BLS Churchyard Lichen Records

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1. Introduction

This report is analysis of the more than 515,000 records from churchyards in England and Wales held in the BLS database. Many of these are from a period of intensive recording in the 1990s, with some records dating back as far as the 1960s, but since then there have been a lot of changes to the churchyard environment. The most notable are:

- Reduced management, resulting in an increase in tree cover, brambles and ivy, and often a taller sward of more coarse grasses where the grass is now cut less often.
- Reduced levels of SO_2 pollution from burning coal, but increasing levels of nitrogen oxides (NOx) and ammonia from transport and industry.
- Most recently a warming and changing climate, making some areas wetter or drier than they used to be.

The lichen flora of many churchyards appears to be changing in response to these and other factors. Lichens are sensitive to many aspects of their environment, with each species having its own ecological niche it which it can survive and thrive, so we can't always attribute the changes we see in the lichens to a particular influence. Even comparing records from recent and past surveys can be misleading if there were differences in expertise or recording effort, but we are beginning to see patterns emerge.

A recent analysis of just the churchyard lichen records made in the last 25 years (2000-25), has revealed some significant changes, with SO_2 tolerant *Lecanora conizaeoides* now rarely seen but corticolous species such as *Arthonia radiata* and *Ramalina fastigiata* now spreading rapidly. The saxicolous flora appears to have changed less, and in this period the most frequently recorded species on stone (with the most often recorded at the top of the list) were:

	Taxon		*Taxon*
1	*Variospora (Caloplaca) flavescens*	16	*Protoblastenia rupestris*
2	*Myriolecis (Lecanora) albescens*	17	*Physcia adscendens*
3	*Candelariella vitellina*	18	*Protoparmeliopsis muralis*
4	*Lecanora campestris*	19	*Xanthoria parietina*
5	*Porpidia tuberculosa*	20	*Myriolecis (Lecanora) crenulate*
6	*Diploicia canescens*	21	*Circinaria (Aspicilia) calcarea*
7	*Myriolecis (Lecanora) dispersa*	22	*Dirina massiliensis f. sorediata*
8	*Psilolechia lucida*	23	*Toniniopsis aromatica*
9	*Lecidella scabra*	24	*Kuettlingeria (Caloplaca) teicholyta*
10	*Lecanora polytropa*	25	*Verrucaria nigrescens*
11	*Acarospora fuscata*	26	*Rhizocarpon reductum*
12	*Tephromela atra var. atra*	27	*Calogaya (Caloplaca) pusilla*
13	*Buellia aethalea*	28	*Phaeophyscia orbicularis*
14	*Lecidella stigmatea*	29	*Verrucaria hochstetteri*
15	*Diplotomma alboatrum*	30	*Candelariella medians*

The rest of this report is based on the analysis of the full dataset for the 60 year period 1963-2023, but these recent changes should be born in mind when reading it. Species names are the accepted names when the report was first prepared in 2023 and have not yet been updated.

2. Records held

2.1 Geographic distribution

The BLS database now includes more than 515k records from 8.6k churchyards and graveyards in England, Wales and the Isle of Man. This analysis is based on the 503k records for the 60 year period 1963-2023.

96% of these are from England. We also hold a small number of records from Scotland and the Channel Isles but the environmental conditions are rather different there so they are not included in this analysis. The graveyards of Wales and Scotland are under-recorded and there is scope there for an interesting survey of the more upland, oceanic and less polluted parts of the country where the lichen flora can be very rich.

All the records are dated, mostly to a particular day but some have been accumulated over a period of time. Each dated list represents a site visit, but when the site was revisited within a few months those records can also be taken together as an accumulated list. There are 11,587 of these individual or accumulated site visits in the BLS database.

Country	Locations	Site visits	Records
England	8,236	11,164	483,649
Isle of Man	36	38	1,711
Wales	345	385	16,981
Total	8,617	11,587	502,251

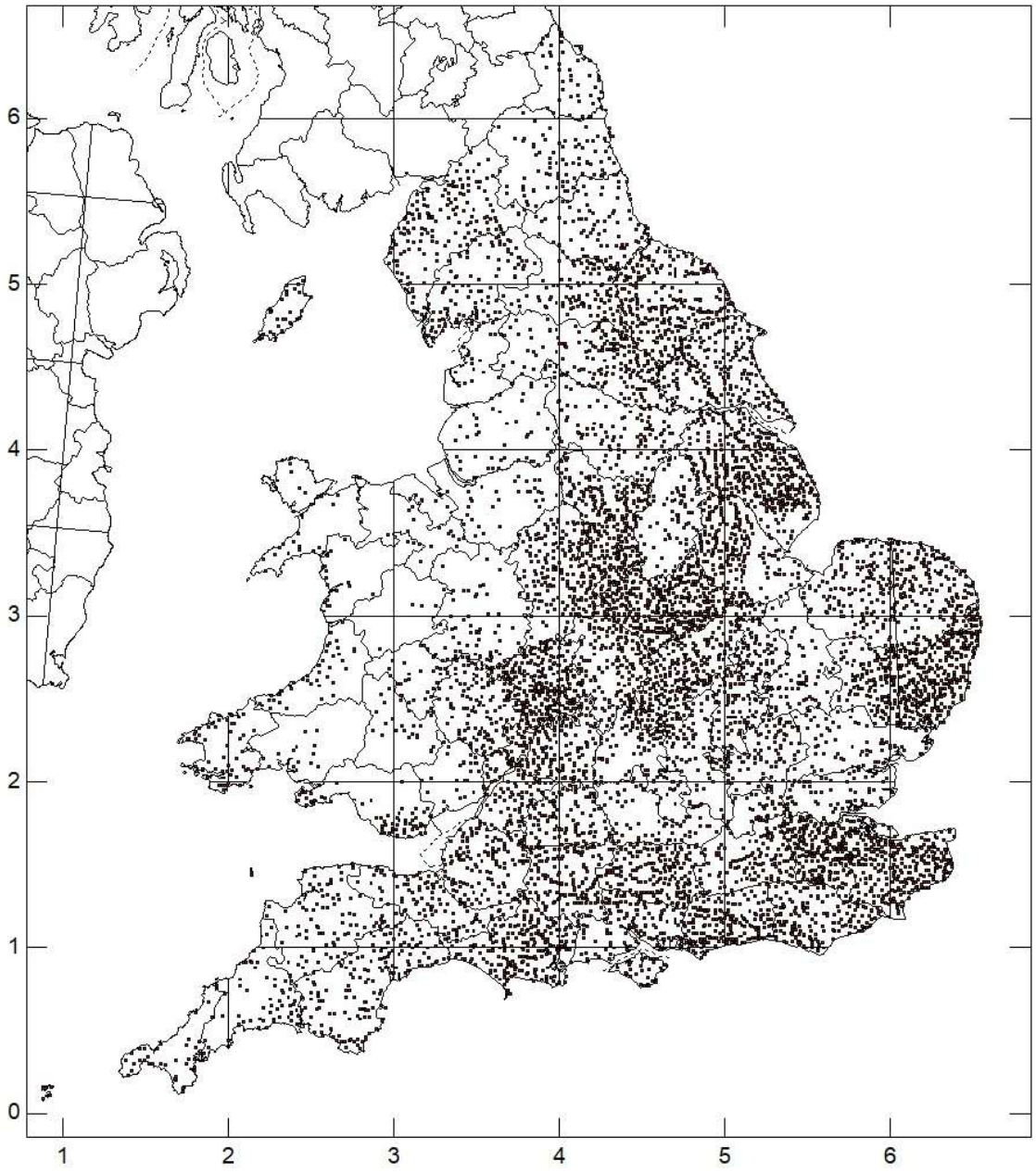
Even within England the recording is patchy and is heavily concentrated on areas where recorders have had a particular interest in churchyard lichens. This may be due in part to the number of interesting old churches or the lichen richness of churchyards in those areas, but the distribution map suggests that there are still counties that have not been recorded as thoroughly as they deserve. The map includes 280 sites in the database for which we only have one or two records, usually from specimens sent to referees or herbaria, and these are likely to be of interest and need a survey.

