

Nature in Cambridgeshire

No 58 2016





Plate 1. *Bacidia viridifarinosa*, growing here on the bark of an old coppice stem of field maple in Madingley Old Wood. The thallus is an inconspicuous dull green warty crust which gives rise to conspicuous bright yellow-green soredia. The soredia are formed initially as irregular small soralia and these tend to become confluent in older parts of the thallus. The white prothallus is just visible as a pale halo surrounding the thallus. To the left of the *B. viridifarinosa* a large patch of *Enterographa crassa* fills the field of view. See article on page 23.



Plate 2. The bark-shedding oak tree (tagged D19) in Madingley Old Wood showing conspicuous white patches of *Schismatomma cretaceum*. See article on page 23.

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Cover Illustration: Adder's Tongue (*Ophioglossum vulgatum*) (Photograph: Henry Arnold.)
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Nature in Cambridgeshire's website: www.natureincambridgeshire.org.uk

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Articles for consideration for future issues should be submitted to the Editor, Mr H.R. Arnold, Windyridge, Shillow Hill, Bury, Huntingdon, Cambridgeshire, PE26 2NX. (email henry@shillow.eclipse.co.uk)

ISSN 0466-6046

Published in association with the Cambridge Natural History Society

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Printed by Target Print Ltd 01954 251189

EDITORIAL

There have been several changes to the Editorial Board this year. Elizabeth Platts, who took over as Chairman in 2005 after the death of Max Walters, has had to step down from the position. We are grateful for all her guidance and advice over the past years. Richard Preece has ably taken her place. Jane Bulleid, who has been a Board member since 1996, has also stepped down. I will miss her support and not least her knowledge of the contents and contributors to Nature in Cambridgeshire. Vicki Harley, our Membership Secretary for the past nine years has also stepped down; her help and knowledge of Cambridgeshire natural history projects were invaluable. Mark Hill has taken over the duties of Membership Secretary. We welcome a new member, Dr Ed Turner, from the Department of Zoology, to the Board.

This year's issue begins with four articles on ancient woodland species, as a small tribute to the late Oliver Rackham, who contributed so much to Cambridgeshire natural history.

Botanical subjects covered this year include Bulbous Meadow-grass, Early Meadow-grass, the disappearing arable flora of the county and some of the less common plants of Hayley Wood. This latter article naturally makes use of Oliver Rackham's research.

An introduction to the harvestmen (Opiliones) of the county, and a short note on a swarm of Summer Chafers are this year's invertebrate topics, and a review of a county wide survey of traditional orchards and their wildlife covers many groups of flora and fauna.

We have obituaries of Norman Moore and Brian Gardiner, who will have been known to many of our readers. The regular contributions are the CNHS Survey report, Bryophyte and Vascular Plant records, plus Weather Notes from the Botanic Gardens. In addition we have a further instalment of our Cambridgeshire Natural History Bibliography, begun in 2006.

Editorial Board: Dr R. Preece (Chairman)
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Does Cambridgeshire have ancient woodland bryophytes?

C.D. Preston and M.O. Hill

The concept of flowering plant species as possible ‘ancient woodland indicators’ has been familiar to botanists since the detailed studies of George Peterken (1974, 1981), Oliver Rackham (1975, 1980) and other authors. Similarly the work of Francis Rose in the 1970s first showed that some epiphytic lichen species are associated with deciduous woodland with a long continuity of tree cover, and this has stimulated much later work (Coppins & Coppins, 2002). However, there are few publications which explore the possibility that there are bryophyte species which are characteristically found in ancient woodland in eastern England. The only published treatment of the subject we have traced is a list of ‘Ancient woodland bryophytes in lowland England’ prepared by R.C. Stern and published by Rose (1992). The list was presumably based on Stern’s field experience, which was primarily in Hampshire and Sussex. In it the species are divided into those ‘normally only found in ancient, little-disturbed woodland’ and those which are ‘commonly (or in some cases occasionally) found in ancient woodland, but are not confined to it’. The list is not very relevant to the Cambridgeshire bryologist, as 16 of the 24 species listed as normally confined to ancient woodland are unknown in the county and a further three are known only from carr at Wicken Fen, leaving five recorded from our ancient woodlands (two of which have been found more frequently in other habitats). In mainland Europe, as in England, there are few studies of ancient woodland bryophytes (Mölder *et al.*, 2015).

It seems unlikely that this paucity of published studies is the result of negligence on the part of bryologists. Indeed, the restriction of some Atlantic bryophytes to sites of continuous woodland cover in western Britain was suggested by Derek Ratcliffe (1968) in a monograph published before the key early papers on vascular plants and lichens. A more likely explanation than bryological negligence is that the association between bryophytes and ancient woodlands is less obvious than it is for flowering plants or epiphytic lichens. There is, however, some evidence that there are ancient woodland bryophytes in Cambridgeshire. In an unpublished study, Birkinshaw (1985) looked at records of 92 woodland species and compared the number of ancient woods, ancient woods which had been felled and replanted and secondary woods in which each was recorded. Although interpretation of the data was complicated by a clear bias in favour of recording ancient woods, Birkinshaw concluded that a number of species, although not strictly indicator species, ‘do show striking tendencies to ancient woodland or ancient woodland converted to plantation’. He listed 12 such species: the mosses *Atrichum undulatum*, *Fissidens bryoides*, *F. exilis*, *F. viridulus*, *Homalia trichomanoides*, *Isothecium myosuroides*, *Neckera complanata*, *Plagiothecium nemorale* and *Thuidium tamariscinum* and the liverworts *Pellia endiviifolia*, *Plagiochila asplenioides* and *Radula complanata*. He did, however, point out that ‘*Pellia endiviifolia* (sic) and the *Fissidens* species

do sometimes occur in damp ditches or on the banks of streams outside woods’.

The aim of this paper is 1) to use updated records of Cambridgeshire bryophytes to reexamine the association between ancient woodlands and bryophyte species in Cambridgeshire; 2) to investigate whether species identified as ancient woodland bryophytes in Cambridgeshire show a similar restriction in their wider British range.

Devising woodland (H_W) and ancient woodland (H_A) preference indices

The basic dataset comprised 48699 records of bryophyte species recorded in localities in Cambridgeshire (v.c. 29) between 1663 and 2014. Most records were localised to a tetrad (2×2 km square), and all except 1130 were assigned to a habitat (Table 1) with codes loosely based on EUNIS (Davies, Moss & Hill, 2004).

Table 1. Coded habitats ascribed to Cambridgeshire bryophyte records. The totals are counts of distinct (tetrad, species) combinations for each habitat, ignoring dates and duplicates.

Code	Name	Count	Code	Name	Count
A2	Saltmarsh	11	G3	Conifer plantation	32
C1	Standing waters	326	G5	New woodland (1990–2014)	114
C2	Running waters	1663	GO	Orchards	742
C3	Reed beds	2	I1	Arable land	1746
D	Fenland	760	J3B	Brick and clay pits	406
E	Grassland	171	J3C	Chalk pits	1243
E1	Dry grassland	3	J3D	Ballast pits	30
E1A	Dry grassland, acidic	64	J3G	Sand and gravel pits	689
E1C	Dry grassland, calcareous	699	J4C	Car parks	31
E2	Improved grassland	20	J4R	Railway lines	565
E3	Washland	182	K	Churches and chapels	3919
E7	Halls and their parks	1301	KC	Cemeteries	339
F3	Dry scrub	393	NM	Mixed	30
F9	Wet scrub	99	NO	No information	372
FA	Hedgerows	30	OP	Open countryside	3820
G1	Broad-leaved woodland	29	UT	Towns	716
G1A	Ancient woodland	1899	UV	Villages	1691
G1R	Recent woodland (1600–1989)	1957			

The ascription to habitat was based on the information with the record, which is sometimes just a locality name although it may also include a description of the habitats surveyed. Many sites are of course mosaics of habitat, so that a site classified as chalk grassland will often include patches of scrub. Fortunately records from ancient woodland are relatively easily identified. Ancient woodlands are defined as those which have had a continuous woodland cover since at least AD 1600. Details were taken from the Ancient Woodland Inventory (Robinson, 1987) and an associated list (dated 17 August 1989) kindly provided

by Dr K.J. Kirby. Only woods greater than 2 hectares in area are included on the inventory. The ancient woods are now mapped on the MAGIC website (www.magic.gov.uk). The Inventory is provisional, and Stone & Williamson (2013) have shown that in Norfolk it includes some ‘pseudo-ancient woods’. Errors are more likely in the east of Cambridgeshire than in the west, where the woods have been particularly well-studied.

Our aim was to characterise species that prefer woodland, in particular those that prefer ancient woodland. For this purpose we developed an ancient woodland preference index H_A , which measures the proportion of ancient woodland sites among all sites where the species was found. As an example, consider the epiphytic moss *Hypnum andoi*. This had nine records, of which two, from Chippenham Fen 2001, were effectively duplicates. It was found three times in Hayley Wood, in 1998, 2003 and 2009. Summarizing, it was found in three ancient woods (Hayley, Eversden and Ten Woods), two fens (Wicken and Chippenham), and a recent wood (Gamlingay Heath Plantation). Thus it was found at six sites, of which three are ancient woodland and four are woodland. Expressed as a percentage, its ancient woodland index is therefore

$$H_A = 100 \times 3 \div 6 = 50$$

and its corresponding index for all woodland is

$$H_W = 100 \times 4 \div 6 = 67.$$

While ancient woods and undrained fens are mostly easy to characterise as sites, many other features are less so. Therefore, for the purpose of the analysis, a ‘site’ was specified as a unique combination of habitat and tetrad. Some such sites comprise several woods or bits of woods. For ancient woods, the extreme case was tetrad TL65S, lying to the south-east of Newmarket. It includes Great and Little Widgham Woods, Plunder Wood, most of Ten Wood and part of Out Wood. In most parts of the county, ancient woods are more widely separated and the tetrad ancient-wood ‘site’ is actually a single site.

When the records were summarised as species in ‘sites’ (habitat/tetrad combinations), the size of the dataset was reduced to 26,094 occurrences. From this dataset, statistics H_A and H_W were calculated for all species.

Ancient and recent woods as bryophyte habitats

The ancient woodlands of Cambridgeshire are now confined to the south of the county, although there are a few bryophyte records from Doddington Wood, a Fenland wood which survived until the 1940s. They are on rather flat ground in sites which (in a county context) are upland rather than low-lying and are some distance from population centres, usually near parish boundaries. The soils are variants on a theme of boulder clay: the sticky calcareous boulder clay, impervious and prone to flooding, which visitors to the western woods have to scrape off their boots or the rather sandier clay found in many of the eastern woods. Part of Gamlingay Wood lies on a large sand lens and White Wood, Gamlingay is on the Lower Greensand. Many of the ancient woods appear to be derived directly from wildwood and presumably have undisturbed soil profiles, but others (e.g. Madingley Wood, Overhall Grove) overlie ancient settlements. Oak, Ash and Field Maple are the most frequent trees, with Blackthorn,

Hawthorn and Hazel as the commonest shrubs. Only a few woods have suffered large-scale coniferisation, notably Gamlingay, Borley, Little Widgham and Ditton Park Woods, and most of these are being 'deconiferised'. However, it is not unusual to find small scale plantings of a few conifers, or their remains.

Traditionally the woods were managed as coppice-with-standards, and large coppice stools (particularly of ash) survive in many woods. There are few very large tree trunks, usually just a few trees, often former pollards, round the woodland edge. Actively coppiced woods must have contained few if any decaying logs and the amount of dead wood almost certainly increased in the 20th century with the decline in management, the death of conifers planted on unsuitable soils and the current outbreak of Dutch Elm Disease. It is less easy to be certain about changes to woodland rides and tracks, another important bryophyte habitat, but we suspect that the steady use they would have received in an actively managed wood has been replaced by periods of neglect sometimes punctuated by the more extreme disturbance caused by modern machinery during periods of felling or deconiferisation. The boundary woodbank and ditch and any internal ditches often provide areas of open soil which remains free from fallen leaves, and a few woods such as Kingston Wood and Out Wood have streams running alongside them. Many private woods contain small areas devoted to pheasant-rearing, and the consequent disturbance and eutrophication often means that these are good places to find small groups of Elders. Woodland nature reserves typically have some reinstated coppice and rely on natural regeneration to replace the tree canopy, and coppicing is being restored in some privately owned woods with the encouragement of landscape-scale conservation initiatives. However, most woods in private ownership have not been coppiced for more than 50 years and several have been partially replanted or planted with trees not native to Cambridgeshire.

