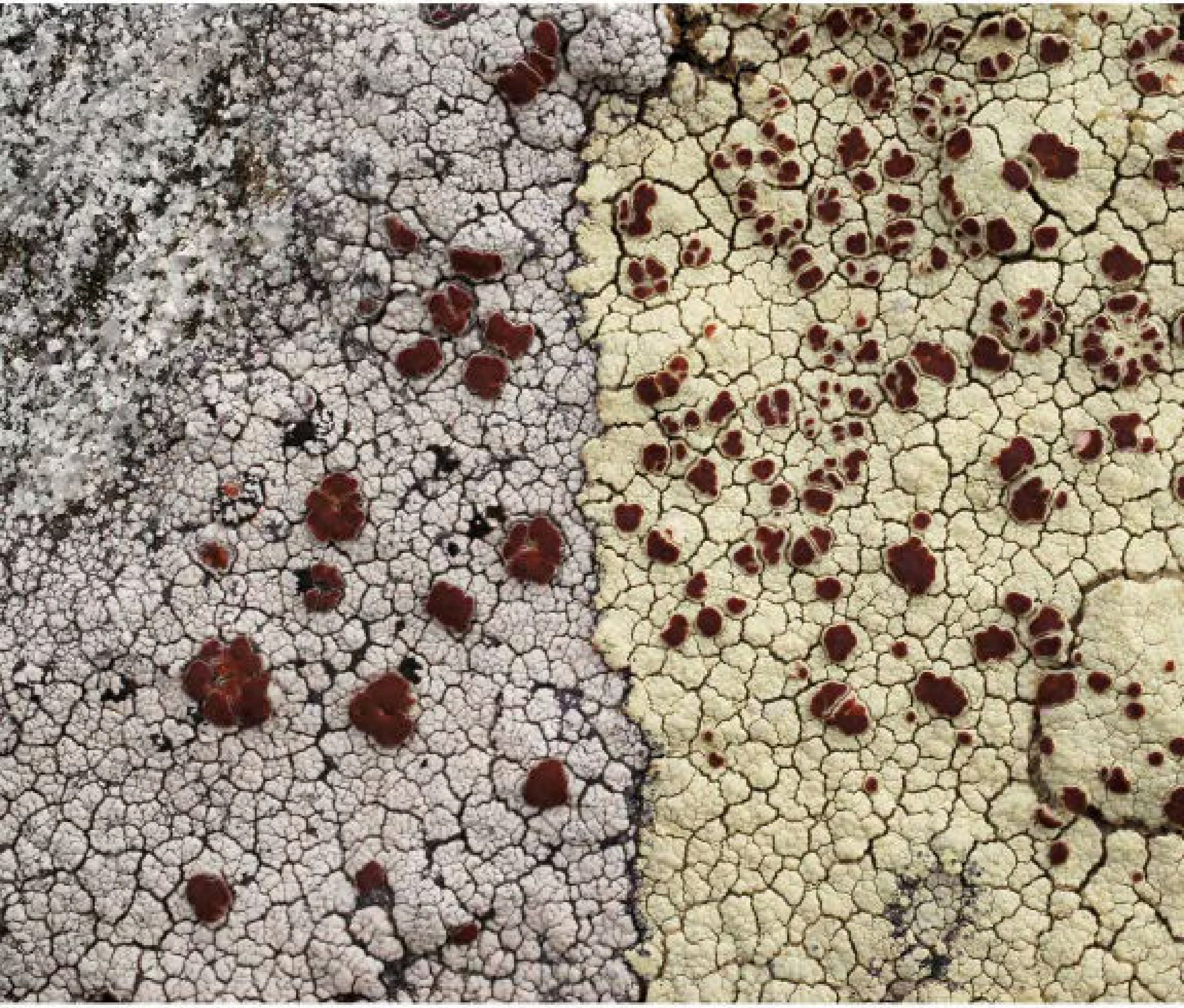
British Lichen Society
Bulletin



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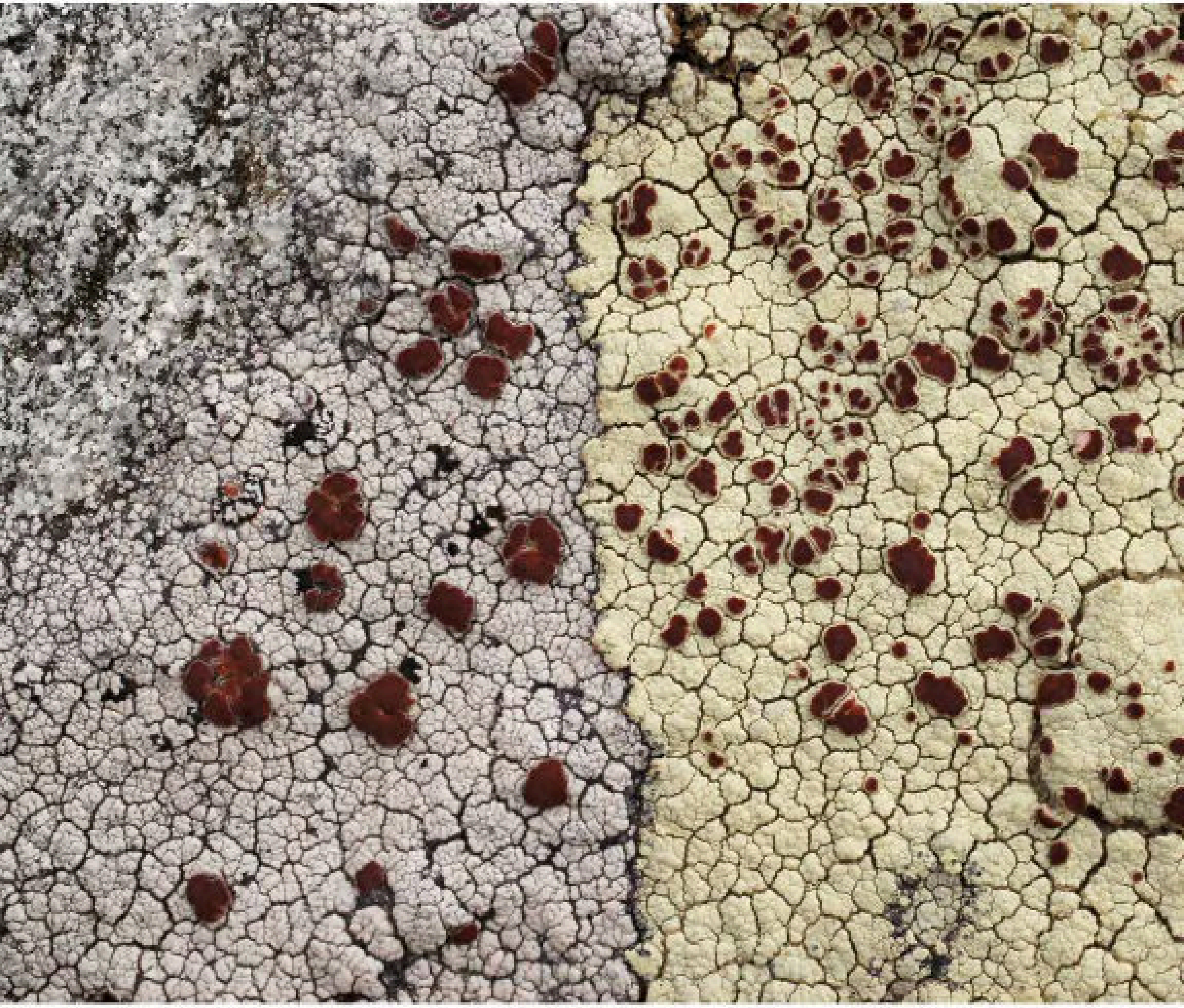

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British Lichen Society Bulletin no. 119
Winter 2016

Welcome to the Winter 2016 Bulletin. Firstly, a very big thank-you to everyone that responded to my message in the summer asking for contributions. At the point that I wrote it appeared that the Winter Bulletin would be a very slim document, but it now appears that it will be the largest ever published in the history of the Society. This has been an indirect benefit of our admin partnership with the Royal Society of Biology, which makes mass communication with members far more practical and cost-effective. The team at the RSB will be contacting you shortly regarding your 2017 subscriptions, if this has not already happened by the time you read this. Please do renew your subscriptions promptly, it helps us all immeasurably. As a reminder, you can contact them via a link from the BLS website (see *http://www.britishlichensociety.org.uk/the-society/join-and-renew*), via email (*member-admin@britishlichensociety.org.uk*) or by phone (020 3793 7852, or +44 20 3793 7852 from overseas).

In the light of our continuing difficulties in recruiting new talent to take up formal roles within the BLS, we shall be reviewing options to reduce further the administrative burden and cut down red tape. At the moment, the responsibility for keeping the BLS going is falling on what seems to be an ever-smaller pool of volunteers, who without exception would like to spend more time with lichens! If you have ideas as to how we can operate more efficiently please approach the President (or any other member of Council).

So, back to the Winter issue. No formal field meeting reports this time (you had three in the summer issue!), but there's plenty more of interest. Neil Sanderson has contributed a really useful guide to *Sticta* in Britain in the light of the re-evaluation of species limits by Nicolas Magain & Emmanuel Sérusiaux, and the genus also features in an account of riverine lichens in Northern Ireland by Mike Simms. Change over time is another major feature, with work on colonisation of different rock types by Andre Aptroot and Laurens Sparrius, and an interesting account of lichenometric dating in the Austrian Alps as part of an MSc project by Joshua Leigh. Joshua's studies were helped by a small grant from the BLS, and we are always interested to receive proposals for other small research projects for possible funding.

The big event over the summer was the 8th Symposium of the International Society for Lichenology, in Helsinki. BLS members played a big role in this exciting and well-organized event. A formal account of the meeting will be published in the IAL Newsletter, but included in this issue are short illustrated summaries from many of the participants who benefited from BLS travel grants. So, you can see something of what was presented, and know that your subscription supports good causes….

Front cover: The common montane lichen *Ophioparma ventosa* has populations both with and without the ability to produce usnic acid. The thallus on the left does not, while that on the right produces that yellow-pigmented chemical.

The field identification of the species within *Sticta fuliginosa s. lat.* in Britain

Introduction

Sticta fuliginosa s. lat. in western Europe has recently been split up into four separate species by Nicolas Magain & Emmanuel Sérusiaux (Magain & Sérusiaux, 2015) in a paper that can be downloaded from <*http://hdl.handle.net/2268/186416*>. I have long found well-developed *Sticta sylvatica* easy to spot but had been quite confused by *S. fuliginosa s. lat.*, including where to draw the line with *Sticta sylvatica*. Now I know why; this work has really helped to resolve a confusing range of morphology into discrete species that are relatively easy to identify in the field, when reasonably well- developed. To date three of the four species have been identified from Britain and the fourth could occur. These are *S. ciliata*, *S. fuliginoides*, *S. fuliginosa s. str.* and *S. atlantica*.

In Britain *Sticta fuliginosa* s. lat. is a widespread but rather local taxon of oceanic woodlands. It has clearly been lost from areas damaged by acidifying pollution in the past and is restricted to little-disturbed wooded habitat within its surviving range. The composite taxon is assessed in Britain as being an International Responsibility species (i.e. with more than 10% of its European or international population found in Britain). It is also assessed and considered to be a Vulnerable red list species in Wales. As such it is important that the distribution of the recently defined segregates are mapped out; they are not likely to be equally distributed or threatened.

Magain & Sérusiaux (2015) provide a tentative key to the species of *Sticta* in Europe which are lichenised with *Nostoc*. This key is reproduced below but converted into the style of the *Lichens of Britain and Ireland*.

The key works well in my experience but includes a dichotomy involving cross-sectioning the thallus and examining at x400 quite early on, where *Sticta ciliata* and *S. fuliginoides* are separated from *S. sylvatica*, *S. fuliginosa s. str.* and *S. atlantica*. Doing cross-sections is a good way of confirming you have the species sorted out, however the species can usually be identified in the field without this microscopic work. Also as species of high conservation interest, one does want to avoid continual collection. As such I have produced a crib for the identification of the species found in Britain: *Sticta ciliata*, *S. fuliginoides* and *S. fuliginosa s. str.* along with the most similar species *S. sylvatica.*

The fourth species in the *Sticta fuliginosa* aggregate, *S. atlantica*, has so far only been found in the Azores and south west Ireland and I have not seen it. Potentially it could occur in the most oceanic parts of Britain, so should be looked out for. The thallus is somewhat branched, but not as regularly as *S. sylvatica*, with the most distinctive feature being small and irregular swellings on its upper surface of the thallus on which the isidia develop. On the underside the tomentum is much sparser, with the tomentum looking like rhizines.

Sticta ciliata

Spotting in the field

The obvious key feature, the cilia on the margins of the young thalli, is a good conformation of identification, but is not actually the best way of spotting this species. The cilia are abundant on young thalli, but are tiny and often absent on older thalli. In mature colonies, there may be few or no young thalli. The presence of apothecia strongly suggests this species, though *Sticta fuliginosa s. str.* can very rarely also have apothecia, and these can also have similar ciliate margins. Also, although fertile material can be expected in any large population it is always rare. In the field it is actually the general shape of the thalli that is the key feature.

Sticta ciliata, Dunsland, N. Devon, a strongly developed colony on sallow, showing mature thalli with revolute margins and flatter younger thalli. Image © N.A. Sanderson.

Young thalli

The young thalli have plain margins, with very variable numbers of marginal cilia. These can be abundant but also can be sparse. Care is needed to distinguish between cilia and tomentum on the underside poking out from the underside; the cilia are simple and white, the tomentum furry and yellowish. When frequent to abundant the cilia are diagnostic, though other species can rarely have cilia on damaged margins. The young thalli are also flat. Young thalli of *Sticta fuliginoides* are very different, rapidly developing into a trumpet shape.

Sticta ciliata, Gleninagh South, The Burren, on hazel, a close-up of a young thallus showing the marginal cilia. Image © N.A. Sanderson.

Mature thalli

The mature thalli are medium-sized, to a maximum of 3 cm diameter, and have a distinctive rounded outline with shallowly crenulate margins. Closer up the neatly recurved margins are diagnostic. *Sticta fuliginosa s. str.* is a larger species, with mature thalli up to 10–12 cm across, with plain margins, a more irregular outline and more deeply divided. *S. fuliginoides* is also a smaller species and can have revolute margins in middle-aged thalli, but has very different younger thalli.

Sticta ciliata, Marlbank, Fermanagh, on hazel, fertile thallus showing cilia on apothecial margin. Image © N.A. Sanderson.

Summary

The main features are:

- Medium-sized mature thalli, rounded outline with recurved margins
- Young thalli flat, usually with marginal cilia
- Confirmed microscopically by the numerous papillae on the outer walls of the cyphella membrane cells (seen most easily in a thick cross-section at x400)

Sticta fuliginoides

Spotting in the field

In quantity this species is easy to spot by the distinctive form of the young thalli. It is rather more difficult to pick out when growing in small quality with *Sticta ciliata*. Clumps lacking young thalli would probably require experience to spot and microscopic work to confirm.

Young thalli

The young thalli are highly diagnostic, rapidly developing into a trumpet shape, which is generally taller than wide with steep angled sides. The young thalli of the other species in the group remain flat and are very different. Mature thalli of *Sticta ciliata* do develop a similar shape, but this is wider than tall, has lower angled sides and has more markedly recurved margins. Marginal cilia are rare on *Sticta fuliginoides* and are associated with damage to the thallus.

Sticta fuliginoides, Coed Llennyrch, Meirionnydd, on hazel, a lacerate old thallus above with young trumpet-shaped thalli below. Image © N.A. Sanderson.

Mature thalli

The maturing thalli become more like *Sticta ciliata*, with a rounded outline and shallowly crenulate margins but giving an impression of being less regular in outline and with less strongly revolute margins. Old thalli can become quite large (up to 5 cm diam.), lacerate and losing their revolute margins.

Summary

The main features are:

- Young thalli very distinctive with trumpet- or vase-shaped thalli, with a tall and narrow silhouette, without marginal cilia
- Small to medium-sized mature thalli, rounded outline with recurved margins but less so than *Sticta ciliata*
- Confirmed microscopically by the sparse papillae on cyphella membrane cells (cross-section at x400)

Sticta fuliginoides, Ten Acre Cleeve, Horner Combe, showing the characteristic trumpet shape of maturing thalli. Image © N.A. Sanderson.

Sticta fuliginoides, Coed Llennyrch, Meirionnydd, on hazel, a group of young trumpet-shaped thalli and mature thalli, which have lost this shape. Image © N.A. Sanderson.

Sticta fuliginosa s. str.

Spotting in the field

Sticta fuliginosa s. str. has no straightforward diagnostic character, and is mostly confirmed by the absence of the diagnostic characters of other species. It has one distinctive character that stands out in the field, however: mature thalli are larger than the other species in the *Sticta fuliginosa s. lat.* group. Very rarely recorded as fertile, and fertile thalli could be confused with the more typically fertile species *Sticta ciliata*.

Young thalli

The young thalli are singularly indistinct, but are flat like *Sticta ciliata* but lack any marginal cilia, except on damaged edges.

Mature thalli

The mature thalli become quite large (up to 5 – 7cm across), and the size alone can stand out from populations of the usually abundant *Sticta ciliata*. Otherwise the thalli are also rounded in outline, but less regularly than either *S. ciliata* or *S. fuliginoides* and the thallus margins are plain to lightly revolute.

Summary

The main features are:

- Young thalli not trumpet- or vase-shaped and without marginal cilia
- Large sized mature thalli, with a rounded outline but less regular than the other species and without recurved margins
- Confirmed microscopically by the lack of papillae on cyphella membrane cells (cross-section at x400)

Sticta fuliginosa s. str., Pen-y-ffrith, Nannau, Meirionnydd, on ash, a large expanding colony (also with a few thalli of *Sticta limbata*). Image © N.A. Sanderson.

Sticta fuliginosa s. str., Dunsland, North Devon, on sallow, an exceptionally large thallus. Unlike large *Sticta ciliata* thalli, this lacks a recurved margin. Image © N.A. Sanderson.

Sticta fuliginosa s. str., East Water Valley, Horner Combe, on an ancient ash, with larger and more irregular thalli than *Sticta ciliata*, the lack of a recurved margin can be seen on the folded over thallus. Image © N.A. Sanderson.

Sticta sylvatica

Spotting in the field

Once the range of variation in the *Sticta fuliginosa s. lat*. group is understood, separating out *Sticta sylvatica* becomes much easier. The regular dichotomous branching and the colour are quite distinctive.

Sticta sylvatica, Gleninagh South, The Burren, on hazel, showing dichotomous branching and dark brown shiny upper surface. Image © N.A. Sanderson.

Young thalli

Younger thalli lacking well-developed and regular dichotomous branching are a bit less distinct. However, the beginnings of this thallus shape are evident in younger material and the dark brown glossy upper surface is always present; this is best seen when dry.

Mature thalli

The mature thalli have very distinct regular dichotomous branching, but also are darker brown on the upper sides than any taxa in *Sticta fuliginosa s. lat*. When dry, the tan to dark brown glossy upper surface is very characteristic, often with shallowly reticulated ridges, which are more marked than in *S. fuliginosa s. lat*. The under side of larger specimens is also jet back near the base, a feature never seen in *S. fuliginosa s. lat.* *S. atlantica* [not yet reported for Britain] is the closest species in the *S. fuliginosa s. lat*. group in appearance but this has the isidia strongly clumped on swellings on the upper surface. It also has a much sparser tomentum on the under side, with the tomentum looking like rhizines.

Summary

The main features are:

- Regular dichotomous branching
- The upper surface tan to dark brown, glossy when dry, with shallowly reticulated ridges, but not maculate
- The under surface jet back at the base

Sticta sylvatica, Gleninagh South, The Burren, on hazel, a closer view showing the dark underside. Image © N.A. Sanderson.

Sticta sylvatica, West of Llyn Cynwch, Nannau, on ash, younger material with less well-developed dichotomous branching, but still showing the dark brown glossy upper surface. Image © N.A. Sanderson.

Distribution

It is very early days to say much about the distribution in Britain of the species in *Sticta fuliginosa s. lat.*, but a brief summary of the knowledge to date is given below. Much more survey is required.

Sticta ciliata: Magain & Sérusiaux did not collect this species during their field trip to Devon, but did collect it from Country Kerry in Ireland. Since then it has been identified widely from western Britain and Ireland. Brain Coppins, after examining specimens in the Royal Botanic Garden Edinburgh [RBGE] collections, suggests that this species is widespread in the most oceanic areas of the western Highlands in Scotland, but does not extend to the east of the distribution of *Sticta fuliginosa s. lat*. in the Highlands. In recent field trips I have found it to be widespread in North Wales and have also found it in North Devon (Dunsland), Somerset (Horner Combe) and the Lake District (Gowbarrow Park) in England. It was typically very abundant where it occurs. I have identifiable photographs from Scilly Isles, North Cornwall (Millook), Caernarvonshire, the Lake District (Borrowdale) in England and Islay and Wester Ross. From Ireland, the Burren, Co Clare and Marble Arch, Co Fermanagh. The species is likely to be found throughout the most oceanic parts of the distribution of *S. fuliginosa s. lat*.

Sticta fuliginoides: this species was found to the south west of Exmoor by Magain & Sérusiaux, as well as in south west Ireland. The species was probably not collected much in the past and Brian did not find any specimens in RBGE. I have found it in the field, but not as frequently as *Sticta ciliata*. It was occasional in North Wales, I have found it once in Horner Combe, north Exmoor, while I have seen pictures from North Cornwall (Millook), Scilly Isles and Caernarvonshire. It appears, so far, to be much less widespread than the other species. To date, the only definite record from further north in Britain is from Dunvegan Park, Isle of Skye (see BLS Bulletin 118), but Brian Coppins is familiar with the funnel shipped thalli of this species from Scotland. So far this taxon appears to be the rarest of the three found to date in Britain.

Sticta fuliginosa s. str.: this species was recorded on the western side of Dartmoor by Magain & Sérusiaux, as well as in south west Ireland. Brian found that there were specimens in RBGE, from further east in the Highlands than *Sticta ciliata*. I have found it in the field in every site examined, growing with either *S. ciliata* or *S. fuliginoides*. At all sites, it was invariably less frequent than whichever of the two other species was dominant. So far I have field records from several sites in North Wales and at Horner Combe, north Exmoor and in North Devon (Dunsland) and have seen photographs from Caernarvonshire, Pembrokeshire, Argyll and Western Ross. This species probably occurs throughout the range of *S. fuliginosa s. lat*.

Ecology

The following observations were made during my recent field trips.

Sticta ciliata: Magain & Sérusiaux noted that this species was especially found in the most humid localities. This was also the case in the North Wales, Devon and Somerset sites where I have seen it. In the exceptionally rich ravine of Ceunant Llennyrch in North Wales, *S. ciliata* was abundant deep in the ravine, but was totally replaced by *S. fuliginoides* in the upper more exposed areas. In humid conditions it appears to be quite a rapidly colonising species, more so than the other two species. In Horner Combe, it was observed as forming large colonies on recently fallen ash branches. These must colonise fast and will soon be displaced by big mosses and *Peltigera* species. At Ceunant Llennyrch, Maentwrog it colonised into a monitoring quadrat and developed apothecia between 2005 and 2014.

Sticta fuliginoides: this species has so far been only found in less humid and more open situations than *S. ciliata*. The only two sites at which it has been recorded as frequent (the upper section of Ceunant Llennyrch, Maentwrog & Dunvegan Park, Isle of Skye), lacked *S. ciliata* altogether. In other sites it occurred with *S. ciliata* but was much more infrequent.

Sticta fuliginosa *s. str.*: this species appears quite tolerant and was found equally in sites with either *S. ciliata* or *S. fuliginoides*. So far it was also always less frequent than either species when it occurred with them. In Horner Combe it appears to be more typical of larger older trees; it may be a slower colonising species than *S. ciliata* and be more dependent on older trees. It appears also to extend further east in the Highlands than the more oceanic *S. ciliata*.

Reference

Magain, N. & Sérusiaux, E. (2015). Dismantling the treasured flagship lichen *Sticta fuliginosa* (*Peltigerales*) into four species in Western Europe. *Mycological Progress* **14**: no. 97. (Downloadable free from *http://orbi.ulg.ac.be/handle/2268/186416*).

Thanks to Emmanuël Sérusiaux for permission to reproduce the key in print. The key in this article can be downloaded as a PDF from: *http://wessexlichengroup.org/Species/Sticta_fuliginosa_s_lat/sticta_key/* and consulted at *http://fungi.myspecies.info/taxonomy/term/6262/key*.

Tentative key to species of *Sticta* in continental Europe when lichenized with *Nostoc*

From Magain & Sérusiaux, *Mycological Progress* (2015) 14: 97, DOI 10.1007/s11557-015-1109-0. The structure of the key has been altered to the form used in the LGBI for the comfort of those habituated to this; otherwise the key is as in the original.

To examine the papillae on the cyphella membrane, it is best to cut a very thick section, this leaves the surface of the cyphella undisturbed, but the papillae still clearly visible. Only very limited material is required to do this; a part of a thallus can be snipped off in the field with several cyphellae. The presence of the papillae can also be detected in vertical views, even at quite low magnifications, as a minutely bumpy texture, but cross sections are recommended where there is doubt.

1. Thallus always producing soralia, mainly at the lobe margins … **Sticta limbata**
(*S. limbata* is the only species with soralia in continental Europe; otherwise it has rather large, suborbicular lobes with plane and undulating margins)
1. Thallus never with soralia, always with isidia or phyllidia…………………… 2

2. Thallus with upper surface strongly maculate; margins always and upper surface usually with typical phyllidia ……………….. **Sticta canariensis** (cyanomorph)
(The cyanomorph of *S. canariensis* is easily characterized by the combination of strongly maculate upper surface and production of phyllidia)
2. Thallus with upper surface never strongly maculate; isidia most usually coralloid, never developing into typical phyllidia ..……………………………. 3

3. Papillae on cyphella membrane ……………………………………………… 4
3. Papillae absent on cyphella membrane ……………………………………… 5

4 Thallus rounded, monophyllous (and then typically mushroom-like) or with several rounded lobes, hardly dissected, dark brown, rarely pale greyish; margin typically involute, rarely sparsely ciliate on regenerating lobules; thallus rather robust; papillae on cyphella membrane few per cell; apothecia unknown ………………………………………………………… **Sticta fuliginoides**
(*S. fuliginoides* almost always has an involute margin and mushroom-like habit when young)
4. Thallus rounded to palmate, with lobes rounded (when young) to truncate (when old), dark dull brownish, lead grey or pale greyish; margin usually not involute, most usually ciliate, especially when young; thallus very fragile and easily broken when dry; papillae on cyphella membrane numerous per cell, easily seen in fresh material; apothecia present in well-developed specimens, typically ciliate ……………………………………………………**Sticta ciliata**
(*S. ciliata* is easily recognized by its fragile and irregular thallus with marginal cilia; it is the only [commonly] fertile species amongst all cyanomorphic species of *Sticta* in Europe)

5. Thallus distinctly branched, almost always dichotomously, typically glossy; lobes involute, becoming shallower and usually with ascending margins; lower surface usually dark, especially towards the centre, strongly contrasting with the white cyphellae ……………………………………….………… **Sticta sylvatica**
(*S. sylvatica* typically has a dichotomously branched thallus, with involute lobes and a black lower surface)
5. Thallus not distinctly branched, although lobes can be lacerate or dissected, not typically glossy; lobes rounded, not becoming shallow; lower surface usually pale or brownish, not strongly contrasting with the white cyphellae ……….. 6

6. Lobe surface with distinct swellings, irregular in shape but always present, with isidia developing on their upper parts .... **Sticta atlantica**
(*S. atlantica* has small and irregular swellings on its upper surface and isidia develop on them)

6. Lobe surface with no or irregular swellings, but rather typically reticulate or scrobiculate, and isidia developing on the edges of these dimples .... **Sticta fuliginosa**
(*S. fuliginosa* has no straightforward diagnostic character and can be recognized because it does not have the diagnostic ones of others: no cilia, no mushroom-like appearance, no swellings on upper surface, no dichotomously branched thallus and no papillae on cells of the cyphella membrane)

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Abundance of lichen species on east and west faces of limestone headstones

Abstract: The abundance of 11 lichen species on the east (E) and west (W) faces of 112 limestone churchyard-headstones (62 in North Devon) was studied. A clear pattern emerged of greater cover of *Caloplaca flavescens* and *Diploicia canescens* on the E than on the W face that was statistically extremely significant, while *Protoblastenia rupestris* along with three species of *Verrucaria* showed greater cover on the W than the E face, that was also significant. Five of the 11 lichens showed no significant difference in abundance between E and W faces.

Aspect preferences are discussed in relation to the growth forms of the lichens and the physical drivers of temperature and relative humidity, both of which were monitored at regular intervals over one year. Less variation in temperature and relative humidity was found on the E aspect than the W aspect, thus providing more uniform conditions on the E.

Results were less clear in counties other than North Devon where physical conditions altered, sample sizes were smaller and some different lichen species were encountered. This study raises interesting questions of lichen preference that could usefully be further explored on this and other headstone substrates and in other regions.

Introduction and aim

Among lichenologists surveying churchyards, remarks are often made suggesting that some lichens, e.g. *Caloplaca flavescens*, are more abundant on the east (or west) of headstones, assuming that headstones are universally oriented east (E) and west (W). While north versus south aspect preferences of many saxicolous lichens are generally accepted little is documented on the relative abundance of particular lichens on the E and W faces of churchyard headstones, and scant explanation is given for differences observed.

The aim of this study was to compare the abundance of lichen species on the E- and W-facing aspects of limestone headstones by testing the null hypothesis that there is no significant difference between their abundance on these two aspects. In parallel, measurements of temperature and relative humidity, taken from meters resting on the E and W surfaces, were compared by testing the null hypothesis that there is no significant difference between them. The physical data are used in discussion of the relative abundance of lichens on E and W faces.

Methods

The total number of churchyards visited in the study was 29 with a 'core' of 16 in North Devon. These churchyards are listed, together with grid reference and altitude, in Table 1.

Table 1: Churchyards visited, with grid reference and altitude

North Devon	**GR**	**Alt (m)**		**Somerset**	**GR**	**Alt (m)**
Alverdiscott	SS520252	140		Kingsbury Episcopi	ST436211	17
Atherington	SS591231	120		Long Sutton	ST470253	30
Bishop's Tawton	SS565302	20		North Cadbury	ST635270	70
Chittlehampton	SS636256	105		Tintinhull	ST498197	40
Coombe Martin	SS586463	30		**Cornwall**	**GR**	**Alt (m)**
Fremington	SS512325	10		Blisland	SX101732	155
High Bickington	SS599206	160		St Colomb Minor	SW839625	45
Marwood	SS545375	116		St Enoder	SW892569	105
Merton	SS525120	75		St Mawgan	SW873659	40
Mortehoe	SS457452	100		**Norfolk**	**GR**	**Alt (m)**
Northam	SS448291	50		Ashwell Thorpe	TM153968	57
Stoke	SS235247	87		Forncett	TM164940	34
Swimbridge	SS622300	50		**Miscellaneous**	**GR**	**Alt (m)**
Tawstock	SS560299	50		Llandybie, Wales	SN618156	110
Winkleigh	SS633081	170		Sark, C.I.	SV462760	101
Yarnscombe	SS562236	140		Shipton Moyne, Glos	ST882896	110

Selection of headstones

A total of 112 limestone headstones (62 in North Devon) was studied. Four headstones were selected in each churchyard, with the exception of Marwood (2), St Enoder (2), Sark (2) and Tintinhull (6). The heights of nearly all headstones were in the range 90–150 cm and width 55–75 cm with the exception of those at Shipton Moyne and Sark where the stones were shorter, about 50–70 cm, but of similar width to the majority.

A preliminary visit was made to each churchyard in order to locate limestone headstones in different parts of the yard so as to minimise factors other than aspect, using the following guidelines:

- An open location with no obvious shading
- Vertical stones without tilt
- Mid-Victorian in age (see Table 2)
- Inscription that could be read

The date range for the 62 North Devon headstones was 1825 to 1902 with a mean date of 1872 (median 1875), while the date range for all 112 headstones was 1765 to 1909, with a mean date of 1866 (median 1870), as shown in Table 2.

Table 2: Dates of headstones

	North Devon headstones	**All headstones**
Number	62	112
Range of Dates	1825 – 1902	1765 – 1909
Median	1875	1870
Mean	1872	1866
Standard deviation	17.91	26.10
99% confidence interval	1866.32 – 1878.42	1859.39 – 1872.32
Standard error of the mean	2.27	2.47

The Fairchild 1882 headstone. Left: E face. Right: W face.

Factors

Several abiotic (physical) factors are likely to influence the percentage cover (abundance) of a lichen on the face of a headstone. These include: the nature of the stone used for the headstone (chemistry, pH, texture, age); temperature (maximum, minimum, mean); relative humidity (maximum, minimum, mean); wind (direction, force); rain (prevailing direction, annual amount); light (quantity, wavelength, reflected); nutrient enrichment; and airborne salt. Man-made factors include: airborne pollutants (including carbon, nitrogen and sulphur compounds); and churchyard maintenance (including cleaning of stones; effect of grass, clippings, weedkiller and fertilizer). Biotic factors include: characteristics of each lichen (thallus type, growth rate, reproduction, pigment, production of lichen substances, physiology of photobiont and mycobiont); competition; and predation. Overall, the situation is complex and it is difficult to assess the impact of so many variables.

The substrate, limestone, was chosen for this study as it is well represented in North Devon churchyards and supports a range of lichens that occur widely. Some factors, including substrate, can be taken as constant for both E and W faces of a given headstone. In the churchyards visited inscriptions, variable among themselves, often faced a pathway and as many faced E as W, so inscription aspect was disregarded as being an important factor in this study. It was suspected that variations in temperature and relative humidity could be important and, moreover, their measurement was practical, dependent on only modest equipment. Results obtained could be related to key characteristics of lichen species whose abundance on E and W faces would be recorded.

Sampling

A standard proforma was developed and used to record observations. Each completed proforma carried site information (eg grid reference, altitude and sketch diagrams of each stone, with its measurements and location in the yard) and inscription (name or noticeable legend, and date).

The E- and W-facing aspects of each selected limestone headstone were divided into three sections with string (see Photograph 1) allowing for easy and accurate recording of abundance for each lichen species. The percentage cover (abundance) of each lichen was recorded for each headstone on E and W faces. Abundance data was summed and adjusted to give the total percentage cover of each species on each aspect, used in comparisons and statistical tests. The lichens recorded by churchyard (on headstones studied) are listed in Table 3 (appended). For detailed study we selected species that were present in most churchyards.

Temperature and relative humidity

A limestone headstone (Fairchild, 1882) in Alverdiscott churchyard was selected for day-long observations of temperature and relative humidity at approximately monthly intervals over a year (11 sets of data in all). For these measurements a pair of identical maximum and minimum electronic meters with resetting facilities was used. The pair of meters was attached to the stone at approximately one-third the distance from the top of the stone (see Photograph 1) and the readings corresponded to the atmosphere just above the stone surface, taken as a proxy for the stone itself. Readings commenced at dawn and continued hourly until dusk on days without precipitation. (The equipment did not enable recording during rain.) Maximum and minimum values at each hourly reading were recorded for temperature and relative humidity. The data collected from the Alverdiscott headstone provided a benchmark for temperature and relative humidity in the study as a whole.

Temperature and relative humidity records for Alverdiscott were compared with data from the Meteorological Office station at nearby Chivenor, that provided reference to a broader range of data including hours of daylight and wind direction.

Statistical tests

Paired t-tests to find the significance of any difference in abundance of a lichen on E and W faces were applied to selected species: *Aspicilia calcarea, Caloplaca flavescens, Clauzadea monticola, Diploicia canescens, Lecanora campestris, Physcia adscendens, Protoblastenia rupestris, Solenopsora candicans, Verrucaria baldensis, Verrucaria hochstetteri* and *Verrucaria nigrescens*. The tests were carried out for North Devon (62 headstones), supplemented by tests on results from headstones in other regions, including Somerset, North Cornwall and Norfolk, and also for the overall total of 112 headstones.

For temperature and relative humidity on the benchmark headstone the results included the maximum and minimum values and the ranges of each, across each day's readings. Paired t-tests were then applied to find the significance of differences in the ranges of both temperature and also relative humidity between the E and W faces of the headstone, using the 11 sets of results obtained across the year.

Results

Scatter diagrams of North Devon results for lichen percentage-cover were used to guide the choice of parameters for analysis with statistical tests. A notable difference was found between the abundance of *C. flavescens* on the E and on the W faces of the headstones. It also seemed that the abundance of *C. flavescens* broadly increased as total lichen cover increased on a headstone face. However, no clear relationship was evident between the abundance of *C. flavescens* and either the diversity of lichens or the headstone date. Thus any differences between the abundance of lichen on E and W faces of a headstone could be primarily attributed to differences in a prevailing independent physical factor or factors.

Of 63 lichen species recorded for the 112 limestone headstones selected for the study, 41 were recorded on the 62 North Devon stones (see Table 3, appended). Results were compared statistically in groups for: all headstones (112) for which results had been obtained; North Devon headstones (62); Somerset headstones (18); North Cornwall headstones (14); and Norfolk headstones (8). Results for these groupings (except Norfolk) are shown in Tables 4 and 5.

Paired t-tests carried out for *Aspicilia calcarea, Clauzadea monticola, Lecanora campestris, Physcia adscendens* and *Solenopsora candicans* did not show any significant difference between abundance (percentage cover) on the E and W faces.

Table 4. Lichen abundance E:W for all and North Devon headstones

Species	All = 112 headstones						
	E % cover		W % cover				
	mean	s.d.	mean	s.d.	t	p	sig
Caloplaca flavescens	25.85	14.26	17.79	12.22	6.29	< 0.0001	ext
Diploicia canescens	6.35	10.01	2.05	4.35	4.70	< 0.0001	ext
Protoblastenia rupestris	3.28	6.79	6.58	9.50	3.47	0.0007	ext
Verrucaria baldensis	2.27	4.25	3.88	6.97	2.68	0.0084	very
Verrucaria hochstetteri	1.21	2.31	3.24	6.03	3.48	0.0007	ext
Verrucaria nigrescens	11.26	0.40	13.90	12.66	2.11	0.0369	sig
	North Devon = 62 headstones						
	E % cover		W % cover				
	mean	s.d.	mean	s.d.	t	p	sig
Caloplaca flavescens	27.02	14.34	17.08	11.89	6.35	< 0.0001	ext
Diploicia canescens	3.80	6.96	0.46	1.50	3.74	0.0004	ext
Protoblastenia rupestris	5.00	8.45	10.02	10.88	3.21	0.0021	very
Verrucaria baldensis	2.71	4.15	5.05	8.43	2.46	0.0167	sig
Verrucaria hochstetteri	1.24	2.10	4.04	6.62	3.44	0.0010	very
Verrucaria nigrescens	10.81	6.66	15.37	10.87	3.01	0.0038	very
ext = extremely significant; very = very significant; sig = significant							

For all 112 headstones, percentage cover of *Caloplaca flavescens*, *Protoblastenia rupestris* and *Diploicia canescens* differed at an extremely significant level between the E and W faces, with greater cover on the E face for *C. flavescens* and *D. canescens* and the reverse for *P. rupestris* (see Photographs 1 and 2). The three *Verrucaria* species also showed significantly higher cover on the W than the E face. The same overall pattern of species cover was found for the North Devon headstones (Table 4). While lower sample numbers may have influenced reliability and confidence in results, lichen cover for Somerset was not found to be significantly different between E and W aspects for any of the species tested (Table 5). For North Cornwall, only *C. flavescens* was very significantly different, with higher percentage cover on the E face. In Norfolk (not shown in tables), the percentage cover of *C. flavescens* on E and W faces did not differ significantly, although *D. canescens* was significantly greater on the E aspect.

Table 5 Lichen Abundance E : W for Somerset and North Cornwall headstones

Species	Somerset = 18 headstones						
	E % cover		W % cover				
	mean	s.d.	mean	s.d.	t	p	sig
Caloplaca flavescens	28.26	12.22	24.48	13.63	0.84	0.41	n.s.
Diploicia canescens	13.16	15.38	4.77	5.51	2.07	0.054	n.q.
Protoblastenia rupestris	1.60	3.54	4.54	7.26	1.40	0.180	n.s.
Verrucaria baldensis	2.33	2.54	4.98	5.61	1.94	0.069	n.q.
Verrucaria hochstetteri	2.20	3.73	3.43	7.24	0.62	0.546	n.s.
Verrucaria nigrescens	8.87	7.00	12.13	11.06	1.09	0.290	n.s.
	North Cornwall = 14 headstones						
	E % cover		W % cover		t	p	sig.
	mean	s.d	mean	s.d			
Caloplaca flavescens	20.26	15.16	13.07	12.66	3.71	0.0026	very
Diploicia canescens	6.22	7.35	4.28	6.62	0.86	0.484	n.s
Protoblastenia rupestris	1.88	2.91	1.64	2.47	0.36	0.725	n.s

Verrucaria baldensis	–	–.	–	–	–	–	–
Verrucaria hochstetteri	–	–	–	–	–	–	–
Verrucaria nigrescens	22.59	21.01	19.45	23.21	0.50	0.628	n.s.
ext = extremely significant; very = very significant; sig = significant; n.q. = not quite significant; n.s. = not significant							

The results of the paired t-tests of the diurnal ranges found for temperature and relative humidity are shown in Table 6. For each parameter, the average of the monthly ranges was greater on the W face than the E, and statistically very significant. Also notable are the overall maximum temperatures recorded for the stone substrate, both on the E (36.4°C) and on the W (39.2°C), that are considerably higher than the maximum of the air temperatures reported for the same days at the local Meteorological Station at Chivenor (25°C). In North Devon the maximum relative humidity measurements were generally high on both faces though on clearer days with some sunshine the minimum values were usually lower on the W than on the E.

Table 6 Alverdiscott Headstone: Temperature and Relative Humidity

	TEMPERATURE								RELATIVE HUMIDITY					
	EAST			WEST			MET OFFICE		EAST			WEST		
	Min °C	Max °C	**Range °C**	Min °C	Max °C	**Range °C**	Min °C	Max °C	Min %	Max %	**Range%**	Min %	Max %	**Range%**
Jan	**-1.5**	1.4	**2.9**	-1.6	15.6	**17.2**	**-2**	7	73	87	**14**	49	87	**38**
Feb	0.3	7.9	**7.6**	0.2	10.7	**10.5**	n/a	n/a	60	90	**30**	62	89	**27**
Mar	-1.4	15.4	**16.8**	**-1.8**	28.3	**30.1**	0	12	48	92	**44**	15	95	**80**
Apr	10.9	24.8	**13.9**	10.8	34.6	**23.8**	13	**25**	40	72	**32**	25	74	**49**
May	9.9	20.6	**10.7**	9.8	27.1	**17.3**	11	16	48	93	**45**	29	97	**68**
June	16.5	**36.4**	**19.9**	9.2	**39.2**	**30.0**	13	21	**17**	75	**58**	**11**	93	**82**
July	14.8	35.0	**20.2**	13.0	26.3	**23.3**	16	23	25	75	**50**	19	79	**60**
Aug	15.7	29.0	**13.3**	11.3	26.5	**15.2**	12	18	42	74	**32**	45	96	**51**
Sept	7.4	18.1	**10.7**	7.6	31.4	**23.8**	10	16	58	90	**32**	31	90	**59**
Nov	0.9	8.7	**7.8**	0.7	10.0	**9.3**	3	11	59	96	**37**	59	96	**37**
Dec	2.9	4.4	**1.5**	2.9	4.4	**1.5**	4	6	84	**97**	**13**	85	**98**	**13**
Mean Range			**11.4**			**18.4**					**35.2**			**51.3**
p			**0.0015**								**0.0018**			
sig			**Very significant**								**Very significant**			
sig = significance; figures in red denote extreme values (maximum or minimum)														

Discussion and Conclusions

From comparison of temperature and relative humidity ranges on the surface of a North Devon limestone headstone at Alverdiscott we can conclude that these physical conditions are more extreme and stressful on the W than the E face. On the W, conditions can become hotter and drier but they remain more equitable on the E face, disproving the null hypothesis. While higher temperatures on the W can drive down the relative humidity on this face, the W is also likely to be subjected to more rain (that is possibly more salt-laden) due to the prevailing south-west winds.

The lichens *Caloplaca flavescens* and *Diploicia canescens* show larger percentage cover (abundance) on the E than on the W face of limestone headstones in North Devon (62) and for all headstones studied (112). Both of these lichens have placodioid growth forms that could be more prone to physical damage from wind and driving rain of the W aspect, and their metabolism may be favoured in the less extreme, more constant temperature and relative humidity on the E face. Conversely, *Protoblastenia rupestris* and species of *Verrucaria* show larger percentage cover on the more exposed W than on the E aspect; being 'superficial' (rather than crustose) or endolithic they may be more protected and tolerant of the more extreme conditions on this aspect. However, t-test results for five of the 11 species, including superficial, crustose, placodioid and foliose growth forms, indicate no statistically significant preference for either the E or W aspect.

The lack of a pattern of abundance, similar to that found for All Headstones and for North Devon, in adjacent counties Somerset and North Cornwall may be due to small sample sizes, as well as being influenced by differences in geography, distance from the sea and local wind direction. Other factors may also play a role, such as variation in the type of limestone available in the mid-Victorian era, when it was likely to have been quarried nearby. It is possible that replacement of *Caloplaca flavescens* by some other lichens on the E face, eg by *C. aurantia* in Somerset and *C. ruderum* in Norfolk (see Table 3), may affect the significance of statistical results in these counties. Further local studies could test these possibilities.

Resources

Most of the data for this study was collected in 2010–2012. While we recognise there have been nomenclature and taxonomic changes since then, it is unlikely they would have any marked impact on the results of this particular study. Nomenclature and descriptions of lichens were based on:

Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O., James, P.W. & Wolseley, P.A. (2009). *The Lichens of Great Britain and Ireland*. London: British Lichen Society.

