LICHENS IN GREENWICH PARK

A survey by Joe Beale, Mark Powell and Paula Shipway

11th May 2017

Summary

The survey produced a list of eighty-five taxa, four of which are only tentatively identified and seven are lichenicolous fungi. Nine of the taxa are currently evaluated as Nationally Scarce (present in 16 to 100 British hectads) and two of them are Nationally Rare (present in 15 or fewer British hectads). However, all except one of these are common species which appear scarcer due to under-recording. *Polycoccum kerneri* is reported for only the second time in Britain and Ireland (the only previous record was from Devon in 1989).

The corticolous communities of Greenwich Park are not rich – the history of pollution

Yahr *et al.* (2009) described the background situation: "Lichen diversity in lowland England was devastated by the effects of industrial pollution during and after the Industrial Revolution, creating the well-known 'lichen deserts' already recognized in the late nineteenth century." Laundon (2012) explained the effects of changing atmospheric conditions in the City of London: "The pollutant which has the greatest adverse effect on lichens is sulphur dioxide (SO_2). No lichens had been recorded in the City before 1954, so that the Square Mile was then a lichen desert. This was because of the high level of sulphur dioxide. Between 1971 and 1980 sulphur dioxide concentrations in the City fell by more than 80%, and since 1980 they have halved again, and continue to decline. *Lecanora dispersa* was apparently the only lichen present before 1973, but since then forty-two species have been found. This unprecedented increase is due to the diminution of sulphur dioxide air pollution. Today the most important pollutant is nitrogen dioxide (NO_2). This is largely a secondary pollutant formed by the oxidation of nitric oxide (NO)."

The background atmospheric conditions in Greenwich will perhaps have been slightly less severe than in the City of London but will have been broadly comparable; Greenwich Park was well within the former severe 'lichen desert' conditions of Eastern England. Most of the lichen species recorded now will be relatively recent colonisers. We found no lichens that are likely to be relicts from pre-Industrial Revolution times.

Periodic surveys of the corticolous lichens (those growing on tree bark) at sites such as Greenwich Park are of great interest in monitoring the phenomenal increase in diversity of lichens in formerly polluted regions. Laundon (2012) gives an optimistic view of the situation: "In the British Isles most groups of organisms are in decline in the early twenty-first century. Fortunately, this is not true of lichens, because in many areas these are increasing, especially those which grow on bark. It is good to be able to report that lichens 'buck the trend' in comparison with other forms of wildlife."

The 'wrong' sort of trees

The subtitle above is not meant as a criticism of any past or present planting plans. It merely points out that the trees present in Greenwich Park are predominantly those which support a relatively low diversity of lichens in this region. *Castanea*, *Platanus*, *Aesculus* and most conifers tend to be relatively poor. The rather sparse occurrences of other species, such as *Crataegus*, *Fraxinus* and *Morus*, tend to be hotspots of diversity. A rather recently planted *Fraxinus* to the east of the Flower Garden has a community of crustose lichens rather different from that seen elsewhere with the only sighting of *Arthonia* radiata in the park and accompanied by *Catillaria nigroclavata* and *Lecanora persimilis*. A *Morus* close by has a tentatively identified specimen of *Punctelia borreri* on one of its branches. A *Morus* in the Flower Garden is particularly well-colonized by lichens and is the only known site in the Park for several foliose lichens.

Greenwich Park, too dry?

The survey was conducted on a fine and breezy day with the grass surprisingly brown for so early in the season. The past winter and current spring is reported to have been notably dry and this is particularly noticeable on a site with a free-draining soil. While the weather conditions have little effect on lichens in the short term, sites on light soils tend to be less humid and this often results in relatively poor lichen communities. If we compare the corticolous communities at Greenwich Park with those at Kew Gardens, the latter appear to be much richer. The main factors leading to this difference are likely to be the species of tree (a great range of tree species at Kew) and the more sheltered and humid conditions at Kew.

The corticolous communities

The lichens of branches in this region can be divided into two main groups, those found on relatively acidic bark and dominated by 'Parmelioid' lichens and those in which nutrient-enrichment is more evident and dominated by species of *Xanthoria* and *Physcia*. With decreasing acidity and increasing effects of enrichment there has been a decline across Eastern England of Parmelioid lichens and an increase of *Xanthoria* and *Physcia* species. Skinner (2016) reported the results of a resurvey of lichens in quadrats at Hatfield Forest (1989 and 2009). The following extract illustrates the changing communities (which appear to be also observed widely across much of lowland England): "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".

