Transactions of the Hertfordshire Natural History Society
Volume 44 Part 1, September 2012

Rose Chafer in Oaklands, Welwyn on 19 May 2012. Photo Alastair Parnel.

Bee Orchid at Weston Hills on 1 July 2012. Photo Steve Woody.

Chicken of the Wood Fungi Laetiporus sulphureus *at Heartwood Forest on 25 July 2011. Photo by Andrew Steele.*

The Hertfordshire Naturalist 2012

Herts Naturalist 2012

New excavation at Little Heath geological SSSI

John Catt

The previous excavation in the Plio-Pleistocene beach gravels at Little Heath geological Site of Special Scientific Interest (TL 017083) described by Moffat and Catt (1983) became very degraded in recent years, mainly through disturbance by badgers. Consequently money was sought through Natural England's Conservation and Enhancement Scheme for a new and larger excavation. The grant was administered by the National Trust, which owns the WW1 gravel pits and surrounding woodland near Potten End, Berkhamsted. The funding became available in February 2012, and the work was completed in March under contract with Archaeological Services and Consultancy Ltd of Milton Keynes.

The site at Little Heath. Photo John Catt.

The new excavation confirmed the sequence of deposits recorded earlier, though the uppermost deposit, the Devensian silty clay gravel (bed 8) of Moffatt and Catt, previously described as 'glacial' gravel by Gilbert (1919), was found to thicken rapidly westwards, forming large involutions into the underlying intertidal sands (bed 7). The beach gravels (bed 6), which underlie the intertidal sands, contain small white quartz or quartzite pebbles, which were sampled throughout the 5-6 metres of gravel. We hope to date these using the new method of cosmogenic nuclide burial dating, in order to obtain a more precise estimate of the time when the sea lapped onto lower parts of the Chilterns. At present the unfossiliferous beach gravels and intertidal sands at Little Heath are tentatively correlated with the sandy ironstone containing Red Crag fossils found in 1926 at Rothamsted near Harpenden (Dines and Chatwin, 1930), and thus with the Red Crag of East Anglia, which is about 2.6 million years old (i.e. late Pliocene or early Pleistocene). The differences in height of these deposits, 160m OD at Little Heath, 130m OD at Rothamsted, 90m OD at Stansted Mountfitchet and near OD on the East Anglian coast, are now attributed to progressive tilting of south-east England during the Pleistocene.

The National Trust has erected a badger-proof fence around the 2012 excavation, incorporating gates to allow access for visitors.

References

Dines, H.G. and Chatwin, C.P. (1930) Pliocene sandstone from Rothamsted (Hertfordshire). *Geological Survey Summary of Progress for 1929*, 1-7.

Gilbert, C.J. (1919) On the occurrence of extensive deposits of high-level sands and gravels resting upon the Chalk at Little Heath near Berkhamsted. *Quarterly Journal of the Geological Society, London* **75**, 32-43.

Moffat, A.J. and Catt, J.A. (1983) A new excavation in Plio-Pleistocene deposits at Little Heath. *Transactions of the Hertfordshire Natural History Society* **29**: 5-10.

John Catt
27 Watling Street, St Albans, Herts, AL1 2PY

Lichen ecology in traditional Hertfordshire orchards and the implications for conservation

Mark Powell, Andrew Harris and Martin Hicks

Summary

Traditional Orchards are now a UK Biodiversity Action Plan (BAP) priority habitat. Where managed in a non-intensive way they have been described as hotspots for biodiversity, but there have been serious declines nationally and locally, over 90% in Hertfordshire. This has significant implications for biodiversity and ecological surveys are needed to improve our understanding and support their conservation. The Herts Biodiversity Projects Fund was used in 2011 to sample ten sites across the county for their lichen interest. A total of 71 species were confirmed from all fruit trees at these sites, with an additional 46 species from other substrates within these sites. There do not appear to be any obvious patterns of lichen community characteristics from the data available, although 19 species occurred on fruit trees in ten or more orchard sites representing the most characteristic communities. The average number of lichen species on fruit trees for each site as 34, and from each site as a whole was 49 species. 69% of species records came from fruit trees, demonstrating both the importance of this habitat as well as additional habitat opportunities within an orchard. All species were relatively common in a national context, the lack of rare species being a reflection of historic pollution and the relatively young age of fruit trees compared to veteran trees. However, orchards clearly support good, diverse lichen floras and are of considerable local importance in that respect. The Herts study compares very favourably with other national studies taking past histories and climate factors into account and helps to demonstrate their local value for biodiversity. Suggestions for appropriate management are also provided.

A variety of foliose lichens on apple bough at Stanley Lord Orchard, Shenley Park. Photo Andrew Harris

Introduction

Traditional Orchards were identified as a Priority habitat under the UK Biodiversity Action Plan (BAP) in 2007. They were identified as hotspots for biodiversity in the countryside, supporting a wide range of wildlife and containing UK BAP priority habitats and species, as well as Nationally Rare and Nationally Scarce species. The wildlife of orchard sites depends on the mosaic of habitats they encompass, including fruit trees, scrub, hedgerows, hedgerow trees, non-fruit trees within the orchard, the orchard floor habitats, fallen dead wood and associated features such as ponds and streams.