Vice counties with the most sites and visits recorded:

Vice County	Locations	Visits	Records
VC54c North Lincolnshire	399	460	16,911
VC55c Leicestershire and Rutland	350	438	16,559
VC25c East Suffolk	344	660	21,466
VC15c East Kent	317	597	22,658
VC37c Worcestershire	301	417	17,160
VC57c Derbyshire	273	303	9,836
VC32c Northamptonshire	265	330	19,127
VC62c Northeast Yorkshire	261	283	10,090
VC09c Dorset	256	333	18,230
VC16c West Kent	230	424	15,881
VC61c Southeast Yorkshire	224	242	8,031
VC53c South Lincolnshire	202	223	9,283
VC39c Staffordshire	201	217	7,005
VC27c East Norfolk	189	222	7,849
VC13c West Sussex	186	312	16,779
VC64c Midwest Yorkshire	185	203	6,357
VC12c North Hampshire	184	293	12,904

Vice County	Locations	Visits	Records
VC14c East Sussex	183	306	15,603
VC38c Warwickshire	175	210	10,385
VC70c Cumberland	165	263	18,525

Distribution of churchyards and graveyards for which we hold records:

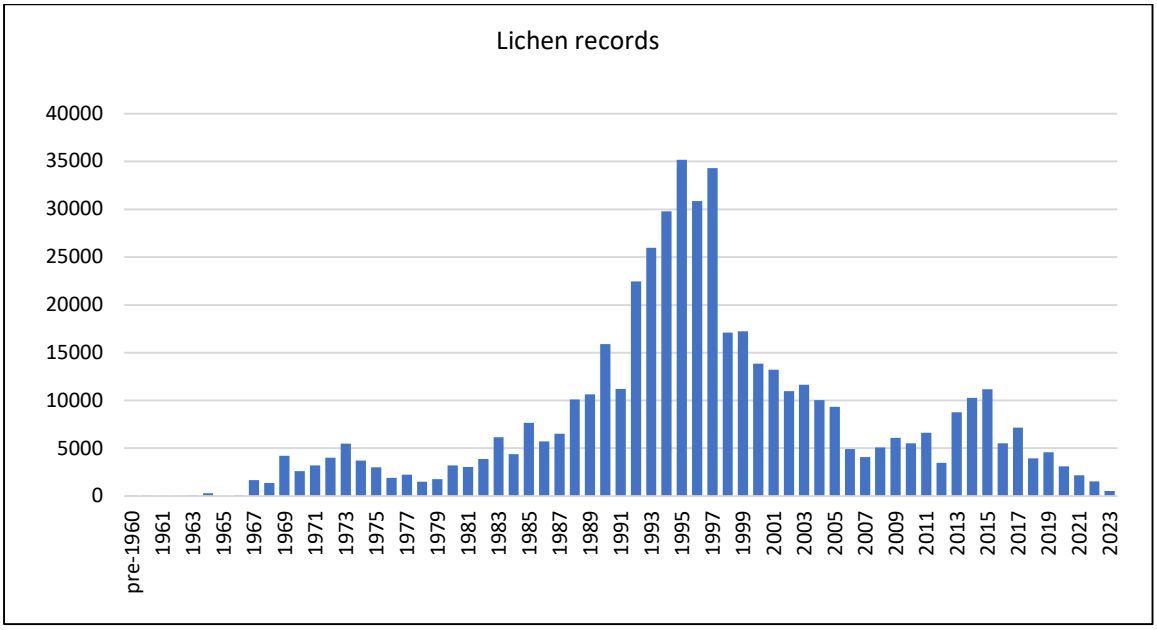


The full data, and summaries by vice county and location, are available as spreadsheets.

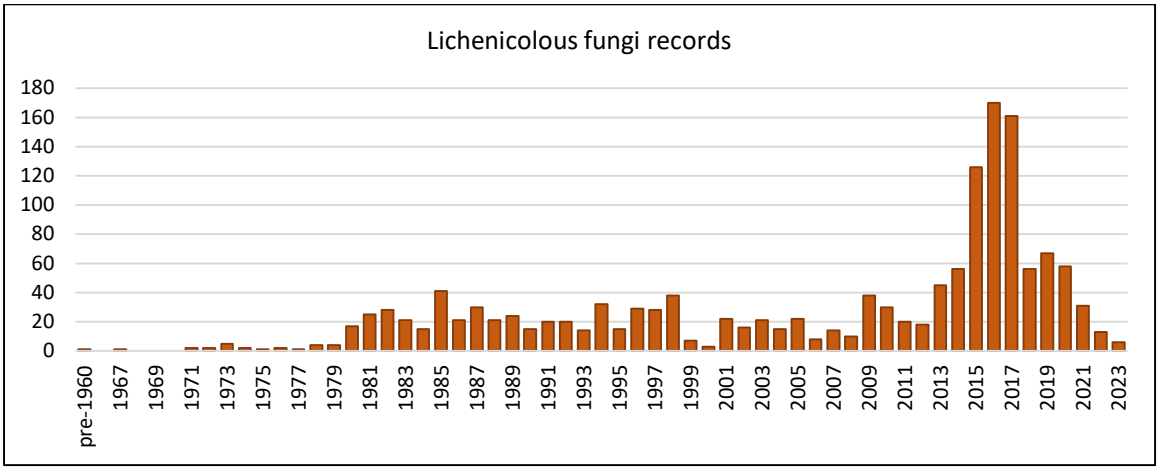
2.2 Temporal distribution

Another issue is the dates on which these sites were recorded, and the lack of recent records. The peak of recording in this habitat was in 1990-1999 but since then the lichen flora may have changed in response to changes in atmospheric pollution (reduced SO_2, increased ammonia and NOx), reduced site management and the maturing of trees, and perhaps even climate change. Some species, such as *Lecanora conizaeoides*, are known to have declined considerably in the last 20 years while others, particularly the nitrophiles (*Xanthoria parietina*, *Physcia* spp., *Arthonia radiata*, etc.) and others such as *Ramalina fraxinea* that are reinvading areas with reduced SO_2 levels have increased.

Analysis of the records from past and recent surveys is telling us much about these changes, and more revisits are needed.



