



The Pond, University Botanic Garden

E. J. Wiseman

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EDITORIAL

In spite of the great drought in 1976 this proves to be a particularly watery issue of our Journal, dealing as it does with the Pond in the University Botanic Garden and also with Hobson's Brook. It has been suggested that future issues might contain reports on each of our Reserves: it would be helpful if opinions for or against this innovation were sent to the Trust Office. In spite of ever increasing costs we have been able to include all our usual features with the exception of the Bird Club Report which is not to hand at the time of going to press.

The deadline for the receipt of contributions to the next issue of 'Nature in Cambridgeshire' is 1 December 1977.

TWENTIETH ANNUAL REPORT 1976

If reference to the prevailing economic gloom is left out of the Annual Report, it is not because of any immunity enjoyed by the Trust but because of a conviction that members would prefer a change of diet. So let us get the bad news out of the way. Membership is down from 3,000 to around 2,600. This is a serious reversal of the previous upward trend and is the reason for the setting up in November of a sub-committee responsible to the Executive, to be known as the Publicity Committee, whose task is to involve a wider public in CAMBIENT's activities, thereby boosting membership and revenue simultaneously.

The Trust's marketing activity has not fared much better with profit from sales estimated at £1,500, the same as in 1975. The incidence of VAT and the administrative costs of the sales operation, many of them intangibles such as labour, inevitably raise doubts about its viability. Nevertheless, credit is due to Mrs. Bythway, our Sales Officer, whose fine judgment in purchasing policy avoided the major pitfalls of today's highly sophisticated markets.

There has been little change in the Trust's eligibility for City or County Grants. However, the Education Committee has agreed in principle to assume the burden of the higher rent payable in 1977 for Fulbourn Educational Nature Reserve and we are grateful to the World Wildlife Fund for a donation of £1,000 towards the purchase of Shepreth L-Moor.

At their June meeting the Council of the Trust were unanimous that the key to further progress lay in the appointment of a fully qualified full-time Conservation Officer. Miss Joy Greenall, selected from 100 candidates in August, jointed the Trust on 1 November in that capacity.

Dr. Walters relinquished the Executive Committee chair to Mr. Peter Conder in July: the latter in turn, owing to commitments abroad, was succeeded by Dr. Michael Smith, Secretary of the Scientific Advisory Committee.

The only new reserve is Whittlesford Mill, owned by the University, under an exchange of letters for restricted access. Negotiations for the purchase of the western portion of Shepreth L-Moor were all but completed by the end

of the year, a retroactive lease for Gamlingay Cinques was obtained from the Parish Council, and a satisfactory renewal of Fulbourn Educational Reserve's lease finally secured.

Management problems have been aggravated by lack of field staff, but it is only fair to say that the relevant committees/volunteers have pulled their weight magnificently. On the practical side, very valuable support has come as always from the Cambridge Conservation Corps whose technical skills keep pace with their boundless enthusiasm. During the year they have added a scrub cutter and a hired Land Rover to their armoury and have themselves financed these acquisitions.

An unabridged copy of the Annual Report for 1976 has been sent separately to each member and is available freely at the Trust Office.

TREASURER'S REPORT

The year 1976 has seen little of any import on the financial side. It will be during 1977 that the Trust will have to bear higher costs incurred by the increase of administrative overheads and the appointment of a conservation officer. It is to be hoped that these additional costs, amounting to approximately £3,500 in a full year, will be met by the results of more active membership and fund raising efforts. It will be no easy task, but with the help of all our members I feel sure that we shall meet our targets and be able to continue the high standards that already exist.

NATIONAL TRUST

Wicken Fen Local Committee Report from May 1975—April 1976

The full report may be consulted in the Trust Office.

The Rev. Dr. A. C. Bouquet, a long-time member of the Local Committee and benefactor to the Fen, died in February 1976. Professor W. H. Thorpe has been co-opted to the Executive Committee and Dr. D. Briggs replaced Dr. S. M. Walters as Botanical Secretary from October 1975.

Accurate figures are not yet available, but it is estimated that the number of visitors during the period has increased slightly over previous years.

Following his contribution to 'Nature in Cambridgeshire', 19, 1976, Dr. J. P. Dempster co-operated with M. L. King and K. H. Lakhani in a paper published in *Ecological Entomology*, 1, 71-84, 'The status of the Swallowtail butterfly in Britain.'

Botanical Secretary's Report

The personnel of the Botany School have continued to be active in the Fen. Common weed species have been collected for study and a careful examination of the bryophyte flora has resulted in the discovery of *Riccardia sinuata* by Dr. H. L. K. Whitehouse.

The growth of *Peucedanum palustre* has been studied with special attention to the relationship between this plant and the Swallowtail butterfly.

Studies in Environmental Biology have been carried out by workers under the direction of Dr. D. E. Coombe, Mr. H. J. Harvey and Dr. R. M. S. Perrin. Subjects included:

Surface and water table levelling.

Diurnal fluctuations in the temperature, oxygen content and pH of various waters.

Distribution of Marsh Fern on the Sedge Fen.

Age distribution of Birch trees.

Flora of paths in relation to usage.

Environmental requirements of Water Lilies.

Zoological Secretary's Report

Messrs. J. R. Flowerdew, S. J. G. Hall and J. Clevedon Brown have continued the small mammal studies initiated in 1973. Bank voles in particular have been investigated and comparisons made with voles from other parts of the British Isles. A 'Guide to the Small Mammals of Wicken Fen' has been written by J. R. Flowerdew. Dr. S. Barnett (Veterinary School, University of Cambridge) is interested in the ticks and parasites of voles, while Dr. M. Kendall and Dr. G. I. Twigg, of London, have worked on the thymus gland of the bank vole and various blood parameters.

Wicken Fen Group

Forty ringing visits were made to the Fen and some 48 species were dealt with. Birds so ringed included Redshank, Woodcock, Long-eared Owl, Cuckoo, Kingfisher, Yellow Wagtail, Whinchat, and Brambling, the highest figure being for 506 Swallows. Observation showed 1975 as a rather disappointing nesting year.

Warden's Report

The abnormal weather has had its effect on the Fen. There was a considerable increase in *Phragmites* in the sedge and litter fields. A dry cold winter might prove disastrous for the sedge fields, but the dry spring has encouraged germination of 'carr' seeds and those of birch trees. The gale of 2/3 January 1976 would have seriously damaged the windpump but for the timely intervention of the Fen staff in the middle of the night. The long planned vista, started by the Conservation Corps in 1960 is now complete, thanks to the Corps and working parties from H.M.S. Ganges (now closed down) and from Acorn Camps.

CAMBRIDGE NATURAL HISTORY SOCIETY

President: Dr. C. L. Forbes

At the six General Meetings held in the Lent and Michaelmas Terms the following lectures were given:

6 February	John Larmouth	The Desert Environment
20 February	Mrs. P. Whitehouse	Natural History in Three Dimensions
5 March	Dr. Sydney Smith	Beetles, Birds and Barnacles—the young Darwin
15 October	Dr. C. L. Forbes Mr. Parks (E. Anglian Water Authority) Dr. P. Grubb	A Symposium — The 500 year Drought
26 November	W. H. Palmer	The Natural History of Wicken Fen
29 October	Dr. C. L. Forbes	
	Fossils in the Sedgwick Museum	

The several sections of the Society held some six meetings each during the year. A successful *Conversazione*, held in the University Department of Zoology, was followed by the Annual General Meeting.

Members of the Trust are reminded that they are entitled to attend all General Meetings of the Society.

Subscriptions: Life Membership, £7.50; Annual, £1; Members of Homerton or Hughes Hall (annual), 50p; Undergraduates (3 years), £2.50.

Applications to: Mr. E. J. Wiseman, The White House, Barley, Royston, Herts, SG8 8HT (City Secretary)
Mr. N. M. James, Sidney Sussex College, Cambridge (University Secretary)

FIELD MEETINGS 1976

Sunday, 25 April, Hayley Wood

No report of this excursion has been received, but the following records have been sent in by Mr. P. D. Sell.

Muntjac (*Muntjacus muntjac*). One seen in early morning of 23 October 1976.

Nuthatch (*Sitta europaea*). One seen on 23 October 1976 and on 6 November 1976.

Collared Dove (*Streptopelia decaocto*). One seen along site of the old railway on 6 November 1976 and probably the same bird in coppiced area on the same date. First record for this wood.

Saturday, 8 May, Wilburton Wood

After the Annual General Meeting some twenty members visited this new reserve, owned by Mr. Pell who accompanied the party together with our Patron, Lord Walston. The Trust is now responsible for the management of the reserve. Although small, the reserve is important as one of the few woodland areas in this part of the Fens. It has a good bird population (a few of us saw the Lesser Spotted Woodpecker) while a feature of particular interest is a chain of small ponds, presumably built as fishponds. These contain a number of interesting lower plants encouraged in their growth by the excellent clearance operations of the Conservation Corps. The excursion was rounded off by a visit to the adjoining vineyard where we were shown round by the owner, Mr. Sneesby, who also allowed us to sample the excellent local product.

Sunday, 23 May, Bedford Purlieus near Wansford

This large wood, owned by the Forestry Commission, is now in the 'new' Cambridgeshire. The wood having previously been in Northants, this was a joint meeting with the Northants Trust who kindly provided experts to guide us round the reserve in the wood. The varied soil composition of the wood has given rise to a very rich and varied flora: 462 species of vascular plants have been recorded—probably the highest total in any lowland wood in Britain. Species observed included Broad-leaved Helleborine (*Epipactis helleborine*), the very local Mountain Melick grass (*Melica nutans*), here at its southernmost British station, Lily-of-the-valley (*Convallaria majalis*), and Hard Fern (*Blechnum spicant*). A fine specimen of Wild Service (*Sorbus torminalis*) was admired. Some members saw Stinking Hellebore (*Helleborus foetidus*) in one of its few natural stations. Dr. Hooper and Dr. Welch of Monks Wood pointed out birds and insects and gave some account of the wood's history. Concern was expressed at the presence of large ironstone workings on the east side of the wood—a threat against which there is no real protection. The destruction of limestone grassland on the west side of the wood by the laying of a pipeline was also a disturbing matter, but fortunately some of the more interesting plants have returned to the area. Mr. Gardiner, our CAMBIENT leader, thanked the Northants Naturalists' Trust for a most enjoyable excursion, and he also gave valuable assistance in identifying insects.

Sunday, 6 June, Soham Reserve: the meadows and Wet Horse Fen

Soham's unique combination of old meadowland and a rich variety of shrub and hedgerow species was much enjoyed by more than thirty members on a fine afternoon. Although a dry spring had restrained the growth, or speeded up the flowering, of many meadow flowers, much of botanical interest was found in a wetter pasture south of the Longmere Lane. Of note here were *Carex nigra*, *Veronica scutellata* and *V. catenata*.

The party followed the ancient hedged-in driveway, rich in the scents and colours of early summer. In the principal wet pasture of the reserve there was still some meadow saxifrage in flower, adder's tongue fern (*Ophioglossum vulgatum*) and a single specimen of *Dactylorhiza fuchsii* was recorded. The reserve's rarity—the frog orchid—eluded discovery on its known favoured site. Thirty bird species were noted, including the now increasingly uncommon Whitethroat, Snipe, Meadow Pipits and Reed-Buntings were seen on the more open wetter fen pasture. The party was able to see the extent of scrub clearance that will undoubtedly benefit the Wet Horse Fen meadow flora, and there was much admiration for the hedge-laying work, done by the Conservation Corps, along the edge of the old Wet Horse Fen's southern boundary.

Sunday, 20 June, Fulbourn Educational Nature Reserve

This Reserve is known to many members of the Trust as a place of beauty offering a variety of woodland and grassland habitats. It has again been well used by parties of school children, who are introduced to the joys of natural history studies and to an appreciation of the countryside. Mrs. Hilary Whittle, a County Peripatetic Teacher for Environmental Education, has been in charge. She takes groups of children for field work on the Reserve, and follows this up with further studies back in the schools.

For the Open Day in June, Mrs. While laid out a nature trail and labelled dozens of plants and trees to be seen on the way. Our visitors were very appreciative of this, and of the 'hand-out' sheet and map which she also prepared. Members of the management committee were on duty along the route to answer questions and to act as guides. So that educational work might be seen in progress, Mrs. While arranged for two groups of children from Cambridge junior schools to come with their teachers and engage in the kind of work normally done on the Reserve: bird watching, invertebrate hunting, flower and tree identification, etc., using the usual instruction and identification sheets provided. At one stage in the afternoon Ox Meadow was seething with activity; the children all enjoyed themselves, and their parents added to the number of interested visitors. Mr. Lambeth, a member of the committee, lives almost opposite the entrance, and he laid out in his garden some of his fascinating collection of rural bygonies. His garden was also used for the serving of over 600 teas by a team of volunteers organised by Mrs. Wilkins. It was estimated that between half-past two and six o'clock that day nearly 900 people visited Fulbourn Reserve.

Sunday, 18 July, Chippenham Fen

It was a great pleasure to pay another visit to this extremely interesting and important fen, which is a National Nature Reserve managed by the Nature Conservancy. Our party of about twenty-five people, was doubly fortunate in that Mr. Martin Musgrave, the Conservancy's Breckland Warden, gave up his Sunday afternoon to show us round and we are extremely grateful to him. It was reassuring to see the reserve looking so peaceful and flourishing in the period of intense drought. It is the management policy to open up as many of the old channels as is practicable and to keep different parts of the reserve at different water levels. We were able to see practical results of the decision in spite of the present low water table and comparative absence of running water. We went to Poor's Fen first of all to see the wealth of fen plants, birds and insects, returning to the main ride to visit the newer parts of the reserve to the north, where we enjoyed an impressive display of orchids. A pair of herons flew over at this point. We looked for bee orchids which had been in flower on the chalk bank in this area earlier in the year, but found no trace. We returned to base via Forty Acre Wood, completing a very pleasant and informative afternoon.

Sunday, 3 October, Brandon Park

Many fungus forays have been to Brandon Park. The number of species recorded varies surprisingly little from year to year, except in very bad seasons such as 1959. This year, with a wet September following a remarkably hot summer, was quite exceptional, not so much for the number of species (which only slightly surpassed the previous best year, 1966) as for the abundance and size of some of the commoner ones. About sixty members were taken round the Park by Dr. H. J. Hudson. We began with enough *Amanita phalloides* to poison us all several times over. Some of us made good use of the unusually large specimens of such table-toadstools as *Tricholoma personatum*, *Marasmius oreades*, and *Lepiota procera*. Less common species included *Rhodophyllus sericeus*, *Gomphidius roseus*, *Suillus aeruginascens*, *Tricholoma argyraceum*, and *Hebeloma sinapizans*. The curious *Collybia cirrhata* was found growing characteristically on rotten *Russula nigricans*. Common fungi which this year were unusually scarce included *Armillaria mellea*, *Tricholoma rutilans*, and *Suillus bovinus*.