The BAP defines Traditional Orchards as structurally and ecologically similar to wood-pasture and parkland, with open-grown trees set in herbaceous vegetation, within small scale individual habitat patches, widely dispersed in the countryside. They can easily be distinguished from other wooded habitats based on the preponderance of domestic fruit and nut species: apple, plum, pear, damson, cherry, walnut and cobnut. Only in a very few cases will there be a significant number of other tree species in a traditional orchard, unless the orchard is becoming woodland through neglect. An arbitrary distinction is that 50% of trees should be domestic fruit or nut species.

Traditional Orchards are defined for priority habitat purposes as orchards managed in a low intensity way, not intensively planted with short-lived, high-density, dwarf or bush fruit trees for fruit production with inputs of chemicals such as pesticides and inorganic fertilisers, or frequent mowing of the orchard floor rather than grazing or cutting for hay.

The estimated extent of traditional Orchards in the UK was 28,750ha, at the rarer end of the scale compared to other existing priority habitats. It is estimated (2011) that since 1950 the overall area of orchards in England has declined by 63%. In 1998-2000 Hertfordshire Biological Records Centre (HBRC) undertook a detailed study into the decline of orchards in Hertfordshire from the 1880s to the present day, identifying a reduction from over 6,000 sites across the county to around 2,000 today. Most of these surviving sites are relatively poor and are unlikely to meet the new definition used by the national Traditional Orchard Priority Habitat survey recently completed for Natural England (2010) by the People's Trust for Endangered Species. For this, crown edges of trees must be within 20m of each other to be included in the orchard patch, and there must be more than five trees within 20m of each other's crown edges. In Hertfordshire PTES identified 477 surviving sites from maps and aerial photos, representing effectively a loss of over 90% of recognisable orchard habitat within the county.

To what extent this loss has impacted upon biodiversity – particularly at the local level in urban and rural areas alike – depends upon the value of their associated ecology and the impacts of its loss. Equally the contribution surviving orchards make and the potential that new ones can offer depends upon a good understanding of that interest.

In 2010 Hertfordshire Environmental Forum (HEF) created a Biodiversity Projects Fund to support biological recording which would contribute towards the delivery of the Local Biodiversity Action Plan. The Traditional Orchards Habitat Action Plan developed by Herts Orchard Initiative (HOI) includes surveys to inform, maintain and enhance the biodiversity associated with Traditional Orchards. HOI successfully applied for funding to undertake a Lichen survey of ten orchard sites across the county to develop a reference list which will serve to:

- Raise understanding of the range of species and lichen communities found in orchards within Hertfordshire and their contribution to orchard biodiversity
- Enable a comparison with other orchards regionally or nationally
- Contribute to Wildlife Site identification criteria if appropriate
- Provide guidance for conservation purposes
- Provide opportunities for encouraging interested volunteers to help or learn from surveys.

Methodology

Ten orchards were selected across the county to provide a reasonable geographic spread and range of sizes, taking account of ownership and access considerations. These were as follows:

- Hailey Lane orchard, Hertford Heath
- Highfield Park orchards, St Albans (Hixberry Lane and Cell Barns)
- Jeacocks orchard, Tring
- The Oval Centre orchard, Harpenden
- Rivers Nursery orchards, Sawbridgeworth (true orchard and northern orchard/scrub)
- Stanley Lord orchard, Shenley Park
- St Elizabeth's Centre orchard, Much Hadham
- Stones orchard, Croxley Green
- Tewin orchard, Tewin
- The Node orchard, Codicote.

On two of these sites (Highfield and Rivers) two lists were made from different orchard blocks of these large sites. Two (Tewin and Rivers) sites were also included in the orchard studies undertaken as part of the OPAL regional orchard project led by the University of Hertfordshire.

Standard British Lichen Society survey forms were used including notes made on substrate and estimates of abundance. Non-fruit tree habitats were also recorded as these are an integral part of an orchard site and its associated features. Some sites were recorded by both MP and AH, but this helped to ensure a level of consistency when recording alone. The results of these surveys and our interpretation of the results are outlined below.

Results

The full list of species recorded and their sites is given as Appendix 1, from which a number of particular observations on the lichen flora can be made.

Arthopyrenia analepta was found in one of the orchards surveyed growing on smooth bark of an apple tree. Smith *et al.* (2009) state that *A. analepta* is a common lichen, 'Throughout the British Isles, but rare in C. & E. England.' MP has been looking out for this lichen in the East Midlands, East Anglia and Home Counties region and has found single records in Bedfordshire, Cambridgeshire and Buckinghamshire. The record from Hertfordshire is further evidence that this coloniser of smooth bark is widespread but still rare in the region. It will be interesting to see if *A. analepta* becomes as frequent in this region as it is in other parts of the country now that sulphur dioxide pollution has abated. As a single example of its abundance elsewhere, the twigs of young hawthorn scrub in Cheddar Gorge are often dotted with its fruits.

Bacidia friesiana is one of the more notable lichens found during the surveys; it was present on the trunk of a semi-shaded *Fraxinus* trunk in Tewin Orchard. Smith *et al.* (2009) state of this species: 'On nutrient-rich bark of trees and shrubs (especially *Sambucus*); rather rare.'