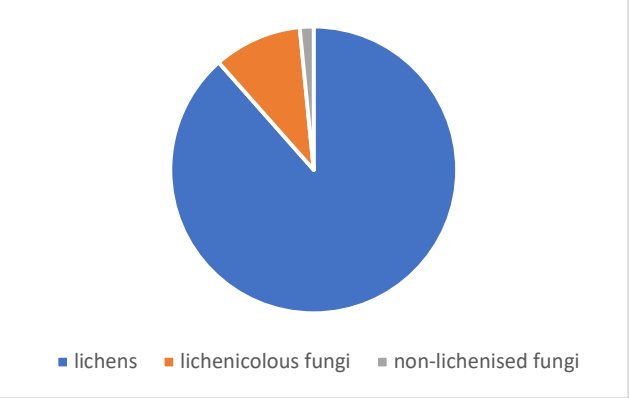
Interest in lichenicolous fungi has increased considerably in the last 10 years, and more than half the records from churchyards were made in that time.



3. Species recorded

3.1 Taxa identified

1,034 taxa were recorded to species level or lower, 915 lichens, 103 lichenicolous fungi parasitic on the lichens, and 16 of the non-lichenized fungi often recorded by lichenologists. Other records were only made to genus or group level.



For this analysis a species list for each site has been produced, and these are available as a spreadsheet. The lists include records from any date so they should not be taken as representing the lichen flora as it is now.

(Note: because some records are to higher or lower levels than species this analysis will sometimes use the terms “taxon” or “taxa” rather than “species”, usually they are interchangeable).

3.2 Lichens

Of the 915 lichen taxa, only 32 are recorded from 50% or more of the sites. All these have a conservation status of LC Least Concern.

BLS no.	Current name	Sites	% sites
298	*Candelariella vitellina f. vitellina*	7490	89%
646	*Myriolecis dispersa*	7418	88%
259	*Caloplaca flavescens*	6878	82%
627	*Myriolecis albescens*	6771	81%
247	*Caloplaca citrina s. lat.*	6769	81%
635	*Lecanora campestris subsp. campestris*	6757	81%
1510	*Verrucaria nigrescens f. nigrescens*	6638	79%
1112	*Physcia adscendens*	6463	77%
1530	*Xanthoria parietina*	6397	76%
572	*Porpidia tuberculosa*	6138	73%
1200	*Psilolechia lucida*	6113	73%
667	*Lecanora polytropa*	6109	73%
1107	*Phaeophyscia orbicularis*	6069	72%
491	*Diploicia canescens*	5836	70%
802	*Lecidella scabra*	5694	68%
820	*Lepraria incana s. lat.*	5650	67%
643	*Lecanora conizaeoides f. conizaeoides*	5355	64%
1114	*Physcia caesia*	5250	63%
661	*Protoparmeliopsis muralis*	5174	62%
10	*Acarospora fuscata*	5154	61%

BLS no.	Current name	Sites	% sites
803	*Lecidella stigmatea*	5130	61%
630	*Tephromela atra var. atra*	5061	60%
291	*Candelariella aurella f. aurella*	4776	57%
261	*Caloplaca holocarpa s. lat.*	4646	55%
496	*Diplotomma alboatrum*	4434	53%
1518	*Verrucaria viridula*	4417	53%
277	*Caloplaca saxicola*	4396	52%
103	*Circinaria calcarean*	4394	52%
281	*Caloplaca teicholyta*	4350	52%
200	*Buellia aethalia*	4257	51%
1189	*Protoblastenia rupestris*	4179	50%
1127	*Physconia grisea*	4161	50%

3.3 Lichenicolous fungi

Of the 103 lichenicolous fungi, the most common by far is *Sarcopyrenia gibba* but although classified as a lichenicolous fungus in the BLS taxon dictionary this is often considered to be lichenized. It was only noted as lichenicolous for 42 of the churchyard sites, and only one record suggests a lichen host. After that the most frequently recorded is *Muellerella lichenicola*, often on *Caloplaca flavescens* or *Lecanora campestris* but also able to parasitise a number of other species.

These are the species recorded from at least 20 sites, in descending order of frequency:

BLS no.	Taxon name	Sites	Parasitic on
1307	*Sarcopyrenia gibba var. geisleri*	742	*Caloplaca citrina s. lat.*
2116	*Muellerella lichenicola*	170	*Caloplaca flavescens, Lecanora campestris*, also *Aspicilia calcarea, Bilimbia sabuletorum, Caloplaca spp., Clauzadea monticola, Cyrtidula hippocastani, Lecania spp., Lecanora horiza, Porpidia spp., Protoblastenia rupestris, Scoliciosporum umbrinum, Tephromela atra, Verrucaria spp.*
2132	*Opegrapha rupestris*	159	*Aspicilia calcarea, Verrucaria baldensis, V. calciseda*
2267	*Weddellomyces epicallopisma*	152	*Caloplaca flavescens*
1501	*Arthonia apotheciorum*	115	*Lecanora crenulata, Lecanora albescens, L antiqua. L. campestris, L. conferta Myriolecis dispersa*
2015	*Athelia arachnoidea*	100	*Lecanora conizaeoides, Punctelia sp. Xanthoria parietina,*
2019	*Intralichen christiansenii*	98	*Lecania spp. Lecanora albescens, also Arthonia epiphyscia, Caloplaca citrina s. lat., C. flavescens, C. holocarpa, C. ruderum, C. saxicola, Candelariella aurella, C. vitellina, Catillaria lenticularis, Clauzadea monticola, L. crenulata. Lecidella stigmatea, Myriolecis dispersa, Psilolechia lucida, Xanthoparmelia mougeotii*
1904	*Kiliasia episema*	68	*Aspicilia calcarea*
2165	*Polycoccum pulvinatum*	65	*Physcia caesia*
2272	*Xanthoriicola physciae*	63	*Caloplaca flavescens, Xanthoria parietina,*
2071	*Illosporiopsis christiansenii*	47	*Physcia adscendens, P. tenella, Xanthoria parietina*
2108	*Erythricium aurantiacum*	39	*Physcia adscendens, P. caesia, P. tenella, Physconia grisea*
2261	*Vouauxiella lichenicola*	38	*Lecanora albescens, L. argentata, L. campestris, L. chlarotera*
2263	*Vouauxiella verrucosa*	34	*Lecanora campestris, L. horiza*
2092	*Lichenoconium lecanorae*	33	*Lecanora albescens, L. campestris, L. conizaeoides, Parmelia sulcata*

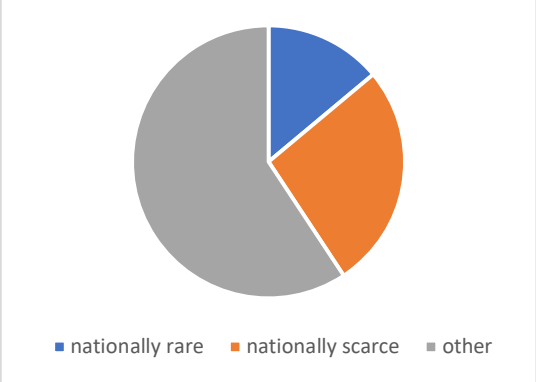
BLS no.	Taxon name	Sites	Parasitic on
2546	*Spiloma auratum*	31	*Dirina massiliensis sorediata*
2091	*Lichenoconium erodens*	28	*Lecanora albescens, L. conizaeoides, L. crenulata, L. sulphurea, Schismatomma decolorans*
2068	*Telogalla olivieri*	27	*Xanthoria calcicola, X. parietina*
2240	*Zyzygomyces physciacearum*	24	*Physcia adscendens, P. tenella, Physconia grisea*
2022	*Buelliella physciicola*	24	*Phaeophyscia orbicularis*
2025	*Cercidospora epipolytropa*	23	*Lecanora polytropa*
2260	*Unguiculariopsis thallophila*	22	*Lecanora chlarotera*
2109	*Marchandiomyces corallinus*	22	*Haematomma ochroleucum, Melanelixia spp., Myriospora dispersa, Parmelia spp., Physcia spp.*
2118	*Muellerella pygmaea*	21	*Aspicilia calcarea, Caloplaca flavescens, Clauzadea monticola, Lecidea fuscoatra, Porpidia tuberculosa, Tephromela atra, Verrucaria muralis, V. ochrostoma*
714	*Arthonia varians*	20	*Lecanora rupicola*

3.4 Species of conservation importance

The records include 55 taxa with IUCN status in Britain of Endangered (EN), Vulnerable (VU) or Near-threatened (NT), and 47 for which Britain has International Responsibility. Most notable among these are *Anaptychia ciliaris*, known from 50 sites, *Bellicidia incompta*, *Caloplaca luteoalba* and *Physcia tribacioides* all known from 9 or 10 sites.