Recent woodland occurs over a much wider range of habitats, and with a somewhat greater range of dominant tree species including Beech and Sycamore. Some adjoin ancient woods, such as the 'Triangle', one of the most studied recent woods in the county, which lies alongside Hayley Wood (Rackham, 1975, 2003), or occur on similar soils, such as Great Heath Plantation, Gamlingay on Lower Greensand or South Lodge Plantation, Croxton on boulder clay. However, others occur on quite different soils, such as Morden Grange Plantation and the Beechwood at Wandlebury on chalk, 'Aconite Wood', Great Abington and Simkins Spinney, Croydon on riverside alluvial soils, Six Acre Plantation, Littleport on peat and Isleham Plantation on sandy soil on the Breckland fringe. There are no conifer plantations (as opposed to coniferised woodlands) of any size in the county.

All woodland in the county was subject to the effects of SO₂ pollution which persisted from the start of regular bryophyte recording in the county in the 1930s until the 1980s. Under its acidifying influence the epiphyte flora of the county was very restricted and calcifuge species were recorded even in plantations on chalk.

Bryophytes with a preference for ancient woodland

Table 2. Bryophytes associated with ancient woodlands in Cambridgeshire ($H_A > 49$). For the explanation of a site and of the preference indices H_A and H_W , see text. Ellenberg R values (Hill *et al.* 2007) measure the acidity of the species' habitats, from occurrence on extremely acidic substrates (1) through moderately acidic (5) and basic (6) to those with free calcium carbonate (9). The names of species with index values based on 10 sites or more are in bold.

Species	Woodland habitat	Ellenberg R	Number of sites	H_A	H_W
Cephalozia connivens	Rotting wood	1	1	100	100
Cephalozia lunulifolia	Rotting wood	2	1	100	100
Fossombronia pusilla	Soil	5	4	100	100
Lejeunea cavifolia	Tree bases	6	4	100	100
Plagiothecium laetum	Tree bases	3	1	100	100
Plagiochila asplenioides	Soil	6	20	79	95
Pseudotaxiphyllum elegans	Soil	3	4	75	100
Ptilidium pulcherrimum	Epiphytic	4	4	75	100
Fissidens exilis	Soil	5	23	74	78
Herzogiella seligeri	Rotting wood	3	7	71	86
Pohlia wahlenbergii	Soil	6	7	71	71
Platygyrium repens	Epiphytic	5	13	69	77
Pellia neesiana	Soil	5	3	67	100
Homalia trichomanoides	Tree bases	7	52	60	73
Lepidozia reptans	Rotting wood	2	5	60	60
Fissidens bryoides	Soil	5	29	59	66
Chiloscyphus pallescens	Soil	6	12	58	67
Dicranum montanum	Epiphytic; rotting wood	3	7	57	57
Plagiothecium curvifolium	Tree bases; rotting wood	3	36	56	72
Tetraphis pellucida	Rotting wood	3	9	56	78
Dicranum tauricum	Rotting wood	3	13	54	62
Atrichum undulatum	Soil	5	54	52	65
Thuidium tamariscinum	Soil	5	61	52	74
Anomodon viticulosus	Tree bases	8	47	51	68
Calypogeia fissa	Soil	3	10	50	60
Hypnum andoi	Epiphytic; rotting wood	4	6	50	67
Orthotrichum speciosum	Epiphytic	6	2	50	50
Pleuridium subulatum	Soil	5	4	50	50
Polytrichum longisetum	Soil	3	4	50	50
Weissia rostellata	Sides of ditches and ruts	5	2	50	50

The species with at least half their sites in ancient woodland ($H_A > 49$) are

listed in Table 2. Of these 30 species, 18 are recorded from fewer than 10 sites and the fewer the sites from which a species is recorded, the greater will be the change in index value if it is discovered in a new site. The discovery of new sites may well result in the addition of rare species to the ancient woodland list. *Nowellia curvifolia*, for example, is represented by three sites in our dataset, one an ancient woodland, ($H_A=33$) but in 2015 it was discovered in two further sites, both ancient woods, which would increase its H_A value to 60 if the results were recalculated on a dataset including 2015 records. Only five rare species in Table 2 are confined to ancient woods and three of these are known from only a single site. Thereafter the species form a continuum with decreasing H_A values.

Table 3. The commoner specialist woodland bryophytes with weaker preference for ancient woodland in Cambridgeshire ($H_w>49$; $H_A<50$; number of sites >9). For the explanation of a site and of the preference indices H_A and H_w , see text. Ellenberg R values are defined as in Table 2. Species with more than twice as many occurrences in ancient as in recent woodland are marked with an asterisk.

Species	Woodland habitat	Ellenberg R	Number of sites	H_A	H_w
* <i>Isoetecium alopecuroides</i>	Tree bases	6	65	49	69
<i>Mnium hornum</i>	Soil; tree bases; rotting wood	4	72	40	68
<i>Cirriphyllum piliferum</i>	Soil	6	75	44	67
<i>Orthodontium lineare</i>	Rotting wood	3	69	41	67
* <i>Plagiothecium nemorale</i>	Soil; tree bases; rotting wood	5	58	48	67
* <i>Rhytidiadelphus triquetrus</i>	Soil	6	30	47	67
* <i>Polytrichastrum formosum</i>	Soil	3	31	45	65
<i>Dicranella heteromalla</i>	Soil	3	57	32	60
<i>Rhizomnium punctatum</i>	Moist soil; rotting wood	5	31	32	58
<i>Neckera complanata</i>	Tree bases	7	86	31	56
<i>Eurhynchium striatum</i>	Soil	6	92	30	52
<i>Plagiothecium denticulatum</i>	Soil; tree bases; rotting wood	4	23	30	52
* <i>Isoetecium myosuroides</i>	Tree bases; epiphytic	4	55	38	51
* <i>Porella platyphylla</i>	Tree bases; chalky soil	8	48	40	50
<i>Orthotrichum pulchellum</i>	Epiphytic	6	32	28	50
<i>Hygroamblystegium varium</i>	Moist soil; tree bases; rotting wood	7	16	31	50
* <i>Campylopus flexuosus</i>	Rotting wood	2	12	42	50

Commoner woodland specialists with weaker preference for ancient woodland are listed in Table 3. We have not listed 16 rare species in this category. The localities with most ancient woodland species in the county are listed in Table 4.

Table 4. The sites in Cambridgeshire with most bryophytes with a preference for ancient woodland. The species counted as ‘Ancient woodland species’ are the 30 species listed in Table 2. The ‘Others’ are the seven species asterisked in Table 3. Sites are as ordinarily defined, not the tetrad-based sites used in the analysis. An asterisk indicates sites which are not ancient woodland.

Site	Ancient woodland species	Others
Hayley Wood	22	7
Gamlingay Wood	21	7
Little Widgham Wood	14	7
*Chippenham Fen	13	5
Hardwick Wood	13	5
Ditton Park Wood	12	5
Eversden Wood	12	6
Ten Wood	11	4
Balsham Wood	9	4
Madingley Wood	9	6
Out Wood	9	5
*Wicken Fen	9	5
Basefield Wood	8	5
*Gamlingay Heath Plantation	8	3
Hildersham Wood	8	4
Kingston Wood	8	7
Langley Wood	8	6
Papworth Wood	8	2
Borley Wood	7	5
Buff Wood	7	5
Great Wood, Kirtling	7	6
Home Wood, Longstowe	7	4
White Wood	7	3

Six of the 12 species identified by Birkinshaw (1985) as ancient woodland bryophytes also occur on our list (Table 2) and two (*Isotheicum myosuroides* and *Plagiothecium nemorale*) show a marked ancient-woodland preference if non-woodland habitats are excluded (Table 3). *I. myosuroides* was recorded from 21 ancient wood sites and only six recent woods; however its occurrence in 14 orchard sites (as a rarity on only one or two trees) precludes it from qualifying as an ancient woodland species by our criterion. *P. nemorale* was found in 28 ancient woodland sites and 11 recent woods; if its five fenland sites were excluded, it too would have qualified by our criterion. Since 1985, recording in the wider countryside, especially in orchards, has extended our knowledge of the habitats of the other species, and one of Birkinshaw’s candidates, *Radula complanata*, has increased greatly in scrub outside woodland.

Why do some species prefer ancient woods in Cambridgeshire?

The list of ancient woodland bryophytes is dominated by calcifuge species. There are 23 species with an Ellenberg R value between 1 and 5, indicating that they tend to occur on acidic substrates, compared to only seven with an R value between 6 and 8 (Table 2). Cambridgeshire's ancient woods are predominantly calcareous rather than base-poor but they do include some areas of acidic substrate which support the calcifuge species in Table 2. There are some areas of acidic soil, which include the Gamlingay Wood sand lens and soils over the boulder clay in some of the eastern woods (e.g. Out Wood and Lower Wood, Weston Colville) which tend to be sandier and more base-poor than the soils of the western woodlands. Ancient woodland soils have usually escaped the ploughing and liming which have reduced the acidity of any agricultural land which was originally base-poor. Rotting wood also offers an acidic substrate in ancient woodland. One factor which may be important is that both soils and rotting wood in ancient woodlands are often moister, at least in the winter, than the scattered acidic habitats in the wider countryside such as railway ballast, roof tiles or rotting timbers. Rotting wood in the open is colonised by a few drought-tolerant calcifuges, notably *Campylopus introflexus* and *Dicranoweisia cirrata*, but not by more moisture-demanding species.

The importance of moist, acidic habitats in supporting the 'ancient woodland' species is shown by the large number of such species at Chippenham Fen, where they are found on decaying wood in Forty Acre Wood as well as on acidic soil, and Great Heath Plantation, Gamlingay, a recent wood on base-poor soils (Table 4). Some also occur as colonists of other habitats. *Fissidens exilis* occurs in stubble fields on acidic soil and this species, as well as *Atrichum undulatum*, *F. bryoides* and *Plagiothecium curvifolium*, have been recorded at Gray's Moor Pits, Chainbridge. Several calcifuges on the 'ancient woodland' list colonised Wicken Fen in the 1960s in response to the acidification of the fen carr.

Platygyrium repens is perhaps less calcifuge in Cambridgeshire than its national Ellenberg score (R=5) would indicate; it is an epiphyte which grows on the trunks of Ash, Willow and other hosts. It has spread in Britain since it was first found near Oxford in 1945; it is also spreading in the Netherlands. Far from having a relictual distribution in ancient woods, it is expanding into them.

There are seven calcicoles in the list of ancient woodland bryophytes. The small liverwort *Lejeunea cavifolia* is much closer than the calcifuges to the classic idea of an ancient woodland species as a relict plant of low dispersal ability. It has a predominantly western distribution and in Cambridgeshire it hides away in a few old ash coppice stools in humid places. It fruits frequently in the west but lacks vegetative propagules. It has not been seen fruiting in Cambridgeshire but it is so rare that its colonies are rarely inspected. Oliver Rackham safeguarded the Hayley colony carefully and when we last inspected it, in 2009, he informed us that the liverwort had been present *on the same tree* since 1966. *Homalia trichomanoides* and *Anomodon viticulosus* are usually found on old coppice stools in woods or the base of ancient pollards on their margins. *Homalia* favours moister and shadier habitats and, although it is much

less demanding in this respect than *Lejeunea*, it grows with it at the two sites where the latter has been recorded recently, Basefield and Hayley Woods. *Homalia* is much more frequent than *Anomodon*, perhaps because it fruits freely and can more easily colonise new substrates. *Orthotrichum speciosum* is an expanding epiphyte which has recently arrived in Cambridgeshire; it may be merely a casual, or it may, like *Platygyrium*, spread preferentially into ancient woods.

Plagiochila asplenioides has the strongest preference for ancient woodland of any of the commoner woodland bryophytes. It is a large and conspicuous plant of the woodland floor, often growing within carpets of *Thuidium tamariscinum* and other large mosses. Like *Lejeunea* it is commoner in western Britain, where it fruits only rarely; fruit has never been recorded in Cambridgeshire and there are no vegetative propagules. It appears to be declining: Oliver Rackham told us that it is much less frequent in Hayley Wood now than when he used to collect material for class practicals in the 1960s. Perhaps, like *Primula vulgaris*, it has suffered from the ‘exceptional run of hot, dry summers, probably without precedent at least since the late medieval warm period’ (Rackham, 1999) which we enjoyed in the late 20th century. *Chiloscyphus pallescens* grows on moist soil, often by paths or rides where competition is reduced by disturbance. *Pohlia wahlenbergii* formerly occurred in disturbed woodland rides but has declined: it was recorded in seven sites between 1945 and 1990 but in only one of them since then. Its mode of persistence in this habitat is unclear, as it rarely fruits (never in Cambridgeshire) and if it has vegetative propagules in Cambridgeshire, they have never been observed.

