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Badgers in Cambridgeshire E.S. Neal

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THE LICHENS OF CAMBRIDGE WALLS

F. H. Brightman

The flowering plants that grow on walls in Cambridge have attracted attention since the earliest days of interest in natural history. The bryophytes that grow with them were described in a paper by Rishbeth (1948). The lichens, in spite of the fact that they are as numerous in species as the bryophytes and from the point of view of area covered more abundant than any other plants, have been virtually ignored. In this survey all the species of lichen that have been observed growing on walls in the city are mentioned, and some aspects of their ecology discussed. The nomenclature employed follows Watson's Census Catalogue (1953) in the main; where another name has been used, that given in the Census Catalogue is indicated in brackets.

Drought and atmospheric pollution are inimical to lichens. The climate of Cambridge may be said to be continental, at least by British standards; the average annual rainfall is 552 mm., and the Meyer precipitation / saturation deficit ratio is 105, the lowest in the British Isles. This no doubt accounts for the absence of the larger foliose and fruticose lichens whose distribution in Britain is restricted to the north west and west. However, contrary to the consensus of local opinion, atmospheric pollution in the city is not negligible. The main source of pollution appears to be domestic heating appliances, which discharge into the air considerable quantities of soot and also sulphur dioxide. It proved possible to brush 0.2 g. of soot from an area of bark of 85 sq. cm. on the branch of a yew tree (Taxus baccata) growing near the University Library. The pH of this soot was 4.0. The bark of other trees in the city had lower pH values than normal, e.g., Ulmus procera 3.8 (5.4), Tilia platyphyllos 3.2 (5.6), Salix alba 3.9 (5.1) (the figures in brackets are the normal average pH values reported by Barkman (1958)).

It is the sulphur dioxide in the smoke from the coal fires and oil burning heaters which is toxic to plants. Various methods of measurement of the concentration of sulphur dioxide are available, but from the present point of view the lead peroxide gauge is the most useful. In this instrument a specially prepared layer of lead peroxide is exposed to the atmosphere, and the lead sulphate accumulating in it is determined at monthly intervals. Thus a monthly total of sulphur dioxide ab-

sorbed by a given area of surface can be calculated, which has a greater relevance for the effect of pollution on a lichen than a series of more or less instantaneous values of the concentration of sulphur dioxide in the atmosphere obtained by the conventional gas analysis type of gauge. For a large conurbation such as Greater London, where a sufficient number of gauges are in use, it is possible to plot on a map a series of isothions, or lines of equal pollution (the term isothion was suggested to me by A. Thorne). The data available are inadequate for this to be possible for Cambridge, but it can be deduced that the isothions would be closer together (i.e., the pollution diminishes more rapidly towards the outskirts of the city) by a factor of about ten. Published figures (D.S.I.R., 1963) show that the absorption of sulphur dioxide by a lead peroxide gauge in the centre of the city averages 1.6 mg. SO_3 /100 sq.cm. /day. This corresponds to the London isothion about 10 km. from the centre (Charing Cross). One kilometre from the Cambridge city centre the value falls to 0.9, corresponding to the London isothion 20 km. from Charing Cross. Six kilometres from the centre the value is 0.4, corresponding to some of the lowest values recorded anywhere, for instance, in Torquay (values as low as 0.2 have been measured, e.g., at Haverfordwest). Thus it can be seen that both climate and atmospheric pollution can be expected to limit the number of lichen species in the city.

On the other hand, the many different kinds of building materials that have been used in Cambridge walls provide a range of substrata that encourages diversity in the lichen flora. Much of the building has been carried out in limestone, which has a pH of 7.5. This type of wall in time comes to bear a particularly rich lichen community. The pioneer species have a crustose habit, the plant body or thallus being very thin and extremely closely applied to the surface of the stone; indeed, it actually etches itself into the limestone, and appears to the superficial glance as a mere stain. Verrucaria viridula (brownish green; clear green when wet) is a good example of this; it is, for instance, the most abundant species on the parapet of the Silver Street bridge. Here, together with the only other two species - present- V. nigrescens (brownish black) and Candelariella vitellina (orange yellow) - it covers rather less than fifty percent of the surface area of the stone. Another early coloniser, but one requiring rather rougher surfaces, is Lecanora dispersa. This