BLS Taxon Dictionary on the website www.britishlichensociety.org.uk

BLS Churchyard Recording Card (2010) on the website www.britishlichensociety.org.uk

The following were used for statistical analysis and guidance:

Chalmers, N. & Parker, P. (1986). *The OU Project Guide. Fieldwork and Statistics for Ecological Projects*. Preston Montford: Field Studies Council

Calculator tools on www.GraphPad.com for the calculation of p value and statistical significance

For the measurement of temperature and relative humidity we used:

Jumbo Display Memory ThermoHygrometer, available from Property Repair Systems, Newton Abbott, Devon

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Appendix (table 3): lichen records by churchyard (on headstones in study)

REGION	North Devon		Somerset	Cornwall	Norfolk	Misc	Total	
NUMBER OF CHURCHYARDS	16		4	4	2	3	29	
LICHEN	n	%	n	n	n	n	n	%
Acrocordia conoidea	2	12.5	–	–	–	1	3	10.3
Aspicilia calcarea	12	75	4	–	–	3	19	65.5
A. contorta subsp. *contorta*	–	–	–	–	–	1	1	3.4
A. contorta subsp. *hoffmanniana*	–	–	–	–	–	1	1	3.4
Belonia nidarosiensis	5	31.3	3	4	1	–	13	44.8
Bilimbia sabuletorum	1	6.25	–	1	–	–	2	6.9
Caloplaca aurantia	1	6.5	4	–	–	–	5	17.2
C. citrina s. lat.	16	100	4	4	–	3	27	93.1
C. dalmatica	4	25	–	–	–	2	6	20.7
C. decipiens	–	–	1	–	–	–	1	3.4
C. dichroa	–	–	–	1	–	–	1	3.4
C. flavescens	16	100	4	4	2	3	29	100
C. flavocitrina	–	–	–	–	–	1	1	3.4
C. oasis	2	12.5	1	–	–	1	4	13.8
C. ruderum	–	–	–	–	2	–	2	6.9
C. teicholyta	4	25	3	–	2	–	9	31
C. xantholyta	2	12.5	–	–	–	–	2	6.9
Candelariella aurella forma *aurella*	–	–	1	–	–	–	1	3.4
C. medians forma *medians*	–	–	2	–	–	–	2	6.9
Catillaria lenticularis	7	43.8	2	2	–	1	12	41.4
Clauzadea monticola	13	81.3	–	4	1	–	18	62.1
Collema auriforme	1	6.25	–	1	–	1	3	10.3
Diploicia canescens	14	87.5	4	3	2	2	25	86.2
Diplotomma alboatrum	4	25	1	–	–	–	5	17.2
Dirina massiliensis forma *sorediata*	–	–	–	1	–	–	1	3.4
Lecania erysibe s. str.	1	6.25	–	–	–	–	1	3.4
Lecanora albescens	16	100	4	4	2	3	29	100
L. campestris subsp. *campestris*	11	68.8	4	4	2	–	21	72.4
L. crenulata	1	6.25	1	–	–	–	2	6.9
L. dispersa	1	6.25	2	–	–	1	4	13.8
L. muralis	1	6.25	–	–	–	–	1	3.4
Lecidella stigmatea	–	–	–	1	1	–	2	6.9
Lepraria incana s. lat.	–	–	–	1	–	–	1	3.4

L. nivalis	–	–	–	1	–	–	1	3.4
Leprocaulon microscopicum	–	–	–	1	–	–	1	3.4
Leptogium gelatinosum	–	–	1	–	–	–	1	3.4
L. plicatile	–	–	1	–	–	–	1	3.4
Opegrapha calcarea	4	25	–	2	–	–	2	20.7
Phaeophyscia orbicularis	2	12.5	1	–	–	–	3	10.3
Phlyctis argena	1	6.25	–	–	–	–	1	3.4
Physcia adscendens	8	50	4	2	2	2	18	62.1
P. tenella	2	12.5	–	–	–	–	2	6.9
P. tribacia	–	–	1	–	–	–	1	3.4
Physconia grisea	1	6.25	1	–	–	–	2	6.9
Protoblastenia calva	1	6.25	1	–	–	–	2	6.9
P. rupestris	16	100	3	4	1	–	24	82.8
Ramalina lacera	–	–	1	–	–	–	1	3.4
R. siliquosa	–	–	–	2	–	–	2	6.9
Sarcogyne regularis	1	6.25	–	–	–	–	1	3.4
Solenopsora candicans	9	56.3	4	1	1	1	16	55.2
Thelidium decipiens	–	–	2	–	–	–	2	6.9
T. incavatum	1	6.25	–	–	–	–	1	3.4
Toninia aromatica	5	31.3	2	1	1	–	9	31
Verrucaria baldensis	15	93.8	4	2	–	2	23	79.3
V. fuscella	2	12.5	–	–	–	–	2	6.9
V. hochstetteri	15	93.8	4	4	2	1	26	89.7
V. macrostoma forma *macrostoma*	1	6.25	1	–	–	1	3	10.3
V. macrostoma forma *furfuracea*	1	6.25	–	–	–	–	1	3.4
V. muralis	–	–	–	–	1	–	1	3.4
V. nigrescens forma *nigrescens*	16	100	4	4	2	2	28	96.6
Verrucaria viridula	–	–	3	–	–	–	3	10.3
Xanthoria calcicola	–	–	1	–	–	–	1	3.4
Xanthoria parietina	3	18.8	2	1	1	–	7	24.1
TOTAL NUMBER OF SPECIES NOTED BY REGION AND OVERALL	**41**		**36**	**26**	**17**	**21**	**63**	

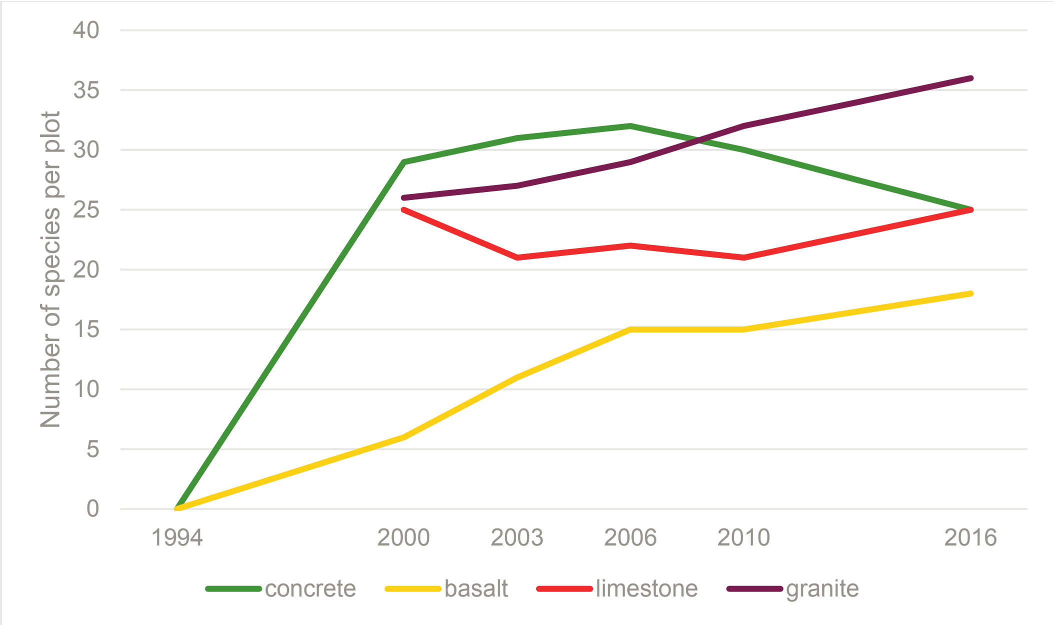
Lichen succession on different rock types on the Van Ewijcksluis dike monument

It is a well-known fact that lichens colonize different substrata with different speed. Lichen colonization of rocky substrates is a relatively slow process though. There is probably a difference in colonization rate and succession between different rock types, but there are no hard data showing this, and there are many other biotic and abiotic factors influencing lichen colonization.

In 1994, at the occasion of some major sea-dike reconstruction, the perfect experimental set-up was unintentionally created to compare lichen succession on different rock types. On one side of a dyke, facing inland and south-exposed, four different areas of the same size (roughly 10 x 20 m each) were covered by four different rock types, *viz.* limestone, basalt, granite and concrete columns (Basalton®). The stones were probably devoid of lichens when placed on the diyke, as no surviving older thalli were observed in 2000, and all lichens were located in normal positions, not all on one side of a boulder, which would be the case when boulders with lichens still attached would have been used. Well-developed lichen vegetation for all rock types is present at a distance of 5-10 km. All other biotic and abiotic variables are the same. It should be noted that the rock faces are close to the sea and in an Atlantic climate, but south-exposed and thus dry during much of the day.

Since 2000, the lichens of the four plots have been investigated five times. All stones were examined, and presence/absence of species was noted. The results are presented here as a help to calibrate lichen vegetation succession observed in similar situations. It can also be referred to when discussing restoration time after disturbance. Tables 1-4 give the species lists noted on the four substrata in 2000, 2003, 2006, 2010, and 2016. Figure 1 gives the number of species observed.

The experimental plots:
above left, concrete; above right, basalt; below left, limestone; below right, granite.



Succession graph for the four rock types

The observations/conclusions that can be made are discussed below. It should be noted that most are in full agreement with currently perceived ecological traits of lichens, but that the calibration part is new in most cases.

1. Lichens colonize calcareous rock more rapidly than siliceous rock. Within 7 years, the number of lichen species on limestone and concrete was already at a stable top level.
2. The number of lichen species on the concrete dropped slightly after 20 years. This can be attributed to competition with mosses and vascular plants, which colonize concrete much faster than the other substrata. On other substrata, competition with mosses and vascular plants plays no role even after 20 years.
3. On basalt, the number of species is almost proportional to time of exposure. On granite, the number of species is still increasing after 23 years, but at a lower rate than initially.
4. There is a guild of pioneer lichens on siliceous rock, but these are not numerous. These include in our study *Lecidea variegatula, Micarea erratica,* and *Trapelia coarctata*, all species that are most common on small pebbles, which is a rather ephemerous substrate as they tend to be rapidly overturned or overgrown. They vanish after 10-20 years.
5. Large foliose lichens (*Parmeliaceae*) are the most prominent element of late succession species on siliceous rock. The first species (*Xanthoparmelia pulla*) arrived on the granite after 10 years; after 20 years two further *Parmeliaceae* were established on the granite, while none are as yet present on the basalt after 23 years.

6. There is a guild of late succession species on calcareous rock. They are characteristic of weathered concrete, old buildings or rock fissures. These include *Caloplaca dichroa, Toninia aromatica* and *Verrucaria polysticta*. They arrive after 20 years or so.
7. After 20 years, lichen cover is fairly high on all substrata, but there is still empty rock available for colonization. Competition between lichens plays some role but probably does not prevent the colonization by additional species.

The above observations can serve to help dating lichen succession stages, at least on more or less comparable sites. Of course, only relatively young guilds can be calibrated with the above data. The development of lichens in the plots will be followed in future, if circumstances permit.

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Lichens on concrete	**2000**	**2003**	**2006**	**2010**	**2016**
Amandinea punctata	•				
Aspicilia calcarea		•	•		
Aspicilia contorta	•	•	•	•	•
Caloplaca arcis		•	•	•	•
Caloplaca citrina	•	•	•	•	•
Caloplaca decipiens	•	•	•	•	•
Caloplaca dichroa					•
Caloplaca flavocitrina	•	•	•	•	
Caloplaca flavovirescens	•	•	•	•	•
Caloplaca holocarpa	•	•	•	•	•
Caloplaca maritima	•	•	•	•	•
Caloplaca oasis	•	•	•	•	
Caloplaca saxicola	•	•	•	•	
Caloplaca teicholyta			•	•	•
Candelariella aurella	•	•	•	•	•
Candelariella medians	•	•	•	•	

Lichens on concrete	**2000**	**2003**	**2006**	**2010**	**2016**
Lecania erysibe	•	•	•	•	
Lecania rabenhorstii	•	•	•	•	•
Lecanora albescens	•	•	•	•	
Lecanora campestris		•	•	•	
Lecanora dispersa	•	•	•	•	•
Lecanora hageni	•	•	•	•	•
Lecanora muralis	•	•	•	•	•
Lecanora semipallida	•	•	•	•	
Lecidella stigmatea	•	•	•	•	•
Phaeophyscia orbicularis	•	•	•	•	•
Physcia adscendens	•	•	•	•	•
Physcia tenella	•	•	•		
Rinodina gennarii	•	•	•	•	•
Sarcopyrenia gibba	•				
Toninia aromatica					•
Verrucaria muralis	•	•	•	•	
Verrucaria nigrescens	•	•	•	•	•
Verrucaria polysticta					•
Xanthoria calcicola	•	•	•	•	•
Xanthoria elegans		•	•	•	
Xanthoria parietina	•	•	•	•	•
Total species number	29	31	32	30	23

Lichens on basalt	**2000**	**2003**	**2006**	**2010**	**2016**
Acarospora fuscata			•		
Amandinea punctata	•	•	•	•	•
Buellia aethalea					•
Buellia ocellata		•	•	•	•
Caloplaca holocarpa		•	•	•	•
Caloplaca oasis			•	•	•
Caloplaca subpallida					•
Candelariella vitellina	•	•	•	•	•
Catillaria chalybeia		•			•

Lichens on basalt	2000	2003	2006	2010	2016
Cladonia humilis				•	
Lecanora campestris				•	
Lecanora hagenii	•	•	•	•	•
Lecanora muralis		•	•	•	•
Lecanora polytropa		•	•	•	•
Lecidella scabra		•	•	•	•
Lecidella stigmatea	•				
Phaeophyscia orbicularis			•	•	•
Physcia adscendens			•	•	•
Rhizocarpon reductum					•
Rinodina gennarii			•		
Xanthoria calcicola	•	•	•	•	•
Xanthoria parietina	•	•	•	•	•
Total species number	6	11	15	15	18

Lichens on limestone	2000	2003	2006	2010	2016
Aspicilia calcarea		•	•	•	•
Aspicilia contorta	•	•	•	•	•
Caloplaca arcis					•
Caloplaca aurantia				•	•
Caloplaca citrina	•				
Caloplaca decipiens	•	•	•	•	•
Caloplaca flavescens		•	•	•	•
Caloplaca flavocitrina	•	•	•	•	•
Caloplaca holocarpa	•	•			
Caloplaca maritima	•				
Caloplaca oasis	•	•	•	•	•
Caloplaca saxicola	•	•	•	•	•
Caloplaca teicholyta	•	•	•	•	•
Candelariella aurella	•	•	•	•	•
Candelariella medians	•	•	•	•	•
Lecania erysibe	•	•	•		
Lecania rabenhorstii	•	•	•	•	•

Lecanora albescens	•	•	•	•	•
Lecanora campestris	•				
Lecanora dispersa	•	•	•	•	•
Lecanora muralis					•
Lecanora semipallida	•	•	•	•	•
Lecidella stigmatea					•
Phaeophyscia orbicularis	•	•	•	•	•
Physcia adscendens	•				
Physcia tenella	•				
Toninia aromatica					•
Verrucaria fuscella		•	•		
Verrucaria muralis	•	•	•	•	•
Verrucaria nigrescens	•	•	•	•	•
Verrucaria ochrostoma	•		•	•	•
Xanthoria calcicola	•		•	•	•
Xanthoria parietina	•	•	•	•	•
Total species number	25	21	22	21	25

Lichens on granite	**2000**	**2003**	**2006**	**2010**	**2016**
Acarospora fuscata	•	•	•	•	•
Acarospora smaragdula					•
Acarospora veronensis		•	•	•	•
Amandinea punctata	•	•	•	•	•
Buellia aethalea	•	•	•	•	•
Buellia badia					•
Buellia ocellata	•	•	•	•	•
Caloplaca crenularia			•	•	•
Caloplaca holocarpa	•	•	•	•	•
Candelariella vitellina	•	•	•	•	•
Catillaria chalybeia		•	•	•	•
Lecanora campestris	•	•	•	•	•
Lecanora hageni	•	•	•	•	•
Lecanora intricata	•	•	•	•	•

Lichens on granite	2000	2003	2006	2010	2016
Lecanora muralis	•	•	•	•	•
Lecanora polytropa	•	•	•	•	•
Lecanora rupicola				•	•
Lecidea grisella	•	•	•	•	•
Lecidea variegatula	•	•	•	•	
Lecidella scabra	•	•	•	•	•
Lepraria incana				•	•
Micarea erratica	•				
Parmelia sulcata					•
Parmotrema perlatum					•
Phaeophyscia orbicularis		•	•	•	•
Physcia adscendens			•	•	•
Physcia caesia				•	•
Physcia tenella					•
Polysporina simplex	•	•	•	•	•
Porpidia macrocarpa	•	•	•	•	•
Rhizocarpon reductum	•	•	•	•	•
Rinodina gennarii	•				
Scoliciosporum umbrinum	•	•	•	•	•
Tephromela atra	•	•	•	•	•
Trapelia coarctata	•	•	•	•	
Trapelia glebulosa					•
Trapelia placodioides	•	•	•	•	•
Verrucaria nigrescens	•				
Xanthoparmelia pulla		•	•	•	•
Xanthoria calcicola	•	•	•	•	•
Xanthoria parietina	•	•	•	•	•
Total species number	26	27	29	32	36

Lichenometric dating in the Austrian Alps: a fieldtrip report and results review

In the summer of 2016, the author spent two weeks in the Zillertal region of the Austrian Alps conducting lichenometric research for completion of the degree MSc Environmental Science by Research at Queen Mary University of London. This research was, in part, funded by the British Lichen Society, after a successful grant application was made. The following article reports on the fieldwork undertaken, reviews the results that were ascertained, and provides a brief overview of the conclusions that were drawn as a result of the completion of a thesis entitled '*Testing the reliability of lichenometric dating in a continental high altitude site: a study in the Austrian Alps',* which can be provided via email for those interested in reading the full thesis.

Figure 1: Panoramic photograph of the upper Zemmgrund, taken from the true right lateral moraine in the Waxeggkees valley.

Between the 30th of June and the 14th of July 2016, fieldwork was conducted in the glacial forelands of the upper Zemmgrund valley, Austria (Figure 2). The upper Zemmgrund itself consists of three small glacial valleys; the Waxeggkees, the Hornkees, and the Schwarzensteinkees. It was however, only the Waxeggkees (B, Figure 3) and the Schwarzensteinkees (C, Figure 3) forelands which were investigated, as the Hornkees foreland was investigated the previous summer.

The environments within the study sites have been classified as alpine meadows and alpine pastures (Bossert, 2014), with the present-day treeline at 2250 m a.s.l. (Pindur, 2001). For the fieldwork the Berliner Hutte (D, Figure 3) was used as a basecamp, where rooms were rented with a half board package The Hut was initially constructed in 1879, and has been continually developed since then meaning a reliable archive of the surrounding environments has been developed. It is situated at 2042 m above sea level, and is within a 15 minute walk of all three glacial forelands, making it a prominent feature on the Berlin High Trail; a 70 km hiking trail that cuts through the study site.

Lichen-size measurement from siliceous rocks of the same lithology was carried out on four moraines in the Schwarzensteinkees foreland, and on two moraines in the Waxeggkees foreland. Each moraine was divided into ten sampling locations at equal distances apart. Following methods similar to those of Matthews (2005) and Golledge *et al.* (2010), measurements were made within a transect, and data collection was further enhanced by collecting data on the distal slope, crest and proximal slope of

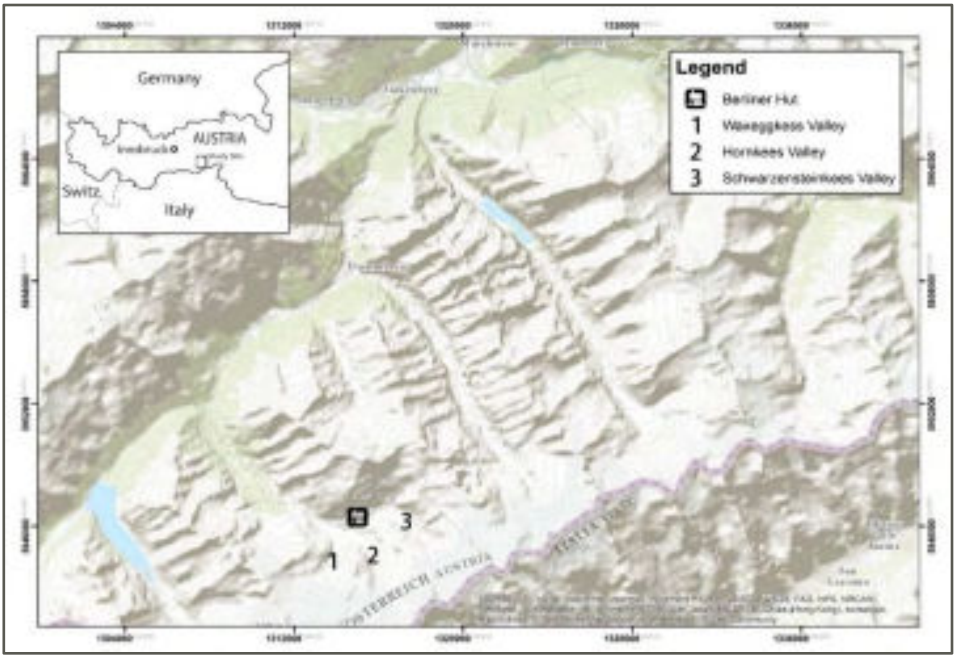

Figure 2: Location map of the study site, highlighting the Waxeggkees and the Schwarzensteinkees forelands and the Berliner Hut (which was the base camp for all expeditions).

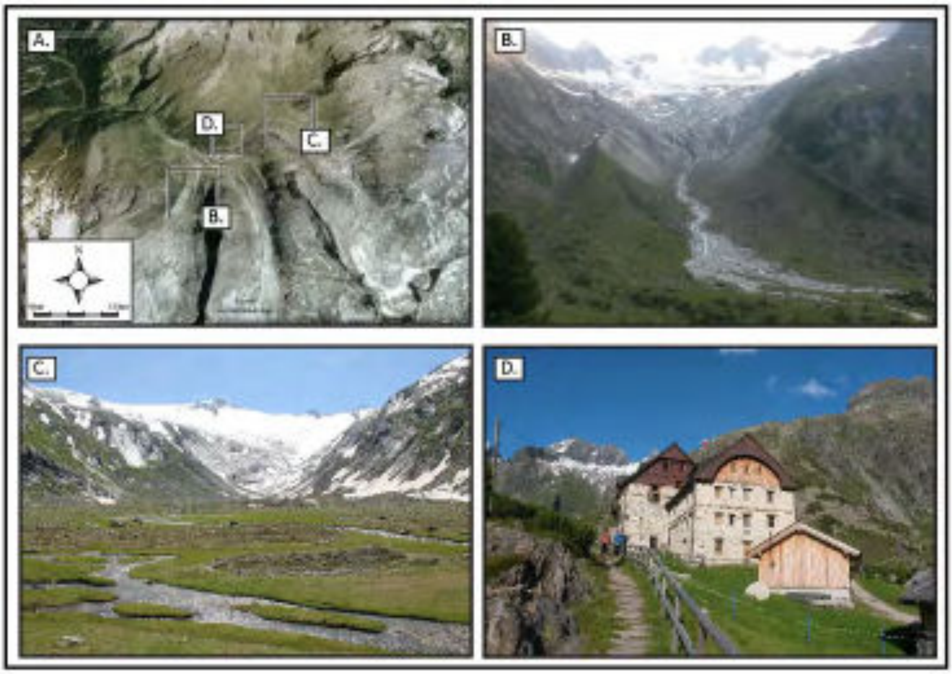

Figure 3: Study site photographs: A - Aerial photograph overview, B - Waxeggkees valley, C - Schwarzensteinkees valley, and D – The Berliner Hutte.

each moraine. Different sides of the moraines are not normally sampled in conjunction with each other, therefore providing new information about lichen-size and lichen-population distributions. Lichen size measurements of the longest axis were used, as it is broadly considered the most suitable measurement parameter (Karlen, 1977; cited in Locke et al., 1979) and Innes (1986a) states that measuring the longest axis is most dependable.

In each transect, measurements of 100 lichen thalli were made, amounting to a total of 300 lichen measurements per sample location, and 3,000 lichen measurements per moraine. This approach was taken as larger sample sizes are considered more reliable (Stockwell and Peterson, 2002; Hernandez *et al.*, 2006), and few lichenometric investigations compile datasets of more than several thousand lichen size measurements. The total count of lichen-size measurements exceeded 24,000 values and, as was stated within the research limitations of the final thesis, complex statistical analysis was not possible, due to time limitations

While in the field eight lichen growth stations were established and at each growth station between three to six lichen thalli were recorded (Figure 4).

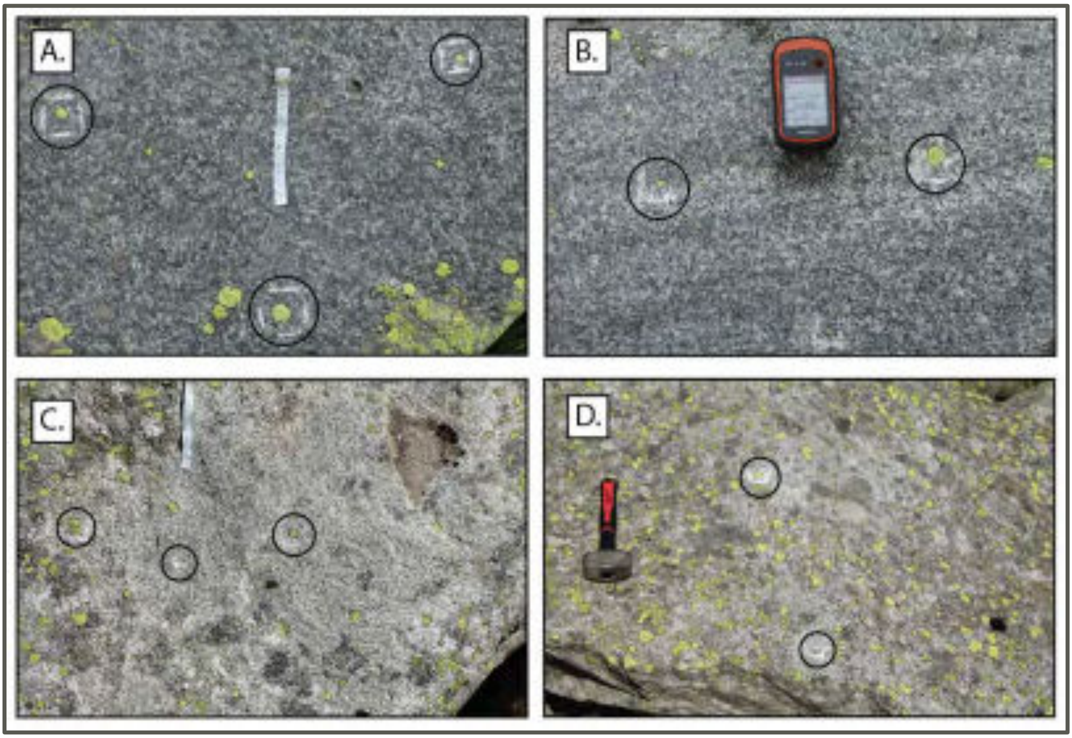

Figure 2: Examples of lichen growth stations constructed within the three valleys of the upper Zemmgrund.

These growth stations were not used for the MSc research directly, but were established with the intention of providing the opportunity for future research, conforming to Osborn *et al.*'s (2015) criteria for the improvement of lichenometric data by founding long term monitoring of lichen growth. The information regarding these lichenometric growth stations is freely available upon request, and future recording of these stations is particularly encouraged if fellow readers are in the locality or undertaking lichenometric monitoring.

The lichen size measurement data for the Waxeggkees and Schwarzensteinkees valleys showed a notable increase in lichen size (largest diameter) with distance from current glacier front. This is consistent with lichenometric dating literature that suggests lichen size is relative to substrate age. This is most notable in the Schwarzensteinkees foreland where there is the greatest range in distances between moraines, although it is still noticeable within the Waxeggkees foreland. The following tables (Table 1 and 2) provide summary statists for the four individual moraines of the Schwarzensteinkees foreland and two individual moraines of the Waxeggkees, the two glacial forelands investigated in 2016.

Table 1: Summary statistics of lichen measurements for each moraine in the Schwarzensteinkees: DS = Distal Slope, C = Crest and PS = Proximal Slope. The number in red indicates the presence of an anomalously large lichen, identified following methods established by Calkin and Ellis (1980). Therefore the next largest lichen size was also displayed in this instance.

	Distance From Glacier Front											
	"1850" Moraine			"1888" Moraine			"1920/26" Moraine			"1926" Moraine		
	DS	C	PS	DS	C	PS	DS	C	PS	DS	C	PS
All Data												
Observations	1000	1000	1000	1000	1000	1000	1000	1000	1000	700	1000	1000
Largest Lichen (mm)	37	37	41	34	33	32	27	27	40/28	34/27	26	26
Smallest Lichen (mm)	3	3	3	3	3	3	3	3	3	3	3	3
Mean	17	16	14	15	15	14	14	13	12	13	12	11
Median	16	15	13	15	15	12	13	11	11	12	11	10
Mode	15	15	15	10	15	10	15	10	10	10	10	10
Standard Deviation	8	7	7	7	7	6	6	6	6	7	6	5
Kurtosis	-0.7393	-0.4197	-0.1224	-0.6516	-0.4655	-0.3202	-0.6211	-0.5051	-0.0803	-0.4232	-0.5555	-0.1881
Skewness	0.3618	0.4706	0.6291	0.4401	0.4510	0.5738	0.4047	0.5202	06288	0.5018	0.4430	0.7103

Table 2: Summary statistics of lichen measurements for each moraine in the Waxeggkees: DS = Distal Slope, C = Crest and PS = Proximal Slope. The number in red indicates the presence of an anomalously large lichen, identified following methods established by Calkin and Ellis (1980). Therefore, the next largest lichen size was also displayed in this instance.

	Distance From Glacier Front					
	"1920/25" Moraine			"1926-36" Moraine		
	DS	C	PS	DS	C	PS
All Data						
Observations	1000	1000	800	1000	1000	1000
Largest Lichen (mm)	28	32	28	44/29	26	29
Smallest Lichen (mm)	3	3	3	5	4	4
Mean	15	14	12	15	14	13
Median	15	13	11	15	14	12
Mode	20	10	10	12	12	10
Standard Deviation	6	6	5	5	5	5
Kurtosis	-0.7897	-0.7175	-0.4379	1.2296	-0.7018	-0.5506
Skewness	0.2025	0.3098	0.4602	0.5198	0.1385	0.3105

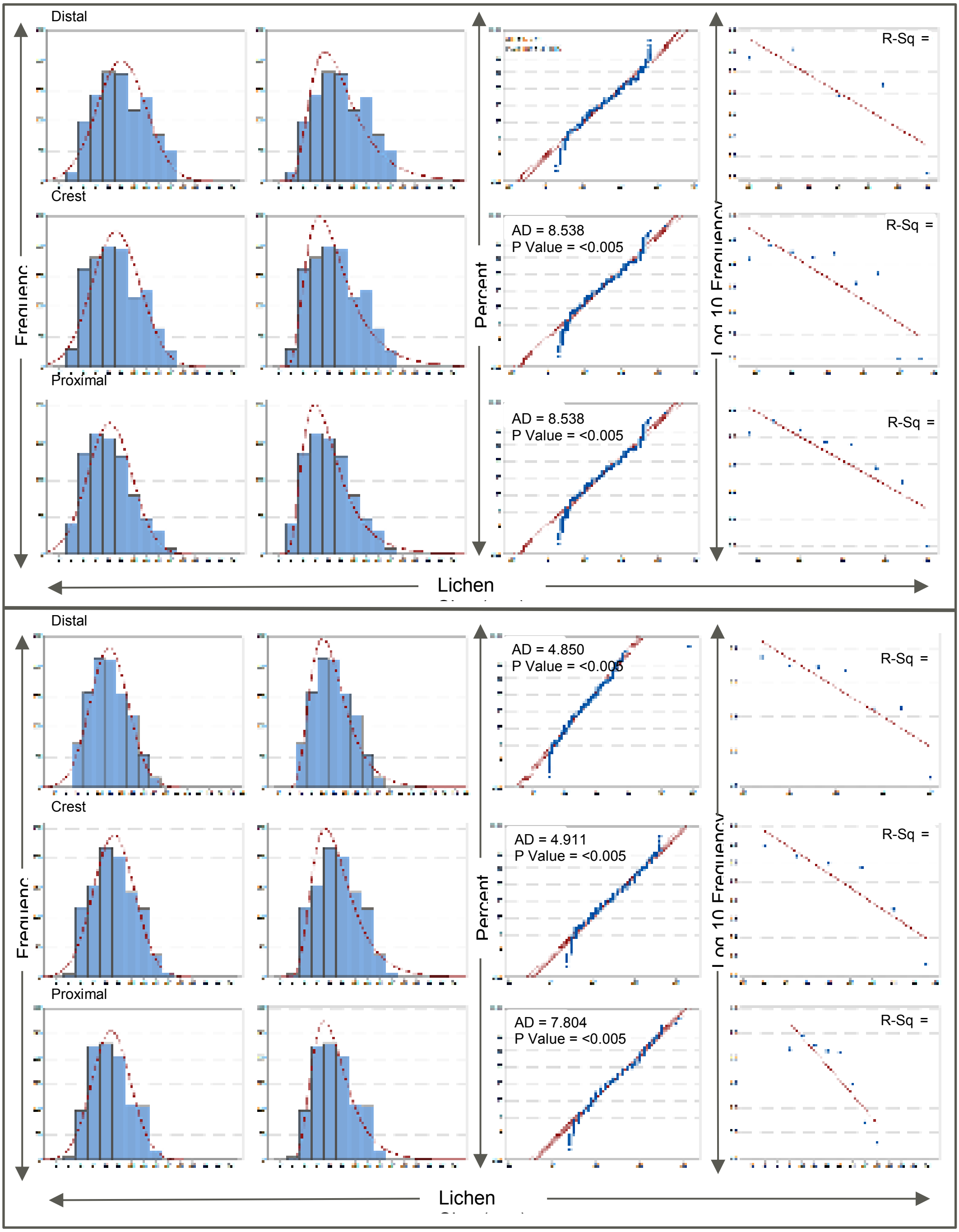

Figure 3: An example of lichen size-frequency plots. This selection of size-frequency plots is from moraines in the Waxeggkees foreland, with theoretical normal and lognormal distributions overlain represented by the red lines (left), Q-Q or quantile probability plots showing lichen size data and demonstrating where each point departs the theoretical normal distribution, represented by the red line (2nd from right), and size-frequency data in log_{10} plots with R^2 ralues (right). Each set shows the three sides of each moraine with the first set dipicting the 1920 moraine, second set 1920-30 moraine.

These data were used alongside data collected in the Hornkees valley by the author on a previous expedition, and was analysed using size-frequency, single largest (SLL), and five largest lichen (5LL) lichenometric dating methods. Size-frequency histograms were established following methods introduced by Bradwell (2001b), and subsequently used by Bradwell (2004) and Roberts *et al.* (2010), while SLL and 5LL methods were used to establish dating curves following the methods proposed by Beschel (1950, 1958 and 1961). Due to the nature of this report, the extensive collection of figures used to display results is not included, and rather a brief overview of results will follow.

The size-frequency analysis of lichen size data (Figure 5) has revealed that the lichen population dynamics in the Schwarzensteinkees, Hornkees, and Waxeggkees forelands are seldom indicative of a unimodal distribution (Bradwell, 2001b, 2004; Golledge *et al.*, 2010; Roberts *et al.*, 2010). It was therefore concluded that a lack of unimodal lichen distributions defines the true nature of lichen population dynamics in the upper Zemmgrund, rather than it being as a result of sampling strategy warping the results. A subsequent investigation of what was considered a near ubiquitous presence of a dip at the 18 mm size-class that presented itself in the size-frequency histograms was undertaken. It was initially thought to be directly correlated to a climate anomaly as described by Lejenas (1989), Brönnimann *et al.* (2004), and Brönnimann (2005). However, after further examinations it was concluded that linking this disruption with extreme cold events cannot be done via use of an estimated growth rate.

The SLL and 5LL methods have shown that relationships between dating curves developed separately for the distal slope, crest, and proximal slope do not follow a defined pattern, with the largest lichens being seemingly randomly distributed on the moraines. This resulted in discrepancies between predicted surface ages for the same moraine, even when lichen size measurements were equivalent (see Figure 6). This was considered of particular importance, as future lichenometric investigations will have to ensure sampling does not consciously exclude any specific area of the moraine. Furthermore, using specific dating curves created from original data, enabled lichenometric age estimations to plot with an error margin of 14 years; below the 20% error margin often considered acceptable for lichenometric dating (e.g. Miller and Andrews, 1972; Calkin and Ellis, 1980; Bickerton and Matthews, 1992; Solomina and Calkin, 2003; Daigle and Kaufman, 2009).

Overall, this second research expedition that was part funded by the BLS has enabled the accumulation of an extensive dataset, which in turn lead to fulfilment of the research project. As a result, the author was able to either accept or reject all of the initial hypothesis, and concluded with the following five statements, taken directly from the submitted thesis:

1. Lichen populations in the upper Zemmgrund are rarely indicative of unimodal distributions. This is most likely due to historical extreme cold events, delayed surface exposure events, and extreme competition from other lichen species (Hale, 1967; Armstrong, 1974; McCarthy, 1977; Innes 1985; Innes, 1986b; Lejenas, 1989; Benedict 1990a, 1990b; Brönnimann *et al.*, 2004; Schneider and Steig, 2009).

2. The creation and application of individual dating curves for the distal slope, crest, and proximal slope of moraines in the upper Zemmgrund fail to portray, within acceptable error margins, accurate relative ages for moraines under investigation.
3. When applying the SLL and 5LL methods for all lichen-size data collected on each moraine, the dating curves enable predictions of relative ages with a maximum error of 14 years, considerably lower than what has previously been considered acceptable (Miller and Andrews, 1972; Calkin and Ellis, 1980; Bickerton and Matthews, 1992; Solomina and Calkin, 2003; Daigle and Kaufman, 2009).
4. In this instance when a reliable dating control is present and extensive lichen-size data collection is undertaken, lichenometry has been shown to produce age estimations accurate and reliable enough to form a glacial chronology, from which further reconstructions can be undertaken.
5. This thesis could not find any support for the claim by Osbourn *et al.* (2015) that lichenometry is a pseudo-science. This study has shown that when used correctly, systematically and carefully, lichenometry could replicate independent age control provided by historical photographs and reports of glacier length changes in three Alpine glacier forelands to within a error of; 14 ±4 years using the SLL method and 8 ±4 years using the 5LL method throughout.

Once again, the author is highly appreciative of the grant provided by the BLS which enabled the progression of fieldwork and subsequent completion of the MSc Thesis, and for the opportunity to provide a report for the BLS Bulletin. Finally, Figure 7 provides a photographic example of the extreme range of weather conditions that were faced by the author whilst conducting fieldwork in the upper Zemmgrund.

Figure 4: The extreme weather conditions that were observed in the upper Zemmgrund between the 30th of June and the 14th of July 2016. Left: Sunny days when the temperature exceed 30ºC, Middle: When the clouds descended and visibility dropped to less than 10m, Right: Sudden and somewhat unexpected heavy snowfall.

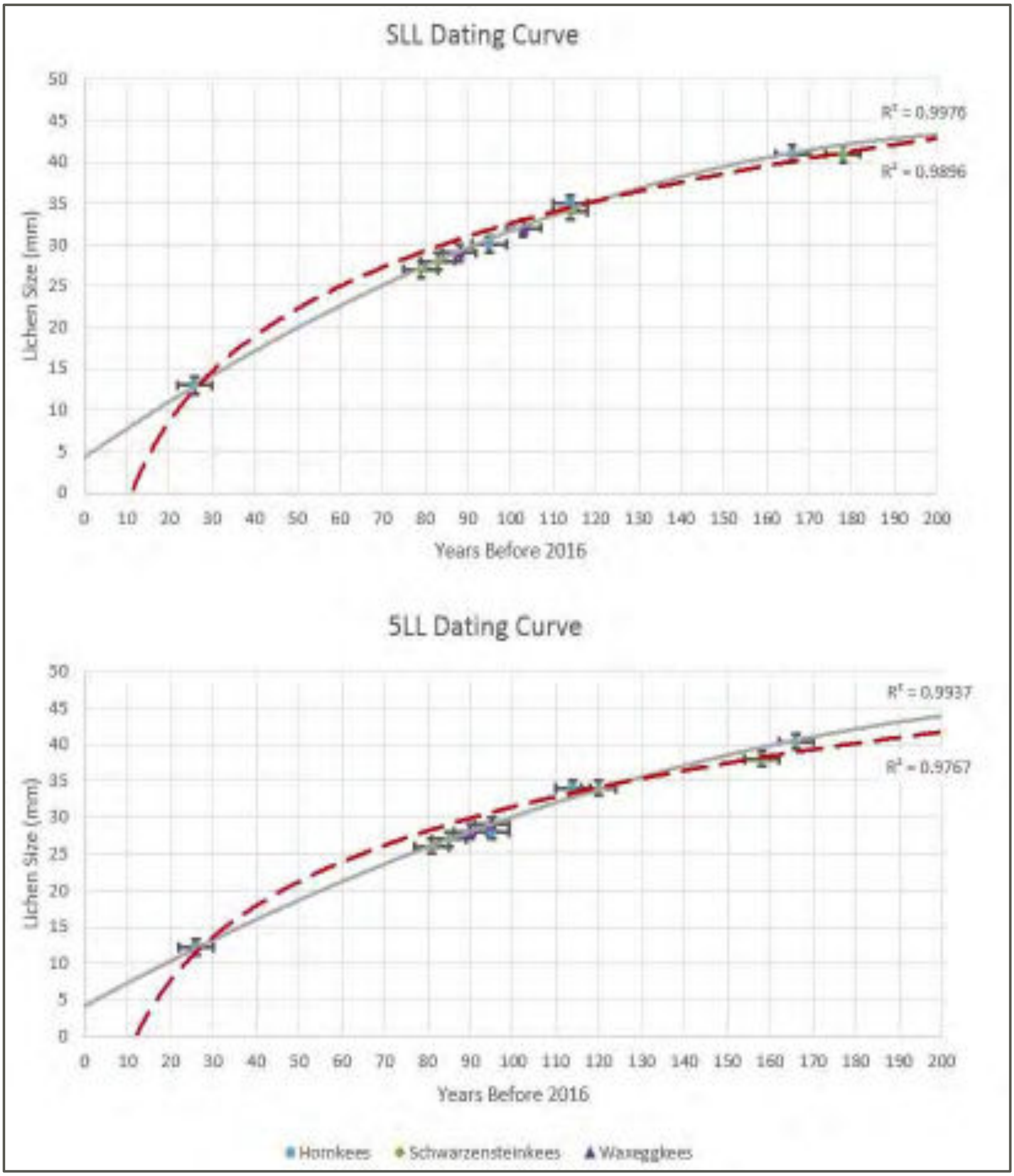

Figure 5: Dating curves using a Logarithmic (Red Dash) and Polynomial (Grey Line) trend line for the Single Largest Lichen (SLL) and 5 Largest Lichen (5LL), collected on each moraine regardless of sample location. Vertical error bars represent 1 mm sampling inaccuracy and horizontal error bars represent a minimum ±4 year error margin. R^2 values correspond with trend line; polynomial - top R^2 value, and logarithmic - bottom R^2 value.

References

Armstrong, R.A., 1974. Growth phases in the life of a lichen thallus. *New Phytologist* **73**, 913-918.

Benedict, J.B., 1990a. Experiments on Lichen Growth. I. Seasonal patterns and environmental controls. *Arctic and Alpine Research* **22**, 244-254.

Beschel, R. E., 1950, Flechten als Altersmasstab rezenter Moranen. *Zeitschrift fur Gletscherkunde und Glazialgeologie* **1**, 152–161.

Beschel, R.E., 1958. Lichenometric al studies in West Greenland. *Arctic* **11**, 254.

Beschel, R.E., 1961. Dating rock surfaces by lichen growth and its application to glaciology and physiography (lichenometry). In: Raasch, G.O., (ed). Geology of the Arctic, vol. 2, 1044–1062. Toronto: University of Toronto Press.

Benedict, J.B., 1990b. Winter frost injury to lichens: Colorado Front Range. *Bryologist* **93**, 423–426.

Bickerton R.W. and Matthews, J.A., 1992. On the accuracy of lichenometric dates: an assessment based on the 'Little Ice Age' moraine sequence of Nigardsbreen, southern Norway. *The Holocene* **2**, 227-237.

Bossert, S., 2014. The high alpine bee fauna (Hymenoptera: Apoidea) of the Zillertal Alps, Austria. *Biodiversity Dara Journal* **2**, 1-24.

Bradwell, T., 2001b. A new lichenometric dating curve for southeast Iceland. *Geografiska Annaler: Series A Physical Geography 83*, 1–101.

Bradwell, T., 2004. Lichenometric dating in Southeast Iceland: the size-frequency approach. *Geografiska Annaler* **86A**, 31-41.

Brönnimann, S., Luterbacher, J., Staehelin, J. and Svendby, T.M., 2004. An extreme anomaly in stratospheric ozone over Europe in 1940–1942. *Geophysical Research Letters* **31**, 1-5.

Brönnimann, S., 2005. The global climate anomaly 1940–1942. *Weather* **60**, 336-342.

Calkin, P.E. and Ellis, J.M., 1980. A Lichenometric dating curve and its application to Holocene glacial studies in the Central Brooks Range, Alaska. *Arctic and Alpine Research* **12**, 245-264.

Daigle, T.A. and Kaufman, D.S., 2009. Holocene climate inferred from glacier extent, lake sediment and tree rings at Goat Lake, Kenai Mountains, Alaska, USA. *Journal of Quaternary Science* **24**, 33-45.

Golledge, N.R., Everest, J.D., Bradwell, T. and Johnson, J.S., 2010. Lichenometry on Adelaide Island, Antarctic Peninsula: size-frequency studies, growth rates and snow patches. *Geografiska Annaler: Series A, Physical Geography* **92**, 111-124.

Hale, M.E., 1967. The Biology of Lichens. Edward Arnold Publishers Ltd., London.

Hernandez, P.A., Graham, C.H., Master, L.L. and Albert, D.L., 2006. The effect of sample size and species characteristics on performance of different species distribution modelling methods. *Ecography* **29**, 773-785.

Innes, J.L., 1985. Lichenometry. *Progress in Physical Geography* **9**, 187-254.

Innes, J.L., 1986a. Dating exposed rock surfaces in the Arctic by lichenometry: The problem of thallus circularity and its effect on measurement errors. *Arctic* **39**, 253-259.

Innes, J.L., 1986b. The size-frequency distributions of the lichens Sporastatia testudinea and Rhizocarpon alpicola through time at Storbreen, South-West Norway. *Journal of Biogeography* **13**, 283-291.

Lejenas, H., 1989. The Severe Winter in Europe 1941–42: The Large-scale Circulation, Cut-off Lows, and Blocking. *American Meteorological Society* **70**, 271-281.

Locke, W.W., Andrews, J.T. and Webber, P.J., 1979. A Manual for Lichenometry. *British Geomorphological Research Group* 26, 1-47.

Matthews, J.A., 2005. Little Ice Age' glacier variations in Jotunheimen, southern Norwvay: a study in regionally controlled lichenometric dating of recessional moraines with implications for climate and lichen growth rates. *The Holocene* **15**, 1-19.

McCarthy, D.P., 1977. Habitat selection and ecology of Xanthoria elegans (Link) Th. Fr. in glacier forefields: implications for lichenometry. *Journal of Biogeography* **24**, 363–373.

Miller, G.H. and Andrews, J.T., 1972. Quaternary history of northern Cumberland Peninsula, east Baffin Island, N.W.T., Canada. Part IV: Preliminary lichen growth curve for Rhizocarpon geographicum. *Geological Society of America Bulletin* **6**, 1133-1138.

Osborn, G., McCarthy, D., LaBrie, A. and Burke, R., 2015. Lichenometric dating: Science of pseudo-science? *Quaternary Research* 83, 1-12.