The excursion to Hayley Wood on Sunday 25 April was a joint meeting with the Beds and Hunts Naturalists' Trust and the Beds Natural History Society. An excursion to Foul Anchor was cancelled owing to lack of support and a meeting on Cavenham Heath had to be cancelled owing to the Nature Conservancy's warning of fire risk.

THE LICHEN FLORA OF CHIPPENHAM FEN,
CAMBRIDGESHIRE:
A STUDY OF SECONDARY WOODLAND

J. R. Laundon

British Museum (Natural History), London

Introduction

Chippenham Fen National Nature Reserve lies in the shallow valley of the Chippenham River, which forms a short arm of the Cambridgeshire Fens. All the reserve is in the parish of Chippenham, with the exceptions of Snailwell Poor's Fen and High Wood which are in Snailwell parish. Much of the vegetation of the reserve is semi-natural, consisting of sedge-reed *Cladium/Phragmites* swamp communities undergoing extensive colonisation by immature trees, especially ash *Fraxinus* and birch *Betula*, and to a lesser extent alder *Alnus*. In addition there are areas of rough pasture and also mature woodland originating from old plantations in Forty Acre and Jerusalem Woods (see Fig. 1).

A brief description of the vegetation is given by Godwin in Salzman (1938, pp. 47-48) and this account is repeated, with only a few small alterations, by Perring, Sell & Walters (1964, p. 21-22). Kassar (1951a) shows that the reserve 'owes its existence in part at least to springs feeding its basin and leading to the development of spring fens.' Kassar (1951b) also provides a history of the fen, and (1952a) a detailed account of the vegetation of the chief area of mature woodland (Forty Acre Wood) in relation to drainage factors, as well describing (1952b) the tree colonisation of the original *Molinietum* which dominated compartments 9 and 10 in 1880. None of these accounts contains any reference to the lichen flora.

In view of the absence of published lichen records from Chippenham Fen in comparison with the data available for other areas of extensive semi-natural vegetation in the Fens (see below), it was decided that a lichen survey should be undertaken. This was confined within the boundaries of the reserve and as such did not include Underdown Plantation; it was carried out on 24 February, 25 March and 29 October 1975; therefore all the lichens mentioned were recorded in 1975.

Secondary Woodland

The four remaining areas of extensive semi-natural vegetation in the Fens, namely Chippenham, Holme, Wicken and Wood Walton Fens, are all examples of recent secondary woodland (i.e. woodland which has developed on land cleared of original forest) remote from areas of primary woodland. Thus the lichen flora of these fen woodlands is of interest because it is not derived from a relict flora as in many woodlands elsewhere in Britain, but comes largely from propagules brought in from outside. Thus the species which colonise the fen woodlands are lichens which are viable and mobile at the present time or at least in the recent past.

Woodland in the Fens was cleared at an early date. In the twelfth century 'some of the isles of the southern Fenland had woods at this time, but the Fenland as a whole was without wood' (Darby, 1974, p. 82). The only areas with any continuity of woodland were small osier holts which 'seem to have been pockets of carr fen, subject only to the lightest control so as to select willows as their main growth' (Ravensdale, 1974, p. 57). As these holts were coppiced at regular intervals they would have had a poor and limited lichen flora. Although woodland was otherwise absent, there were willows along the banks by the rivers and ditches 'to hold the peaty soil together more securely against the strain of floodwaters' (Ravensdale, 1974, p. 40) just as there are today; as an example in the Parish Field Book of Landbeach, Cambridgeshire, Henry Clifford records that 'on the little Eye bank there were finde great willows estimated XIX score in number. Scripsi 1587.' (Ravensdale, 1974, p. 40). Trees of this kind would have provided the chief habitat in the Fens for corticolous lichens during medieval and later times.

In Chippenham parish the clearance of woodland had been completed by the middle of the twelfth century (Spufford, 1965, p. 13) and from then onwards throughout medieval times the parish consisted entirely of open-fields except for the village itself, the fen in the north-west corner, and the heath on the chalk in the extreme south (Spufford, 1965). Chippenham Fen was an important area from the economic standpoint of the parish, as it provided both peat for fuel and common pasture for many centuries. On the fen 'peat digging had been known in the twelfth century. . . . The Preceptory obviously relied on turf for fuel in the absence of wood. . . . It seems possible that this digging resulted in the creation of "broads" on a small scale. In 1544 two "lakes" were described in Chippenham Fen which had disappeared again by the eighteenth century. It is not impossible that these owed their existence to twelfth- and thirteenth-century activities. Rights of digging for fuel in the fen were treasured by the very poor in Chippenham, and their abolition with enclosure at the end of the eighteenth century gave rise to a great deal of trouble.' (Spufford, 1965, pp. 23-24).

It was in 1796 that John Tharp made preparations to drain, enclose and plant the fen; before this time it was described as 'being all inundated the greater part of the year' (Spufford, 1965, pp. 53-54). Apparently almost two million trees had been planted before 1810, chiefly in two main plantations: Forty Acre Wood and Jerusalem Wood (Kassas, 1951b, p. 20), both of which still exist today. Forty Acre Wood 'was a young plantation of conifers in 1800' but a 'coniferous wood was never established' because 'deciduous trees came in as soon as the land was made ready for plantation.' (Kassas, 1952a, p. 59.) It is clear that there was no woodland on the fen before Tharp's plantations. A map of the parish, dated 1712, called 'A survey of the Mannor . . . of Chippenham . . . by Heber Lands' (Cambridge Record Office R 58-16-1) shows individual trees. 'Chippenham Fen, including what is now Forty Acre Wood, is shown as treeless except for a few groups of trees in the extreme east corner of the site of the wood. To the south is "The Marsh", also treeless, part of which is now occupied by the largest of the Jerusalem Plantations' (Rackham, in litt.). The woodland at Chippenham Fen therefore dates from c. 1800, and thus most of the epiphytic lichen flora developed on the fen after this date.

The epiphytic flora is comparatively rich. Large sheets of *Parmelia caperata* extend up the boles of about twenty trees over the eastern part of the fen. *P. caperata* still occurs elsewhere in the Fens, but only as isolated individual plants, as at Wicken Fen (Laundon, 1973) and Monks' Wood (Laundon in Steele & Welch, 1973, p. 99), and nowhere forms the extensive sheets which remain at Chippenham. Extensive stands of *P. revoluta* are also present. Perhaps the most interesting lichens recorded are *Enterographa crassa* and *Graphis elegans*, both growing low down on a few adjacent ash *Fraxinus* trees in the north-west section of Forty Acre Wood, both being quite rare in Eastern England at the present time. *Enterographa crassa* is regarded by Rose in Morris & Perring (1974, p. 262) as an 'old forest' lichen epiphyte which can be regarded as an indicator species and therefore used in calculating the 'Index of Ecological Continuity' of the forest environment. The presence of *Enterographa* in secondary woodland dating from c. 1800 clearly shows that this lichen cannot always be regarded as an 'old forest' lichen, and consideration should be given to its removal from Rose's list of indicator species. The nearest old woodland to the fen is Dalham Lawns 10 km. to the south-east (Rackham, in litt.).

Despite the occurrence of *Enterographa* and *Graphis*, the lichen flora of Forty Acre Wood is generally rather poor, the boles being dominated by *Lecanora conizaeoides*, *Lepraria incana*, or green algae, when not smothered with ivy *Hedera helix*. *Hedera* is remarkably abundant in the northern part of Forty Acre Wood, where it smothers the *Fraxinus* and other trees, and, being evergreen, shades out the lichen flora, as well as directly overrunning epiphytes on the surface of the bark so that they are eliminated by competition from the climbing roots and stems. Kassas (1952a) discusses and illustrates the abundance of *Hedera* in Forty Acre Wood, and Rackham (1975, pp. 50-51) remarks that 'ivy is often a precise indicator of secondary parts of woods, even after centuries.'

The occurrence in mature woodland of alder *Alnus*, birch *Betula*, ash *Fraxinus* and oak *Quercus*, etc., forming Forty Acre Wood and the plantation belts of Jerusalem Wood, is one of the two main reasons for the occurrence of a rich corticolous lichen flora at Chippenham Fen in comparison with the three other fenland reserves. At the other reserves the shrub and tree colonisation is comparatively recent, having occurred during the present century, and it therefore follows that the colonisation of corticolous lichens is also more recent and therefore more limited, with an absence of lichens (e.g. *Chaenotheca ferruginea*) characteristic of old trees. The abundance of *Fraxinus* at Chippenham Fen, present because of the calcareous nature of the waters which feed it, is particularly advantageous for many lichens. This is because the bark of *Fraxinus* has a neutral pH (Barkman, 1958, p. 108) and is readily colonised by many species in comparison with the acid bark of *Alnus*, *Betula* and *Quercus* which is often poorly colonised in this part of Britain. The richest lichen flora is found on the mature *Fraxinus* trees bordering the Main Ride (right-of-way) through the centre of the fen.

The other reason for the rich corticolous flora is the low level of background air pollution. Comparisons of the lichen flora of the various fenland reserves show that there is a pollution gradient stretching across the southern

Fens, with the highest levels in the west and the lowest levels in the east, where the Fens meet East Anglia. This gradient is probably part of the much larger pollution gradient stretching from the highly polluted west Midlands to the much cleaner air of the coastal belt of East Anglia (Hawksworth & Rose, 1970, Fig. 1). The comparatively clean air at Chippenham Fen is particularly indicated by the extensive sheets of *Parmelia caperata* (see Ferry *et. al.*, 1973, pp. 348-350) and *P. revoluta*, which indicate a lichen flora of zone 7, equivalent to a winter sulphur dioxide level of about 40 $\mu\text{g}/\text{m}^3$ on the Hawksworth & Rose (1970) scale.

This low pollution level, and the occurrence of mature woodland, account for the greater number of lichen epiphytes which are present at Chippenham Fen in comparison with the other comparable fenland reserves. On bark and wood, thirty-four species have been recorded, in comparison with thirty-one at Wicken Fen National Trust Reserve (Laundon, 1973), and substantially more than Wood Walton Fen National Nature Reserve (twenty-two species; Laundon, 1972) and Holme Fen National Nature Reserve (nineteen species; Laundon, 1958). Lichen habitats are limited to these substrates at Chippenham Fen because there are no stone buildings or constructions, and the waterlogged ground is unsuitable for lichen colonisation. Saxicolous habitats occur at Wicken and Wood Walton Fens, and terricolous lichen habitats at Wood Walton and Holme Fens, so that the highest total number of recorded lichens from the four areas is thirty-nine from Wicken Fen, in comparison with thirty-four at Chippenham, twenty-nine at Wood Walton and twenty-seven at Holme. The number of lichens at Chippenham might be expected to increase because the extensive tree colonisation taking place ensures a continuing increase in epiphytic habitats.

The nitrophilous communities which occur along the southern edge of the fen (Fig. 1) form a particularly interesting feature of the lichen flora. Ten nitrophilous species are present, namely *Buellia canescens*, *B. punctata*, *Candelariella cf. reflexa*, *Physcia adscendens*, *P. orbicularis*, *P. tenella*, *Physconia grisea*, *Ramalina farinacea*, *Xanthoria candelaria* and *X. polycarpa*. Of these species, *Buellia canescens* and *Physcia orbicularis* are especially common on the bases of trees on the bank at the western end of South Jerusalem Wood. As all ten lichens are situated at distances of under twelve metres from the edge of the fen, facing and adjacent to ploughed fields, and are absent (with the exception of a single locality for *Candelariella*) from both the whole of the interior of the fen and, so far as is known, from the edge where it adjoins meadow and rough pasture, it would appear that their presence is due to agricultural dust and fertiliser, wind-blown into the fen from arable soil as a result of farming activities. Green algae and *Lecanora conizaeoides* are both abundant in the same habitats. The bark is hypertrophicated (i.e. nutrient-enriched) even where a screen of young *Acer* and *Sambucus* forms a barrier between the fields and the older tree bases, as along the edge of South Jerusalem Wood. Therefore the land use of the surrounding fields would appear to have a significant effect on the lichen flora of the margin of the fen.

Comparisons with Primary Woodlands

In view of the recent interest in lichens as indicator species of relict forest (Rose in Morris & Perring, 1974), it is useful to compare the lichen floras of the secondary woodlands of the Fens with those of the primary woodland (i.e. woodland continuously present since prehistoric times) on the clay nearby. Chippenham (Laundon, present work) and Wicken Fens (Laundon, 1973) are well-documented examples of secondary woodland, whilst Monks' Wood (Laundon in Steele & Welch, 1973) in the parish of Sawtry, 8 km. from Huntingdon, and Hayley Wood (Rackham, 1975) in the parish of Little Gransden, 16 km. from Cambridge, are well-documented primary woodlands. All four areas have been subject to recent studies of their lichen floras, and these have been published in the literature cited. Moreover, Mr. B. J. Coppins visited Monks' Wood in 1974 and recorded a number of additional lichens (Coppins, in litt.) to be published shortly.

As regards lichen epiphytes recorded which are present in both areas of primary woodland but absent from both areas of secondary woodland there are seven species: *Arthonia spadicea*, *Buellia griseovirens*, *Cladonia macilenta*, *C. squamosa*, *Lepraria candelaris*, *Pertusaria pertusa* and *Platismatia glauca* (*Cetraria glauca*). Probably only one of these, *Lepraria candelaris* is apparently restricted to primary woodland in this part of England, although *Opegrapha lyncea* is probably also a similar indicator and is found at Hayley Wood but is not recorded for Monks' Wood. Of the other species, the distributions of *Arthonia spadicea* and *Buellia griseovirens* require further study, the two species of *Cladonia* occur commonly on heaths, and *Pertusaria pertusa* and *Platismatia glauca* grow elsewhere on isolated roadside trees, as in west Northamptonshire for example.

Lichen epiphytes present in both areas of secondary woodland yet absent from both areas of primary woodland comprise six species. These are *Cladonia fimbriata* (but present on the ground in Hayley Wood), *Lecanora chlarona*, *Physcia adscendens*, *P. orbicularis*, *Ramalina farinacea* and *Xanthoria polycarpa*. The last four are nitrophilous and their presence at Chippenham Fen is attributed to penetration of the woodland edge by agricultural dust. Both species of *Physcia* and *Xanthoria polycarpa* have great difficulty in penetrating into primary woodlands in Britain, and it is therefore possible that these three may be regarded as indicators of secondary growth. The three other species, *Cladonia fimbriata*, *Lecanora chlarona* and *Ramalina farinacea*, occur in primary woodland elsewhere (e.g. primary woods of Rockingham Forest, Northamptonshire) and therefore cannot be indicator species of secondary woodland.