The habitat of our ancient woodland species elsewhere in Britain

Unlike Cambridgeshire, the neighbouring county of Suffolk has large tracts of acidic, sandy soils in Breckland and in the Sandlings region which runs in a broad band along the coast. These areas have very little ancient woodland, but extensive conifer plantations. The excellent maps of ancient woodland, soils and bryophyte records (in tetrads) provided by Sanford & Fisk (2010) allow their distributions to be compared. *Atrichum undulatum* and *Plagiothecium curvifolium* are relatively frequent in the Sandlings and Breckland, and *Fissidens bryoides* and *Thuidium tamariscinum* also occur there. *Calypogeia fissa*, *Cephalozia lunulifolia*, *C. connivens*, *Dicranum tauricum*, *Herzogiella seligeri*, *Hypnum andoi*, *Lepidozia reptans*, *Pellia neesiana*, *Polytrichum longisetum*, *Ptilidium pulcherrimum* and *Tetraphis pellucida* are uncommon in Suffolk but have a good proportion of their localities in these acidic areas. However, *Fossombronia pusilla* and (to a lesser extent) *Pseudotaxiphyllum elegans* are concentrated in the areas of clay soils in central Suffolk where ancient woodland is most frequent. This is also true of the Cambridgeshire calcicoles *Anomodon viticulosus*, *Homalia trichomanoides*, *Lejeunea cavifolia* and *Plagiochila asplenioides*, although *Chiloscyphus pallescens* extends into the Sandlings.

In western Britain the ancient-woodland calcifuges of Cambridgeshire have a much broader habitat range. Bates (2015) provides an account of the bryophytes

of mid-west Wales, at the same latitude as Cambridgeshire. Here *Atrichum undulatum* is very common but avoids the most acid soils. *Fissidens bryoides* is one of the most frequent lowland bryophytes, found ‘in deciduous woodland, hedgerows, conifer plantations, lanesides, streambanks, ditchsides, ... churchyards and gardens’. The main habitats of *Thuidium tamariscinum* are broad-leaved woodland, streambanks, coniferous plantations and grass verges. *Calypogeia fissa* is a species of earth banks in woodland or by rivers in open moorland, as well as mires and flushes. Bates had few records of the diminutive *Fissidens exilis*, but in Carmarthenshire it is a plant of ‘stream banks, hedges and gaps in semi-improved pasture’ (Bosanquet *et al.*, 2005).

Not all the calcifuges are frequent in the west. *Plagiothecium curvifolium* is typically a woodland species, with a notable tendency to colonise conifer plantations (Blockeel *et al.*, 2014). *Dicranum tauricum* is most frequent in central England and occurs on rotting wood or as an epiphyte of acidic bark in a range of habitats.

The calcicole species are not restricted by substrate pH in Cambridgeshire, but some are limited by lack of shelter and the absence of rock outcrops. In mid-west Wales, *Lejeunea cavifolia* is found by streamsides or waterfalls in humid valley woodland or shaded gullies (Bates, 2015). In Pembrokeshire, it ‘shows a particular affinity for *Fraxinus* boles in valley woodland’, associated with *Homalia* (Bosanquet, 2010). *Homalia* occurs in broadly similar habitats. In west Wales, *Plagiochila asplenioides* commonly occurs with other bulky bryophytes on shaded woodland banks (Bates, 2015; Bosanquet *et al.*, 2005). The preference of all three species for ancient woodland in the drier climate of Cambridgeshire is unsurprising. The other calcicoles (like many of the calcifuges) have a less similar range of habitats outside Cambridgeshire. The drought-tolerant *Anomodon* is abundant on rock outcrops and drystone walls in areas of limestone geology and *Chiloscyphus pallescens* is frequent in marshes, fens, flushes and upland springs. *Pohlia wahlenbergii* has a remarkably wide habitat range in northern and western Britain, extending from arable fields and forest tracks through dripping rocks and crags to springs and flushes on mountain tops.

Bryophyte dispersal

Unlike vascular plants other than ferns and orchids, bryophytes are often dispersed over hundreds of kilometres (Bosanquet, 2012; Bremer & Ott, 1990). For epiphytes that colonise orchards, the propagules must be mainly spores or gemmae, as larger plant parts are unlikely to establish on trees. Thus colonies of *Isothecium myosuroides* in Cambridgeshire orchards almost certainly derive from spores originating in western Britain, where the species is abundant. Such orchard occurrences are essentially casual and do not result in self-sustaining populations. In ancient woodland, the chances of establishment by long-distance transport of spores and gemmae are much lower, because there is an enormous ‘rain’ of propagules within the wood. Even so, several epiphytes are clearly of non-local origin. *Ptilidium pulcherrimum* is thought to reach England from Scandinavia (Blockeel *et al.*, 2014); *Orthotrichum speciosum* probably comes

from the same source.

Not only epiphytes, but also several colonists of rotten wood, are clearly of non-local origin. Strong evidence for this comes from the fact that there is little spread within any one wood. Oliver Rackham's colony of *Nowellia curvifolia* in Hayley Wood produces capsules, but in spite of its long establishment does not appear to have spread locally. Likewise most colonies of *Campylopus flexuosus*, *Cephalozia* spp., *Hypnum andoi* and *Lepidozia reptans* must arise by long-distance transport, mainly from western Britain. These are classic 'satellite species' in the sense of Hanski (1982).

Even bryophytes of the woodland floor show greater powers of spread than most vascular plants. Some such as *Calypogeia fissa*, *Fissidens bryoides*, *F. exilis*, *Fossombronia pusilla* and *Pleuridium subulatum* produce abundant capsules or gemmae. They can be transported by machinery, animals and footwear from wood to wood. Indeed, *F. bryoides* has a remarkable ability to colonise even very small patches of disturbed acid soil. *Thuidium tamariscinum*, on the other hand, has been observed to produce spores only once in Cambridgeshire, in Eversden Wood. It persists outside woods in shaded parkland and old lawns, and colonises disused chalkpits and chalk cuttings. In the 1960s it appeared in Wicken Fen, and it was found as a new colonist in young *Salix* woodland at Block Fen in 2002. *Rhytidiadelphus triquetrus*, which never fruits in Cambridgeshire, has declined as ancient woods became darker in the absence of coppicing. It has a similar habitat profile to *Thuidium* but does not occur in lawns. It also sometimes colonises new habitats, being found in a clay pit at Whittlesey in 2005, a roadside near Madingley in 2010 and a newly-planted wood nearby in 2013.

Plagiochila asplenioides, however, is notably immobile. It has spread from Hayley Wood to the Triangle, and has been found (in two tetrads) in South Lodge Plantation at Croxton. (An old Wicken Fen record needs confirmation.) It does not occur at all in the wider countryside.

Conclusion

Woodland bryophytes in Cambridgeshire differ in the extent to which they occur in ancient woodland. Some show a strong preference for this habitat; these do not form a discrete group but represent one end of a continuous spectrum. We list 30 'ancient woodland bryophytes', species for which at least half their 'sites' (as defined earlier) are ancient woods, together with seven species having a discernible but weaker preference for the habitat. Most of the epiphytes and rotten-wood specialists are persistent casuals ('satellite species'). The length of the ancient-woodland list is a result of the flat topography and restricted geology of Cambridgeshire. Ancient woods in Cambridgeshire offer a range of niches for calcifuges in an otherwise overwhelmingly calcareous county. If we had more acidic soils, some of the calcifuges, which are abundant in moister and more acidic areas of Britain, would be found outside ancient woodland. Some of our more calcicolous ancient woodland species are also frequent in a range of habitats further north and west. However, the liverworts *Lejeunea cavifolia* and *Plagiochila asplenioides* are properly ancient woodland species in

Cambridgeshire, having a limited range of habitats and apparently low dispersal ability.

Acknowledgments

We are grateful to Louise Bacon, Jeff Bates and Richard Fisk for very helpful comments on a draft of this paper. It is a pleasure to include it in a volume dedicated to Dr Oliver Rackham, who was a good friend to the bryologists and woodland bryophytes of Cambridgeshire.

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Ancient Woodland butterflies

Louise Bacon

Cambridgeshire is a very poorly-wooded county, but has a current and historically significant set of woodland butterflies. Although only around 3% of the county can be defined as woodland, some of the species which are reviewed here are also species of hedgerows, shelter belts and plantations as well as of sites which would be thought of as woodland. Over the past 50 years, woodland butterflies have undergone substantial and significant changes, not always for the worse. We will mostly consider ancient woodlands, and their butterfly assemblages. All butterflies need larval foodplants, nectar or other sugar resources for adult insects, in a suitable habitat context.

An ancient woodland site in Cambridgeshire in modern times typically consists of mature canopy woodland, often with a shrubby understorey. There may or may not be an area of coppice rotation, and rides may be dark, or more open, grassy and flower-rich. The main tree species of Ash, Maple, Hazel and Oak are not especially butterfly-significant trees. Some of the more minor components of our woodlands, most notably Blackthorn, Elm and Sallow, are the most important tree species from the viewpoint of butterfly larval foodplants; however, most woodland butterflies have herbaceous plants as larval hosts. The traditional woodland structure of canopy trees, coppice and a network of rides and glades which are grassy and often nectar-rich, makes a varied and vital resource for butterflies.

It is hard to imagine what our woodlands were like even 80 years ago, when coppice-with standards was still widespread, and the glade and ride network would have been flowery and diverse, as the butterflies which specialise in this sort of woodland have undergone massive declines nationally and are long lost from Cambridgeshire woodlands (the dates below refer to last recorded dates for the whole county, including woods in Huntingdonshire and around Peterborough, within the modern county but historically part of Northamptonshire). These species, known colloquially as the Woodsman's Followers, include now nationally endangered species such as the Pearl-bordered, and Small Pearl-bordered Fritillaries lost in 1966 and the 1950s respectively, and the Duke of Burgundy (1950s), Wood White (1920s, apart

from singletons in the 1970s and 1980s which may have been releases) and Chequered Skipper (1968). As this group is so much in trouble countrywide, it is unlikely that we will get these species back in our woodlands, but there are still lots of butterflies to enjoy.

There are butterflies which are spreading and increasing in number in Cambridgeshire, and others which are surviving well and are definitely woodland insects. There is also a set of grassland specialists and generalist species, which make good use of the ride networks within many of our woodlands. We will look briefly at these first, and then explore the spread of some of the special woodland butterflies which are making their presence felt in the county.

Typical wider landscape species, with larvae whose foodplants are grasses or other herbs, can be found in a woodland setting where there are either glades, or open rides and are indeed found in most of our woodlands in the county. Meadow Browns, Ringlets and Large and Small Skippers will use this habitat, often if it is hot outside the woodland, and the temperature is likely to be lower in the wood. Peacocks, Red Admirals and Commas are also regular woodland butterflies. Ivy on trees can provide excellent overwintering places for the adults, and summer flowers are excellent feeding stations for the adult insects, especially in late summer when Ivy flowers and ripe blackberries provide critical pre-hibernation feeding. Another common woodland butterfly found even in gardens and town parks is the Speckled Wood. Although now thought of as a fairly common generalist species, this seems not always to have been the case. In the Victoria County History for vc29, it was described as a rare species found only in one wood near Cambridge, although it was known from several SW Cambridgeshire woods a decade or two later. By the 1970s it seems to have been found in quite a few woods, but rarely elsewhere; the significant population expansion seems to have started in the mid 1990s, and is likely linked to climate change – this species is now multi-voltine with probably three overlapping broods per year. It is only since 2000 that this really has become a widespread and familiar butterfly in woodlands and other habitats; a remarkable expansion from a once rare species.

A walk through one of our woodlands such as Gamlingay or Hayley wood in mid July should result in 10 – 12 species being seen along the rides, most of which would be classified as generalists or grassland species.

The woodland specialist species which we have in Cambridgeshire can be split in to two groups; those species which we have had for a long time but which have specific woodland needs in terms of microclimate or larval foodplant and secondly the recent re-colonists.

The first group are mostly Hairstreaks (*Lycaenidae*) – the Purple, White-letter and Black (we do not have Brown Hairstreak in the county although it was historically recorded in Cambridgeshire until around 1920 and Huntingdonshire until around 1970).

The Purple Hairstreak is a species of the canopy, almost always around Oaks, the larval foodplant. It is widespread, even found on isolated oaks in grassland settings as well as woodland, and is usually found only with careful watching of

any suitable habitat. The fact that it rarely descends from the canopy means that it is hard to see – evenings in midsummer are the best time to watch for small silvery butterflies fluttering around the oak leaves. When they do land, it is usually with their wings closed, on a leaf or twig, making them very hard to spot.

