

Nature in Cambridgeshire

No 52 2010



Cambridge, and also many times in drainage ditches etc, as it usually floats and is conspicuous enough to be spotted on a walk. Older records: - R. Cam at Sheep's Green and Baitsbite; Burwell Lode; R. Ouse at Ely; Sutton and Mepal, in ponds; The Washes, Sutton; Old R. Nene at March; Guyhirne – W. R. Cam at Grantchester, 1947 – E.A.G. Figures 1D and E.

Acknowledgments

We wish to thank Dr Ken Adams, Dr J. W. Bates, Dr Chris Carter, Dr Sheila Francis, Prof. Maurice Moss and Dr Chris Preston. Figures A, B, D and E have been reproduced in Belcher and Swale 1976.

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The Lichens of Wicken Fen

Mark Powell

This paper provides two annotated species lists of lichens for Wicken Fen separated in time by 36 years. The differences between the two lists are quite remarkable and possible explanations for these differences are discussed.

Lichens are dual organisms consisting of a fungus and a photosynthetic partner living together in symbiosis. The scientific names used for lichens are actually those applied to the fungal partner, while the photosynthetic partner has a separate name in the algae or cyanobacteria. The composite lichen association strictly speaking has no name. The photobiont provides the fungus with the products of photosynthesis, whilst the fungus provides the alga or cyanobacterium with minerals and protection from the elements.

Lichens are remarkably sensitive to air pollution, particularly sulphur dioxide. The comparatively small number of lichens present at Wicken Fen in 1972 (38 species) is partially accounted for by the background pollution of sulphur dioxide that affected much of eastern England at that time. However, the presence of a few species such as *Flavoparmelia caperata*, *Ramalina farinacea* and *Usnea*

subfloridana which are quite sensitive to sulphur dioxide suggest that the air was less polluted than in the midland area of England further to the west from where these lichens were almost absent at that time. The closure in 1971 of the brickworks at Little Fen, Burwell, only a mile from the area, removed a local source of pollution. Since the early 1970s there has been a steady fall in background sulphur dioxide levels across eastern England due to the decline in coal-fired power stations, heavy industry and of domestic coal fires along with stricter emission controls. The closure of brickworks in the Marston Vale (upwind of Wicken) has also removed a considerable source of sulphur dioxide. The 2008 list for Wicken Fen has 76 species of lichen, double the 38 species recorded in 1972. Much of this increase may be attributed to the lichen colonisation in the wake of declining sulphur dioxide levels but other factors must also be considered. The more recent survey looked at a wider range of man-made structures than were studied in 1972; the National Trust workshops, a school study shelter and a large concrete manhole cover were examined in addition to the concrete post by the windmill. Saxicolous lichens are more complicated than corticolous species in their response to declining sulphur dioxide levels. Calcareous substrates are alkaline in nature and served to buffer the habitat when sulphur dioxide was at greater concentrations. The change in the lichens of calcareous substrates thus tends to be less dramatic than that for bark. The concrete post by the windmill had the same number of species (twelve) in 2008 as it did in 1972, though the composition changed slightly. *Caloplaca decipiens*, *C. saxicola* and *Xanthoria parietina* were lost while *Caloplaca holocarpa*, *Lecanora albescens* and *Xanthoria calcicola* were gained. If we separate out the corticolous lichens we find that 31 species grew on bark in 1972 compared with 46 species in 2008. Species such as *Arthonia radiata*, *Lecanora carpinea*, *Lecidella elaeochroma* and *Parmotrema perlatum* are conspicuous and easily recognised and it seems likely that these have colonised due to the decline in atmospheric sulphur dioxide. The same may be true of *Arthonia punctiformis*, *Arthopyrenia punctiformis*, *Cyrtidula quercus*, *Jamesiella anastomosans* and *Lecanora confusa* but a note of caution must be made in the case of these five species. The first three are pioneer species of twigs and are not true lichens – they do not have a photosynthetic partner. They are traditionally recorded by lichenologists but are often overlooked. *Jamesiella anastomosans* was described new to science in 1972 and was presumably poorly understood at that time. *Lecanora confusa* has had, until recent years, a distinctly western distribution in England. It is likely that it has spread considerably but it may also have been overlooked – young specimens are similar in appearance to *Lecanora symmicta*. There is a small number of species that buck the trend and which have become less common with ameliorating atmospheric conditions. The most dramatic decline has been that of *Lecanora conizaeoides*. J. R. Laundon describes this species in 1972 as “The most common epiphyte. Occurs also on wooden posts”. This species was not found as an epiphyte during the 2008 survey and it is now rarely found on bark in East Anglia. *Hypogymnia physodes* is also undergoing a general decline in lowland England. In 1972 it was frequent in carr woodland on Wicken Fen. The only record in 2008 was on a roofing sheet of the school study shelter. Now that sulphur dioxide concentrations have fallen below