The most noteworthy fact to emerge from this comparison is the general similarity of the epiphytic lichen flora in both the primary and the secondary woodlands. The most important difference between the lichen flora of the two types is the more limited bark surface available for colonisation by lichens in the secondary woodland at Chippenham Fen (and in other secondary woods elsewhere) because of the abundance of ivy *Hedera*. This flowering-plant is characteristic of secondary woodland (see Rackham, 1975, pp. 50, 115) and its effect on lichen vegetation by competition appears to have been little studied. A second major difference between the lichen floras

of the two woodland types is that the primary woodlands are much richer in total numbers of epiphytic lichens, with sixty species, as compared with the secondary woodlands total of forty-one. There is only a single lichen, *Lepraria candelaris*, which can probably be regarded as a primary indicator occurring in both the clay woods, where it is quite rare. This sparsity of primary indicators is due to the intensive management which has occurred in the coppice-with-standards woodlands over many centuries. As Rackham (1975, p. 53) remarks 'any lichens . . . that depend on a succession of mature or decaying trees, will have been reduced by the practice of felling oaks young. A big felling for some great work—a fairly common event in these woods—would finally eliminate them, unless the boundary pollards provided a refuge.' Following his lichen survey of numerous woodlands, Rose (in Morris & Perring, 1974, pp. 260–265) concluded that 'coppice-woodlands in particular have very reduced lichen floras . . . coppice management . . . seems to have eliminated much of the lichen flora and nearly all the old forest species.' The three lichens, *Physcia adscendens*, *P. orbicularis* and *Xanthoria polycarpa*, which may be regarded as indicators of secondary growth, are too restricted in distribution in the two fens to have much importance as indicators. Therefore lichens are of little value as general indicator species for use in differentiating between primary coppice-with-standards and secondary woodlands. It is fortunate that flowering-plants (see Rackham, 1975, p. 50) can be used instead in this respect. Lichens are, however, important as indicators of the continuity of some other types of vegetation, as for example, high forest and medieval parkland, as Rose (op. cit.) has demonstrated.

Species List

The nomenclature is based on James (1965) with later corrections. Compartment numbers are given in parenthesis following the locality. See Fig. 1 for place names and compartment numbers.

Buellia canescens (Dicks.) de Not. Scarce. At base of old *Fraxinus* in south-east margin of Forty Acre Wood (7). At base of sycamore *Acer pseudoplatanus*, *Betula*, *Fraxinus*, *Hedera*, *Quercus* and elm *Ulmus* in margin of South Jerusalem Wood (12).

B. punctata (Hoffm.) Massal. Scarce. Several plants on old *Fraxinus* branch in south-east margin of Forty Acre Wood (7). Several plants on young *Fraxinus* in margin of High Wood. One plant on rotting elder *Sambucus* in margin of South Jerusalem Wood (12).

Candelariella cf. *reflexa* (Nyl.) Lett. Scarce. On old *Fraxinus* branch in south-east margin and on *Fraxinus* in south margin of Forty Acre Wood (7).

Catillaria griffithii (Sm.) Malme. Scarce. Covering the underside of a dead sloping bole of *Acer pseudoplatanus* in margin of South Jerusalem Wood (12).

Chaenotheca ferruginea (Turn. ex Sm.) Mig. Scarce. On south side of *Quercus* in north-west section of Forty Acre Wood (7).

Cladonia coniocraea (Flörke) Spreng. Scarce. Amongst mosses at base of *Fraxinus*.

- C. fimbriata* (L.) Fr. Scarce. Amongst mosses at base of *Fraxinus*.
- Enterographa crassa* (DC.) Fée. Scarce. Several plants at base of two mature *Fraxinus* in north-west section of Forty Acre Wood (7).
- Evernia prunastri* (L.) Ach. Occasional. Chiefly on *Fraxinus*.
- Graphis elegans* (Borr. ex Sm.) Ach. Scarce. Several plants at base of mature *Fraxinus* and on a nearby shrub in north-west section of Forty Acre Wood (7). The plants are unhealthy, being overgrown with a thin film of alga.
- Hypogymnia physodes* (L.) Nyl. (*Parmelia physodes* (L.) Ach.) Frequent. Chiefly on *Fraxinus*.
- H. tubulosa* (Schaer.) Hav. (*Parmelia tubulosa* (Schaer.) Bitt.) Scarce. On boles and branches of *Fraxinus*.
- Lecanora chlarona* (Ach.) Nyl. Scarce. On *Fraxinus* in several parts of the fen.
- L. conizaeoides* Nyl. ex Cromb. Abundant. On bark of many species.
- L. expallens* Ach. Occasional.
- Lecidea granulosa* (Hoffm.) Ach. Scarce. On mature *Fraxinus* on Main Ride.
- L. querneae* (Dicks.) Ach. Scarce. On mature *Fraxinus* on Main Ride.
- Lepraria incana* (L.) Ach. Abundant on shaded bark in Forty Acre Wood (7); occasional at base of trees elsewhere.
- Ochrolechia androgyna* (Hoffm.) Arnold. Scarce. On two mature *Fraxinus* on Main Ride.
- Parmelia caperata* (L.) Ach. Occasional. Always forming extensive sheets on sloping *Fraxinus* boles where it occurs. On six boles on Main Ride, on six or more boles in spinney in East Meadows (13), on four or more boles in Forty Acre Wood (7) and on one bole in eastern section of North Jerusalem Wood (6).
- P. revoluta* Flörke. Occasional. Abundant on a number of *Fraxinus* boles. One of the most common foliose lichens on the fen.
- P. subaurifera* Nyl. Scarce. On two trees in Forty Acre Wood (7). On two *Sambucus* in south margin of Snailwell Poor's Fen (4).
- P. subrudecta* Nyl. Local. On mature *Fraxinus* on Main Ride and in Forty Acre Wood.
- P. sulcata* Tayl. Occasional. Chiefly on *Fraxinus*.
- Parmeliopsis ambigua* (Wulf.) Nyl. Scarce. Several plants on *Fraxinus* on Main Ride.
- Pertusaria amara* (Ach.) Nyl. Occasional on *Fraxinus* in Forty Acre Wood (7). Two plants of forma *isidiata* Harm. on *Fraxinus* on Main Ride.
- Phlyctis argena* (Spreng.) Flot. Occasional. At base of trees.
- Physcia adscendens* (Th. Fr.) Oliv. Scarce. Several plants on *Sambucus* in south margin of Snailwell Poor's Fen (4).

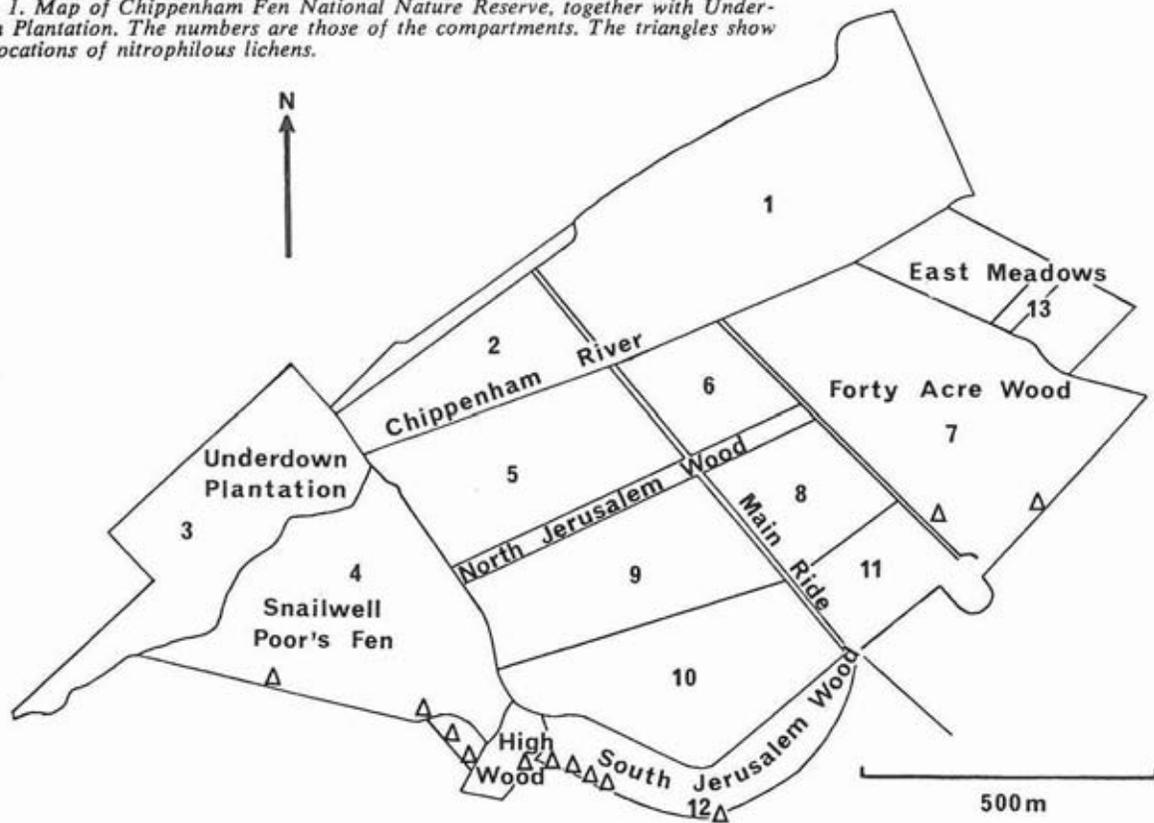
- P. orbicularis* (Neck.) Poetsch. Scarce. On dogwood *Thelycrania* in margin of High Wood. On exposed roots and at base of boles of *Acer pseudo-platanus*, *Fraxinus*, *Quercus* and *Ulmus* in margin of South Jerusalem Wood (12).
- P. tenella* (Scop.) DC. Scarce. On old *Fraxinus* branch in south-east margin of Forty Acre wood (7). Several plants on *Sambucus* in south margin of Snailwell Poor's Fen (4). Many plants on rotting *Sambucus* in margin of South Jerusalem Wood (12).
- Physconia grisea* (Lam.) Poelt. (*Physcia grisea* (Lam.) Zahlbr.) Scarce. Several plants on old *Fraxinus* branch in south-east margin of Forty Acre Wood (7). Two plants at base of *Betula* in margin of South Jerusalem Wood (12).
- Ramalina farinacea* (L.) Ach. Scarce. One plant on rotting *Sambucus* in margin of South Jerusalem Wood (12).
- Xanthoria candelaria* (L.) Th.Fr. Scarce. Several plants on old *Fraxinus* branch in south-east margin of Forty Acre Wood (7). On *Ulmus* in margin of High Wood. Many plants on rotting *Sambucus* in margin of South Jerusalem Wood (12).
- X. polycarpa* (Hoffm.) Oliv. Scarce. Several plants on *Sambucus* in south margin of Snailwell Poor's Fen (4). One plant on rotting *Sambucus* in margin of South Jerusalem Wood (12)

Summary

Chippenham Fen is richer in epiphytic lichens than other fenland reserves, with thirty-four species recorded in 1975. A low level of background air pollution and the occurrence of mature woodland, with an abundance of *Fraxinus*, are the main reasons for the good lichen flora. The woodland dates from plantings of c. 1800, and is a well-documented and characteristic example of secondary growth. Most of the epiphytic lichen flora developed on the fen after 1800. Nitrophilous communities occur along the southern edge, the presence of which is attributed to agricultural dust wind-blown into the fen from arable farming activities.

The lichen floras of the secondary woodlands of Chippenham and Wicken Fens are compared with the lichen floras of the primary woodlands of Monks' Wood and Hayley Wood with a view to investigating indicator species. Although the primary woodlands are much richer in total numbers of species, and the lichen flora of the secondary woodland at Chippenham is restricted by the abundance of *Hedera*, the epiphytic lichen flora is similar in both types, mainly because of the intensive management of the primary coppice-with-standards woodlands over many centuries. It is concluded that lichens are of little value as general indicator species for use in differentiating between primary coppice-with-standards and secondary woodlands.

FIG. 1. Map of Chippenham Fen National Nature Reserve, together with Underdown Plantation. The numbers are those of the compartments. The triangles show the locations of nitrophilous lichens.



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THE USE OF WATER IN THE BOTANIC GARDEN POND, CAMBRIDGE

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Sedgwick Museum

In ordinary times, the Pond presents a clear water surface of some 2780 m², replete with fish and ducks and surrounded by mature trees (see the cover illustration). Water is supplied by a leat from Hobson's Brook, the flow being controlled by a small sluice. In 1974, difficulty was experienced in controlling the water level, and there was a suspicion of leakage. Accordingly, in February 1975 an experiment was set up to determine the rate of consumption of water by the Pond and to determine whether the losses were due to leakage or evaporation or to some combination of these factors.

The supply of water was gauged by measuring the head flowing over a v-notched weir fixed across the leat. The level of the Pond was also gauged, and so was the water level in Hobson's Brook. The instruments used were clock-driven float-operated recorders; they provided charts of water level vs. time, the clock being wound weekly and the chart being replaced at the same time. Water level records taken with these instruments are accurate to about two millimetres in level and about two hours in time, quite sufficient for the purpose of the experiment. The rainfall record kept at the Garden was also consulted; 238 mm of rain fell during the 183 days of the experiment.

The Pond level record was used to determine whether water supplied to the Pond made it deeper, or whether the water was consumed by leakage or evaporation. A knowledge of the rate of supply (deduced by formula from the measured head flowing over the v-notched weir) thus enabled a water balance to be drawn up week by week, or more conveniently chart-period by chart-period, since the charts were not changed at precise weekly intervals.

The results are shown in Fig. 1. It will be seen that consumption was about 3 m³ per hour in February and March, before plant growth had become active and when much of the consumption may have been due to leakage. Consumption rose during the spring and early summer (April, May, June) and became more or less steady at about 10 m³ per hour in July and August, a hot dry period with maximum availability of solar energy when evaporation will have been very great.

The magnitude of this consumption may be appreciated by considering that a cubic metre of water weighs a metric tonne, almost an Imperial ton, and that evaporation takes place mainly during daylight hours. Thus the high rate of 10 m³ per hour for a 24-hour day amounts to 240 tons per day with a peak of perhaps 30 or 40 tons per hour at noon.

To investigate the relationship between leakage, evaporation and the expected evaporation from a pond of this size, comparison was made with the figures for evaporation measured at the Cambridge Water Company's Fleam Dyke Pumping Station, about 9 km. east of the Pond and 23 metres

higher above sea level. The comparison is shown in Fig. 2. It will be seen that there is an approximately linear relationship between pond water consumption and Fleam Dyke evaporation. The approximate mean straight line intercepts the ordinate axis (pond water consumption) at about 2.5 m³ per hour for zero Fleam Dyke evaporation; this figure is taken to represent the leakage from the Pond, and the remainder of the consumption is the evaporation. Pond water level varies very little, so that the head of pressure causing the leak, and hence the leak itself, will vary little through the year.