Pindur, P., 2001. Der Nachweis von prähistorischen Lawinenereignissen. In: Oberen Zemmgrund, Zillertaler Alpen. Mitteilungen der Österreichischen Geographischen Gesellschaft, 143, 193-214.

Roberts, S.J., Hodgson, D.A., Shelley, S., Royles, J., Griffiths, H.J., Deen, T.J. and Thorne, M.A., 2010. Establishing lichenometric ages for nineteenth- and twentieth-century glacier fluctuations on South Georgia (South Atlantic). *Geografiska Annaler: Series A Physical Geography* 92. 125-139

Schneider, D.P. and Steig, E.J., 2009. Ice cores record significant 1940s Antarctic warmth related to tropical climate variability. *Proceedings of the National Academy of Sciences* 105, 12154-12158.

Solomina, O. and Calkin, P.E., 2003. Lichenometry as applied to moraines in Alaska, U.S.A., and Kamchatka, Russia. *Arctic, Antarctic, and Alpine Research* **35**, 129-143.

Stockwell, D.B.R. and Peterson, A.T., 2002. Effects of sample size on accuracy of species distribution models. *Ecological Modelling* **148**, 1 – 13.

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Correction & additions to the medullary chemistry of the genus *Usnea* in the British Isles

Correction

In a previous paper by the author (Harrold, 2014) an error was found in Table 2, Medullary Compounds by Species. In the case of *U. wasmuthii*, it was erroneously stated that alectorialic acid may be present whereas in fact the '±' should have been shown in the salazinic acid column indicating its possible occurrence. A corrected version of Table 2 is included overleaf.

Additions

Since writing the original paper, two specimens correlating to *U. glabrescens s. lat.* have been found in Scotland and these vary from the chemical substances comments made for that species in the paper. Both specimens were identified by Philippe Clerc.

The first specimen was collected in Glen Affric on *Betula* by the author and J. Douglass in 2013 (PH13107A in E) and was considered by P. Clerc (*pers. comm*. 2015) to belong to *U. glabrescens s. str*. It had no medullary compounds which is the first time this null chemotype has been found for this species.

	2-o-demethylpsoromic acid	4-o-demethylbarbatic acid	4-o-demethyldiffractaic acid	U. articulata unid 1	U. articulata unid 2	alectorialic acid	barbatic acid	bourgeanic acid	confumarprotocetraric acid	connorstictic acid	consalazinic acid	constictic acid	convirensic acid	cryptostictic acid	diffractaic acid	fumarprotocetraric acid	galbinic acid	lobaric acid	menegazziaic acid	murolic acid complex	norstictic acid	protocetraric acid	psoromic acid	salazinic acid	squamatic acid	stictic acid	thamnolic acid	no medullary compounds %
articulata				±	±											+						±						
ceratina		±	±				+								+													
cornuta											±	+		±					±		±	±		±		+		
dasypoga						±																		+				6%
esperantiana								+				+												+				
flammea												+		±				±	±		±					+		
flavocardia	±																						+					
florida						±																					+	
fragilescens v. *mollis*												+		±					±		±					+		
fulvoreagens												±		±					±		±					±		
glabrata									±				±			+						±						
glabrescens	±											±							±		±		±			±		9%
hirta																				±								23%
rubicunda	±											±							±		±		±			±		
silesiaca																	±							+				
subfloridana						±																			±		±	3%
subscabrosa																						+		±				
wasmuthii		±					±				±													±				6%

Table 2. Medullary Compounds by Species. + = always present, ± = sometimes present

The second specimen was collected near Fort William on *Betula* by Jenny Ford in 2014 (JF14041B in E) and was considered by P. Clerc (*pers. comm*. 2015) to belong to *U. glabrescens s. lat*. although leaning towards the *U. fulvoreagens* morphotype. The only medullary compound found was norstictic acid in large amounts, again a new chemotype for this variable species.

Acknowledgement
The author thanks Philippe Clerc who has given assistance freely on taxonomically difficult specimens.

Reference

Harrold, P. (2014). The medullary chemistry of the genus *Usnea* in the British Isles. *BLS Bulletin* **115**: 44–54.

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Observations on changes in the lichen flora of Hatfield Forest, Essex, over a nineteen year period

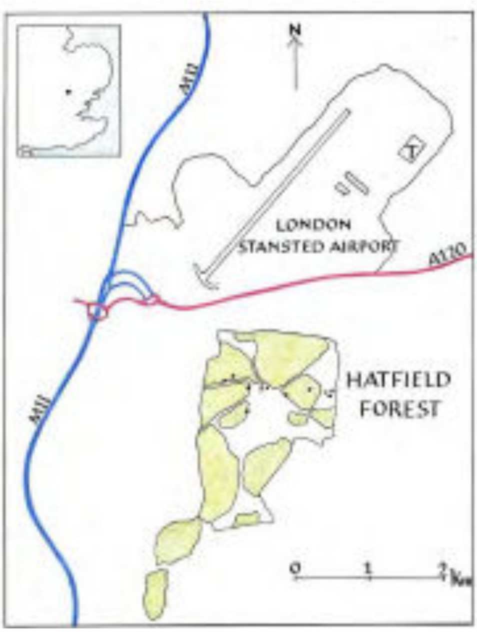


Fig. 1: map showing Hatfield Forest, London Stansted Airport and major roads. The dots in the Forest show the principal sample sites.

The centre of Hatfield Forest, described by Oliver Rackham (2003) as '…the supreme example of a surviving medieval Forest…' lies just 4km south of London Stansted airport, now the fourth busiest airport in the UK with 22.5 million passengers passing through it in 2015. It would be surprising if the enormous expansion of this airport over the last 25 years has not affected the lichen biota of the Forest. The observations presented here demonstrate that this biota has changed over this period but these changes echo those seen throughout much of lowland England.

This is not an account of the complete lichen biota of the Forest, but a few facts might be of interest. Many lichenologists have visited the Forest over the years, the earliest published records coming from E.M. Holmes (1891) with further ones from K.L. Alvin (1959) and many unpublished records from Simon Davey, Peter Earland-Bennett, Allan Pentecost, Francis Rose, myself and others. A total of 132 corticolous and terricolous lichens have been recorded. The list includes several that are rare or unknown elsewhere in Essex such as *Bacidia incompta*, *Candelariella xanthostigma*, *Gyalecta truncigena*, *Lecanora sublivescens*, *Ochrolechia androgyna*, *Pertusaria coccodes* and *Schismatomma cretaceum*.

In November 1989 a series of 19 quadrats was set up on trees in Hatfield Forest, on an approximate east-west transect across the site from Bush End Gate at the eastern edge to the Portingbury Hills in the west. The aim of the study was to monitor changes in the lichen biota over a couple of years and to ascertain the health of the lichens by recording growth of individual lichen thalli. Quadrats were selected on trees where there was obvious macrolichen growth and which were accessible. These trees were also included in a study by Dr. K.J. Adams on recording nitrogen oxides levels in the Forest.

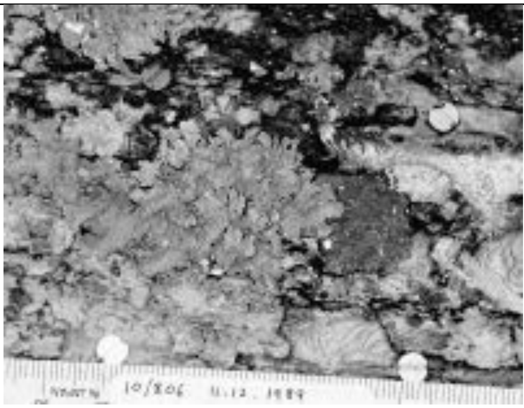
The lichens of the sites selected fell roughly into two groups. One group, of seven sites, was somewhat acidophilous with *Hypogymnia physodes*, *Parmelia saxatilis*, *P. sulcata*, *Lecanora conizaeoides*, *Violella fucata* and *Pseudevernia furfuracea*. Most of these sites had only two or three species from that selection. A larger group of eleven sites bore a *Parmelia s.l.*–rich community with *Parmelia sulcata*, *Punctelia subrudecta*, *Melanelixia subaurifera*, *M. glabratula*, *Parmotrema perlatum*, *Ramalina farinacea* and *Lecanora expallens*. Again, none of the eleven sites bore all seven lichens.

The quadrats were small, about 5 x 5 cm and marked by small stainless steel screws. On each visit the quadrat was photographed, lichen thallus outlines were traced and notes made. In some cases the screws had to be regularly loosened because of bark growth threatening to cover the screw heads. A total of five visits were made, on 24 Nov 1989 (setting up), 18 June 1990, 11 Jan 1991, 10 July 1991 and 9 Dec 1992. The visits revealed quite a dynamic situation with losses from abrasion and mollusc damage in most quadrats but also growth of the lichen thalli at the same time. Even if part of a thallus had been lost it was still usually possible to measure any radial increase in size on the remaining portions. The monitoring involved the measurement of growth of eleven species of lichen and the results are summarised in Table 1 below.

Lichen species	**Number of thalli monitored**	**Growth observed between 1989 and 1991 (mm radial growth per year)**
Cliostomum griffithii	1	+3
Hypogymnia physodes	20	10 thalli showed increases of +1 to +4 10 thalli showed decreases to -8 or were lost
Melanelixia glabratula	4	1 thallus showed increase of +3 3 thalli showed no change
Melanelixia subaurifera	6	5 thalli showed increases of +2 to +4 1 thallus showed no change
Parmelia saxatilis	5 (1 site)	All showed increases, +2 to +3
Parmelia sulcata	26	21 thalli showed increases of +1 to +5 4 thalli showed decreases to -3, one lost
Parmotrema perlatum	1	+5
Pseudevernia furfuracea	2 (1 site)	+1 to +3 (lobe lengths)
Punctelia subrudecta	6	All showed increases, +2 to +6
Ramalina farinacea	4	0 to +2 but 2 thalli showed reduction in number of lobes
Schismatomma decolorans	4 (1 site)	0 to +1

Site 10: ancient pollard maple on North Plain, TQ 536205, 6 December 1989. The quadrat site is arrowed.

Site 10, 28 February 2009.



Site 10, close-up of quadrat, 11 December 1989. The main lichen is *Parmelia sulcata* with a smaller dark thallus of *Melanelixia subaurifera* to its right.

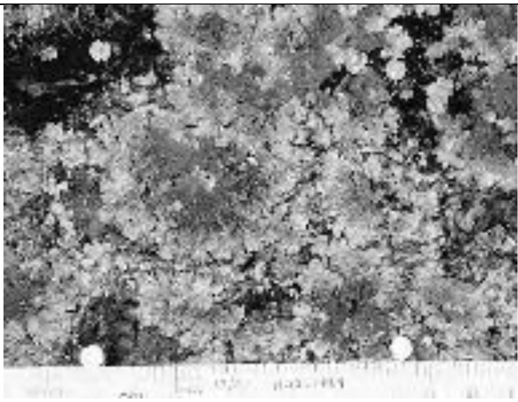
Site 10, 28 February 2009. No *Parmelia or Melanelixia* remains; the pale lichen is *Physcia adscendens*. The 'crust' in between is *Hyperphyscia adglutinata*

Table 2: Site 10, North Plain, Hatfield Forest. *Parmelia*–dominated community replaced by a *Physcia*-dominated community over 19 years.

On 28 February 2009, the opportunity was taken to re-visit the Forest and to attempt to re-find the quadrats after essentially a gap of 19 years. 12 of the 19 quadrats were found and re-examined. The remaining sites were not located, mainly because they were in coppiced areas which had changed appearance drastically.

Of the seven sites with a somewhat acidophilous lichen flora, five were not re-found or shaded out, the remaining two showing a change to a biota dominated by *Xanthoria* and *Physcia* species. *Lecanora conizaeoides* was not seen although it had been present in four quadrats in 1990. Of the eleven *Parmelia s.l.* dominated sites, five were not re-found or were shaded out. The other six sites showed signs of a change to a more nitrophilous biota with the presence of *Xanthoria parietina*, *Candelariella reflexa* and *Physcia* species (not recorded previously) and the decline or disappearance of *Parmelia sulcata*, *Punctelia subrudecta* and *Melanelixia* species.

Two sites are of special interest as some of the location screws were re-found, allowing a fairly accurate view of the changes. Site 10, an ancient pollard maple, showed the complete replacement of *Parmelia sulcata* and *Melanelixia subaurifera* by *Hyperphyscia adglutinata* and *Physcia adscendens*. Site 19, the bough of an ancient ash, was dominated by a sheet of *Parmelia saxatilis* in 1989. By 2009 the *Parmelia saxatilis* had completely disappeared, replaced by *Physcia adscendens/tenella* and some tiny thalli of *Xanthoria parietina*.

	
Site 19: bough of ancient ash tree immediately west of Round Coppice, tree no. 3189, 6 December 1989. The quadrat site is arrowed.	Site 19, 28 February 2009.
	
Site 19, close-up of quadrat, 11 December 1989, showing an almost complete cover of *Parmelia saxatilis*. Measurements during the year showed that it was growing.	Site 19, 28 February 2009. The *Parmelia saxatilis* has completely disappeared. The surface is fairly bare except for *Physcia adscendens/tenella* , some tiny thalli of *Xanthoria parietina* and an unidentified crustose species. Note that two of the quadrat positioning screws are still evident.
Table 3: Site 19, west of Round Coppice. *Parmelia saxatilis* replaced by the nitrophilous lichens *Xanthoria parietina* and *Physcia* spp.	

None of the above observations will come as a surprise to lichenologists recording in the east and south-east of England where the rise in abundance of nitrophilous lichens has been steady over the last two decades. However, the question arises as to whether the changes in Hatfield Forest, because of the proximity of the airport, are more marked than in other parts of the region. As there is no study outside the Forest comparable to this one, the answer can only be approached from field observations.

In any woodland in the eastern region, the upper branches of trees, as sampled in fallen and felled branches, will now usually be dominated by *Physcia* species and *Xanthoria parietina*. A number of crustose lichens, particularly *Lecidella elaeochroma* and *Lecanora chlarotera* (both very rare in the region 30 years ago), are also now abundant. In 2009, fallen and felled branches in Hatfield Forest showed these species. Epping Forest, the other large ancient Essex forest, is also showing a rise in the abundance of nitrophilous species with the usual assemblage on small branches and recent records of *Physcia stellaris*, for example.

In 2012, the consultancy AEA was commissioned by Stansted Airport Limited to undertake a diffusion tube study to evaluate how average nitrogen dioxide (NO_2) levels change with distance from the airport. The study included five tubes positioned in Hatfield Forest. It ran for three months in early 2012 and the resulting map and data show, as one might expect, high levels of NO_2 in the immediate vicinity of the airport terminal building, along the runway and following the M11 and the A120 roads. The average NO_2 levels here were evaluated as being between 27 and 34 μg/m³, the EU standard being 40μg/m³. Interestingly, the levels fall off very rapidly as one moves away from the hot spots so that within a kilometre of the airport, NO_2 levels were within the range 15 to 25 μg/m³, roughly the background level for the surrounding area. The readings from the sites within the Forest ranged from 13μg/m³ in the central area to 18μg/m³ in the north, nearest the airport. The prevailing wind direction from the south west must

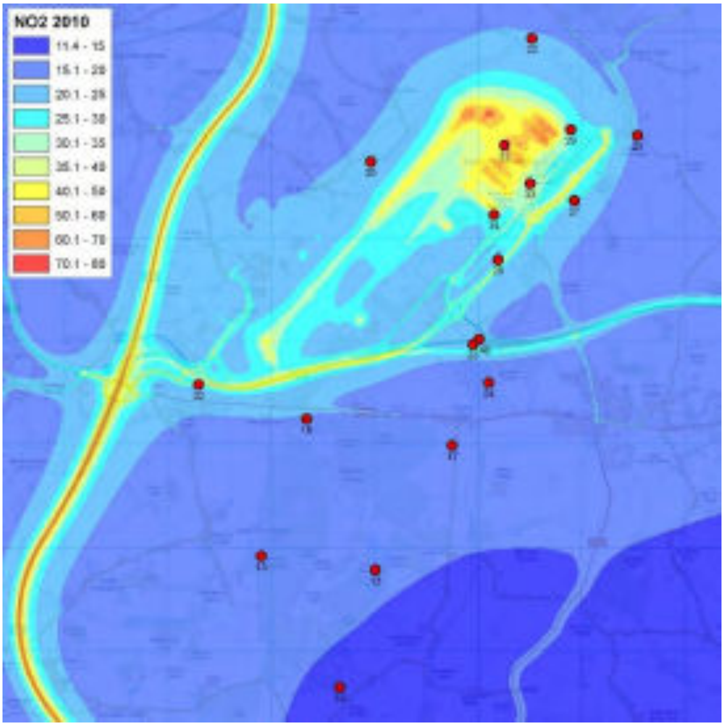


Fig. 2: NO_2 levels around Stansted airport and Hatfield Forest, early 2012.The red dots are sampling stations, the southernmost five being in the Forest. Compare with fig.1.

help to keep pollutant levels lower although on winter days when there is a northerly wind, the smell of aircraft fuel in the Forest can be quite strong.

These results suggest that for this pollutant the effect of the airport may be more localised than one might expect. However, the monitoring time was short and peaks will of course be higher than the mean. Data presented on a London website (*www.eastlondonlines.co.uk*) in 2016 show NO_2 peak levels to be up to three times the mean levels, all mean levels complying with the EU standard.

The data presented here show that there have been significant changes in the lichen biota in the centre of Hatfield Forest over the period 1989 to 2009 with a clear increase in nitrogen-loving species. It may be that the nearby airport does not exacerbate the change as much as one might expect although it must contribute to it. Other sources of nitrogen compounds, such as intensive farming of pigs and poultry, undoubtedly have a part to play. According to DEFRA statistics produced at the end of 2015, NO_2 pollution levels are declining but ammonia levels are remaining roughly level if not increasing. The cumulative effect of these pollutants must also be a concern. Despite the increase in abundance of nitrogen-loving species, acidophilous lichens are still around in the Forest. In June 2016 an area in the north of the Forest, the gloriously named Old Woman Weaver's Marsh (near point 18 on fig.2), was examined. Fertile *Chaenotheca ferruginea* was on several oak trees and fence rails bore *Parmelia saxatilis*, *P. sulcata*, *Evernia prunastri*, *Hypogymnia physodes*, *Trapeliopsis granulosa*, abundant *Lecanora conizaeoides* and a thallus of an *Usnea* species, the first ever record from the Forest and only 4km south west of the airport terminal.

Fig.3: *Lecanora conizaeoides* and *Usnea* sp. on a fence post, Hatfield Forest, June 2016

The lichens of Hatfield Forest seems to be in a state of flux. The pity is that the Forest has been, in the past, home to some locally rare lichens, some lost by changes brought about by nitrogen enrichment, other through felling of some lichen-rich trees. More work is needed now to see what has survived and to monitor future changes.

Thanks are due to Stansted Airport for permission to reproduce Fig. 2 and to Brian Stacey for advice. The 1989 survey was undertaken with a small grant from the Nature Conservancy Council (now Natural England).

References

Alvin, K.L. (1959). Lichens of Hatfield Forest. *Essex Naturalist* **30**: 166-169

DEFRA (2015). Emissions of air pollutants in the UK, 1970 to 2014. Statistical Release 17 December 2015

Holmes, E.M. (1891). Lists of mosses, lichens and hepaticae gathered in Hatfield Forest. *Essex Naturalist* **4**: 220-221.

Rackham, O. (2003). *Ancient Woodland*. 2nd edition. 584pp. Castlepoint Press.

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Tales of the Riverbank

Over the last 25 years I have visited hundreds of locations across Ireland in search of lichens. Sometimes the lichens have found me whilst I was doing something else. On one occasion more than a decade ago I was helping to excavate a swallow-hole on Poulacapple Mountain, in the Burren, in the hope that we would find a route into the unexplored cave beyond. A fair bit of time was spent sitting at the top of the pothole, patiently waiting for the signal to haul up the next bucket of spoil from those digging below. As I waited, my eye was caught by a distinctive lichen festooning the branches of scrubby *Salix* that surrounded the pothole. Taking a closer look I was surprised to discover it was *Pseudocyphellaria crocata* – the first record for the region and one of just a handful of records for the entire country! It confirms the old adage that "a true lichenologist is never off duty".

Around the same time I was enlisted by the Environment & Heritage Service to undertake lichen surveys of various ASSIs (Areas of Special Scientific Significance) across Northern Ireland. Many were woodlands, some of which bordered rivers and streams, but two sites in particular stand out in my memory. Altmover Glen is an area of rather scruffy woodland on the Woodburn River near Dungiven, Co Londonderry. There were a few oceanic taxa present, including *Nephroma parile*, *Pannaria conoplea* and *P. pezizoides*, but the most remarkable, which I had never seen before nor since, were numerous abundantly fertile lobes of *Sticta fuliginosa*. Or so I thought. Perusing the recent paper by Magain & Sérusiaux (2015) it seemed likely that these might actually be *Sticta ciliata*. Re-examining the specimen I had lodged in the Ulster Museum herbarium back in 2004 this was confirmed, making it the first record of this species from Northern Ireland!

The second site was, coincidentally, also on the Woodburn River - but a different Woodburn River, near Carrickfergus, in Co. Antrim. The northern branch, North Woodburn Glen, was an ASSI already on the EHS list but it proved singularly unremarkable. The southern branch, South Woodburn Glen, lies nearby and directly downstream from the Woodburn Reservoirs. It was not on the ASSI list but since it was nearby, and I knew it to expose some interesting geology, I thought I'd take a look (for the rocks, rather than any lichens – remember the old adage "a true geologist is never off duty"?). A series of steps descended into a narrow rocky gorge where the remains of a Victorian tourist path could be followed over fallen trees and rocks. The humidity was spectacularly high and the bryophytes truly luxuriant, but the lichens seemed unremarkable. However, passing a dripping crag I was astonished to find it covered with abundant thalli of a dark brown isidiate *Sticta*. This was remarkable since the site is just 15km downwind of Belfast and so, by rights, such pollution sensitive lichens should long ago have succumbed to the onslaught of the city's coal fires. What is more, many of the large brown thalli had one or more small bright green lobes around their edge, instantly identifying it as *Sticta canariensis*. This is the least common of the four 'traditional' species of *Sticta* in Ireland (although the picture is complicated by Magain & Sérusiaux's paper which identifies a further three species). All other recent Irish records of this taxon lie far to the west, in the hyperoceanic rural habitats where they might be expected, albeit rarely. As such, the Woodburn *Sticta canariensis* is perhaps the most surprising discovery I have made in 25 years of licheneering. Ultimately its presence there led to designation of this site as another ASSI. It hints, perhaps, at the composition of the pre-industrial lichen biota in this area, but how on Earth did this lichen, with its demanding ecological requirements, survive here? Just upstream from this section of gorge the burn cascades some 15 metres into a pool, generating a constant draught and a fine mist of water droplets in the narrow gorge beyond. I believe that it is this permanently humid environment, fed by clean water from the reservoirs just upstream, that has protected these lichens from the effects of more acidic rainfall associated with Belfast's coal fires in earlier decades and centuries.

Left: *Pseudocyphellaria crocata*, Poulacapple Pot, Co. Clare. Right: *Sticta ciliata*, Altmover Glen, Co. Derry.

Sticta canariensis cascading down a damp crag, South Woodburn Glen, Co. Antrim.

Left: *Sticta canariensis*, with small lobes of the green algal morph arising from the isidiate cyanobacterial morphs, South Woodburn Glen, Co. Antrim. Right: pools and riffles on the Glenarm River, Co. Antrim, with abundant *Collema dichtomum* (adjacent to penknife).

More recently, in July 2015, I was approached by the Ulster Wildlife Trust to undertake a search for *Collema dichotomum*, the River Jelly Lichen, in the Glenarm River in north Co. Antrim. This lichen was first discovered in Northern Ireland by the renowned Irish naturalist John Templeton in 1825, supposedly at a location called Sallagh Braes, near Larne, Co. Antrim, although today there is no suitable habitat evident. In the first half of the 20th century it was recorded at a couple of other lowland sites in western Ulster but, if it was once present there, it is unlikely to have survived to the present day under the constant onslaught of agricultural runoff and other sources of pollution to which so many of Ireland's lakes and rivers have been subjected for decades. Richard Brinklow found it in the Glenarm River in 1973, and it was seen again there by Nick Stewart in 1992, but nobody had seen it since. In 2014 the Glenarm estate was the location for Northern Ireland's bid to win the annual All-Ireland Bioblitz but, once again, *Collema dichotomum* remained elusive. We did win (for the third consecutive year), with well over 100 species of lichen contributing to our victory, but recent rainfall had raised the river level and submerged the ledges where *Collema dichotomum* and its friends might be residing. The invitation from the UWT was, therefore, an opportunity not to be missed and seemed to come at a good time. All too often requests to survey rivers for their lichens arrive in late Autumn or Winter, just when river levels are too high to undertake the work, so early July seemed to offer plenty of scope before the end of the Summer. But this is Northern Ireland and frequent rainfall kept river levels high throughout July, August and much of September. One trip planned at short notice following a few dry days in September was, alas, thwarted by my need to attend an unavoidable meeting. Inevitably it rained the following day and prospects were beginning to look bleak. But finally, in early October, a decent dry spell arrived and I could finally get down to the river.

Collema dichtomum (left of centre) and *Leptogium plicatile* on basalt ledge, Glenarm River, Co. Antrim.

Previous records for *Collema dichotomum* in the Glenarm River were not very precise and I thought I might have a difficult job locating it along the ~3km stretch of river on the estate. However, it quickly became apparent that the boulder-strewn lower reaches of the river did not offer suitable habitat, narrowing the search somewhat. Further up there were wide basalt ledges, with pools and riffles. This looked more promising and, indeed, I located several small thalli within 5 minutes of getting down to business. These actually proved to be near the downstream limit of the species and, as I worked my way slowly upstream I came across areas where it occurred in some abundance. Over the course of the day I was able to establish that the Glenarm River still supports a thriving and healthy population of *Collema dichotomum* along several hundred metres of the river where the habitat is favourable. Upstream the ledges and riffles give way to another boulder-strewn stretch where it was not found.

Dermatocarpon luridum on basalt ledge, Glenarm River, Co. Antrim.

Of course a river that supports a healthy population of *Collema dichotomum* might also be expected to support other interesting riparian species, and the Glenarm River did not disappoint in this respect. Alongside numerous thalli of *Collema dichotomum* were others of the superficially similar *Leptogium plicatile*, providing an ideal opportunity to compare these two species. Other delights were *Collema flaccidum*, *Dermatocarpon meiophyllizum* and, of course, the brilliant green of *Dermatocarpon luridum*. But among these were occasional thalli of a very skinny *Leptogium*. Might it be *Leptogium massiliense* perhaps? But the habitat was wrong and it didn't quite fit the description. Or was it maybe *Leptogium subtorulosum*? It matched this much better, both morphologically and in terms of habitat, but this species is known at just a few sites in England and Wales. I managed to get a few pictures (my Coolpix 4500 had just packed up so I had to fall back on a much inferior Lumix), and from these Brian Coppins was able to confirm that it was indeed *L. subtorulosum*, and first record of this potential RDB species for Ireland! It was pleasing enough to confirm that *Collema dichotomum* was still doing well at Glenarm, but a real bonus to discover a species new to Ireland as well.

Leptogium subtorulosum on basalt ledge, Glenarm River, Co. Antrim.

On a somewhat different note, in the early noughties I was approached about undertaking a lichen survey of a deep wooded ravine on the Glendine River, near Dungiven in Co. Waterford. This site holds probably the largest sporophyte population of the Killarney Fern, *Trichomanes speciosum*, in Europe but it was threatened by a proposed realignment of the N25 Cork-Waterford road. In the event this never happened, and my services were not called upon, but the site stuck in my mind. Being so important for this rare fern, what lichenological treasures might also lurk there? Several years passed before I had a chance to find out. The sides of the ravine were so steep that the only way in was directly along the river, but I persevered. So what delights were revealed? Well, frankly, not a lot. Lichenologically it was dull. Very dull. *Dimerella lutea* was the best I could manage. A huge disappointment after all those years of anticipation…

Reference
Magain, N. and Sérusiaux, E. (2015). Dismantling the treasured flagship lichen *Sticta fuliginosa* (*Peltigerales*) into four species in Western Europe. *Mycological Progress* **14**: 97 (33 pp.). doi 10.1007/s11557-015-1109-0.

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The lichens of the Rollright Stones

Introduction

The Rollright Stones are located on the top of a ridge in the Cotswolds on the Oxfordshire – Warwickshire border about 9 kilometres from Chipping Norton. The OS reference is: SP295309.

The Rollright Stones consist of three groupings of stones: The King's Men, an assemblage of about 77 stones, the Whispering Knights, an assemblage of five stones, and the King Stone, a solitary upright stone with a small circle of several flat stones nearby. The King's Men and the Whispering Knights are in Oxfordshire. The King Stone is in Warwickshire, about 50m across an unclassified road from the main entrance to the Rollright Stones. The main circle of stones, known as the King's Men, is about 33m in diameter. The Whispering Knights is located about 300m in an easterly direction from The King's Men.

The oldest grouping, the Whispering Knights, is thought to be a dolmen or burial chamber about 5000 years of age, pre-dating Stonehenge. Our work is the first study of the lichens of this group of stones. The King's Men date to between 4000 and 4500 years before the present and are considered to be contemporaneous with Stonehenge. The King Stone is the youngest of the Rollright Stones dating to about the middle of the Bronze Age or approximately 3500 years before the present.

The Rollright Stones have been owned and managed by the Rollright Trust since 1998. The most complete and up to date histories of the Rollright Stones are by Lambrick (1988) and Lambrick (2013). Earlier histories explained various theories about their origin, frequently comparing this assemblage of stones to those at Stonehenge (Ravenhill 1932).

The Rollright Stones geology

The stones of the Rollright Stones are about 165 million years old and originate from the Middle Jurassic Period. Geologists consider them to be of a hard siliceous variety of stone from the Great Oolite Group of the Chipping Norton Limestone Formation (Oxford Geology Trust 2007). Viles *et al.* (2011) studied the effects of weathering on the Rollright Stones. They found that rainwater as well as soil moisture, particularly at the base of the stones, has helped to deteriorate the limestone. The impact of lichen acids, in combination with a multitude of pits in the stone that collect rainwater, may be a factor in the deterioration of some of the stones. However Viles *et al.* (2011) state that at least one species of lichen, *Verrucaria nigrescens*, may have a protective effect on the underlying substrate. This species has been identified on 61 of the stones by Winchester (1988). The stones were not quarried but are thought to have been exposed several hundred metres down the hill from their present location. At some point in history the people who created The Rollright Stones managed to transport them uphill to their present site.

History of lichen studies of the Rollright Stones

The first known study of lichens on The Rollright Stones was during a field meeting by the British Lichen Society. This was held in October 1970. Unfortunately no publications arose out of this field meeting and there are no surviving field notes by any of the participants from this day trip. (Price *pers. comm.*, 2013 and Coppins *pers. comm.*, 2013).

The most recently published lichen flora of Oxfordshire (Bowen 1980) does not include any information about the lichens of the Rollright Stones. There are no known records of lichens on the King Stone in any of the lichen literature from Warwickshire.

Winchester (1986) presented a talk on her studies in lichenometry at a joint meeting of the British Lichen Society and the Linnean Society. She discussed her findings of dating stone monuments by measuring growth patterns in lichens on the stone monuments at the Rollright Stones and another stone circle at Castlerigg in Cumbria. Winchester (1988) used a variety of sophisticated techniques to study the movement of various stones at the Rollright Stones. As part of her studies she measured growth rates of lichens and did a species count. She identified 58 species of lichens in her study. Among her findings is that at least one thallus of *Aspicilia calcarea* may be over 800 years of age. She also found that the stones have been moved over time, erected, fallen and re-erected on numerous occasions. No doubt this human intervention has impacted on the growth and presence of lichens on individual stones. Similar findings have been found at Stonehenge and many other stone circles found throughout Great Britain as elsewhere in the world.

The last detailed survey of lichens on the Rollright Stones appears to have been carried out by Winchester *et al.* (2000). They made a separate list of lichens for each of their 78 recorded stones of the King's Men stone circle. They found 59 taxa in total. Gilbert (2000) made a general survey of the lichens of the Rollright Stones and noted there were over 50 lichens.

Viles & Zhang (2013) studied weathering on the Rollright Stones. They concluded that 3 – 10 cm of rock material on various stones has eroded in the last 4000 – 5000 years due to the action of rainwater and moisture coming from the surrounding soil. The impact of rock deterioration and water on lichen growth over this period of time may be a contributory factor to the lichen biota.

Our survey

The current survey aimed to update the taxonomy of the species present at Rollright, check previous identifications and to include the King Stone and the Whispering Knights which appear to have no previous lichen records. We have recorded 75 taxa in 34 genera on the Rollright Stones. The most common genera are *Caloplaca* with 13 species, *Lecanora* with 6 species and *Verrucaria* with 10 species. Some records from the former survey have been reinterpreted and additional interesting lichens have been added for the site.

Much progress has been made with the taxonomic understanding of British lichens in the last decade but there is still a long way to go (including with the *Verrucariaceae* which are richly represented at Rollright). The lichens that are most difficult to identify in the field also tend to be those that are most difficult to collect without damaging the stones. Hence our findings presented here are a refinement of the good work done previously but cannot be considered to be the final and complete list of what is present. Collection and analytical techniques continue to be refined and improved and further surveys in future decades will undoubtedly reveal more. The stones are popularly supposed to be uncountable and the cryptic crusts that grow upon them will also be a challenge to any lichenologist who wishes to compile a complete inventory of what is present.

Conservation evaluation

One purpose of this study was to determine if any notable species are present. The Conservation Evaluation Table of Woods & Coppins (2012) has been used to assess the lichen taxa recorded by us at The Rollright Stones. The Red List Categories of the IUCN (International Union for the Conservation of Nature) give an indication of the threat status of each species. All of the lichen species recorded by us at Rollright have a threat category of "LC" (Least Concern) except for *Lecanora horiza*, which is currently listed as "NT" (Near Threatened) and *Verrucaria squamulosa* which is currently Not Evaluated. However *L. horiza* has been much overlooked by British lichenologists and its status will almost certainly be downgraded with the next review of British lichens. A further category relevant to conservation evaluation is the recognition of species with a restricted distribution, providing an indication of rarity based on the post-1960 records held by the British Lichen Society Mapping Scheme Database.

Verrucaria squamulosa is Nationally Rare (occurring in fewer than 16 British hectads) though its true abundance is not yet known. Eight of the lichen species recorded by us at Rollright are listed by Woods & Coppins (2012) as Nationally Scarce (NS) meaning that they have been recorded from 16 to 100 British hectads. Seven of these eight species (*Aspicilia contorta* subsp. *hoffmaniana*, *Bacidia fuscoviridis*, *Caloplaca dichroa*, *Lecania inundata*, *Lecanora horiza*, *Opegrapha rupestris* and *Verrucaria calciseda*) are actually common and widespread species; their designation as NS results from under-recording. This leaves *Caloplaca ochracea* that Fletcher & Laundon (2009) describe as "scarce."

Almost all of the lichen species recorded on The Rollright Stones might be expected to turn up during detailed surveys of churchyards in Warwickshire and Oxfordshire. There are two interesting exceptions; *Caloplaca ochracea* and *Clauzadea immersa* are very rarely recorded in churchyards in the region. The abundance of *Acrocordia conoidea* and *Thelidium papulare* is also very unusual for this region. The last mentioned four species constitute a particularly distinctive element of the lichen communities on the Rollright Stones and the first pair of species appears to be restricted to the King's Men.

The numbering of the stones

During the course of the fieldwork it became obvious that the numbering of the stones of the King's Men used by Winchester *et al*. (2000) was different from the numbering of the plan based on the "1920 official survey." During our survey we only had the 1920 plan to hand but subsequent reference to the plan in Winchester *et al*. (2000) allowed us to resolve this double numbering issue. When we refer to individual stones we use a "W" to indicate the numbering used by Winchester *et al.* and an "S" to indicate the numbering used in the 1920 plan.

There appears to be no previous recognized numbering of the Whispering Knights and we have assigned our own numbering of the five large stones starting with the easternmost of the tall stones and working clockwise around the cluster ending with the low stone at the north-east.

The King's Men

The stones of the King's Men have somewhat richer lichen communities than those of the King Stone and the Whispering Knights. The reasons for the relative richness of the King's Men could perhaps be speculated on by investigating the history of disturbance to the stones and of adjacent land management. Two of the more interesting species at Rollright, viz. *Clauzadea immersa* (on two stones) and the nationally scarce *Caloplaca ochracea* (on three stones), are restricted to the King's Men. The latter species was recorded by Winchester *et al.* (2000) as *Caloplaca dalmatica* but is proved to be *Caloplaca ochracea* on account of its distinctive thick-walled, four-celled spores. In recent years frugal collection methods have been developed (using razor blades rather than chisels) and, with permission of the Rollright Trust, the collection of tiny specimens has allowed us to perform microscopic examination resulting in more reliable identification of critical species. Our determinations broadly agree with those of Winchester *et al.* (2000) and confirm that the community on the King's Men is dominated by *Acrocordia conoidea*, *Aspicilia calcarea*, *Caloplaca aurantia*, *C. flavescens*, *Lecanora albescens*, *Solenopsora candicans* and *Verrucaria nigrescens*. The 2000 survey recorded *Caloplaca flavovirescens* from five stones and *Protoblastenia incrustans* from seven stones. Both are conspicuous species but, despite searching for them, the current survey failed to find any trace of either. We suspect that this may be a case of mistaken identity and cast a slight shadow of doubt upon these records. The stones from which

Protoblastenia incrustans was recorded in 2000 have strong colonies of *Protoblastenia rupestris* and we think that it is only the latter which is present at Rollright.

Until recently, those members of the *Verrucariaceae* which redeposit calcite to create a thick white, marble-like thallus tended to be recorded as *Verrucaria baldensis* on sight. Recent work has shown that in lowland England much of such material is actually *V. calciseda* and that *V. baldensis* is relatively uncommon. Although somewhat similar, these two species are readily separated on morphological and anatomical characters and we find that *V. calciseda* is by far the more frequent species of this pair on the King's Men. Only *V. baldensis* was recorded in the previous survey and this name was probably applied to both species.

Winchester *et al.* (2000) list *Porina linearis* (on two stones) and *Thelidium decipiens* (on three stones) while the current survey failed to find them (though the former was rediscovered during a visit by the Churchyard Group of the BLS in 2014.)

An interesting species which is rather frequent on the King's Men and which was not recorded by the 2000 survey is *Thelidium papulare* (its large prominent perithecia may have been previously passed over as *Acrocordia conoidea* which is even more common on the stones). For discussion of more subtle discrepancies between the two surveys see our Taxonomic Notes below.

The King Stone and other stones in the vicinity

The King Stone has a similar suite of dominant species as that found on the King's Men (*Acrocordia conoidea*, *Aspicilia calcarea*, *Caloplaca aurantia*, *C. flavescens*, *Lecanora albescens*, *Solenopsora candicans* and *Verrucaria nigrescens*). Although it is difficult to compare this single stone with the numerous stones of the King's Men, the impression is of a slightly poorer community on the King Stone. This is not to dismiss its importance, just interesting to note that certain species such as *Caloplaca ochracea* and *Clauzadea immersa* appear to be absent.

The large sheet of white lichen growth near the base of the south side is not a single ancient thallus as is the case with the "largest lichen" on one of the King's Men (stone 56 S). The former comprises numerous thalli of *Lecanora albescens* while the latter is a single individual of *Aspicilia calcarea*. The top of the King Stone has a large colony of *Lecania erysibe* which is present in only small quantity on a few of the King's Men.

A metal fence surrounds the King Stone and just outside the north side of this fence are a few flattish stones, not quite as flat as paving slabs, but much trodden upon. Although these stones appear to be worn down to bare rock, they actually have a complete and distinct community forming a closed mosaic of pale, thin or immersed thalli. The abundance of *Thelidium incavatum* and *Sarcogyne regularis* are a feature of these well-worn stones.

Some ten metres north of the King Stone is a small circle of modest sized stones which appears to be used for sitting on around a camp fire. These have a distinctly different community to those on the named stones at Rollright. This community appears to be dominated by colonists and the list of species would not be out of place on calcareous paving and garden walls.

The Whispering Knights

The community on these stones is rather similar to that on the King Stone having a similar range of dominants to those on the King's Men but without certain notables such as *Caloplaca ochracea* and *Clauzadea immersa*. Of particular interest here is the presence of *Dermatocarpon miniatum* on stones 1 and 3, and a colony of *Ramalina* cf. *lacera* on stone 2. Stone 3 is one of the tall stones leaning in towards the centre in a conspiratorial manner. Water seeps down the underhanging side, a somewhat unusual occurrence caused by the topography of the apex. The upper portion of this rain track supports a large colony of *Xanthoria candelaria*, its only station at Rollright. The rest of the rain track shows an interesting succession through colonies of *Candelariella medians*, *Physcia adscendens* and *Diploicia canescens*. On stone 4, one of the lower stones, a shady crevice contains a colony of a species of *Verrucaria* with a green, squamulose thallus. At the time of the survey we had no option than to consider this to be a form of *V. viridula* which is the way that British lichenologists had treated such material. Orange (2013) has reported *V. squamulosa* as new to the British Isles and we now consider this to be the identity of the colony on stone 4. A whole day could be spent studying the complex ecology of this cluster of five giant stones.

Comparison with Stonehenge lichens

The Rollright Stones are located 145 kilometres from Stonehenge in Wiltshire. Although roughly of comparable age, created between 4000 and 4500 years ago, one part of the Rollright Stones predates Stonehenge. The Whispering Knights, considered to be a burial chamber consisting of four upright stones and one horizontal stone, was created about 5,000 years ago.

Although geologists describe the rock type of The Rollright Stones as a 'siliceous limestone', the lichen community on all of the stones is as if they were located on a pure, highly calcareous limestone. Stonehenge is composed of sarsen sandstone from Wiltshire as well as the famous bluestones from the Preseli Hills in Wales that are dolerite and rhyolite rocks of volcanic origin.

The most recent lichen survey of Stonehenge, dating from 2013 (Coppins *pers. comm*., 2013 and as annotated on the NBN database from 7 December 2013), lists 108 species of lichens. Prior studies, done between 1973 and 2004 listed between 50 and 100 species. The Highways Agency (2005) did a three-year study of the lichens of Stonehenge. They concluded that there have been some species increasing in numbers and some decreasing in numbers. The results were inconclusive as to the cause though environmental factors and human influence were part of their study.

In the last forty years the number of species identified at Stonehenge has increased by about 25%. During our study the number of species has also increased from previous studies by about 25%. We can speculate that taxonomic splits and increasing competence and greater survey effort will have been factors in this increase in species numbers.

Stonehenge supports some lichens typical of a maritime environment. It has been speculated that the 'maritime' lichens on Stonehenge and other sarsens might have originated by long distance travel of sea spray but we are not sure that this theory has been accepted. It might be that the hard acidic sarsen stone happens to be conducive to the 'maritime' lichens.

The Rollright Stones do not have any maritime element. The number of species common to both sites is fourteen. These are mainly generalist species associated with nutrient-enriched microhabitats. It is interesting to make some comparison with Stonehenge but the communities are completely different (calcareous limestone vs. hard acidic sandstone and volcanic rock).

Table 1. Species recorded by us at each sub-site at the Rollright Stones

	The King's Men	**The Whispering Knights**	**The King Stone**	**Minor stones near King Stone**
Acrocordia conoidea	•	•	•	
Agonimia tristicula		•		
Aspicilia calcarea	•	•	•	
A. contorta contorta	•	•	•	
A. contorta subsp. *hoffmananiana*	•	•	•	
Bacidia arnoldiana	•		•	
Bacidia fuscoviridis	•	•		
Belonia nidarosiensis	•			
Bilimbia sabuletorum	•	•		
Botryolepraria lesdainii	•	•		
Caloplaca cf. *albolutescens*				•
Caloplaca aurantia	•	•	•	
Caloplaca chrysodeta	•	•	•	

	The King's Men	The Whispering Knights	The King Stone	Minor stones near King Stone
Caloplaca crenulatella	•			
Caloplaca dichroa	•		•	
Caloplaca flavescens	•	•	•	
Caloplaca flavocitrina				•
Caloplaca limonia	•	•	•	
Caloplaca marmorata	•	•		
Caloplaca oasis				•
Caloplaca ochracea	•			
Caloplaca teicholyta	•			
Caloplaca variabilis	•	•	•	
Candelariella aurella	•	•		
Candelariella medians	•	•	•	
Catillaria chalybeia	•	•		
Catillaria lenticularis	•	•	•	
Clauzadea immersa	•			
Clauzadea cf. *metzleri*	•			
Clauzadea monticola	•	•		
Collema crispum	•	•		
Collema cf. *fuscovirens*	•			
Collema tenax	•			
Dermatocarpon miniatum	•	•		
Diploicia canescens	•	•		
Diplotomma alboatrum	•	•	•	
Lecania erysibe s. str.	•		•	
Lecania inundata				•
Lecania rabenhorstii	•		•	
Lecanora albescens	•		•	
Lecanora campestris	•	•		
Lecanora crenulata	•	•	•	
Lecanora dispersa	•	•		
Lecanora horiza	•	•	•	
Lecanora muralis				•

	The King's Men	The Whispering Knights	The King Stone	Minor stones near King Stone
Lecidella stigmatea	•			
Lepraria lobificans	•			
Lepraria vouauxii	•	•		
Leptogium cf. *plicatile*	•			
Opegrapha rupestris	•	•	•	
Phaeophyscia orbicularis	•	•	•	
Physcia adscendens	•	•	•	
Placopyrenium fuscellum	•	•		
Placynthium nigrum	•			
Protoblastenia rupestris	•		•	
Ramalina cf. *lacera*		•		
Sarcogyne regularis	•			
Sarcopyrenia gibba				•
Solenopsora candicans	•	•	•	
Thelidium incavatum				•
Thelidium papulare forma *papulare*		•		
Toninia aromatica	•	•	•	
Verrucaria baldensis	•		•	
Verrucaria caerulea	•			
Verrucaria calciseda	•	•	•	
Verrucaria hochstetteri	•		•	
Verrucaria macrostoma forma *furfuracea*	•	•	•	
Verrucaria macrostoma forma *macrostoma*	•			
Verrucaria nigrescens forma *nigrescens*	•	•	•	
Verrucaria nigrescens forma *tectorum*	•		•	
Verrucaria squamulosa		•		
Verrucaria viridula	•	•		
Xanthoria calcicola	•			
Xanthoria candelaria s. str.		•		
Xanthoria parietina	•	•	•	

Taxonomic notes

***Caloplaca* cf. *albolutescens*.** A sterile thallus, observed on one of the minor stones forming a small fire pit north of the King Stone, closely resembles *C. albolutescens*. When fertile this lichen is very distinctive but when sterile it is rather nondescript. There is a high likelihood that this identification is correct as it is common in such recent calcareous communities but it has been very much overlooked by British lichenologists and confused with *C. teicholyta*.