From what we know of their national distribution in all habitats, not just churchyards, 145 are considered nationally rare (NR) and 278 nationally scarce (NS). Some fall into more than one of these categories but altogether 447 taxa have at least one of these statuses, 43.2% of the total. This number is expected to reduce as more records of under-recorded species come in.

Status	Taxa
CR Critically endangered	0
EN Endangered	6
VU Vulnerable	6
NT Near Threatened	37
IR International Responsibility	45
NR Nationally Rare	144
NS Nationally Scarce	277



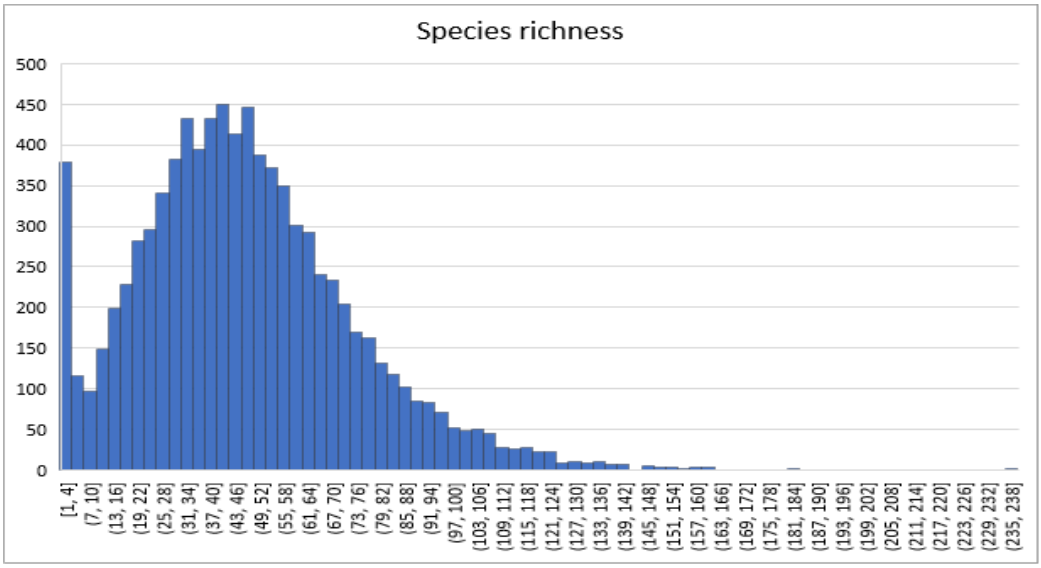
The lichens with the highest IUCN conservation status (EN and VU) are:

BLS no.	Taxon	Conservation status	Sites
EN Endangered			
45	*Anaptychia ciliaris*	EN A2 NS P Eng Wa	50
254	*Caloplaca flavorubescens*	EN A NS P Eng Sc Wa	1
266	*Caloplaca luteoalba*	EN A2, C1 NS P Eng Sc Wa S8	9
287	*Caloplaca virescens*	EN A, C, D NS P Eng Sc	1
473	*Cryptolechia carneolutea*	EN A2, C1+2, D NS P Eng IR	2
448	*Scytinium fragrans*	EN A, C NR P Sc Wa IR	1

BLS no.	Taxon	Conservation status	Sites
VU Vulnerable			
153	*Bellicidia incompta*	VU A P Eng Sc Wa	10
682	*Lecanora strobilina*	VU D2 NR	1
769	*Lecidea sarcogynoides*	VU D2 NR	2
1123	*Physcia tribacioides*	VU C1, D1 NS P Eng Wa S8	9
1381	*Teloschistes flavicans*	VU A NS P Eng Wa S8	2
1025	*Xanthoparmelia tinctina*	VU D2 NR	1

3.5 Species richness

Disregarding the churchyards for which we only have a few records, the average species richness (including lichenicolous fungi) is 49.3, with a maximum of 256.



The 30 sites, all of them churchyards, with the highest species count are:

Vice County	Location	Spatial Reference	Taxa
VC17 Surrey	Mickleham - St. Michael & All Angels	TQ170533	238
VC09 Dorset	Iwerne Courtney (Shroton) - St. Mary	ST859124	184
VC32 Northamptonshire	Wappenham - St. Mary	SP625456	162
VC34 West Gloucestershire	Newland - All Saints	SO552095	162
VC03 South Devon	Throwleigh - St. Mary the Virgin	SX667907	161
VC05 South Somerset	Nettlecombe - The Blessed Virgin Mary	ST056377	159
VC08 South Wiltshire	West Winterslow - All Saints	SU229325	159
VC13 West Sussex	Stopham - St. Mary the Blessed Virgin	TQ026189	158
VC02 East Cornwall	St. Gennys	SX148971	155
VC16 West Kent	Lamberhurst - St. Mary the Virgin	TQ682365	155
VC24 Buckinghamshire	Thornborough - St. Mary the Virgin	SP743336	153
VC04 North Devon	South Tawton - St. Andrew	SX653945	152
VC15 East Kent	Sandhurst - St. Nicholas	TQ790273	152
VC24 Buckinghamshire	Olney - St. Peter and St. Paul	SP889509	152
VC03 South Devon	Widecombe-in-the-Moor - St. Pancras	SX718768	151

Vice County	Location	Spatial Reference	Taxa
VC03 South Devon	Slapton - St. James	SX822450	149
VC11 South Hampshire	West Tytherley - St. Peter	SU274297	149
VC20 Hertfordshire	Standon - St. Mary	TL396222	148
VC32 Northamptonshire	Milton Malsor - Holy Cross	SP737556	148
VC34 West Gloucestershire	Bitton - St. Mary	ST681693	147
VC45 Pembrokeshire	Stackpole Elidor	SR988973	147
VC09 Dorset	Whitchurch Canonicorum - St. Candida & Holy Cross	SY396954	146
VC15 East Kent	Brookland - St. Augustine	TQ989258	142
VC70 Cumberland	Brigham	NY085309	142
VC20 Hertfordshire	Aldbury - St. John the Baptist	SP963124	141
VC70 Cumberland	Bowness on Solway - St. Michael	NY224627	141
VC03 South Devon	Tedburn St. Mary - St. Mary the Virgin	SX806944	140
VC32 Northamptonshire	Courteenhall - St. Peter & St. Paul	SP765529	140
VC09 Dorset	Lytchett Matravers - St. Mary the Virgin	SY935961	139
VC32 Northamptonshire	Marston - St. Lawrence	SP536421	139

4. Substrates

4.1 Available data

Of the lichen records (not non-lichenized and lichenicolous fungi) in the dataset, 279,028 include information on whether it was corticolous, saxicolous, lignicolous, or some combination of those, and further detail of the substrate and/or position is held in 219,826 of these records.