plant, which must be the commonest lichen in Britain, has a thin inconspicuous thallus covered with small densely crowded cup-shaped fruiting bodies (apothecia). It is abundant in Cambridge on limestone - for instance, it covers considerable areas of the walls of the Fitzwilliam Museum, there being in this situation between 300 and 400 apothecia per sq. cm. It is also abundant on concrete and cement, where it is accompanied by the pale yellow Caloplaca citrina, the orange yellow Candelariella vitellina and C. aurella (the thallus of the former consists of conspicuous granules, and apothecia are usually scarce; the latter has very small granules and always bears many apothecia), and Rinodina demissa which has an inconspicuous thallus and black apothecia. Lecanora dispersa is even to be found growing on oxide scale on an iron bridge in the grounds of St. John's.

On older limestone structures, such as Clare bridge and St. John's bridge, other crustose species form a completely closed community. These include Lecanora campestris (grey; brown apothecia), Lecidea (Biatora) coarctata (greenish grey; apothecia reddish brown), Caloplaca (Placodium) erythrocarpa (bluish grey; apothecea orange red), Protoblastenia rupestris (thallus inconspicuous; apothecia minute, orange) and Placynthium nigrum (black, with a dark blue tinge). Rather scarcer are Lecanora atra (grey, rough; apothecia conspicuous, shining black) and Aspicilia calcarea (grey showing white growth zones; apothecia greyish black). Various foliose species, in which the thallus is a thicker, lobed and leaf-like structure attached to the stone by thin threads (rhizoids) and easily removed intact, say, by means of a penknife, overgrow the crustose species on limestone that has remained undisturbed long enough. Examples are the orange species Xanthoria parietina and X. aureola (the latter distinguished by the crowded outgrowths on the upper surface), and Physcia adscendens (grey, with some erect lobes), P. orbicularis (grey, but green when wet), P. caesia (ashy grey, with conspicuous powdery patches) and P. grisea (brownish grey). Other species which are a conspicuous feature of the climax community are squamulose (or subfoliose), the thallus being thick and lobed, but very intimately applied to the stone and not removable intact. Examples are the orange species Caloplaca aurantia (Placodium callopismum) and C. (Placodium) decipiens (the latter distinguished by the yellow powdery patches on the surface). An additional species of interest which occurs on ledges on the walls of King's College Chapel

is Candelariella (Placodium) medians; this differs from other Candelariella species, which are granular, in having an orbicular pale orange thallus which is quite conspicuous.

At the other extreme, sandstone supports a very poor lichen flora. In exposed situations it is very acid. Evidence has been presented elsewhere (Brightman, 1959) indicating that calcareous substrata (in particular, asbestos roofing tiles) provide comparatively favourable lichen habitats in towns because of their power of neutralising sulphur dioxide. In similar situations the low pH (3.5) of sandstone may be attributed to its feeble buffering powers. As a substratum for lichens it is correspondingly unfavourable. The sandstone parapet of King's bridge is colonised by only one lichen, the yellowish green crustose species Lecanora conizaeoides - a striking contrast with the other bridges across the Cam mentioned above. Elsewhere by the river, sandstone at soil level, which was thus exposed to the buffering effects of soil water, had a pH of 7.0. It was colonised by the crustose species Lecidea (Biatora) coarctata and the greyish green squamulose species Squamaria muralis.