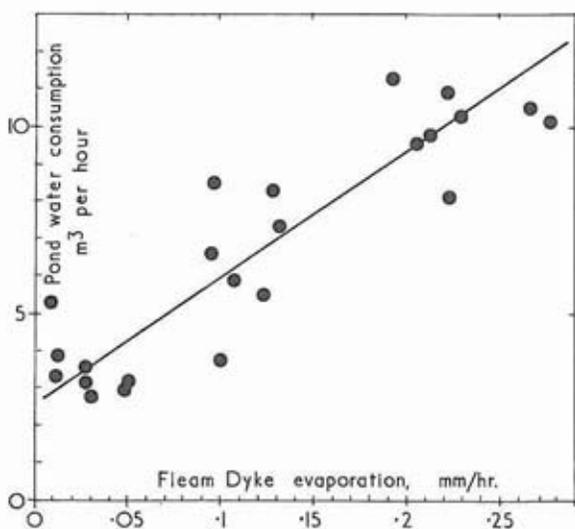
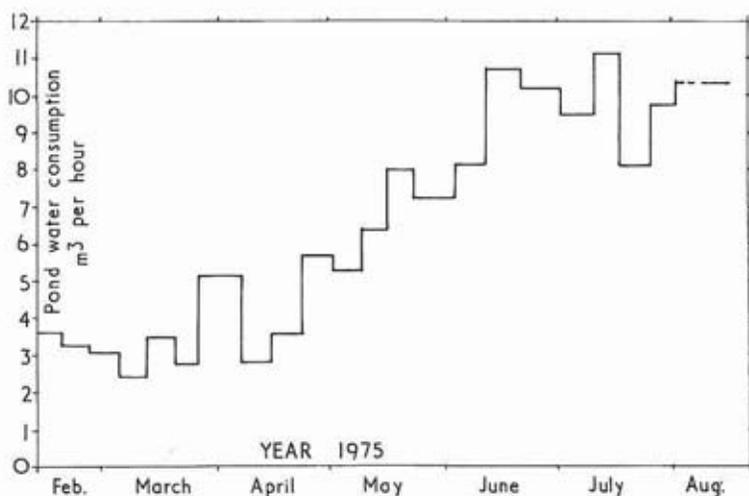
The Fleam Dyke evaporation pan is in a very exposed position, so that evaporation from it is rather greater than one would expect from the Pond. Here again the result of the experiment was unexpected, for if the Pond evaporation is expressed as millimetres depth on the pond area (instead of cubic metres) it comes to about 12.4 times greater than the Fleam Dyke figures.

It is concluded that the trees around the Pond, some of which are shown in the cover illustration, draw a great deal of water from it; ten or twelve times as much as evaporates from the free water surface of the pond itself.

The year 1976 presented a combination of factors rare in this district. The winter 1975/6 had been exceptionally dry, though comparable with that of 1973/4. The summer was hotter and drier than 1975 and was indeed more extreme than any summer for many years. Evaporation in July 1975 at Fleam Dyke amounted to 137 mm and in July 1976 to 195 mm. The Pond consumption of water was not measured, but may well have been 350 tons per day in autumn 1976. At this time, the flow from Nine Wells spring feeding Hobson's Brook was very small, the springs themselves being dry for the first time on record with the water rising in the bed of the stream just below the springhead spinney. Evaporation and transpiration so reduced the flow that the water fell below the sill of the Pond intake sluice and finally dried up altogether. The Pond also dried out (Pate 1).

It is difficult to draw general lessons from an experiment with limited objectives and from a single drought. The story may however be taken as illustrating the great importance of adequate autumn flow from chalk springs for a wetland situation in South Cambridgeshire.

My thanks are due to the Director of the Cambridge University Botanic Garden for permission to publish this article and to the Cambridge Water Company for permission to use their evaporation records.



Explanations of Figures

Fig. 1. Graph of Pond water consumption against time in 1975. Consumption is measured in cubic metres per hour averaged over each chart period of about one week.

Fig. 2. Graph of Pond water consumption against net evaporation as measured at the Cambridge Water Company's Fleam Dyke evaporation pan. Both quantities averaged per hour over the same chart periods as in Fig. 1.

THE FERTILITY OF HOBSON'S BROOK

Ernest A. Gray

Culture Centre of Algae and Protozoa

Flowering water plants are as dependent as land plants on soil for nitrogen, phosphate and potash. If compelled to take all their nourishment from water, a disproportion arises between protein build-up and starch formation, shown by retarded growth and early death.¹ In commercial watercress production in chalk streams, although the phosphate and nitrogen content of natural waters is very low, Lyon and Howard state that the beds are irrigated by such large quantities of water that rather more than 4½ cwt. per acre per week of nitrate of soda and 5½ lb. per acre per week of superphosphate may be supplied.² Superphosphate is added to the beds to build up the natural content. Much is washed away, but they quote Barbier and Marcel for the observation that some is 'fixed' by the bottom mud and slowly released over many weeks. Waters from the Greensand, however, contain adequate phosphate, and therefore phosphate fertilisers are not added to beds irrigated by such streams. There is a thin band of Greensand in the valley of Hobson's Brook, once a rich source of phosphatic nodules. The natural waters of the Brook supplied by the Nine Wells chalk springs are enriched by supplies of phosphate, potash and nitrogen from treatment of the arable land through which it flows for rather more than a mile before entering the suburbs of Cambridge. Experiments at Rothamsted and elsewhere have shown that very little phosphate and potash escape from the soil, although the amount of potash lost is distinctly dependent upon the quantity supplied as manure. Nitrates vary with the time of year, and also with the interaction of temperature, growth of crop, cultivation, and percolation. Drainage waters are more concentrated in winter and early spring but with spring growth of the crop, nitrates disappear from drainage waters.

However, a heavy rainfall in spring, before nitrates have been much drawn upon by the crop, or just after the land has been broken up in autumn and is still warm, results in a considerable washing out of nitrates. In heavy soil, nitrates are washed into the subsoil, but at Woburn, where the soil is sandy, they were found to rise again by capillarity. The soil of the valley of the Brook is a sandy loam, and it originally had a high water table, compensated for today by irrigation, so that nitrates should tend to be preserved. A further source of nitrates in the stream is provided by the root nodules of beans sown at intervals on the banks, while in the stream itself the nitrogen-fixing bacterium found in spring and autumn (in autumn especially) in the vicinity of green plants,³ and also blue-green algae,⁴ at times not uncommon, must add a quota of unknown volume. Mechanical disturbances of the soil, ploughing and harrowing, and irrigation, accelerate the release of mineral nutrients from the soil. The swift current of the upper third of the Brook ensures that soluble nutrients are first washed down into the lower reaches, and the last to be enriched are those upstream close to the springs. Micro-

phytes as well as macrophytes of course will benefit, and during winter particularly, the bottom mud will become progressively enriched from the lower third to the springs with nutrients available from spring plant growth, algae benefiting first, followed by flowering plants. At the time the latter begin to grow, crops on the banks may have locked up further supplies of nitrate to the water, but sufficient should have accumulated in the bottom mud to permit flowering aquatics to attain maturity.

Raymond Pond¹ states that in experiments upon *Vallisneria*, a flowering aquatic, and *Chara*, an alga, the best growth of both plants was obtained in loamy soil, the poorest on a clay soil, while a sandy loam with some humus supported a moderate growth. The 'soil' of Hobson's Brook will reflect the sandy loam and humus of the valley soil although in the upper third, close to the springs, it runs for a hundred yards through a chalk gully succeeded after a short interval by a hundred yards of gravel. The linear rate of flow in this stretch averaged two feet per second, but in the final yards of the Brook before it entered the suburbs, it averaged only two inches per second. At five inches per second nothing heavier than clay particles can be moved, supporting the contention that in the lower third of the rural reach, plant nutrients absorbed to clay or mineral particles would precipitate out in mid-stream.

When a microbiological survey of the rural reach of the stream was carried out between 1946-49, the flowering plants were found to be rather restricted in numbers of individuals and of species. They exhibited a marked zonation—*Zannichellia*, for instance, favoured a gravel patch in the middle third of the reach, but was not found elsewhere. *Sparganium* was common in the upper third near the springs, dotted in clumps in midstream from there on. *Phragmites* was most noticeable fringing the gravel reach below the springs and the banks immediately below a culvert where the Bedford railway crosses the stream. *Nasturtium officinale*, the famous Brook water-cress, that once had a commercial sale, filled the middle third—and had a seasonal distribution. *Sparganium* began to shoot in spring, followed by *Phragmites*, *Zannichellia* and *Potamogeton*. The remaining plants, *Nasturtium*, *Callitriche verna* and some others flowered in late summer. Every year, growth of flowering aquatics was preceded by growth of the filamentous diatom *Melosira*, which first became visible as brown patches on the floor of the stream, but especially at the margins, first far down the reach, and then advancing upstream until finally the springs were approached. *Batrachospermum moniliforme* followed *Melosira* upstream, appearing in the lower reaches in early summer, and weeks later in the gravel reach below the springs. At that time, the land was under a modified Norfolk rotation, with a flock of arable Suffolk sheep that lambed on the banks in spring and were folded in the stubble after harvest. Mineral fertilisers were not used, and no signs of eutrophication (excessive plant growth) were noted until the late summer of 1948. The west bank of the middle reach was dressed with farmyard manure and after a fortnight of close humid weather, there was a massive growth of *Nasturtium* in the reach, which spread back to the gravel stretch, and far downstream into the final few hundred yards.

In 1950 the cropping cycle was interrupted, and the middle and lower third of the rural reach went down to grass in preparation for the Royal Show held beside the Brook in 1951. The following spring the grassland was ploughed up and a phosphatic fertiliser applied to the banks of the centre of the reach, and in the summer a massive growth of flowering aquatics, notably *Sparganium* and *Potamogeton*, choked the final third down stream of the Brook. Some simultaneous estimations of the phosphorus, potash and nitrogen of the water in the centre of the stream and in the banks showed a rough correlation most marked as regards nitrogen. When a second microbiological study of the rural reach was carried out from 1969-73, the land was under a modern intensive system with no sheep and relatively frequent dressings of mineral fertilisers. Perhaps as a result of damming the stream for irrigation, many insects (caddis flies, *Trichoptera*, May flies, *Ephemeroptera*, etc.) were not observed, and there was no zonation of flowering aquatics, which were sparse in numbers.

The particular object of the enquiry was to investigate the survival in nature of *Escherichia coli*, the biological index of faecal pollution, and since phosphorus is concerned in its metabolism, a series of eight estimations of the phosphorous content of the water in the middle third of the reach was made in the summer of 1970. In April the east bank had received 300 cwt. (approximately $6\frac{1}{2}$ cwt. per acre) of a mixture yielding twenty parts nitrogen, fifteen potassium and fifteen phosphorus; at the end of the month the west bank was dressed with the same amount of the same mixture, and on the second of May the east bank also received liquid nitrogen yielding seventy-two units of nitrogen. The first estimation was made a fortnight after the east bank had been dressed, six others during the time the rhizospheres of cereals growing on the land might be expected to bring the phosphorus into solution, and the last shortly after harvest. (Table 1.) The figures are regarded as low, but justify the assumption that phosphorus does appear in the Brook after it has been spread on the banks. Plant 'blooms' were a noticeable feature of the second enquiry. One of algae occurred in March 1970 and a second of *Nasturtium officinale* in June that year. Both, however, occurred upstream, in the upper third of the reach, and thus could not be associated with the mineral dressing of the banks. There were four 'blooms' in 1971, of macrophytes in February, of macrophytes and algae in April and in May, and in August of algae.

In that year, the forty-five acre field bordering the centre of the rural reach was divided into three parts. In March thirteen acres of potatoes received a dressing expressed as 120 parts nitrogen, 180 phosphorus, and 240 potash. In April twenty-two acres sown with dwarf beans received a dressing of 120 parts nitrogen, 80 phosphorus and 45 potash, while in the same month six acres of wheat received six units of nitrogen. Whether the April 'blooms' in the stream were connected with the March dressing, or those in May with the April dressing, can only be speculated upon in the absence of chemical analyses of the water. 'Blooms' of algae were noted in the stream in February 1972, and of algae and macrophytes in May and June that year, after sixteen acres sown with peas had been dressed with a mixture of nil nitrogen, 28 phosphorus and 56 potash in

February, while twenty-nine acres of broad beans received in February and June a dressing of nil nitrogen, 60 phosphorus and 60 potash. Again it can only be conjectured whether the 'blooms' bore any relation to the minerals spread on the land, or were simply normal physiological rhythms: for example, the spring and autumn burst of diatoms. The point is, however, an important one. During the second inquiry it was found by field observations and in the laboratory, that there is an inverse correlation between numbers of *E. coli* and the mass of photosynthesising green plant tissue;⁵ low numbers of the organism were associated with green plants in the light. Carbon dioxide is an essential metabolite of *E. coli* and a decrease in the CO₂ content of natural waters due to photosynthesis will greatly reduce their numbers. Agricultural practice that increases the volume of plant life in a stream not necessarily flowing through arable land has a direct impact upon this observation, which has a practical aspect in Public Health estimations of potable waters.

When the second enquiry opened, the Nine Wells springs were found to be running to no more than a quarter of their former capacity, which averaged fifty litres per second between 1946-49. The water level was low in 1971, and the succeeding year 1972 was the driest in the district since 1951. The contrast between the former bustling life of the Brook and the reduction of species encountered from 1969-73 illustrated a suggestion put forward in a paper read to the Twelfth International Limnological Congress held at Cambridge in 1953, namely, that the microbiology of the stream hinged upon agriculture itself dominated by soil and climate.⁶ The life of the Brook had suffered because the climate of the valley had changed, the gush of fresh spring water had greatly diminished, and as a result the stream had to be damned for irrigation. Should the climate of the first enquiry ever be restored, so that the Wells once more run to full capacity and adequate ground water renders irrigation superfluous, then it may be assumed that the life of the Brook, micro- and macro-fauna and flora alike, will regain all its pristine vigour. At present (1976) there is no sign of this; continued drought has gripped the valley so severely that the Wells have almost ceased to flow.

The surrounding land has in the past been some of the best wheat land near Cambridge, under a cereal rotation since Domesday Book, and a rescue operation is to be mounted. Water will be piped in from the Cam, or from a reservoir, or from both sources, so that plenty is available for irrigation. The fertility of the stream will continue to be drawn almost exclusively from agricultural practice, but what picture will the future life of the Brook present? Hitherto the plants and animals of the Brook have been rather restricted in total numbers and numbers of species, and many of them, notably the water shrimp *Gammarus* and the watercress *Nasturtium officinale*, were typical of chalk waters. The populations that succeed them, when the Brook is no longer filled by cold alkaline water gushing from chalk springs, but coming from very mixed sources of doubtful purity, present a fascinating study in ecology that should be recorded from the beginning; a most rewarding challenge to a student with a taste for field work.