Sometimes a species is found growing on several substrates in the same churchyard (e.g. stone+wood, or sycamore+oak+lime). It will then be included in all the relevant counts below.

4.2 Lichens on stone (saxicolous)

The dataset includes 251,129 records of lichens noted as growing on stone, 90.0% of the records for which we have substrate information. These represent 838 taxa, 81% of the taxa recorded for churchyards. Those recorded most often are:

Taxa	Records
Candelariella vitellina f. vitellina	5042
Caloplaca flavescens	4784
Myriolecis dispersa	4777
Myriolecis albescens	4679
Lecanora campestris subsp. campestris	4627
Verrucaria nigrescens	4215
Porpidia tuberculosa	4146
Lecanora polytropa	4018
Psilolechia lucida	4016
Caloplaca citrina s. lat.	4008
Diploicia canescens	3950
Physcia adscendens	3938
Lecidella scabra	3826
Xanthoria parietina	3657
Acarospora fuscata	3652

Taxa	Records
Phaeophyscia orbicularis	3592
Tephromela atra var. atra	3518
Lecidella stigmatea	3369
Protoparmeliopsis muralis	3245
Physcia caesia	3171
Lepraria incana s. lat.	3122
Candelariella aurella f. aurella	3030
Diplotomma alboatrum	3028
Buellia aethalia	2970
Aspicilia calcarea	2969

The lichen flora of each stone type varies, depending on the pH, coarseness, geochemistry and other factors. It also varies with pollution, aspect, shade and dampness. We have insufficient data to analyze that here, but it may account for the considerable variation between sites that this analysis shows.

The number of records for each of the main stone types are shown below. Churchyard records for other rock types, such as serpentine and dolomitic limestone, were too few analyze.

Stone type	Visits	Records	Taxa
Natural siliceous			
SSd sandstone	3,412	53,338	506
SFl flint	262	819	132
SGr granite	1,848	9,072	307
SIr ironstone	278	2,207	232
Natural calcareous			
SLm limestone	1,995	25,198	414
SMa marble	1,470	7,001	187
Man-made			
SBr brick	834	4,048	260
SCe cement	211	1,122	140
SCo concrete	706	2,019	172
SMo mortar	1,353	6,717	256
STi tile	182	496	138

4.2.1 Siliceous stone types

The siliceous stone types used in churchyards, mainly sandstone, ironstone, granite and flint, support 563 species, with the greatest diversity found on sandstone. The lichen flora of the four main stone types is distinctly different, as shown by the following lists (in decreasing order) of the species found most commonly on each.

Sandstone includes a wide variety of fine and coarse-grained rocks, some quite calcareous and others not, but despite this it has the most consistent lichen flora, with 6 taxa being recorded in 40% or more of site visits and another 18 in more than 20%. The flora of ironstone is more varied.

Sandstone – *Candelariella vitellina, Porpidia tuberculosa, Lecanora polytropa, Acarospora fuscata, Lecidella scabra, Psilolechia lucida, Lepraria incana* s. lat.*, Lecanora conizaeoides, Tephromela atra, Protoparmeliopsis muralis*

Ironstone – *Tephromela atra, Diploicia canescens, Rinodina teichophila, Physconia grisea, Psilolechia lucida, Myriolecis antiqua, Phaeophyscia orbicularis, Caloplaca chlorina, Lecidella stigmatea, Lepraria incana* s. lat.

Granite – *Buellia aethalia, Lecanora polytropa, Acarospora privigna, Buellia ocellata, Rhizocarpon reductum, Acarospora fuscata, Candelariella vitellina, Melanelixia fuliginosa, Porpidia tuberculosa, Physcia dubia*

Flint – *Psilolechia lucida, Tephromela atra, Rinodina oleae, Myriolecis dispersa, Leimonis erratica,Xanthoria parietina, Diploicia canescens, Caloplaca saxicola, Candelariella vitellina, Lepraria incana* s. str.

The most common records overall for these siliceous rock types in churchyards are shown below:

Taxa	% SSd sandstone	% Sir ironstone	% SGr granite	% SFl flint
Candelariella vitellina f. vitellina	58.9	14.0	16.67	8.78
Psilolechia lucida	44.7	17.3	3.73	26.72
Tephromela atra var. atra	34.9	20.5	5.41	23.28
Lecanora polytropa	49.9	3.2	28.35	1.91
Buellia aethalia	16.1	0.7	46.81	6.49
Acarospora fuscata	48.0	2.5	18.40	0.38
Porpidia tuberculosa	53.4	3.2	11.20	0.76
Lecidella scabra	45.3	12.2	7.36	1.91
Rhizocarpon reductum	28.6	0.7	25.05	3.05
Lepraria incana s. lat.	35.6	15.1	2.16	1.15
Lecanora conizaeoides f. conizaeoides	35.4	3.6	9.25	1.15
Diploicia canescens	15.7	20.5	2.38	10.31
Myriolecis dispersa	22.9	8.6	2.22	13.74
Rinodina oleae	19.5	10.4	1.19	15.65
Protoparmeliopsis muralis	29.5	13.7	1.73	1.15
Lecanora expallens	23.1	13.3	1.57	5.34
Lecanora campestris subsp. campestris	24.6	12.6	2.81	3.05
Melanelixia fuliginosa	26.6	1.4	13.58	
Lecanora sulphurea	17.7	15.1	1.68	5.73
Lecanora orosthea	26.3	9.7	1.41	1.91
Buellia ocellata	10.6		25.16	3.05
Lecidella stigmatea	19.6	15.5	1.08	1.53
Acarospora privigna	9.7	0.4	26.52	0.76
Ochrolechia parella	22.2	5.0	3.41	3.82
Parmelia sulcata	21.4	5.4	6.49	0.76
Scoliciosporum umbrinum	24.6	4.7	2.44	1.91
Myriolecis albescens	23.4	6.1	0.54	2.29
Physcia adscendens	8.1	14.0	2.38	6.11
Caloplaca citrina s. lat.	21.9	7.6	0.76	0.38
Parmelia saxatilis s. lat.	24.2	0.4	5.52	

4.2.2 Calcareous stone types

Limestone and marble support 430 species, a high diversity but many of these were only recorded a few times and the stones are dominated by a fairly consistent flora of the more common species. Limestone here includes a range of hard and softer rocks, including clunch and dolomitic limestones. Marble is a finer and harder rock, and the lichen flora often includes a distinctive community of the nitrophilous species associated with *Xanthoria parietina* as well as the calcareous rock species also found on limestone. This mix is sometimes found on limestone as well.