The larvae of the White-letter Hairstreak feed on Elm, and it is unclear whether it has declined or not, as again it is not easy to see. It is not as canopy-dependent as its Purple sibling, coming down to person-height to nectar on Bramble or other flowers from time to time. As with all Hairstreaks, it rests with wings closed, and in this case this shows precisely how it got its name – a white W runs across the underwing. It is found in many of our woodlands where there are decent stands of elm, but is also found in hedgerows with lots of elm; it seems perfectly happy on Small-leaved or Anglian Elms as well as on English Elm. Both of these butterflies appear to have stable populations, and there are few conservation or management concerns at present in our area.

The third hairstreak, the Black, is more of an enigma. It is a rare insect, found in the UK only in a swathe from Oxfordshire, through parts of Bedfordshire and Huntingdonshire through into the Peterborough/Northamptonshire border area. It is surprising that a species whose larvae feed on Blackthorn leaves is so restricted in range; a preference for young blackthorn growth in sheltered sunny glades may be part of the issue. It is not expanding its range, and most of its colonies seem to be known, although not all are managed in the best way. It is not a mobile species – within a large wood there can be six or more discrete colonies, as there are in woods like Brampton and Monks Wood. It may be that an area of less ideal wood is a sufficient barrier, or it may be an insect which just doesn't disperse very far.

The remaining woodland specialist butterflies are all within the *Nymphalidae* family – Fritillaries and Admirals.

The White Admiral is increasing in range and numbers in many places in eastern England, but at present still seems to be very restricted within Cambridgeshire. Its larvae feed on Honeysuckle, seeming to prefer partly-shaded creeper, with bramble flowers for nectaring adults, and despite this being a relatively oft-found niche, the butterfly does not yet seem to be widely present; again some of the large Huntingdonshire woods are currently the most reliable places to see it. This species has undergone occasional 'explosions' in very warm spells such as those recorded in 2006 and 2012 with occasional lone individuals being recorded on garden nectar sources such as Buddleia. It is possible that this species will, as has happened for the remaining two species, expand in its range and numbers and become a more familiar insect.

The two woodland butterflies remaining to review are possibly the most charismatic.

When 'The Butterflies of Cambridgeshire' was published in 2006, both the Silver-washed Fritillary and the Purple Emperor were listed in the 'extinct' section of the book. The former is now a regular and in places common sight in the ancient woods of south-west Cambridgeshire. A large, orange butterfly, it is an impressive, strong flier and very fond of nectaring on Marsh Thistle and

Hemp Agrimony flowers, both frequent components of woodland coppice and ride flora communities. It had not been recorded regularly after the 1950s, although very occasional singletons were seen in Monks Wood through until 1994. This species had been increasing in numbers and expanding in range in central England, and during warm summers, individuals seem to have dispersed from the core range.

This seems to have happened with increasing regularity during the mid 2000s and it was recorded in Brampton Wood and Bedford Purlieus in 2006, and that seems to have been the start of the colonisation. It seems to have happened in waves, this appearance in a woodland followed by a couple of years of consolidation, and then another wave of expansion. This large butterfly is now a familiar sight in July in Hayley, Gamlingay, Waresley, Eversden and Brampton Woods and Bedford Purlieus. The spread east has continued, and smaller numbers are also found in other woods in the county. A typical mid July day walk down the main ride in Gamlingay wood would probably mean that 20 – 30 of these magnificent butterflies can be seen. Many naturalists have said that the fritillaries they see are deliberate releases from reared stock, and when only the occasional individual was being seen this was a possibility. However, it seems very unlikely that this is the case now, as so many are present, in so many woodlands, and the waves of expansion out from the original founding colonies of the county have been mappable, at three year intervals, allowing for consolidation. A strong flier, a very few individuals have been observed making landfall on the east coast of England, clearly having flown across the southern North Sea. One other reason for the success of the Silver-washed Fritillary may be that its larval foodplant, violets, appear to be far less palatable to troublesome herbivores such as Muntjac, and are thus thriving in parts of our woodlands, as well as the resurgence of flowery rides through many of the ancient woodlands of Cambridgeshire and Huntingdonshire.

The last butterfly under discussion is the most recent to return to our county butterfly fauna, the Purple Emperor. Even most butterfly enthusiasts in the county are probably not, or only recently are, aware of the return of this species to our woodlands. Long thought of as extremely restricted in range and tied to the use of a 'Master oak', much fieldwork has been done by determined volunteers in Hertfordshire, who discovered, with persistence, that these butterflies were in many more woods in that county than ever thought before, and that there were ways of finding them moderately easily. This, and the coincidence that range expansion was probably just underway, in around 2010, meant that occasional individuals were seen, tantalising glimpses of what we now think is an established population. Records come from several of the woods of western Cambridgeshire, again from Castor Hanglands and Bedford Purlieus near Peterborough (the latter of those being the first modern record in 2010) to Gamlingay and Hayley woods, as well as private woods in the SE of the county, towards the Essex/Suffolk borders. The larval foodplant is Sallow, but the adults do indeed seem to need mature oak adjacent to this to display around. The most reliable place to watch them now is not actually a woodland, but is in fact the large oaks adjacent to the Rothschild bungalow at Woodwalton Fen; a July

afternoon spent watching them here sallying forth from the oaks and returning to perch, almost invisibly on twigs on the edge of these trees gives a good feel for how it is then not easy to find them in a woodland setting. This aside, several people in the area have developed the knack of seeing them, and with reliable sightings from multiple woods over the last three years, it seems that it is now well established in the county, albeit at very low population densities and rarely in an easy-viewing situation. New localities continue to be found across Cambridgeshire and Essex and it seems destined to become a more frequent butterfly in our woods.

The modern woodland management scheme, broadly involving de-coniferisation, coppicing within part of a wood but retaining significant areas of mature closed-canopy woodland, and mown, quite wide, flowery rides, seem to be serving the remaining butterfly fauna well. Although we have lost a suite of coppice-specific species which we will probably not get back by colonisation (as significant UK declines continue) and are so far removed from extant colonies that introduction is not realistic, we still have a suite of woodland-specific butterflies, one of which, the Black Hairstreak, has a significant (if small) part of its UK population in our woods.

The generalist species, mostly those normally associated with meadows and gardens, also seem to be doing well on the grassy rides and glades network now being nurtured in the woods. Some of these are species now starting to decline at a UK scale, and it remains to be seen if woodlands turn out to be a better or no worse habitat for some of these species. Weather and climate, as well as changes in woodland management, are having an effect on the species of butterfly living in our woodlands, and we should expect further changes in the next few decades, to follow on those which have been mentioned here.

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Birds of Cambridgeshire's ancient woodlands

Louise Bacon

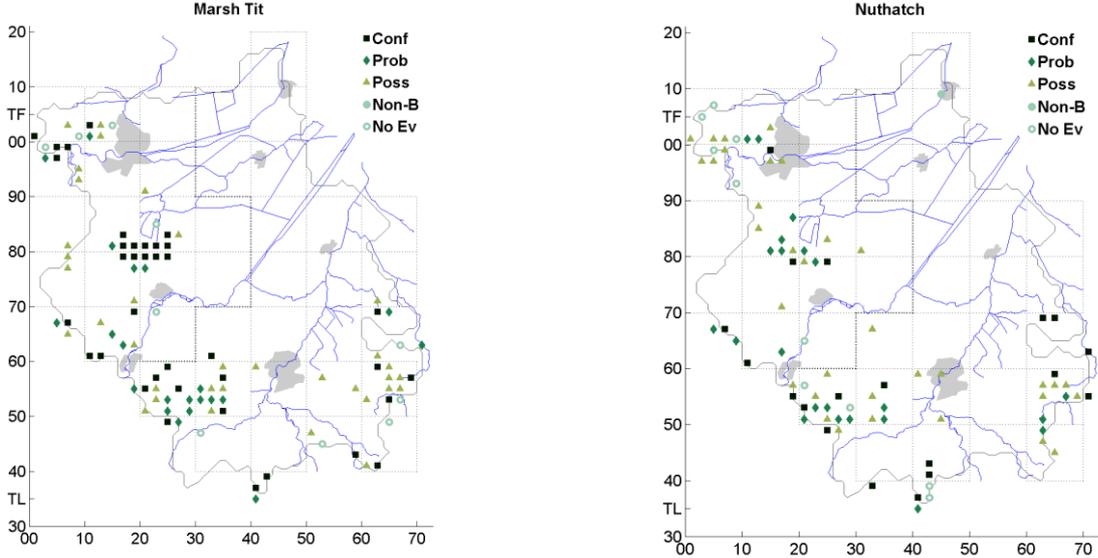
As would be expected from a poorly-wooded county such as Cambridgeshire, we do not have significant populations of many of the specialist birds of woodlands to be found in the United Kingdom; in fact, many of these specialists

are birds usually associated with the oak woods of the western British Isles, such as Redstart, Wood Warbler and Pied Flycatcher. For us, such species are migrants stopping in a variety of places to feed. Other specialists such as Willow Tit, Hawfinch, Lesser Redpoll, Nightingale and Woodcock have either never been common or were once commoner but now rare or extinct within Cambridgeshire’s woodlands.

We know quite a lot about the populations of woodland birds, from the 2007-2011 county (Bacon et al 2013) and national (Balmer et al 2013) bird atlases, and from a survey organised by the Cambridgeshire Bird Club in 2003 (Bacon & Jordan 2004). Research has been carried out on woodland birds across the country by the BTO and RSPB, and the needs and population changes for many species are well understood.

More often, the species which are most commonly seen in our woodlands are generalist species such as Blue, Great and Long-tailed Tit, Chaffinch, Robin, Wren, Song Thrush, Blackbird, Great Spotted and Green Woodpecker, Jackdaw and Jay, and the summer visitors Blackcap and Chiffchaff. We do have a few more specialist species such as Goldcrest, Coal and Marsh Tit, Nuthatch, Treecreeper and Tawny Owl.

Many of our ancient woodlands have good populations of these generalist and woodland specialist birds, mainly because these are the largest remaining woodlands in the county – few of our significant blocks of trees are plantation.



Many of the birds we find in woodlands are actually using a connected landscape, often of small woods linked by hedge lines through a farmed landscape, and these birds do not have a great capacity for crossing large tracts of un-hedged farmland. A quick look at some distribution maps will show that Nuthatches and Marsh Tits are not found in the north and west of the county, where there are no significant woodlands, ancient or otherwise.

The focus of this article will now be those specialist woodland birds which we do still find in our woods, and those which we no longer find breeding or wintering in our ancient woodlands.

Many of the species doing well in our woodlands nest in holes, such as the tits, woodpeckers, Nuthatch, Treecreeper, Jackdaw and Tawny Owl. Whilst the size and location of the hole varies, holes imply older trees, so a tidy, all-coppice wood is unlikely to suit these species; nowhere in our ancient woods is coppice dominant across the whole wood. The larger species, Jackdaw and Tawny Owl do adapt well to boxes, so this can be another opportunity for them to thrive even where natural holes are not available. The Marsh Tit is the most in trouble and the most restricted of these species still present in reasonable numbers – most of the woods in south west Cambridgeshire have them. They need around ten times the amount of space that the same sized Blue Tit needs. As they need several hectares for a territory, small woods in a fragmented landscape are not good for them; they are also very sedentary and are reluctant to move across large tracts of open country. The very similar Willow Tit used to occur in the county, and, despite the problems of telling them apart from Marsh Tit, a survey in 2004 succeeded in showing that there were only one or two left. These are now lost (Bacon et al 2013, Balmer et al 2013, Bacon & Jordan 2004) and the cause is probably climatic in part, as there has been a big retraction in range across England, although woodland structure is also likely to be a factor.

Other species which used to be found in our woods, especially Nightingale, Woodcock and Lesser Redpoll, have also now been lost as woodland breeders in the last 20 years. (Woodcock still frequent our ancient woods in winter; these could be migrating birds from northern Britain or from Europe or Russia.) The Nightingale is now a summer visitor to wet scrub, such as willows around mature gravel pits, and Woodcock are rare but resident in our fenland sites where there is wet, not ancient woodland. Probably the losses from our ancient woods on the boulder clay are down to the cessation of coppicing, the increased drying out of woodlands, and the diminution of understorey, in part down to herbivore damage. There is no longer a wet, tangled mess under the canopy, as coppice or in other neglected areas; Nightingales find the nearest to this in willow scrub.