the level where it is a limiting factor for most lichens, the influence of other atmospheric factors is becoming apparent, though the effects are complicated and still incompletely understood. Nitrogen compounds are important; ammonia has alkaline properties and can raise bark pH while nitrogen oxides increase acidity. Both increase the nitrogen available as a nutrient. Some lichens such as *Candelariella reflexa* thrive in highly eutrophicated environments - it is sometimes a feature of the "canine zone" at the base of tree trunks frequented by urinating dogs. This species has colonised Wicken Fen since 1972 and has become quite widespread on the site. In 1972 nitrophilous lichens were very localised. In St Edmund's Fen by Monk's Lode there were a few mature trees (*Populus* spp., *Salix fragilis*) and a dead willow shrub (*Salix cinerea*) bearing nitrophilous lichens (e.g. *Amandinea punctata*, *Physcia* spp., *Xanthoria* spp.). The lichens grew chiefly in the rain tracks from the platforms at the top of the trunks of two pollarded crack willows, and from a bark wound on a poplar. Nitrophilous matter was washed down the rain tracks in sufficient quantity to enable the nitrophilous lichen community *Xanthorion* to become established. Some nitrophilous species also occurred on the isolated trees and shrubs on Adventurer's Fen. *Amandinea punctata* and *Physcia adscendens* which were confined to these specialised situations have spread to become frequent across Wicken Fen by 2008.

Unfortunately there appear to be few records of lichens before 1972. The earliest lichen record appears to be of a specimen of *Flavoparmelia caperata* collected by Mr B Ing in 1960 and housed in the herbarium of the Botany School, University of Cambridge. The woodland and carr of Wicken Fen is of comparatively recent origin, none is believed to be ancient. A small Silver Birch (*Betula pendula*) wood developed from planted trees between Spinney Bank and Sedge Fen Drove. Other areas of carr began to develop in the late nineteenth century when strip mowing of the Fen died out. During the twentieth century shrub and tree colonisation of the Fen continued and provided extensive habitats for corticolous lichens. J. R. Laundon considered that such habitats were previously much more restricted and so the lichen flora was probably richer in 1972 than at any time before. The corticolous lichen communities of eastern England have shown a spectacular re-colonisation in recent decades but they have not fully recovered from past industrial pollution and the re-colonisation is not a simple reverse of the order in which lichens are lost with increasing sulphur dioxide. Some species appear to be able to spread rapidly, other including many members of the genus *Pertusaria* appear to be poor colonists and none has been found at Wicken Fen.

Sawn wood provides a specialised and valuable habitat. *Lecanora conizaeoides* which was abundant on trees and shrubs at Wicken Fen in 1972 now "hangs on" at the site on the cladding boards of the windmill and Tower Hide. The only record of *Parmelia saxatilis* at the Fen was from a weathered field gate. There is a growing realisation of the importance of sawn wood for lichens and their associated invertebrate communities. When fences are renewed, the retention of old posts in the line of the new fence should be considered.

Lichens are frequently overlooked by non-lichenologists even though they grow in close proximity to humans on many man-made structures. The effort

expended in recording lichens on a single concrete post (next to the windmill) in 1972 and 2008 reflects the importance of such structures in describing the lichen composition of a site. A final observation regarding the domesticity of lichens is of the community that has colonised the roofing sheets of the school study shelter (TL 563704). These sheets are a corrugated, lightweight, fibre-based board. With tens of acres of mature carr in close proximity, these roofing sheets exhibit some of the best “corticolous” lichen assemblages at Wicken Fen. *Melanohalea exasperatula* and *Hypogymnia physodes* were found nowhere else.

List of species recorded by J. R. Laundon in 1972

The following is a transcript of the list that was published in the leaflet “Lichens of Wicken Fen” by J. R. Laundon, Number 10 in the “Guides to Wicken Fen” series published by the National Trust in 1973. The nomenclature has been updated and follows “The Lichens of Great Britain and Ireland”, C. W. Smith *et al.*, 2009.

Amandinea punctata. Local. On two trees and a dead shrub in St Edmund’s Fen.

Caloplaca citrina. Local. Scarce on a *Populus* in St Edmund’s Fen. Frequent on the concrete post by the windmill.

C. decipiens. Rare. One plant on the south-west side of the concrete post by the windmill.

C. saxicola. Rare. Several plants on the concrete post by the windmill.

Candelariella aurella. Rare. Several plants by the concrete post by the windmill.