Limestone – *Verrucaria nigrescens, Caloplaca flavescens, Myriolecis albescens, Protoblastenia rupestris, V. hochstetteri, Aspicilia calcarea, Lecanora campestris, Candelariella medians, Caloplaco teicholyta, Diploicia canescens.*

Marble – *Physcia adscendens, P. caesia, Phaeophyscia orbicularis, Xanthoria parietina, Verrucaria nigrescens, Candelariella aurella, Caloplaca holocarpa, Myriolecis dispersa, Caloplaca saxicola, M. albescens.*

The most frequently recorded taxa are shown below:

Taxa	% SLm limestone	% SMa marble
Verrucaria nigrescens f. nigrescens	47.7	32.4
Physcia adscendens	24.3	49.0
Phaeophyscia orbicularis	22.2	39.4
Physcia caesia	14.8	41.9
Caloplaca flavescens	43.9	9.6
Xanthoria parietina	15.7	35.8
Myriolecis albescens	37.7	13.2
Candelariella aurella f. aurella	21.0	24.5
Verrucaria hochstetteri	32.9	7.6
Myriolecis dispersa	23.7	16.4
Lecanora campestris subsp. campestris	28.5	9.3
Caloplaca holocarpa s. lat.	15.7	21.2
Aspicilia calcarea	31.5	3.7
Protoblastenia rupestris	33.7	1.1
Candelariella medians f. medians	26.4	8.0
Caloplaca citrina s. lat.	20.7	11.6
Bagliettoa parmigera s. lat.	24.4	7.3
Caloplaca saxicola	17.0	14.0
Lecania erysibe s. lat.	14.6	12.7
Placopyrenium fuscellum	23.5	3.5
Diploicia canescens	24.8	1.3
Caloplaca teicholyta	25.5	0.5
Lecidella stigmatea	21.8	3.7
Toniniopsis aromatica	23.6	0.3
Verrucaria viridula	20.3	2.8
Xanthoria calcicola	16.7	5.8
Catillaria lenticularis	19.8	2.6
Caloplaca aurantia	19.7	2.3
Myriolecis crenulata	19.0	2.4
Caloplaca dichroa	18.8	2.2

4.2.3 Man-made substrates

The man-made substrates, brick, cement, concrete, mortar and tile, support 372 species, but there is considerable variation between substrates and between sites. The most commonly recorded on each substrate, in descending order, are shown below.

Cement and mortar are highly calcareous and have a similar flora but concrete is rather different. They are all dominated by crustose species:

Cement – *Myriolecis dispersa, Candelariella aurella, Caloplaca saxicola, Lecanora campestris, Verrucaria nigrescens, Lecanora campestris, Lecidella stigmatea, Diploicia canescens, Rinodina oleae, Myriolecis albescens.* (all crustose)

Mortar – *Myriolecis albescens, M. dispersa, Candelariella aurella, Diplotomma alboatrum, Verrucaria muralis, Rinodina oleae, Caloplaca citrina s. lat., Lecidella stigmatea, Toniniopsis aromatica, Caloplaca flavescens.* (all crustose)

Concrete – *Caloplaca crenulatella, Lecidella stigmatea, Aspicilia contorta, Protoblastenia rupestris, Parmeliopsis muralis, Lecanora campestris, Caloplaca holocarpa s. lat., Aspicilia calcarea, Candelariella aurella, Verrucaria nigrescens.* (1 placodioid, 9 crustose)

Brick and tile are less calcareous with a lichen flora more like that of sandstone. The species found on tile include foliose lichens and others typical of the communities found on exposed surfaces.

Brick – *Lecidella scabra, Tephromela atra, Candelariella vitellina, Psilolechia lucida, Trapelia coarctata, Lecanora campestris, Myriolecis dispersa, Rinodina oleae, Protparmeliopsis muralis, Ochrolechia parella.* (1 placodioid, 9 crustose)

Tile – *Xanthoparmelia mougeotii, Xanthoparmelia verruculifera, Candelariella vitellina, Porpidia tuberculosa, Xanthoria parietina, Trapelia coarctata, Buellia ocellata, Catillaria chalybeia, B. aethalea, Lecidella scabra.* (3 foliose, 7 crustose)

The most common records overall from these substrates are shown below:

Taxa	% SCe cement	% SMo mortar	% SCo concrete	% SBr brick	% STi tile
Myriolecis dispersa	24.6	21.1	5.5	12.1	2.7
Candelariella aurella f. aurella	21.8	21.0	7.1	5.9	1.6
Lecidella stigmatea	15.6	14.0	18.1	7.0	2.2
Myriolecis albescens	13.7	24.5	4.4	9.0	0.5
Lecanora campestris subsp. campestris	16.6	6.1	8.6	12.6	2.2
Rinodina oleae	14.2	16.5	3.0	11.8	0.5
Caloplaca citrina s. lat.	13.3	15.2	5.4	10.4	0.5
Verrucaria nigrescens f. nigrescens	16.6	10.1	7.1	7.1	1.1
Caloplaca flavescens	12.8	13.4	4.1	7.0	
Caloplaca saxicola	18.0	12.1	3.1	2.5	1.1
Caloplaca holocarpa s. lat.	10.9	8.2	8.4	7.4	1.6
Aspicilia contorta subsp. contorta	11.8	2.7	17.1	1.7	1.6
Verrucaria muralis	7.1	18.9	4.5	3.4	
Candelariella vitellina f. vitellina	3.3	1.2	0.4	14.5	13.2
Diploicia canescens	15.2	6.4	0.7	8.5	1.6
Lecania erysibe s. lat.	13.7	10.0	3.4	4.7	0.5
Protoblastenia rupestris	9.5	7.2	12.0	1.2	1.6
Diplotomma alboatrum	7.1	19.6	0.8	3.7	
Protoparmeliopsis muralis	2.8	1.2	11.3	10.7	4.4
Lecidella scabra	1.4	0.8	2.3	20.0	4.9
Verrucaria viridula	9.0	7.0	6.2	6.5	
Toniniopsis aromatica	11.4	13.9	1.7	1.4	
Xanthoria parietina	5.2	3.3	4.5	6.4	8.2
Sarcogyne regularis	10.0	11.2	5.0	0.8	
Xanthoria calcicola	12.8	2.4	3.3	5.9	1.6
Psilolechia lucida	1.9	5.5		13.9	2.7
Tephromela atra var. atra		1.9	0.6	16.7	4.4

Taxa	% SCe cement	% SMo mortar	% SCo concrete	% SBr brick	% STi tile
Caloplaca crenulatella	0.9	1.8	19.5	0.7	
Porpidia tuberculosa	0.9	0.1	1.0	8.9	12.1
Trapelia coarctata	0.5	0.3	0.7	13.2	7.7

4.3 Lichens on wood (lignicolous)

The dataset includes 7,992 records noted as growing on wood, 2.9% of those for which we have data. These represent 295 taxa, 28.5% of those recorded from churchyards. There is some overlap here with the lists for corticolous and saxicolous species as some lichens can grow on more than one substrate.

Most of the wood is worked timber, usually part of a bench or fence, rather than fallen trees or branches which tend to be tidied away in churchyards. Three of the 10 species recorded most often are foliose, the others crustose.

Those recorded most often are:

Taxa	Records
Lecanora conizaeoides f. conizaeoides	579
Placynthiella icmalea	388
Trapeliopsis flexuosa	362
Parmelia sulcata	348
Amandinea punctata	310
Hypogymnia physodes	308
Micarea denigrata	307
Lecanora symmicta	226
Melanelixia subaurifera	206
Lecanora expallens	201
Hypocenomyce scalaris	192
Xanthoria polycarpa	185
Evernia prunastri	176
Trapeliopsis granulosa	164
Candelariella vitellina f. vitellina	155
Physcia tenella	152
Buellia griseovirens	142
Flavoparmelia caperata	142
Lecanora chlarotera	138
Physcia adscendens	127
Xanthoria parietina	126

4.4 Lichens on trees (corticolous)

4.4.1 Available data

The dataset includes 21,837 records noted as corticolous. These represent 386 taxa, 37.3% of those recorded from churchyards. There is some overlap here with the lists for lignicolous and saxicolous species as some lichens can grow on more than one substrate.