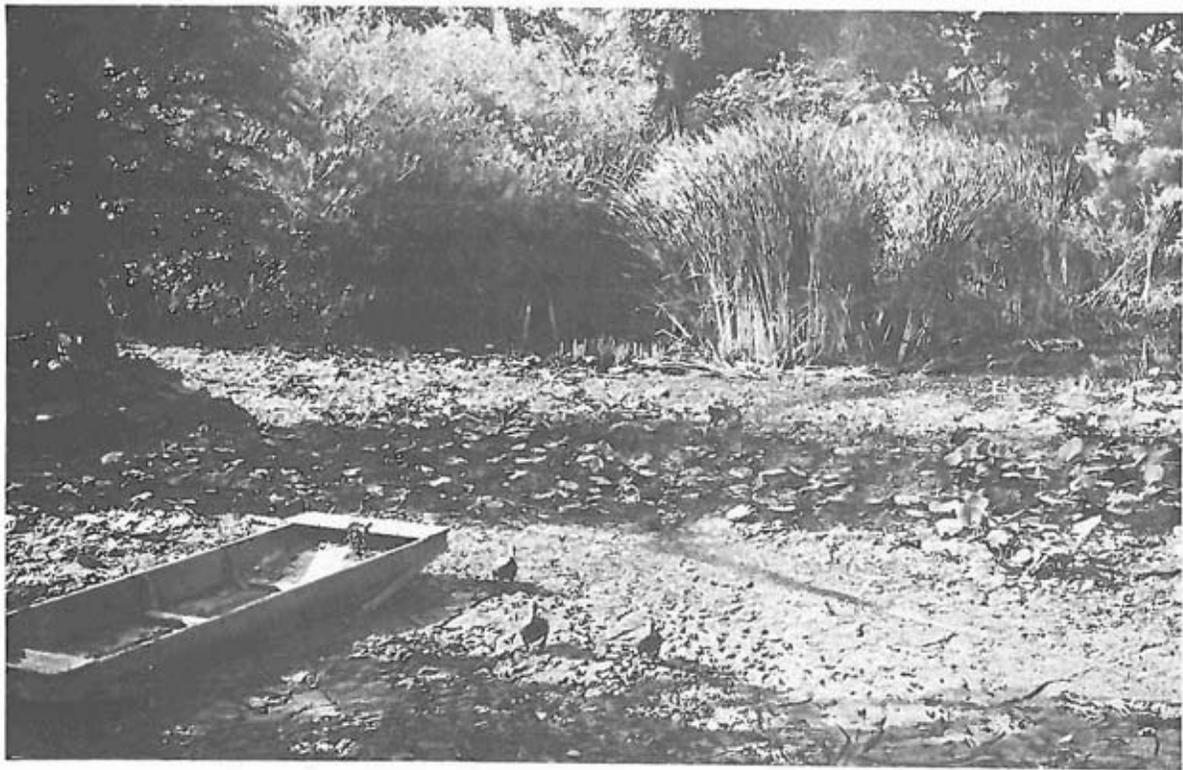
ACKNOWLEDGEMENTS

I am indebted to Dr. A. Eden, N.A.A.S. for the 1952 chemical estimations and to Dr. P. J. Grubb, University Botany School, for those of 1970, and to A. F. Pemberton, Esq., Church Farm, Trumpington, for details of mineral top-dressings and for permission, cordially granted, to walk over his fields.

Table 1. Phosphorus in the Brook 1970

<i>Date</i>	<i>Soil Treatment</i>	<i>Phosphorus as M.E./L. PO₄</i>	<i>Plant</i>	<i>Weather</i>
20 April	East bank zone 3 dressed with 300 cwt. mineral mixture.			No rain the previous 24 hours
2 May	East bank Zone 3 received liquid Nitrogen			No rain the previous 24 hours.
4 May		0		No rain the previous 24 hours.
11 May	Irrigation until 18 May	1		Rain on the 10th
18 May	West bank Zone 3 dressed with 300 cwt. mineral mixture	2.5		No rain the previous 24 hours.
29 May	Irrigation resumed until 8 June	1.5		Rain on the 28th
8 June		8.5		Electric storm on the 7th June
24 June		6.5		Rain showers all day
29 June			Nasturtium upstream	Heavy rain on the 28th
20 July		5.5		Drizzling all day
28-30 July	Harvest			
11 August		2		Drizzling morning on the 10th

Phosphate expressed as micro-equivalents per litre. Phosphorus increased in the water after a week's irrigation, 11-18 May, and again from 29 May to 8 June, combined with an electric storm on 7 June. Wheat was sown on both banks of the stream.



Botanic Garden Pond, August 1976

Plate I

W. H. Palmer



Plate II

Senecio paludosus, grown in the Garden from seed of the plant discovered in 1972—the first British record since 1857. See *Nat. in Cambs.* 1973, p. 37 W. H. Palmer



Hobson's Brook, winter 1976

W. J. N. Warner



Plate IV

Swallowtail Butterfly, Wicken Fen

W. H. Palmer

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LEPIDOPTERA IN CAMBRIDGESHIRE

R. J. Revell

The Perse School, Cambridge

Response to last year's appeal for dated observations of butterflies and moths in the county has been most encouraging. Detailed lists from Hardwick (John Selby) and the Devil's Dyke (Jeffrey Riley) have been received as well as many single records. Since Part I of the Geometer list was published, the following records of species not thought to have been seen recently have come to light:

Scopula floslactata Haw. Cream Wave.

Ditton Park Wood: 18.5.52. Several. C.C.S. (The wood has since been planted up with conifers.)

Orthonama obstipata Fab. Gem.

Girton: 157.69. One female. C.C.S.

Hydriomena ruberata Frey. Ruddy Highflyer.

Wicken: 26.5.74. One. C.C.S.

The Geometridae of Cambridgeshire and the Isle of Ely (Part II)

(Cont. from p. 60 19, 1976)

Eupithecia spp. the 'Pugs'. These diminutive moths are sometimes ignored by collectors. Some species are so similar to each other, particularly when the wing scaling has worn a little, that certain identification is impossible without dissection of the genitalia. Most, however, are distinctive in the caterpillar stage, and are often specific in their choice of food plant. Their distribution in the county is imperfectly known at present, and will require a great deal of diligent searching of the known food plants.

- Eupithecia tenuiata* Hubn. Slender Pug.
Larva on Sallow, Eared Sallow and Goat Willow (catkins).
V.C.H. Wicken and Chippenham.
Dernford Fen: one beaten from Sallow 1950-57 B.S.C.N.H.S.
- Eupithecia inturbata* Hubn. Maple Pug.
Larva on Field Maple (flowers).
V.C.H. Cambridge, Whittlesford, Boxworth, Chatteris.
Girton: occasional 1969-73 C.C.S.
- Eupithecia haworthiata* Doubl. Haworth's Pug.
Larva on Old Man's Beard.
V.C.H. common on chalk.
Dernford Fen: 1950-57 B.S.C.N.H.S.
Girton: a few in 1968 and 1969 C.C.S.
This species should be found wherever the food plant grows in quantity.
- Eupithecia plumbeolata* Haw. Lead-coloured Pug.
Larva on Common Cow Wheat.
V.C.H. Wicken, Whittlesford.
No recent records.
- Eupithecia linariata* D. & S. Toadflax Pug.
Larva on Common Toadflax (flowers and seeds).
V.C.H. S. Cambs., fairly common.
Wicken Fen: 5.6.40 D.W.F.
Dernford Fen: abundant 1950-57 B.S.C.N.H.S.
Girton: 22.6.70, 12.7.72 C.C.S.
Fowlmere: occasional 1973 J.R.
- Eupithecia pulchellata* Steph. Foxglove Pug.
Larva on Foxglove (flowers and seeds).
V.C.H. S. Cambs., fairly common; Whittlesford.
Cambridge: 1961-64 S. R. Davey.
Girton: occasional 1969-73 C.C.S.
Fowlmere: one 10.8.73 J.R.
In view of the rarity of wild Foxglove in the county, it seems likely that this insect is being supported by garden varieties.
- Eupithecia exigua* Hubn. Mottled Pug.
Larva on a wide variety of woody plants.
V.C.H. common.
Still a common species. No recent records for the Isle of Ely.
- Eupithecia insigniata* Hubn. Pinion-spotted Pug.
Larva on Apple, Hawthorn and Sloe.
V.C.H. Cambridge 1875, Gog Magogs 1880.
This attractive and nationally uncommon species has appeared twice in recent years.
Linton: one 8.5.73 R.J.R.
Fowlmere: one 1974 J.R.

- Eupithecia valerianata* Hubn. Valerian Pug.
Larva on Common Valerian.
V.C.H. Wicken, Chippenham, Bottisham.
No recent records.
- Eupithecia pygmeata* Hubn. Marsh Pug.
Larva on Greater Stitchwort.
V.C.H. Wicken, Burwell, Chatteris, Ely.
Wicken: 26.5.74 C.C.S.
- Eupithecia venosata* Fab. Netted Pug.
Larva on Red, White, Bladder and other Campions (seeds).
V.C.H. Cambridge, Chesterton, Teversham, Fleam Dyke.
An attractive and easily recognised species which is not common in the county.
Cambridge: 1950-60 E.C.P.-C.; 6.7.71 J. D. Scoble.
Girton: 15.6.69, 24.6.72 C.C.S.
Linton: 17.6.70 R.J.R.
- Eupithecia centaureata* D. & S. Lime-speck Pug.
Larva on the flowers of various plants, mainly Compositae and Umbelliferae.
V.C.H. common.
Still a common species.
I. of E.: March, occasional 1969-73 H.P.; Welches Dam 17.6.74 P.S.N.H.S.
- Eupithecia trisignaria* Herr. Triple-spotted Pug.
Larva on Angelica (flowers and seeds).
V.C.H. not mentioned.
Wicken: 24.7.73 H. E. Chipperfield.
- Eupithecia absinthiata* Clerck Wormwood Pug.
Larva on Ragwort, Golden Rod, Hemp, Agrimony, Yarrow.
V.C.H. common.
Chippenham: 20.7.71 C.C.S.
Girton: 1967-74 occasional C.C.S.
Fowlmere: 1974 J.R.
- Eupithecia assimilata* Doubl. Currant Pug.
Larva on Redcurrant, Blackcurrant and Gooseberry.
V.C.H. common.
Girton: occasional 1969-73 C.C.S.
Haslingfield: one 2.6.40 D.W.F.
Hauxton Gravel Pits: 1971 L. K. Evans.
- Eupithecia expallidata* Doubl. Bleached Pug.
Larva on Golden Rod (flowers).
V.C.H. not mentioned.
Toft: 10.8.73 C.C.S.
- Eupithecia vulgata* Haw. Common Pug.
Larva on the leaves of a wide variety of plants.
V.C.H. very common.
Quite common, but no recent records for the Isle of Ely.

- Eupithecia tripunctaria* Herr. White-spotted Pug.
Larva on Angelica and Hogweed (flowers and seeds).
V.C.H. Wicken, Chippenham, Swaffham Prior.
Girton: occasional 1969-73 C.C.S.
Toft: 10.8.73 C.C.S.
Meldreth: 1973 P.S.N.H.S.
Linton: May 1970 R.J.R.
- Eupithecia subfuscata* Haw. Grey Pug.
Larva on Groundsel, Hemp Agrimony, Harebell and Sheepsbit.
V.C.H. Wicken, Chatteris, Cambridge and Wisbech.
Fairly common, but no recent records for the Isle of Ely.
- Eupithecia icterata* Vill. Tawny-speckled Pug.
Larva on Yarrow.
V.C.H. widely distributed, fairly common.
Still fairly common, but no recent records for the Isle of Ely.
- Eupithecia succenturiata* L. Bordered Pug.
Larva on Ragwort, Yarrow, Wormwood, Mugwort and Chamomile.
V.C.H. widely distributed in the south, not common.
Still widely distributed, but never in large numbers. No recent records for the Isle of Ely.
- Eupithecia subumbrata* L. Shaded Pug.
Larva on Rough Hawkbit, Beaked Hawkbeard and probably other Compositae.
V.C.H. Wicken, Chippenham, Horningsea.
Wicken Fen: a few 22.6.59 D.W.F.
Chippenham Fen: one 23.6.69 E.S.
Dernford Fen: July 1972 P.S.N.H.S.
Fulbourn Fen: 16.6.72 P.S.N.H.S.
Girton: two 6.6.70 C.C.S.
Fowlmere: occasional J.R.
- Eupithecia simpliciatata* Haw. Plain Pug.
Larva on Goosefoot and Orache.
V.C.H. Whittlesford, Wisbech, Chatteris, Burwell Fen, Cambridge.
Cambridge: 1961-64 S. R. Davey.
Girton: 29.7.71, 2.8.71 C.C.S.
Fowlmere: common 1973 J. R.
Dernford Fen. 20.7.81 P.S.N.H.S.
- Eupithecia distinctaria* Herr. Thyme Pug.
Larva on Thyme.
V.C.H. not mentioned.
Dernford Fen: June 1953, seven B.S.C.N.H.S.
Toft area: 1968 G. J. King.
Toft: 1973 C.C.S.

Eupithecia indigata Hubn. Ochreous Pug.

Larva on Larch and Scots Pine.

V.C.H. Wicken.

Girton: 23.5.70, 26.5.70 C.C.S.

Linton: two June 1973 R.J.R.

Eupithecia pimpinellata Hubn. Pimpinell Pug.

Larva on flowers of Burnet Saxifrage.

V.C.H. Fleam Dyke, Fulbourn, Whittlesford, Wicken.

Roman road near Hildersham: Oct. 1974, larvae collected R.J.R.

This is probably a common, but overlooked species.

Eupithecia nanata Hubn. Narrow-winged Pug.

Larva on Ling.

V.C.H. Wicken.

Girton: 30.6.74 C.C.S. A most surprising record. The species must be maintaining itself on various cultivated heathers.

Eupithecia fraxinata Crewe. Ash Pug.

Larva on Ash.

V.C.H. S. Cambs., Chippenham, Chatteris, Whittlesford, Soham.

Cherry Hinton: one 14.8.45 D.W.F.

Girton: 1969 and 1970 C.C.S.

Eupithecia virgaureata Doubl. Golden-rod Pug.

Larva on Golden-rod, Ragwort and Cow Parsley (*Anthriscus sylvestris*).

V.C.H. Chatteris.

Girton: fairly common 1969-73 C.C.S.

Toft: frequent C.C.S.