C. xanthostigma. Local. Frequent on a *Populus* in St Edmund’s Fen.

Cladonia fimbriata. Local. On several boles of *Salix pentandra* in the north-east corner of the Sedge Fen. Rare elsewhere.

Diploicia canescens. Local. Several plants on a *Salix fragilis* on the north side of St Edmund’s Fen. On *Salix fragilis* in Adventurers’ Fen.

Evernia prunastri. Occasional. In carr and on immature *Fraxinus*.

Flavoparmelia caperata. Rare. One plant on mature *Salix pentandra* in the north-east corner of the Sedge Fen.

Hypogymnia physodes. Frequent. In carr.

Hypotrachyna revoluta. Rare. Several plants on mossy trunk of mature *Salix pentandra* in the north-east corner of the Sedge Fen.

Lecanora campestris. Rare. One plant on the top of the concrete post by the windmill.

L. chlarotera. Local. Several plants on dead stems of *Salix cinerea* in St Edmund’s Fen. On *Salix fragilis* in Adventurers’ Fen.

L. conizaeoides. Abundant. The most common epiphyte. Occurs also on wooden posts.

L. dispersa. Local. Scarce on a *Populus* in St Edmund’s Fen. Abundant on the concrete post by the windmill.

L. expallens. Frequent. In carr etc.

- L. muralis*. Rare. A few plants on the top of the concrete post by the windmill.
- L. pulicaris*. Local. On *Fraxinus*, *Populus*, *Salix*, etc.
- Lecidella stigmatea*. Rare. One plant on the south-west side of the concrete post by the windmill.
- Lepraria incana*. Abundant. Chiefly on the rough bark of older trees.
- Melanelixia fuliginosa* subsp. *glabratula*. Local. Chiefly on *Fraxinus*.
- M. subaurifera*. Local. In carr etc.
- Parmelia sulcata*. Frequent. In carr etc. The most common foliose lichen.
- Phaeophyscia orbicularis*. Local. Frequent on a *Populus* in St Edmund's Fen, and on the top of the concrete post by the windmill.
- Phlyctis argena*. Local. On *Salix pentandra* in the north-east corner of the Sedge Fen.
- Physcia adscendens*. Local. A few plants on a *Populus* in St Edmund's Fen. On *Salix fragilis* in Adventurers' Fen.
- P. caesia*. Rare. Several plants on the concrete post by the windmill.
- P. tenella*. Local. Frequent on a *Populus* and on three *Salix fragilis* in St Edmund's Fen. Scarce on *S. cinerea* in carr near the windmill. On *S. fragilis* in Adventurers' Fen.
- Physconia grisea*. Rare. Several plants on a *Salix fragilis* in St Edmund's Fen.
- Punctelia subrudecta*. Frequent. In carr etc.
- Ramalina farinacea*. Local. One plant, one cm tall, on dead stem of *Salix cinerea* in St Edmund's Fen. Four plants, one cm tall, on old *Salix fragilis* on Spinney Bank.
- Rinodina oleae*. Local. Scarce on *Populus* in St Edmund's Fen. Frequent on the concrete post by the windmill.
- Trapeliopsis granulosa*. Rare. At base of *Fraxinus* in St Edmund's Fen.
- Usnea subfloridana*. Rare. One plant, one cm tall, on mature *Salix pentandra* in the north-east corner of the Sedge Fen.
- Xanthoria candelaria* sens. lat. Local. On a *Populus* and on two *Salix fragilis* in St Edmund's Fen.
- X. parietina*. Local. Several plants on a *Populus* in St Edmund's Fen, and on the concrete post by the windmill.
- X. polycarpa*. Rare. Several plants on dead stems of *Salix cinerea* in St Edmund's Fen.

List of species recorded by M. Butler and M. Powell in 2008

Descriptions of abundance give a suggestion of how frequently the species was found during the survey. Voucher specimens of some species are housed in Herb. Powell.

Amandinea punctata. Frequent. On twigs and mature bark of tree trunks, widespread on the Fen.

Anisomeridium polypori. Rare. At base of mature willow trunk (tagged 0058) and on a *Sambucus* stem in Sedge Fen. TL5570.

Arthonia punctiformis. Rare. On *Alnus* twigs near the north edge of Baker's Fen. TL567699.

A. radiata. Occasional. On *Prunus* sp. suckers in visitor car park, on *Rhamnus* in St Edmund's Fen and on *Acer campestre* at north edge of Bakers Fen. TL5669 and TL5670.