The reasons for the disappearance of Lesser Redpoll in the county are less clear at present – they are rarer across Britain than they used to be, but like the Willow Tit have contracted their range north – it may be climatic as it seems for the Willow Tit. The last species which is in real decline, and this now seems to be at a national scale, is the Lesser Spotted Woodpecker (Balmer et al 2013). Down to probably one or two pairs in the county, this tiny woodpecker prefers

undisturbed woods, and doesn't do well in the presence of its increasingly common relative, the Great Spotted Woodpecker. The Lesser Spotted Woodpecker was commonest during the period of Dutch Elm disease in the 1970s and the loss of elms combined with the loss of traditionally managed orchards may have contributed to its decline in Cambridgeshire (Jarman 2011). Recent studies have indicated that chick starvation may be a reason for its lack of breeding success (Smith & Charman, 2012). Most of its remaining UK sites are not disclosed, to avoid human disturbance as well, as this is likely to be an increasing problem as it becomes rarer.

The restoration of coppicing does seem to be benefiting two species which are increasing their populations anyway – the Chiffchaff and the Blackcap. Both of these warblers arrive early in the spring (our wintering birds belong elsewhere in the summer) and nest in bramble, or for Chiffchaffs, sometimes in grass tussocks close to the ground. Vulnerable to trampling or predation, an open woodland with no understorey is not going to favour these birds, but they do seem to cope a little better than the species we have lost completely, as just discussed. In some of the south west Cambridgeshire woods such as Hardwick and others, there are now more of these two species than there were 10 years ago – thicker vegetation in the coppice coupes and ride edges seems to positively correlate with their territories. Willow Warblers are also birds of coppice, similar to Chiffchaff in their habits, but they are a long-distance summer migrant and seem to be doing badly in lowland England – a few still linger in coppice woods with dense shrub layers, but more often encountered in wetter habitats, a little like the Nightingale. However, this species is doing better in northern and western Britain, often in different habitats, and it is really no longer a species of our ancient woodlands.

Many of these losses seem to be linked to the vegetation structure in our ancient woods, the coppice cycle, canopy versus open areas, the presence of brambles, the understorey and shrub layer structure, and the effects on these of human management and of deer. The species doing well are more generalists, capable of utilising many types of woodland or other habitat with trees, and whilst this means we still have lots of birds in our woods, they are not quite the places they used to be, and have never been anything akin to the bird communities found in the oak woods of western Britain. The bird communities associated with our ancient woodlands are changing, we have lost several species in the last decades but other species can still be found or are increasing.

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Woodland Lichens - Oliver Rackham's last excursion with the Cambridge Lichen Group

Mark Powell

The Cambridge Lichen Group undertook a survey of the West Cambridgeshire woodlands in the years 2010 to 2012 (Powell *et al.* 2013). Madingley Wood had not been visited during that study, a deficiency which we addressed on 7th February 2015.

One of the eight participants of the Madingley Wood survey was Oliver Rackham who was on good form, as engaging and interested as ever, and apparently in good health.

It is pleasing to report that the lichens at Madingley Wood proved to be surprisingly interesting with three species which are associated, in this region, with ancient woodland sites.

Enterographa crassa, an indicator of ecological continuity, is present in much greater quantity than in any other Cambridgeshire wood that we have visited.

Bacidia viridifarinosa was collected by Brian Coppins from Madingley Wood in 1974 and we found it to still be present. In a central part of the Old Wood there is a rather dense stand of large elm trees and it is here that *B. viridifarinosa* was found in some quantity, forming extensive colonies on the bases of the elms (and also on Field Maple stools) in close association with *E. crassa*.

Schismatomma cretaceum, a species typical of the dry sides of old trees was found on a rather remarkable oak tree in the Old Wood (tagged D19). The distinctive feature of this old oak is the way that it sheds its bark plates and so the trunk lacks the hard, deeply incised acidic bark of typical oaks. Instead the trunk's surface is formed of a smoother, more basic sub-bark. The dry, underhanging west side of the trunk is dominated by *Schismatomma cretaceum* and *Opegrapha vermicellifera* with a good quantity of *Enterographa crassa* and *Bacidia viridifarinosa*.

Corticolous lichens recorded in Madingley Wood, 7th February 2015

Column 1: standard British Lichen Society number for each taxon

Column 2: taxon name

Column 3: IUCN and other conservation designations. LC = Least Concern, DD = Data Deficient, NE = Not Evaluated, IR = a species for which Britain has International Responsibility, NR = Nationally Rare (occurring in 15 or fewer British hectads), NS = Nationally Scarce (occurring in 16 to 100 British hectads)

Column 4 (substratum): CAc = *Acer campestre*, CAp = *Acer pseudoplatanus*, CCo = *Corylus avellana*, CFx = *Fraxinus excelsior*, CQ = *Quercus robur*, CSm = *Sambucus nigra*, CU = *Ulmus* sp.

212	<i>Amandinea punctata</i>	LC	CFx
49	<i>Anisomeridium polypori</i>	LC	CFx
69	<i>Arthonia radiata</i>	LC	CFx
70	<i>Arthonia spadicea</i>	LC	CFx
144	<i>Bacidia delicata</i>	LC	CAc
2502	<i>Bacidia sulphurella</i>	LC NS	CFx
1583	<i>Bacidia viridifarinoso</i>	LC	CQ, CU, CAc
207	<i>Buellia griseovirens</i>	LC	CCo
297	<i>Candelariella reflexa</i>	LC	CFx
470	<i>Chaenotheca brachypoda</i>	LC	CFx
344	<i>Chaenotheca ferruginea</i>	LC	CFx
349	<i>Chaenotheca trichialis</i>	LC	CQ
359	<i>Cladonia ramulosa</i>	LC	CFx
489	<i>Dimerella pineti</i>	LC	CFx
504	<i>Enterographa crassa</i>	LC	CQ, CU, CAc
1125	<i>Hyperphyscia adglutinata</i>	LC	CAc
583	<i>Hypogymnia tubulosa</i>	LC	CFx
2468	<i>Hypotrachyna afrorevoluta</i>	LC	CFx
613	<i>Lecania cyrtella</i>	LC	CFx
614	<i>Lecania cyrtellina</i>	LC	CSm
639	<i>Lecanora chlarotera</i>	LC	CFx
641	<i>Lecanora confusa</i>	LC	CFx
649	<i>Lecanora expallens</i>	LC	CFx
621	<i>Lecanora hagenii</i>	NE	CFx
688	<i>Lecanora symmicta</i>	LC	CFx
797	<i>Lecidella elaeochroma</i> f. <i>elaeochroma</i>	LC	CFx
1974	<i>Lepraria incana</i> s. str.	LC	CFx
1629	<i>Lepraria lobificans</i>	LC	CFx
997	<i>Melanelixia glabratula</i>	LC	CAp
1020	<i>Melanelixia subaurifera</i>	LC	CFx
993	<i>Melanohalea elegantula</i>	LC	CFx
887	<i>Micarea prasina</i> s. lat.		CFx
953	<i>Opegrapha niveoatra</i>	LC	CU
954	<i>Opegrapha ochrocheila</i>	LC	CFx
964	<i>Opegrapha varia</i>	LC	CFx

965	<i>Opegrapha vermicellifera</i>	LC	CQ
943	<i>Opegrapha vulgata</i>	LC	CAc
1022	<i>Parmelia sulcata</i>	LC	CFx
1008	<i>Parmotrema perlatum</i>	LC	CAp
1107	<i>Phaeophyscia orbicularis</i>	LC	CFx
1110	<i>Phlyctis argena</i>	LC	CFx
1112	<i>Physcia adscendens</i>	LC	CFx
1120	<i>Physcia tenella</i>	LC	CFx
1168	<i>Porina aenea</i>	LC	CFx
1614	<i>Porina byssofila</i>	DD NR	CFx
1989	<i>Punctelia jeckeri</i>	LC	CFx
2070	<i>Punctelia subrudecta s. str.</i>	LC	CFx
1234	<i>Ramalina farinacea</i>	LC	CAc
1318	<i>Schismatomma cretaceum</i>	LC IR	CQ
1375	<i>Strigula jamesii</i>	LC NS	CFx
1530	<i>Xanthoria parietina</i>	LC	CFx
1531	<i>Xanthoria polycarpa</i>	LC	CFx

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Bulbous Meadow-grass (*Poa bulbosa*) in Cambridgeshire (v.c. 29)

A.C. Leslie

Bulbous Meadow-grass (*Poa bulbosa*) is a small, densely tufted, winter green perennial grass, in which the lowest stem internode is swollen to form a narrow, pear-shaped ‘bulb’, surrounded by the bases of the basal leaves. In late spring or early summer the little mats of foliage become suffused with a distinctive orange-brown as the foliage dies off for the summer months; once known, and for just a few weeks, this colour makes the plants easier to spot in closely mown or grazed turf and this is one of the best times to look for it in new areas. In the autumn new leafy growth appears, the leaf blades usually less than 10cm long and up to 2.5mm wide, held erect or slightly arching and sometimes a distinctive slightly greyish green. Many populations flower poorly, but when present in late spring the flowering stems may be up to 40cm tall (although usually a bit shorter), and seem disproportionately tall for the short, rather contracted panicle of spikelets which are 3-5mm long and often patterned in green, purple and gold. In some plants the spikelets may be wholly or partially replaced by leafy growths, these viviparous variants being known as var. *vivipara* Koel.

In the British Isles Bulbous Meadow-grass is a scarce plant occurring predominantly in coastal areas from South Wales, round southern and eastern England, up to the north Lincolnshire coast, very rarely further north; it is also known in the Channel Islands and from Co. Wexford in Ireland. Most coastal sites are considered native and it is found in open, usually infertile sandy soils, including stabilised shingle and sand dunes, but is also reported from bare chalk and limestone. There are some scattered inland sites, whose status is usually considered uncertain, although some may be overlooked native sites. In the London area, for example, there are eighteenth century records on heaths and commons both north and south of the Thames, although these are sometimes dismissed as errors. However, this species has recently been shown to be widespread along several miles of the Thames towpath in Surrey, from near Weybridge to Hurst Park and is also locally abundant on the Middlesex side of the river at Hampton Court. For a long time some botanists refused to accept these populations as *P. bulbosa*, for they rarely if ever flowered and they were dismissed as variants of other species of *Poa*.

Despite these other inland occurrences it still came as something of surprise to find that Cambridgeshire has some extensive populations of Bulbous Meadow-grass. The species had never been noted by our past Flora writers. This story thus starts on 19 April 2003, when having come by train from Cambridge to Newmarket, I was walking along the south side of Paddocks Drive (near the station in the v.c.29 part of the town) on my way to do some recording on the Devil's Ditch. I noticed some patches of the tell-tale orangey-leaved grass in the short mown turf just behind the kerb. I had grown this species in Guildford for many years and so was very familiar with its appearance and on closer examination, yes, it had little swollen bulbs just below soil level; one plant even had a flower stem. It proved to be dominant in a narrow band along the kerb and scattered in turf further from the road and there were further patches in short turf on the other side of the road further to the west. It seemed a propitious start to the day. I continued on my way to the Ditch along the A1304 and found more plants all along the road from outside the cemetery to the roundabout where the A1303 and 1304 meet, although much of these populations are in West Suffolk (v.c.26), but it was also on the roundabout, which is back in v.c.29, as well as in one place on the verge at the north-eastern end of the A1303.

At this point I moved on to the Ditch to sit down and have my lunch and to consider my options for the rest of the day. Tempted by this new discovery I decided to abandon the Ditch recording and walk back through Newmarket to look for more Bulbous Meadow-grass. In this I was successful, finding more along the A1304 both to the south-west and north-east of the town (almost all in v.c.26), but also more along the road where it runs beside the gallops on The Limekilns to the north-east, where it is again in Cambridgeshire. In these sites along the road it was usually in very short turf or rather bare areas on the verges of the roads or adjacent footpaths, often where the surface was gravelly but compacted: it is not a plant of soft verges or those with denser taller vegetation. In such places along the A1304 it was often accompanied by plants such as *Cochlearia danica*, *Spergularia marina*, *Puccinellia distans* and *Plantago*

coronopus, but this association is not typical of other localities and I do not believe that it is part of the relentless spread of these and other maritime invaders on our roadsides.

In the following months I returned to the Newmarket area finding further populations of this grass on the A1304, with at least one site with numerous flowering plants, all with normal inflorescences. Furthermore it then became apparent that Bulbous Meadow-grass was frequent along a gravelly track running over Newmarket Heath, on the north-east side of the July Course, and running alongside the Devil's Ditch, and it was also present on the opposite side of the Course just around the corner of the junction with the Beacon Course. It was becoming clear that, although confined to man-made habitats, this species was present over a wide area and gave every indication of having been around for a long period of time.