Reach: common 1969-70 B. & B.

Eupithecia abbreviata Steph. Brindled Pug.

Larva on Oak.

V.C.H. Whittlesford, Ely.

Hayley Wood: 16.5.65 C.C.S.

Linton: one 12.4.73 R.J.R.

Eupithecia dodoneata Guen. Oak-tree Pug.

Larva on Oak.

V.C.H. Chatteris, not common.

There seem to be no recent records.

Eupithecia pusillata D. & S. Juniper Pug.

Larva on Juniper.

V.C.H. Fleam Dyke. (The Juniper is still there.)

Dernford Fen: 1972 P.S.N.H.S.

Girton: 14.7.72, 30.7.72, 15.7.74, 5.8.74 C.C.S.

Linton: 14.7.73 R.J.R.

Fowlmere: 1974 J.R.

These latter must have been feeding on some form of garden Juniper.

- Eupithecia lariciata* Frey. Larch Pug.
Larva on Larch.
V.C.H. Gog Magogs.
Linton: June 1973 R.J.R.
- Eupithecia tantillaria* Bois. Dwarf Pug.
Larva on Spruce.
V.C.H. Shelford.
No recent record.
- Chloroclystis v-ata* V-Pug.
Larva on Bramble, Sloe, Hawthorn, Old Man's Beard and other plants.
V.C.H. widely distributed, not common.
Locally common south of Wicken.
- Chloroclystis chloerata* Mab. Sloe Pug.
Larva on Sloe.
V.C.H. Not mentioned.
This species, which has only recently been recognised as a British insect, probably occurs widely in the county, but has, so far, only been recorded at Wicken Fen and Toft by Dr. Colin Smith.
- Chloroclystis rectangulata* L. Green Pug.
Larva on Apple.
V.C.H. very common. Melanic forms at Cambridge, Chatteris and Chippenham.
A common species; the melanic forms seem commoner than the type now.
I. of E.: Chittering 1.7.70 D.J.L.A.
- Chloroclystis debiliata* Hubn. Bilberry Pug.
Larva on Bilberry.
V.C.H. Conington (presumably a casual introduction).
No further records.
- Gymnoscelis rufifasciata* Haw. Double-striped Pug.
Larva on Old Man's Beard, Holly, Gorse, Broom, Hawthorn.
V.C.H. Wicken, Chatteris, Whittlesford.
Cambridge (Gogs): May 1940 D.W.F.
Cherry Hinton: 10.8.45, 14.8.45 D.W.F.
Hayley Wood: 22.4.71 C.C.S.
Girton: common 1969-73 C.C.S.
- Anticollix sparsata* Treit. Dentated Pug.
Larva on Yellow Loosestrife.
V.C.H. common at Wicken.
Very much a Fenland insect, retiring in its habits and never straying far from its foodplant.
Wicken: still to be found in some numbers.
Chippenham: 19.7.63 B.S. (A new locality.)
- Chesias legatella* D. & S. Streak.
Larva on Broom.
V.C.H. Chatteris, Wisbech.
No recent records.

- Chesias rufata* Fab. Broom-tip.
Larva on Broom.
V.C.H. Cambridge.
No recent records. There is probably not enough of the foodplant in the county to support these two species.
- Aplocera plagiata* L. Treble-bar.
Larva on Common St. John's Wort.
V.C.H. widely distributed but not common.
This easily recognised species sometimes flies by day and seems common in the Linton/Abington area. Records from elsewhere are surprisingly few:
Hayley Wood: 10.6.73 C.C.S.
Swaffham Prior: one 1972 D.A.B.
Horseheath: one 29.8.74 P.J.
Girton: occasional 1969-73 C.C.S.
- Aplocera eformata* Guen. Lesser Treble-bar.
Larva on Common St. John's Wort.
V.C.H. One specimen on Hunts. border near Chatteris; Fulbourn 1935.
No further records, but the species is very similar to *A. plagiata* and may have been confused with it.
- Odezia atrata* L. Chimney-sweeper.
Larva on Earthnut (*Conopodium majus*).
V.C.H. Gamlingay Heath.
One individual of this species was captured in 1972 by J. D. Scoble in Almoner's Avenue, Cambridge.
- Lithostege griseata* D. & S. Grey Carpet.
Larva on Treacle Mustard and Flixweed.
V.C.H. near Chippenham.
No recent records, but, as a breckland species, it is likely to be found in its former locality.
- Euchoeca nebulata* Scop. Dingy Shell.
Larva on Alder.
V.C.H. S. Cambs., rare; Mepal; Chippenham.
Chippenham Fen: 15.8.70, 20.7.71 C.C.S.
Fulbourn Fen: 16.6.73 P.S.N.H.S.
Bottisham, a wood near Bottisham Hall: 13.7.73 P.S.N.H.S.
- Asthenes albulata* Hufn. Small White Wave.
Larva on Birch, Hornbeam and Hazel.
V.C.H. fairly common.
Wicken: quite a number of records from 1949 to 1973.
Girton: 9.8.70 C.C.S.
- Hydrelia sylvata* D. & S. Waved Carpet.
Larva on Birch, Alder and Goat Willow.
V.C.H. Ely (1887).
No recent records.

Hydrelia flammeolaria Hufn. Small Yellow Wave.

Larva on Field Maple and Alder.

V.C.H. fairly common; Chippenham, Wicken, Whittlesford, Ely, Doddington.

Wicken Fen: one 5.6.40 D.W.F.

Chippenham: 20.7.71 C.C.S.

Girton: occasional 1969-73 C.C.S.

Linton: one 14.7.73 R.J.R.

Shudy Camps: one 22.7.74 P.S.N.H.S.

Fowlmere: occasional 1973 J.R.

Lobophora halterata Hufn. Seraphim.

Larva on Aspen.

V.C.H. Wicken, Ely, Chippenham, Whittlesford.

Wicken Fen: 1.6.74 C.C.S.

Girton: 1970 and 1971, not noted since. C.C.S.

Reach: rare 1969/70 B. & B.

Dullingham and Brinkley: 1950-60 E.C.P.-C.

Certainly occurs commonly just over the Suffolk boundary in Lawn Wood near Withersfield, and is probably present in other Cambs. woods in this area.

Trichopteryx carpinata Bork Early Tooth-stripe.

Larva on Birch, Alder, Goat Willow and Honeysuckle.

V.C.H. Whittlesford, Bottisham and Stuntney.

Fordham (Trust Reserve): 11.4.74 R.J.R. The only recent record.

Abraxis sylvata Scop. Clouded Magpie.

Larva on Wych Elm.

V.C.H. not mentioned by the earlier lepidopterists.

Balsham: 5.8.55 G.R.F. (Ent. Rec. 67, p. 264.) First Cambs. record.

Chippenham Fen: 1956 "Adults were taken at light. Subsequent beating produced three larvae off Elm, of which only four trees could be located."

B.O.C.G. (Ent. Rec. 69, p. 33.) Since Mr. Gardiner's efforts, nothing further has been seen of this attractive species in the county.

Abraxis grossulariata L. Magpie.

Larva on Currants, Gooseberries and a wide variety of other plants.

V.C.H. very common.

A common and easily recognised species, frequently to be seen flying by day.

I. of E.: March, rare 1969-73 H.P.

Pterapherapteryx sexalata Ret. Small Seraphim.

Larva on White and Goat Willows.

V.C.H. Wicken, Chatteris, Wisbech, Whittlesford.

Widely distributed and common in some areas. No recent records for Isle of Ely.

Acasis viretata Hubn. Yellow-barred Brindle.

Larva on Holly, Ivy, Dogwood and Privet.

V.C.H. Chippenham, Cambridge and Whittlesford.

Appears in ones and twos in many localities from Wicken southwards.

- Lomaspilis marginata* L. Clouded Border.
Larva on Aspen, Black Poplar and various Willows and Sallows.
V.C.H. fairly common.
A common species in lamp places throughout the county.
- Ligdia adustata* D. & S. Scorched Carpet.
Larva on Spindle-tree.
V.C.H. Cambridge and neighbourhood; Chatteris.
Wicken Fen: 15.7.66 Briggs and Haxby.
Hayley Wood: 16.5.74 C.C.S.
Girton: 1970 and 1973 C.C.S.
Toft: 1971 and 1973 C.C.S.
Linton: one or two each year 1970-73 R.J.R.
- Semiothisa notata* L. Peacock Moth.
Larva on Birch.
V.C.H. Cambridge.
No recent records.
- Semiothisa liturata* Clerck. Tawny-barried Angle.
Larva on Larch and Scots Pine.
V.C.H. Conington.
Girton: one 13.7.70 C.C.S.
Linton: one 30.6.70 R.J.R.
The only three individuals ever taken in the county?
- Semiothisa clathrata* L. Latticed Heath.
Larva on White Clover.
V.C.H. Common.
A common day- and night-flying species in the southern part of the county.
ab. *nocturnata* (a very dark form). Chippenham Fen: 1956 "I took one there in 1949, and have heard of others from there" (B.O.C.G. Ent. Rec. 69, p. 33).
- Semiothisa brunneata* Thunb. Rannoch Looper.
Larva on Bog Myrtle and Bilberry.
V.C.H. Wicken Fen (1920).
A native of Scotland (Perthshire and northwards) but occasional specimens have been captured in England, presumably migrants.
- Semiothisa wauaria* L. V.-moth.
Larva on Redcurrant, Blackcurrant and Gooseberry.
V.C.H. widely distributed, locally common.
Still widely distributed, but cannot be described as common nowadays.
I. of E.: March, frequent 1969-73 H.P.
- Cepphis advenaria* Hubn. Little Thorn.
Larva on Bramble, Wild Rose, Dogwood and Bilberry.
V.C.H. Wisbech 1858.
No recent records.

Petrophora chlorosata Scop. Brown Silver-line.

Larva on Bracken.

V.C.H. Doddington, Chatteris, Cambridge (Roman Road).

Girton: 6.6.70, 9.6.70 C.C.S.

Reach: frequent 1969-70 B. & B.

Cambridge (6 Madingley Road): 17.6.50 E.C.P.-C.

Babraham Hall: 19.6.50 E.C.P.-C.

Linton: two 28.5.70 R.J.R. (Bracken grows on one of the Hildersham Furze Hills.)

Plagodis pulveraria L. Barred Umber.

Larva on a wide variety of deciduous trees and shrubs.

V.C.H. "In woods at Whittlesford, Mr. Bond."

No recent records.

Plagodis dolabraria L. Scorched Wing.

Larva on Birch, Oak and Goat Willow.

V.C.H. widely distributed, not very common.

Fairly frequent in a number of localities from Wicken southwards.

Opisthograptis luteolata L. Brimstone.

Larva on many types of trees and shrubs.

V.C.H. common.

This yellow species to be found commonly nearly everywhere in the county

I. of E.: March, occasional 1969-73 H.P.

Epione repandara Hufn. Bordered Beauty.

Larva on Alder, Hazel, Oak, Black Poplar and various Willows.

V.C.H. widely distributed.

Apart from Wicken Fen, where it seems common, other records are:

Reach: common 1969-70 B. & B.

Balsham: 11.8.55 G.A.F. (Ent. Rec. 67, 6. 264.)

Linton: occasional 1970-73 R.J.R.

Fowlmere: one 10.7.73 J.R.

I. of E.: Welches Dam August 1974 H.P.

Pseudopanthera macularia L. Speckled Yellow

Larva on Wood Sage and Red Dead-nettle.

V.C.H. near Cambridge.

No recent records of this easily recognised day-flying species.

Apeira syringaria L. Lilac Beauty.

Larva on Privet, Honeysuckle, and Lilac.

V.C.H. widely distributed, fairly common.

Still well distributed, but never appears in large numbers.

Ennomos autumnaria Wern. Large Thorn.

Larva on a wide variety of woody plants.

V.C.H. not mentioned.

A large and handsome species of erratic habits.

Balsham: 7.5.56 G.A.F. First Cambs. record; three in September 1966 G.A.F. (Ent. rec. 78, p. 310.)

Girton: 27.9.72 one female from which large numbers were bred and released in 1973. C.C.S.

Linton: common 1971, one only 1973. R.J.R.

Fowlmere: one 16.9.73 J.R.

Ennomos quercinaria Hufn. August Thorn.

Larva on a wide variety of deciduous trees and shrubs.

V.C.H. widely distributed, fairly common.

Cambridge (Almoner's Avenue): 23.9.71

Balsham: 3.9.58 G.A.F. (Ent. Rec. 70, p. 296); 6.9.59 G.A.F. (Ent. Rec. 72, p. 8.)

Balsham: 3.9.59 Aofi:IrD ufind R-g,C

Linton: 17.8.71 R.J.R.; 5.8.75 R.J.R.

This formerly common species seems scarce and irregular in appearance these days.

Ennomos alniaria L. Canary-shouldered Thorn.

Larva on Lime, Elm, Birch, Alder, Oak and Willow.

V.C.H. widely distributed, fairly common.

Quite a common species in most areas.

I. of E.: March, occasional 1969-73 H.P.; Welches Dam 1974 H.P.

Wilburton: M.S.

Ennomos fuscantaria Haw. Dusky Thorn.

Larva on Ash.

V.C.H. Wicken, Chatteris, Milton, Cambridge, Whittlesford.

Quite common in most areas where Ash grows.

I. of E.: Welches Dam September 1974 H.P.

Ennomos erosaria D. & S. September Thorn.

Larva on Oak and Birch.

V.C.H. not mentioned.

Cambridge: 1953 (two) the first Cambs. record apparently. B.O.C.G.; 1956 B.O.C.G. (Ent. Rec. 69, p. 33.)

Linton: one 19.8.71 R.J.R.; several 1975 R.J.R.

Selenia dentaria Fab. Early Thorn.

Larva on a wide variety of woody plants and also Bird's Foot Trefoil.

V.C.H. common.

Double-brooded and usually common everywhere.

I. of E.: March, rare 1969-73 H.P.; Welches Dam, August 1974 H.P.

Selenia lunularia Hubn. Lunar Thorn.

Larva on Rose, Sloe, Plum, Elm, Birch, Oak and Ash.

V.C.H. Chippenham, Cambridge, Madingley.

Balsham: one 7.6.54 G.A.F. (Ent. Rec. 67, p. 66); several 1956 G.A.F. (Ent. Rec. 68, p. 230).

Linton: one 29.5.70 R.J.R.

Selenia tetralunaria Hufn. Purple Thorn.

Larva on a wide variety of woody plants.

V.C.H. widely distributed, not usually common.

The above remarks on distribution still apply to this attractive species.

Odontopera bidentata Clerck. Scolloped Hazel.

Larva on a wide variety of woody plants including Larch and Juniper.

V.C.H. widely distributed, fairly common.

Recent records seem to indicate that this species is less common than formerly.

Crocallis elinguaris L. Scalloped Oak.