Caloplaca dichroa was described as new to science in 2006; former surveys will have recorded its thallus as *C. citrina*. *C. dichroa* is common on calcareous substrata, both natural outcrops and artificial structures. It has a preference for horizontal or sloping (rather than vertical) surfaces and takes its name from the variability in colour between different individuals, ranging from bright pure yellow to deep orange. When well developed the thallus is covered in fine blastidia, but the production of blastidia tends to be suppressed in the vicinity of apothecia. The 2000 survey recorded *C. holocarpa* from 21 stones of the King's Men while we failed to find any convincing specimens of it. We suspect that clusters of *C. dichroa* apothecia were misinterpreted as *C. holocarpa*. The habitat seems wrong for *C. holocarpa* which is usually a feature of more acidic substrata. Fletcher & Laundon (2009) state that *C. oasis* (syn. *C. holocarpa* auct. Brit.) "includes most British records identified as *C. holocarpa*, on calcareous rocks, cement, mortar, asbestos, etc." This would be a possible source of the former records of *C. holocarpa* except that we failed to find *C. oasis* on any of the King's Men. Another source of confusion might be mistaking *C. marmorata* (recorded as *C. lactea* in 2000) for *C. holocarpa*. However Winchester *et al*. (2000) appear to be aware of *C. marmorata* and record both species. The majority of the former records of "*C. holocarpa*" are from the tops of the stones which is where *C. dichroa* is best developed and often fertile and so it is with some confidence that we reinterpret the previous records of *C. holocarpa* as *C. dichroa*.

***Clauzadea* cf. *metzleri*.** A thallus on stone 16S has a morphology somewhat intermediate between *C. monticola* and *C. immersa* (both of which are confirmed as occurring on the King's Men). Unfortunately the tiny specimen (*Powell* 3191) was insufficient to confirm the presence of *C. metzleri* so we make a tentative report which could be pursued during a future survey.

***Collema* cf. *fuscovirens*.** Winchester *et al*. (2000) reported *Collema auriforme* from four stones in the south-eastern quadrant of The King's Men where we found *C.* cf. *fuscovirens*. We are sure that our recent survey reports the same lichen but with a different tentative identification.

***Lecanora horiza*.** Woods & Coppins (2012) provide a conservation evaluation of British lichens in which *L. horiza* is stated to have an IUCN designation of Near Threatened and a restricted distribution category of Nationally Scarce. Malíček & Powell (2013) indicate that *L. horiza* is much more common as a saxicolous species than British field lichenologists have previously realized. The separation of *L. horiza* from *L. campestris* presents considerable problems, compounded by the inaccurate description of *L. horiza* given by Edwards *et al.* (2009). Some thalli on the vertical faces of some of the King's Men (e.g. stone 1S) conform to the typical morphology of *L. horiza* having large fruits with very glossy discs, the fruits giving the impression of almost falling out of the thallus.

Leptogium* cf. *plicatile. On stone 2S we found a small thallus which we believe to be *L. plicatile*. Gilbert *et al*. (2009) point out that this species is very variable and may be confused with other species such as *Collema auriforme* and *L. schraderi*. One strategy for the future would be to take named material of the possible species to the site to compare in situ, along with the collection of a lobe to examine its anatomy.

Ramalina* cf. *lacera. The genus *Ramalina* forms shrubby tufts and, despite being conspicuous, the species are morphologically variable and thin layer chromatography is often required for confirmation. We prefer to leave our identification tentative.

Verrucaria squamulosa. The material collected from Stone 4 of the Whispering Knights (*Powell* 3192) appears to conform to the description of *V. squamulosa*, a species which was described as new to science in 2003 but which has only recently been recognized as occurring in Britain by Orange (2013). *V. squamulosa* is currently Nationally Rare (recorded from fewer than 16 British hectads) though its true abundance is not yet known due to under-recording. This site may be a new county record for this species.

References

Bowen, H.J.M. (1980). A lichen flora of Berkshire, Buckinghamshire and Oxfordshire. *Lichenologist* **12:** 199–237.

Edwards, B., Aptroot, A., Hawksworth, D.L. & James, P.W. (2009). *Lecanora*. In *The Lichens of Great Britain and Ireland*. (C.W. Smith *et al.*, eds): 465-502. London: British Lichen Society.

Fletcher, A. & Laundon, J.R. (2009). *Caloplaca*. In *The Lichens of Great Britain and Ireland*. (C.W. Smith *et al.*, eds): 245-273. London: British Lichen Society.

Gilbert, O. (2000). The Rollright Stones – An early church? *Churchyard Lichen News* No. 6: Autumn.

Gilbert, O.L. & Jørgensen, P.M. (2009). *Leptogium*. In *The Lichens of Great Britain and Ireland*. (C.W. Smith *et al.*, eds): 541-551. London: British Lichen Society.

Highways Agency (2005). Lichens at Stonehenge. Year Three of a Three Year Survey Baseline (2004).

Lambrick, G. (1988). *The Rollright Stones, Megaliths, Monuments, and Settlements in the Prehistoric Landscape*. Historic Buildings and Monuments Commission for England; English Heritage Archaeological Report no. 6.

Lambrick, G. (2013). *Images of the Stones*. A Pictorial Guide to the Rollright Stones. The Rollright Trust.

Malíček, J. & Powell, M. (2013). *Lecanora horiza* and other surprises in the *Lecanora subfusca* group. *Bull. Brit. Lichen Soc.* **112:** 66-71.

Orange, A. (2013). New, Rare and Interesting Lichens. *Bull. Brit. Lichen Soc*. **112:** 80.

Oxford Geology Trust (2007). Local Geodiversity Action Plan for Oxfordshire's Lower and Middle Jurassic edn 1: 12-13.
Ravenhill, T.H. (1932). *The Rollright Stones and the men who erected them.* Birmingham: Cornish Bros.
Viles, H., Fang, G. & Sharples, T. (2011). *Weathering and Deterioration Survey of The Rollright Stones*. Unpublished report. Oxford Rock Breakdown Laboratory, University of Oxford.
Viles, H. & Zhang, H. (2013). *Weathering and Deterioration Survey of the Rollright Stones.* Research Project, School of Geography and the Environment, University of Oxford.
Winchester, V. (1986). Horizons in Lichenology. *Bull. Brit. Lichen Soc*. **59:** 10.
Winchester, V. (1988). An assessment of lichenometry as a method for dating recent stone movements in two stone circles in Cumbria and Oxfordshire. *Botanical Journal of the Linnean Society*. **96**: 57–68.
Winchester, V., Pedley, I. & Gilbert, O. L. (2000). *Rollright Stone Circle: Survey of Lichens on the Stones*, October 2000. Unpublished report.
Woods, R.G. & Coppins, B.J. (2012) *A Conservation Evaluation of British Lichens and Lichenicolous Fungi. Species Status 13*. Peterborough: Joint Nature Conservation Committee.

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The puzzle of the monkey puzzle tree *Araucaria aruacana* as a lichen substrate

Epiphyllous lichens that are specially adapted for life on leaf surfaces are becoming increasingly common and diverse. A decade or more ago only box (*Buxus sempervirens*) seemed to have any noteworthy species. Now any long-lived leaves are worth a search. Of all the long-lived leaves perhaps those of the *Araucaria* or monkey puzzle tree might take the prize for longevity. Their leaves seem to be able to survive for several years if not more and are a potential epiphyll paradise.

The tree was introduced to Britain from South America in 1795, so the oldest are therefore little more than 200 years old. Unfortunately as well as defeating the monkey, the viciously spiky leaves are both dangerous to inspect (particularly given the focal length of a x10 lens) and difficult to remove for collection and study purposes. Most older trees have a canopy well out of reach and cherry pickers are not current standard lichen recording gear. Even if secateurs or high-pruners and gauntlets are carried you then need an owner willing to sacrifice the symmetry of a prize specimen tree! Binoculars may be the most useful bit of equipment.

One of the authors (RGW) had searched the few monkey puzzles present in Central Wales but with no success whatsoever. Leaves were liberally covered in algae but lichens were non-existent. A trip west into the Teifi Valley, Ceredigion and the churchyard of Llanwenog (SN494456) was therefore something of a revelation when the leaves of a large and rather isolated female tree (above) were found tasselled with fruticose lichens. Ceredigion sports a rather more than average number of monkey puzzle trees including a small forestry trial block. Only the lowest branches could be examined of the Llanwenog tree and then only by balancing on a wall top. Most impressive amongst the hoary white tassels was *Ramalina fastigiata* with *R. farinacea* and *Evernia prunastri*. A greyish coloured form of *Xanthoria parietina* was also frequent as was the inevitable *Physcia tenella*. No crustose lichens could be found.

SPC notes a visit of the BLS to another Ceredigion churchyard by Tom Chester, Frank Dobson & Jeremy Gray in spring 1996. In Ysbyty Cynfyn (St John the Baptist), Parson's Bridge Church, (SN752791), alt 240 m, they recorded on a monkey puzzle tree planted in the burial yard *Lecanora conizaeoides*, *Lecanora albella* (as *L. pallida*) and *Lecidella elaeochroma* amongst others. SPC noted *Pertusaria pertusa* on the trunk of one by the entrance gate in 2011 but on a visit in 2015 could find no trace, not even a granule, of *Lecanora conizaeoides*, nor *L. albella* on the main tree, where small lobes of *Physcia tenella* were now predominating. So in two decades the epiphyte suite had undergone a transformation, switching from acidophiles and species tolerant of mild nutrient enrichment, e.g. *L. albella*, to nitrophiles. This demonstrates the value of annotating substrate 'metadata' when filling out record cards and the value of such distinctive and rarely planted trees such as the monkey puzzle that leave no doubt as to whether you have selected the right tree on a later visit. Thus recording cards become value-added monitoring cards.

A young tree, but tall and growing strongly, planted *ca* 1985 at alt. 240 m in the garden of 'Trefenter' above Llanddewi Brefi, had in 2014 an interesting number of epiphylls on sheltered leaves on accessible low branches on the damp side of the trunk, including *Dimerella lutea*, *Fuscidea lightfootii, Hypotrachyna revoluta, Parmelia sulcata, Physcia tenella* and *Fellhanera viridisorediata*.

We are both resolved to take more of an interest in the lichens of this unique tree. The experimental block of stunted trees planted by the Forestry Commission above Esgair Fraith in Ceredigion in *ca* 1953 still awaits a lichenologist - but perhaps not for much longer.

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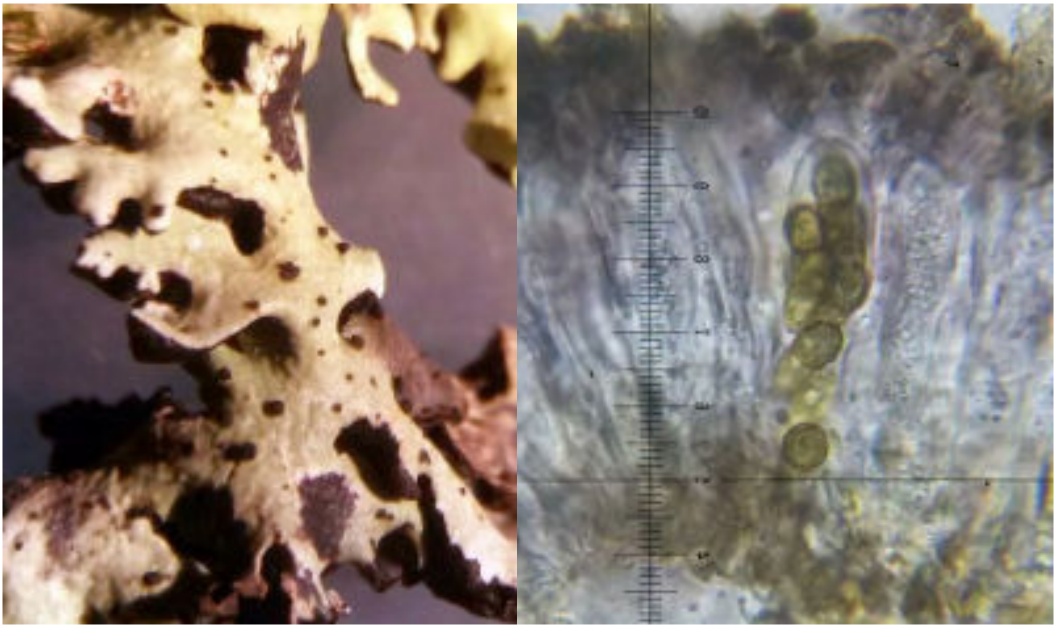
More pisciphilous lichens… Following the impressive picture in the previous *Bulletin* of a dead fish in the Antarctic sporting an *Usnea* beard, here is a Scottish example. The picture was taken by Peder Aspen in 2001 in Ballachuin Atlantic Hazel wood, in company with Brian and Sandy Coppins, and shows the very dried, leathery skin of the lumpsucker fish *Cyclopteris lumpus* with *Usnea subfloridana* and *Platismatia glauca* growing on the surface and quite firmly attached. Peder couldn't resist a picture, but sadly left it behind, thus avoiding odd smells coming from the RBGE lichen collection.

Abrothallus prodiens, a parasite of *Hypogymnia physodes*

On the last day of February this year I set out with friends to a favoured local place in the Pentland Hills (Lothian) for a spot of mycology. As a relative beginner with lichens I also wanted to use the opportunity to try to make a list of lichens and maybe collect some bits and pieces I hadn't seen before, of which there are still many.

At some point during the day as we looked at some *Hypogymnia physodes* we noticed small black growths on the surface. Lichens have a lot of tricks that I don't know, so I couldn't say whether this was just a part of the lichen or not, but the feeling was that it wasn't. After a brief discussion I was nominated as its guardian and put it in my collecting box. We carried on collecting other scraps as we generally do before heading off.

A microscope session later, we had looked at a number of fungi and had a long debate about whether one fungus was lichenised or not, even trying to key it out in separate references. I don't think we ever resolved that one due to destructive testing and lack of photography but another I had a similar dilemma about turned out to be *Strangospora moriformis* (ID BJC).



Abrothallus prodiens: ascomata on thallus of *Hypogymnia physodes* (left); asci and ascospores (right).

Over the next couple of days the collecting box was gradually emptied and processed and I was pleased to see asci and spores in good condition which made me feel that a positive identification was more likely. I was also pretty sure it wasn't part of the lichen. On the other hand I had no way of "getting at" it! I had no idea then that there is a lichenicolous fungi key.

I spent some time fishing about in the internet and looking for some kind of material where I could match the spore pictures I had before finally sending off the pictures to Brian Coppins with a plea for help (and my incorrect stab at identification, naturally). Of course he identified it immediately and told me that the current known range was only from the highlands of Scotland. It's always good to get a bit of beginner's luck and the two finds on that day certainly qualified. The site itself probably still has much to offer and you never know – maybe there's a nother nice surprise waitig for us there.

When I did get hold of the lichenicolous fungi key it keyed out quite easily with hindsight – but then they always do, don't they?

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What's going on? Yeasts in the cortex

The lichen symbiosis is traditionally presented as a mycobiont (usually an ascomyctete fungus) and a photobiont (an alga or cyanobacterium that photosynthesises and provides energy in the form of sugars for the fungus). If two photobionts are present in a lichen thallus they are kept well apart, with the additional one being wrapped up in structures called cephalodia. To complicate matters further, a growing number of lichenicolous fungi have been described - these are fungi growing on lichens. We even know of lichens growing on lichens, most famously *Diploschistes muscorum* on *Cladonia.* But a recent paper, by Toby Spribille and colleagues at the University of Montana, has astonished the whole biological community. They suggest that there may routinely be a second fungal component in lichens confined to the cortex, a single celled, yeast-like basidiomycete, and that it may be this component rather than the ascomycete that produces lichen compounds (the 700+ complex organic chemicals unique to lichens) - and that this second fungal component has been there as long as lichenised fungi have existed (about 200 million years). They even speculate that lichens may be much easier to cultivate in the laboratory now that their true composition is understood, pointing out that failure to form a cortex accounts for the rather amorphous form of laboratory-cultivated mycobiont hitherto.

How on earth did they discover this and make these bold claims? They were studying two 'species' of *Bryoria* that were already known to be genetically identical but were strikingly different in colour and toxicity. *Bryoria tortuosa* is full of vulpinic acid, a toxin strong enough reputedly to poison wolves, and yellowish in colour while *Bryoria fremontii* is dark brown and non-toxic. They hypothesised that a difference in the expression of genes (from identical genotypes) must account for the different phenotypes. They used state-of-the-art mRNA transcriptome sequencing, looking for typical ascomycete single-nucleotide polymorphisms (SNPs), but found no difference at all between the two 'species'. However, when they widened the analysis to look for SNPs from all fungi they were surprised to find clear genetic evidence of the presence of a basidiomycete fungus in the *B. tortuosa* thalli. The basidiomycete could not be detected using any form of traditional microscopy. They therefore used another cutting-edge technique called FISH (fluorescent in situ hybridisation), targeting specific RNA sequences typical of ascomycetes and basidiomycetes. The ascomycete fluoresced purple and the basidiomycete fluoresced green. The latter were now seen to be single-cell, yeast-like (budding), and confined to the cortex (where the vulpinic acid is concentrated). They then went on to demonstrate a yeast in the cortex of many other macrolichens from different continents and to estimate the age of the new fungal order. They have called the new 'yeasts' *Cyphobasidia.* The discovery of an entire new order of fungus is of great interest taxonomically and biologically – Spribille has apparently used the analogy of discovering primates among the vertebrates!

One practical implication of all this, if confirmed, is that bioprospecting of lichen compounds can begin in earnest now their origin is better understood and if laboratory cultivation of lichens, or even the new yeasts alone, becomes possible. Many lichen compounds are already known to be biologically active, with antibacterial, antiviral, anti-prion and even anti-cancer properties. For example, usnic acid is active against methicillin-resistant *Staphylococcus aureus* (the flesh-eating bacterium hospitals have struggled to eradicate) and also acts against herpes simplex virus. One isoform of usnic acid has anti-proliferative effects on human breast cancer and lung cancer cell lines *in vitro* – probably by inducing programmed cell death (apoptosis) but without damaging DNA. This means it could be a potential anti-cancer compound without the typical toxicities of conventional chemotherapies. These days some new cancer treatments still arise from bioprospecting natural species, while the majority are developed by designing proteins to fit molecules involved in increasingly well-understood intracellular oncogenic pathways.

The anti-prion effect of a serine protease found specifically in *Parmelia sulcata*, *Cladonia rangiferina* and *Lobaria pulmonaria* is of particular interest. This lichen compound, as yet not characterised, denatures prions at ambient temperature and unremarkable pH in aqueous solution – all of which is quite remarkable, given that prions are notoriously resistant to standard disinfection and autoclave practices. We may really need this if bovine spongiform encephalopathy or Creuzfeldt-Jacob disease become more widespread.

References

Spribille,T. *et al.* (2016). Basidiomycete yeasts in the cortex of ascomycete macrolichens. *Science* **353**: 488-492.

Rankovic, B. (ed.) (2015). *Lichen Secondary Metabolites*. Springer International Publishing, Switzerland.

Mayer, M. *et al.* (2005). Usnic acid. *Anticancer Drugs* **16**: 805-809.

Rodriguez, C., Bennett, J. & Johnson, C. (2012). Lichens: unexpected anti-prion agents? *Prion* **6**: 11-16.

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The ultimate metallophyte? ……. unless you know better!! Photograph by Paul Harrold, 2015. *Stereocaulon dactylophyllum* var. *dactylophyllum* on railway cleat near Rannoch station. Substrate courtesy of Network Rail (Scotland).

The stump lichen (*Cladonia botrytes*) – an amazing recent journey

Thank you Andy Acton!

Background
In another life I was the Site Manager of the RSPB Abernethy Forest Reserve and during that period, in 1987, a corridor of old Scots pines was felled to allow an overhead power line to be installed to one of the more remote properties just off the reserve. In 1998, Sheila Street, as part of a wider survey, undertook a survey of the stumps created by the felling and on four out of the one hundred checked she found the rare stump lichen *Cladonia botrytes*. I knew very little about lichens at the time but

did make a pilgrimage to see it on one of the stumps, and after much searching amongst other *Cladonias* succeeded in finding it. Earlier this year I received an email from Andy Acton asking whether I knew if *Cladonia botrytes* was still to be found along the powerline and something in the back of the memory thought it had now gone. On checking, I found that Rebecca Yahr had re-surveyed many of the previously known sites in 2006 from Deeside to Strathspey and south to Kindrogan finding that it had been lost from many of them, including the powerline site, mainly due to ongoing decay of host stumps but also by the growth of bryophytes and surrounding vegetation over time. Rebecca was very helpful and let Andy and myself see copies of the report from that survey giving an almost up to date picture of the current status of this beautiful wee lichen.

Rebecca's paper gives a lot of information about timescales, sites and populations; one example is the Abernethy powerline site:

"The area of woodland through which the powerline was installed dates back generally to the early 1900s, with a photograph from about 1900 showing much of the woodland quite open from previous fellings and with the occasional 'granny-type' pine across the area. These older trees would have been too multi-stemmed in the late 1800s to have provided the straighter stemmed trees required by the sawmills of the time. However, they would have provided the seeds for the current crop of trees. The power-line was installed in 1987 creating a corridor about 30-40 metres wide in which all the trees were felled. This was naturally regenerated Scots pine woodland with not too many trees to the hectare and from Sheila Street's survey we know that about 100 stumps were available to be checked along the one-kilometre corridor. Being open grown, the trees and hence stump diameters would be of a good size for 90-100 year old trees, with an average diameter of occupied stumps from Sheila's survey of 72cm (range 66 to 79cm)."

Andy Acton's enquiry kicked something off in my mind and as I was out and about looking at other things I started looking down at any stumps I encountered. Photographs of possible *Cladonia botrytes* were sent to Rebecca during this period, all with negative replies but with the helpful comment that "you will know it when you see it." I often find that searching for one thing will often produce another and so it happened with this lichen. Our chalet guests were desperate to see a crested tit during the difficult to see egg-laying period and I went out one morning to see if I could hear calling birds or see a male calling his female to present her with food. Walking towards a calling bird I left the Scots pine woodland to wander across an area previously comprising lodgepole pine plantation (*Pinus contorta*), all of which had been felled by timber harvester during the winter of 1999/2000 as part of the EU LIFE Wet Woods Restoration Project. Following the felling this area had been left to develop naturally and across the site there are lots of young Scots pines and birches but also numerous stumps. Having lost the calling crested tit I stopped to wait for the bird to call again giving me time to look down at the many stumps. Rebecca was right and on about the third stump checked there was a tiny *Cladonia* with lots of podetia all topped with

The first find of *Cladonia botrytes*, on a lodgepole pine stump

distinctly pinkish apothecia. Was this the lichen I was looking for? At this stage I have to admit to not being a lichenologist, but do have an interest in looking for the rarer species on aspens, so I've a very limited knowledge of this group, particularly *Cladonias*. I walked back to the house for my better SLR camera along with tripod and spent the next hour carefully photographing what I had found. Care had to be taken because despite the stump being about 27cm in diameter it was very fragile, particularly at the junction between sap-wood and heart-wood which, on this stump, is where the lichen was growing. With greater confidence a photo was again sent to Rebecca and her reply confirmed that a new site for the stump lichen had been found.

I returned the next day to continue checking stumps and at the end of that search four more stumps with the lichen had been found. Sadly, at this stage, I didn't have my hand-tally counter with me so can't be sure of the number of stumps checked but it probably numbered a couple of hundred. The third site where the lichen was found was also a little unusual in that the lichen was growing on a fallen lodgepole pine log, probably one of the large side branches that were typical of this group of trees. The finds had also come from about two hectares of stump habitat searched, and in this part of the Abernethy Forest Reserve lodgepole pines had been removed from about one hundred hectares as part of the Wet Woods Project! Because all of this felled area had been subjected to either drain blocking in the wetter area to re-create bog woodland or left to regenerate naturally after the logs had been removed, not all of the one hundred hectares would be suitable for the lichen. This was certainly the case adjacent to my initial finds; an almost impenetrable thicket of young Scots pines and birches have established, where any surviving stumps were very difficult to find. However, what was available was quite a large area of stump-rich habitat which hadn't been re-planted (a rarity in normally managed commercial woodland) providing an opportunity for stump/*Cladonia botrytes* checking.

The stump on which the first find was made

Survey results to date

These initial finds were quite unusual in that the tree species was lodgepole pine, not Scots pine, a first. The next outing to check stumps took me to an area of felled Norway spruce where again the lichen was found, another new host. The trees in this area were, as far as can be ascertained, planted in 1973 and felled during 1999 -2000. The lichen was found sixteen years after the trees were felled but sadly, hadn't been looked for earlier. Street (1998) found the lichen eleven years after the trees were felled along the powerline.

My next nine outings took me to another area of ex-lodgepole pine which was felled by a timber harvester during winter 1997/98 making the stumps eighteen years old. This area had many stumps that were in an advanced state of decay but despite that, the lichen was found on 35 of them providing the most diverse locations/positions occupied by the lichen around the stumps. The selection of photos below illustrates these finds, hopefully to aid others who might be looking for this lichen.

Two populations on a stump, marked with blue pencils: survey method detailed below

As I wandered the sites I was also checking other suitable looking pieces of fallen/decaying timber comprising mostly Scots pine or, where the lodgepole pines had been felled, the piles of branches/brash left behind by the timber harvesting machine. Having just completed my search of an area of lodgepole pine stumps over several visits, and pedalling home, I was tempted off the track to visit another felled area not previously visited. This site was quite damp being close to a dammed up drain and, despite many of the twenty-five stumps checked looking suitable, nothing was found. In the same area I came across a long-fallen pine, long dead and worth checking. 5th July 2016 will be long remembered because on a section of deadwood on the top of the main tree trunk was a very healthy population of *Cladonia botrytes* although on a very loose sliver of decaying timber. The procedure I had adopted at each find then followed. Switch on my GPS and photograph GPS screen/lichen on location, place a pencil pointing at the lichen before taking a general photo of the lichen on the log followed by close up photos of the lichen itself. The latter would making counting the number of podetia easier, if needed, once home. In Scotland, this lichen has previously been found mainly on Scots pine stumps, but there is also one record on a dead heather stem and also on 'peaty soil' (Coppins & Coppins 1998). So my find on the fallen pine would appear to be the first record from a naturally occurring section of deadwood.

As a guide, and without any scientific back-up, when I see a stump with a good population of *Cladonia portentosa* I can see potential, and quite often *C. botrytes* is also present. This was very obvious when I made my 50th find, being drawn in by the good population of *C. portentosa* visible from a distance. Another feature that seems to have been raised before (Yahr *et al.*, 2013) is that areas where conifers have been felled and subsequent regen has failed, creating a glade, the resulting stumps, provided they are left undisturbed for long enough, have the potential to support the lichen. Examples were found at Kindrogan, and the way-leave felling corridor at Abernethy.

Cladonia botrytes growing amongst C. portentosa, with other *Cladonia* species also present.

Conclusion

My fascinating recent journey into *Cladonia botrytes* has established several things:

- *C. botrytes* has been found on stumps of two 'new' (at least for Scotland) tree species – lodgepole pine and Norway spruce; before, it was recorded only from the stumps of Scots pine;
- by methodically recording throughout my searches, I have been able to form conclusions about habitat requirements, e.g. the value of glades, the preference for drier habitats rather than boggy areas;
- I have established the strong possibility that the presence of *C. portentosa* on a lodgepole pine stump can be quite a good guide or indication that *C. botrytes* may be present;
- A positive highlight was finding a population on a 'natural' habitat – the fallen pine trunk. The presence of this diminutive lichen seemingly only colonizing on man-made habitats of stumps was a little worrying;
- My focussed searches have resulted a greater number of sites, numbers of stumps and more individual numbers of podetia of *C. botrytes* than were previously known in Scotland.

Despite good number of finds listed in the table below is the lichen really rare? I would say yes mainly because the number of forested sites where stumps of felled trees are left undisturbed for 10-20 years is quite rare. However, for the lichen to appear in quantity, as in Abernethy, it has to be there somewhere at the time the trees were felled.

There has been some interesting work done in Sweden: Kristine Bogomazova (2012) looked at *C. botrytes* in Sweden, and found that apart from the preference for stumps, the lichen was not uncommon on soils in clear-cut forests, on humus on the ground and on boulders. She speculates that *C. botrytes* is a relatively fast-colonising species and will occur in natural habitats in forests, such as in conditions created by storms or forest fires. It will therefore take advantage of clear-fell forests where stumps provide ample suitable habitat opportunities.

Cladonia botrytes growing on a fallen coniferous twig, Uppland, Sweden. Image © Kristine Bogomazova

Kristine also sent me a series of photographs of *C. botrytes* in Sweden – the abundance of the lichen cover on some of the stumps was almost overwhelming! It has never been reported growing so thickly on stumps in Scotland. But other interesting photos showed *C. botrytes* growing on the ground amongst needle litter, small pebbles, bryophytes and small vascular plants. And, what for me was of most interest, was a photo of *C. botrytes* growing on a fallen pine twig. In my searches for this lichen amongst clear-fell I have looked at brash and woody debris, but so far without success. Clearly, a niche yet to be realised in Scotland.

In Scotland, perhaps the find on the dead heather stem is a bit of a clue or could it also be growing, so far unfound, on dead twigs and branches of nearby live trees? Again, my find on the dead fallen pine tree might also be a clue. Is it difficult to find? Initially yes and in woodland with the wrong habitat/stump relationship a lot of searching could go unrewarded as shown by my visits to Curr Wood in the table below where the lichen has been recorded once in the past. However, the small size and pinkish apothecia even to a general natural history recorder like me made it easy to spot once I knew what I was looking for. My only regret is that the light in the head didn't come on earlier because I'm sure there were a lot more stumps supporting the lichen, in the areas that I've been searching, in years gone by. Happy hunting.

A final image, at sunset. The vast swarms of midges cannot be seen…

Table 1. *Cladonia botrytes* records made by Stewart Taylor, between 17 April and 4 September 2016

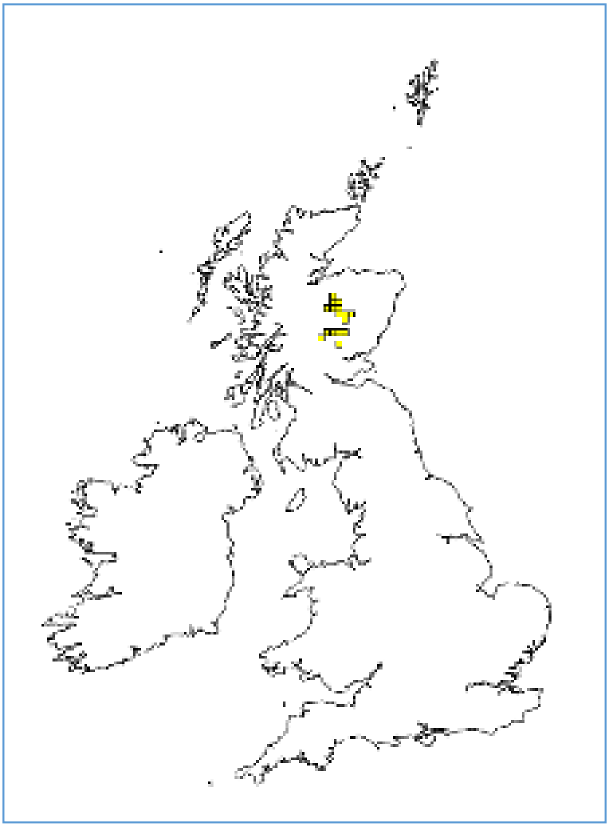
Date	Stumps counted	Stumps with *Cladonia botrytes*	Location
17/04/2016	not counted	0	Curr Wood
18/04/2016	not counted	0	Curr Wood
20/04/2016	not counted	3	Abernethy
21/04/2016	not counted	2	Abernethy
23/04/2016	not counted	0	SNH Dell
24/04/2016	not counted	2	Abernethy
26/04/2016	not counted	0	Abernethy
27/04/2016	not counted	0	Craigmore
28/04/2016	220	0	Curr Wood
30/04/2016	150	0	Curr Wood
03/05/2016	200	0	Curr Wood
15/05/2016	10	2	Abernethy
16/05/2016	370	9	Abernethy

Date	Stumps counted	Stumps with *Cladonia botrytes*	Location
19/05/2016	309	1	Abernethy
25/05/2016	172	5	Abernethy
12/06/2016	142	3	Abernethy
30/06/2016	not counted	1	Abernethy
01/07/2016	184	6	Abernethy
03/07/2016	295	2	Abernethy
03/07/2016	64	2	Abernethy
05/07/2016	25	1	Abernethy
22/07/2016	75	2	Abernethy
11/08/2016	170	2	SNH Dell
13/08/2016	250	0	SNH Dell
04/09/2016	138	2	Abernethy
Totals	**2995**	**50**	

Table 2. Details of stumps

Stump **diameter** (if roundish) (cm)	Stump **dimensions** if not round (cm)	Stump **height** to lichen location from ground (cm)	**Log length & lichen height** from ground (cm)
11	12 x 4	5	160 & 12
13	13 x 9	x2 @ 8	92 & 16
14	16 x 17	x2 @ 9	
16	18 x 20	10	
17	20 x 11	11	
17	20 x 16	x3 @ 12	
17	20 x 17	13	
17	21 x 16	14	
21	21 x 27	x4 @ 15	
21	22 x 18	x3 @ 16	
21	24 x 18	17	
21	24 x 22	x3 @ 18	
25	24 x 27	22	
26	24 x 36	x2 @ 25	
	25 x 18	28	
	25 x 20	30	
	25 x 22	31	
	26 x 30	32	
	26 x 43	x2 @ 36	

Stump **diameter** (if roundish) (cm)	Stump **dimensions** if not round (cm)	Stump **height** to lichen location from ground (cm)	**Log length & lichen height** from ground (cm)
	29 x 26	38	
	30 x 14	x2 @ 41	
	30 x 20	48	
	44 x 39	49	
		50	
		56	
		80	
		Sloping 20 to 0	
Average = 18cm		Average = 25cm	
6 stumps weren't measured (forgot!), 1 stump too fragile to measure, the lichen at one stump had fallen off (stump collapsed), lichen was growing on the side of one stump and one was growing on a fallen tree.			



Current *Cladonia botrytes* distribution (NBN Gateway Sept 2016)

Acknowledgements

I would like to say a big thank you to Brian and Sandy Coppins for inviting me to their Aspen lichen survey at the RSPB Insh Marshes Reserve in February 2010 where seeing *Fuscopannaria ignoblis*, *Anaptychia ciliaris*, and particularly the wee pinheads *Sclerophora pallida* and *S. peronella* set me on a road that ultimately led to the contents of this paper. Brian must also be thanked for his help with many "is this?" type queries and for help with identifying the other *Cladonias* included in this paper. A huge thank you is also due to Sandy for her help in getting this text through the draft stages and to completion. Thanks also to Rebecca Yahr for help and encouragement through the initial identification stages, for confirmation of my first *Cladonia botrytes* find, and for sharing her helpful report. I am also grateful to Kristine Bogomazova for sharing her amazing Thesis and encouragement after my initial find and for permission to use her photograph of the lichen on a twig and thereby setting the next "to find" challenge! I didn't realise that Sheila Street's survey during my previous RSPB life would be so important so a big thank you for delving into the files to provide me with a copy of the 1998 report. And finally, thanks to Andy Acton for setting the ball rolling.

References

Bogomazova, K. (2012). *Ecology of the lichen Cladonia botrytes in Sweden*. SLU, Department of Ecology 2012:18. *http://stud.epsilon.slu.se*

Church, J.M., Coppins, B.J., Gilbert, O.L., James, P.W. & Stewart, N.F. (1997). *Red Data Books of Britain and Ireland: Lichens.* Vol. 1: Britain. JNCC, Peterborough.

Coppins, A.M. & Coppins, B.J. (1998). *Action Plans for Lower Plants in Scotland Project. Lichens. Cladonia botrytes*. [Report to Scottish Natural Heritage & Royal Botanic Garden Edinburgh].

Yahr, R. (2006). Status survey of *Cladonia botrytes* in the Scottish Highlands. [Joint Report for the RSPB and RBGE].

Yahr, R., Coppins, B.J. & Coppins, A.M. (2013). Transient populations in the British conservation priority lichen, *Cladonia botrytes*. *Lichenologist* **45**: 265–276.

Street, S. (1998). *Cladonia botrytes Pilot Survey in Badenoch and Strathspey*. Edinburgh: Scottish Natural Heritage.

EU LIFE Wet Woods Restoration Project

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.595.8570&rep=rep1&type=pdf

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=336.0

Wet Woods Hydrological Survey – Abernethy (SNH)

http://www.snh.org.uk/pdfs/publications/commissioned_reports/Wet%20Woods%20Abernethy.pdf

Map 10. Areas 2 and 3 cover some of the areas I have been checking stumps.

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Sectioning: some ideas that might help

Some years ago I watched David Hill cut sections of a lichen apothecium, I think it was a *Lecidella*. With his rock-steady hand he produced a series of sections as if he was slicing Parma ham in a delicatessen, every slice thin and perfect. It was an uplifting sight but I must admit I felt slightly despondent. Could I ever hope to match this standard? Probably not, I'm afraid, with my not so steady hand, but I hope the following observations may help some of you who like me struggle to produce useful sections.

Of course the first factor is practice. Sectioning lichen thalli and apothecia is a skill and like any skill improves with repetition. For many years my work and family kept me too busy to do much lichenology but since my retirement a couple of years ago I have spent many more hours at the microscope and my skills have improved. But I know that I will never attain the level of skill demonstrated by those who spend their lives working on lichens. I have, however, spent some time working on a couple of techniques that may help.

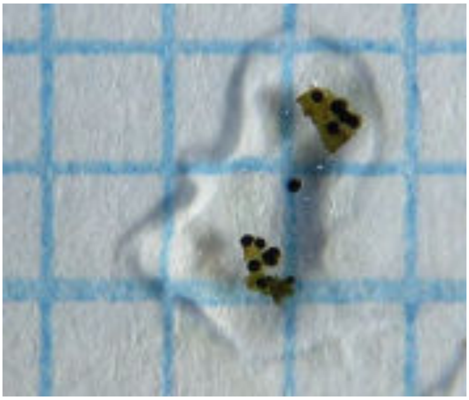
The first tip, and this is not original (I believe bryologists do this for cutting leaf sections), is to use a straight edge for cutting against. You could use the short end of a steel ruler or any other straight edge. I have found that the short side of a microscope slide works well for me and it's easier if the edge is bevelled. Bevel the edge on a fine carborundum stone. Don't use a coarse stone as the edge will fracture irregularly and don't grind away too much. You must leave part of the original edge (about a third) as the cutting guide. The advantage of a glass slide over a metal guide is that you can see through the glass and this helps with positioning it.

The bevelled slide is particularly useful for cutting sections of foliose lichen thalli. You could of course use the traditional method of inserting a piece of the thallus into a slit in a piece of tissue such as a sliver of carrot and then slicing the carrot. However, I have obtained excellent results with my glass slide. Moisten the item to be sectioned and place it on a microscope slide. Place your cutting edge on top and cut away the first piece to get a clean edge. Then slightly nudge your straight edge, sometimes just relaxing the pressure is enough, and slice again. Repeat until you have a number of sections. Under the dissecting microscope remove the sections that are clearly too thick, add a drop of water if necessary and the cover slip.

I make no claims of originality in suggesting the use of a straight edge for cutting but my second technique is, I believe, my own invention. A year ago, I was attempting to cut sections of perithecia of *Phylloblastia inexpectata*, quite a common lichen in Essex on leaves of *Prunus laurocerasus*. I found that however sharp my blade it dragged the perithecium along the shiny leaf surface instead of cutting into it. I began to experiment with adhesives to fix the perithecia in position and this led to my discovery of Gum Arabic and a potentially useful new technique.

Gum Arabic is a naturally occurring gum, exuded by at least two African species of *Acacia* and one of the exports of Ethiopia. It is a safe product, in fact you will have eaten it as it is a constituent of foods such as ice cream. It is sold in artists' supplies shops in small bottles, for use by watercolour painters. I have tried it from two sources. The first supplier was the up-market Cornelissons in London and I found this gum was fine to use as supplied. My other supplier was the well known firm of Winsor & Newton and their gum was far too runny. For this technique the gum needs to have the consistency of Golden Syrup. I poured the contents of my 75ml Winsor & Newton bottle into a beaker which I covered with a clean handkerchief to keep out dust. After about three days in my boiler cupboard the volume had reduced to about 30ml and the viscosity was perfect.

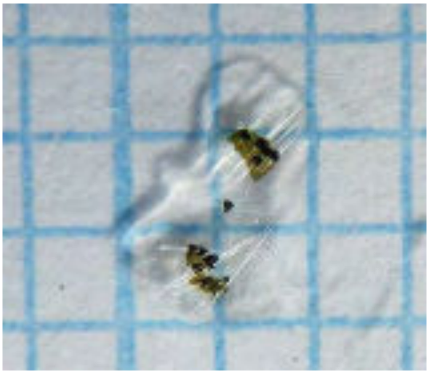
This technique works well for sectioning small things and anything that you can't manage to hold firmly in position. I have used it for sectioning pyrenocarps and for cutting sections of lobes of tiny *Leptogium* species. You could use it for tiny globose apothecia which become detatched from their thallus as soon as you touch them. My friend Pat Cavanagh obtained excellent longitudinal sections of a *Pseudephebe* species the very first time she tried this method.



The first step is to put a small blob of Gum Arabic onto a microscope slide. I find a small watercolour brush is useful here. Then place your specimen, perhaps a cluster of perithecia or a tiny lobe, in the gum, submerging it with the brush or a mounted needle and orientating it into the best position for cutting sections. Try to keep the blob of gum as small as possible; you will find the right amount with a little experience.

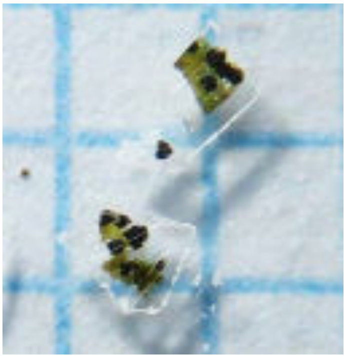
Fig.1: A cluster of perithecia of Porina aenea in Gum Arabic. 2mm square graph paper behind.

Then leave the gum to solidify as the water in it evaporates. You need to leave it until it becomes like a soft plastic in texture. If you are impatient and try to cut into it too soon the gum will stick to the blade. If you leave it too long, say overnight, the preparation can become too dry and rather brittle, in which case breathe on it a few times to soften the gum.



Under the dissecting microscope, using your blade, with or without a guiding straight edge, cut your sections. You will find the plastic texture of the gum gives excellent support. Be sure to cut right through your specimen. If you don't you will later find your sections still joined at the base, resembling a miniature book. One rather good result of immersion in the gum is that it renders the specimen slightly translucent and you can easily see the ostiole of a perithecium for instance.

Fig.2: The perithecia, now set in the hardened Gum Arabic, have been sectioned.



At this stage I cut off any excess gum and discard it, leaving just the areas around the sectioned specimens. Then add a drop of water and wait for the glue to soften and diffuse into it.

Fig.3: Excess Gum Arabic has been cut away and discarded.

Now is the time to have a cup of tea. Resist trying to separate the sections too soon or you will damage them, just let things happen naturally. Leave it at least ten minutes and then you can gently stir your preparation with a mounted needle. This separates the sections and after removal of any chunky pieces the cover slip can be placed.

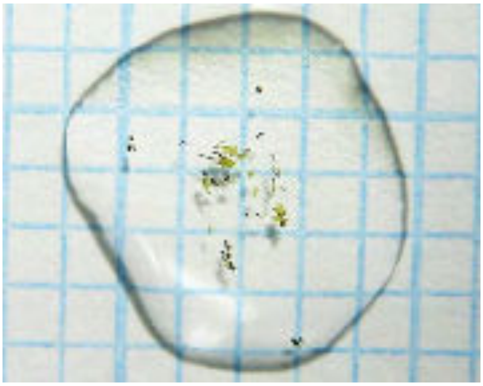


Fig 4 (left): Now rehydrated, the sections and other debris have separated.

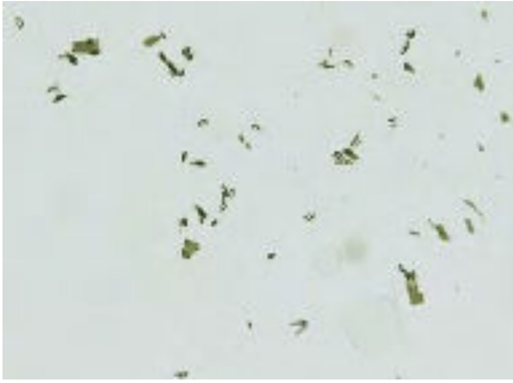


Fig. 5: (right) The same, under a cover slip. Several useful sections are visible.

Gum Arabic is a complex mixture of oligosaccharides, polysaccharides and glycoproteins. The actual chemicals present and their concentrations varies considerably as the gum is collected from the wild from at least two species of tree. I was concerned that the presence of the gum might affect chemical reactions under the microscope but my crude experiments suggest that there is nothing to worry about when undertaking normal identification work.

Mixing Gum Arabic with bleach solution and with dilute KOH produces no visible reaction. Lugol's Iodine, however, is decolourised. Not being a chemist I can report the observation but not explain it. I tried a couple of tests to see if easily observable reactions were affected when the specimens were mounted in Gum Arabic. I looked at the reaction of granules of *Placynthiella dasaea* with bleach and the reaction of a thallus squash of *Flavoparmelia soredians* with KOH. In both cases the expected reactions were observed. I also cut sections of apothecia of *Lecania cyrtella* using the method outlined above and followed this with treatment with KOH and then Lugol's Iodine, obtaining satisfactorily stained asci. The presence of the gum does slow down the spread of reagents across the slide as it forms an invisible pool of higher viscocity and it makes things easier if you draw off some of the gum with a slip of filter paper, irrigating with water from the opposite side. It also helps if you have kept the amount of gum used as small as possible. My photographs for demonstration purposes show rather more gum than I would normally use.

In conclusion, I would encourage you to purchase a small amount of Gum Arabic and experiment. A small amount will last a lifetime.

John Skinner
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Churchyard lichen surveys in Hertfordshire

Building on the work of BLS Lowland Churchyard project, we have been aiming to survey as many churchyards in Hertfordshire as possible. Much has been achieved thanks to the help and expertise of Mark Powell, Paula Shipway, Catherine Tregaskes and others. Judith Evans, who promotes the Living Churchyards project in St. Albans diocese *http://www.stalbans.anglican.org/faith/living-churchyards* has also been invaluable in publicising the lichen surveys and providing contact with the churches resulting in many requests for visits coming from them. Following each visit a report of the survey is produced. It is hoped that these will act as a resource for future lichenologists who visit the churches, who will read about such things as the rediscovery of *Lecania coeruleorubella* at Great Wymondley Church as well as maybe having a chuckle at our primitive concepts of taxonomy.