Candelariella reflexa is a very common lichen species which is favoured by the nutrient enrichment to which our landscape is currently subjected. Smith *et al.* (2009) state that apothecia are very rarely found in this species. A fertile specimen on the branch of an apple tree in St. Elizabeth's Orchard, Much Hadham is the only such occurrence that the authors of this paper have ever encountered.

Diploschistes muscorum was found in three of the Hertfordshire orchards where it parasitizes species of *Cladonia* growing on the old bark of branches and trunks of fruit trees. Smith *et al.* (2009) give the ecology as follows: 'Initially parasitic on *Cladonia* squamules and podetia... On calcareous soil, wall tops or base-rich dunes; local.' Field observations suggest that the ecological range of this species is actually somewhat wider, MP has found it on *Cladonia* growing in acid grassland at Rushmere Park in south Bedfordshire and again on *Cladonia* growing on a thatched roof at Milton Ernest in north Bedfordshire. The occurrences on *Cladonia* growing on bark are the first instances that we are aware of growing on trees. A recent record, again on a fruit tree branch, at Cliveden in Buckinghamshire suggests that *Diploschistes muscorum* can now be considered to be part of the orchard mycota.

Hypotrachyna revoluta was, until recently, treated as a single species in Britain. Smith *et al.* (2009) state under their treatment of *H.revoluta*, that 'Most specimens may be attributable to *H. afrorevoluta* (Krog & Swinscow) Krog & Swinscow (1978) characterized by the relatively dark lower surface, small lobes and soredia initially formed in pustules.' It is now accepted that both species occur in Britain and both were found with some frequency in the current surveys (*H. afrorevoluta* in four of the twelve orchards and *H. revoluta* in nine). These frequencies of occurrence in Hertfordshire orchards may be slightly misleading due to recorder bias. Young thalli may be difficult or impossible to name with certainty and '*H. revoluta*' may have been preferentially used for such specimens. This potential bias suggests that a '*H. revoluta* s.lat.' option should be used by lichenologists for specimens which are difficult to determine with certainty.

Lecanora barkmaniana was described as new to science in 1999. It is one of an interesting polyphyletic group which was unknown to lichenologists and not found in herbarium material before the 1980s. In the years either side of the Millennium there were a flurry of papers in *The Lichenologist* describing several new species of *Bacidia*, *Fellhanera* and *Lecanora*. Some of these species including *L. barkmaniana* are associated with high levels of nutrient enrichment. This lichen was found several times during the orchard surveys, the first records for Hertfordshire, and it is a member of the community which appears to have colonised young bark in recent years.

Lecanora hagenii and *L. persimilis* are members of the *L. dispersa* group. This group is considered to be the most difficult for taxonomic study in the large genus *Lecanora* (Laundon 2003). Because of the difficulty of identification these lichen species have been rather poorly recorded in the past. Sliwa (2007) produced a revision of the *L. dispersa* group, this helped but the introduction of her paper includes the following cautionary words: 'This revision is intended as a contribution to the ongoing struggle with the taxonomy of this common yet so difficult species complex.' The Hertfordshire orchard surveys show that *L. hagenii* and *L. persimilis* are common members of the corticolous mycota (occurring in five and seven out of the twelve orchards respectively). Our observations suggest that *L. hagenii* has the broader ecological range, occurring on nutrient-rich bark of all kinds (and a characteristic member of the community on *Sambucus* twigs) while *L. persimilis* is more restricted in its requirements and occurs especially on the hard,

smooth bark of *Fraxinus* twigs. A third member of the group, *L. dispersa* s.str., is frequently encountered on saxicolous substrata but also occurs occasionally on bark, especially where the bark is particularly enriched by nutrients (it is the most resistant lichen species to intense dog urination at the bases of trees). As is often found during lichen surveys, occasional single trees have a distinctive community rather different from those surrounding it but the reason for the differences is often not at all apparent. Towards the south end of Oval Orchard there is an apple tree which forks into four main stems from low down; this tree is noticeably different, even from a few yards away, due to the noticeable quantity of yellow *Xanthoria parietina* growing on it. This common lichen is typical of high eutrophication; it forms the yellow/orange patches on roofs below television aerials on which birds perch. Closer inspection shows that the bark has an abundance of another species of lichen that grows in nutrient rich situations, *Phaeophyscia orbicularis*. Also present are the only records in the orchard for *Physcia caesia*, *Catillaria nigroclavata*, *Caloplaca holocarpa* and *Lecanora dispersa*. Other than the *Catillaria*, these species are usually considered more typical of saxicolous habitats but sometimes colonise bark when nutrient levels are high. A similar community has been recorded on an apple tree in a Cambridgeshire orchard; the tree was close to a long-established bonfire site and was presumably enriched with wind-blown ashes. In the case of the tree at Oval Orchard there was no particular reason for this single tree being so distinctively enriched.

Normandina pulchella is a frequent lichen on mossy trees in the south and west of the British lsles but it is almost absent from much of the Midlands, East Anglian and Home Counties region. This species was found on a mossy apple tree branch at St Elizabeth's orchard, Much Hadham, the first record for Hertfordshire and a considerable extension of its range. The decline in atmospheric sulphur dioxide in recent decades has favoured a more luxuriant growth of bryophytes in addition to allowing a re-colonisation of many lichen species. *N. pulchella* may benefit from both factors and this record suggests that the tiny glaucous squamules should be looked for during surveys in the region.