Larva on Sloe, Plum, Hawthorn, Apple, Birch, Beech, Privet and Honey-suckle.

V.C.H. common.

A common and widespread species.

I. of E.: Chittering 1.7.70 D.J.L.A.; March frequent 1969-73 H.P.!
Welches Dam July-August 1974 H.P.

Ourapteryx sambucaria L. Swallow-tailed Moth.

Larva on Bramble, Sloe, Hawthorn, Ivy, Birch, Oak, Privet and Elder.

V.C.H. common.

This large, easily recognised species is widespread and common.

I. of E.: Chittering 1.7.70 D.J.L.A.; March occasional 1969-73 H.P.

Colotois pennaria L. Feathered Thorn.

Larva on Blackthorn, Hawthorn, Birch, Oak, Poplar, Sallow and Ash.

V.C.H. widely distributed.

This substantial autumn-flying species is still widely distributed with ever occurring in great numbers.

I. of E.: March occasional 1969-74 H.P.

Angerona prunaria L. Orange Moth.

Larva on Old Man's Beard, Broom, Sloe, Plum, Hawthorn, Birch, Beech and Privet.

V.C.H. Cambridge, Linton and Hildersham.

I. of E.: March rare 1969-73 H.P. This is the only recent record.

For five years the author has been hoping to see this colourful and variable insect in its old haunts!

Apocheima hispidaria D. & S. Small Brindled Beauty.

Larva on Oak.

V.C.H. not mentioned.

Balsham: "used to turn up in some quantity" G.A.F. (Ent. Rec. 78 [1966] p. 301.) This must be the first county record.

Hayley Wood: one 10.4.70 R.J.R.

Apocheima pilosaria D. & S. Pale Brindled Beauty.

Larva on a wide variety of deciduous trees and shrubs.

V.C.H. common.

Girton: 1970-17 C.C.S.

Linton: occasional R.J.R.

Madingley: 29.5.40 D.W.F. (two larvae).

Dernford Fen: May 1954 B.S.C.N.H.S. (two larvae).

This winter-flying species is almost certainly more common than these records suggest.

Lycia hirtaria Clerck. Brindled Beauty.

Larva on a wide variety of wild and cultivated deciduous trees and shrubs.

V.C.H. common.

Still common and widely distributed. This species is well known for its thriving in the middle of large towns.

I. of E.: March rare 1969-74 H.P.; Wisbech 2.4.53 W.S.E.

Biston strataria Hufn. Oak Beauty.

Larva on Oak, Birch, Elm, Sloe and Plum.

V.C.H. widely distributed, not common in fenland.

Hayley Wood: 15.4.70 J.D.S. and R.J.R.; 11.4.74 C.C.S.

Cambridge (Almoner's Avenue): 12.4.71 J.D.S.

Girton: regular in very small numbers. C.C.S.

Fulbourn Fen: 12.4.70 R.J.R.

Linton: occasional 1970-74 R.J.R.

Biston betularia L. Peppered Moth.

Larva on Oak, Birch, Elm and many other trees and shrubs.

V.C.H. "common. Form *doubledayana* (now *carbonaria* Jordan) first seen in Cambridge about 1894; Chatteris 1906; Wisbech 1890; now commoner than the typical form in Cambridge."

Without having counted the numbers of the two forms from year to year, the author estimates that ab. *carbonaria* forms about 50% of the population at the present time in Linton. This form is the well-known example of industrial melanism upon which Dr. Kettlewell has conducted so much research.

A very heavily marked form (ab. *insularia*) is also not uncommon at Linton.

Common everywhere, including the Isle of Ely.

Agriopsis leucophaearia D. & S. Spring Usher.

Larva on Oak.

V.C.H. Cambridge, Doddington, Langley Wood.

Cambridge and Balsham Wood: 1956 occasional B.O.C.G. (Ent. Rec. 69, p. 33.)

Girton: 25.2.71 C.C.S.

A species which flies very early in the year and is probably overlooked.

Agriopsis aurantiaria Hubn. Scarce Umber.

Larva on Sloe, Hawthorn, Birch, Alder, Oak and Goat Willow.

V.C.H. Cambridge.

Cambridge: "pre-1960" E.C.P.-C.

Dernford Fen: one 26.10.74 R.J.R.

- Agriopsis marginaria* Fab. Dotted Border.
 Larva on Sloe, Hawthorn, Birch, Alder, Hornbeam, Oak, Goat Willow.
 V.C.H. common.
 A common and widely distributed species.
- Erannis defoliaria* Clerck. Mottled Umber.
 Larva on Rose, Sloe, Hawthorn, Birch, Hornbeam, Oak, Honeysuckle.
 V.C.H. common.
 Cambridge (Magdalene College): 1971 L. K. Evans.
 Fulbourn Fen: 1971 R.J.R.
 Reach: common 1969-70 B. & B.
 Quy Fen: 1947 J. Heath.
 Girton: common 1969-73 C.C.S.
- Menophra abruptaria* Thunb. Waved Umber.
 Larva on Privet and probably Lilac.
 V.C.H. widely distributed.
 Wicken Fen: 17.5.73 D. Wilson.
 Cambridge (Almoner's Avenue): 18.5.71 J.D.S.
 Reach: frequent 1969-70 B. & B.
 Histon: 1974 A.M.B.
 Girton: fairly common 1969-73 C.C.S.
 Linton: a few each year 1970-74 R.J.R.
- Peribatodes rhomboidaria* D. & S. Willow Beauty.
 Larva on Old Man's Beard, Yew, Broom, Rose, Hawthorn, Ivy, Birch and Privet.
 V.C.H. common.
 A common species everywhere.
 I. of E.: March occasional 1969-73 H.P.
- Alcis repandata* L. Mottled Beauty.
 Larva on Bramble, Sloe, Plum, Hawthorn, Ivy, Elm, Birch, Hazel and Honeysuckle.
 V.C.H. Extraordinarily, only two records (Wicken and Cambridge) mentioned for this common species. It is just possible that the remarks for this species have been transposed with those of *Epione repandaria* Hufn.
 Common and widely distributed, but no record for the Isle of Ely.
- Serraca punctinalis* Scop. Pale Oak Beauty.
 Larva on Birch, Oak and probably other trees.
 V.C.H. not mentioned.
 Chippenham Fen: one in 1956 B.O.C.G. (Ent. Rec. 69, p. 33.) This would appear to constitute the first county record.
 Chippenham Fen: 19.7.63 B.S.
 Balsham: "used to turn up in some quantity" G.A.F. (Ent. Rec. 78 [1966], p. 301.)
 Wicken Fen: 23.6.71 D.W.F.; 1.6.71 two males C.C.S.; 11.6.73, 15.6.73 D. Wilson.
 Reach: rare 1969-70 B. & B.
 Fulbourn Fen: five 9.6.73 P.S.N.H.S.

Hayley Wood: 10.6.73 C.C.S.

Abington: 17.6.75 R.J.R.

All the known records have been given for this special which appears to have invaded the county since the last war. Also found in Hunts. and Suffolk.

Cleorodes lichenaria Hufn. Brussels Lace.

Larva on Pear, Apple, Beech and Oak.

V.C.H. widely distributed, not common. Wisbech, Ely, Chatteris, Whittlesford, Swaffham Prior.

No recent records.

Ectropis bistortata Goeze. Engrailed.

Larva on Oak.

V.C.H. Stapleford and Chippenham are given for *E. crepuscularia* which probably refers to this species.

Widely distributed and common.

I. of E.: March rare 1969-73 H.P.

Ectropis crepuscularia D. & S. Small Engrailed.

Larva on Larch and Birch.

V.C.H. The localities mentioned under *E. bistortata* may refer to this closely related species.

There are no definite recent records for this species.

Ectropis extersaria Hubn. Brindled White-spot.

Larva on Birch, Alder, Hazel, Oak, White Willow and Goat Willow.

V.C.H. Conington, Soham.

No recent records. Needs looking for in its former haunts.

Aethalura punctulata D. & S. Grey Birch.

Larva on Birch and Alder.

V.C.H. Chippenham (common), and Wisbech.

No recent records, but very likely to be found in its old localities in the spring.

Ematurga atomaria L. Common Heath.

Larva on Purple Loose strife, Dock, Bog Myrtle, Eared Sallow, Heather, Ling and presumably other plants.

V.C.H. widely distributed.

Devil's Dyke: 1968 E. G. Hancock.

Reach: 1969-70 B. & B.

Quy Fen: 1947 J. Heath.

Wicken Fen: 31.5.40, 6.6.71, 23.6.71 D.W.F.

Swaffham Prior: fairly common 1971-73 D.A.B.

Bupalus piniaria L. Bordered White.

Larva on Scots Pine, Larch, Norway Spruce and Silver Fir.

V.C.H. Fleam Dyke, Gog Magogs, Babraham, Stuntney.

Madingley: one by day 29.5.40 D.W.F.

Chippenham: one 23.6.69 E.S.

Girton: 12.6.70 C.C.S.

Linton: 20.6.74 R.J.R.

- Cabera pusaria* L. Common White Wave.
Larva on Birch, Alder, Hazel, Oak and Goat Willow.
V.C.H. very common.
Quite a common species.
I. of E.: West Fen, Ely 6.7.67 M. C. Davey.
- Cabera exanthemata* Scop. White Wave.
Larva on Birch, Alder, Hazel, Aspen, Sallow and Goat Willow.
V.C.H. very common.
As common as the previous species.
I. of E.: March, rare 1969-73 H.P.
- Lomographa bimaculata* Fab. White Pinion Spotted.
Larva on Hawthorn.
V.C.H. widely distributed.
Cambridge (Gogs): May 1940 common D.W.F.
Reach: frequent 1969-70 B. & B.
Dernford Fen: occasional 1971-73 P.S.N.H.S.
Girton: regular in small numbers 1969-73 C.C.S.
- Lomographa temerata* D. & S. Clouded Silver.
Larva on Sloe, Plum and Bird Cherry.
V.C.H. widely distributed, fairly common.
Still a common and widely distributed species.
I. of E.: Chittering 1.7.70 D.J.L.A.
- Aleucis distinctata* Herr. Sloe Carpet.
Larva on Sloe.
V.C.H. not mentioned.
Hildersham: 5.5.70 one R.J.R. Apparently the only record for the county.
- Theria rupicapraria* D. & S. Early Moth.
Larva on Sloe, Plum, Hawthorn and Bilberry.
V.C.H. common.
Girton: 4.2.73 C.C.S.
Reach: common 1969-70 B. & B.
Hauxton gravel pits: 1971 L. J. Evans.
Linton: occasional 1970-74 R.J.R.
This species is probably quite common in most places, but is likely to be overlooked due to its habit of flying in January and February.
- Campaea margaritata* L. Light Emerald.
Larva on a wide variety of woody plants.
V.C.H. widely distributed.
A common species in most places.
I. of E.: Welches Dam 17.6.74 P.S.N.H.S.
- Hylaea fasciaria* L. Barred Red.
Larva on Scots Pine and Larch.
V.C.H. Wisbech.
Chippenham: 19.7.63 B.S. The only recent record.

Aspitates ochrearia Rossi Yellow Belle.

Larva on Wild Carrot.

V.C.H. widely distributed in the south and south-east.

Roman Road (Wandlebury area): 15.5.49 two, 21.5.49 several, 1.6.50 one E.C.P.-C.

Chippenham Fen: 28.5.49 two E.C.P.-C.

This mainly coastal and breckland species was unsuccessfully worked for in 1974. The foodplant is common enough, and it is to be hoped that the moth has not been lost to the county.

Perconia strigillaria Hubn. Grass Wave.

Larva on Gorse, Broom, Heather and Ling.

V.C.H. Sawston, Newmarket, Devil's Dyke.

No recent records.

VASCULAR PLANT RECORDS

G. Crompton

Although the prolonged drought and intense heat last summer severely affected our flora, local botanists succeeded in recording an astonishing number of interesting or new records of aliens and hybrids. The search for hybrids has been inspired by Clive Stace's book on 'Hybridisation in the British Flora', and curiosity about bird seed aliens continued unabatedly.

The careful search of old records for Gamlingay has resulted in some of this year's most interesting records. Obviously, no one should give up hope because a plant has not been seen for fifty years or more! I am grateful to all who have sent in so many good records (far more than there is space to publish), and also to those who have taken the trouble to send records for new 10 km. squares, or checked up on old localities and reported 'still there', or, alas, 'gone'.

Two-thirds of the nationally rare species in Eastern England have become either extinct or are reduced to one or two localities since 1950. Cambridgeshire has contributed no less than one-sixth to this total; there is, therefore, an urgent need to record annually our remaining endangered rare species.

There may be some confusion about the relative roles of Dr. Charles Turner and myself regarding plant records. When I took over from Mr. Pankhurst as B.S.B.I. Recorder for V.c. 29, I also inherited his meticulously organised scheme for a new Flora of Cambridgeshire based on the tetrad recording method. Most fortunately Dr. Turner subsequently volunteered to take over this onerous task, and is now solely in charge of organising this long-term project. In all other respects I continue as Vice-County Recorder, and these duties include the collection of new records on a 10 km. sq. basis for keeping the Flora of Cambridgeshire up to date.

It is a pleasure to record my gratitude to Peter Sell, Peter Yeo and Alan Leslie for their generous help over the past two years with taxonomic and nomenclatural problems.

Polypodium vulgare L. Three fronds on the bole of a dead oak tree, Madingley Wood, D. E. Coombe, 26.3.76. This is the first time it has been found not growing on a wall.

Silene otites (L.) Wibel One hundred and fifty plants on cinders of disused railway track, Swaffham Prior, 52/582656, G. M. S. Easy, 21.8.76. Third CR. Ballast for the railway, opened in 1884, was brought from Freckenham; it was removed a few years after the line closed in 1964.

Chenopodium glaucum L. Bourn, 52/323568, A. C. Leslie, det. J. P. M. Brenan, in K, 29.8.76. Second CR, and the first record since Humphrey Gilbert-Carter recorded it in 1924.

Abutilon theophrasti Medicus Waste ground at Cambridge Sewage Farm, 52/475613, 1.9.75, and by former tip at Ely, 52/548803, 6.9.75, G. M. S. Easy. NCR. An alien from S.E. Europe and the Mediterranean, it has velvety leaves and typical malvaceous small orange flowers.

Trifolium medium L. West side of Buff Wood, D. E. Coombe, 2.9.69; Lattersey Hill, Whittlesey, 52/281962-283962, G. M. S. Easy, 30.6.76. Third and fourth extant localities and the first new records since 1940.

Trifolium subterraneum L. New roadside verge (made about six years ago), Gamlingay, 52/236520, D. E. Coombe, 18.11.75. First confirmed record here since 1859, and long thought to have been extinct. By October 1976 there were many thousands of plants associated with *Trifolium striatum* and *Medicago arabica*.