At Greenwich Park, the balance is tipped in favour of the *Xanthoria*/*Physcia* community too, despite the natural 'acidity' of the site and its tree species. *Parmelia sulcata* is present reasonably frequently on shaded horizontal branches, where it is accompanied by *Punctelia subrudecta* and *Melanelixia subrudecta* (and others in smaller quantity). In comparison *Xanthoria* and *Physcia* species are abundant on twigs and branches throughout Greenwich Park.

Xanthoria polycarpa appears to have declined across Eastern England over the last decade. Although it is a species of nutrient-enrichment, it is perhaps rather less so than *Physcia adscendens*, *P. tenella* and *Xanthoria parietina* and these species are now the dominant species of most twigs and small branches. At Greenwich Park *X. polycarpa* is rather common when compared with many other sites. The hard bark of the dominant types of tree will be less absorbent to nutrients and this may be allowing *X. polycarpa* still to thrive.

A few individual trees add disproportionately to the diversity of lichens at Greenwich Park. This is common to many sites but is particularly noticeable at a site dominated by *Castanea*, *Platanus* and Quercus. To add to the *Crataegus*, *Fraxinus* and *Morus* list in a previous section, some young *Ulmus* near the Royal Observatory support a richer community than most of the larger trees elsewhere.

At this point it is useful to introduce the concept of 'toxic legacy'. The bark of the trunks of many species of trees is a long-lasting surface and the bark of old tree trunks will have been subjected to many decades of sulphurous and sooty pollution during the twentieth century. This sort of old bark tends to resist colonization by lichens. An example is of several large *Fraxinus* trees in a dell. If these had grown in a less polluted region they would support a rich assemblage of lichens but here they are colonized by algal crusts, along with small patches of sorediate lichens and no macro-lichens.

Figure 1. *Physcia stellaris* at Greenwich Park. Formerly almost completely eradicated from Eastern England and the Midlands by sulphur dioxide pollution, *P. stellaris* appears to be spreading. Its separation from *P. aipolia* ought to be straightforward but may cause uncertainty (and the taxonomy may be more complicated than we realise). Currently the name *P. stellaris* is applied to specimens with a K- medulla and with lobes that have very indistinct white flecks (maculae).

The canine zone

The use of trees by urinating dogs modifies the epiphytes which grow on the lower trunks of trees throughout Greenwich Park. The most frequently visited trees have lower trunks dominated by algal crusts, sometimes accompanied by *Lecanora dispersa*. The algal crusts often resemble sorediate lichen crusts, being rather thick and sometimes with a whitish surface due to the presence of a superficial layer of dead algal cells.

Boundary wall near Maze Hill gate

This wall is of interest for the lichen community on the sandstone coping blocks, and for the presence of *Polycoccum kerneri*, lichenicolous on *Lecidea fuscoatra*, representing only the second British record. The lichen community on the sandstone is dominated by *Candelariella vitellina*, *Catillaria chalybeia*, *Lecidella scabra*, *Lecanora muralis*, *Lecidea fuscoatra* s. lat and *Porpidia soredizodes* with smaller quantities of *Amandinea punctata*, *Buellia aethalea, B. ocellata, Lecanora dispersa, L. polytropa* and *Lecidella carpathica*.

Terricolous lichens

The only terricolous lichens were found among the relatively sparse vegetation on a couple of the Saxon burial mounds. *Cladonia furcata* is present along with one or two other species which were so poorly developed that reliable identification was not possible. The most notable lichen here is *Cetraria aculeata*, a common lichen in the national context, but relatively exciting to find in an urban park.

Absentees

There are many lichens which are now common across Eastern England but which were not encountered in Greenwich Park. The post-AGM meeting of the British Lichen Society visited Abney

Park Cemetery in Stoke Newington. The *Fraxinus* stems there supported numerous colonies of various lichens containing *Trentepohlia* as their photosynthetic partner. *Porina aenea*, *P. byssophila*, *Strigula jamesii* and *S. taylorii* were all present in quantity at Abney Park but appear to be completely absent in Greenwich Park. Species of *Opegrapha* are a significant component of the recolonizing community across Eastern England and some sites support six or more members of this genus; none were found in Greenwich Park. On twigs across Eastern England, *Scoliciosporum chlorococcum* appears to have declined while *Halecania viridescens* has dramatically increased; neither species was encountered during our survey. *Unguiculariopsis thallophila* is a lichenicolous fungus which is now frequently encountered bursting out of its host in Eastern England. Despite the presence of its host (*Lecanora chlarotera*) at Greenwich Park, no signs of *U. thallophila* were spotted. The apparent absence of *Physcia caesia* at Greenwich Park is very surprising.