Phylloblastia inexpectata is a foliicolous lichen species which was named as new to science in 2007. Smith *et al*. (2009) state that it is 'rare' in the British Isles but there have been many additional records from across England since that publication and it appears to be actually rather frequent. It has been found growing on the surfaces of various evergreen leaves; at Tewin Orchard it occurs on the leaves of *Ilex aquifolium* in the roadside hedge.

Porina aenea appears to occur in two forms which are often clumped together and treated as a single taxon. Specimens from smooth bark with prominent perithecia and a K- involucrellum are well-named as *P. aenea*. The larger, semi-immersed perithecia with a K+ blue-grey pigment, which are found rather frequently on old bark (often close to the bases of tree trunks), may be *Porina byssophila* which is generally considered to be a saxicolous species. Such material is present on mature *Fraxinus* trees at the north edge of St. Elizabeth's Orchard, Much Hadham.

Ramalina farinacea *at Tewin. Photo Andrew Harris.*

Discussion

A total of 404 lichen records were made from fruit trees; a further 184 additional records were made from the sites elsewhere. Given that 69% of all records were obtained from fruit trees within the orchards, this demonstrates the significance of this substrate as a habitat for lichens, but also the value of other features within a site.

This survey of orchards in Hertfordshire leads to similar conclusions to those of recent surveys in Cambridgeshire and Bedfordshire, in that the lichen communities are dominated by common species. If we consider the lichens occurring on all substrata we find that 21 lichen species occur in all, or all but one, of the Hertfordshire orchards and these can be expected to be found in most large orchards. 43 species were present in at least half of the orchards, 83 in two or more sites leaving a long 'tail' of 37 species found at only one site. Tewin had the most species overall – 71, with the Highfield Park orchards the least, with 35 and 36 species. If we consider just those lichen species present on the fruit trees in Hertfordshire orchards, we find that 71 identified lichen taxa were found on these. The average for each site in respect of fruit trees was 34 species, and from each site as a whole was 49 species. The less frequently occurring lichens are also predominantly common species.

Table 1. *The frequency of lichen species found on fruit trees, ie the number of species occurring at only one site, the number at two sites, etc.*

Number of orchards where species were found	Number of species found on fruit trees
1	17
2	6
3	3
4	9
5	5
6	2
7	5
8	2
9	3
10	10
11	6
12	3

When all fruit tree species are plotted against their frequency of occurrence, a pattern emerges, showing a very limited and characteristic lichen community on fruit trees.

Only 3 species occurred on fruit trees in each of the 12 orchard sites, whilst 17 species occurred in only one of the sites surveyed (Table 1). However perhaps the most characteristic lichens are those 19 species which occur in ten or more locations on fruit trees. The majority of the species (40) are found less frequently, on five or less occasions.

There did not seem to be any significant relationship between numbers of species and size of orchard; Rivers is a large site and supported an average of 48 species in total, the same number as Jeacock's Orchard, one of the smallest sites. Tewin had a small number of fruit tree lichens but was the most species-rich site overall. St Elizabeth's and Rivers supported most fruit tree lichens with 47 and 44 species respectively, but these are large sites; small orchards – such as Jeacock's, Highfield and the Node each supported 31 species, indicating that even small remnant orchards can certainly be locally important in supporting lichens on fruit trees. Indeed, Tewin only had 26 fruit tree lichen species whilst Hailey Lane, a much smaller site, supported 42.

None of the lichen species found in the orchards are specially protected by law and all have a threat status of 'least concern' (LC) except for a few instances which are considered 'data deficient' (DD) or 'not evaluated' (NE). None of the lichen species listed in the 'Revised Index of Continuity' (Coppins & Coppins, 2002), those considered indicative of ecological continuity, were found in Hertfordshire orchards.

There are two main factors which lead to the general lack of rare lichens in Hertfordshire orchards. Lichen diversity 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 (Hawksworth & Rose, 1970). Regions such as the Home Counties are still in a re-colonization phase following the dramatic decline of atmospheric sulphur dioxide concentrations and affected by the increased influence of atmospheric compounds of nitrogen. The ecological continuity was broken by atmospheric pollution and the re-colonization involves mainly easily spread colonists.

Even if there had not been this dramatic history of pollution, orchards contain relatively young trees which are analogous to recent, secondary woodland. It is in ancient, unpolluted woodlands and on ancient trees that the most notable lichen species tend to occur. Whilst veteran fruit trees can occur – particularly pears – in general fruit trees are less long lived than native trees and so the rarer species associated with

trees of considerable age are not present. However, some orchard sites are much older than others and this could lead to some rarer species being present although more studies would be required to demonstrate this.

Another factor which may need to be considered is that of climate, in that parts of the country such as the south west, are naturally wetter and support a more diverse lichen flora than drier areas such as East Anglia.

The fruit trees within Hertfordshire orchards often support colonies of lichens which are visually impressive. This is partly due to the structure of the trees; pruning to encourage fruiting usually encourages low, gently ascending branches which are easily viewed and are flushed with rainwater run-off from the crown. Although the fauna associated with the lichen communities was not investigated, it is known that lichen thalli provide food and shelter for a variety of invertebrates which are then available to the wider food chain. Branches and twigs covered with luxuriant lichen growth, even when supporting only common species, provide much more potential for biodiversity than bare bark.