Trifolium micranthum Viv. Roadside bank, Gamlingay, 52/231519, A. C. Leslie, 5.11.75. First record not in a lawn since C. E. Moss last recorded it at Gamlingay.

Scorpiurus muricatus L. Path at Hurst Park Avenue, Cambridge, Mrs. D. M. Watson, 1974. NCR. A bird seed alien from S. Europe with unmistakable fruits; the pods are spirally coiled and armed with ridges and spines.

Sorbus intermedia (Ehrh.) Pers. Devil's Ditch, 52/618615, P. D. Sell, 12.6.73. NCR. Small saplings have also been recorded by G. M. S. Easy, from disused railway lines at Cherry Hinton in 1975, and Trumpington in 1976. This tree is widely planted in Cambridge.

Epilobium adenocaulon Hausskn. × *E. palustre* L. Wicken Fen, 52/557704 A. C. Leslie, 14.7.76. Third CR. Both parents present; a native species hybridising with a naturalised alien from N. America.

Rumex crispus DC. × *R. obtusifolius* L. (*R. pratensis* Mert. and Koch) Roadside, Gamlingay, 52/246526, A. C. Leslie, 11.8.76. Both parents present. According to Sell, this is a fairly common hybrid which has been overlooked.

- Quercus petraea* (Mattuschka) Liebl. × *Q. robur* L. Margin of White Wood, Gamlingay, 52/216518, A. C. Leslie, 11.8.76. First record since C. E. Moss collected it at Gamlingay in 1909. Either 'still there' or third CR!
- Cuscuta campestris* Yuncker Allotments, Isleham, Rev. B. Goodchild, in CGE, det. S. M. Walters and P. F. Yeo, 27.8.70, on *Callistephus chinensis*. NCR. Cambridge Sewage Farm, 52/474614, 1.11.70, and 52/475615, 18.7.76, G. M. S. Easy. Both times on *Polygonum aviculare*. Second CR. An American species of Dodder which has become widely naturalised in Europe.
- Solanum nigrum* L. × *S. sarrachoides* Sendtner Market garden, Gamlingay Cinques, 52/228530, A. C. Leslie in CGE, conf. J. M. Edmonds, 11.10.75. Apparently new to science as a naturally occurring plant. NCR.
- Solanum villosum* Miller, subsp. *villosum* (*S. luteum* Miller) Botany School Field Station, Storey's Way, 52/433596, R. I. E. Brettel, conf. J. M. Edmonds, 24.8.76. NCR. Although there is no obvious source for this alien from C. and S. Europe, it is widely distributed over the whole Field Station grounds.
- Nicotiana rustica* L. Waste ground, Chesterton, Mrs. D. M. Watson, 1974. NCR. A N. American species, it was formerly widely cultivated for tobacco, and naturalised in Europe, where it is now replaced by *N. tabacum* L.
- Verbascum phoeniceum* L. Tip at Triplow, 52/445445, G. M. S. Easy, 1971. This beautiful European Mullein with violet flowers is a rare casual in Britain.
- Verbascum speciosum* Schrader Roadside banks by recently constructed by-pass at Abington, 52/536492, 15.8.74; Teversham, 52/495582, 18.6.76, G. M. S. Easy, conf. A. C. Leslie. NCR.
- Verbascum bombyciferum* Boiss. Trumpington, 52/452549, 19.7.76, G. M. S. Easy, conf. A. C. Leslie. This popular garden plant from Asia Minor was formerly called *V. 'Brusa'*. It was found on the site of allotments disused for nearly ten years. Part of a group of ca. fifty plants with *V. nigrum* and a series of hybrids, some of which have yet to be determined.
- Linaria repens* (L.) Miller × *L. vulgaris* Miller (*L. × sepium* Allm.) Roadside bank, Gt. Chishill, (V.C.-9), 52/417389, G. M. S. Easy, conf. A. C. Leslie, 20.9.75. NCR. There are over 200 well-established plants, but it has not been recorded in Cambridgeshire or Essex before. Only *L. vulgaris* occurs along the bank to either side of this interfertile hybrid swarm.
- Sesamum indicum* L. Cambridge Sewage Farm, 52/475615, G. M. S. Easy and A. C. Leslie, 13.9.76. NCR. Sesame is a native of S.E. Asia, and widely cultivated in S.E. Europe for oil from the seeds.

- Thymus serpyllum* L. Cambridge Gap, Devil's Ditch, 52/615616, G. Crompton in CGE, conf. C. D. Pigott, 23.7.76. Although there are specimens from Morden Grange Plantation in CGE in 1921, and from the Devil's Ditch collected by Newbould, in BM, the absence of this species in modern times has led to doubt being cast on whether it had ever occurred outside of Breckland. At the Cambridge Gap it extends for over sixty metres along the edges of the footpath. It was also reported on the east side of the A11 by R. W. David in 1952, and only needs a specimen to confirm this earlier refinding of the species on the Devil's Ditch.
- Salvia reflexa* Hornem. Tip near Fen Drayton, 52/327684, 31.10.70, and tip at Cherry Hinton, 52/483574, 12.9.71, G. M. S. Easy, NCR. A rare bird-seed alien introduced with millet from Colorado and Dakota.
- Salvia bifida* Boenn. Gamlingay, 52/238517, A. C. Leslie, 11.8.76. Second CR. The uncommon segregate of *G. tetrahit* L. *sensu lato*.
- Scutellaria galericulata* L. Plentiful around small ponds, Gamlingay, 52/229516, A. C. Leslie, 11.8.76. Last recorded at Gamlingay before 1930.
- Galium spurium* L. New by-pass, Swaffham Prior, 52/56-63-, D. Jardine, conf. J. E. Raven, 1974, and N. Jardine, 1976. Third CR. This rare species is almost extinct in Britain; it was first recorded in V.c. 29 by C. E. Raven in 1936 on walls at Ely.
- Symphoricarpos microphyllus* Kunth Little Abington, 52/539491, B. and S. Jackson, det. C. J. King, 21.9.74. NCR. This garden escape is established in a hedgerow; it has dark pink berries, and smaller leaves than the widely naturalised White Snowberry, *S. albus* (L.) S. F. Blake (*S. rivularis* Suksdorf).
- Filaginella uliginosa* (L.) Opiz (*Gnaphalium uliginosum* L.) Wet ruts in roadside verge, Gamlingay, 52/232519, 18.11.75; gone by October 1976, when the site was too dry for it, D. E. Coombe. A succinct example of why this relatively widespread species is recorded only occasionally.
- Cirsium arvense* (L.) Scop. \times *C. palustre* (L.) Scop. (*C. \times celakovskianum* Knaf) Old railway track, Hayley Wood, 52/293534, R. I. S. Brettell and A. C. Leslie, conf. P. D. Sell, 11.7.76. NCR. A single clump with three stems; both parents present.
- Centaurea diluta* Aiton Madingley Ornithological Field Station, E. M. Barraud, in CGE, det. R. D. Meikle, 7.55. NCR. Coldham's Lane Tip, C. C. Townsend in CGE, 1958. This bird-seed alien, introduced with Moroccan Canary-grass, has become fairly common in the 1970s; G. M. S. Easy has recorded it on tips in nine 10 km. squares since 1969.
- Hieracium maculatum* Sm. Old railway, Long Road, Cambridge, 52/456555, G. M. S. Easy, det. P. D. Sell, 19.7.76. Second CR.
- Hieracium cheriense* Jordan ex Boreau University Botanic Garden, P. D. Sell in CGE, 8.6.50, 1953 and 1955. Naturalised on paths by 1 Brookside since 1950; it also occurs as a weed in the Garden. NCR. Old Railway, Kingston, 52/327551-329553, G. M. S. Easy, conf. P. D. Sell, 12.8.76. Second CR.
- Hieracium salticola* (Sudre) P. D. Sell and C. West Milton Army Camp, 52/465615, G. M. S. Easy, conf. P. D. Sell, 21.8.73. Second CR.

- Hieracium umbellatum* L. Old railway sidings, Soham, 52/587733-587736, G. M. S. Easy, conf. P. D. Sell, 20.8.76. Hundreds of plants but not in a native habitat. Only the second record since the 1880s.
- Pilosella officinarum* C. H. and F. W. Schultz subsp. *tricholepia* (NP) Sell and West Old railway, Gamlingay, 52/238518, G. M. S. Easy, det. P. D. Sell, 12.9.76. The first record since 1954.
- Crepis setosa* Haller fil. The Limekilns, near Newmarket, 52/667660, G. M. S. Easy, 10.7.76. Second CR. Again, introduced with grass seed on recently sown edge of the heath.
- Juncus effusus* L. × *J. inflexus* L. (*J. × diffusus* Hoppe) Gamlingay, 52/238517, A. C. Leslie, 11.8.76. NCR. One large clump with both parents present.
- Phalaris minor* Retz Gamlingay Cinques, 52/226529, G. M. S. Easy, 3.7.76. Third CR. First record since 1950; a bird-seed alien occurring in burnt area of natural grassland.
- Setaria verticillata* (L.) Beauv. Cambridge Sewage Farm, 52/47-61-, E. A. Robinson in CGE, as *Echinochloa crus-galli*, det. A. C. Leslie, 28.9.55. NCR.

WEATHER NOTES FOR CAMBRIDGESHIRE 1976

J. W. Clarke

A year of extremes—extremely dry, extremely hot, and extremely wet, is the simplest description of the weather during 1976. Most noteworthy was the exceptional heat of the summer, which has probably not been equalled since the early eighteenth century. No less than thirty-six days exceeded 80°F compared with twenty of 1975 and seventeen in 1959, the two hottest summers of the past twenty-five years.

Drought has been a feature of several recent years but that of 1976 surpassed them all. It was intensified by the preceding low rainfall in 1975 (especially in the autumn) and the great heat of the summer. Many crops were deficient or failures and the grain harvest began on one Cambridgeshire farm in June and on many others it was completed in July.

The total rainfall for the year (17.71 ins.) was much lower than average though not so low as in 1972 and 1964. It can be divided into two distinct periods, a dry and droughty first eight months and a very wet last four months. In the six month period January to June only 4.62 ins. of rain fell, whilst in the autumn period, September to December, 10.83 ins. fell.

The year began with a great gale during the night of 1/2 January, doing tremendous damage to trees and buildings throughout the county. The first three weeks of January were mild and spring-like. Towards the end of the month a short period of severe weather developed with snow lying on several days. This continued for a few days into February but did not persist and the rest of the month was mild. In March temperatures were a

little below normal and a little above in April. A sharp frost on 29 April damaged fruit blossom and vegetation. During May mean maximum temperatures were 4°F above average—the beginning of a trend which continued until the end of August. The first part of June was mostly rather warm but on 22 June a heatwave began and lasted until the middle of July. During this period sixteen consecutive days had maxima over 85°F. On the 26 June the temperature reached 95°F. Three other days also exceeded 90°F: 25 June, 27 June and 3 July. Apart from a few cooler days at the end of July and the beginning of August when the heatwave gave way to more normal temperatures, the very warm weather continued until the last days of August. All the autumn months had about average temperatures. December was cold with many frosty and foggy days and also a thunderstorm on the evening of 7 December.

Weather Records at Swaffham Prior 1976

Temperature °F

<i>Month</i>	<i>Mean max.</i>	<i>Mean min.</i>	<i>Highest</i>	<i>Lowest</i>	<i>Rainfall ins.</i>
JANUARY	44°	38°	55 on 12th	22 on 28th	1.44
FEBRUARY	45°	36°	61 on 25th	27 on 15th	0.66
MARCH	47°	35°	60 on 28th	26 on 7th	0.45
APRIL	56°	39°	64 on 20th	27 on 8th	0.63
MAY	66°	46°	78 on 7th	27 on 14th	1.09
JUNE	77°	54°	95 on 26th	42 on 3rd	0.35
JULY	78°	54°	91 on 3rd	45 on 29th	0.93
AUGUST	76°	52°	85 on 25th	45 on 1st	1.33
SEPTEMBER	65°	51°	73 on 6th	42 on 19th	2.38
OCTOBER	57°	48°	66 on 1st	35 on 31st	3.28
NOVEMBER	47°	38°	54 on 8th	54 on 8th	3.03
DECEMBER	39°	33°	47 on 8th	23 on 29th	2.14

ANNUAL MEANS 58.1

43.7

TOTAL 17.71

Number of days over 80°F

36

Number of days over 70°F

88

Number of days with a maximum under 32°F

3

Number of days with a minimum under 32°F

56

Last air frost of the spring

29th April

First air frost of the autumn

11th November

Days with snow lying

3

Why the Trust has been formed

The countryside is changing rapidly before our eyes. Some change is, of course, inevitable; but nearly all the alteration is tending towards a loss of variety, interest and beauty, and the destruction of areas still in a natural or semi-natural state. County Naturalists' Trusts are now active in practically all parts of Great Britain. Our own Trust, which has played a valuable part in the growth of the voluntary conservation movement, has many urgent tasks to perform in Cambridgeshire and the Isle of Ely.

Aims of the Trust

1. To conserve the wildlife interest of Cambridgeshire and the Isle of Ely.
2. To set up Nature Reserves by acquisition or agreement in order to manage and protect their wildlife.
3. To promote in the public an interest in and understanding of conservation and natural history by publicity and education.
4. To co-operate with all local and national organisations concerned with the conservation of the countryside.

Privileges of Membership

Members are entitled to visit the 1,000 acres of Nature Reserves owned or managed by the Trust. They can also attend summer field excursions arranged by the Trust, and all receive a copy of *Nature in Cambridgeshire* and two newsletters each year. Members may attend all General Meetings of the Cambridge Natural History Society.

Membership

Minimum subscriptions: Ordinary £3 p.a., Life £50, Family Membership (husband, wife and any children under 12) £4.50, Corporate Membership, Schools, etc. £3 p.a., Juniors under 21, £1 p.a. Full particulars from the Secretary, 1 Brookside, Cambridge, CB2 1JF.

LEGACIES

Some members may have considered the possibility of leaving money to the Trust in the form of a legacy. We are therefore including a suggested form of bequest, worded as a codicil to an existing will, which might prove useful. The testator should, of course, consult his or her legal adviser in making this alteration.

This is a codicil to the last Will of me.....(name)

of

.....(address)

I give a legacy of.....pounds (£.....) free of all duty to the Cambridgeshire and Isle of Ely Naturalists' Trust, and I declare that the receipt of the Treasurer or Secretary for the time being or proper Officer of the Society shall be a sufficient discharge to my Trustees for the said legacy.

In all other respects I confirm my said Will.

Signed, dated and witnessed.

S. G. HALES AND SON, PRINTERS, ROYSTON, HERTS

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is not complete
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a visit to the most
exciting of shops



Joshua Taylor

Cambridge