Judith Evans has now created a 'lichen library' on the Diocesan website *https://1drv.ms/f/s!Amu5MUFZ43hcak0BC6VwS2QkKUE* where the reports can be accessed. Besides becoming a scientific archive, the reports also aim to be of interest to the congregations any promote an interest in lichens. A recent visit to Kelshall church in north Hertfordshire resulted in a particularly large number of interesting records and a request to provide a display on the lichen survey for their open day. I am very grateful to the congregations of churches for their support and welcome and frequent offers of coffee even though on one occasion 'the people who had come to look at the lichens' were taken to be the people who had come to look at the lighting!

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Editor's note: the following pages contain an example report from the project. Making the information accessible in this way to the church congregations and others within the diocese provides a great advertisement for lichens and lichenology. Hopefully this will translate into new members and new recruits for the survey team…

THERFIELD – CHURCH OF ST MARY THE VIRGIN

Grid Reference: TL 334 370
Altitude: 157 (m)
Vice County: 20
Date of survey: 30/07/2016
Surveyed by: Mark Powell, Andrew Harris, Paula Shipway and Catherine Tregaskes

Duration of survey: 8 hours

Therfield is located on high ground within a rural part of north-east Hertfordshire. The present church of St. Mary the Virgin was completed in 1878. However, it replaced a church dating from the 13th Century so it exists on a much older site. The church is mainly flint with limestone dressings and the churchyard has a typical variety of memorials of limestone, marble, sandstone and granite.

Churches with their surrounding churchyards are hotspots for lichen biodiversity partly due to the variety of stonework and the large number of small-scale features they contain. Just think of the number of different materials used in the construction of St. Mary's; the various nooks and crannies, slopes and aspects found on the building; the churchyard with its different designs of memorials and variety of trees, even the old wooden entrance gate has several species. A large proportion of the lichens were found on stone or masonry. Hertfordshire lacks natural outcrops of hard rock so its churchyards are particularly important for such lichens and the plethora of microhabitats found in the churchyard is the main reason why they often have so many different lichens.

Churchyard lichen studies are fascinating because it is never easy to predict what will be found. While sharing many characteristic lichens every churchyard is unique in some way. With Therfield it is the sheer number of 155 taxa of either lichens or lichenicolous fungi which are parasitic on them. It is not unusual for a good churchyard to exceed 100 but this figure is exceptional and, to date, the highest number for a churchyard in Hertfordshire. It made an interesting comparison with neighbouring St. Faith's at Kelshall.

St. Mary's church did not have the high coverage of *Caloplaca aurantia* and *Verrucaria calciseda* typical of the older stonework of St. Faiths. Whereas the most interesting records at Kelshall were found on the church, at Therfield the churchyard had more species. Two of these, *Lecanora soralifera* and *Myriospora smaragdula* (Figure 8), tend to be found in Hertfordshire in relatively species-rich churchyards.

FIGURE 1: THE LICHEN PARTNERSHIP

Lichens are a combination of a fungus enclosing an alga. Most lichenised fungi are dependent on the association and the dominant partner exploiting the other for sugars. Though the alga may be capable of living independently, it also benefits from the partnership in being able to survive in exposed habitats, such as sun-baked headstones, protected from strong light and desiccation. Nearly everything a lichen needs can be taken from the atmosphere or rainwater, so they require little from the substrate they grow on, though the chemistry and texture of e.g. stone or bark has a strong influence on the species which can colonise. Lichens can be useful indicators of the quality of the atmosphere and environment.

Section through a lichen: Photo ©Paula Shipway

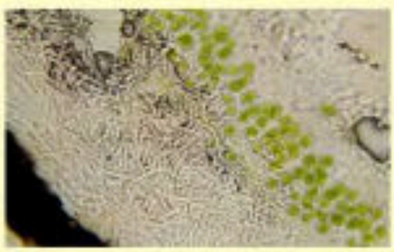
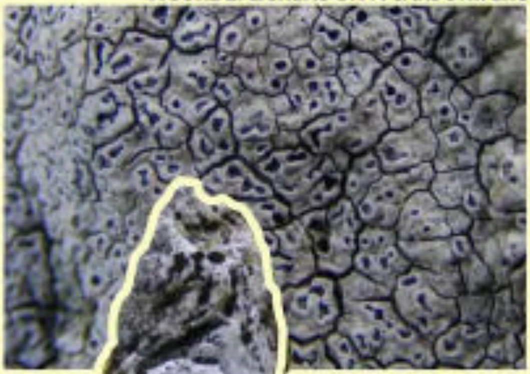
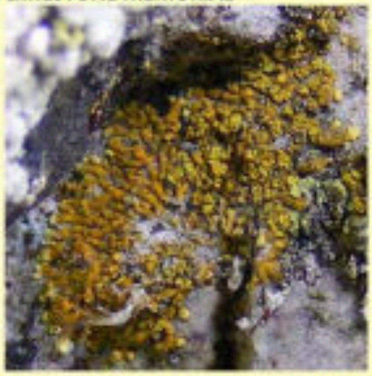


FIGURE 2: LICHENS ON A CARBONIFEROUS LIMESTONE MEMORIAL





Therfield also has the only known example in Hertfordshire of *Caloplaca cirrochroa* (top right). This is the John Wilfred Sewart memorial (1982) found in the north western corner of the churchyard. Though probably introduced with the stone this lichen is persisting in good condition and is accompanied by an association of lichens including *Verrucaria baldensis* and *Aspicilia calcarea* (top left) not found elsewhere in the churchyard

FIGURE 3: LICHENS AT THERFIELD AND THE CHURCHYARD ECOSYSTEM

Poplar Grey (*Acronicta megacephala*): The moth is well camouflaged against the lichen encrusted north wall of the church

A lichen grazer, the Millipede *Polyxenus lagurus* has distinctive bristly tufts

Lichens can have great aesthetic appeal (Figure 6) and though others may be more cryptic, each has its place in the ecosystem. Some offer camouflage, shelter or food for other organisms (figure 3). Others may tell an interesting story, e.g. *Lecanora conizaeoides* would once have widespread at Therfield when levels of sulphur dioxide from coal fires were higher, but is now limited to a timber post by the gate. Our knowledge of lichens is still very incomplete, but churchyard surveys are pushing the boundaries of our understanding forward. Several overlooked lichens have been discovered in the last decade such as *Verrucaria obfuscans* found at St Mary's on the iron-stained limestone of the eastern windowsill. This lichen was first recoded in Britain at Great Milton Church, Oxfordshire in April 2015 (Powell 2015). As well as *Caloplaca cirrochroa*, Therfield churchyard now has a first county record for *Lichenochora obscuroides* parasitic on lichen on the oak tree.

There is much left to be learnt e.g. one lichen found on the chamfered plinth, with prominent dark fruits and large simple spores has been examined carefully but its identity is still unknown. Therfield churchyard, like many others, still has mysteries to be resolved.

An illustrated tour of the church and churchyard

The following is an illustration of the lichen habitats and some of the typical lichen species found at St. Mary the Virgin, Therfield.

FIGURE 4: THE SOUTH SIDE OF THE CHURCH

The view below illustrates the variety of features and building materials present on the church which provide a large number of small-scale habitats for lichens.
The insets show two examples of lichens found on the crusts of flint:
Top right *Diploicia canescens* is sometimes called the 'Brain Lichen' because of the way it has overlapping lobes.
Below right *Lecanora antiqua* was described as new to science in 2010

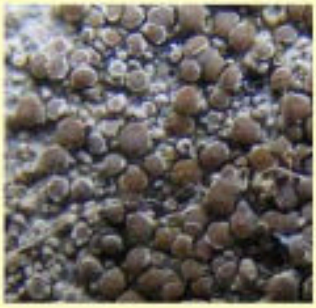
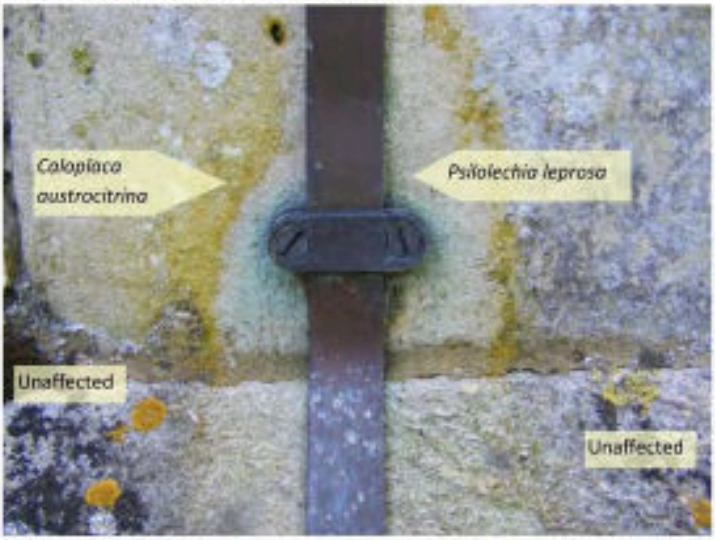
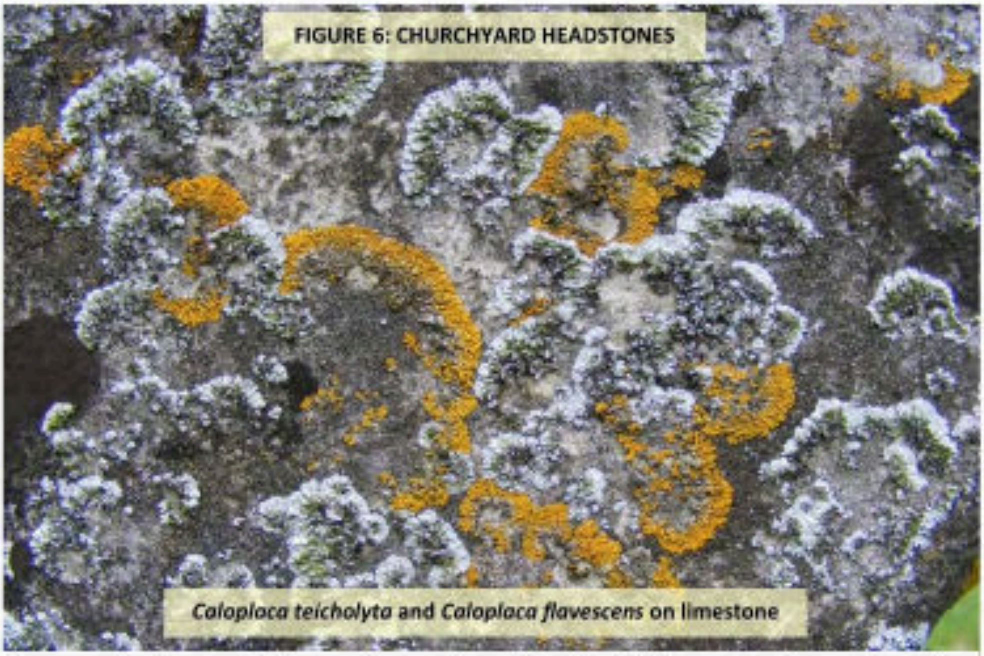


FIGURE 5: THE LIGHTNING CONDUCTOR



The north side of the church does not have any lichens of great interest, but does have this good example of lichen zonation with copper contamination. The bread-crumb-like crusts of *Psilolechia leprosa* occur where the stonework is most stained. Beyond this, there is an outer zone of *Caloplaca austrocitrina*.

FIGURE 6: CHURCHYARD HEADSTONES



Caloplaca teicholyta and *Caloplaca flavescens* on limestone

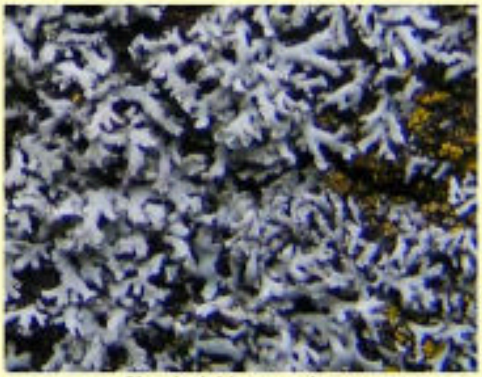
Limestone has the most obvious and spectacular colonisation of lichens as can be seen from these two photographs of headstones at Therfield. An intricate pattern of concentric circles can be created by the growth, falling away and re-growth of the lichen thalli (crusts). However it is often on the more subdued sandstone headstones that discoveries of unusual species are made.

FIGURE 7: Two lichens which are common at Therfield *Caloplaca flavescens* (left) and *Candelariella medians* (right)

FIGURE 8: SANDSTONE AND GRANITE

Examples of the lichens found on non-calcareous memorials at Therfield which might be rare or absent in Hertfordshire were it not for its churchyard memorials

Lecanora soralifera forms extensive patches on a sandstone headstone and footstone in the north-east corner of the churchyard

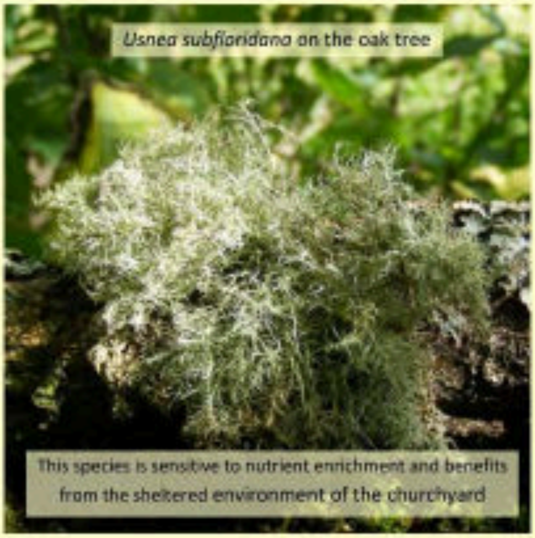


Physcia dubia on sandstone

'Islands' of *Myriospora smaragdula* on granite

FIGURE 9:THE CHURCHYARD TREES

Therfield churchyard has a large number of corticolous lichens as well: 46 taxa, nearly 30% of the total recorded, were on bark. An Oak tree near to the northern boundary was particularly well encrusted with a good range of species. The foliage of this tree is rather weakly with the lichens benefiting from increased light coming through; the lichens are not the cause of the tree's decline.



Usnea subfloridana on the oak tree

This species is sensitive to nutrient enrichment and benefits from the sheltered environment of the churchyard

FIGURE 10

Phlyctis argena is a lichen normally found on bark, but here is forming large pale grey patches on this headstone located beneath trees in the south-east corner of the churchyard

TABLE 1: A list of the lichens and lichenicolous fungi found at St. Mary the Virgin, Therfield

BLS No	Lichen taxa	Status	C	Y	Substrate	Small-scale habitat
0010	*Acarospora fuscata*	LC		√	Sax	Sandstone headstone and granite kerb
0038	*Agonimia tristicula*	LC	●		Bry	On moss growing on chamfered plinth north side
0212	*Amandinea punctata*	LC		√	Sax	Sandstone headstone
0049	*Anisomeridium polypori*	LC		√	Cort	Trunk of Ash tree
0064	*Arthonia lapidicola*	LC	●		Sax	Iron stained limestone windowsill
0068	*Arthonia punctiformis* (F)[2]	LC		√	Cort	On *Sorbus* in north-west corner
0069	*Arthonia radiata*	LC		√	Cort	Walnut twigs
1542	*Arthopyrenia punctiformis* (F)[2]	LC		√	Cort	Cedar
0105	*Aspicilia calcarea*	LC		√	Sax	Carboniferous limestone memorial (Sewart 1982)
0113	*Aspicilia contorta subsp. hoffmanniana*	LC NS	●		Sax	Limestone buttress slope, south facing
#N/A	*Bacidia cf. neosquamulosa*	#N/A		√	Cort	Oak on northern edge
0148	*Bacidia fuscoviridis*	LC NS		√	Sax	Concrete base of oil tank
2502	*Bacidia sulphurella*	LC NS		√	Cort	Oak on northern edge
0165	*Bilimbia sabuletorum*	LC	●		Bry	Moss on chamfered plinth
1628	*Botryolepraria lesdainii*	LC	●		Sax	Mortared recess on north side
0200	*Buellia aethalea*	LC		√	Sax	Granite memorial
0207	*Buellia griseovirens*	LC		√	Lig	Entrance gate
0219	*Buellia ocellata*	LC	●		Sax	Red roof tile of tower

BLS No	Lichen taxa	Status	C	Y	Substrate	Small-scale habitat
2442	*Caloplaca arcis*	LC NS	•		Sax	Limestone windowsill
0239	*Caloplaca aurantia*	LC	•		Sax	Limestone dressings
2613	*Caloplaca austrocitrina*	LC	•		Sax	Limestone particularly with iron or copper staining
0242	*Caloplaca cerinella*	LC		√	Cort	Trunk of Walnut
#N/A	*Caloplaca cf. pyracea*	#N/A		√	Cort	Walnut
0263	*Caloplaca chlorina*	LC		√	Sax	Top of sandstone headstone
0825	*Caloplaca chrysodeta*	LC	•		Sax	Mortared recess on chamfered plinth
0246	*Caloplaca cirrochroa*	LC		√	Sax	Carboniferous limestone memorial (Sewart 1982) Only record of this species for Hertfordshire
0249	*Caloplaca crenulatella*	LC	•		Sax	Limestone: Slab at entrance of south porch
2443	*Caloplaca dichroa*	LC NS	•	√	Sax	Limestone windowsills and headstones
0259	*Caloplaca flavescens*	LC	•	√	Sax	Widespread on limestone and marble
2527	*Caloplaca holocarpa s. str.*	LC	•		Sax	Red roof tile of south porch
2607	*Caloplaca limonia*	LC	•		Sax	Limestone dressing towards base of buttress
2461	*Caloplaca oasis*	LC		√	Sax	Limestone headstone
0271	*Caloplaca obscurella*	LC		√	Sax	Concrete slab by the north wall of the church
0277	*Caloplaca saxicola*	LC	•		Sax	Flint crust
0281	*Caloplaca teicholyta*	LC	•	√	Sax	Limestone windowsills and headstones
0291	*Candelariella aurella f. aurella*	LC	•		Sax	Concrete repair patch on windowsill
0296	*Candelariella medians f. medians*	LC	•	√	Sax	Widespread on limestone and marble
0297	*Candelariella reflexa*	LC	•	√	Cort+Lig	Lignum on tower and oak bark
0298	*Candelariella vitellina f. vitellina*	LC	•	√	Sax	Sandstone step and headstones
1609	*Catillaria atomarioides*	LC NS		√	Sax	Top of granite headstone
0311	*Catillaria lenticularis*	LC	•		Sax	Limestone step on south side of chancel
0375	*Cladonia coniocraea*	LC		√	Lig	Entrance gate
0396	*Cladonia macilenta*	LC		√	Lig	Entrance gate
0751	*Clauzadea monticola*	LC		√	Sax	Concrete slab by the north wall of the church
0429	*Cliostomum griffithii*	LC		√	Cort	Sycamore
0440	*Collema crispum var. crispum*	LC		√	Sax	Carboniferous limestone memorial (Sewart 1982)
0463	*Collema fuscovirens*	LC		√	Sax	Carboniferous limestone memorial (Sewart 1982)
0491	*Diploicia canescens*	LC	•	√	Cort+Sax	Flint and mortar infill and tree bough
0496	*Diplotomma alboatrum*	LC	•		Sax	Limestone dressings
0511	*Evernia prunastri*	LC		√	Cort	Cherry and oak boughs
0987	*Flavoparmelia caperata*	LC		√	Cort	Cherry and oak boughs
1018	*Flavoparmelia soredians*	LC		√	Sax	Top of sandstone headstone
0521	*Fuscidea lightfootii*	LC		√	Cort	On *Prunus*
1704	*Halecania viridescens*	LC NS		√	Cort	On Walnut
1125	*Hyperphyscia adglutinata*	LC		√	Cort	*Malus* trunk
0582	*Hypogymnia physodes*	LC		√	Cort	On Prunus
0583	*Hypogymnia tubulosa*	LC		√	Cort	Oak on northern edge
2577	*Hypotrachyna revoluta s. str.*	LC		√	Sax	Oak on northern edge
0547	*Jamesiella anastomosans*	LC		√	Cort	On *Prunus*

BLS No	Lichen taxa	Status	C	Y	Substrate	Small-scale habitat
0613	*Lecania cyrtella*	LC		√	Cort	Elder twigs
2551	*Lecania erysibe s. lat.*		•		Sax	Mortar on north side
0616	*Lecania erysibe s. str.*	LC	•		Sax	Limestone: Chamfered plinth
1625	*Lecania hutchinsiae*	LC	•		Sax	Crust of flints set in north wall
1707	*Lecania inundata*	LC NS		√	Sax	Top of limestone headstone
1708	*Lecania rabenhorstii*	LC	•		Sax	Limestone: Chamfered plinth
0627	*Lecanora albescens*	LC	•	√	Sax	Widespread on mortar and limestone
0640	*Lecanora antiqua*	LC	•		Sax	Crust of flint set in south wall
0635	*Lecanora campestris subsp. campestris*	LC	•	√	Sax	Sandstone step and limestone headstone
0636	*Lecanora carpinea*	LC		√	Cort	Oak on northern edge
0639	*Lecanora chlarotera*	LC		√	Cort	Walnut twigs
1996	*Lecanora compallens*	LC NS		√	Cort	Sycamore trunk
0643	*Lecanora conizaeoides f. conizaeoides*	LC		√	Lig	Wooden post by entrance gate
0644	*Lecanora crenulata*	LC	•		Sax	Limestone dressings
0646	*Lecanora dispersa*	LC	•		Sax	Flint crusts and Ash trunk
0649	*Lecanora expallens*	LC	•	√	Cort+Sax	Flint crusts and Ash trunk
0621	*Lecanora hageni*	NE		√	Cort	Walnut trunk
1764	*Lecanora horiza*	NT NS		√	Sax	Eastern face of marble headstone
0661	*Lecanora muralis*	LC		√	Sax	Top of sandstone headstone
0757	*Lecanora orosthea*	LC		√	Sax	Granite headstone
0667	*Lecanora polytropa*	LC	•	√	Sax	Red roof tile of tower and sandstone headstone
0679	*Lecanora soralifera*	LC	•	√	Sax	Sandstone step on north side and headstones
0688	*Lecanora symmicta*	LC		√	Lig	Entrance gate
0797	*Lecidella elaeochroma f. elaeochroma*	LC		√	Cort	Walnut twigs
0802	*Lecidella scabra*	LC	•		Sax	Sandstone step
0803	*Lecidella stigmatea*	LC	•	√	Sax	Sandstone step and limestone headstone
1974	*Lepraria incana s. str.*	LC	•	√	Sax	Crusts of flints in north wall and sandstone headstones
1604	*Lepraria vouauxii*	LC	•	√	Sax+Bry	Limestone buttress on north side and headstones often with mosses
0849	*Leptogium turgidum*	LC	•		Sax+Bry	Limestone: Chamfered plinth
1020	*Melanelixia subaurifera*	LC		√	Cort+Sax	Walnut trunk and granite headstones
0996	*Melanohalea exasperatula*	LC		√	Cort	Oak on northern edge
0021	*Myriospora rufescens*	LC		√	Sax	Sandstone headstone
0025	*Myriospora smaragdula*	LC		√	Sax	Granite kerb
0952	*Opegrapha mougeotii*	LC NS	•		Sax	Mortar on east facing wall
0964	*Opegrapha varia*	LC		√	Cort	Trunk of Ash tree
2441	*Opegrapha viridipruinosa*	LC NS		√	Cort	Trunk of Ash tree
1022	*Parmelia sulcata*	LC		√	Cort+Sax	Sandstone headstone and Oak on northern edge
1008	*Parmotrema perlatum*	LC		√	Cort	Oak on northern edge
1107	*Phaeophyscia orbicularis*	LC	•	√	Cort+Sax	Limestone windowsill, Oak and Walnut bark
1110	*Phlyctis argena*	LC		√	Cort+Sax	*Sorbus* trunk and headstone under trees
1112	*Physcia adscendens*	LC	•		Sax	Crusts of flints set into tower

BLS No	Lichen taxa	Status	C	Y	Substrate	Small-scale habitat
1114	*Physcia caesia*	LC	●	Y	Sax	Red roof tiles of south porch and headstone
1116	*Physcia dubia*	LC		Y	Sax	Limestone headstone in NE corner of churchyard
1120	*Physcia tenella*	LC		Y	Cort	Walnut twigs
1127	*Physconia grisea*	LC	●		Bry	Overgrowing mosses on chamfered plinth
1492	*Placopyrenium fuscellum*	LC	●		Sax	Limestone
0732	*Placynthiella icmalea*	LC		Y	Lig	Entrance gate
1167	*Polysporina simplex*	LC		Y	Sax	Granite kerb
1690	*Porpidia soredizodes*	LC		Y	Sax	Sandstone headstone
0572	*Porpidia tuberculosa*	LC		Y	Sax	Sandstone headstone
1189	*Protoblastenia rupestris*	LC	●	Y	Sax	Limestone: Chamfered plinth and buttresses and Carboniferous limestone memorial (Sewart 1982)
1637	*Psilolechia leprosa*	LC M*	●		Sax	Limestone dressings on north side of tower stained by copper from lightning conductor
1200	*Psilolechia lucida*	LC	●	Y	Sax	Flint crusts and sandstone headstone
1989	*Punctelia jeckeri*	LC		Y	Cort	Cherry on south side and Oak on northern edge
2070	*Punctelia subrudecta s. str.*	LC		Y	Cort	Cherry on south side and Oak on northern edge
1234	*Ramalina farinacea*	LC		Y	Cort+Sax	Cherry and sandstone headstone
1235	*Ramalina fastigiata*	LC		Y	Cort	Oak on northern edge
1266	*Rhizocarpon reductum*	LC		Y	Sax	Granite headstone
1289	*Rinodina oleae*	LC	●		Sax	Crusts of flints set in south porch
1322	*Scoliciosporum umbrinum*	LC	●		Sax	Red roof tile of tower
1395	*Thelidium pyrenophorum*	LC NS	●	Y	Sax	Limestone: Chamfered plinth and buttress slopes and memorials
1415	*Toninia aromatica*	LC	●		Sax	Limestone: Common on chamfered plinth
0692	*Trapeliopsis flexuosa*	LC		Y	Lig	Entrance gate
1471	*Usnea subfloridana*	LC		Y	Cort	Oak on northern edge
1479	*Verrucaria baldensis*	LC		Y	Sax	Carboniferous limestone memorial (Sewart 1982)
1480	*Verrucaria calciseda*	LC NS		Y	Sax	Limestone footstone and carboniferous limestone memorial (Sewart 1982)
1495	*Verrucaria hochstetteri*	LC	●		Sax	Limestone: Chamfered plinth
1519	*Verrucaria macrostoma f. furfuracea*	LC	●		Sax	Limestone: Buttress dressings
1502	*Verrucaria macrostoma f. macrostoma*	LC		Y	Sax	Limestone headstone
1507	*Verrucaria muralis*	LC	●		Sax	Limestone windowsill on south side just below *Arthonia lapidicola* zone
1510	*Verrucaria nigrescens f. nigrescens*	LC	●	Y	Sax	Widespread on limestone
2514	*Verrucaria nigrescens f. tectorum*	LC	●		Sax	Limestone: South porch buttress slope
2649	*Verrucaria obfuscans*	#N/A	●		Sax	Iron stained limestone of eastern windowsill
1511	*Verrucaria ochrostoma*	DD NR	●		Sax	Limestone windowsill
2621	*Verrucaria squamulosa*	#N/A	●		Sax	Sandstone step on south side of chancel
1518	*Verrucaria viridula*	LC	●	Y	Sax	Limestone dressings and headstone
1005	*Xanthoparmelia mougeotii*	LC	●		Sax	Red roof tile of tower
1526	*Xanthoria calcicola*	LC	●	Y	Sax	Flints set in tower and limestone headstone
1527	*Xanthoria candelaria s. lat. (X. 'nowakii')*	LC	●		Sax	Crust of flint set in south wall
2364	*Xanthoria candelaria s. str.*	LC		Y	Sax	Granite headstone

BLS No	Lichen taxa	Status	C	Y	Substrate	Small-scale habitat
1530	*Xanthoria parietina*	LC		√	Cort	Walnut twigs
1531	*Xanthoria polycarpa*	LC		√	Cort	Cedar
0950	*Xanthoria ucrainica*	LC NS		√	Sax	Sandstone cross

BLS no	Lichenicolous fungi (Lichen parasites)	Status	C	Y	Substrate	Host and situation
#N/A	*Acremonium sp*	#N/A		√	Lic	*Physcia caesia* on headstone
1501	*Arthonia apotheciorum*	LC NS	●		Lic	*Lecanora albescens*
#N/A	*Laetisaria lichenicola*	#N/A		√	Lic	*Physcia adscendens*
2087	*Lichenochora obscuroides*	LC NR		√	Lic	*Phaeophyscia orbicularis* on Oak First County Record
2108	*Marchandiomyces aurantiacus*	LC		√	Lic	*Melanelixia subaurifera*
2132	*Opegrapha rupestris*	LC NS		√	Lic	*Verrucaria calciseda* on Carboniferous limestone memorial (Sewart 1982)
2165	*Polycoccum pulvinatum*	LC NS	●		Lic	*Physcia caesia* on porch roof
2179	*Pyrenidium actinellum*	LC NS	●		Lic	*Caloplaca teicholyta* on windowsill
1307	*Sarcopyrenia gibba var. geisleri*	LC	●		Sax	Limestone buttress slope, south facing
2240	*Syzygospora physciacearum*	LC NS		√	Lic	*Physcia tenella*
2260	*Unguiculariopsis thallophila*	LC NS		√	Lic	*Lecanora chlarotera*
2263	*Vouauxiella verrucosa*	NE NR		√	Lic	*Lecanora horiza* on limestone headstone
2267	*Weddellomyces epicallopisma*	LC NS	●		Lic	*Caloplaca flavescens* on chamfered plinth

TABLE 2: ABBREVIATIONS and TOTALS

Total lichen taxa[1]		142
Lichenicolous fungi		13
C	On the church	71
Y	In the churchyard	107

Substrate		Definition	Total
Bry	Brylicolous	On moss	5
Cort	Corticolous	On Bark	42
Lic	Lichenicolous	On lichens	12
Lig	Lignicolous	On lignum (timber)	8
Met	Metal	On metal	0
Other	Other	In this instance algal crust	0
Sax	Saxicolous	On stone, brick, mortar etc	98
Terr	Terricolous	On ground/soil	0

Conservation status[3]

LC =	NS =	NS =	NT =	DD =	NE =
Least concern	Nationally scarce	Nationally rare	Near threatened	Data deficient	Not evaluated

Notes

1. 'Taxa' includes species and their subspecies and forms
2. *Arthonia punctiformis* and *Arthopyrenia punctiformis* are non-lichenised fungi but are treated as 'honorary lichens' because they are closely related to lichenised species and occupy a similar niche.
3. Conservation status depends upon the number of records for the lichen (Woods and Coppins 2012). Several 'Nationally Rare' and 'Nationally Scarce' lichens may be under-recorded because their identity is difficult to confirm or because they are recently described species. This is why, confusingly, they may also have the IUCN status of 'Least Concern'

References:

Powell, M. (2015). Two overlooked but widespread crusts: *Verrucaria obfuscans* and *V. ochrostoma*. *Bull. Brit. Lichen Soc*. 117: 2-6

Woods, R. G. & Coppins, B. J. (2012) *A Conservation Evaluation of British Lichens and Lichenicolous Fungi. Species Status 13*. Joint Nature Conservation Committee, Peterborough

Identification references:

Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. J. & Wolseley, P. A. (2009). *The Lichens of Great Britain and Ireland*. London: British Lichen Society

Dobson, F. S. (2005) *Lichens: An illustrated Guide to the British and Irish Species* (Fifth edition), Slough, The Richmond Publishing Co. Ltd)

Websites

British Lichens Website species gallery: http://www.britishlichens.co.uk/speciesgallery.html
British Lichen Society Website: http://www.britishlichensociety.org.uk/

Available from the British Lichen Society website:
BLS Churchyard Lichens factsheet: *CHURCHYARD LICHENS: A factsheet – your questions answered* (pdf –updated September 2012) British Lichen Society

Chester, T. and Palmer, K. (1994); Chester, T. (2001); Revised: Pedley, I. (BLS Churchyards Project Co-ordinator) (2009) Churchyard Lichens, Green_cfga_article_IP_final

BLS rare and threatened lichens list:
http://www.britishlichensociety.org.uk/sites/default/files/recording-mapping-downloads/BLS%20Rare%20and%20Threatened%20Lichens%20list%20Oct%202011.pdf

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APPENDIX 1: Other records

Vascular plants: Maidenhair Spleenwort, Hart's-tongue Plantago media, Veronica chamaedrys, Cardamine pratensis, Galium album, Rumex acetosa, Centaurea nigra agg. Lysimachia nummularia, Viola odorata, Potentilla reptans, Prunella vulgaris, Primula vulgaris, Ajuga reptans, Leucanthemum vulgaris,

Butterflies and Moths: Green-veined White, Small White, Meadow Brown, Gatekeeper, Marmalade Fly, Cinnabar Moth,

Birds: Green Woodpecker, Goldcrest, Coal Tit, Blue Tit, Nuthatch

Presentations at IAL8 (Helsinki, August 2016) supported by the BLS

The British Lichen Society made travel grants to a substantial number of members to attend the International Association of Lichenology conference in Helsinki. The abstracts from the meeting are all available online at *http://ial8.luomus.fi/*, but examples of those supported by the BLS are given below along (sometimes in a slightly expanded or modified form) with an image selected by the presenter.

Is *Pseudocyphellaria lacerata* Degel. (Ascomycota: Lobariaceae) really in Britain?

In the UK, a series of high-priority species for conservation action are surrounded by taxonomic uncertainty. One such case is *Pseudocyphellaria lacerata*, one of a suite of internationally important temperate rainforest taxa distributed from Macaronesia to the west coast of the UK, which is distinguished from its more common congener *P. intricata* by its isidiate rather than sorediate margin. We use a multi-locus phylogenetic approach, together with complimentary analysis of morphological, chemical and environmental data, to confirm or reject the hypothesis that *P. lacerata* in the UK is distinct from *P. intricata*. We sampled these taxa across their UK range in addition to material from the type locality of *P. lacerata* in the Azores. Out of the five markers so far tested, only ITS and RPB2 show any informative sites, separating isidiate material from the Azores plus two British sites from the remaining sorediate populations in England and Scotland. We find no evidence that *P. lacerata* is distinct from that taxon in the Azores, but that it has sequence-based and morphological discontinuities compared to the commoner *P. intricata*. *P. lacerata* in the UK has an extremely restricted distribution.

Kristine Bogomazova
Royal Botanic Garden, Edinburgh

Phosphatase activity in nitrophobic and nitrophytic lichens

Eutrophication leads to changes in epiphytic lichen community structure whereby those species adapted to oligotrophic conditions (nitrophobes) are replaced by a small number of species that are tolerant of high nutrient loads (nitrophytes). The physiological basis of lichen adaptation to high nutrient deposition loads is poorly understood. We have measured rates of surface-bound phosphomonoesterase (PME) activity in nitrophobic and nitrophytic lichens and used a fluorescent marker (ELF 97) to locate enzyme activity in sections of lichen thalli. PME activity was higher in nitrophobic than in nitrophytic species, possibly reflecting the relative availability of nitrogen and phosphorus in their respective habitats. ELF 97 locates PME activity predominantly in the fungal tissue of the cortices consistent with a function in phosphorus scavenging from atmospheric deposits. Activity is associated with the cell lumina but is insensitive to oxygen deprivation suggesting that PME could be a membrane bound enzyme with an outward facing active site, which is independent of physiological activity. PME could be induced in both lichen photobionts and the nitrophyte *Xanthoria parietina* when grown in P-deprived axenic culture. We suggest that lower phosphorus scavenging efficiencies might be advantageous in lichens adapted to eutrophicated habitats.

Gabrielle Brown[1], Andreas Beck[2], Trista Crook[1] and Peter Crittenden[1]
University of Nottingham, UK[1] and Botanische Staatsammlung München, Germany[2]

Transition to the glassy state in the lichen *Flavoparmelia caperata* (L.) Hale: molecular mobility in relation to thallus water content

Lichens are desiccation tolerant, but the relationship between thallus water content (TWC), cytoplasmic viscosity and metabolism are underinvestigated. As water is lost, cellular components undergo "vitrification", which is the transition from a liquid to a "rubbery" to a "glassy state", in which molecules are "frozen in structure". In the glassy state molecular mobility is strongly reduced, slowing down chemical reactions, including those causing cellular deterioration. Here we report on changes in the contents of photosynthetic pigments, α-tocopherol and fatty acids in the lichen *Flavoparmelia caperata*, with the aim of studying the relationship between water status and molecular mobility. Thalli of *Flavoparmelia caperata* were dried and kept up to 45 days at various relative humidity (RH), resulting in TWCs from 0.26 to 0.05 g H_2O g^{-1} of dry weight (DW). Photosynthetic pigments and alpha-tocopherol, and fatty acids were measured by HPLC and GC-MS, respectively, whereas molecular mobility was measured by dynamic mechanical thermal analysis. The enzyme-dependent conversion of xanthophyll cycle pigments was used to study if enzymatic activity ceases as a consequence of vitrification. Most metabolites were not affected by the treatments. However, α-relaxation, a marker of the transition of the glassy to liquid state, occurred at lower temperatures in thalli at 0.15 than at 0.03 g H_2O g^{-1} DW, indicating a difference in viscosity. Accordingly, violaxanthin was de-epoxidised only at TWCs higher than 0.12 g H_2O g^{-1} DW. At these TWCs samples were in the "rubbery" state which still has sufficient molecular mobility for enzymatic reactions. By contrast, no enzymatic activity was found below 0.08 g H_2O g^{-1} DW. In summary, vitrification and the accompanying restriction of enzyme-dependent metabolism occurs at TWC between 0.12 and 0.08 g H_2O g^{-1} DW, corresponding to 35 and 55% RH. These results may help to better understand the underlying mechanisms of desiccation tolerance.

***Fabio Candotto Carniel**[1,3], Beatriz Fernández-Marín[2], Erwann Arc[3], Wolfgang Stöggl[3], Teresa Craighero[1], José Manuel Laza[2], Mauro Tretiach[1], Ilse Kranner[3]*
[1]University of Trieste, Italy, [2]University of the Basque Country, Bilbao, Spain, [3] University of Innsbruck, Austria

Networked: investigating the causes and implications of non-random interaction patterns among mycobionts and photobionts

Partner selection remains a puzzling issue in ecology and evolutionary biology. While we often observe non random partnerships among mutualistic symbionts in nature, we rarely have sufficient data to unequivocally ascribe these interaction patterns to specific mechanisms. In a recent study, we took advantage of an extensive dataset developed by François Lutzoni and colleagues at Duke University to look at preferential partner selection in cyanolichens involving mycobionts belonging to the genus *Peltigera* (section *Polydactylon*) and *Nostoc* cyanobacteria. The identity of mutualistic partners was determined using molecular tools, for 250 thalli sampled around the globe. We used network analysis to identify potentially non-random patterns of association between mycobionts and photobionts. We found that this interaction network linking mycobionts and photobionts was significantly modular, meaning that there were subgroups of mycobionts and photobionts that preferentially interacted together, rather than with the rest of available partners. Further analyses showed that these preferential interactions were not solely caused by the large spatial scale at which the sampling had been done. In other words, boreal mycobionts and photobionts were not simply interacting together because they were at the same place at the same time: even when looking at interactions within biomes or regions of the globe, preferential associations remained significant. An additional set of analyses also showed that the mycobionts-photobionts interaction network was significantly anti-nested. This means that there was a turnover in the preferred partner for different species of mycobionts and photobionts. This potentially suggests that there is a trade-off to be made for mycobionts and photobionts, whereby being a better partner for a given species implies being a worse partner for another, such that there would be no "jack-of-all-trades" that would dominate these lichen communities. Finally, we found that most interactions in the network were symmetric. This means that if a given mycobiont spends most of its interactions with a given photobiont, the reverse will also be true. This has potentially important ramifications for coevolution in the system, as our results suggest that mycobionts and photobionts that preferentially interact together may become more and more coadapted to each other. Overall, our contribution allowed us to evidence non random interaction patterns in lichen associations, and to highlight the potential use of network-based tools in lichenology.

P.-L. Chagnon
University of Alberta, Edmonton, Canada

Thermal acclimation in polar macrolichen

Many eco-physiological studies deal with the question of how the absolute rates and the balances between photosynthesis and respiration will change in response to climate. Climate models have assumed that both will rise exponentially with short-term changes in temperature. Thermal acclimation in response to temperature changes can alter this short term response, so that respiration responds much less to temperature fluctuations than anticipated. Although acclimation of respiration to temperature has been demonstrated for lichens, how fast they can respond to environmental temperature change, is unknown at present. The Antarctic Peninsula and arctic Svalbard belong to the regions of the world that had experienced relatively fast regional climate warming and, due to their relatively simple ecosystems, serve as early warning system in understanding species and ecosystem responses to climate change. Terrestrial ecosystems here are dominated by mosses and lichens. In our experimental setup we assess thermal acclimation of 3 polar macro-lichens by measuring full respiration response as well as net photosynthesis, light and water relations before and after an incubation treatment, at different temperatures. Initial results show that acclimation may be a species specific trait that can be a key process determining species distribution and fitness under rapid changing climates.

Placopsis concortuplicata, an Antarctic and southern Chile endemic crustose lichen species. This species has cyanobacteria in cephalodia. In the experiment, this species could not acclimatize to an increased temperature regime.

C. Colesie, A. Ullmann, B. Büdel
University of Kaiserslautern, Germany

Lichens and climate change: the problem of scale and non-analogue climates

Statistical models have been widely used to compare distribution records with present-day climate variables. These 'bioclimatic models' are projected for baseline (present-day) and future climate change scenarios, exploring risk as the loss or spatial shift in a species' suitable climate.

A first criticism of this approach is the concept of climatic equilibrium. The comparison of distribution data with climate surfaces assumes the direct climatic control of a species' occurrence, rather than testing for this. A second criticism relates to forward projection of climate models, and in particular the potential extrapolation to future non-analogue environments, such as higher rainfall during low light winter periods as expected in Britain.

These criticisms were tested by using a two-year growth experiment for three lichen species – *Lobaria pulmonaria, Sticta fuliginosa*, and *Usnea hirta* – across three climatically-contrasting botanic garden sites (Fig. 1). Growth for all species showed seasonal patterns (peak growth in spring and early summer, reduced growth in winter), superimposed onto a distinct month-by-month variability.

Figure 1: Growth frames positioned at the Dawyck botanic garden site, and pendants on which lichens were grown.

The measured growth over two-years correlated with each species' 'likelihood of occurrence' derived from bioclimatic models utilising 10km (coarse-grained) distribution records. For example, growth for *S. fuliginosa* was highest at the most oceanic site (Benmore) with mass loss for the more continental site (Dawyck), while growth for *U. hirta* was highest at Dawyck (more continental) with mass loss at Benmore (oceanic), matching with their known distributions. Growth for *L. pulmonaria* was more consistent across the climatically-contrasting sites (though highest at the oceanic Benmore). This tentatively supports the assumption of climatic equilibrium for a species' baseline distribution.

However, growth models at a monthly resolution were used to compare a species performance for baseline and future climates (2080s), and these models showed a sensitivity to the choice of alternative model predictors (e.g. monthly precipitation totals, or number of rain-days), and irradiance (e.g. the interaction of seasonal light availability with wetness). The results urge caution in the interpretation of bioclimatic models when based on seasonal or annual climate averages, and which do not take account of the interaction between climate and light availability, and the potential this interaction holds for future non-analogue environments.

Christopher Ellis
Royal Botanic Garden Edinburgh

Aspects of biodiversity and chemical diversity studied in Hungarian lichen herbaria

Due to HPTLC studies the knowledge of lichen substances in Hungarian samples has developed a lot since 1998. The distribution patterns of secondary metabolites within lichen thalli are often taxon specific, and therefore have been widely used in lichen taxonomy and systematics since they represent cryptic chemical diversity additional to morphological-anatomical biodiversity. *Cetrelia* and *Xanthoparmelia* species were studied in details. A total of 430 specimens of historical and recent collections (from 6 Hungarian herbaria: BP, EGR, JPU, SAMU, SZE, VBI) were studied mostly from Central Europe, the Balkan and Eastern Asia. Vegetative propagules (soredia, isidia), pseudocyphellae, rhizines, features of lower surface are the main morphological characters analysed against alectoronic acid, anziaic acid, α-collatolic acid, imbricaric acid, 4-demethyl imbricaric acid, microphyllinic acid, olivetoric acid, 4-O-methylolivetoric acid, perlatolic acid, physodic acid, 4-O-methylphysodic acid (in *Cetrelia*), fumarprotocetraric acid, norstictic acid, salazinic acid, stictic acid (in *Xanthoparmelia*). Cortical pigments, atranorin in *Cetrelia*, usnic acid in *Xanthoparmelia* are usually present, but some specimens are lacking these substances. Comparing the distribution of species before and after the taxonomic revision based both on morphology and lichen secondary chemistry, several striking examples are presented for demonstrating the importance of lichen substances in identification.

After the chemical revisions the species diversity within the genus *Cetrelia* increased from 1–2 to 1–3 at the studied sites in Hungary. The number of *Xanthoparmelia* species increased in the investigated countries of the Balkan (from 3 to 4 in Albania, from 2 to 4 in Macedonia and from 3 to 4 in Serbia).

Relation of morphology and chemistry was studied in Asian and European *Cetrelia* species. The Asian isidiate *C. braunsiana* and *C. pseudolivetorum* produce the same substances as the European sorediate *C. chicitae* and *C. olivetorum* respectively (Fig. 1). The decorative *C. japonica* contains microphyllinic acid not found in the other studied species.

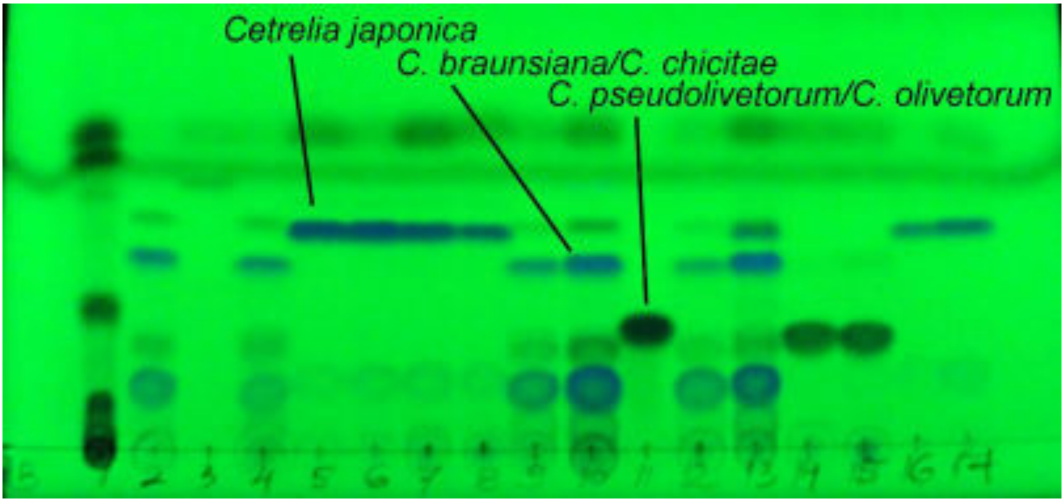

Fig. 1. Lichen substances of the Asian *Cetrelia japonica*, *C. braunsiana* (or the European *C. chicitae*) and *C. pseudolivetorum* (or the European *C. olivetorum*) on HPTLC plate developed in solvent system C (toluene:acetic acid=20:3 by volume) under UV 254nm.