Parmotrema perlatum *and* Flavoparmelia caperata *at Stanley Lord Orchard Shenley Park. Photo Andrew Harris.*

The study of lichen communities in orchards is of considerable scientific merit. Orchard sites are easily relocated and mature fruit trees remain relative unchanged in size and structure over many years and hence return visits at intervals several years apart provide important information about the changes of lichen communities with changing atmospheric and climatic conditions.

It is not only the fruit trees that support lichen communities in orchards. Non-fruiting trees and shrubs, old buildings, neglected machinery, gates and fences all have the potential to add to the lichen diversity of a site, reflecting past or current management of sites. These – as the UK BAP states – reflect the range of ecological niches present and demonstrate a holistic approach is valuable when considering the full biodiversity interest of traditional orchard sites.

A comparison with other national orchard lichen studies

A survey of nine orchards in Cambridgeshire (Perrin 2011) was undertaken in 2009/10 to extend the knowledge regarding lichens within the county's orchards beyond the one previous known survey at Wisbech St Mary and aimed to determine whether the lichen mycota differed between apple and plum trees. The following is an extract from Perrin's report:

Typical traditional orchards harbour about 30-40 epiphytic lichen species on the fruit trees, though more species may be added by examination of other trees present and non-living substrates. The lichen species found in Cambridgeshire orchards are mostly common ones, which are not confined to orchard trees. Plums appear to be better hosts than apples or pears, which is the reverse of the situation for bryophytes. The impression is of a lichen flora slowly recovering following earlier atmospheric SO_2 pollution.

The overall species total for this lichen survey of nine Cambridgeshire orchards was 74, although 15 of these species were found on non-fruit tree substrata, giving a total of 59 epiphytic species on fruit trees (apple, pear or plum). The six epiphytic fruit tree species found at all sites were *Candelariella reflexa*, *Lecanora chlarotera*, *Lecidella elaeochroma*, *Melanelixia subaurifera*, *Parmelia sulcata* and *Phaeophyscia orbicularis*. The following lichens were found at all but one of the sites: *Amandinea punctata*, *Lecanora expallens*, *Lepraria incana*, *Physcia adscendens*, *Punctelia jeckeri*, *Xanthoria parietina*, *X. polycarpa* and *X. ucrainica*. All of these lichens, except *X. ucrainica*, were also found in all, or all but one, of the Hertfordshire orchards with additions of *Anisomeridium polypori*, *Arthonia radiata*, *Evernia prunastri*, *Lecania cyrtella*, *Lecanora symmicta*, *Parmotrema perlatum*, *Physcia tenella* and *Scoliciosporum chlorococcum* all of which were also common in the Cambridgeshire orchards. These species can be considered particularly characteristic of orchards in Eastern England but there are many more that occur only slightly less frequently.

Regarding other orchard lichen surveys, 131 epiphytic lichens were found in the six traditional orchards surveyed by English Nature (Lush *et al.* 2009), including 16 nationally rare or scarce species. The Rummers Lane plum and apple orchard at Wisbech St Mary held 44 lichen species, of which 10 species were seen only once or twice, giving a core population of 34 taxa. The main lichen communities here were *Xanthorion* on twigs and branches, which was frequent, indicating a nutrient-enriched bark and the *Parmelion* group, on boughs and thicker branches. Dominant or abundant species were *Parmelia sulcata* and *Physcia tenella*. The tree trunk lichen cover was represented by one dominant species, *Anisomeridium polypori*, with occasional *Dimerella pineti*. The impression of the lichen mycota at Rummers Lane orchard was of an invasion phase following a previous lengthy period of sulphur dioxide air pollution. The site was in a zone of relatively high historic atmospheric sulphur dioxide pollution and the lichen mycota found in the 2004 survey was relatively poor compared with orchard sites in other parts of the country, consisting mostly of very common species.

The other orchards in the English Nature survey all had richer epiphytic lichen communities than Rummers Lane, with up to 80 species being recorded in Slew orchard in Devon. Only Park Farm orchard in Kent had a similar history to Rummers Lane, with relatively high historic levels of sulphur dioxide. This site also had a lichen community probably representative of a recovery phase, with 52 species (core 30 species). The three Devon orchards in the survey (one cherry orchard and two apple orchards) had all been exposed to only low sulphur dioxide levels in the past, and these had the highest lichen species counts.

A survey of three orchards in the Wyre Forest (Smart & Winnall 2006) also found a poor lichen community, with only 27 epiphytic species being recorded, and no specialities. Again, this part of the country was close to some of the highest sulphur dioxide pollution from the Birmingham area in the past, which may have affected the paucity of lichens in the survey.

Another orchard lichen survey was conducted in Yorkshire, from 1999 onwards, by Henderson (2008). This was an informal survey of 23 orchards (mainly apple) across the county which recorded a total of 75 species across all sites. The richest sites lie in the north of the county, away from the southern conurbations, with species totals ranging from 26 at Ripley Castle and Springhall School, Ripon to 38 at Newby Hall. Between them, these sites contained almost three-quarters of the total lichen species found in Yorkshire orchards. Orchards with a history of regular spraying hosted few lichens, one such orchard having just three species. The most frequently occurring species were *Xanthoria polycarpa* in 22 orchards, *X. parietina*, *Physcia tenella* and *Lecanora conizaeoides* each in 21 orchards and *L. dispersa* and *Parmelia sulcata* each in 18 orchards.