Walls built of brick frequently display an interesting mosaic of communities. The top surface, and ledges formed when as is frequently the case there is a protruding 'damp course' of tiles or header bricks, dry rather slowly after rain and also may tend to accumulate a scanty humus deposit. Such situations are occupied by foliose species. Yellow hand made bricks and soft red bricks (described further below) support Xanthoria parietina and X. aureola. Sand faced red bricks (see below) are colonised by various foliose species and also Cladonia fimbriata, a species which consists of grey-green squamules bearing cup-shaped structures (scyphi) on slender stalks. Hypogymnia physodes (Parmelia physodes) may be found here. This grey species (distinguished from true Parmelia species by the possession of an internal cavity between its upper and lower surfaces) is surprisingly rare in Cambridge; in the London area it is the first foliose lichen to appear as one travels outwards from the so-called 'lichen desert' in the centre of the city. Parmelia sulcata (grey, with a network of fine white lines on the surface), also rare in Cambridge (it is second in the 'order of entry' in London) may be found here as well. Another scarce species is Diploschistes scruposus (brownish grey, crustose), found rarely overgrowing mosses on

wall tops. The bases of walls, which are somewhat damper than the higher parts, are frequently colonised by the bluish grey squamulose species Diploicia canescens. This species will tolerate slightly shaded situations, but on parts of walls which are in permanent shadow the only lichen found is Lepraria incana (L. aeruginosa) which consists of a loose grey-green powder. It frequently overgrows mosses, and may be the lichen shown in the lower photograph on Plate 19 in the paper by Rishbeth (1948). The mortar community is different from those of the bricks themselves, and like that of concrete. It is usually dominated by Caloplaca citrina; Caloplaca (Placodium) murorum (similar, but rather more orange in colour), Biatorella pruinosa (grey, very inconspicuous), and of course the ubiquitous Lecanora dispersa are also typical. However, when the mortar is particularly soft and moist, Caloplaca aurantia (and its variety heppiana, distinguished by its yellower, more convex lobes) and Caloplaca erythrocarpa will grow on it, and spread to adjacent parts of the brick which are presumably impregnated with lime. In very wet rather shaded situations the gelatinous Collema crispum may rarely be found.

Different kinds of brick have their characteristic species. A yellow, hand made brick, with a smooth surface, supports when wet enough an abundant growth of Lecidea (Biatora) lucida. This crustose species is an unmistakable shade of bright green-yellow, and will cover the whole exposed surface of the brick. However, the water absorbing power of this type of brick is low (6%) and the lichen can only develop when due to local conditions the wall is more or less permanently saturated. The pH of these bricks is 6.6. Another common type of brick is bright red and very soft in texture. They normally have a pH of 6.8, and their water absorbing power is high (17-20%). Lecidea lucida grows on them, but they are so porous that they frequently become impregnated with lime from the mortar, and it is then replaced by Caloplaca citrina. The most favourable brick for lichens is a sand-faced red brick with a pH of 5.8 and a water absorbing power of 12%. Calcicole species are excluded, but the water content and surface texture encourage the growth of the larger species such as Cladonia fimbriata and the various Physcia species. The crustose species Lecanora sulphurea (greenish grey) and Ochrolechia parella (grey, ridged, rough and granular) may also be found here. Finally, a dull red stock brick with a rather low

pH (6.0) and a low water absorbing power (9%) is colonised by Lecanora conizaeoides only. This species has been called poleophilous (town-loving) by Erichsen (1929); it is certainly extremely tolerant of atmospheric pollution, and in Ireland, where it is at the limit of its range, it seems to be confined to towns (Brightman, 1964). It is ubiquitous in Cambridge on sufficiently moist and acid substrata, on walls, roofs and the barks of trees.

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THE BADGER IN CAMBRIDGESHIRE

A. E. Vine

At the beginning of 1964 the Trust's total knowledge of the distribution of the badger in Cambs. was restricted to two or three localities in the Barrington area and the south-west of the county. The Mammal Society was organising a nationwide survey and I agreed to do this for the county. Work commenced at the end of May and a field meeting on June 7th showed that several persons knew more about the badger than had previously been suspected - certainly more than I knew at that time. Mr. A. F. O'Sullivan gave considerable assistance in the Barrington area. Mr. O. Rackham completed enquiry forms both for three setts in the same area and for three setts which he had found elsewhere in the county, and Mr. J. Sturgess maintained a regular watch at a group of setts in the south-west of the county. Initial information was also given by a number of other persons, including G. Crompton, J. C. Faulkner, W.E.H. Fiddian, K. Norman, and