A. spadicea. Rare. On *Fraxinus* trunk at south side of St Edmund's Fen. TL567699.

Arthopyrenia punctiformis. Rare. On *Alnus* twigs near the north edge of Baker's Fen. TL567699.

Aspicilia contorta. Rare. On concrete base at south side of National Trust workshops. Not identified to subspecies level. TL563704.

Bacidia arceutina. Rare. On heavily shaded *Fraxinus* trunks in St Edmund's Fen. TL566700.

B. sulphurella. Rare. On shaded bark in St Edmund's Fen. TL566701.

Buellia griseovirens. Rare. On sawn wood and corrugated roofing sheets of school study shelter. TL5670.

Caloplaca citrina sens. str.. Occasional. On calcareous substrates including the walls of the National Trust workshops and a concrete manhole cover in the overflow visitor car park. TL5670.

C. decipiens. Rare. On wall of the National Trust workshops. TL563704.

C. flavocitrina. Occasional. On wall of the workshops and on the concrete post by the windmill. TL5670.

C. holocarpa. Occasional. On wall of the workshops, on concrete manhole cover in the overflow car park and on the concrete post by the windmill. TL5670.

C. obscurella. Rare. On *Fraxinus* trunk at south edge of St Edmund's Fen. TL567699.

C. saxicola. Occasional. On walls of the workshops and on concrete manhole cover in overflow car park. TL5670.

C. teicholyta. Occasional. On concrete base at south side of the workshops and on concrete manhole cover in overflow car park. TL5670.

Candelariella aurella. Occasional. On walls of the workshops and the concrete post by the windmill. TL5670.

C. medians. Rare. On walls of the workshops. TL563704.

C. reflexa. Occasional. On various trees and shrubs in St Edmund's Fen and Sedge Fen. TL5570 and TL5670.

C. vitellina. Rare. On sawn wood including the frames of reed fencing panels next to the Anglian Water site. TL563704.

Cladonia chlorophaea. Occasional. On weathered boards of bird hide and on rotting stumps in Sedge Fen. TL5670.

C. fimbriata. Rare. On damp bark in St Edmund's Fen. TL566701.

Chaenotheca ferruginea. Rare. On bark of mature willow tree (tagged 0054) in Sedge Fen. TL559707.

Cliostomum griffithii. Rare. On bark of willow pollard to south east of visitor centre. TL563704.

Cyrtidula quercus. Rare. On *Quercus* twigs of scrubby tree along central ride. TL566701.

Diploicia canescens. Rare. On bark of mature willow in St Edmund's Fen and on willow pollard south east of visitor centre. TL5670.

Evernia prunastri. Rare. On blackthorn in Sedge Fen. TL5670.

Flavoparmelia caperata. Rare. On oak trunk in Sedge Fen. TL5670.

Jamesiella anastomosans. Rare. On upper surface of inclined *Betula* and *Crataegus* trunks in St Edmund's Fen. TL563704.

Hypogymnia physodes. Rare. On corrugated roofing sheets of school study shelter. TL563704.

Hypotrachyna revoluta. Occasional. On the bark of various trees and shrubs in St Edmund's Fen and Sedge Fen. TL5570 and TL5670.

Lecania cyrtella. Rare. On *Sambucus* twigs near north edge of Baker's Fen. TL567699.

L. erysibe. Rare. On concrete manhole cover in overflow car park and walls of National Trust workshops. TL5670.

Lecanora albescens. Occasional. On concrete structures including the concrete post by the windmill and the walls of the workshops. TL5670.

L. campestris. Occasional. On concrete structures including the concrete post by the windmill. TL5670.

L. carpinea. Rare. On *Prunus* sp. stems in the visitor car park.

L. confusa. Rare. On *Prunus* sp. stems in the visitor car park.

L. chlarotera. Occasional. On twigs of various tree and shrub species on Sedge Fen and St Edmund's Fen. TL5570 and TL5670.

L. conizaeoides. Rare. On sawn wood including the windmill, the Tower Hide and fence posts beside the Anglian Water site. TL5570 and TL5670.

L. dispersa. Occasional. On the walls of the workshops and on the concrete post by the windmill. TL5670.

L. expallens. Frequent. On the bark of various tree species in St Edmund's Fen and Sedge Fen. TL5570 and TL5670.

L. muralis. Rare. On concrete structures including the concrete post by the windmill. TL5670.

L. pulicaris. Rare. On *Quercus* twigs in Sedge Fen. TL558707.

L. saligna. Occasional. On sawn wood including fence panels beside the Anglian Water site and wooden seats in Sedge Fen. TL5570 and TL5670.