Management of orchards with lichens in mind

Lichens are not parasitic on their host trees and should be welcomed for their beauty and their contribution to biodiversity. The pruning of fruit trees, while removing some of the lichens present on a tree, will allow the branches that remain to receive more light which is advantageous to most lichen species. The use of chemical sprays, particularly fungicides, is likely to have a deleterious effect on lichen communities. Ivy (*Hedera helix*) is often considered as a welcome feature, valued for its cover, pollen and berries but it eliminates lichen communities on those portions of the tree that are smothered. In general, both for the sake of the tree and for the lichens, it would be best to prevent trees from becoming covered in ivy but it may be appropriate to leave ivy on trees that are already well-covered.

Stubs of dead wood and dead branches have the potential to acquire a range of lignicolous lichen species. Only a small range of common lignicolous lichen species were found in the current survey but the potential observed on dead branches elsewhere in the country suggests that consideration should be given to retaining some dead wood in the crown of old fruit trees.

Old gates and fences can support particularly interesting lichen species and measures should be considered to preserve these even when the structures have reached the end of their useful life. Gates can be retained in similar light conditions, strapped to a nearby fence, when they have to be replaced. Old fence posts can often be retained in the line of the fence when new posts and wire have to be added.

When restoring old orchards where fruit production is not the primary objective, retaining older trees

or standing deadwood is valuable for continuity purposes, allowing these to provide opportunities to enable colonisation of younger wood over time. This is relevant to all ecology, although older, diseased trees are often removed for horticultural reasons so some compromise is required.

In Hertfordshire, very few orchards are known to be in receipt of agri-environment funding. The PTES survey reported seven sites within Environmental Stewardship. Given the local value of orchards, clearly such a low level of support is disappointing and further consideration should be given to raising the profile of orchard conservation within agri-environment schemes within the county.

Acknowledgements

The authors would like to acknowledge the support of the HEF Biodiversity Projects Fund in helping to fund this work, Hertfordshire Orchard Initiative in providing contact details and the University of Hertfordshire in promoting public surveys at two of the study sites as part of the OPAL project.

References

Burroughes, A.E., Oines, C.M., Oram, S.P. and Robertson, H.J. (2010) *Traditional Orchard Project in England – The creation of an inventory to support the UK Habitat Action Plan*. Natural England Commissioned Reports, Number 077.

Coppins, A.M. and Coppins, B.J. (2002). *Indices of Ecological Continuity for Woodland Epiphytic Lichen Habitats in the British Isles*. British Lichen Society.

Henderson, A. (2008) Lichens in orchards. In: Orchards and Groves: their history, ecology, culture and archaeology (ed. I.Rotherham). *Landscape Archaeology and Ecology* **7**: 76-85.

Hawksworth, D.L. and Rose, F. (1970). Qualitative scale for estimating sulphur dioxide air pollution in England and Wales using epiphytic lichens. *Nature* **227:** 145-148.

Laundon, J.R. (2003). The status of *Lecanora zosterae* in the British Isles. *Lichenologist* **35**: 97-102.

Lush, M., Robertson, H.J. & Alexander, K.N.A. (2009). Biodiversity studies of six traditional orchards in England. *Natural England Research Reports*. **25**.

Śliwa, L. (2007) A revision of the *Lecanora dispersa* complex in North America. *Polish Bot. J.* **52**: 1-70.

Smart, M.J. & Winnall, R.A. (2006). The biodiversity of three traditional orchards within the Wyre Forest SSSI in Worcestershire: a survey by the Wyre Forest Study Group. *English Nature Research Reports* **707**.

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

UK Biodiversity Action Plan Priority Habitat Descriptions.

Mark Powell, Bedfordshire Lichenoligist, 15 Rotten Row, Riseley, Bedford, MK44 1EJ
Andrew Harris, HNHS Lichen Recorder, 136 Trowley Hill Road, Flamstead, St. Albans AL3 8DZ
Martin Hicks, Herts Biological Records Centre/Herts Orchard Initiative

Appendix. The lichen species found in the 12 orchards surveyed and their frequency of occurrence (abundance category). Species in [colour] were found on fruit trees in ten or more orchards. Frequencies are in [colour] where that species was recorded on fruit trees.