There was still more to come. For in January 2005 Paul Green and I found many plants in close mown turf mainly on the south side of the access road running diagonally from the July Cottages car park by the Ditch down to the July Course grandstands, growing in the shade of planted limes (*Tilia x europaea*), sometimes occurring right up to the base of the trunk, but not extending beyond the shade of the trees into the adjacent short chalk grassland turf; it was also in closely mown turf by the other access road coming down to the stands just to the south-west; the same day we found that it was abundant over large parts of the track running beside the hedge on the south-west side of the July Course (i.e. parallel to my earlier find on the other side of the Course), as well as there being a great deal more on the other side of this part of the Heath, mostly under a much older avenue of limes running down to the Rowley Mile grandstand from the A1304 (this latter site being in v.c.26). Then in 2006 I had it on a mown verge (again partially shaded by limes) in Old Station Road in the town and in 2012 added a small colony of about a dozen plants under a London Plane (*Platanus x hispanica*) not far away along New Cheveley Road, both again in the Cambridgeshire section of the town. I have now walked many other verges around the town but without any further success!

The first indication that this species might not be confined to the Newmarket area came in 2004 when I was investigating the flora of tracks and often slightly sandy fields just to the north-east of Little Wilbraham. Here Bulbous Meadow-grass was found to be abundant on the well-mossed, but otherwise largely unvegetated margins of an entirely unshaded concrete farm track, for some distance on either side of where the footpath from the village crosses the track on the way out to the Little Wilbraham Road. It was still present and little changed in abundance in 2015 and again gives the appearance of having been present for some time in this locality.

Then in 2007 Bulbous Meadow-grass turned up for the first time in Cambridge, a small population on a shallow roadside bank along the east side of Trumpington Road, near St Faiths's School; it is still there but rather reduced in numbers. In 2012 I found it in three more sites in or near the city: a large population in mown turf along verges on the Cambridge Science Park, a few plants under three old Beeches (*Fagus sylvatica*) at Wandlebury and a third site

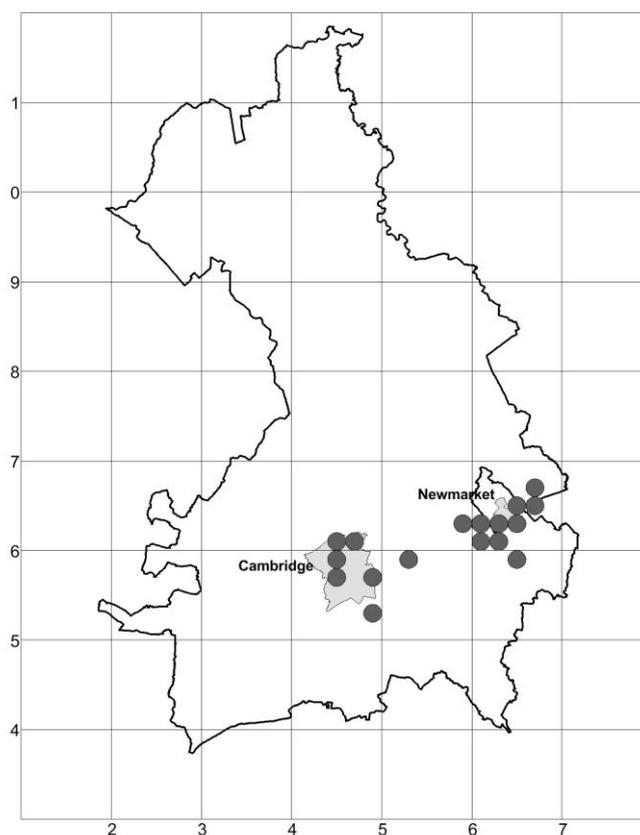
where it was locally frequent under just one tree (a London Plane) in the grounds of Cherry Hinton Hall. The following year street-walking in the north of the city yielded a site on verges along Perse Way and in 2015 I found scattered plants under mature London Planes along the Carlyle Road margin of Alexandra Gardens, a few of which later produced flowering stems, again all non-proliferous. The Wandlebury site may have been found a little earlier by a visiting botanist (Paul Stanley), but there is some confusion about where he was looking and he originally suggested he saw it in the Gogs beechwood, where I have been unable to locate it.

I have now searched many miles of verges and other likely areas in Cambridge as well as further afield in the county, but with one exception, the above are all the sites of which I am aware. Their distribution is indicated in Figure 1 and a full listing is given in an appendix to this article. To date Bulbous Meadow-grass has been largely absent from our naturally sandy areas around Chippenham and Kennett, or areas such as Hildersham Furze Hills, where one might have expected any native populations to occur; nor has it been found on the more acid greensands at Gamlingay, although this may be a less likely area as this species does seem to prefer areas of more calcareous sand.

As noted above, all flowering material that has been seen in these sites has been of a non-proliferous variant and has been otherwise fairly uniform in appearance. There is, however, one further population in which a rather different variant occurs and in a rather surprising habitat. This is at Stetchworth, where it can be found abundantly over about 100 yards in quite deep shade of old beech trees that were probably originally planted along the edge of the Stetchworth Park Stud, on the south-west rim of the Devil's Ditch. I first saw and was puzzled by these plants in May 2007. There were lots of them, some forming low-domed, rock hard patches on a largely bare woodland floor (some of them were a foot across), all with long floppy leaves up to 150 x 1mm (and looking more like *Festuca rubra*). A few had flowering stems with rather narrow panicles with some proliferous growths at the apex. The 'bulbs' were generally rather more slender than the other plants encountered in the county and all these characters persisted in cultivation. I have to confess that I completely misidentified these plants and am grateful to another visiting botanist, Mike Wilcox, to whom I showed cultivated material, for pointing out what the plant might be. One other visitor I took to see the plants in the wild suggested that they might in fact be a closely related European relative, *Poa timolentis* (*P. bulbosa* subsp. *timolentis*), which comes from the Balkans and the Aegean region, but when I submitted material to the BSBI grass referee (Tom Cope, at Kew), he was sure it is a variant of *Poa bulbosa*, which can vary considerably over its wide range. It seems likely that some of these plants at this site are of considerable age and that they are of independent origin to others now present in the county.

However, its occurrence here under trees and in other parkland sites such as at Wandlebury, Cherry Hinton Hall and Alexandra Gardens might suggest that there is a possibility that it may sometimes be introduced with the trees (perhaps originating as a nursery weed) or that it was at one time included as a constituent

Figure 1. Cambridgeshire distribution of Bulbous Meadow-grass.



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of woodland grass mixes. The idea of using a winter green, but summer-dormant grass under deciduous trees is not entirely absurd, although I have yet to find any evidence for such a practice. Cope & Gray (2009) in the BSBI Grass Handbook suggest that this species is ‘often grown in gardens, but the proliferating variant is preferred’, but I have never seen it cultivated locally or in nurseries (except in my own garden!). It seems likely that many of our other populations may have originated with sand and gravel used in the construction of tracks and along verges; later local spread, especially by the dried ‘bulbs’ being blown by the wind seems entirely possible.

In other parts of East Anglia Bulbous Meadow-grass is known from the seaside in southern Essex, and intermittently around the coast to north-west Norfolk. In Suffolk in particular there are a few localities on dry heaths and commons away from but still near the coast and very occasionally further away, such as those now reported at Newmarket. The nearest of the previously known sites to us is on the edge of Breckland, at Icklingham, where it was first reported by F. Lupton in 1999. I could not find his site on a roadverge just out of the village in January 2015, but did see a substantial population on the mown verges of West Road in the village and along the consolidated sandy verges of a metalled track that extends westwards from the end of this road. This track eventually leads through to Cavenham Heath, but the grass does not extend that far or out on the Heath; nor could I find it in the sandy fields around Icklingham

village. In the *Flora of Norfolk* (Beckett *et al.*, 1999) there is another Breckland site noted on the county border with Suffolk, on sandy ground at Diss. There are no other Breckland records, but it seems more than likely that other sites may yet to be discovered in this region, although their status may remain equivocal.

In a broader context Bulbous Meadow-grass is widespread in the Mediterranean region (including North Africa), extending up the western coast of Europe to Scandinavia and the Baltic, but is also widespread inland in continental Europe and extends to temperate Asia as well. It has been introduced elsewhere, such as in North America and in Australia.

Whilst it is unlikely that Bulbous Meadow-grass is an overlooked native in Cambridgeshire, it is certainly very well established here and has probably been with us for some time, perhaps a very long time, just un-noticed and unrecognised. It is a lesson, at least in part, in not ignoring the vegetation of apparently dull roadside verges and tracks! I would be delighted to hear of any further records for this intriguing little grass.

Acknowledgments

I am grateful to Nick Millar for providing the map included as Figure 1.

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Appendix. Sites for *Poa bulbosa* in Cambridgeshire (v.c. 29) and adjacent parts of West Suffolk (v.c. 26).

The sites are listed in numerical order of 10km squares and in date order within the squares; the sites are all in v.c. 29 unless otherwise stated.

TL45 (a) At least a dozen clumps on raised roadside verge on east side of Trumpington Road, Cambridge, between the entrance to the Headmaster's House drive and the main entrance to St Faith's School, TL451565, 13 May 2007, ACL (**CGE**); still present but fewer clumps, 22 April 2012.

(b) About 100 tufts in rather open vegetation under a large London Plane, Cherry Hinton Hall grounds, Cherry Hinton, Cambridge, TL48225630, 18 March 2012, ACL; all foliage turning orange-brown and plants flowering well, 20 May 2012 (**CGE**).

(c) Scattered clumps in thinly vegetated ground around the base of three widely separated old beech trees, at the northern edge of grassy area ("Games Field"), Wandlebury, Gogmagog Hills, Cambridge, TL49535331 and 49595326, 3 November 2012, ACL.

(d) Scattered on rather bare ground under three large London Plane trees, on the Carlyle Road border of Alexandra Gardens, Cambridge, TL44855944, 5 April 2015, ACL; some in flower 3 May 2015 (**CGE**).

TL46 (a) Abundant along c.80 yards of north-east verge of ring road, Cambridge Science Park, Milton, starting more-or-less opposite the spur road to buildings 1-10 and carrying on to the Centre, TL46776141 to 46816146, 25 February 2012, ACL (**CGE**), also one on opposite side of road at entrance to spur road and another on the verge of the roundabout near the entrance to the site; most concentrated within 2ft of the kerb, with a few scattered some feet away under light shade of trees.

(b) Frequent along the roadside fringe of grass verge, mostly in front of 115 Perse Way, Cambridge; a few on opposite side of road, outside nos.108 & 112, TL44716043, 6 April 2013, ACL.

TL55 (a) Abundant along mossy margins of unshaded, concrete track running through fields north-east of Little Wilbraham, either side of where a footpath from the village crosses the track on the way out to the Little Wilbraham Road, TL53945919, 20 June 2004, ACL (**CGE**); still abundant 22 March 2015.

TL56 (a) Numerous clumps on a short stretch of dry open track running beside the hedge at the junction of the July and Beacon Courses, Newmarket Heath, TL59996262, 14 June 2003, ACL.

TL65 (a) A large colony extending for c.100yards under mature beeches at the edge of Stetchworth Park Stud, on the south-western lip of the Devil's Ditch fosse, also extending for a short distance along one of the strips of woodland running at right angles to the Ditch into the stud fields, TL64665905 to 64565916, first found 20 May 2007, ACL (**CGE**).

TL66 (a) Dominant in a narrow band along the kerb on south-east side of Paddocks Drive, Newmarket, TL643626, 19 April 2003, ACL (**CGE**), with some scattered in the turf further from the road; one plant in flower; still there 20 April 2014, with several patches in flower.

(b) A few patches in short turf at edge of curb on eastern side of entrance to driveway c.50 yards to south-west of site above (ACL, same date).

(c) Scattered along the south-east side of A1304 from outside Newmarket cemetery (TL637629) to just south-west of the entrance to the golf club (TL6261), not continuous but frequent in places, 19 April 2003, ACL. Only the plants just south-west of the golf club entrance are in v.c. 29, the remainder are in v.c. 26.

(d) A few patches in very short open turf at edge of layby on north-west side of A1304, just north-east of the Devil's Ditch, Newmarket, TL621616, 19 April 2003, ACL.

(e) One small patch on north side of roundabout at junction of A1303 and 1304, just south-west of the Devil's Ditch, Newmarket, TL614613, 19 April 2003, ACL.

