wall bears *Stereocaulon Vesuvianum* and some very healthy plants of *Cladonia Fimbriata*.

The B 8000 Road

Further on, below the last conifer plantation before Rhubodach is another abandoned section of road running, on the inland side, for about 300 metres. This fully metalled macadamised road was by-passed in 1968. In 1982, this by-passed section was covered with grass and moss and already young *Betula* was regenerating on it. What was significant, however, was the appearance of a considerable number of lichen on parts of the road undoubtedly formerly traversed by traffic to Rhubodach Ferry. The majority of plants were *Cladonia* type – mainly *Impexa*. One stopped counting after 50 plants – there must have been between 100 and 200 plants of *Impexa*. There were several plants of *C. Furcata*, *Tenuis* and *Gracilis*. Also present were several *Cladonia Coniocraea* and some small (doubtful) plants of *C Fimbriata*.

Several plants of *Peltigera Canina* and *Polydactyla* by the side of the road may have been there before 1968. The growth of grass and moss – but above all the rapidity of *Betula* regeneration has now virtually wiped out the bulk of this attempted colonisation.

Climate in Bute

Perhaps the key lies in Bute's changing rainfall – given in 1984 as 46 inches per annum for the last 100 years, 56 inches per annum for the last 10 years, and 61 inches per annum for the last 3 years. Some of the plants of *C Impexa* were as much as 7 cm by 4 cm and as high as 3 cm; they were however competing with moss and grass. This colonisation must have been extremely rapid. The climate in Bute seems in recent years to have developed a rhythm of a monsoon deluge in

Autumn ("when the bramble blackens the rain and wind come on"), a reasonably temperate Winter followed by a cold and reluctant late Spring with searing dry winds and a low (but not freezing) night temperature, then a spell of drought in Summer.

However, the severe cold snap of the Winter of 1981/82, followed by the drought of the Summer of 1983 and again of 1984 seemed to leave lichen unaffected though having a temporary deleterious effect on some mosses and wild flowers.

Some types of lichen are stated to sporulate best at temperatures between 15°C and 20°C. Some authorities are of the opinion that the essential trigger mechanism is the change from one weather condition to another rather than a specific weather condition itself.

Bute lies astride the Highland Line, which runs from Scalpsie Bay to Rothesay Bay. The vegetation in the Northern half is obviously Highland, and no discussion on lichen in Bute would be complete without mention of the two ancient post mature Highland woods of Shalunt and Balnakailly.

Shalunt Wood

In Shalunt Wood, *Graphis Scripta* abounds and even *G. Elegans* is frequent. *Opegrapha* and *Arthonia* are present in variety. *Pannaria Rubiginosa*, *Porina Chlorotica* and *Phaeographis Dendritica* occur. Again, *Peltigera* is common on the banks of the burn and *Cladonia Squamosa* and *C Strepsilis* are common. On rocks above the wood *Lecidea Sulphurea* and *L Orosthea* occur. The wood is so ancient and decaying (in parts) that decorticate trunks are common and portions of loose *Betula* bark abound. In other parts of the wood, notably above the quarry, there is a rapid regeneration of *Betula*. One wonders if *Betula* would be climax here! The richness of lichen is all in the old post mature part of the wood. In the new regenerated *Betula* there is very little. Yet the two parts of the wood enjoy the same climate and exposure. The host would appear here to be paramount.

Balnakailly Wood

Moving up to Balnakailly Wood we find another dichotomy. The wood is again Highland and post mature, but there is little or even no regeneration. Here there is an upper drier portion and a lower damper portion. It is not by accident that the ants, for which the wood is known, inhabit the upper drier parts – they do not like the dampness of the lower parts. The complete opposite is true of many of the lichen species. The variety and richness of lichen is at the lower end of the burn, in particular the first two or three hundred metres. On trees at the mouth of the burn in addition to the usual *Parmelia*, *Usnea*, *Peltigera* and

Cladonia, the pendant hair like threads of *Alectoria Fuscescens* are found on the NE aspect of the trunk. So far, the only other place this last lichen has been observed is in the wood above Birgidale Knock – but it is very inconspicuous. The variety of *Parmelia* and *Cladonia* within the wood is great. Compounding of the habitat is readily seen, the NW side of the burn, particularly abounds in heichs and howes, sheuchs and dunnies. These give shelter and trap moisture. Rotting logs abound. There is evidence of coppicing in the long ago, but more often one sees a rotting or decorticate trunk standing up and one or more new trunks beside it.