BLS no.	Species	Orchard												No. of orchards	Threat status
		Tew	Oval	SLrd	Stn	RvsO	RvsN	Jea	Hly	StEz	CelB	Hxb	Node		
10	*Acarospora fuscata*												LO	1	LC
38	*Agonimia tristicula*												VLF	1	LC
212	*Amandinea punctata*	O	F	F	F	F	p	LF	F	F	F	O	O	12	LC
49	*Anisomeridium polypori*	R	R		O	O	p	LA	R	R	R	R	O	11	LC
68	*Arthonia punctiformis*	R	R			O	p	LF	O	O	R		O	9	LC
69	*Arthonia radiata*	O	R	O	F	O	p	LF	F	O	O	O	R	12	LC
1540	*Arthopyrenia analepta*								R					1	LC
1542	*Arthopyrenia punctiformis*					R	p	R	R	O	R		O	7	LC
113	*Aspicilia contorta subsp. hoffmanniana*						p							1	DD NR
132	*Bacidia arnoldiana*												R	1	LC
	Bacidia cf. adastra										R	R		2	LC
130	*Bacidia neosquamulosa*	R												1	
147	*Bacidia friesiana*	R												1	LC NS
2502	*Bacidia sulphurella*	R												1	LC
207	*Buellia griseovirens*							R						1	LC
242	*Caloplaca cerinella*	R						R						2	LC
	Caloplaca cf. asserigena						p							1	
263	*Caloplaca chlorina*					R								1	LC
2351	*Caloplaca citrina s. str.*	R												1	LC
247	*Caloplaca citrina s.lat.*				R				R				LF	3	LC
249	*Caloplaca crenulatella*	R			VLF		p			p				4	LC NS
2315	*Caloplaca flavocitrina*	VLF				R				R				3	LC
261	*Caloplaca holocarpa*	R	R				p							3	LC
	Caloplaca holocarpa agg.					R								1	LC
2527	*Caloplaca holocarpa sens. str.*									p				1	LC
2461	*Caloplaca lithophila (C. oasis)*						p			p				2	LC
271	*Caloplaca obscurella*	R	R							O			R	4	LC
281	*Caloplaca teicholyta*						p							1	LC
289	*Candelaria concolor*	R						R	R	R			R	5	LC
291	*Candelariella aurella f. aurella*						p			p			LO	3	LC
297	*Candelariella reflexa*	F	F	LA	F	D	p	F	F	F	O	R	F	12	LC
298	*Candelariella vitellina f. vitellina*	R						R	R					3	LC
316	*Catillaria nigroclavata*	R	R				p							3	LC NS
371	*Cladonia chlorophaea s.lat.*	O	R			R		VLA	VLA	R			LA	7	LC
375	*Cladonia coniocraea*	R			LO			R	O	R		R		6	LC
384	*Cladonia fimbriata*								LF					1	LC
410	*Cladonia pyxidata*											R		1	LC
429	*Cliostomum griffithii*	R				R								2	LC
440	*Collema crispum var. crispum*	R												1	LC
459	*Collema tenax var. tenax*	R												1	LC
912	*Cyrtidula quercus*				R		p		R	R				4	LC NS
489	*Dimerella pineti*	D											R	2	LC
491	*Diploicia canescens*		R						R					2	LC
494	*Diploschistes muscorum*	R							R				VLF	3	LC
495	*Diploschistes scruposus*												LF	1	LC
496	*Diplotomma alboatrum*												LO	1	LC
511	*Evernia prunastri*	O	O	O	R	O	p	LA	R	O	R	R	O	12	LC
987	*Flavoparmelia caperata*	F	O	VLD	R	O	p	O	O	R			O	10	LC
1018	*Flavoparmelia soredians*	R		R	R	R	p							5	LC
521	*Fuscidea lightfootii*	R	R							R			VLF	4	LC
533	*Graphis scripta*								R					1	LC
1125	*Hyperphyscia adglutinata*		R					R	R	O	R	R	O	7	LC
578	*Hypocenomyce scalaris*												LF	1	LC

BLS no.	Species	Orchard												No. of orchards	Threat status
		Tew	Oval	SLrd	Stn	RvsO	RvsN	Jea	Hly	StEz	CelB	Hxb	Node		
582	*Hypogymnia physodes*	R	F	LA	R	O		LF	O	O	R		F	10	LC
583	*Hypogymnia tubulosa*					R	p	R						3	LC
2468	*Hypotrachyna afrorevoluta*	p	p						O	R	R		R	6	
1013	*Hypotrachyna revoluta*	O	O	LF	R	O		F	F	R			O	9	LC
613	*Lecania cyrtella*	A	O	R	O	F	p	LA	F	O	LF	LF		11	LC
616	*Lecania erysibe*								R					1	LC
1707	*Lecania inundata*						p							1	LC NS
159	*Lecania naegelii*	R	R	R		R	p						R	6	LC
627	*Lecanora albescens*	R					p			p			LO	4	LC
2121	*Lecanora barkmaniana*		R	R		R			O	R			R	6	DD NR
635	*Lecanora campestris subsp. campestris*									p			LO	2	LC
636	*Lecanora carpinea*	R	R	O	R	O	p		R	R	R		R	10	LC
639	*Lecanora chlarotera*	O	D	O	O	O		LF	R	O	F	O	O	11	LC
641	*Lecanora confusa*	R	R	R	R	R	p					R		7	LC
643	*Lecanora conizaeoides f. conizaeoides*	R	R			R	p	VLF			R			6	LC
646	*Lecanora dispersa*	VLF	R		R		p	R	O	p			R	8	LC
649	*Lecanora expallens*	F	F	F	O	F	p	O	O	F	F	O	LF	12	LC
661	*Lecanora muralis*				R					p	O	LF		4	LC
1836	*Lecanora persimilis*	R			R	R	p	R		R		R		7	LC NS
672	*Lecanora pulicaris*					R				R			R	3	LC
675	*Lecanora saligna*	R										VLA		2	LC
	Lecanora sp			R										1	
688	*Lecanora symmicta*	O	O	O	LF	O	p	F	O	O	O	O	O	12	LC
621	*Lecanora umbrina (L. hagenii)*	O	R	VLF	VLF			VLF						5	NE
797	*Lecidella elaeochroma f. elaeochroma*	O	O	F	F	O	p	LF	O	O	LA	O	VLD	12	LC
802	*Lecidella scabra*	R												1	LC
803	*Lecidella stigmatea*				R	O	p			p		O	LO	6	LC
1974	*Lepraria incana s. str.*	F	O	R	R	F		F	F	F	O	O	O	11	LC
1604	*Lepraria vouauxii*												LA	1	LC
998	*Melanelixia fuliginosa subsp. fuliginosa*												VLF	1	LC
997	*Melanelixia fuliginosa subsp. glabratula*			R		R		R					R	4	LC
1020	*Melanelixia subaurifera*	F	A	VLA	F	A	p	VLD	LA	A	O	O	F	12	LC
877	*Micarea denigrata*	O		R				LA			R		LO	5	LC
920	*Normandina pulchella*									R				1	LC
948	*Opegrapha herbarum*	R												1	LC
964	*Opegrapha ochrochelia*		R			R				R		VLA		4	LC
	Opegrapha sp.			R										1	
964	*Opegrapha varia*	R						VLA		R				3	LC
1015	*Parmelia saxatilis*	R		R					R	R			LO	5	LC
1022	*Parmelia sulcata*	A	A	LD	F	A	p	LA	F	F	F	LF	F	12	LC
1008	*Parmotrema perlatum*	R		R	R	R	p	R	O	R	R	R	O	11	LC
1107	*Phaeophyscia orbicularis*	A	A	VLA	LO	O	p	O	O	O	LA	O	LA	12	LC
1110	*Phlyctis argena*	R								R			LA	3	LC