(f) One small clump in short turf behind the kerbstone at junction of current A1303 and the old line of the road, just south-west of the A1303/1304 roundabout, Newmarket, TL614612, 19 April 2003, ACL.

(g) Scattered along the south-east side of A1304, north-east of Newmarket, TL66226546 to 66096535, 19 April 2003, ACL; several patches with flowering stems.

(h) One patch on south-east side of A1304 on the north-eastern outskirts of Newmarket, TL654646, 19 April 2003, ACL (in v.c. 26).

(i) Locally frequent in dry open turf a few feet from the edge of the road, north-west side of A1304, north-east of Newmarket, TL659652 and at 660653, 4 May 2003, ACL.

(j) Frequent in a limited area of dry open ground a few feet from the edge of the road, north-west side of A1304, just south-west of the junction with the A14, north-east of Newmarket, TL667660, 4 May 2003, ACL (**CGE**), many plants in flower.

(k) Frequent along a stretch of track running parallel to the Devil's Ditch and beside the July Course on Newmarket Heath, from the Bomber Gap south-west to at least TL60896228 and again on gravelly ground on the south-west side of the road running parallel to the Ditch which extends from the end of this track to the car park by the July Cottages, TL615617, 4 May 2003, ACL.

(l) Verges of diagonal access road running down from the July Cottages to the July Course stands, mostly on the south side and in the shade of limes (and sometimes right up to their trunks), but not spreading out into the open chalk turf, TL61796150, 16 January 2005, ACL & P.R. Green; also found the same day in the short mown turf on either side of the

other access road which runs straight down to the stands from the July Cottages car park road, TL61406162.

(m) Abundant over almost the entire length of a slightly sunken, probably once gravelled track running beside the hedge on the south-west side of the July Course on Newmarket Heath, TL 60896203 to the previously recorded site at 59996262, 16 January 2005, ACL & P.R. Green.

(n) Scattered in short mown turf, mostly under mature limes in the 'central reservation' between roads leading down from the A1304 to the Rowley Mile grandstand on Newmarket Heath, TL63126284, 16 January 2005, ACL & P.R. Green; this site was subsequently found to be more extensive with large numbers of plants (all in v.c.26).

(o) Scattered along verge of north side of Old Station Road, Newmarket, e.g. TL64986340, 26 March 2006, ACL; still there March 2012; partially in mown turf under limes, but some large patches in unshaded turf towards the Heath Road end.

(p) Several large clumps on a narrow mown grass verge, under one London Plane tree, opposite 202 New Cheveley Road, Newmarket, TL65176297, 10 March 2012, ACL.

Early Meadow-grass (*Poa infirma*) in Cambridgeshire

C.J. Cadbury & A.C. Leslie

Status in Britain and Ireland

At the time of *New Atlas of the British & Irish Flora* (Preston *et al.*, 2002), Early Meadow-grass (*Poa infirma*) had been recorded in Britain only from the Isles of Scilly, mainland Cornwall, along the south coast to East Sussex, including the Isle of Wight, and in the Channel Islands, with two sites in Ireland. Since then botanists have located it in further coastal sites in southern and eastern England, at least as far north as north Norfolk, as well as in scattered inland sites in the south and east of England; there have also been further Irish records. This extension of range must be in part due to genuine distribution spread, but also to improved recognition of this overlooked, small, early-flowering grass.

Identification

This annual makes an appearance in winter, especially in such a mild one as 2015/16. Its small size, narrow yellow-green leaves and usually a complete absence of anthocyanin pigments give it a different appearance from Annual Meadow-grass (*Poa annua*); occasionally in plants from more exposed sites there may be some purplish tinging towards the apex of the lemmas. Annual Meadow-grass has a much longer flowering period, with some plants being found in flower throughout the year, but Early Meadow-grass flowers during March to May, before it dies down and disappears. The anther size is diagnostic: less than 0.5 mm long in Early Meadow-grass and scarcely longer than wide, greater than 0.5 mm long in Annual Meadow-grass and at least twice as long as wide. It is good practice always to check this character before recording any population of this species as other characters are not so reliable. In Annual Meadow-grass the lower panicle branches usually become patent to reflexed and

the florets are densely packed in the spikelets, whereas in Early Meadow-grass the panicle branches usually remain erecto-patent and the florets are less densely placed so that the rachis of the spikelet is often visible. The similarities in these two species are not so surprising, as the diploid *P. infirma* is believed to be one of the ancestors of the tetraploid *P. annua*, the other parent being *P. supina*, another European but non-British species, which has long anthers. Sterile hybrids between *P. infirma* and *P. annua* have been reported elsewhere in the British Isles, as well as putative fertile derivatives of hybrid origin. Occasional plants in our populations have been noted where the anther character has not been so clear cut and these might repay further study.

A poor competitor

___As might be expected, this insignificant annual is a poor competitor and an early successional coloniser of bare, sparsely vegetated ground. In coastal sites Early Meadow-grass occurs in open sites such as cliff-top paths, car parks and semi-fixed dunes (Cope & Gray, 2009). In Cambridge city, however, its main habitat is in the shade of deciduous trees (29 out of 42 sites at which the habitat was recorded) – Horse-chestnut (*Aesculus hippocastanum*) (deepest shade in summer) in seven instances, plus one with both Horse-chestnut and Beech (*Fagus sylvatica*), seven with lime (*Tilia* sp.), three with Hornbeam (*Carpinus betulus*), three with Beech, three with London Plane (*Platanus × hispanica*), one of them shared with lime, and one each with Sycamore (*Acer pseudoplatanus*) and birch (*Betula* sp.). At one site (Villa Road, Histon) the grass was scattered near a clump of six substantial Lawson’s Cypresses (*Chamaecyparis lawsoniana*) and three maples (*Acer* sp.) in 2008. The Lawson’s Cypresses now cast deep shade, so the site is no longer suitable. Where Early Meadow-grass occurred under trees, in most instances it was plentiful on the more sunlit south side. More open habitats included gravel drives, cobbles, paving/footpaths, car parks, waste ground and roadside edges.

Associates

___The most frequent associates of Early Meadow-grass at a sample of 21 Cambridge sites in February 2016 were Common Chickweed (*Stellaria media*) (14 sites), Lesser Celandine (*Ficaria verna*) (nine sites), Cow Parsley (*Anthriscus sylvestris*) and Dandelion (*Taraxacum* sp.) (both with five), Lesser Chickweed (*Stellaria pallida*) and naturalised Winter Aconite (*Eranthis hyemalis*) (both with four). Annual Meadow-grass occurred in at least four sites but was probably under-recorded.

Distribution in Cambridgeshire

___At the time of writing, March 2016, Early Meadow-grass has been recorded at 41 sites within Cambridge itself, with further sites at Histon, Rampton and Willingham to the north and at Swaffham Bulbeck and Newmarket to the north-east, whilst to the south it has been seen by the A1307 on the Gogmagog Hills, as well as at Wandlebury and in Stapleford; most of these sites were initially reported by A.C.L. None was found in Ely when the environs of the cathedral

were thoroughly searched on 10 February 2016 by C.J.C. These sites cover 26 monads in the 10-km squares TL45, 46, 55, 56, 65, 66, all in v.c. 29. Nineteen of the monads lie within the Cambridge city boundary and this concentration could at least partly be due to better botanical cover, particularly in the winter and early spring when botanists are less likely to be tempted to explore further afield. It was locally abundant at 11 sites in 2016: for example on Christ's Pieces the grass was spread over a radius of 9 m around a very large Horse-chestnut, at Cherry Hinton Hall for 9 m around a Horse-chestnut, and for 7 m around a Copper Beech in Cambridge University Botanic Garden.

Persistence at sites

— The first records for Early Meadow-grass in Cambridgeshire were made in 2001 – in a temporary car park on waste ground between Hills Road and Station Road and under railings by Hobson's Conduit where it runs beside the Botanic Garden. The car park site has now been built on and it was not present by the Botanic Garden in 2016. However, at 21 out of 37 sites visited in 2016 it has apparently persisted for at least five years, in spite of being an annual. It was first recorded at one site 13 years previously, and it has persisted for 12 years at four sites, for 10 years at two sites, for nine years at two sites, for seven years at three sites, for six years at five sites and for five years at three sites.

— It was no longer present at 17 former sites that were checked in 2016. Herbicides are likely to have caused the eradication of colonies at several sites, such as at Peterhouse College, on Panton Street and in Gonville Place at the edge of Parker's Piece. It does suffer such treatment around the base of London Planes in Sidgwick Avenue, although in 2016 there were localised patches of the grass around six trees on the north side and eight on the south side of the road. Many of the sites from which it has been lost have developed a sward of perennial grasses and Annual Meadow-grass.

How did Early Meadow-grass arrive in Cambridge?

— Early Meadow-grass was almost certainly overlooked for a period after its initial colonisation and probably still is in places outside the city, but in the last two decades there have been enough observant botanists aware of its existence and patrolling the city to record its spread. It is possible that it arrived here with tourist traffic directly from the Continent: it is found in sandy, mostly coastal places around the Mediterranean, extending into south-western Asia and up the European Atlantic coast to south-western Britain. It is also recorded as an introduction in South America (Cope & Gray, 2009). It is equally possible that inland occurrences, such as ours, are derived from the active spread of this species round our southern and eastern coasts, arriving here on feet and vehicles; the association with car parks and gravel drives may point this way. It is certainly known now from coastal sites in the neighbouring counties of Essex, Suffolk and Norfolk, and scattered inland sites are reported from some of these counties as well as from Hertfordshire and Northamptonshire. In Surrey the first record was from the car park of the much-visited R.H.S. Garden at Wisley.

Locally, introduction with soil, or more likely sand and gravel, cannot be ruled out, or the occasional introduction as a nursery weed (perhaps with shrubs brought to nurseries from southern Europe, as this is a proven source of such weeds). Indeed several of these factors may be involved.

How has Early Meadow-grass spread in Cambridge?

Although it was reported from two sites in or near the University Botanic Garden in 2001 and 2006, the Garden is an unlikely source, although in the past it has been the origin locally of several other vascular plants, e.g. Canadian Waterweed (*Elodea canadensis*), Wall Lettuce (*Mycelis muralis*) and Jersey Cudweed (*Gnaphalium luteoalbum*). Early Meadow-grass is not generally a plant of mown lawns (with the exception of a site outside the Judge Business School in Trumpington Street) and is thus unlikely to have been spread by mowers. It seems probable that people's footwear and vehicles are the main vectors of spread. Early Meadow-grass is certainly found at sites much used and trampled by people, such as on the Backs on Queens' Road, the back entrance to King's College, King's College School, Lammas Land close to the Fen Causeway pedestrian crossing, Christ's Pieces, Petersfield Green on East Road and the grounds of Cherry Hinton Hall. Other sites are close to roads or in car parks such as on Sidgwick Avenue, the roundabout at the busy junction of Chesterton Road and Elizabeth Way, the overflow car park at Wandlebury and the original site off Station Road. Although there have been some reports of its spreading as a weed of salted verges elsewhere in southern England, this does not seem to have been a significant factor in Cambridgeshire.

Other urban invaders

Early Meadow-grass is not the only vascular plant that has recently colonised Cambridge. Musk Stork's-bill (*Erodium moschatum*) is now well naturalised and persisting in mown turf in at least 20 sites within the city, including in abundance on the north-west side of Milton Road north-east of Woodhead Drive. Knotted Hedge-parsley (*Torilis nodosa*), which started to spread rather earlier, is now frequent on many grassy roadsides, especially in urban settings. Even more surprising is Four-leaved Allseed (*Polycarpon tetraphyllum*), long known from Cornwall, the Isles of Scilly and the Channel Islands, which is now making an appearance on the streets of Cambridge.

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Cambridgeshire's disappearing arable flora: a personal view

C. James Cadbury

Abstract

I have recorded vascular plants growing on arable and other disturbed soils in Cambridgeshire (v.c. 29) for over 50 years. In 2015 I surveyed 62 sites, including soils on Chalk, various calcareous clays, Fenland peat and silts, and sandy soils. This paper discusses the results of this survey, with references to my earlier records and those of others where relevant. Nearly three-quarters of the 198 species recorded were annuals. The most widespread 37 species each occurred at more than 10 sites. Of the 145 arable annuals recorded in Cambridgeshire 16 (11%) are considered threatened in England as a whole (Stroh *et al.*, 2014) and another three must be close to extinction in the vice-county. By 2015 the majority of cereal crops in Cambridgeshire had become almost devoid of arable weeds as a result of treatment with herbicides. At most sites arable plants were restricted to field headlands. The very few species-rich sites with threatened species were largely tilled strips that had deliberately not been treated with herbicides or were on farms with organic management that precludes their use. The demise of arable plants is likely to continue, leading to the imminent loss of even more species.