Most are from sycamore (*Acer pseudoplatanus*) and other maples (*Acer* sp.), ash (*Fraxinus excelsior*), oak (*Quercus* sp.), lime (*Tilia* sp.) and yew (*Taxus baccata*).

Tree host	Visits	Records	Taxa
CAc Field Maple	126	490	86
CAp Sycamore and Norway Maple	517	2,646	198
CFx Ash	459	2,272	202
CQ Oak	321	1,994	183
CTi Lime	253	1,128	155
CTx Yew	285	741	97

4.4.2 Broadleaved trees

The lichen flora of each of these trees is different, although with many species in common. The ten species most commonly recorded on each tree, are shown below in descending order:

Field maple – *Physcia tenella, Xanthoria parietina, Lecanora chlarotera, Parmelia sulcata, Lecidella elaeochroma, Amandinea punctata, Evernia prunastri, Ramalina farinacea, Physcia adscendens, Xanthoria polycarpa*. (7 foliose, 3 crustose)

Sycamore and Norway maple – *Lecanora chlarotera, Evernia prunastri, Lecidella elaeochroma, Physcia tenella, Amandinea punctata, Parmelia sulcata, Ramalina farinacea, Xanthoria parietina, Lecanora expallens, Melanelixia subaurifera.* (6 foliose, 4 crustose)

Ash – *Lecanora chlarotera, Lecidella elaeochroma, Xanthoria parietina, Physcia tenella, Parmelia sulcata, Arthonia radiata, Amandinia punctata, Ramalina farinacea, Evernia prunastri, Physcia adscendens.* (6 foliose, 4 crustose)

Oak – *Parmelia sulcata, Lecanora chlarotera, Evernia prunastri, Melanelixia subaurifera, Physcia tenella, Xanthoria parietina, Ramalina farinacea, Flavoparmelia caperata, Lecidella elaeochroma, Arthonia radiata.* (7 foliose, 3 crustose)

Lime - *Lecanora chlarotera, L. expallens, Parmelia sulcata, Lecidella elaeochroma, Xanthoria parietina, Amandinea punctata, Evernia prunastri, Pertusaria pertusa, Ramalina farinacea, Punctelia subrudecta s. lat.* (5 foliose, 5 crustose)

Not surprisingly most of the species near the top of the list overall are considered to be nitrophiles or at least tolerant of the high levels of atmospheric ammonia or NOx now found in much of England and Wales. These include *Amandinea punctata, Arthonia radiata, Lecidella elaeochroma*, *Phaeophyscia orbicularis*, *Physcia adscendens*, *P. tenella*, *Xanthoria parietina*, *and X. polycarpa.*

The species recorded most often on each broadleaved tree host are shown below, in descending order, with frequencies above 20% highlighted. The figures indicate the proportion of site visits that include records from that tree, and the surprisingly low values for some common species may be due to under-recording of trees during churchyard recording.

Taxa	% CAc field maple	% CAp sycamore	% C ash	% CQ oak	% CTi lime
Lecanora chlarotera	23.8	30.9	33.8	28.7	23.3
Parmelia sulcata	18.3	20.5	20.5	30.8	21.7
Physcia tenella	27.0	21.3	21.8	23.4	10.7
Xanthoria parietina	25.4	19.0	23.3	21.2	14.2
Lecidella elaeochroma	14.3	22.6	29.4	18.7	15.0
Evernia prunastri	11.9	24.2	13.7	27.7	13.8
Amandinea punctata	14.3	20.7	15.3	14.3	14.2

Taxa	% CAc field maple	% CAp sycamore	% C ash	% CQ oak	% CTi lime
Ramalina farinacea	11.9	20.1	15.3	19.0	11.9
Lecanora expallens	6.3	17.0	11.8	14.3	23.3
Melanelixia subaurifera	10.3	15.1	9.2	25.2	10.3
Arthonia radiata	9.5	7.2	15.7	15.6	9.1
Flavoparmelia caperata	9.5	7.5	10.5	19.0	9.5
Physcia adscendens	11.9	11.0	13.5	10.0	8.3
Xanthoria polycarpa	11.1	6.4	8.9	14.6	5.9
Phaeophyscia orbicularis	9.5	7.7	10.9	5.3	7.9
Pertusaria pertusa	3.2	9.1	6.5	9.0	13.4
Punctelia subrudecta s. lat.	2.4	6.2	8.7	11.2	11.9
Melanelixia glabratula	6.3	10.1	5.4	9.3	8.3
Phlyctis argena	9.5	6.4	7.4	9.3	5.5
Diploicia canescens	7.9	11.0	4.4	6.9	6.7
Cliostomum griffithii	6.3	6.0	6.3	7.5	7.9
Physconia grisea	6.3	12.8	3.9	3.7	6.7
Ramalina fastigiata	7.9	7.9	5.0	9.3	3.2
Parmotrema perlatum	4.0	5.4	4.6	11.5	4.3
Hypogymnia physodes	3.2	6.0	5.0	10.6	4.0
Hyperphyscia adglutinata	7.1	7.5	5.2	2.5	5.9
Lepra amara	1.6	5.6	4.8	8.4	6.7
Lepraria incana s. lat.	1.6	4.4	3.3	5.9	9.1
Punctelia subrudecta s. str.	4.8	3.1	2.8	10.3	1.6
Pyrrhospora quernea	0.8	4.3	5.7	6.9	4.7
Arthonia atra	1.6	7.4	5.4	4.4	3.6
Candelariella reflexa	4.0	3.5	3.9	7.8	2.0
Enterographa crassa	2.4	4.3	1.5	7.5	4.7

4.4.3 Yew

The lichen flora of yew is rather different, and although some of the most common species are again nitrophiles these are less frequent than on the broadleaves and are present at much lower abundance. *Zwackhia prosodea*, *Alyxoria xerica* and *Opegrapha vulgata*, with other species of *Alyxoria* and *Opegrapha*, are a significant component of the flora.

Taxa	% CTx yew
Physcia tenella	26.0
Zwackhia prosodea	17.9
Xanthoria parietina	17.5
Physcia adscendens	13.0
Alyxoria xerica	12.3
Opegrapha vulgata	9.8
Melanelixia subaurifera	9.1
Lepraria incana s. lat.	7.7
Parmelia sulcata	7.0
Xanthoria polycarpa	6.7
Amandinea punctata	6.0
Cresponea premnea	5.6

Taxa	% CTx yew
Hypogymnia physodes	5.3
Ramalina farinacea	4.6
Diploicia canescens	4.6
Opegrapha vermicellifera	4.6
Hyperphyscia adglutinata	4.2
Hypotrachyna revoluta s. lat.	4.2
Evernia prunastri	3.9
Punctelia subrudecta s. str.	3.9
Punctelia subrudecta s. lat.	3.5
Parmotrema perlatum	3.5
Alyxoria varia	3.5
Lecidella elaeochroma f. elaeochroma	3.2
Phaeophyscia orbicularis	3.2
Enterographa crassa	3.2
Diarthonis spadicea	3.2
Lepraria finkii	3.2
Opegrapha corticola	3.2

5. Positions

5.1 Available data

As well as substrate many of the churchyard records also include coded information on position, particularly whether the lichen was recorded on the church building, the boundary wall, headstones or other types of tomb, and other structures within in the churchyard.