BLS no.	Species	Orchard												No. of orchards	Threat status
		Tew	Oval	SLrd	Stn	RvsO	RvsN	Jea	Hly	StEz	CelB	Hxb	Node		
2464	*Phylloblastia inexpectata*	R												1	LC
1112	*Physcia adscendens*	A	F	LD	LD	A	p	LA	LD	A	A	O	LA	12	LC
1113	*Physcia aipolea*	R								R		R		3	LC
1114	*Physcia caesia*		R	R					R		R	R		5	LC
1120	*Physcia tenella subsp. tenella*	O	F	O	LA	F	p	A	LA	A	O	A	LA	12	LC
1127	*Physconia grisea*	O	O	R					O	R	R			6	LC
732	*Placynthiella icmalea*	R			O	R		LF						4	LC
	Porina cf. byssophila									R				1	
1168	*Porina aenea*									R				1	LC
1189	*Protoblastenia rupestris*									p				1	LC
1989	*Punctelia jeckeri*	F	F	O	R	O	p	O	F	O	O	R	F	12	LC NS
2070	*Punctelia subrudecta s.str.*	R	O	O		O	p	O	F	O		O	O	10	LC
1234	*Ramalina farinacea*	O	R	O	R	R	p	O		O			R	9	LC
1235	*Ramalina fastigiata*	R	R				p	R						4	LC
	Ramalina sp.				R				R		R	R		4	
1289	*Rinodina gennarii*						p							1	LC
2282	*Rinodina oleae*	R											R	2	LC
1306	*Sarcogyne regularis*												R	1	LC
1320	*Scoliciosporum chlorococcum*	O	O	F	O	F	p	LA	F	F	LF	O	O	12	LC
692	*Trapeliopsis flexuosa*	O			R	R		LF			R		R	6	LC
	Usnea sp.	R												1	
1471	*Usnea subfloridana*								R		R			2	LC
	Verrucaria cf. muralis									p				1	
1510	*Verrucaria nigrescens f. nigrescens*						p			p				2	LC
1530	*Xanthoria parietina*	F	F	O	LD	F	p	LA	O	F	LF	O	F	12	LC
1531	*Xanthoria polycarpa*	O	O	R	O	F	p	LF	O	F	F	O	F	12	LC
950	*Xanthoria ucrainica*	R	R	R		R		R	O	O				7	LC NS
	Lichen unidentified				R									1	
	Lichen unidentified							R						1	
	Lichen unidentified								R					1	
	Lichen unidentified												R	1	
	Species total	**71**	**47**	**39**	**41**	**47**	**49**	**48**	**51**	**63**	**36**	**35**	**60**		

Abundance category

D	dominant
A	abundant
F	frequent
O	occasional
R	rare
L	locally
VL	very locally
p	present

Threat status

LC least concern
DD data deficient
NE not evaluated

Orchards and date surveyed

Tew	Tewin	02/04/2011
Oval	The Oval	16/04/2011
SLrd	Stanley Lord	19/04/2011
Stn	Stones	21/04/2011
RvsO	Rivers Orchard	23/04/2011
RvsN	Rivers Nursery Site	23/04/2011
Jea	Jeacocks	27/04/2011
Hly	Hailey Lane	13/06/2011
StEz	St. Elizabeths	13/06/2011
CelB	Cell Barns	08/07/2011
Hxb	Hixberry Lane	08/07/2011
Node	The Node	11/10/2011