Table: list of lichens and lichenicolous fungi recorded at Greenwich Park

Column A gives the standard BLS number for each taxon. If Column A is filled with red it indicates that the taxon is new for VC 16 (West Kent). The maps on the BLS website, accessed in February 2017, were used to determine which species are new for West Kent; all are lichenicolous fungi, a group which is much under-recorded.
Column B gives the name of each taxon recorded.
Column C indicates whether the taxon is a lichenicolous fungus {LF}, a lichen-related fungus {F} or a lichen (0).
Column D gives the conservation designations as follows: LC = Least Concern, DD = Data Deficient, NS = Nationally Scarce, NR = Nationally Rare, Sc = relevant to Scottish sites.
Column E gives the substratum upon which the taxon was growing: Cort = corticolous (growing on bark), Lic = lichenicolous, Sax = saxicolous (growing on stone).
Column F provides habitat details using the standard BLS habitat codes.

212	*Amandinea punctata*	0	LC	Cort	CQ
2683	*Arthonia parietinaria*	{LF}		Lic	Z1530
69	*Arthonia radiata*	0	LC	Cort	CFx
1542	*Arthopyrenia punctiformis*	{F}	LC	Cort	CCt
107	*Aspicilia contorta subsp. contorta*	0	LC	Sax	STa
200	*Buellia aethalea*	0	LC	Sax	SSd
219	*Buellia ocellata*	0	LC	Sax	SSd
2442	*Caloplaca arcis*	0	LC NS	Sax	SCo
249	*Caloplaca crenulatella*	0	LC	Sax	STa
2315	*Caloplaca flavocitrina*	0	LC	Sax	SBr
2607	*Caloplaca limonia*	0	LC	Sax	SCo
2461	*Caloplaca oasis*	0	LC	Sax	SCo
271	*Caloplaca obscurella*	0	LC	Cort	CQ
277	*Caloplaca saxicola*	0	LC	Sax	SCo
289	*Candelaria concolor*	0	LC	Cort	CU
291	*Candelariella aurella f. aurella*	0	LC	Sax	SMo
297	*Candelariella reflexa*	0	LC	Cort	CQ
294	*Candelariella vitellina f. flavovirella*	0	LC	Sax	SSd
298	*Candelariella vitellina f. vitellina*	0	LC	Sax	SSd
306	*Catillaria chalybeia var. chalybeia*	0	LC	Sax	SSd
316	*Catillaria nigroclavata*	0	LC NS	Cort	CFx