Position	Visits	Records	Taxa
XX church	4,431	86,180	607
XBw/XRw boundary or retaining wall	2,059	19,635	452
XHd headstone	3,120	45,627	504
XCht/XTt chest or table tomb	1,497	7,072	338
XPa path	531	1,099	135
XBe bench or seat	249	1,248	154

5.2 Church building and walls

660 taxa are noted as being found on the outside of church buildings, including those on buttresses, the roof or the porch, or the boundary wall or a retaining wall. This represents 63.8% of all the species recorded from churchyards. The species recorded most often are:

Taxa	% XX Church	% XBw/XRw Walls
Myriolecis albescens	60.0%	26.7%
Caloplaca flavescens	53.3%	18.4%
Myriolecis dispersa	54.0%	17.2%
Caloplaca citrina s. lat.	42.5%	27.2%
Lecanora campestris subsp. campestris	43.9%	24.0%
Candelariella vitellina f. vitellina	36.0%	21.7%
Diploicia canescens	49.5%	8.0%
Verrucaria nigrescens	34.9%	22.3%

Taxa	% XX Church	% XBw/XRw Walls
Lecidella scabra	28.6%	22.6%
Tephromela atra var. atra	32.1%	18.5%
Diplotomma alboatrum	44.7%	5.3%
Lepraria incana s. lat.	31.8%	17.0%
Lecidella stigmatea	28.3%	19.3%
Candelariella aurella f. aurella	34.4%	11.9%
Rinodina oleae	34.4%	11.4%
Caloplaca saxicola	36.3%	5.5%
Psilolechia lucida	34.0%	5.0%
Dirina massiliensis f. sorediata	37.1%	1.5%
Myriolecis crenulata	33.0%	3.3%
Caloplaca holocarpa s. lat.	20.6%	15.6%
Toniniopsis aromatica	26.9%	7.9%
Caloplaca teicholyta	30.6%	3.4%
Xanthoria parietina	19.4%	14.1%
Ochrolechia parella	18.1%	15.3%
Lecanora polytropa	15.5%	17.4%
Acarospora fuscata	18.1%	14.8%
Lecania erysibe s. lat.	23.2%	9.3%
Verrucaria viridula	22.2%	10.0%
Protoblastenia rupestris	21.1%	10.8%
Porpidia tuberculosa	13.0%	18.5%

5.3 Headstones and tombs

541 taxa are recorded from headstones, chest tombs and table tombs in the churchyard or graveyard, 52.3% of the total for churchyards. None have been recorded from monuments inside churches. There is a considerable overlap with the lichen flora of church buildings and walls, but the most frequently recorded species are different. Headstones, with their mainly vertical surfaces and east and west aspects, have a fairly consistent core lichen flora, while chest and table tombs, with their large horizontal surfaces, show more variation between sites.

Taxa	% XHd Headstones	% XCht/XTt Chest and table tombs
Lecanora polytropa	41.5	13.2
Candelariella vitellina f. vitellina	40.4	10.1
Acarospora fuscata	38.2	12.0
Porpidia tuberculosa	35.0	14.9
Physcia adscendens	41.8	3.9
Phaeophyscia orbicularis	36.5	4.3
Physcia caesia	35.9	3.2
Psilolechia lucida	36.2	2.1
Verrucaria nigrescens	28.9	8.4
Myriolecis albescens	29.4	5.6
Caloplaca flavescens	27.0	7.7
Lecanora conizaeoides f. conizaeoides	32.1	2.0
Xanthoria parietina	31.0	3.1

Taxa	% XHd Headstones	% XCht/XTt Chest and table tombs
Rhizocarpon reductum	24.4	7.5
Buellia aethalea	28.4	3.0
Melanelixia fuliginosa	22.2	8.4
Lecanora soralifera	21.2	8.7
Lecanora campestris subsp. campestris	24.0	5.0
Myriolecis dispersa	26.2	2.6
Parmelia saxatilis s. lat.	19.0	8.6
Aspicilia calcarea	12.0	15.6
Caloplaca citrina s. lat.	23.0	3.9
Protoparmeliopsis muralis	18.1	7.9
Candelariella aurella f. aurella	24.2	1.3
Lepraria incana s. lat.	21.0	3.3
Scoliciosporum umbrinum	14.8	8.9
Caloplaca holocarpa s. lat.	20.7	2.4
Protoblastenia rupestris	7.9	14.9
Parmelia sulcata	18.8	2.6
Verrucaria hochstetteri	12.3	9.1

5.4 Church path

135 taxa are recorded from church paths, but this includes those that are paved, tarmac, gravel or just grass so there is a lot of variation between sites. The species most often recorded are:

Taxa	% XPa Path
Protoparmeliopsis muralis	33.9
Lecanora campestris subsp. campestris	12.6
Aspicilia contorta subsp. contorta	10.4
Physcia caesia	9.6
Lecidella stigmatea	8.9
Caloplaca crenulatella	8.5
Caloplaca citrina s. lat.	6.4
Aspicilia calcarea	5.1
Candelariella vitellina f. vitellina	5.1
Myriolecis dispersa	4.9
Blennothallia crispa	4.5
Lecidella scabra	4.1
Aspicilia contorta subsp. hoffmanniana	4.0
Verrucaria nigrescens	4.0
Caloplaca holocarpa s. lat.	3.8
Protoblastenia rupestris	3.8
Enchylium tenax var. ceranoides	3.2
Xanthoparmelia conspersa	3.2
Xanthoria parietina	3.2
Phaeophyscia orbicularis	3.0

5.5 Benches and seats

154 taxa are recorded from seats and benches in churchyards and graveyards, but the number of records is small and it seems likely that this habitat is under-represented in the database. Those recorded most often are:

Taxa	% XBe Benches and seats
Amandinea punctata	27.7%
Parmelia sulcata	23.3%
Lecanora symmicta	20.5%
Melanelixia subaurifera	16.5%
Trapeliopsis flexuosa	16.1%
Buellia griseovirens	15.7%
Micarea denigrata	15.7%
Hypogymnia physodes	14.9%
Xanthoria polycarpa	14.1%
Lecidella elaeochroma f. elaeochroma	13.7%
Xanthoria parietina	13.3%
Candelariella vitellina f. vitellina	12.9%
Flavoparmelia caperata	12.9%
Lecanora chlarotera	12.4%
Lecanora conizaeoides f. conizaeoides	12.4%
Candelariella reflexa	12.0%
Physcia tenella	10.8%
Lecanora expallens	10.4%
Evernia prunastri	8.8%
Physcia adscendens	8.8%
Placynthiella icmalea	8.8%
Phaeophyscia orbicularis	8.0%
Melanelixia glabratula	7.6%
Punctelia subrudecta s. str.	7.6%
Physcia caesia	7.2%
Xanthoria candelaria s. lat.	6.4%
Hypotrachyna revoluta s. lat.	6.0%
Flavoparmelia soredians	5.6%
Ramalina farinacea	5.2%
Halecania viridescens	4.8%
Parmotrema perlatum	4.8%