But Bracket Fungi are common in this wood and it is probable that attack by this kills a trunk and new growth springs from a healthy base. *Calicium* and *Catillaria* are frequent on these rotting trunks. The variety of habitats is great. The tiny pink mushroom like discocarps of *Baomyces Roseus* and the brown of *Baomyces Rufus* can be seen in little earthy overhangs on the side of the burn. Even a few centimetres can constitute the difference between a favourable and an unfavourable habitat.

Creagan Lochan

Above Balnakailly Wood lies the Bull Loch (434 feet), and above this at 520 feet on large damp rocks are huge clumps of *Cladonia Uncialis*, – turgid especially when moist. Again, these clumps, more than two feet across, face North and spring from the peat of dead heather roots. This cannot be a comfortable spot on a cold winter day. But lichen are tough. They stand cold well, more so when dry. In one experiment eight lichen species were subjected to minus 196° C, and one survived. They are the only living organisms at both Poles. But they do not stand prolonged heat and drought so well. Dry deserts contain relatively few lichen species.

Summary

According to lichen zonal tables, Bute has an unpolluted atmosphere.

It possesses an equable climate of moist temperate type.

It has a rich variety of lichen habitats, the most important of which are the plethora of cliffs, fallen rocks and ancient walls, and the several native Highland woods of post mature type.

Lichen can be studied all the year round (discocarps are visible even though sporulation is in abeyance).

Bute is rich in Lichen and it is of ideal size and structure to offer a rewarding study.

POPULATION STUDIES OF CLYDE SEABIRDS

Part Four

By J. A. GIBSON

(Continued from *Transactions*, Vol.XX, page 67)

Three previous parts of the Population Studies of Clyde Seabirds have already been published in the Society's *Transactions*, in Volume 17 (1969), Volume 18 (1970) and Volume 20 (1976), and it was originally envisaged that the entire Clyde Seabird Survey would be completed in four parts.

In the years immediately following the publication of part three, however, it soon became apparent that several significant changes were taking place throughout the seabirds of the Clyde, and during the past decade some of these changes have become extremely marked. The great Kittiwake colony on Ailsa Craig is steadily declining, the decrease in Common and Arctic Tern populations, previously becoming evident, has progressed to such a degree that barely half-a-dozen modest colonies now remain, and the Black-headed Gull, once far and away the commonest Clyde gull, has now undergone the most dramatic decline of all, to the point of near extinction as a breeding species. On the credit side, however, new breeding colonies of the Storm Petrel and Manx Shearwater have been discovered, the Fulmar and Black Guillemot are obviously extending their ranges, and the Ailsa Craig Gannet colony and large predatory gulls are steadily increasing.

Detailed investigations into these marked population changes have been in active progress for some time, but as yet it is by no means clear whether some changes are fully developed or still progressing, and much additional work is required. This fourth part is therefore confined to the Clyde distribution and population of the Lesser Black-backed Gull and Herring Gull. The fifth part will deal with the Black-headed Gull and Common Gull, and it is hoped that the sixth part may then be the final part, which will record and summarise all the recent marked changes, and will also bring the census work uniformly up to date.

18. LESSER BLACK-BACKED GULL *Larus fuscus* L.

19. HERRING GULL *Larus argentatus* Pontoppidan

The Clyde breeding stronghold of the universally well-known Lesser Black-backed and Herring Gulls has long been south Argyll, the Clyde islands, and the Ayrshire coast. These areas are therefore