430	*Cetraria aculeata*	0	LC	Terr	
	Cladonia cf. coniocraea	0		Terr	
389	*Cladonia furcata subsp. furcata*	0	LC	Terr	
	Cladonia cf. pyxidata			Sax	SMo
491	*Diploicia canescens*	0	LC	Cort	CCt
498	*Diplotomma hedinii*	0	LC NS	Sax	SMo
511	*Evernia prunastri*	0	LC	Cort	CCt
987	*Flavoparmelia caperata*	0	LC	Cort	CU
1018	*Flavoparmelia soredians*	0	LC Sc	Cort	CCs
1125	*Hyperphyscia adglutinata*	0	LC	Cort	CU
582	*Hypogymnia physodes*	0	LC	Cort	
583	*Hypogymnia tubulosa*	0	LC	Cort	
2468	*Hypotrachyna afrorevoluta*	0	LC	Cort	CQ
2577	*Hypotrachyna revoluta s. str.*	0	LC	Cort	CQ
2667	*Laetisaria lichenicola*	{LF}		Lic	Z1112
1707	*Lecania inundata*	0	LC NS	Sax	SLm
627	*Lecanora albescens*	0	LC	Sax	SCo
2121	*Lecanora barkmaniana*	0	LC NS	Cort	CQ
636	*Lecanora carpinea*	0	LC	Cort	CQ
639	*Lecanora chlarotera*	0	LC	Cort	CQ
1996	*Lecanora compallens*	0	LC NS	Cort	
641	*Lecanora confusa*	0	LC	Cort	CFg
646	*Lecanora dispersa*	0	LC	Cort	CU
649	*Lecanora expallens*	0	LC	Cort	CU
661	*Lecanora muralis*	0	LC	Sax	SSd
1836	*Lecanora persimilis*	0	LC	Cort	CFx
667	*Lecanora polytropa*	0	LC	Sax	SSd
610	*Lecanora semipallida*	0	LC NS	Sax	SMo
688	*Lecanora symmicta*	0	LC	Cort	CQ
724	*Lecidea fuscoatra s. lat.*	0		Sax	SSd
796	*Lecidella carpathica*	0	LC	Sax	SSd
797	*Lecidella elaeochroma f. elaeochroma*	0	LC	Cort	CQ
802	*Lecidella scabra*	0	LC	Sax	SSd
803	*Lecidella stigmatea*	0	LC	Sax	SCo
1974	*Lepraria incana s. str.*	0	LC	Cort	CQ
2108	*Marchandiomyces aurantiacus*	{LF}	LC	Lic	Z1112,CQ
1020	*Melanelixia subaurifera*	0	LC	Cort	CQ
1022	*Parmelia sulcata*	0	LC	Cort	CQ
1107	*Phaeophyscia orbicularis*	0	LC	Cort	CQ
1112	*Physcia adscendens*	0	LC	Cort	CQ
1119	*Physcia stellaris*	0	LC	Cort	CCt
1120	*Physcia tenella*	0	LC	Cort	CQ
1127	*Physconia grisea*	0	LC	Cort	CCt
2160	*Polycoccum kerneri*	{LF}	NE NR	Sax	Z0724,SSd
1690	*Porpidia soredizodes*	0	LC	Sax	SSd
1200	*Psilolechia lucida*	0	LC	Sax	SBr

	Punctelia cf. borreri	0		Cort	
1989	*Punctelia jeckeri*	0	LC	Cort	
2070	*Punctelia subrudecta s. str.*	0	LC	Cort	CQ
1235	*Ramalina fastigiata*	0	LC	Cort	CCt
1289	*Rinodina oleae*	0	LC	Sax	SBr
1306	*Sarcogyne regularis*	0	LC	Sax	SMo
2240	*Syzygospora physciacearum*	{LF}	LC NS	Lic	Z1112,CQ
2603	*Tubeufia heterodermiae*	{LF}	NE	Lic	Z1112,CQ
	Verrucaria cf. macrostoma	0		Sax	SLm
1507	*Verrucaria muralis*	0	LC	Sax	SMo
2514	*Verrucaria nigrescens f. tectorum*	0	LC	Sax	SSd
1511	*Verrucaria ochrostoma*	0	DD NR	Sax	SLm
1518	*Verrucaria viridula*	0	LC	Sax	SBr
1526	*Xanthoria calcicola*	0	LC	Sax	SCo
1530	*Xanthoria parietina*	0	LC	Cort	CQ
1531	*Xanthoria polycarpa*	0	LC	Cort	CQ
950	*Xanthoria ucrainica*	0	LC NS	Cort	CQ
2272	*Xanthoriicola physciae*	{LF}	LC	Lic	Z1530,CCt

Appendix: recent records of additional species at Greenwich Park, that were not found during the May 2017 survey

Records by Joe Beale (2016/17):
Cladonia coniocraea
Cladonia sp.
Illiosporiopsis christiansenii (LF)
Laetisaria lichenicola (LF)
Parmotrema perlatum
Physcia aipolia
Ramalina farinacea
Usnea sp.

Records from a preliminary study by Ishpi Blatchley, Don Chapman, Linda Davies and Amanda Waterfield, 5th March 2008.
Athelia arachnoidea (LF)
Lecanora campestris
Lecanora conizaeoides
Protoblastenia rupestris

References

Laundon, J.R. (2012) Lichens invade the City of London. *The London Naturalist* **91:** 53-68.
Skinner, J.F. (2016) Observations on the changes in the lichen flora of Hatfield Forest, Essex, over a nineteen year period. *Bull. Brit. Lichen Soc.* **119:** 42-48.
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