L. symmicta. Rare. On *Quercus* twigs in Sedge Fen. TL558707.

Lecidella elaeochroma. Occasional. On sallow in St Edmund's Fen and *Prunus* sp. stems in the visitor car park. TL5670.

L. stigmatea. Occasional. On concrete structures including the post by the windmill. TL5670.

Lepraria incana. Occasional. On shaded trunks of various tree and shrub species in St Edmund's Fen and Sedge Fen. TL5570 and 5670.

L. lobificans. Occasional. On shaded bark in St Edmund's Fen and Sedge Fen. TL5570 and TL5670.

Melanelixia fuliginosa subsp. *glabratula*. Rare. On sallow in St Edmund's Fen. TL5670.

M. subaurifera. Frequent. On various species of trees and shrubs in St Edmunds Fen and Sedge Fen. TL5570 and TL5670.

Melanohalea exasperatula. Rare. On corrugated roofing sheets of school study shelter. TL563704.

Opegrapha ochrocheila. Rare. On *Fraxinus* bark in St Edmund's Fen and Sedge Fen. TL5670.

Parmelia saxatilis. Rare. On wooden gatepost of roadside gateway opposite No. 26 Lode Lane. TL564705.

P. sulcata. Frequent. On various species of trees and shrubs in St Edmund's Fen and Sedge Fen. TL5570 and TL5670.

Parmotrema perlatum. Occasional. On various species of trees and shrubs in St Edmund's Fen and Sedge Fen. TL5670.

Phaeophyscia nigricans. Rare. On weathered gate opposite No. 26 Lode Lane and on cast iron manhole cover in overflow car park. TL5670.

P. orbicularis. Frequent. Occurs both as an epiphyte and on concrete including the post by the windmill. TL5670.

Phlyctis argena. Rare. On sallow in St Edmund's Fen and on the trunk of mature willow (tagged 0058) in Sedge Fen. TL5570 and 5670.

Physcia adscendens. Frequent. As an epiphyte in St Edmund's Fen and on corrugated roofing sheets of school study shelter. TL5670.

P. caesia. Rare. On concrete structures including the post by the windmill. TL5670.

P. tenella. Occasional. On sallow in St Edmund's Fen and *Quercus* and *Prunus spinosa* in Sedge Fen. TL5570 and TL5670.

Physconia grisea. Rare. On *Sambucus* near north east corner of Baker's Fen. TL5669.

Placynthiella icmalea. Rare. On weathered gate opposite No. 26 Lode Lane and on fence next to Anglian Water site. TL5670.

Porina aenea. Rare. On shaded *Fraxinus* stems in St Edmund's Fen. TL5670.

Punctelia subrudecta. Occasional. On mature *Populus* sp. in St Edmund's Fen and on *Prunus spinosa* in Sedge Fen. TL5670.

Punctelia jeckeri. Rare. On *Populus* sp. in St Edmund's Fen and on corrugated roofing sheets of school study shelter. TL5670.

Ramalina farinacea. Rare. On sallow in St Edmund's Fen. TL5670.

Rinodina gennarii. Rare. On concrete post by the windmill. TL562705.

R. oleae. Rare. On wooden seat in Sedge Fen. TL5570.

Sarcogyne regularis. Rare. On concrete base at south side of workshops. TL563704.

Xanthoria calcicola. Rare. On concrete including the post by the windmill. TL5670.

X. parietina. Frequent. Occuring both as an epiphyte and on concrete structures. TL5670.

X. polycarpa. Occasional. On sallow in St Edmund's Fen and on *Prunus spinosa* in Sedge Fen. TL5670.

X. ucrainica. Occasional. As an epiphyte on various species in St Edmund's Fen and Sedge Fen. More rarely on sawn wood including the weathered gate opposite No. 26 Lode Lane. TL5670.

Unconfirmed lichen records (2008)

Caloplaca cf. *chlorina*. Rare. On base of *Sambucus* trunk, north edge of Baker's Fen. TL568698.

Lecanora cf. *compallens*. Rare. On the trunk of the willow pollard just southeast of the visitor centre and on corrugated roofing sheets of school study shelter.

Punctelia cf. *borreri*. Rare. On sallow in Sedge Fen. TL560704.

Verrucaria cf. *macrostoma* f. *macrostoma*. On concrete manhole cover, on walls of the workshops and concrete post by the windmill. TL5670.

Acknowledgments

I am grateful to all the National Trust staff for allowing access and in particular to David Dench for his encouragement. I am also indebted to Martin Butler (lichen recorder for Bedfordshire) whose help in the field was invaluable and to the following referees who kindly determined material for me: B. J. Coppins, P. W. James and J. R. Laundon.