Our work was supported by the Hungarian Scientific Research Fund (OTKA K81232).

Edit Farkas[1], Bernadett Biró[1], Mónika Sinigla[2] and László Lőkös[3]
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Can large-scale biodiversity monitoring tell us about rare lichens? A case study re-evaluating the distribution and ecology of *Cladonia rei* in Alberta, Canada

Conservation of rare species depends on accurate data as well as accurate assessments of rarity. In our presentation we explored the ability of the Alberta Biodiversity Monitoring Institute (ABMI), a non-traditional, large-scale systematic monitoring program that assesses many species from many taxa simultaneously, to improve our understanding of the ecology and distribution of rare species. In particular, we used data from the ABMI's rapid biodiversity assessments for macrolichens and calicioid lichens and fungi at 778 1 ha sites systematically distributed across the province of

Alberta, Canada (area of 661,848 km^2). We focused on *Cladonia rei* Schaerer because of its cryptic morphology, particularly for novice field technicians, as well as its unique chemical signature (homosekikaic acid). Historically *C. rei* was considered broadly distributed but imperiled in Alberta with 7 known collections at the beginning of our study. We tested this understanding using 5 years of ABMI lichen samples (70,181 lichen specimens, including 27,870 *Cladonia* specimens), co-occurring vascular plant data, and habitat information from sites across 5 of the province's 6 major ecological

Fig. 1. *Cladonia rei* growing on the vascular plant *Selaginella densa*, from a grassland site in Alberta, Canada.

regions. Using comparative morphology, thin layer chromatography and habitat modelling, we show that *C. rei* is actually not rare in Alberta, is common where it is present, which is almost entirely within the temperate grasslands and parklands of Alberta (often hidden by graminoids), and exhibits a consistent phenotype within those natural regions that differs from that documented in eastern North America and parts of Europe (Figure 1). While the grasslands and parklands are some of Alberta's most anthropogenically-disturbed ecosystems with a long history of agriculture and human settlement, *C. rei* consistently can be found where natural vegetation persists, often in conjunction with cattle-grazing. In conclusion, we determined that ABMI data helped us better understand which species were truly rare in Alberta by elucidating common but cryptic or under-collected species. One of the immediate benefits realized is more focused attention on the species that the data suggest require conservation.

Diane L. Haughland, Ashley Hillman and Ermias Azeria
Alberta Biodiversity Monitoring Institute, Royal Alberta Museum, Edmonton, Canada

Molecular systematics of the genus *Ramalina* with an emphasis on the *Ramalina siliquosa* complex

Ramalina siliquosa, photographed on the Isle of Skye

Our multi-locus molecular phylogeny shows that the taxonomy currently recognized in *The Lichens of Great Britain and Ireland* is correct: there are two species, one that corresponds to *R. cuspidata,* and one to *R. siliquosa*. Although this may seem obvious to some BLS members, it isn't always easy to find hard-and-fast characters to distinguish these two species, and there has been significant controversy about species recognition in this group. For example, almost 50 years ago, my graduate school advisor, Bill Culberson, split this complex into no less than six "chemospecies"—a conclusion that has been hotly disputed by multiple workers since that time.

I collected many of the 52 "*R. siliquosa* group" specimens sequenced for this project whilst attending BLS field meetings in the UK when I was Curator of Lichens at the Natural History Museum from 2004 through 2008. I also collected specimens from the Isle of Skye whilst collecting twig lichens with Rene Larson in Scotland in autumn 2004; and more from Cornwall during a summer holiday in 2007. My successor at NHM, Holger Thüs, retrieved all of these specimens for me from a freezer deep in the museum's basement; in addition, he generously loaned me a number of his own collections of this group from the Isles of Scilly. Most recently, colleagues at Edinburgh sent me a further loan of freshly collected specimens for sequencing. What I'm trying to say is this: although I'd been working on this research project since graduate school, it was my life and career in the UK that really helped me cinch these results. I am very grateful for the opportunities given to me by the NHM and the BLS, and for all the personal and professional connections I made in the UK. It seems especially fitting indeed that I was able to present this work in Helsinki with the help of a BLS Travel Grant. Thank you!

Scott LaGreca, with Steven Leavitt and Thorsten Lumbsch
Cornell University, Ithaca, NY, USA and The Field Museum, Chicago

Proposal to use mating type locus (*MAT*) sequences to account for the interbreeding criterion in lichen species delimitation

Presented and discussed are conceptual considerations on the potential use of the mating type locus (*MAT*) in low-level phylogenetic studies of lichenized ascomycetes, in order to apply the criterion of interbreeding capability to lichen species delimitation. A review of species recognition methods currently used in lichenology shows that these do not take into account the interbreeding criterion, the basic premise of the Biological Species Concept and implicit component of other species concepts. The *MAT* locus is considered the biologically most meaningful molecular marker in terms of the interbreeding capability criterion. Examples of several studies on non-lichenized ascomycetes demonstrate the suitability of mating type genes to resolve species aggregates. The interspecific nucleotide variability of coding *MAT* sequences even exceeds that of the Internal Transcribed Spacer (ITS) region. Therefore, it is concluded, and advised, that future infra-generic phylogenetic studies and attempts to resolve species aggregates of lichens should include examination of *MAT* sequences. Furthermore, it is suggested that identical or very similar *MAT* amino acid sequences should be taken as proof of interbreeding capability and therefore conspecificity, which means they could be used as a lower boundary for splitting when the segregation of putative cryptic species is considered. In the past, the major obstacle for routine use of the *MAT* locus was its immense variability among closely related taxa, and the associated difficulties in amplifying portions of it. This obstacle has now been overcome with the advent of Next Generation Sequencing methods and whole genome sequencing. Additionally, research on lichen ecology and conservation would greatly benefit, because *MAT* sequences that were originally generated for phylogenetic analyses can also be used to analyse the mating systems of the respective species.

Lars R. Ludwig
University of Otago, Dunedin, New Zealand

The rich history of lichenizing in the Chic Choc Mountains, Québec, Canada

The Chic-Choc Mountains from the summit of Mt Alberta

The Chic-Choc Mountain Range (Chic-Chocs) on the Gaspé Peninsula in eastern Québec is part of the northernmost region of the Appalachian Mountains in continental North America. Formed ca. 480 million years ago, the Chic-Chocs have eroded over time and the summits of many peaks are now large plateaus (up to 9 km in length). Plateaus above ~1000 m have arctic-alpine environments that are hypothesized to have been nunataks during the Wisconsin glaciation. These conditions combined with a coastal influence and regionally uncommon substrata, such as amphibolite and serpentine rock, have contributed to a rich lichen biota with many disjunct populations, which have attracted lichenologists for over a century. A historical review of lichen collecting in the Chic-Chocs was presented. This mountain range has been visited by lichenologists almost every decade since 1882 and specimens have been reviewed by specialists around the globe. The results from these collectors were presented. The lichen biota of the Chic-Chocs includes 570 lichen and allied fungi species, 15 species that reach their southern limit in eastern North America, and 6 species that are not known to occur for over 1000 km to the north.

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Intraspecific variation of *Polycauliona candelaria* (L.) Frödén, Arup & Søchting (*Teloschistaceae*)

Lichens with bipolar distribution constitute about 40% of the known flora in Antarctica. Currently, most of the studies on the evolution of bipolar species of lichens point to a probable Holarctic origin and colonization of the southern regions through dispersion. Polycauliona candelaria is a fruticose lichen, with rare apothecia, frequently sorediate, and markedly ornithocoprophilic. The aim of this work was to evaluate the genetic patterns along its wide distribution with DNA sequence data. We requested herbarium material from north and south hemispheres, except Antarctica (sampled by our research group). After DNA extraction, ITS region was amplified and sequenced in a preliminary analysis. Until the moment, 50 sequences were obtained and 17 haplotypes detected: 10 from northern hemisphere specimens and seven from Antarctica. Only one point mutation differentiated northern and southern haplotypes indicating the absence of a marked geographic subdivision of the genetic variation. After this initial screening, more genetic markers and specimens will be added to analyses in order to provide a complete overview of the origin and dispersion routes of this species.

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A little explored lichen hot spot in tropical Asia: 66 new species and 666 new records from Sri Lanka

Tropical lichens are an extremely successful and diverse group of fungi. The combination of a topographically varied and geologically ancient landscape and repeated influxes of biota from spatially and temporally disparate biogeographic regions have resulted in a highly diverse lichen biota in Sri Lanka, including species that apparently are absent from India. For instance, Sri Lanka became one of the *Graphidaceae* hot spots in the world. During a lichen collecting trip made in 2015, in representative wet, dry, submontane and montane habitats on the island, 66 new species and 666 new records in many different genera were discovered. With new species described previously, Sri Lanka has become the country with the highest number of new species and new records reported per area size during the past four years. In addition, fresh material was collected of species which were hitherto only known from older type material: as a result, molecular analysis was carried out elucidating the phylogenetic positions of endemic genera, e.g. *Leightoniella*. Comparison with other recently explored areas of tropical Asia reveals Sri Lanka as a hot spot for lichen diversity in this region.

The monotypic genus *Leightoniella* was described by Henssen (1965), based on 19th century material collected in Sri Lanka by Thwaites and described as *Pterygium zeylanense* by Leighton. It was assigned to the *Collemataceae*. It was subsequently reported only once, from Australia. During field work in Sri Lanka in 2015, specimens were recollected by the first author, in several localities. The fresh material has ascospores with a thick gel layer with pointed, asymmetrical tips, unlike *Collemataceae* ascospores, but resembling some *Pannariaceae*. DNA sequence data place *Leightoniella* firmly in the *Pannariaceae*, close to *Physma* and *Lepidocollem*a. The affinites of the genus have remained obscure because it is gelatinous and lacks rhizines or felt on its lower surface, which were characters of the *Collemataceae* rather than the *Pannariaceae*.

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Drivers of lichen community composition in old growth and secondary lowland rain forests of northeast Borneo

We have studied the epiphytic lichen communities in two of the largest remaining areas of old growth lowland rainforest in the Malaysian state of Sabah (NE Borneo), separated by extensive areas of oil palm plantations and secondary forests. We have compared the lichen communities within and between these areas with those found in logged forest fragments, following principles of the BioAssess-protocol. We found significant differences in lichen communities of old growth from those of logged forests, but also between the two old growth forest areas. Lichen communities from

both old growth forest areas include a wide range of taxa significantly associated with specific features such as tree girth, bark structure and the presence of buttresses. The effects of bark pH and polyphenol content are less significant. Logged forests support fewer taxa, most of these being associated with disturbance, but relicts of "old growth" taxa can survive in low frequencies. The use of a quantitative approach, estimating frequency of each taxon in each plot, allows us to detect the scale of devastation of lichen communities in the logged forest and the shifts between lichen communities associated with a range of conditions in the old growth forest.

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Ecological factors determining local symbiont associations in *Nephroma* cyanolichens

Environmental controls on cyanobacteria-lichen associations have rarely been studied. We surveyed populations of *Nostoc* from co-occurring *Nephroma* lichens across a strong climate gradient in temperate Scottish forests, sampling cyanolichens, bryophyte mats and bare bark. Results from Sanger sequencing will be compared with those from pooled samples from an Illumina NGS library, defining patterns of diversity, comparing selectivity, and examining biogeographic patterns in environmentally-available *Nostoc*.

Sanger sequences of Nostoc rbcLX from 184 fresh collections of *Nephroma* and companion species were added to a dataset from O'Brien (2013) for phylogenetic analysis. As expected, *Nostoc* from *Nephroma* in this study is clustered with cyanobionts from other *Nephroma* spp, *Lobariaceae* and *Pannariaceae*, both from Scotland and elsewhere. More than 25 sequence types from *N. laevigatum* were found, each restricted to either eastern or western sites, though often shared with other

cyanolichens. Strong biogeographic patterns were also found in *Nostoc* from these co-occurring cyanolichens. In contrast, only one sequence type from *N. parile* was found across both eastern and western sites, both with high sequence similarity to *Nostoc* photobionts from *Lobaria pulmonaria* and *N. parile* from other studies (>98.5%).

Sanger sequences from bark and bryophyte mats showed that symbiotic *Nostoc* sequences can be amplified in half of tested samples (n=8), and we expect these as an important reservoir. These sequences match *Nostoc* sequences from *Pannariaceae*, *Lobariaceae*, and *N. parile* most closely.

Preliminary PCR results for Illumina library preparations show that pooled samples from bark and bryophytes are complex, with many bands. Even sites with no known cyanolichens and those from trees with no visible cyanolichens show complex communities of cyanobacteria. Illumina sequencing is underway, with results expected soon, comparing diversity and selectivity across sites with differing ecological settings.

Reference: O'Brien, H. (2013). Symbiotic *Nostoc* revisited. *PhotobiontDiversity.org*

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Lost and Found lichens: visit to Sutherland 18–25 June 2016

This is a report of a survey visit for the Lost and Found Fungi project managed by RBG Kew (*http://fungi.myspecies.info/content/lost-found-fungi-project*). Many thanks to the Esmée Fairbairn Foundation for the funding.

The six lichenologists included Paul Cannon (Royal Botanic Gardens, Kew), John Douglass, a freelance field lichenologist, Steve Price (an amateur lichenologist and British Lichen Society field meetings organiser) Kristine Bogomazova (PhD student in lichen taxonomy at Royal Botanic Gardens, Edinburgh), Sally Ward from Scottish Natural Heritage, a recent attendee at the Kindrogan Field Studies Council lichen course and Heather Paul, an intermediate amateur.

The week aimed to do targeted searches for lichens and one non-lichenized fungus which might be genuinely rare or just seriously under-recorded in order to extend knowledge of the species and their conservation needs. This was combined with an educational/mentoring aspect to improve skills in lichenology. The species targeted were *Lecanora achariana, Umbilicaria spodochroa, Siphula ceratites, Lobothallia melanaspis, Hypogymnia vittata* and a fungus *Tulostoma niveum*.

The group stayed in a holiday let at Scourie, North-West Scotland, looking towards Handa Island, a wildlife reserve with important populations of seabirds. We watched deer out of the kitchen window in the morning and enjoyed the sunsets over the sea at 11PM , which temporarily distracted us from our microscopes. We had two vital pieces of equipment – a large table in the kitchen for the excellent meals that everyone cooked, including Steve's huge bowls of porridge that some people felt needed the addition of peanut butter and chocolate spread (and once even a splash of whisky) and another in the sitting–room for microscopes with a huge wall map of the north of Scotland. The sofas were rarely used, the TV only went on for a rough weather forecast each night (and for the EU referendum result) and we did not miss the lack of wifi or mobile signals. The weather remained almost completely dry, and the midges left us alone, apart from around the front door.

Saturday

Some of us travelled up the west coast of Scotland from the BLS field meeting on the Sleat peninsula (Skye) on a perfect sunny day. On arrival Dr Jean Balfour, who owns the Scourie estate, visited and welcomed us and was interested in the aims of the project. The welcome included a bottle of claret, which was consumed with considerable enthusiasm.

Sunday

John (modelling his new fluorescent cagoule) leaves no stone unturned in his search for lichens…

Sally Ward joined us for the day to learn about saxicolous lichens. Our habitat was the freshwater lochans near Scourie. The main focus was on the splash and amphibious zone and the tops of boulders in and around the lochans (wellingtons essential).We hoped to find *Lecanora achariana*. It was thought that this habitat was suitable although there have been no records this far north and it is considered very rare. *L. achariana* resembles *Lecanora muralis*, with which it often grows, and also could be confused with *Xanthoparmelia conspersa.* Both of these were found but no *Lecanora achariana.*

We recorded and learned about the following lichens from this habitat (rocks where there is frequent inundation and/or seepage tracks) – *Placynthium flabellosum*, which grows on very damp acid rocks and can frequently be submerged, *Placynthium pannariellum*, *Placynthium tantaleum, Collema glebulentum, Rhizocarpon caesium* and *Rhizocarpon lavatum* which were both found on cobbles within 5–10 cms of the water level, *Ionaspis lacustris* with a parasite *Endococcus verrucisporus* and *Sagediopsis lomnitzensis*, *Verrucaria aethiobola* and *V. anziana*. *Ionaspis lacustris* with cream to orange slightly cracked thallus and deep orange–red-brown apothecia, often with a reddish brown prothallus was found all week whenever we were near lochans with rocks or burns (small lochs and streams). *Porina leptalea*, which lives on both deciduous and coniferous trees as well as damp rocks, was also found.

Placynthium flabellosum, a waterside species with fan-shaped minutely foliose lobes

Sally was introduced to *Umbilicaria cylindrica, U. polyrrhiza*, *U. polyphylla, U. proboscidea* and *U. torrefacta* on nearby siliceous rocks in this montane habitat and also *Pertusaria pseudocorallina* (K+yellow–red), with brown-tipped isidia and *P. corallina* (K+yellow), with longer isidia without brown tips. *Massalongia carnosa* with its small foliose thallus with small matt brown squamules (dark green when wet) was found on acidic boulders and *Stereocaulon vesuvianum* var. *nodulosum* with pseudopodetia with naked upper parts, each terminated by small globose soralium, ended a day of exploring these rocky and wet habitats.

In the evening Heather set out to identify a *Micarea* with an almost non-existent thallus. As midnight approached (although it was still light outside), her first effort to use PD led to a minus result and she realised she had gone wrong. John helped by pointing out that she had not actually applied the PD to the thallus which was so thin. The ID of *Micarea lignaria* followed and as John said, she had chosen a species requiring many of the basic tests – developing her skills.

Monday

We headed for Sheigra north west of Kinlochbervie, near the coast, which was one of the sites where *Siphula ceratites* had been recorded in 1984. We had a one square kilometre grid reference. We spread out and began to search the boggy areas either side of the track, looking in shallow hollows for a chalky-white tufts up to 3 cm high, like a vertical version of *Thamnolia vermicularis. Cladonia* spp., *Pycnothelia papillaria* and *Ochrolechia* spp. were all scanned to no avail. Late in the morning as we got higher, Heather suddenly saw a few very short tufts with a rooting base. All thoughts of lunch

Siphula ceratites growing in a soil pocket, Sheigra

Surveying populations of *Siphula ceratites*, Sheigra

were abandoned as we mapped, and calculated the size and extent of the patches which were often in bare stony ground with a thin layer of peat and associated with *Cladonia* species. The thalli were up to 1.5 cm tall. Steve then found another substantial colony of *Siphula ceratites* on the hill to the east of the track.

John showed us *Cetraria islandica* subsp. *crispiformis* with strongly channelled and incurved lobes, narrower than in *C. islandica* subsp. *islandica. Umbilicaria deusta* with a downward recurved thallus margin added to the *Umbilicaria* records. *Pseudephebe pubescens* formed prostrate mats and *Sphaerophorus fragilis* formed even and compact cushions.

Kristine was due to join us that evening and managed to make contact despite the infrequent mobile reception to say her bus only ran on Thursdays so Paul set off to the train station at Lairg 45 miles away to rescue her.

Tuesday

We went to Loch Eriboll on the North coast to look for *Umbilicaria spodochroa* , recorded from a single site close to the sea opposite Eilean Dubh in 1974. Again we spread out and there can't have been many seepage tracks in boulders that weren't searched, while we tried to work out what had made Peter James and Oliver Gilbert stop at this point on the A838.We were looking for a single-lobed *Umbilicaria*, with a grey-brown, often whitish upper surface, lower surface mostly dark brown to black, never pink, rough rimose-warted with abundant branched dark brown-black rhizinomorphs and with frequent black apothecia with a thick rim and central protruding 'button' of sterile tissue (see *Lichens of Great Britain and Ireland*). We didn't find it and concluded that the building of a track near the shore for the fish farm may have disturbed the particular boulder it lived on.

We did find the usual suite of *Umbilicarias*, including *U. polyrrhiza* with apothecia, said to be very rarely fertile in the *Lichens of Great Britain and Ireland* and described as '2.5 mm diameter, convex, black with radiating gyri from a central point'. Erect rhizinomorphs were observed on the thallus margins and these also arose from cracks in the surface.

Fertile thallus of *Umbilicaria polyrrhiza*, with its extraordinary gyrose apothecia

Others recorded included *Icmadophila ericetorum* and *Vahliella leucophaea.* John and Kristine walked uphill and recorded the mostly montane species *Alectoria sarmentosa subsp.* vexillifera, *Allantoparmelia alpicola*, *Ochrolechia frigida* forma *frigida*, *Pertusaria dactylina* and *Thamnolia vermicularis*. Heather found bedrock with a good population of *Lasallia pustulata*, but none could be found in similar habitat nearby.

Wednesday

The aim was to refind *Lobothallia melanaspis* (formerly *Aspicilia melanaspis*) in a lochan above Inchnadamph, where it had been recorded in 1958 and 1995 by Oliver Gilbert. We walked up to Loch nan Cuaran where we lunched with wonderful views of mountains. Steve was leaving that day but first he checked the boulders on the perimeter of the loch for *L. melanaspis* but didn't find it. In fact his three-hour circumnavigation of the shoreline revealed but a very depauperate lichen flora. John walked higher past two other lochans before reaching Lagan Mhuirich to be joined later by Paul. Kristine searched Loch Meall nan Caorach. The *Lichens of Great Britain and Ireland* describes *L. melanaspis* as 'the only foliose *Aspicilia* in Britain. The large, loosely attached lobes and sessile apothecia resemble a white form of *Anaptychia runcinata* or a very large *Physcia* sp. It is rare and endangered and is found on siliceous lakeside rocks near 700 m'. Approximately 120 thalli of *Lobothallia melanaspis* were recorded at Lagan Mhuirich on 8 boulders, but none were found at the other lochs nearby.

Loch nan Cuaran, surrounded by montane habitat with a very complex geology

Heather stayed at Loch nan Cuaran at approx. 600 metres and recorded *Alectoria nigricans, Allantoparmelia alpicola*, *Pseudephebe pubescens* and *Geltingia associata* with large black apothecia covering a white thallus – possibly an *Ochrolechia* – this was loose on a ledge. The limestone valley is a site for *Tulostoma niveum* – a stalkball – previously found on the tops of moss-covered boulders, but it was early in the year for this and no new sites were found here or in other suitable habitat we visited.

Thursday

We set out to search again for *Siphula ceratites*, last recorded looking towards Suilven above the path to Inverkirkaig Falls near Lochinver in 1971, 1980 and 1991. This time we had a grid reference to 100 square metres so had high expectations and were not surprised when Kristine and Heather found the first patch after 5 minutes search. We started to record the size of the patches, but quickly realised that this time it was extensive, growing in soil pockets in grass. At times *Siphula ceratites* grew sparsely; more often it was thick and the soil pockets were heavily populated. Sometimes dead grass was lying on top, sometimes the soil pockets were in rock. The aspect of the gently undulating grassy plateau varied, but *Siphula ceratites* was found in every aspect. Eventually we managed to record it in the next kilometre square to the north.

Lobothallia (*Aspicilia*) *melanaspis* lon lochside boulders at its only known British site

The solid cortex of *Siphula ceratites*, which has thalli with rounded apices, is C+violet–yellow–brown, soon fading, and K+yellow to yellow brown and KC+ yellow–orange to yellow–brown, Pd–, UV ± violet-glaucous or ± yellow. It has been called chalk worms and is also found in Coulin Forest and near Cove, both in Wester Ross. McVean in an article in 1956 considers its occurrence in Scotland and notes it has no mechanism for long range spread, being dispersed by fragmentation. In the USA it has been called waterworms and arctic fingerbones and can apparently stand in water for a long time. It is also found on the coast of Norway. (In contrast *Thamnolia vermicularis* – mountain worms – is hollow and has pointed apices, a prostrate habit and is C–, K+ pale yellow, KC–, Pd +yellow, UV+ white according to *The Lichens of Great Britain and Ireland*).

Other finds included *Amygdalaria pelobotryon* – on low, flushed rocks – the thallus is cracked/areolate, sometimes with nitrogen-fixing cephalodia and sometimes tinged pink and is C+pink. We learned that *Lecidea phaeops* is similar but has a C– thallus. *Epigloea soleiformis* on an algal film on *Stereocaulon vesuvianum* was later determined by Brian Coppins. Most excitingly, Brian has just identified a lichenicolous fungus on the *Siphula* from a historical collection from Inverkirkaig uncovered by Heather as

Sphaerellothecium siphulae, new to Britain and previously only recorded from the Russian Arctic.

The habitat for *Siphula ceratites*, in moorland with Suilven in the background

Friday

Watercourses occupied us all day, starting with a bridge on the A838 over a burn going into the Kyle of Durness. The burn appeared eutrophic – possibly because of the limestone outcrop further upstream but was found to support species including *Ionaspis lacustris, Rhizocarpon caesium, Staurothele fissa, Verrucaria anziana* and *V. aethiobola* on siliceous rocks and *Staurothele caesia*, *Thelidium papulare* and *Gyalecta jenensis* on a limestone outcrop running across the burn.

Lichens found in the limestone outcrop either side of the burn included *Dermatocarpon miniatum, Solorina saccata, Protoblastenia calva* with deep orange apothecia in shallow pits, *Collema polycarpon* in a rosette-like cushion and very fertile with stalked apothecia, *Collema auriforme* with coarse granular isidia, *Collema multipartitum* with a much-branched thallus, *Gyalecta jenensis* and *Belonia* (now *Gyalecta*) *nidarosiensis* showing the orange photobiont in a large orange-pink sheet on a vertical side of a boulder. Lunch by the road yielded *Stereocaulon delisei* with terminal granular soredia, larger than in *Stereocaulon vesuvianum* var. *nodulosum.*

In the afternoon John was in his element in another burn coming from Loch an Eas Ghairbh near Rhiconich. In the amphibious zone not more than 30 cm above the water level this yielded *Ionaspis lacustris*, *Placynthium flabellosum, Porina guentheri* var. *guentheri, P. guentheri* var. *lucens, P. lectissima, Staurothele fissa*, *Verrucaria aethiobola* and *V. anziana*. We learned that in *Porina* species the whole of the perithecium is usually exposed. In *Verrucaria*s the thallus is usually partly over the perithecia. *Porina* species generally like shade and some can live under water for some weeks. *Rhizocarpon amphibium* can also live under water or up to 30–40cm above during periods of drought. It is grey, areolate with flat black apothecia in concentric rings. *Rhizocarpon lavatum* was seen again. In wet climates it can live on the top of boulders. It is not specifically a fresh water specialist. *Porpidia hydrophila* also lives on inundated siliceous rocks. It has a blue epithecium which can clearly be seen in section. In the terrestrial zone which can sometimes get inundated there were lichens including *Stereocaulon* species*, Ochrolechia parella, Parmelia sulcata* and *Pertusaria corallina*.

Cornicularia normoerica near the Falls of Kirkaig

John had shared his knowledge of lichens in watercourses but back at base we felt we needed to test his wide knowledge of chocolate spreads. Could he really tell the difference between two well-known brands? He closed his eyes and we gave him 4 teaspoons of chocolate spread. His score was 1 out of 4!

Saturday

We drove two hours across Sutherland to the east coast, to Ferry Links near Golspie to admire *Hypogymnia vittata* in short coastal turf with small pebbles beside a wellfrequented track from the nearby car park. The thallus is browner than in *Hypogymnia physodes*, and the apices of most lobes have a large pore on the underside. It is Pd–, whereas *H. physodes* is Pd+ orange to red. So far it has only been recorded in Britain from this site.

Hypogymnia vittata with its brown thallus (right) growing in association with *H. physodes* (left)

Two hours later we were still in the same patch of short turf, looking at *Peltigera leucophlebia, Thamnolia vermicularis, Psoroma hypnorum*, tiny jelly lichens, *Ochrolechia frigida* var. *lapuensis* and nearby *Diploschistes muscorum* on *Cladonia pocillum*. It was surprising to see so many high-montane specialists within a few metres of the sea.

Kristine and Heather then looked briefly at the lichen heath at Cuthill links, noting that despite the recent rain the lichens were dry and brittle and could be easily damaged. We looked at a notice board erected by the Skibo Estate, raising awareness of the lichens and the need to avoid trampling them where the lichen heath borders the golf-course. The soil is a mix of sand and pebbles and there is a very rich cover of lichens including many *Cladonia* species growing among the heather.

This was a fitting end to an excellent and enjoyable, hardworking and good humoured week in which we learned lots and found some of our targets –*Siphula ceratites, Lobothallia melanaspis* and *Hypogymnia vittata*. We didn't find new sites but maybe in the future people going to these areas will continue to look out for all these lichens. Many thanks to Paul and John for leading this week.

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Report of the BLS field meeting at Wallington, Northumberland (VC67), 17 January 2016

Finding a good lichen site for the field meeting following the AGM is always difficult, but when the meeting was held in Newcastle upon Tyne it was a particular challenge. This year we settled on the National Trust property at Wallington, about 20 miles north-west of Newcastle, hoping that the mix of woodland, gardens, old walls and tea shop would provide something for everyone. This is one of the closest sites to the city to have any lichens of note but it had not been surveyed in any detail so we had no idea what we would find.

Sunday dawned cold but bright, with a couple of inches of fresh snow on the ground, a glorious winter's day for Northumberland. 28 members and locals donned gloves and an extravagant assortment of woolly hats, and were met by Paul Hewitt, NT Countryside Manager, and his dog. Paul gave us a brief introduction to the site and stayed with us for a while as we explored. The party soon broke up into small groups, some visiting the woods while others headed for the buildings and the old walled garden.

Studying the Bishopsgate griffins

Mark Powell and others started with the walls of the gatehouse and tea shop, and soon found that familiar lichens could look worryingly different in the north of England. A masterclass on *Caloplaca* was inevitable, and we soon got to grips with *Caloplaca austrocitrina*, a species that so far is greatly under-recorded in north-east England.

Over the road, the walled garden was also of interest with, amongst other things, *Myriospora rufescens* on a wall and *Lecania inundata* on a stone urn nearby. Trees in the orchard had both *Ramalina fastigiata* and *Ramalina fraxinea*, both species that are recolonising Northumberland rapidly after decades of absence.

The main lawn has a number of isolated trees and stone objects, including a basalt column from the Giants Causeway and a set of large stone griffin heads that once adorned the Bishopsgate in London. *Tephromela grumosa*, on the basalt column, is common in this area but was new to some, as was *Aspicilia grisea* growing with it. The griffins gave us an opportunity to study some more problematic crusts, especially *Verrucaria viridula* and *Thelidium incavatum*.

Trees on the lawn were rich in lichenicolous fungi, with *Marchandiomyces aurantiacus*, *Illosporiopsis christiansenii*, *Ungiculariopsis thallophila* and *Xanthoria physciae* all showing well. However, the find of the day was undoubtedly *Caloplaca luteoalba* growing on a chestnut near the griffins. This was the first record for VC67 in 45 years, and a new location for the species.

Woodlands in this area can be hard work, but the efforts of Brian Coppins, Doug McCutcheon and others produced an impressive list for the West Wood that included no less than eight species of *Opegrapha* and two of *Strigula*. *Graphis scripta* and *Thelotrema lepadinum* were found to be surprisingly common, suggesting that these woodlands may be older than they look.

After another gathering to pay homage to the *Caloplaca luteoalba* we headed back to the cars, only to realise that we had all walked past *Parmelia ernstiae* on a beech tree on the way in, only the second record for the county.

Paying homage to *Caloplaca luteoalba*. The dog was not impressed…

Wallington proved to be much better for lichens than expected, and we haven't yet looked at the parkland trees or the riverside so there may be more to find. Inspired by this I went back to Shaftoe Crags, a moorland site only two miles from Wallington, a few weeks later and got another surprise. Not only was the *Lasallia pustulata* for which the site is famous doing well but there was also a large population of *Cetraria islandica* which hadn't been seen there since it was recorded by Winch some 200 years ago. All this only 20 miles from Newcastle!

Janet Simkin
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Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Acarospora fuscata	•			•
Amandinea punctata		•		
Anisomeridium biforme		•		
Anisomeridium polypori		•		
Arthonia didyma			•	
Arthonia punctiformis	•			
Arthonia radiata	•	•	•	
Arthonia spadicea		•	•	
Arthopyrenia punctiformis		•		
Aspicilia grisea	•			
Bacidia caligans	•			
Bacidia rubella		•		
Bilimbia sabuletorum	•			
Buellia aethalea	•			
Buellia griseovirens	•	•		
Calicium viride	•	•		
Caloplaca austrocitrina	•			•
Caloplaca cerinella	•			
Caloplaca citrina s. lat.				•
Caloplaca flavescens	•			
Caloplaca flavocitrina	•			
Caloplaca limonia	•			

Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Caloplaca luteoalba	•			
Caloplaca obscurella	•	•		
Candelariella aurella forma *aurella*	•			•
Candelariella reflexa	•			•
Candelariella vitellina forma *vitellina*	•			•
Catillaria chalybeia var. *chalybeia*	•			•
Catinaria papillosa		•		
Chaenotheca brachypoda		•		
Chaenotheca chrysocephala	•			
Chaenotheca ferruginea	•	•	•	
Chaenotheca trichialis	•	•		
Chrysothrix candelaris		•		
Cladonia chlorophaea s. lat.				•
Cladonia polydactyla var. *polydactyla*			•	
Cliostomum griffithii	•	•		
Collema crispum var. *crispum*	•			
Cystocoleus ebeneus			•	
Dimerella pineti		•		
Diplotomma alboatrum	•			•
Diplotomma hedinii	•			

Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Evernia prunastri	•	•		•
Fellhanera bouteillei			•	
Fuscidea lightfootii	•	•		•
Graphis elegans		•		
Graphis scripta		•	•	
Haematomma ochroleucum var. *porphyrium*		•		
Hypogymnia physodes	•	•	•	•
Hypogymnia tubulosa				•
Hypotrachyna afrorevoluta				•
Illosporiopsis christiansenii	•			
Laeviomyces opegraphae		•		
Lecanactis abietina		•	•	
Lecania cyrtella				•
Lecania cyrtellina		•		
Lecania hutchinsiae	•			
Lecania inundata				•
Lecania naegelii		•		
Lecanora albescens	•			•
Lecanora antiqua	•			
Lecanora argentata		•		
Lecanora barkmaniana	•			
Lecanora campestris subsp. *campestris*	•			•
Lecanora carpinea				•
Lecanora chlarotera	•	•	•	•
Lecanora compallens		•		
Lecanora conizaeoides forma *conizaeoides*		•		
Lecanora crenulata				•
Lecanora dispersa	•			•
Lecanora expallens	•	•		

Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Lecanora polytropa				•
Lecanora pulicaris	•			•
Lecanora soralifera	•			
Lecanora sulphurea				•
Lecanora symmicta	•			
Lecidea grisella				•
Lecidella elaeochroma forma *elaeochroma*	•	•		
Lecidella scabra				•
Lecidella stigmatea	•			•
Lepraria incana s. lat.	•		•	
Lepraria incana s. str.	•	•		
Lepraria lobificans	•	•		
Leptogium teretiusculum				•
Marchandiomyces aurantiacus	•			
Marchandiomyces corallinus	•			
Melanelixia glabratula	•	•		
Melanelixia subaurifera	•	•		
Myriospora rufescens				•
Ochrolechia androgyna	•	•		
Ochrolechia parella	•			•
Ochrolechia subviridis		•		
Opegrapha atra	•			
Opegrapha calcarea	•			
Opegrapha gyrocarpa	•			
Opegrapha herbarum	•	•		
Opegrapha multipuncta		•		
Opegrapha niveoatra		•		
Opegrapha ochrocheila		•		
Opegrapha sorediifera		•		
Opegrapha varia	•	•		•

Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Opegrapha vermicellifera		•		
Opegrapha vulgata		•		
Parmelia ernstiae	•			
Parmelia saxatilis			•	
Parmelia sulcata	•	•		•
Parmeliopsis ambigua		•		
Peltigera praetextata		•		
Pertusaria albescens var. *albescens*		•		
Pertusaria albescens var. *corallina*		•		
Pertusaria amara forma *amara*	•	•	•	
Pertusaria corallina	•			
Pertusaria flavida		•		
Pertusaria hymenea		•		
Pertusaria lactescens	•			•
Pertusaria leioplaca	•			
Pertusaria pertusa		•	•	
Phaeophyscia orbicularis	•	•		
Phlyctis argena	•	•		
Phycopeltis arundinacea	•			
Physcia tenella	•	•		•
Physconia enteroxantha		•		
Physconia grisea	•	•		
Physconia perisidiosa	•			
Placopyrenium fuscellum				•
Platismatia glauca	•	•		•
Porina aenea		•	•	
Porina byssophila		•		
Porina chlorotica forma *chlorotica*			•	
Porpidia cinereoatra	•			•

Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Porpidia crustulata				•
Porpidia macrocarpa forma *macrocarpa*				•
Porpidia tuberculosa				•
Protoblastenia rupestris	•			•
Psilolechia lucida			•	
Punctelia jeckeri	•			
Punctelia subrudecta s. lat.				•
Punctelia subrudecta s. str.	•			
Pyrrhospora quernea		•	•	
Ramalina farinacea	•	•		•
Ramalina fastigiata				•
Ramalina fraxinea				•
Rinodina oleae	•			
Rinodina sophodes	•			
Rinodina teichophila	•			
Sarea resinae		•		
Schismatomma decolorans		•		
Scoliciosporum umbrinum	•			
Stenocybe septata		•		
Strigula jamesii		•		
Strigula taylorii		•		
Syzygospora physciacearum	•			
Tephromela atra var. *atra*	•			•
Tephromela grumosa	•			
Thelidium incavatum	•			
Thelotrema lepadinum	•		•	
Toninia aromatica	•			
Trapelia coarctata				•
Tuckermannopsis chlorophylla	•			
Unguiculariopsis thallophila	•			

Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Usnea subfloridana	•			•
Verrucaria hochstetteri				•
Verrucaria muralis	•			
Verrucaria nigrescens forma *nigrescens*	•			•
Verrucaria nigrescens forma *tectorum*	•			•

Taxon Name	House, gardens	West Wood	East Wood	Walled garden
Verrucaria viridula	•			
Xanthoparmelia mougeotii			•	
Xanthoria parietina	•	•		
Xanthoria polycarpa	•			
Xanthoriicola physciae	•			

British Isles List of Lichens and Lichenicolous Fungi

September 2016 update to list

The fully corrected list is available on the BLS web site, *www.britishlichensociety.org.uk*

We are indebted to Paul Diederich, Brian Ecott, Mark Powell and Neil Sanderson and other checklist users, for bringing several of the required changes to our notice. Anyone encountering difficulties or errors regarding nomenclature or BLS code numbers, please contact one of us, as below.

E-mail contacts (with main responsibilities): *Brian Coppins* (nomenclature, BLS and NBN species dictionaries, spelling, authorities, dates of publication) *lichensEL@btinternet.com*. *Mark Seaward* (allocation of BLS numbers and abbreviations) *m.r.d.seaward@bradford.ac.uk*. *Janet Simkin* (Recorder and spread-sheet species dictionaries) janetsimkin@btinternet.com.

Add:		
2669	*Cladosporium licheniphilum* #	Cladosp lich #
2673	*Diplotomma parasiticum*	Diplot para
2670	*Gyalidea hyalinescens var. pauciseptata*	Gyalidea hyal pauc
2671	*Hainesia xanthoriae* #	Hain xant #
2667	*Laetisaria lichenicola* #	Laet lich #
2674	*Myriospora tangerina*	Myri tang
2672	*Pyrenochaeta xanthoriae* #	Pyrenoch xant #
2663	*Sticta atlantica*	Sticta atla
2664	*Sticta ciliata*	Sticta cili
2666	*Sticta fuliginoides*	Sticta fuliginoides
2665	*Sticta fuliginosa s. str.*	Sticta fuli'osa s.s.

Deleted from list:						
						Notes
2067	*Guignardia fimbriatae #*	Guig fimb #				1

Change of genus (sometimes also species epithet):						
Change from:			Replace with:			Notes
2435	*Collolechia caesia*	Collol caes	2435	*Placynthium caesium*	Placynthium caes	
531	*Graphina ruiziana*	Graphina ruiz	531	*Graphis ruiziana*	Graphis ruiz	
2423	*Laeviomyces fallaciosus #*	Laev fall #	2423	*Lichenodiplis fallaciosus #*	Lichenodip fall #	
2076	*Laeviomyces opegraphae #*	Laev opeg #	2076	*Lichenodiplis opegraphae #*	Lichenodip opeg #	
2077	*Laeviomyces pertusariicola #*	Laev pert #	2077	*Lichenodiplis pertusariicola #*	Lichenodip pert #	
2108	*Marchandiomyces aurantiacus #*	March aura #	2108	*Marchandiobasidium aurantiacus #*	March'ium aura #	
722	*Rimularia furvella*	Rimu furv	722	*Lambiella furvella*	Lamb furv	
1894	*Rimularia fuscosora*	Rimu fuscoso	1894	*Lambiella fuscosora*	Lamb fuscoso	
1992	*Rimularia globulosa*	Rimu glob	1992	*Lambiella globulosa*	Lamb glob	
725	*Rimularia gyrizans*	Rimu gyri	725	*Lambiella gyrizans*	Lamb gyri	
736	*Rimularia insularis*	Rimu insul	736	*Lambiella insularis*	Lamb insul	
1895	*Rimularia sphacelata*	Rimu spha	1895	*Lambiella sphacelata*	Lamb spha	
2239	*Syzygospora bachmannii #*	Syzy bach #	2239	*Heterocephalacria bachmannii #*	Heteroce bach #	
2240	*Syzygospora physciacearum #*	Syzy phys #	2240	*Heterocephalacria physciacearum #*	Heteroce phys #	

Moved into synonymy:						
Change from:			Replace with:			Notes
529	*Graphina anguina*	Graphina angu	529	*Graphis inustuloides*	Graphis inus	
1215	*Rinodina degeliana*	Rino dege	1215	*Rinodina subparieta*	Rino subp	

Change of rank:						
Change from:			Replace with:			Notes
1804	*Rinodina mniaraea* var. *cinnamomea*	Rino mnia cinn	1804	*Rinodina cinnamomea*	Rino cinn	
1998	*Rinodina mniaraea* var. *mniaraeiza*	Rino mnia mniaraeiza	1998	*Rinodina mniaraeiza*	Rino mnia	

Change of abbreviation:						
Change from:			Replace with:			Notes
544	*Gyalidea hyalinescens*	Gyalidea hyal	544	*Gyalidea hyalinescens var. hyalinescens*	Gyalidea hyal hyal	
2109	*Marchandiomyces corallinus #*	March cora #	2109	*Marchandiomyces corallinus #*	March'ces cora #	
1367	*Sticta fuliginosa*	Sticta fuli	1367	*Sticta fuliginosa s. lat.*	Sticta fuli'osa s.l.	

Note
1 – *Guignardia fimbriatae* is a synonym of *Lichenosticta alcicornaria*, but the British record probably refers to *Phaeopyxis punctum*.

B.J. Coppins, M.R.D. Seaward & J. Simkin

Literature pertaining to British lichens – 59

Lichenologist **48**(3) was published on 3 May 2016, **48**(4) on 28 July 2016, and **48**(5) on 27 September 2016.
Taxa prefixed by * are additions to the checklists of lichens and lichenicolous fungi for Britain and Ireland. Aside comments in square brackets are by the author of this compilation.

ERTZ, D., TEHLER, A., IRESTEDT, M., FRISCH, A., THOR, G. & VAN DEN BOOM, P.P.G. 2015 [publ. on line 25 April 2014]. A large-scale phylogenetic revision of *Roccellaceae* (*Arthoniales*) reveals eight new genera. *Fungal Diversity* **70:** 31–53. Further advances in the phylogeny of the Arthoniales has led to the recognition of several new genera. Those relevant to the British Isles are: *Gyrographa* Ertz & Tehler, with *G. gyrocarpa* (Flot.) Ertz & Tehler (syn. *Opegrapha gyrocarpa*) and *G. saxigena* (Taylor) Ertz & Tehler (syn. *O. saxigena*);

Pseudoschismatomma Ertz & Tehler, with *P. rufescens* (Pers.) Ertz & Taylor (syn. *O. rufescens*); and *Psoronactis* Ertz & Taylor with *Psoronactis dilleniana* (Ach.) Ertz & Tehler (syn. *Lecanographa dilleniana*, *Lecanactis dilleniana*).

LIU, X.-Z., WANG, Q.M., GÖKER, M., GROENEWALD, M., KACHALKIN, A.V., LUMBSCH, H.T., MILLANES, A.M., WEDIN, M., YURKOV, A.M., BOEKHOUT, T. & BAI, F.-Y. 2016. Towards an integrated phylogenetic classification of the *Tremellomycetes*. *Studies in Mycology* **81:** 85–147 [Available free on-line]. The two lichenicolous fungi previously placed in *Syzygospora* are assigned to the genus *Heterocephalacria* Berthier (1980) as *H. bachmannii* (Diederich & M.S. Christ.) Millanes & Wedin (syn, *Syzygospora bachmannii*) and *H. physciacearum* (Diederich) Millanes & Wedin (syn. *Syzygospora physciacearum*).

MUGGIA, L., KOPUN, T. & ERTZ, D. 2015. Phylogenetic placement of the lichenicolous, anamorphic genus *Lichenodiplis* and its connection to *Muellerella*-like teleomorphs. *Fungal Biology* **119:** 1115–1128. Molecular data from samples of *Lichenodiplis lecanorae* and *Muellerella* species found them to belong to a single monophyletic clade. With regard to samples on *Tephromela atra*, it was concluded that *L. lecanorae* and *M. atricola* represent, respectively, the anamorphic and teleomorphic stages of the same fungus, and this is supported from culture studies.

RESL, P., MAYRHOFER, H., CLAYDEN, S.R., SPRIBILLE, T., THOR, G., TØNSBERG, T. & SHEARD, J. 2016. Morphological, chemical and species delimitation analyses provide new taxonomic insights into two groups of *Rinodina. Lichenologist* **48:** 469–488. *Rinodina degeliana* is shown to be the sorediate morph of *R. subparieta* (Nyl.) Zahlbr. (1831); the fertile, non-sorediate morph being known only from Japan. The three 'chemical varieties' of *Rinodina mniaraea* are shown to be independent species, of which two are reported from Britain (N. Scotland): *R. cinnamomea* (Th. Fr.) Räsänen (1931) (syn. *R. mniaraea* var. *cinnamomea*) and *R. mniaraeiza* (Nyl.) Arnold (1870) (syn. *R. mniaraea* var. *mniaraeiza*).

RESL, P., SCHNEIDER, K., WESTBERG, M., PRINTZEN, C., PALICE, Z., THOR, G., FRYDAY, A., MAYRHOFER, H. & SPRIBILLE, T. 2015. Diagnostics for a troubled backbone: testing topological hypotheses of trapelioid lichenized fungi in a large-scale phylogeny of *Ostropomycetidae* (*Lecanoromycetes*). *Fungal Diversity* **73:** 239–258. [Available free on-line]. This phylogenetic study finds that the genus *Rimularia* contains two groups of taxa, firstly *Rimularia* s. str., as typified by *R. limborina*, belonging to the *Trapeliaceae*, and a group referred to *Lambiella* Hertel (1984) that belongs in the *Xylographaceae*, along with *Xylographa*, *Lithographa* and *Ptychographa*. The British species referred to *Lambiella* are: *L. furvella* (Nyl. ex Mudd) M. Westb. & Resl (syn. *R. furvella*), *L. fuscosora* (Muhr & Tønsberg) M. Westb. & Resl (syn. *R. fuscosora*), *L. globulosa* (Coppins) M. Westb. & Resl (syn. *R. globulosa*), *L. gyrizans* (Nyl.) M. Westb. & Resl (syn. *R. gyrizans*), *L. insularis* (Nyl.) T. Sprib. (2014) and *L. sphacelata* (Th. Fr.) M. Westb. & Resl (syn. *R. sphacelata*). [*R. mullensis* is probably referable to

Lambiella, but DNA sequence data is not yet available]. The genus *Ainoa*, previously placed in the *Trapeliaceae*, is found to belong to the *Baeomycetaceae*.

SUIJA, A., DE LOS RIOS, A. & PÉREZ-ORTEGA 2015. A molecular reappraisal of *Abrothallus* species growing on lichens of the order *Peltigerales*. *Phytotaxa* **195:** 201–226. Of the 15 or so species found on peltigeralean hosts, only one (*A. welwitschii* on *Sticta* spp.) is so far known from the British Isles. [Given the many good populations of species of genera such as *Lobaria*, *Nephroma* and *Pseudocyphellaria*, there is a good chance of *A. welwitschii* not remaining alone!]

ZHAO, X., LEAVITT, S.D., ZHAO, Z.T., ZHANG, L.L., ARUP, U., GRUBE, M., PÉREZ-ORTEGA, S., PRINTZEN, C., ŚLIWA, L., KRAICHAK, E., DIVAKAR, P.K., CRESPO, A. & LUMBSCH, H.T. 2016 [publ. online 11 December 2015]. Towards a revised generic classification of lecanoroid lichens (*Lecanoraceae*, *Ascomycota*) based on molecular, morphological and chemical evidence. *Fungal Diversity* **78:** 293–304. From a phylogenetic analysis the genus *Lecanora* is shown to be polyphyletic. A core group of *Lecanora* is supported as monophyletic and includes species of the *L. carpinea*, *L. rupicola*, and *L. subcarnea* groups, and a core group of the *L. subfusca* group. Three monophyletic clades that are well supported in the analyses and well characterized by phenotypic characters are accepted as: *Myriolecis* Clem. (1909) (*L. dispersa* group), *Protoparmeliopsis* (*L. muralis* group) and *Rhizoplaca*. British species of *Myriolecis* are: *Myriolecis agardhiana* (Ach.) Śliwa, Zhao Xin & Lumbsch (*L. agardhiana*), *M. albescens* (Hoffm.) Śliwa, Zhao Xin & Lumbsch (syn. *L. albescens*), *M. andrewii* (B. de Lesd.) Śliwa, Zhao Xin & Lumbsch (syn. *L. andrewii*), *M. antiqua* (J.R. Laundon) Śliwa, Zhao Xin & Lumbsch (syn. *L. antiqua*), *M. crenulata* (Hook.) Śliwa, Zhao Xin & Lumbsch (syn. *L. crenulata*), *M. dispersa* (Pers.) Śliwa, Zhao Xin & Lumbsch (syn. *L. dispersa*), *M. fugiens* (Nyl.) Śliwa, Zhao Xin & Lumbsch (syn. *L. fugiens*), *M. hagenii* (Ach.) Śliwa, Zhao Xin & Lumbsch (syn. *L. hagenii*), *M. invadens* (H. Magn.) Śliwa, Zhao Xin & Lumbsch (syn. *L. invadens*), *M. persimilis* (Th. Fr.) Śliwa, Zhao Xin & Lumbsch (syn. *L. persimilis*), *M. pruinosa* (Chaub.) Śliwa, Zhao Xin & Lumbsch (syn. *L. pruinosa*), *M. salina* (H. Magn.) Śliwa, Zhao Xin & Lumbsch (*L. salina*), *M. sambuci* (Pers.) Clem. (1909) (syn. *L. sambuci*), *M. semipallida* (H. Magn.) Śliwa, Zhao Xin & Lumbsch (syn. *L. semipallida*), *M. straminea* (Wahlenb. ex Ach.) Śliwa, Zhao Xin & Lumbsch (syn. *L. straminea*) and *M. zosterae* (Ach.) Śliwa, Zhao Xin & Lumbsch (syn. *L. zosterae*). [*Protoparmeliopsis* is represented in the British Isles by *P. achariana* and *P. muralis*. There are no British representatives of *Rhizoplaca*].

B.J. Coppins
Email: lichensel@btinternet.com

New, Rare and Interesting Lichens

Contributions to this section are always welcome. Submit entries to Chris Hitch, Orchella Lodge, 14, Hawthorn Close, Knodishall, Saxmundham, Suffolk, IP17 1XW, in the form of species, habitat, locality, VC no, VC name, (from 1997, nomenclature to follow that given in the appendix, see BLS Bulletin 79, which is based on the Biological Record Centre for instructions for Recorders, ITE, Monks Wood Experimental Station, Abbots Ripton, PE17 2LS, 1974). Grid Ref (GR) (please add letters for the 100km squares to aid BioBase and Recorder 2000, as these are used in the database and on the NBN Gateway), altitude (alt), where applicable in metres (m), date (month and year). NRI records should now include details of what the entry represents, eg specimen in Herb. E, Hitch etc., with accession number where applicable, field record or photograph, to allow for future verification if necessary or to aid paper/report writing. Determined/confirmed by, Comments, New to/the, Finally recorder. An authority with date after species is only required when the species is new to the British Isles. Records of lichens listed in the RDB are particularly welcome, even from previously known localities. In the interests of accuracy, the data can be sent to me on e-mail, my address is cjbh.orchldge@freeuk.com, or if not, then typescript. Copy should reach the subeditor at least a fortnight before the deadline for the Bulletin. Please read these instructions carefully.

Please note that from summer 2017, Grid References in NRI data will be as follows, eg. TM123.456.

New to the British Isles

Diplotomma parasiticum: (B. de Lesd.) Diederich, Cl. Roux & Van Haluwyn (2014): lichenicolous on apothecia of *Lecanora dispersa agg*. on north wall of church, Athelstaneford, VC 82, East Lothian, GR 36(NT)/532.773, alt 78 m, July 2016. Herb. Powell. Ascospores 3-septate, minutely warted (oil-immersion). This is the third lichenicolous lichen of the genus known from the British Isles. **BLS No. 2673**.

M. Powell and B. J. Coppins

Pyrenochaeta xanthoriae: lichenicolous on *Xanthoria parietina*, on dead *Fraxinus* twig, Ringstead Cemetery, VC 32, Northamptonshire, GR 42(SP)/981.748, May 2016. Herb. Powell 4072. Causing considerable damage to the host, making it conspicuous in the field. Pycnidia 50-90 µm diam., with conspicuous setae around the ostiole. Conidiogenous cells arranged in vertical chains, conidia produced terminally and laterally, hyaline, 3-3.5(-4) × 1.5-2 µm. For full description see Diederich (1990) in Mycotaxon 37: 297-330. **BLS No. 2672**. *M. Powell*

Other Records

Abrothallus prodiens: on *Hypogymnia physodes* in *Salix/Betula* carr, Red Moss SWT Reserve, VC 83, Midlothian, GR 36(NT)/16-63-, February 2016. Herb. AS.

Determined by B. J. Coppins. First British record outside the Scottish highlands. New to the Vice-county. *A. Shuttleworth*

Absconditella trivialis: on heavy metal-polluted soil beside disused railway track bed at former copper smelting works, lower Swansea Valley, VC 41, Glamorgan, GR 21(SS)/675.960, alt 25 m, April 2001. Herb. SPC. New to the Vice-county. *S.P. Chambers*

Acrocordia macrospora: on boundary wall, Carisbrooke Castle, Newport, VC 10, Isle of Wight, GR 40(SZ)/485.877, alt 20 m, April 2016. New to the Vice-county. *M. Putnam*

Arthonia epiphyscia: on esorediate *Physcia* sp. lobe, on dust-enriched *Crataegus monogyna* twig, in derelict hedgeline in upland pasture, *c*. 500 m northwest of Camnant Bridge, north of Esgairdraenllwyn, VC 43, Radnorshire, GR 32(SO)/082.830, alt 350 m, September 2016. Herb. SPC. New to the Vice-county. *S.P. Chambers*

Arthonia molendoi: on *Xanthoria parietina* on lignum of bottom rail of kissing gate, affected by calcareous influence, at entrance to Pound Farm Reserve (Woodland Trust) VC 25, East, Suffolk, GR 62(TM)/32-63-, May 2016. Herb Hitch (X19). Determined by M. Powell. Second record of this species, for the county. *C.J.B. Hitch & M. Powell*

Arthonia punctiformis: on bark of pendulous young branch of *Cupressus*, overhanging southwest corner of garden by unmade road, Peterhouse Crescent, Woodbridge, VC 25, East Suffolk, GR 62(TM)/261.491, August 2016. Herb. Hitch (U10) ex Earland-Bennett. Determined by P.M. Earland-Bennett. An interesting new substrate for this fungus, which is usually on *Betula*. *P.M. Earland-Bennett & C.J.B. Hitch*

Arthopyrenia analepta: on *Crataegus* twig, Farnborough Hall (Dairy Ground), VC 38, Warwickshire, GR 42(SP)/429.489, August 2016. Herb. Powell 4136. New to the Vice-county. *M. Powell*

Bacidia circumspecta: rare on roots of *Ulmus glabra* stool, growing on cliff, former upland pasture woodland, Yew Crag, Gowbarrow Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/4145.2050, alt 200 m, May 2016. A new Vice-county record for a rare Section 41 species. *N.A. Sanderson*

Bacidia squamellosa: occasional on *Fraxinus* and *Corylus*, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3967.2044, 35(NY)/3944.2038, 35(NY)/3926.2038 and 35(NY)/392.204, alt 200 – 250 m, May 2016. First records of this species for northern England. New to the Vice-county. *N.A. Sanderson*

Bacidia subincompta: on ancient *Fraxinus* pollard within open upland pasture woodland, Troutbeck Park, Lake District, VC 69, Westmorland, GR 35(NY)/4219.0591, alt 210 m, May 2016. For distribution details see item below. New to the Vice -county. *N.A. Sanderson*

Bacidia subincompta: on two ancient cankerous *Fraxinus*, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3889.1963 & 35(NY)/3888.2002, alt 210 and 250 m respectively, May 2016.

A new site for this Section 41 species, a very rare species in England. New to the Vice-county. *N.A. Sanderson*

Bacidia subturgidula: on lignum of fallen old *Quercus*, on boundary of ancient *Quercus* woodland, amongst recent *Quercus* woodland, developed in old fields, Gold Point Heath, Arne, VC 9, Dorset, GR 30(SY)/9790.8946, alt 5 m, June 2016. Sixth world record for this rarely recorded southern oceanic dead wood specialist and Section 41 lichen. New to the Vice-county. *N.A. Sanderson*

Bactrospora corticola: in cervices of dry bark on old *Quercus*, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC70, Cumberland, GR 35(NY)/3871.1915, alt 170 m, May 2016. First record of this species for the Lake District. New to the Vice-country. *N.A. Sanderson*

Biatora chrysantha: (i) on three old *Quercus*, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3967.2042, 35(NY)/3964.2053 and 35(NY)/3965.2053, alt 230 – 250 m, May 2016; (ii) on two *Quercus* trees, within former upland pasture woodland in ravine, Aira Force, Gowbarrow Park, Matterdale, Lake District, VC 70, Cumberland, 35(NY)/3998.2077 and 35(NY)/4000.2085, alt. 210 and 220 m respectively, May 2016. New to the Lake District. *N.A. Sanderson*

Biatora chrysantha: on old *Quercus* in grove within open upland pasture woodland, Glenamara Park, Patterdale, Lake District, VC 69, Westmorland, GR 35(NY)/3868.1560, alt 230 m, May 2016. New to the Lake District. *N. A. Sanderson*

Biatora globulosa: on flushed bark of hollow old *Fraxinus*, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3940.2032, alt 220 m, May 2016. A northern and eastern lichen that is very rare in England. First record for this species in the Lake District. New to the Vice-country. *N.A. Sanderson*

Biatora vernalis: on two *Fraxinus*, fertile on one and on two *Quercus*, within former upland pasture woodland in ravine, Aira Force, Gowbarrow Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3998.2078, 35(NY)/3998.2080, and 35(NY)/4000.2104, alt 220 m and 35(NY)/3999.2100 alt 230 m, May 2016. Second time recorded in the Lake District. First recent record of it from England.
N.A. Sanderson

Briancoppinsia cytospora: on *Punctelia subrudecta* on trunk of *Acer platanoides* in urban street, Woodgrange Drive, Southend-on-Sea, VC 18, South Essex, GR 51(TQ)/896.853, March 2011. Herb. P. M. Earland-Bennett. Determined by B.J. Coppins. Previously, only found on *Lecanora conizaeoides* in Essex.
P.M. Earland-Bennett

Buellia hyperbolica: on lignum on limb of recently fallen old *Quercus*, the limb probably long dead before the tree fell, Gritnam Wood, New Forest, VC 11, South Hampshire, GR 41(SU)/2831.0651, alt 40 m, July 2016. A new wood and 10km grid square record, for this Section 41 lichen. *N.A. Sanderson*

Caloplaca albolutescens: fertile, growing on sandstone where it is affected by run-off from mortar courses, The Obelisk, Farnborough Hall, VC 38, Warwickshire, GR 42(SP)/430.486, August 2016. Field record. New to the Vice-county. *M. Powell*

Caloplaca asserigena: on south side of *Crataegus monogyna* in pasture, Gilfach (Radnorshire Wildlife Trust reserve), VC 43, Radnorshire, GR 22(SN)/964.716, alt 270 m, May 2016. Field record. Determined by S. P. Chambers. New to the Vice-county. *T.A. Lovering & S.P. Chambers*

Caloplaca cerinelloides: on lignin of old *Sambucus* on downland, St. Catherine's Point, VC 10, Isle of Wight, GR 40(SZ)/49-75-, alt 48 m, April 2016. New to the Vice-county. *H. Paul, M. Putnam and J. Jones*

Caloplaca limonia: on sandstone outcrops, St. Catherine's Point, VC 10, Isle of Wight, GR 40(SZ)/49-75-, alt 48 m, April 2016. New to the Vice-county. *M. Putnam*

Caloplaca lucifuga: on large old *Quercus*, within former upland pasture woodland in ravine, Aira Force, Gowbarrow Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3996.2065, alt 200 m, May 2016. First recent record for northern England for this Section 41 species. New to the Vice-country. *N.A. Sanderson*

Caloplaca phlogina: extensive colonies on stems of two old *Sambucus*, Farnborough Hall (Dairy Ground), VC 38, Warwickshire, GR 42(SP)/429.489, August 2016. Field record. New to the Vice-county. *M. Powell*

Caloplaca pyracea: on sweeping branch of aspen poplar, *Populus tremula*, Broom Covert, Pound Farm Reserve (Woodland Trust), VC 25, East Suffolk, GR 62(TM)/32-63-, May 2016. Herb. Hitch (X11/A). Determined by M. Powell. New to the county. *C.J.B. Hitch & M. Powell*

Caloplaca ulcerosa: sparingly fertile on stems of two old *Sambucus*, Farnborough Hall (Dairy Ground), VC 38, Warwickshire, GR 42(SP)/429.489, August 2016. Field record. New to the Vice-county. *M. Powell*

Catillaria fungoides: on old *Fraxinus* in parkland, Kingstone Lacy Park, VC 9, Dorset, GR 31(ST)/9833.0128, alt 25 m, May 2016. New to the Vice-county. *N. A. Sanderson, B. Edwards, V. Giavarini & the Wessex Lichen Group*

Catillaria fungoides: small patch on trunk of *Fraxinus* in churchyard (St Mary), Weston Turville, VC 24, Buckinghamshire, GR 42(SP)/859.102, March 2016. Herb. Powell 4020. New to the Vice-county. *M. Powell, A. Harris & P. Shipway*

Catillaria nigroclavata: on bark of *Salix*, Reigate Heath, VC 17 Surrey, GR 51(TQ)/240.499, April 2016. Herb. P.F. Cannon P 2222 in **K**(M). Second record for the Vice-county. *P.F. Cannon*

Chaenotheca brachypoda: in bark crevices on trunk of *Fraxinus*, Farnborough Hall (The Orchard), VC 38, Warwickshire, GR 42(SP)/433.494, August 2016. Field record. New to the Vice-county. *M. Powell*

Chaenotheca hispidula: in dry bark crevices on trunk of *Fraxinus*, Farnborough Hall (The Orchard), VC 38, Warwickshire, GR 42(SP)/433.494, August 2016. Herb. Powell 4133. New to the Vice-county. *M. Powell*

Chaenotheca stemonea: sterile, in deep bark crevices of veteran *Quercus*, Farnborough Hall (Oak Hill), VC 38, Warwickshire, GR 42(SP)/436.489, August 2016. Herb. Powell 4134. New to the Vice-county. *M. Powell*

Chaenothecopsis pusilla: on exposed lignum on ancient *Quercus* on rock outcrop, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3978.2091, alt 260 m, May 2016. New to the Vice-country. *N.A. Sanderson*

Chaenothecopsis pusilla: extensive colony on large strip of exposed, weathered lignum on veteran *Quercus*, Farnborough Hall (The Orchard), VC 38, Warwickshire, GR 42(SP)/436.489, August 2016. Herb. Powell 4134. New to the Vice-county. *M. Powell*

Cladonia callosa: rare on hard humus in gaps in the canopy of *Calluna – Agrostis curtisii – Trichophorum* humid heath, in gently sloping area of moorland, Dunkery Hill, VC 5, South Somerset, GR 21(SS)/9050.4236, alt 220 m, September 2016. The area was being searched for *Pycnothelia papillaria*, which was seen near there in 1998. It was not refound, although a suitable habitat is present. New to Exmoor and the Vice-county. *N.A. Sanderson*

Cladosporium licheniphilum: on single fruit of *Xanthoria parietina* with *Marchandiomyces auranticus*, on *Fraxinus* bole by lake, Needham Lake, VC 25, East Suffolk GR 62(TM)/09-54-, November 2004. Herb. Hitch (Z12). The *Cladosporium* sp. determined by M. Powell and the *Marchandiomyces* sp. confirmed by him. The main species is new to the county. *C. J. B. Hitch P. M. Earland-Bennett*

Collema dichotomum: common on basalt ledges along several hundred metre stretch of Glenarm River, VC H.39, Antrim, GR 34(D)/3--1--, alt 60 m, October 2015. Confirms presence of a healthy population of this species at its only remaining station in Northern Ireland. Previously recorded at this site in 1976 and 1992. *M.J. Simms*

Collema polycarpon: in abundance on Borghese Balustrade, Cliveden, VC 24, Buckinghamshire, GR 41(SU)/910.850, August 2016. Herb. Powell 4129. New to the Vice-county. *M. Powell & P. Shipway*

Didymocyrtis slaptoniensis: anamorph, lichenicolous on *Xanthoria parietina*, Upton House garden, VC 38, Warwickshire, GR 42(SP)/368.456, August 2016. Herb. Powell. The pycnidial stage appears to be more common than the teleomorph in the Midlands and Eastern England. New to the Vice-county. *M. Powell*

Didymocyrtis slaptoniensis: anamorph, lichenicolous on *Xanthoria parietina* on Juglans in churchyard (St. Michael & All Angels), Mickleham, VC 17, Surrey, GR 51(TQ)/171.534, September 2016. Herb. Powell 4138. New to the Vice-county. *P. F. Cannon, F. S. Dobson & M. Powell*

Diplotomma pharcidium: on fallen *Fraxinus* twig, in valley north-east of Morwenstow Church, VC 2, East Cornwall, GR 21(SS)/207.154, alt 105 m, November 2015. Herb. Bacciu. Confirmed by B.J. Coppins. Southerly extension of its range away from Scotland. New to the Vice-county. *N.G. Bacciu and Devon Lichen Group*

Endococcus ramalinarius: on blackened thalli of *Ramalina fastigiata* on *Sorbus*, Findhorn Valley, Logie House Farm, VC 95, Morayshire, GR 38(NJ)/005.502, alt 100 m, May

2016 (**E**). Determined by B.J. Coppins. Second British record. New to the Vice-county.
H. Paul

Endococcus ramalinarius: on *Ramalina farinacea* on roadside *Acer platanoides*, 1 km south of Meallmore Lodge, west side of B9154. Moy, VC 96, East Inverness-shire, GR 28(NH)754.373, alt 290 m, May 2016. Herb. Coppins 25043 (**E**). Third British record. New to the Vice-county. *B.J. Coppins*

Enterographa brezhonega: parasitising *Porina rosei*, on ancient *Quercus petraea*, within *Quercus – Fagus – Ilex* pasture woodland, Kings Hat, Hollands Wood, New Forest, VC 11, South Hampshire, GR 41(SU)/3051.0558, alt 50 m, August 2016. Second site for this apparently very rare parasite in the New Forest and Britain. *N.A. Sanderson*

Fellhanera viridisorediata: corticolous on leaning stem of *Prunus* in churchyard (St Mary), Weston Turville, VC 24, Buckinghamshire, GR 42(SP)/859.102, September 2016. Herb. Powell. New to the Vice-county.
M. Powell and the Churchyard Sub-committee

Fellhanera viridisorediata: extensive colonies (including richly fertile material) on living and dead *Ulex* stems in secondary woodland, Clophill, VC 30, Bedfordshire, GR 52(TL)/07.38, July 2016. Herb. Powell 4111. This superb material allowed detailed examination of hyphal pigments and recrystallization of roccellic acid on a microscope slide. For details see: *http://fungi.myspecies.info/all-fungi/fellhanera-viridisorediata* New to the Vice-county. *M. Powell*

Fuscidea cyathoides: sterile, lignicolous thallus, on northwest-facing base of old softwood fencepost, Bryn Cosyn, *ca* 150m east of Nant y Moelau, VC 46, Cardiganshire, GR 22(SN)/743.596, alt 450 m, June 2016. Herb. SPC. An unusual non-saxicolous occurrence of this species. *S.P. Chambers*

Fuscidea gothoburgensis: on sheltered south-facing vertical side of Ordovician shale boulder, c. 150 m south of the summit of Pumlumon Fawr, VC 46, Cardiganshire, GR 22(SN)/790.866, alt 700 m, September 1999. Herb. SPC. Recently detected on a collection of *Miriquidica pycnocarpa* forma *sorediata* from the locality. New to the Vice-county. *S.P. Chambers*

Gyalidea hyalinescens: on schistose stone in ditch, by track, east of Inverlochlarig, VC 87, West Perthshire, GR 27(NN)/441.185, alt 140 m, June 2016. Herb. Coppins 25054 (**E**). New to the Vice-county. *B.J. Coppins*

Gyalidea subscutellaris: on gritty, metal-rich 'grime', in six out of twenty crevices inspected between large blocks of clinker in wall beside old railway line, Swansea, VC 41, Glamorgan, GR 21(SS)/682.969, alt 30 m, May 2016. Herb. SPC. New to the Vice-county. *S.P. Chambers & C.M. Forster-Brown*

Halecania viridescens: corticolous on *Fraxinus* twig, Farnborough Hall (car park), VC 38, Warwickshire, GR 42(SP)/431.494, August 2016. Field record (based on habitat, morphology and Pd reaction). New to the Vice-county. *M. Powell*

Heterodermia obscurata: on boughs of *Quercus* in parkland, Colebrooke Park, Brookborough, VC H.33, Fermanagh, GR 23(H)/4--4--, alt 80 m, May 2013.
M.J. Simms

Heterodermia obscurata: on branch of mature, fallen *Quercus* in meadow, Newtown NNR, VC 10, Isle of Wight, GR 40(SZ)/42-90-, alt 16 m, April 2016. Herb. H. Thüs (NHM). New to the Vice-county. *M. Putnam*

Hypotrachyna revoluta: (i) on procumbent trunk of Japanese Larch, *Larix kaempferi*, Calais Muir Wood, Dunfermline, VC 85, Fifeshire, GR 36(NT)/12-87-, alt 100 m, January 2016; (ii) on horizontal branch of *Salix*, at edge of carr, Cullaloe LNR, VC 85, Fifeshire, GR 36(NT)/189.875, alt 90 m, January 2016. Both Herb. AS. Confirmed by B. J. Coppins. New to the Vice-county. *A. Shuttleworth*

Laetisaria lichenicola: two records from VC 46, Cardiganshire; (i) on *Physcia tenella* on twig of collapsed *Sorbus aucuparia* on scrubby slope, c. 300 m south-southwest of Glan-rhyd-y-dre, Bwlch-y-fadfa, GR 22(SN)/424.483, alt 180 m, September 2016; (ii) on *P. tenella* on twig of fallen *Picea sitchensis* at edge of plantation block, *c*. 300 m southeast of Darren-fach, GR 22(SN)/422.482, alt 140 m, September 2016. Herb. SPC. New to Wales. *S.P. Chambers*

Lecania inundata: two records from VC 46, Cardiganshire; (i) top of concrete gatepost and on various crusts including *Verrucaria nigrescens*, along south-facing boundary wall, Gartheli Church, west of Llwyn-y-groes, GR 22(SN)/586.567, alt 150 m, March 2013; (ii) stonework on side of mortared structure in field, c. 250 m west of Coedfoel-Uchaf, S of Pren-gwyn, GR22(SN)/426.434, alt 175 m, May 2013. Herb. SPC. Equalling collections currently placed under this name by churchyard workers in lowland England. First & second Vice-county records and seemingly the first Welsh records. *S.P. Chambers*

Lecanora argentata: growing on lower trunk of old *Juglans* in parkland, Upton Park, VC 38, Warwickshire, GR 42(SP)/368.458, August 2016. Herb. Powell 4112. New to the Vice-county. *M. Powell*

Lecanora barkmaniana: corticolous on *Fraxinus* branch, Upton Park, VC 38, Warwickshire, GR 42(SP)/368.458, August 2016. Herb. Powell 4112. New to the Vice-county. *M. Powell*

Lecanora campestris* var. *dolomitica: large patch on rendered stone, north wall of church, Long Melford, VC 26, West Suffolk, GR 52(TL)/865.467, May 2016. Field observation and photograph. Confirmed by M. Powell. Second record of this variety for the county and East Anglia. *C.J.B. Hitch & M. Powell*

Lecanora conferta: on quartzose sandstone church wall, Colebrooke, Brookborough, VC H.33, Fermanagh, GR 23(H)/4--4--, alt 100 m, May 2013. Only the second recent record for this species in Northern Ireland. New to the Vice-county. *M.J. Simms*

Lecidea commaculans: on rocks by small river, Inverlochlarig Burn, VC 87, West Perthshire, GR 27(NN)/43387.18916, alt 210 m, June 2016. Herb. Coppins 25051 (**E**). New to the Vice-county. *B.J. Coppins*

Lecidea sanguineoatra: on acid bark of two old *Fraxinus*, within open upland pasture woodland, Glenamara Park, Patterdale, Lake District, VC 69, Westmorland, GR 35(NY)/3877.1508 and 35(NY)/353840.1552, alt 260 and 300 m respectively, May 2016. New to the Vice-county. *N.A. Sanderson*

Lempholemma chalazanellum: growing amongst moss, on coping of boundary wall round churchyard (St. Michael & All Angels), Mickleham, VC 17, Surrey, GR 51(TQ)/171.534, September 2016. Herb. Powell 4140. New to the Vice-county.
P.F. Cannon, F.S. Dobson & M. Powell

Lepraria crassissima: covering the face of a sandstone headstone in churchyard, Deopham, VC 27, East Norfolk, GR 63(TG)/050.005, August 2016. Herb. P.W. Lambley. Determined by A. Orange. New to the Vice-county for this uncommon species. *P.W. Lambley*

Leptogium subtile: on lignum inside hollow old *Fraxinus* within open upland pasture woodland, Glenamara Park, Patterdale, Lake District, VC69, Westmorland, GR 35(NY)/3875.1510, alt 310 m, May 2016. New to the Vice-county. *N.A. Sanderson*

Leptogium subtorulosum: on basalt ledges low in river, with *Collema dichotomum* and *Dermatocarpon meiophyllizum*, Glenarm River, VC H.39, Antrim, GR 34(D)/3--1--, alt 60 m, October 2015. Confirmed by B.J. Coppins. New to Ireland. *M.J. Simms*

Leptoraphis atomaria: abundant on bole of aspen poplar, *Populus tremula*, Broom Covert, Pound Farm Reserve (Woodland Trust), VC 25, East Suffolk, GR 62(TM)/32-63-, May 2016. Herb. Hitch (X11/B). Determined by M. Powell. New to the county and East Anglia. *C.J.B. Hitch & M. Powell*

Lichenoconium lichenicola: parasitic on *Physcia tenella* apothecium, *Malus* twig, Escot Park, VC 3, South Devon, GR 30(SY)/080.979, alt 76 m, January 2016. Herb. Bacciu. Determined by B. J. Coppins. New to England and the Vice-county.
B. Benfield & N.G. Bacciu

Lichenomphalia umbellifera: in peaty gulley in gravel heathland near car park, Bonchurch Downs, Ventnor, VC 10, Isle of Wight, GR 40(SZ)/573.786, alt 238 m, April 2016. Herb. M. Putnam. New to the Vice-county. *M. Putnam*

Marchandiomyces aurantiacus: on moribund *Physcia tenella* on dust-enriched *Crataegus monogyna* twig in derelict hedgeline in upland pasture, *c*. 500 m northwest of Camnant Bridge, north of Esgairdraenllwyn, VC 43, Radnorshire, GR 32(SO)/082.830, alt 350 m, September 2016. Herb. SPC. New to the Vice-county. *S.P. Chambers*

Marchandiomyces corallinus: lichenicolous on *Parmelia saxatilis* growing on branch of dying *Malus*, Farnborough Hall (The Orchard), VC 38, Warwickshire, GR 42(SP)/433.494, August 2016. Herb. Powell 4135. New to the Vice-county. *M. Powell*

Melaspilea interjecta: on horizontal schistose rock at side of small river, Inverlochlarig Burn, VC 87, West Perthshire, GR 27(NN)/43416.18815, alt 200 m, June 2016. Herb. Coppins 25053 (**E**). New to the Vice-county. *B.J. Coppins*

Micarea coppinsii: lignicolous on small, weathered wooden post in churchyard (St. Michael & All Angels), Mickleham, VC 17, Surrey, GR 51(TQ)/171.534, September 2016. Herb. Powell 4138. New to the Vice-county.
P.F. Cannon, F.S. Dobson & M. Powell

Micarea curvata: occupying otherwise bare sandstone of north-facing shoulders of several old sandstone gravestones in churchyard (St. Michael & All Angels), Mickleham, VC 17, Surrey, GR 51(TQ)/171.534, September 2016. Herb. Powell 4141. New to the Vice-county. *P.F. Cannon, F.S. Dobson & M. Powell*

Micarea curvata: scurfy to granular fawn thallus on sandstone memorial in churchyard, Long Melford, VC 26, West Suffolk, GR 52(TL)/865.467, May 2016. Herb Hitch ex Powell (LM/A-2). Determined by M. Powell. New to the county and East Anglia. *C.J.B. Hitch & M. Powell*

Micarea doliiformis: (i) on acid *Fraxinus* bark in ravine within upland pasture woodland, Groove Gill, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3919.2049, alt 310, May 2016; (ii) on old *Quercus* growing on cliff, with former upland pasture woodland, Yew Crag, Gowbarrow Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/4151.2059 , alt 210 m, May 2016. New sites for this species for northern England. New to the Vice-county. *N.A. Sanderson*

Micarea inquinans: on *Dibaeis baeomyces* on damp soil, Tair Allt Gorge, south of Cefn Brwynog, VC 46, Cardiganshire, GR 22(SN)/820.651, alt 410 m, July 2016. Herb. SPC. Second Vice-county & Welsh record for this species. *S.P. Chambers*

Micarea stipitata: on old *Betula* within open upland pasture woodland, Glenamara Park, Patterdale, Lake District, VC 69, Westmorland, GR 35(NY)/3847.1551, alt 280 m, May 2016. New to the Vice-county record. *N.A. Sanderson*

Micarea subnigrata: on rocks by small river, Inverlochlarig Burn, VC 87, West Perthshire, 27(NN)/4336.1888, alt 200 m, June 2016. Herb. Coppins 25052 (**E**). New to the Vice-county. *B.J. Coppins*

Micarea xanthonica: local on *Betula* and *Alnus* within open upland pasture woodland, Glenamara Park, Patterdale, Lake District, VC 69, Westmorland, 35(NY)38-14- and 35(NY)/38-15-, 35(NY)/39-14-, 35(NY)/39-15-, alt 280 - 330 m, May 2016. New to the Vice-county. *N.A. Sanderson*

Microcalicium ahlneri: (i) on lignum of fallen *Quercus* trunk, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3987.1983, alt 150 m, May 2016; (ii) on lignum exposed on big sprawling ancient multi-trunked *Quercus*, within former upland pasture woodland, Yew Crag, Gowbarrow Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/4133.2048, alt 180 m, May 2016. New for this species in the Lake District. New to the Vice-county. *N.A. Sanderson*

Mycoglaena myricae: on *Myrica gale*, Canada Farm, Shapwick NNR, VC 5, Somerset, GR 31(ST)/418.409, alt 5 m, June 2014. Herb. Bacciu. New to the Vice-county. *N. G. Bacciu*

Mycoporum lacteum: abundant on single old *Ilex* on cliff, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3961.2093, alt 310 m, May 2016. Second location for this species, known from the Lake District. New to the Vice-county. *N.A. Sanderson*

Mycoporum lacteum: on four ancient *Ilex* within open upland pasture woodland, Troutbeck Park, Lake District, VC 69, Westmorland, GR 35(NY)/4199.0602, 35(NY)/4180.0610, 35(NY)/4179.0611 and 35(NY)/ 4178.0611, alt 180 – 200 m, May 2016. Third location for this species, known from the Lake District. New to the Vice-county. *N.A. Sanderson*

Opegrapha viridipruinosa: on east side of broad bole of *Sambucus* by large box tomb in churchyard, Linton, VC 64, Mid-west York, 44(SE)/00-63-, September 2015. Herb. Hitch (G35) and Herb M. R. D. Seaward (dup). Confirmed by M. Powell. New to the Vice-county. *C.J.B. Hitch & A. Henderson.*

Parmeliopsis ambigua: on sandstone headstone in churchyard, Gimingham, VC 27 East Norfolk, GR 63(TG)/286.367, July 2016. It has declined markedly in East Anglia and also is the first site in Norfolk on stone. First post 2000 record for this species in the Vice-county. *P.W. Lambley*

Placynthium cf. tremniacum: on shady side of large Carboniferous limestone boulder by pavement area in exposed site, Keld Bank, Ingleborough, VC 64, Mid-West Yorkshire, GR 34(SD)/746.771, May 2013. Herb Hitch ex Swinhoe (L811). Determined by Per M. Jørgensen. Although it is cf., is is included, as it is rarish and needs to be known about in the event of the taxon being further investigated. New to Ingleborough. *C.J.B. Hitch*

Porina linearis: on limestone string course north side of church, Hessett VC 26, West Suffolk, GR 52(TL)/933.618, May 2016. Field recording and photographs. Determined by M. Powell. New to the county and East Anglia. *C.J.B. Hitch and M. Powell*

Pronectria oligospora: on deceased thallus of *Punctelia subrudecta* on branch of *Crataegus monogyna*, on scrubby slope *c.* 300 m south-southwest of Glan-rhyd-y-dre, Bwlch-y-fadfa, VC 46, Cardiganshire, GR 22(SN)/424.483, alt 180 m, September 2016. Herb. SPC. Second Vice-county & Welsh record, & 5th British record. *S.P. Chambers*

Protoblastenia lilacina: several thalli amongst *P. rupestris* on limestone coping, Terrace Balustrade, Cliveden, VC 24, Buckinghamshire, GR 41(SU)/910.850, August 2016. Herb. Powell. New to the Vice-county. *M. Powell & P. Shipway*

Protoparmelia oleagina: large sterile colony on vertical side of sandstone headstone in churchyard (St. Michael & All Angels), Mickleham, VC 17, Surrey, GR 51(TQ)/171.534, September 2016. Herb. Powell 4139. Probably much overlooked on gravestones. The 'K+ oily' reaction in a squash preparation helps with confirmation of sterile material. New to the Vice-county. *P.F. Cannon, F.S. Dobson & M. Powell*

Protoparmelia oleagina: on lignum on two fallen *Quercus* trunks, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3987.1983 and 35(NY)/3875.1925, alt 150 and 180 m respectively, May 2016. New for this species to northern England. New to the Vice-county. *N.A. Sanderson*

Pseudevernia furfuracea: fertile, thallus fallen from mature *Larix*, Fernworthy Reservoir, Dartmoor, VC 4, North Devon, GR 20(SX)/658.839, alt 376 m, January 2016. Herb. Bacciu. Determined by B.J. Coppins. *N.G. Bacciu*

Pyrenochaeta xanthoriae: lichenicolous on *Xanthoria parietina,* Upton Park, VC 38, Warwickshire, GR 42(SP)/368.458, August 2016. Herb. Powell 4112. New to the Vice-county. *M. Powell*

Pyrenochaeta xanthoriae: on *Fraxinus* twig, fallen into car park area at entrance to Pound Farm Reserve (Woodland Trust), VC 25 East Suffolk, GR 62(TM)/326.636, May 2016. Herb. Hitch ex Powell (MP/C-A). Determined by M. Powell. Second British record for this species. New to the county and East Anglia.
M. Powell and C.J.B. Hitch

Ramonia nigra: on bark of ancient *Quercus*, beside flush within pasture woodland on steep slope, Ten Acre Cleeve, Horner Combe, VC 5, South Somerset, GR 21(SS)/8887.4366, alt 190 m, September 2016. Although best known from lignum inside hollow trees, this species also occurs on base rich *Quercus* bark, but is very difficult to spot in this habitat unless the bark is wet. First record for this very rare Section 41 species, from Exmoor and the Vice-county. *N.A. Sanderson*

Rinodina biloculata: on twig of *Crataegus monogyna* in pasture, Gilfach (Radnorshire Wildlife Trust reserve), VC 43, Radnorshire, GR 22(SN)/964.716, alt 270 m, August 2016. Herb. SPC. Gilfach's 428th lichen. New to the Vice-county.
S.P. Chambers & H.F. Clow

Rinodina bischoffii: on top of limestone chest tomb in churchyard (St. Michael & All Angels), Mickleham, VC 17, Surrey, GR 51(TQ)/171.534, September 2016. Herb. Powell 4140. New to the Vice-county. *P.F. Cannon, F.S. Dobson & M. Powell*

Rinodina pityrea: on lignin of old *Sambucus* on downland, St. Catherine's Point, VC 10, Isle of Wight, GR 40(SZ)/49-75-, alt 48 m, April 2016. Herb. M. Putnam. Determined by B.J. Coppins. New to the Vice-county. *M. Putnam*

Rinodina pyrina: on old *Ulmus glabra* in rough pasture, East Sluggan, Kinveachy Forest SSSI, VC 95, Morayshire, GR 28(NH)/871.219, alt 290 m, May 2016. Herb. Coppins 25046 (**E**). A notable inland occurrence. The second record of this species for the Vice-county. *B.J. Coppins*

Ropalospora viridis: local on *Betula* and *Alnus* in open upland pasture woodland, Glenamara Park, Patterdale, Lake District, VC 69, Westmorland, GR 35(NY)/39-15- and 35(NY)/38-15-, alt 250 - 340 m, May 2016. New to the Vice-county.
N.A. Sanderson

Schismatomma graphidioides: on ancient *Ilex* within open upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/3973.2059, alt. 240 m, May 2016. The second modern record for the vice-country and northern England for this Section 41 species. *N.A. Sanderson*

Schismatomma quercicola: on small old *Ilex* in open upland pasture woodland, Troutbeck Park, Lake District, VC69, Westmorland, 35(NY)/4174.0621, alt 190 m, May 2016. New to the Vice-county. *N.A. Sanderson*

Skyttella mulleri: parasitic on *Peltigera praetextata*, on *Fraxinus* and small rock, within oceanic pasture woodland, Yeals Combe, Horner Combe, VC 5, South Somerset, GR 21(SS)/8953.4438 and 21(SS)/8946.4437, alt 110 m and 120 m respectively, February

2016. First record for England, for this species, a distinctive parasite, which seems likely to be rather rare. *N.A. Sanderson*

Sphaerellothecium parietinarium: parasitic on *Xanthoria parietina*, on limestone boulder near Pulpit Inn, Portland Bill, VC 9, Dorset, GR 30(SY)/678.689, alt 27 m, January 2016. Herb. P. Bowyer. Determined by B.J. Coppins. New to the Vice-county. *P. Bowyer*

Stereocaulon nanodes: two records from VC 41, Glamorgan; (i) abundant on clinker and cinder fragments on former railway sidings, Swansea, GR 21(SS)/672.959, alt 25 m, April 2008; (ii) on vitreous clinker and cinder crumbs, at former copper smelting works, White Rocks, Swansea, GR 21(SS)/663.948, alt 10 m, May 2016. Field records. New to the Vice-county. *S.P. Chambers & C.M. Forster-Brown*

Sticta ciliata: on mossy *Alnus* in damp woodland, Altmover Glen, west of Dungiven, VC H.40, Londonderry, GR 24(C)/6--0--, alt 95 m, February 2004. Abundantly fertile with characteristic ciliate apothecia. Confirmed using Ulster Museum herbarium material, July 2016. New to Northern Ireland. *M.J. Simms*

Stigmidium epistigmellum: on apothecia and thallus of *Caloplaca marina*, The Leithes, North Berwick, VC 82, East Lothian, GR 36(NT)/57197.85694, April 2016. Herb. Coppins 25031 (**E**). First record of this species on the Scottish east coast. New to the Vice-county. *B.J. Coppins*

Strangospora moriformis: on lignum of standing dead *Quercus*, within upland pasture woodland, Glencoyne Park, Matterdale, Lake District, VC 70, Cumberland, 35(NY)/3869.1909, alt 160 m, May 2016. First record for this species for the Lake District. New to the Vice-county. *N.A. Sanderson*

Strigula phaea: on base rich old *Quercus petraea* deep in rocky gorge within oceanic ravine woodland, Ceunant Cynfal, VC 48, Merionethshire, GR 23(SH)/7076.4103, alt 150 m, April, 2015. Second record for this species for Wales. New to the Vice-county. *N.A. Sanderson, A.M. Cross & D. Lamacraft*

Strigula taylorii: on *Fraxinus* pollard, within former upland pasture woodland, Yew Crag, Gowbarrow Park, Matterdale, Lake District, VC 70, Cumberland, GR 35(NY)/4156.2054, alt 170 m, May 2016. New to the Vice-county. *N.A. Sanderson*

Strigula taylorii: corticolous on large *Acer pseudoplatanus*, Upton House, VC 38, Warwickshire, GR 42(SP)/370.459, August 2016. Herb. Powell 4112. This species appears to be spreading across the Midlands and Eastern England; a similar spread is reported from the Netherlands. New to the Vice-county. *M. Powell*

Strigula taylorii: on bark of *Crataegus*, Teazle Wood, Leatherhead, VC 17, Surrey, GR 51(TQ)/157.585, May 2016. Herb. P.F. Cannon P2268 in **K**(M). Second record for Surrey. *P.F. Cannon*

Teloschistes flavicans: large thallus plus 16 smaller thalli on *Catalpa*, also a few thalli on nearby *Malus*, Bonython Gardens, south of Helston. VC 1, West Cornwall, GR 10(SW)/698.201, and GR 10(SW)/697.201 June 2016. A new 10 km square for this rare species. *P.W. Lambley*

Thelidium fontigenum: on damp, crystalline marble, on carved top of headstone (dated 1882) in chapel burial yard, Capel y Fadfa, Bwlch-y-fadfa, VC 46, Cardiganshire, GR 22(SN)/437.494, alt 245 m, September 2016. Herb. SPC. New to the Vice-county. *S.P. Chambers*

Thelidium pyrenophorum: on limestone chest tomb in churchyard, (St. Michael & All Angels), Mickleham, VC 17, Surrey, GR 51(TQ)/171.534, September 2016. Herb. Powell 4140. New to the Vice-county. *P.F. Cannon, F.S. Dobson & M. Powell*

Unguiculariopsis thallophila: on thallus of *Lecanora chlarotera* on *Fraxinus* sapling in glade in wood, Broom Covert, Pound Farm Reserve (Woodland Trust), VC 25, East Suffolk, GR 62(TM)/32-63-, May 2016. Herb Hitch ex Powell (MP/A-B). Determined by M. Powell. New to the county and East Anglia. *C.J.B. Hitch & M. Powell*

Verrucaria caerulea: extensive colonies on limestone coping of Packway Balustrade, Cliveden, VC 24, Buckinghamshire, GR 41(SU)/909.846, August 2016. Herb. Powell 4129. New to the Vice-county. *M. Powell & P. Shipway*

Verrucaria caerulea: in small quantity on limestone coping of balustrade to the south-west of Upton House, VC 38, Warwickshire, GR 42(SP)/369.456, August 2016. Herb. Powell. New to the Vice-county. *M. Powell*

Verrucaria obfuscans: on limestone gravestone in churchyard (St Andrew), Cobham, VC 17, Surrey, GR 51(TQ)/107.597, April 2016. Herb. Powell 4048. New to the Vice-county. *P.F. Cannon, F.S. Dobson & M. Powell*

Verrucaria obfuscans: on limestone of gently sloping base of urn atop a broad scuplted pillar like plinth, in churchyard, Hessett, VC 26, West Suffolk, GR 52(TL)/933.618, May 2016. Herb. Hitch ex Powell (MP/G-A). Determined by M. Powell. New to the county. *C.J.B. Hitch & M. Powell*

Verrucaria ochrostoma: on brick sill, under window with metal bars, of building by car park, beside railway station, Ipswich, VC 25 East Suffolk, GR 63(TM)/158.438, August 2016. Herb. Hitch. Determined by M. Powell. Growing with sterile *Vezdaea leprosa*. *P.M. Earland-Bennett*

Verrucaria ochrostoma: on limestone windowsill, Upton House, VC 38, Warwickshire, GR 42(SP)/370.456, August 2016. Herb. Powell. New to the Vice-county. *M. Powell*

Vezdaea leprosa: rare in Suffolk. For details, see under *Verrucaria ochrostoma*.

Wadeana dendrographa: on ancient *Fraxinus* pollard within open upland pasture woodland, Troutbeck Park, Lake District, VC 69, Westmorland, 35(NY)/4219.0591, alt 210 m, May 2016. New to the Vice-county for this Section 41 species. *N.A. Sanderson*

Wadeana minuta: on old *Quercus* beside stream within pasture woodland, Horner Wood, Horner Combe, VC 5, South Somerset, GR 21(SS)/8925.4372, alt 130 m, September, 2016. First record for this Section 41 species, since 1998, which is very rare in England. *N.A. Sanderson*

Xanthoparmelia luteonotata: on slate roof of church porch, Great Hockham, VC 28, West Norfolk, GR 52(TL)950.921 April 2016. Herb. P. W. Lambley. Determined by C.J.B. Hitch. A new 10 km square for this uncommon species. *P.W. Lambley*

Xanthoria ulophyllodes: on old *Ulmus glabra* in rough pasture, East Sluggan, Kinveachy Forest SSSI, VC 95, Morayshire, GR 28(NH)/871.219, alt 290 m, May 2016. Herb.Coppins 25045 (**E**). New to the Vice-county. *B.J. Coppins*

Xylographa vitiligo: wide-spreading but sterile patches on base of decaying hardwood fencepost in sheepwalk fenceline adjacent to cairn south of Bryn Cosyn, *c.* 275 m east of Nant y Moelau, VC 46, Cardiganshire, GR 22(SN)/744.595, alt 440 m, June 2016. Herb. SPC. New to the Vice-county. *S.P. Chambers*

Corrigendum

I wish to thank P.M. Earland-Bennett for pointing out the errors which appeared in BLS Bulletin 118, p. 60. The two entries for *Lichenostigma maureri*..... should both read *Lichenostigma maureri* as anamorph *Phaeosphaerobolus usneae*: on *Flavoparmelia*.....

(Editorial note. The anamorph is the asexual reproductive stage and the teleomorph is the sexual reproductive stage in the phyla Ascomycota and Basidiomycota.)

British Lichen Society Field Meetings & Workshops Programme 2016/17

Field Meetings Secretary: Steve Price, Woodlands, Combs Road, Combs, High Peak, Derbyshire SK23 9UP
email *fieldmeetings@britishlichensociety.org.uk*

*note: **All members** of whatever level of experience are welcomed on **all BLS Field Meetings**. No member should feel inhibited from attending by the fact that some meetings may be associated with BLS Council meetings or the AGM. Workshops, on the other hand, may be aimed at members who have some level of experience. If so this fact will be specified in the meeting notice.*

BLS AGM 2017 Field Outing – Abney Park Cemetery, London

Sunday 22nd January 2017

A one day field outing to Abney Park Cemetery will follow the AGM which is being held at the Natural History Museum, London.

Abney Park in Stoke Newington, one of the ‘magnificent seven’ garden cemeteries of London, is a woodland memorial park and Local Nature Reserve, managed by the London Borough of Hackney. It is close to Stoke Newington tube station giving easy access from central London.

The location address is: Abney Park, Stoke Newington High Street, London N16 0LH

Further details will be announced at the AGM.

BLS WORKSHOP - Royal Botanic Gardens, Kew
Lichen Imaging

Friday 17th (evening) to Sunday 19th February 2017

organiser: Paul Cannon

A weekend workshop on the photographing and imaging of lichens will be held at the Royal Botanic Gardens, Kew. Topics to be covered will include macro photography, for both field-work and lab-work, and image stacking and manipulation techniques. Some assistance with microscope applications will also be provided.

The minimum equipment needed is a digital camera - SLR or compact. A camera with close focusing and manual focusing is preferred, but the event will help you to get the most out of any type of camera (even a smartphone). Do not buy a camera specially for the meeting (or at least consult the organiser for advice beforehand). It's better to work with a camera that you are familiar with, even if you don't know what all of the buttons do.

The number of places on the workshop will be limited. Cost £30 per person. Attendees should book their place with the Field Meetings Secretary, Steve Price, email: *fieldmeetings@britishlichensociety.org.uk* or by post to Woodlands, Combs Road, Combs, High Peak SK23 9UP and on booking send him £30 per person, cheques payable to 'The British Lichen Society' (not 'BLS' please).

Further details of the programme will be sent out to attendees nearer the time of the meeting.

BLS SPRING FIELD MEETING/WORKSHOP - Malham Tarn Field Centre
Lichens of limestone habitats

Tuesday 18th to Tuesday 25th April 2017

organisers / tutors: Brian Coppins and Allan Pentecost

This meeting will study the superb limestone habitats around Malham and will have extra laboratory / tutorial sessions built in to the timetable. The field outings will each day focus on a particular lichen habitat / group of lichens and there will be adequate time back at base for microscope work and discussion. This meeting will also be an opportunity for attendees to bring along and share their own limestone lichen puzzles and problems.

Meeting Base
Field Studies Council, Malham Tarn Field Centre, Settle, N Yorks, BD24 9PU (tel 01729 830331). See *http://www.field-studies-council.org/centres/malhamtarn.aspx*

Accommodation and costs

20 bed spaces have been reserved, more spaces may be available if this need is known early. The cost for the week, including the use of the laboratory work room is £249. This is for full board accommodation (breakfast, packed lunch and evening meal). The price quoted is based on shared accommodation in a mix of twin, triple or bunk bedded rooms.

A limited number of sole occupancy rooms may be available for the sole occupancy supplement of £30 per person. Some rooms are en-suite but not all. Improvements to the accommodation are underway and should be mostly completed by the time of the meeting.

Non-resident attendees can have an evening meal and daily refreshments (tea/coffee/cake) and this is £70 for the week.

Booking

Note: because of the workshop nature of this meeting there will be a **strict limit on the number of attendees**, whether resident at the Centre or staying elsewhere. Bookings will be taken on a first-come first-served basis.

Attendees should book onto the meeting with the Field Meetings Secretary, Steve Price, email: *fieldmeetings@britishlichensociety.org.uk* or by post to Woodlands, Combs Road, Combs, High Peak SK23 9UP and send him a £35 deposit per person, cheques payable to 'The British Lichen Society' (not 'BLS' please).

Microscope Work

A laboratory / meeting room has been booked for our sole use throughout the week. Bring your own microscopes if you can. The Centre has some stereo and compound microscopes which we are welcome to use but only a few. The BLS stereo and compound microscope will also be available for communal use. If possible please bring your own consumables (microslides/cover slips/razor blades/chemicals).

Timetable

The meeting will run from the evening of Tuesday 18th April when we will gather after dinner for an introductory meeting. We vacate the accommodation first thing on the Tuesday 25th. Further details of the programme will be sent out to attendees nearer the time of the meeting.

Relevant maps

OS Landranger 1:50,000 - No. 98 - Wensleydale & Upper Wharfedale
OS Explorer Leisure 1:25,000 - OL2 - Yorkshire Dales - Southern & Western
(OS Explorer Leisure 1:25,000 - OL30 - Yorkshire Dales - Northern & Central)
British Geological Survey 1:50,000 - Sheet 60 - Settle

BLS SUMMER MEETING 2017 – Öland, Sweden

Monday 12th to Sunday 18th June 2017

Organisers – Lars Borg and Ulf Arup

The Great Alvar on the island of Öland in south-east Sweden supports extensive areas of superb calcareous soil-crust and limestone pavement communities. The siliceous boulders are also notable. At 26,000 ha this is one of the largest areas of alvar in the world. Other ecosystems to visit include rich deciduous forests and grazed woodland, for example the big oak forest Ottenbylund in the south of Öland (which, incidentally, is the biggest bird watching station in Sweden), hazel forests, boreal pine and fir forests. We also plan to visit boreal needle forests on the mainland including a lichen pine forest with a lot of Cladonia species such as *Cladonia stellaris.*

During the meeting Ulf Arup will give a presentation to the group on his ongoing research on *Lecanora*.

On the Alvar of Öland there may develop a typical soil crust society with *Cladonia symphycarpa*, *Collema tenax*, *Fulgensia fulgens*, *F. bracteata*, *Psora decipiens*, *Squamarina lentigera*, *Toninia sedifolia* and usually *Verrucaria nigrescens* on the small pebbles. Other typical soil lichens include *Cladonia macroceras*, *Flavocetraria nivalis*, *F. cucullata*, *Romjularia lurida*, and *Thamnolia vermicularis*. More rare species are *Leptogium schraderi* and *Vulpicida tubulosus.* On limestone pavement *Aspicila calcarea*, *A. contorta*, *Placynthium nigrum*, *Protoblastenia rupestris*, *Caloplaca glomerata*, *C. dichroa*, *Collema cristatum*, *C. fuscovirens*, *C. polycarpon* and *Squamarina cartilaginea* thrives. *Clauzadea immersa* usually occurs around deep crevices. Rare species include *Acarospora cervina, Squamarina gypsacea*, *Psora vallesiaca*, *Protoblastenia cyclospora*, *Aspicilia coronata* and *Caloplaca dolomiticola*.

Meeting Base

The meeting will be residential at Allégården at Kastlösa. Allégården is located between Öland Bridge and Ottenby, about 25 km south of Öland bridge, 50 m from Route 136, next to Kastlösa church.

address:
Allégården Kastlösa
Kastlösa bygata 2
386 61 Mörbylånga
Sweden
Telephone: +46 (0) 485-421 75
Mobile: +46 (0) 72-302 21 75
E-mail: *info@kastlosa.se*
see *http://www.kastlosa.se/en/* to look at the facilities.

Accommodation and costs

There is a variety of room types available.

Ölandsgården: Hotel rooms with shower, toilet and TV. Twin rooms. Price 795 SEK /night for one person. 985 SEK/night for two persons. Breakfast included. It is possible to have 3 persons sharing - slightly cheaper.

Norrgården: Twin rooms with toilet. Shower and TV separately. Price 550 SEK/night for one person. 750 SEK/night for two persons. Breakfast included. It is possible to have 3 persons sharing - slightly cheaper.

Hostel rooms with toilet 250SEK/night.(Three beds in every room). Used as single room 400 SEK/night.Breakfast is not included. It is possible to make breakfast in a communal kitchen.

Free Wi Fi in all rooms and a pool in the garden.

These bed spaces are being held for us until **1st of March 2017.** Subject to availability rooms will be able to be booked after this date.

It is possible to get dinner, (two dishes 195 SEK) and packed lunch. Advanced notice is needed to take dinner and packed lunch. Evening dinner needs to be ordered by 12 noon. Also advise at the time of booking regarding any special dietary needs.

Note: (£ 1 = 10,85 SEK on the 18th of October 2016.)

Bookings and payment

A preliminary booking has been made for accommodation. Attendees should make their own reservations directly with Allégården, mentioning that the booking is part of the British Lichen Society group. Please book by email. It is not possible to book by the Allégården website because the rooms will appear as booked. This is because they have been booked, for the BLS!

Please inform Steve Price, the Field Meetings Secretary (email: *fieldmeetings@britishlichensociety.org.uk*) when a room booking has been made and when travel plans have been made inform him of your flight times and when you expect to arrive at Kalmar Station (see ***Travel*** below).

Payment for the accommodation is to be made by individuals directly to Allégården. Payment can be made by credit card.

Travel

The most convenient transport from the UK is to fly to Kastrup, Copenhagen. From the railway station inside Kastrup there are direct trains once per hour to Kalmar. Rail tickets can be purchased at the station on the day of travel. Train times can be viewed on the website *http://www.thetrainline-europe.com* and on other websites.

Attendees will be picked-up by minibus at Kalmar railway station. Pick-up times at Kalmar are yet to be decided. This will be determined by the attendees arrival time at Kalmar. Preferably attendees should endeavor to arrive at Kalmar railway station before 18.00.

Having vacated the accommodation first thing on the Sunday18th attendees can be returned to Kalmar railway station. More precise arrangements will be made nearer the time.

The minibus(es) will be available for transport during the meeting. Attendees using the mini-bus(es) will be expected to share the hire costs and fuel. As a guide one minibus (9 persons) for one week costs approx. 6500 SEK or 700 SEK/person + the cost of fuel. This depends on full occupancy of each minibus.

Microscope and meeting room
A meeting room has been reserved for the duration of the meeting for presentations and microscope work. Some microscopes will be provided for our use.

Some chemicals (C & K) will be available for attendees to fill their field-test bottles.

Further details of the programme will be sent out to attendees nearer the time of the meeting.

BLS AUTUMN MEETING 2017 – Epping Forest

Wednesday 6th^th (evening) to Sunday 10th (afternoon) September 2017

local organiser – John Skinner

Epping Forest is due for a re-survey - last looked at in 2003 by Peter James and Linda Davies when 64 species were recorded. Records going back to 1784 show that the forest's lichen flora has mirrored the changes in air quality and composition over the years. Many changes can expected to be found on this Society visit.

A room in the Field Studies Council field centre has been booked for evening use on Wed, Thur, Fri and Sat. This is at: Epping Forest Field Centre, Paul's Nursery Road, High Beach, Loughton, Essex IG10 4AF. Telephone: 020 8502 8500

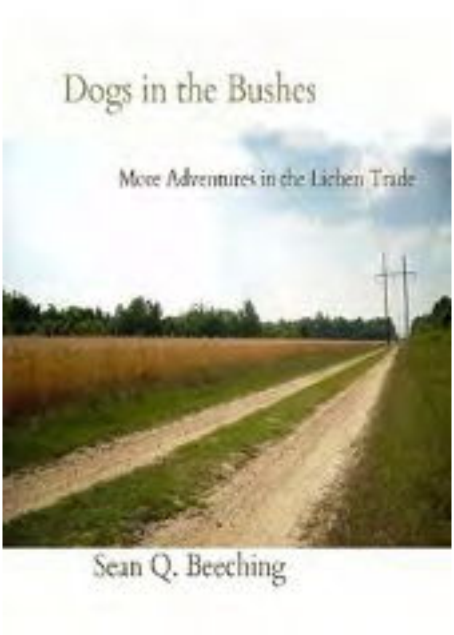
The meeting will convene at 8.00pm on Wenesday 6th September at the Epping Forest Field Centre for an introductory talk.

There being no suitable group accommodation in the area attendees will have to make their own arrangements.

Meeting details and a list of some possible accommodation will be sent out to those interested in attending the meeting.

To indicate an interest in the meeting email Steve Price, the Field Meetings Secretary, on *fieldmeetings@britishlichensociety.org.uk* or by post to Woodlands, Combs Road, Combs, High Peak SK23 9UP.

Book review



Dogs in the Bushes: More Adventures in the Lichen Trade. By Sean Q. Beeching. 2015 FORT!/da? Books in association with Public Domain Inc. and published by Lulu.com. 350 pages with a few black and white photos. Page size 210mm x 147mm. ISBN 978-0-557-43385-8. Paperback: £11.08 (excl. VAT).

This is an account of year of lichen hunting trips by an amateur lichenologist in southern USA. Lichenologists in Britain will immediately identify with the author with is wide interests and keen observations of the places he visited describing experiences that will resonate with any member of the BLS who has attended BLS field meetings. It is a partly travelogue, partly diary and partly mind-dump. In reading it we really get to feel we know Sean as he enthuses about his lichen finds and describes the lichen habitats and other lichenologists. He does mention the Brian and Sandy Coppins at the beginning but mostly those in US and Canada. Brian is described as "….the hero of British lichen study, in his deerstalker cap, tweeds and Charles Darwin beard, looking like a Victorian adventurer just arrived by steam packet,…."! Sandy is described as a good-natured highly regarded student and David Richardson as a fine lichenologist from Nova Scotia with a British accent.

Most of the places he visits are in Georgia although he includes one trip to Australia, one to Canada and two to Connecticut. Several of the lichens mentioned are species we would recognize. For example, Sean: "What is this lichen that looks like *Thelotrema*?" Sandy: "*Thelotrema*"); *Lobaria pulmonaria* mentioned as disappearing from Connecticut and *Ochrolechia yasudae* (sic *Ochrolechia subviridis* to us) "with isidia like dicks" in the Appalachians. *Pseudocephellaria aurata* (green specklebelly) occurs in sheets on trees, *Psilolechia* is brilliant green and *Hypogymnia physodes* is considered a weed in the North but is a delight to find at 4000ft in Georgia

I would recommend this as a holiday read as it is entertaining and informative and it is well written and easy to read. You won't learn a huge amount about lichens but get an idea of what it is like as an amateur lichenologist in southern USA and I guess we learn that being a lichenologist is much the same here ever you are in the world! If you enjoyed reading Oliver Gilbert's The Lichen Hunters you will enjoy this North American equivalent.

David Hill
d.j.hill@bris.ac.uk

Important: Changes to the Lichen Recording Scheme databases

Throughout the life of the British Lichen Society members and others have been encouraged to submit records of those lichens found throughout the British Isles. Initially this was achieved through the submission of completed recording cards to Mark Seaward who collated them and developed the Society's 'Mapping Scheme'. For details of the historical development of this ground breaking and herculean task see Mark's Swinscow lecture (Seaward 2015). The data on the cards were used to map the distribution of each lichen species at a 10 x 10km resolution. While a remarkably successful project in itself the computer technology then available did not permit the capture the full range of information held on the record cards.

Subsequently, in 1999, the Society started the development of a location-based database of lichen records, and for 10 years from 2003 we tackled the enormous task of transferring the full range of data held on recording cards collected for the Mapping Scheme into the Recorder 6 database. We have also input the churchyard cards and converted records from other databases, and now we are concentrating on the older records for which we have more information to add from notebooks and 'det' books, publications and herbaria.

In the meantime there has been a steady flow of new records, but not all these have found their way to Janet or Brian to be included in the Recorder 6 database. Some were sent to Mark for the Mapping Scheme, and others have gone to local record centres or into private databases and not been passed on. There is clearly a possibility of duplication of effort and of loss of data in this arrangement. With the agreement of all the authors of this note**, in future <u>all</u> record cards and spreadsheets should be sent to Janet Simkin (for England or Wales) or Brian Coppins (for Scotland).** We have no problem with records also being sent to local record centres, but they will not be sent on to us so we need to get them directly as well.

Records input online to iRecord will come to the BLS only if entered through the **iRecord Lichen Recording Activity**, so any others should also be sent to Janet or Brian in spreadsheet form. Please note, however, that iRecord is not intended for bulk input of large volumes of records and we prefer to receive records from active recorders in BLS spreadsheets, as now. The inclusion of substrate details, accurate grid references and other information is increasingly important to the use of modern records, and this is most easily done by using the spreadsheet.

In the process of transferring data from Mapping Scheme cards into the Recorder 6 database, only those cards which could be securely located by a full OS grid reference, or which could be given a grid reference from an identifiable location description, were captured. This has meant that a small number of cards were omitted. While these are only located only to a 10 x 10 km square they may contain useful information such as dates, habitat, the collectors name etc. It was decided therefore that all the Mapping Scheme cards would be scanned and made available electronically as pdf files to all members of the society. This scanning process is currently being undertaken by Les Knight and is approximately half complete (5000 cards scanned). The scans will be made available to members on request, initially probably through a dropbox folder but in time we hope to be able to put them on the BLS website.

Mark Seaward has kindly offered to continue to act as 'Archivist' to these records. His help with the interpretation of the handwriting and the annotations on many cards, and his knowledge of the recorders, their publications and the herbaria in which their specimens may be found, is invaluable.

The BLS Recorder 6 database is there to be used, and if you need a list of records for a site, vice county or species, or an analysis such as the species recorded from a particular substrate, please ask. We try to give a quick response. Vice county lists and 10km distribution maps are already on the BLS website but can also be obtained from Janet if you need the most up to date information.

To summarise:

- Send all record cards and electronic records for **England and Wales** to Janet Simkin at records@britishlichensociety.org.uk
- Send all record cards and electronic records for **Scotland** to Brian Coppins at lichensel@btopenworld.com
- For advice on interpreting historic record cards contact Mark Seaward at M.R.D.Seaward@Bradford.ac.uk
- For site lists, vice county lists, species records and distribution maps, and for access to the scans of mapping scheme cards contact Janet Simkin on records@britishlichensociety.org.uk

Reference

Seaward M.R.D. (2015) Spots before the eyes: half a century of mapping lichens. *BLS Bulletin* **116**: 144-152.

Les Knight (Data Committee Chair), *Brian Coppins*, *Mark Seaward*, *Janet Simkin*

The Ursula Duncan Award for 2015

At the Annual General Meeting in Newcastle to great applause Ishpi Blatchley was awarded the Ursula Duncan Award for services to the Society.

Ishpi Blatchley joined the Society in the early eighties with a first degree in zoology from Dublin and a doctorate in endocrinology from London. She was initially inspired to take an interest in lichens by Peter James and a series of lectures he delivered at the Natural History Museum and then by Frank Dobson's courses at Juniper Hall.

Ishpi was invited on to the Churchyards Sub-committee in the mid-1990s and assumed a special responsibility for the conservation of lichens in churchyards and cemeteries. This resulted in a collaboration with the late Tom Chester in writing "Churchyard Lichens and their Conservation" which formed a chapter in the Society's publication "Lichen Habitat Management". She continues with this conservation role today and represents the group on the Conservation Committee reporting on progress in churchyard matters.

It was to enthusiastic and warm applause that Ishpi Blatchley received the Ursula Duncan Award together with thanks and appreciation from The President, Janet Simkin.

After Tom's untimely death the work of the Churchyard sub-committee became less formal and perhaps might have been phased out altogether but for Ishpi's commitment and constant enthusiasm and, more crucially, by her willingness to take on much of its logistics and organization.

This willingness has also extended to a frequent involvement in the general running of the Society, an involvement which invariably included tasks which might be viewed as unrewarding and time consuming—data inputting, document checking, attending meetings arranged by other organizations etc. – the type of work so important to a society and yet one which other members have been reluctant to take on. It is important work which is too easily overlooked, particularly as it is always carried out by Ishpi with so little complaint. One such notable undertaking was her proof reading of much of the "Lichens of Great Britain and Ireland". Ishpi's invaluable contribution to this monumental work, recognised as such in the "Acknowledgements", added so much to its accuracy and clarity.

Ishpi is a regular attendee at Field Meetings and her warm presence and easy familiarity is much valued. She has organised Field Meetings herself—the Kent Meeting in 2014 was a great success, buoyed up by Ishpi's passionate interest in lichen identification and conservation. All of those who attended left replete with happy memories of lichen discoveries and wonderful habitats.

Beyond her formal input into the work of the Society Ishpi has a broad spectrum of other interests in natural history. She regularly leads walks and talks devoted to lichen awareness and conservation aimed at the general public and natural history societies. For many years she has been an enthusiastic bat recorder and conservationist. In 2012 The Borough of Bromley recognised Ishpi's unique contribution to her community with the award of "Unsung Hero".

Inevitably as a committed member of the Society for so many years Ishpi has served on all the traditional committees—on the Data Committee, as Minuting

Secretary; on the Education Committee and, as indicated previously, on the Conservation Committee. She has served on Council on several occasions and is serving in this capacity today. It is this quiet, unassuming support for the work of the Society which has made her so appreciated and respected and it is a remarkable and unique tribute to Ishpi that all of the Council's Officers and Members acted as "Supporters" (normally five are required) in the proposal that she should receive this prestigious award. We are blessed indeed as a society to have such a wonderful, hardworking and dedicated member whom we honour in this way.

Notice of: BRITISH LICHEN SOCIETY MEETINGS, SWINSCOW LECTURE and ANNUAL GENERAL MEETING 20th – 22nd JANUARY 2017

The Natural History Museum, Cromwell Rd, London SW7

Accommodation near the Natural History Museum in London: ranging from YHA accommodation from £23 a night at weekend at 38 Bolton Gardens *http://www.yha.org.uk/hostel/london-earls-court* to the Eden Plaza Hotel at 65-67 Queen's Gate SW7, 0207370 6111where you can ask for NHM rates at c. £70 a night. Baden Powell House is a similar price for a single room. Other reasonable places in the vicinity include Curzon House Hotel at 58 Courtfield Gardens *info@curzonhousehotel.co.uk* and Hotel Olympia at 49 Earls Court Square SW5 where a single room for a night is c.£50. These prices may change in January.

Nominations

Nominations for Officers for 2017 and four members of Council for the period 2017-2020 should be sent in writing to Pat Wolseley, Secretary, c/o Department of life Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD before 18 December 2016. No person may be nominated without their consent. John Douglass, Maxine Putnam and Catherine Tregaskes retire from Council this year and are not eligible for re-election as Council members.

Council Meeting

Council will meet at **14.00 on Friday 20th January 2017** in the Board Room. Please let the Secretary have any items you wish Council to discuss by 18th December, 2016.

At 6 p.m. we will meet in the foyer of the Neil Chalmers seminar room, at the far end of the new Darwin Centre 2 on the ground floor, for a glass of wine and nibbles prior to the Dougal Swinscow lecture in the Neil Chalmers seminar room at 18.30.

Dougal Swinscow lecture
This year the Dougal Swinscow lecture will be given by Dr Juri Nascimbene from the University of Padova in Italy. He has written widely on the effects of forest management and climate change on epiphytic lichens and in particular species of *Lobaria* and the Lobarion community that urgently need conservation measures in Europe.

Patterns and drivers of epiphytic lichen diversity in productively managed forests: perspectives for conservation in a global change scenario
Dr Juri Nascimbene – Dep. of Biology, University of Padova, Italy

Abstract: The capability of forests to sustain a rich biota is increasingly evaluated against management practices, especially within protected areas, where conservation issues are fully included in the management framework. Lichens are a species rich and sensitive component of the forest biota and the improvement of lichen diversity by conservation-oriented forest management is likely to benefit forest functions since lichens play important ecological roles. In this lecture, I will present my research experience stressing the exploration of the patterns and drivers of epiphytic lichen diversity in productively managed forests in Italy. In particular, I will focus on factors acting at multiple spatial scales, considering the response of lichens to both management-related and climate-related factors.

The BLS dinner will be held in the Ognisko restaurant at 8.15 (part of the Polish club) at 55 Exhibition Rd where they offered us a fixed menu for £29 plus a service charge which amounts to £32.60. Please fill in the booking slip (sent separately with the *Bulletin*) and return with cheque to the treasurer John Skinner 28 Parkanaur Ave, Southend-on-Sea, Essex SS1 3HY – **to be received by 20 December**.

ANNUAL GENERAL MEETING/EXHIBITIONS/LECTURE MEETING

Saturday, 21st January, 2017
The Annual General Meeting will be held in the Flett theatre of the Natural History Museum, London SW7 5BD at 10.30 a.m. on Saturday 21st January 2017. The Museum is open to the public from 10 a.m. on Saturday and the entrance to the Flett theatre is from Exhibition Rd. If anyone wants to come earlier they must use the staff entrance in Exhibition Rd and let the secretary know what time they intend to come.
The foyer of the Flett theatre is reserved to put up exhibits of lichen interest from 9.30 a.m., onwards. This is an opportunity for members to see what you are doing so please contribute items to this. Display boards and tables will be available but we need to organise this well before the meeting so please let Pat Wolseley know the subject and/or title of your exhibit and space required (e.g table, electrical or internet connection) **by 14th December, 2016**. Exhibits should be taken down at the end of the meeting.

Mark Seaward will provide a limited number of books for sale at fixed prices on Friday evening in the Foyer of the Neil Chalmers seminar room. Please bring other books for inclusion in the book auction to the foyer of the Flett theatre on Saturday morning.

Programme

Saturday 21st January
9.45 Reception, coffee will be served in the foyer of the Flett theatre
10.30 Annual General Meeting

AGENDA
1. Apologies for absence
2. Minutes of the Annual General Meeting January 2016
3. Matters arising
4. BLS Constitution
5. Officers and Committee Chair Reports
6. Election of Officers -Field Meetings Officer 2017
7. and four members of Council
8. Any other business
9. Date and place of next AGM

12.45 Lunch - either in the ground floor restaurant of the NHM or at local venues.

Lecture Meeting: Special lichen communities

14.00 – 14.40 Dr Chris Ellis

Scottish Woodland Communities and Indicator Species – Three Practical Applications

Abstract: Recent work at the Royal Botanic Garden Edinburgh has integrated across the three themes presented in this talk. First, testing the classic 'Coppins & Coppins' indicators of ecological continuity, while accounting for sampling bias (lichenologists have a homing instinct for the nicest sites!!). Second, the quantification of environmental effects controlling lichen distributions, and the relevance of this for developing indicators of habitat quality and species risk, focussing on temperate rainforest, ancient woodlands and climate change. Third, systematic Epiphyte Community Classification, and the use of indicator species for habitat/species recovery, especially practical action following the removal of invasive Rhododendron.

14.40 - 15.20 Neil Sanderson

Fire, Grazing and hard Black Humus: the Ecology of Lichen Diversity in the New Forest Heathlands

Abstract: A recent systematic survey of the lichens of the New Forest Heathlands has revealed a thriving and diverse assemblage. The survey included random sampling of ten 1ha plots and a representative sample of 100 1km squares. The survey added many interesting species, including species such as *Cladonia callosa* and *C. zopfii*, and has confirmed that the heathland still supports a vigorous and viable lichen assemblage. Species such as *Cladonia strepsilis* and *Pycnothelia papillaria*, which are declining across lowland Europe, still have very large populations. The surviving rich lichen assemblage can be related both to low ammonia pollution across the Forest and to internal soil and land management factors. Lichen diversity is associated with open heaths where the ground is well lit. Low soil productivity is a primary factor but management is also very important. Varied grazing pressure, combined, in less browsed stands, with long rotation controlled burning are fundamental in maintaining diversity. Past soil disturbance is an additional local factor promoting diversity. Under this traditional management the New Forest clearly now supports a much richer lichen assemblage than other lowland heaths in England, even those under conservation management.

15.20- 15.50 Tea

15.50 – 16.20 Janet Simkin

From contamination to conservation; the lichen communities of lead mines

Lead mines and smelters were once sites of intense industrial activity and so dusty and polluted that very little could grow there. Now they support a distinctive plant and lichen flora including metallophytes and other species of conservation importance, but this has largely developed since mining ceased and on some sites it is still changing rapidly. Species of interest are often restricted to very small areas within a site, if they are there at all. This study has used records from the Pennines and mid-Wales to investigate these lichen communities and the distribution of rare species within and between sites, and the findings may have implications for conservation.

16.20 -16.50 Bryan Edwards

The Isle of Portland: Assessing a multiple interest site

Abstract: The Isle of Portland is a limestone peninsula protruding into the English Channel along the Dorset coast in Southern England. Famed for its building stone significant areas both along the coast and inland have been quarried. Lichens are a notified feature of the Isle of Portland SSSI with both maritime and limestone species well represented. Due to its southerly position it supports species and assemblages that are more typical of limestone regions further south in Europe. The sheltered eastern undercliff is the richest area with approximately 160 species recorded from the limestone and maritime chert boulders plus a further 20 species from limestone soils. Three species, *Arthonia meridionalis*, *Gyalecta hypoleuca* and *Lecanographa dialeuca* are currently unknown elsewhere in Britain and Ireland.

16.50 Instructions for field meeting

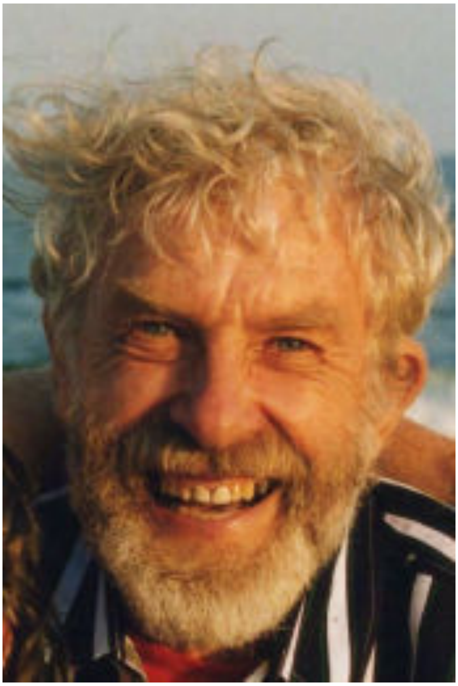
CLOSE

Field Meeting

Field meeting on Sunday 22nd January.

A visit to Abney Park Cemetery one of the 'Magnificent Seven' in the Borough of Hackney. It was established in 1840 in a former arboretum of 13ha. Today it includes several veteran trees and is an LNR for its wildlife. Check on the website *http://www.abneypark.org/* Nature page for the fungi recorded but no lichens are on that page so we have to change that! Travel to Stoke Newington railway station and it's a 3 minute walk to the entrance. Please bring your lunch with you. We will have access to the education room for hot drinks. If we have time we can investigate nearby Clissold Park, a more open public space with a café.

Obituary: Wolfgang Siegfried Gunther Maass 1929-2016



(Photo Oliver Maass)

Wolfgang S.G. Maass was born on 23 October 1929 in Helsinki, Finland. He studied Botany and Chemistry at the Ernst-Moritz-Arndt University in Greifswald (East Germany) and then at the Eberhard Karl's University in Tübingen (West Germany). Wolfgang obtained his doctoral degree in 1957, based on a thesis entitled "Light growth reactions and phototropism in *Phycomyces blakesleanus*". From 1958 to1960 he worked at the Max Planck Institut für Eiweiss- und Lederforschung on the chemistry of tannins in Norway spruce (*Picea abies*) and isolated the stilben glucoside "piceatannol" from its needles. Through having taken part in one of Professor Bünning's traditional field trips to Torne Lappmark and in field trips with Professor Helmut Gams to Lule Lappmark and the Monte del Vesuvio near Naples, he was introduced to the Floras of the Arctic and of the Mediterranean. He was commissioned to make a contribution to the "Kleine Kryptogamenflora" of Helmut Gams by supplying a key to the identification of *Sphagnum* mosses.

In 1960 he emigrated to Canada to work at Dalhousie University with Professor Kraft von Maltzahn on gametophyte cultures of *Sphagnum* and tissue cultures from the cambium of Norway spruce. He then went to the "Atlantic Regional Laboratory" of the National Research Council (NRC) to do research on ion exchange in peatmosses and on the distribution of peat mosses in Atlantic Canada. Wolfgang had a strong classical training in botany and became very focused on bryophytes and lichens. He travelled to the high Arctic, Yukon and Alaska to search for these cryptogams. He began to work on the biosynthesis and chemistry of lichen substances and published the first 2-directional thin layer chromatography system for the separation of lichen acids, a technique subsequently refined by the Culbersons at Duke University.

Wolfgang began to conduct surveys of the lichen flora of Atlantic Canada, especially after the presence of *Erioderma pedicellatum* in North America became known (Ahti and Jørgensen 1971, Jørgensen 1972). He investigated the type locality of *E. pedicellatum* and made expeditions to Newfoundland and the coast of Labrador. In 1987, Wolfgang took early retirement, but continued his work on the lichens of the Maritime Provinces

Along with David Richardson, Wolfgang was given a contract by the Nova Scotia Power Corporation to study the impact of air pollution using lichens and mosses as biomonitors around the newly constructed Point Aconi Electricity Generating Plant. This increased his interest in the response of lichens to air pollution and habitat destruction. He visited Newfoundland several times and established a close collaboration with Eugene Conway from the Newfoundland Lichen Education and Research Group and Christoph Scheidegger from the Lichen Specialist Group of the IUCN Species Survival Commission and others. He completed a status report on *Erioderma pedicellatum*, with David Yetman, for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2002. Eventually this lichen and *E. mollissimum* were listed under the Species At Risk Act (SARA) in Canada and assessed as endangered in Nova Scotia and New Brunswick. Wolfgang's pioneering research, documentation and collection of these lichens as well as many others in genera such as *Anzia* "*Cavernularia*" (= *Hypogymnia*), *Coccocarpia*, *Fuscopannaria*, *Pannaria*, *Parmeliella*, *Platismatia*, *Pseudevernia*, *Sticta*, and *Thelotrema*, laid the foundation for the active conservation of lichens in eastern Canada.

Unfortunately a few years ago Wolfgang became unwell which curtailed his field activities. His extensive collections are to be found at the Nova Scotia Museum of Natural History, the Canadian Museum of Nature, in Bergen and Helsinki, and elsewhere. Wolfgang's very large private lichen herbarium was transferred to the New Brunswick Museum in Saint John where it is being curated and studied by Dr. Stephen Clayden who notes: "The collections made by Wolfgang Maass provide important documentation of the diversity, ranges and habitats of forest-inhabiting lichens in Atlantic Canada. Beginning in the 1960s, when few others were studying lichens in this region. He travelled widely through Nova Scotia, Newfoundland, and New Brunswick, exploring many areas remote from settlements and main roads. His keen eye and all-round knowledge of field botany led to many notable discoveries. From this baseline of collections and data, much will be learned about the nature and extent of ongoing changes in species diversity, abundance, and habitats." (Clayden, in litt.). With his passing, Nova Scotia, Canada, and indeed the entire world of lichenology has lost an important pioneer in the documentation of the lichen flora of northeastern North America and a researcher dedicated to understanding the complex nature of lichen chemistry.

This short obituary is abstracted from the more comprehensive account of Wolfgang's life which was published recently in Symbiosis 2016, 69(3):199-203 and included a list of publications by Wolfgang Maass.

David H.S. Richardson
Environmental Science, Saint Mary's University, 923 Robie Street, Halifax, Nova Scotia B3H 3C3, Canada

Robert Cameron
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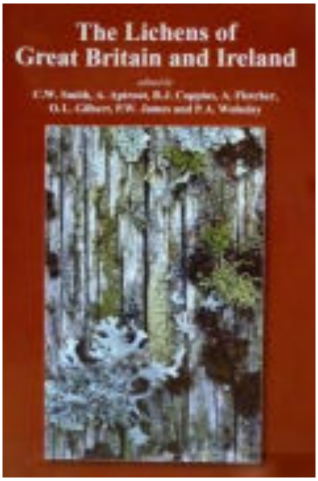

Cat.1. The Lichens of Great Britain & Ireland. Ed. Smith et al. (2009). Hardback, 700pp.
This work, a much enlarged revision of 'The Lichen Flora of Great Britain and Ireland published in 1992, reflects the enormous advances in lichen taxonomy over the last two decades. There are keys to 327 genera and 1873 species, with detailed descriptions and information on chemistry and distributions. The language is accessible, avoiding obscure terminology and the keys are elegant. The Lichens of Britain and Ireland is undoubtedly the standard work for the identification of lichens in Great Britain and Ireland and will be indispensable to all serious students of lichens and to other biologists working in the related fields of ecology, pollution, chemical and environmental studies.

BLS members: £45.00 ; non-members £65.00
Postage & Packing £7.50 UK (note this is a very heavy book!), £15.00 Europe.

Lichen Atlas of the British Isles, ed. M.R.D. Seaward
The Atlas has been published in fascicles, unbound A4 sheets hole-punched for keeping in a ring binder. Each species account includes a distribution map and a discussion of the lichen's habitat, ecology, identification and status.
Fascicles 1 and 2 (*Cladonia* part 1) are out of print.
Cat.3. Fascicle 3: The foliose *Physciaceae* (*Anaptychia*, *Heterodermia*, *Hyperphyscia*, *Phaeophyscia*, *Physcia*, *Tornabea*) plus *Arctomia*, *Lobaria*, *Massalongia*, *Pseudocyphellaria*, *Psoroma*, *Solorina*, *Sticta*, *Teloschistes*. (54 spp) 1998.
Cat.4. Fascicle 4: *Cavernularia*, *Degelia*, *Lepraria*, *Leproloma*, *Moelleropsis*, *Pannaria*, *Parmeliella*. (36 spp) 1999.
Cat.5. Fascicle 5: Aquatic Lichens and *Cladonia* part 2. (64 spp). 2000.
Cat.6. Fascicle 6: *Caloplaca*. (58 spp) 2001.
All fascicles are offered to members and non-members at a special price of £3.00 each, (approximately half price). Postage & Packing £3.50 UK, £10.00 Europe, **per fascicle**.
Cat.7. Fascicles 3 to 6 for £9.00 (Buy 3, get one free!). per fascicle. Postage and packing £10.00 UK, £25.00 Europe.

Cat.8. Microchemical Methods for the Identification of Lichens by A. Orange (2010)

2nd edition, with two colour plates. Full of useful information on pigments, crystals, colour tests with reagents and TLC. Price £8.00 members, £10.00 non-members. Postage and packing £3.50 UK, £8.50 Europe.

Cat.9. Conservation Evaluation of British Lichens and Lichenicolous Fungi by B.J.Coppins and R.G. Woods (2012)

An update and revision of the 2003 edition and now extended to include lichenicolous fungi. Provides a comprehensive catalogue of threat statuses. Also included are lists of specially protected species in England, Scotland and Wales and those species for which Britain has an internationally important population. It is no. 13 of the JNCC's Species Status volume series. A4 paperback 155pp. £7.00. Postage and packing £5.00 UK, £10.00 Europe.

Cat.10. Surveying and Report Writing for Lichenologists Ed. D.J. Hill (2006)

Guidelines on commissioning surveys, fieldwork, identification and report writing, aimed principally at those people and organisations commissioning surveys and at those undertaking them. However, much of the information is of value to any lichenologist engaged in field recording.

BLS members £7.00; non-members £10.00. Postage & packing £2.50 UK, £6.50 Europe.

Cat.13. Usnea 'Aide Memoire' by P.W. James

A5 booklet with drawings and many useful tips for identifying the British species of this difficult genus.

BLS members £2.00; non-members £3.00. Postage & packing £1.50 UK, £2.50 Europe.

Cat.14. The Lichen Hunters by O.L. Gilbert (2004). Hardback, 208pp.

If you have been on any lichen field meetings in the last fifty years, this is a book you will enjoy. The late Oliver Gilbert's boundless enthusiasm comes across in every page as he describes field meetings and explorations around Britain. Many past and present members of the Society are fondly remembered in this delightful book. Special price, now £6.00. Postage & packing £4.50 UK, £10.50 Europe.

Cat.15. 'Understanding Lichens' by George Baron (1999). Paperback, 92pp.
An excellent introduction to lichenology, from the basic biology of lichens to their environmental importance as well as the history of the science.
BLS members £8.95; non-members £9.95. Postage and packing £2.50 UK, £6.50 Europe.

Cat. 16. A Field Key to Common Churchyard Lichens by Frank Dobson (2003)
Spiral-bound book with strong paper. Illustrated keys to lichens of stone, wooden structures, soil and mosses. 53 colour photographs. Covers many common lowland lichens.
BLS members £6.50; non-members £7.50. Postage and packing £2.50 UK, £6.50 Europe.

Cat. 17. A Field Key to Coastal and Seashore Lichens by Frank Dobson (2010)

A superb guide to over 400 species. 96 colour photographs. In the same format as cat. 16.
BLS members £10.00; non-members £12.00. Postage and packing £2.50 UK., £6.50 Europe.

Cat. 18. A Field Key to Lichens on Trees by Frank Dobson (2013)

A superb guide to around 500 species. 96 colour photographs. In the same format as cat. 16.
BLS members £15.00; non-members £17.00. Postage and packing £2.50 UK, £6.50 Europe.

Cat. 21 and 22. Lichen Wall Charts illustrated by Clare Dalby.

Two beautifully illustrated wall charts, **'Lichens on Trees'(cat.21)** and '**Lichens on Rocky Seashores' (cat.22)** have been produced by artist Clare Dalby. Each is A1 size (80cm wide x 60cm high) and feature over 40 species in colour, nomenclature updated to 2010. £5.00 per poster, £4.00 per poster for purchases of 8 or more. Postage and packing (for up to two posters) £6.50 UK, £7.00 Europe.

Cat.23. Parmelia identification CD-Rom
Although the nomenclature has been superceded, this CD provides a useful range of photographs and other information for identification. BLS members: £5.00; non-members £7.00. Postage and packing £2.00 UK, £5.00 Europe.

Cat.25. Greetings Cards/Notelets by Claire Dalby

A set of five cards with envelopes, featuring five exquisite pen and ink illustrations of British lichens.
£2.00 per set. Postage & Packing £2.00 UK, £3.50 Europe.

Cat.26. BLS Postcards

A set of 16 beautiful photographic postcards of British lichens.
£2.00 per set. Postage & Packing £1.50 UK, £3.50 Europe.

Cat.27. Woven ties with below-knot motif of BLS logo. Attractive ties with discreet BLS logo. Colours available: maroon, navy blue, brown, black and gold.
£7.00. Postage & Packing £1.50 UK, £3.50 Europe.

Cat. 28. Car sticker, diam. 12 cm. peels off easily. Recognise fellow members in the car park!
£1.00. Postage & packing £1.00 (UK), £2.50 (Europe).

Cat. 29. Enamel badge, diam. 2.5 cm, pin fixing, matt finish. A well -made attractive badge.
£1.00. Postage & packing £1.00 (UK), £2.50 (Europe).

Cat. 30. Fabric badge, diam. 6 cm. Ideal for sewing onto a cap or rucksack.
£1.00. Postage & packing £1.00 (UK), £2.50 (Europe)

Cat. 31. Lichens – An Illustrated Guide to the British and Irish Species 6th Edition (2011)

This enlarged edition (496pp) of this popular book provides an invaluable guide to identifying the British and Irish species, both for the beginner and the more advanced lichenologist. With detailed air pollution references and distribution maps, it offers the environmentalist and ecologist a concise work of reference, compact enough to be used in the field. The 6th edition has been revised to conform with the nomenclature of 'The Lichens of Great Britain and Ireland' ed. Smith, C.W. et al. (2009) and more recent changes. Over 160 additional species to the previous edition have been added so over 1,000 species are now treated.

Entries usually consist of a description of each species, a photograph, notes on habitat, chemical tests, line drawings to clarify the description and a distribution map giving three date separations. There is an enlarged generic key and a much extended section on sterile species. A generic synopsis is included to assist the more experienced lichenologist.

Paperback edition is now out of print (a new edition is expected within the next two years) but ***a small number of hardback copies are available at the paperback price of £35.00.*** Postage & packing £5.00 UK, £12.00 Europe.

Publication of the Summer 2017 Bulletin

Copy for the Summer 2017 Bulletin should reach the editor (contact details on the inside front cover) by 1 May 2017

BRITISH LICHEN SOCIETY - 2016 MEMBERSHIP DETAILS

Applications for membership should be made through the Society's website where information about membership and a secure 'mySociety' portal is provided: *http://www.britishlichensociety.org.uk/join-and-renew*. **Queries on membership matters** including applications not using the internet should be made to The Membership Secretary, Heidi Döring (contact details see inside front cover). **Changes of postal address and email** can be updated in your personal online account or be sent to the Membership Secretary.

CATEGORIES OF MEMBERSHIP, FEES AND SUBSCRIPTION RATES
Membership is per calendar year. Renewal of annual subscriptions is due on or before 1st January.

Regular Membership for individuals (not available to institutions) who have signed the Application Form and paid the fee. Regular Members are entitled to receive our *Bulletin*, and they can subscribe to *The Lichenologist* at as special member's rate. Regular Members can use facilities of the Society and have voting rights.
Annual rate for 2016: **£30 / $50**

Discounted rate for Student members in full-time education. Annual rate for 2016: **£15 / $25**

Discounted rate for Senior members of the age 65 years and above. Annual rate for 2016: **£15 / $25**

Life Membership is available to persons age 65 and over. Life Members have the same entitlement as Regular Members. Life Membership fee when taken up in 2016: **£300 / $500**

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Family Membership is for persons living in the same household as a Member. They are entitled to use all the Society facilities, but receive no publications and have no voting rights. Rate for 2016: **£5 / $10**

Journal only subscriptions are available to institutions.
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