Introduction

Arable fields have distinct communities of plants, a high proportion of which are annuals. In a landscape of intensive farming with large fields, much restricted margins, improved seed-screening, dense crops, high input of nitrogen fertiliser, a shift from spring to autumn cultivation (though this now shows some signs of reversal owing to agricultural policy changes), loss of over-wintered stubbles and summer fallows, and particularly almost universal and thorough herbicide treatment, many of these plants have fared badly for at least the last 50 to 60 years. Indeed several species are among the most threatened vascular plants in Britain. In Cambridgeshire (v.c. 29), about 177,000 ha (80%) out of a total area of 221,352 ha are under agriculture. Since a substantial proportion of this is arable it is not surprising that the arable flora has suffered severely.

For over 50 years I have recorded vascular plants in the cultivated fields of Cambridgeshire. My efforts, however, have not represented a systematic or anything like a comprehensive survey until 2015, and even then only a sample of sites was covered.

Methods

In my study a site is defined as a plot of disturbed soil, usually an arable field with a particular crop. In all, 62 sites were covered in 2015 and another four in previous years only (Table 5). At 12 sites surveys of earlier years since 2000 were repeated in 2015 to try to determine short-term changes, though it must be recognised that much depends on the crop grown and the tillage patterns. This survey and the forthcoming new Cambridgeshire Flora being prepared by Alan

Leslie will provide a picture of the current situation that may be compared with that in 10 to 20 years' time. The species occurring in Cambridgeshire that are listed as threatened or near threatened in England (Stroh *et al.*, 2014) and their status in the county are included in Table 4. The nomenclature for vascular plants follows that in Stace (2010).

At most sites all species were recorded, not just the scarcer and more threatened ones, and their frequency noted. A grid reference was taken with a GPS tracker (given to six figures in Table 5). The soil type and crop influenced the selection of sites. Six sites – Trumpington Country Park, two sites at Kingfishers Bridge (Wicken), waste ground beside Kennet railway station, land by Clopton Way at Tadlow, and Millbridge Brook housing estate (Gamlingay) – were not arable but had been subject to fairly major soil disturbance. Another three sites (excluded from the total) were the banks of Fenland drains rather than arable; these were locations for Spreading Hedge-parsley (*Torilis arvensis*).

Cambridgeshire has four main soil types – on Chalk and limestone, on clays, on peat (sometimes silty) and on sands. There is Chalk in the east, stretching from near Royston (on the Hertfordshire border) to Reach near Newmarket. Around Fowlmere, Thriplow, Newton and Whittlesford there are shallow periglacial ground ice hollows (pingos) in a chalky marl. Close to Wicken there is an outcrop of late Jurassic (Oxfordian) limestone. In the south-west, extending to West Cambridge, there is a variety of calcareous clays, including Gault and Boulder Clay. In the Fens of the north-west the soils are base-rich peat but have become increasingly silty as the peat has been reduced by drainage and agriculture. In the extreme south-west, close to the Bedfordshire border, the soil is sandy and acidic. The Breckland sands which overlie Chalk extend into Cambridgeshire on the eastern fringe of the county, east of Fordham. Between Cottenham and Oakington there is a pocket of Greensand.

The predominant crop on Chalk and the clays in 2015 was winter wheat, but a certain amount of oil-seed rape was also grown. A few fields had broad beans. On Fenland peat the main crops were sugar beet and potatoes together with some wheat and maize (increasingly grown now). Carrots are grown on sandy soils and peat but not commonly. At Whitegates Farm near March, where there is organic management, there were plots of asparagus, globe artichokes and squashes.

I surveyed 66 sites – 20 on Chalk, one on limestone, 15 on clays and chalky marl, 18 on Fenland peat, two on Fenland silt (excluding the three specifically examined for Spreading Hedge-parsley), eight on sandy soils and two on sandy loam (Table 5).

Total number of species recorded

Of the 198 species of vascular plants recorded in this survey of arable and disturbed ground, 145 (73%) were annuals and 53 were biennials or perennials. Excluded from the total were seven crop relicts and 10 species that had been deliberately sown. The most widespread 37 species are listed in Table 1; they occurred in 10 (16%) to 34 (55%) of the 62 sites surveyed in 2015.

Table 1: Numbers (and percentages) of sites in which the most widespread vascular plants were recorded in 2015 from arable fields and other disturbed soils in Cambridgeshire

Sites (62)	
34 (55%)	<i>Chenopodium album</i>
33 (53%)	<i>Tripleurospermum inodorum</i> , <i>Veronica persica</i> *
32 (52%)	<i>Cirsium arvense</i> (perennial)
30 (48%)	<i>Fallopia convolvulus</i>
29 (47%)	<i>Senecio vulgaris</i>
28 (45%)	<i>Polygonum aviculare</i> agg.
25 (40%)	<i>Papaver rhoeas</i>
24 (39%)	<i>Sonchus asper</i>
23 (37%)	<i>Alopecurus myosuroides</i>
22 (35%)	<i>Capsella bursa-pastoris</i> , <i>Galium aparine</i> , <i>Sisymbrium officinale</i>
20 (32%)	<i>Euphorbia helioscopia</i> , <i>Helminthotheca (Picris) echioides</i>
19 (31%)	<i>Viola arvensis</i>
18 (29%)	<i>Anisantha sterilis</i> , <i>Persicaria maculosa</i> , <i>Sonchus oleraceus</i>
17 (27%)	<i>Avena fatua</i>
15 (24%)	<i>Geranium dissectum</i> , <i>Sinapis arvensis</i> , <i>Urtica urens</i>
14 (23%)	<i>Atriplex patula</i> , <i>Geranium pusillum</i> , <i>Plantago major</i>
13 (21%)	<i>Anagallis arvensis</i> , <i>Artemisia vulgaris</i> (perennial), <i>Euphorbia exigua</i> (Vulnerable), <i>Persicaria lapathifolia</i>
12 (19%)	<i>Anisantha diandrus</i> , <i>Matricaria discoidea</i> *, <i>Sonchus arvensis</i> (perennial)
11 (18%)	<i>Convolvulus arvensis</i> (perennial), <i>Malva sylvestris</i> (perennial)
10 (16%)	<i>Aethusa cynapium</i> , <i>Poa annua</i>
Total 37 species (all annuals except five perennials)	

* *Veronica persica* was first recorded in Britain in 1825 and *Matricaria discoidea* in 1869 (Stace & Crawley, 2015).

Chalk and limestone

Morden Grange Farm, Ashwell, on Chalk, was the richest site of all those surveyed in Cambridgeshire in terms of nationally threatened and scarce arable vascular plants, with five such species recorded since 2008; in all, 43 species were recorded on the site. Mutlow Hill, beside the Fleam Dyke, and Chrishall Grange, south of Thriplow, both had two nationally scarce fumitories, *Fumaria vaillantii* (Endangered) and *F. parviflora* (Near Threatened). All these three chalky sites were unplanted tilled strips that had not been treated with herbicides. The Chrishall Grange site, when surveyed in 2008, had 32 species, but by 2015, when the strip was under wheat, there were only 23; the fumitories were then restricted to the crop margin. Chalky arable at Allington Hill, north of Six Mile Bottom, had 43 species, with three nationally threatened in 2015 and a fourth in 2012 (recorded by Jonathan Shanklin). Chalky waste ground beside Kennet railway station had 47 species but no nationally threatened or scarce ones.

The smaller fumitories (*Fumaria* spp.) are characteristic of chalky arable. Common Fumitory (*F. officinalis*) was recorded at seven sites on Chalk in 2015, including subsp. *wirtgenii* with small sepals at Mutlow Hill. On other soils in Cambridgeshire this species seems to be less common. The occurrence of the four species is shown in Table 2.

Twelve plants of *F. parviflora* appeared at Kingfishers Bridge, Wicken, in 1996, shortly after the excavation of the wetland.

Table 2: The occurrence of the smaller fumitories *Fumaria* spp. at five sites in Cambridgeshire (James Cadbury’s records)

	Morden Grange (Chalk)		Mutlow Hill (Chalk)		Chrishall Grange (Chalk)		Litlington (Chalk)	Fordham (sand)	
	2009	2015	2012	2015	2008	2015	2015	2011	2015
Common <i>F. officinalis</i>	A	F	F	LA	F	O	O	–	R
Dense-flowered <i>F. densiflora</i>	LF	–	–	–	LF	–	R	O	O
Fine-leaved <i>F. parviflora</i>	O	–	O	O	LA	R	–	–	–
Few-flowered <i>F. vaillantii</i>	O	R	O	LF	R	–	–	–	–
A: abundant; LA: locally abundant; F: frequent; LF: locally frequent; O: occasional; R: rare; –: absent.									

Common Ramping-fumitory (*F. muralis*) does not usually occur in arable situations; indeed it is generally scarce in East Anglia. What appeared to this species made a surprising appearance in chalky arable at Chrishall Grange in both 2008 (one plant) and 2015 (43 plants). As it was not flowering the subspecies could not be determined.

I saw Rough Poppy (*Papaver hybridum*) at seven sites on Chalk between 1997 and 2015 and on calcareous clay between Whittlesford and Newton in 2015. Prickly Poppy (*P. argemone*) (Vulnerable) is rarer. I recorded it at Morden Grange in 2009 and it occurred in four sites including Litlington in 2015. Yellow-juiced Poppy (*P. lecoqii*) is more widespread. In my garden on Barton Road, Cambridge, it has appeared naturally annually from about 1990 to 2015.

Venus’s-looking-glass (*Legousia hybrida*) is another plant associated with calcareous arable. I have seen it at Morden Grange (2000), Fowlmere (2001, 2002, 2012 and 2015) and Whittlesford (2014) and particularly at Kingfishers Bridge, Wicken (abundant on a rotovated strip on Jurassic limestone in 2001, less frequent in 2002 and rare in 2004 and 2008).

Wild Candytuft (*Iberis amara*) (Vulnerable) was abundant on the south-facing embankment of the main line railway at Morden Grange, Ashwell, in 2000. It had spread onto the herbicide-free chalky tilled strip on the south side by 2009 and was flowering plentifully there in early October 2015.

I have recorded Night-flowering Catchfly (*Silene noctiflora*) (Vulnerable) at six sites in small quantity in calcareous arable fields since 1982, including 44 plants at Kingfishers Bridge with Venus’s-looking-glass in a rotovated strip in 2002. Here on 14 July I noted that the flowers were opening at 9.30 p.m. and had closed by 6.30 a.m. the next day. Initially the petals were pale pink on the upper side before inrolling to expose their creamy-yellow backs. Other features are the sticky nature of the plant and the green-banded calyx. The largest

population occurred on calcareous clay at the margin of a broad strip of tilled but unsprayed ground between Whittlesford and Newton in 2015. This site was additional to the six mentioned above.

I recorded Small Toadflax (*Chaenorhinum minus*) on only five sites on Chalk and one on chalky marl, but it is rather easily overlooked. However Jonathan Shanklin has seen it in the Fens. There are several recent records of Cornfield Knotgrass (*Polygonum rurivagum*) in Cambridgeshire. I collected plants resembling this species on chalky arable at Steventon End, Ashdon (TL604436), in 2011 and near Balsham (TL556496) in 2014, but when Alan Leslie checked them he was unable to confirm their identity; however he was happy with plants that I gathered from chalky arable at Morton Grange in 2015.

Grass-poly

Grass-poly (*Lythrum hyssopifolia*) is one of Cambridgeshire's special plants. Gigi Crompton has catalogued in detail the records in the vice-county from John Ray's first in 1660 up to 2001 (Crompton, 2001). It has Endangered threat status in England (Stroh *et al.*, 2014). In Cambridgeshire it is now largely restricted to pingos in five monads around Fowlmere (TL4045, 4145, 4146, 4245 and 4246), three monads west of Whittlesford (TL4448, 4548, and 4549) and a single monad south of Chippenham Park (TL6667). It has also occurred since 2008 at Fen Drayton Pits, a non-arable site. Around Fowlmere it has been known since 1958 and at one site it was recorded over a span of 33 years. North of the RSPB's Fowlmere nature reserve Grass-poly occurred in a damp depression from 1994 to 1996. It had disappeared from there by 1997, when cultivation ceased and the field became grassy. However it appeared nearby in 1998 in other damp hollows and 'tramlines' in crops through which farm machinery had been driven. There were several thousand plants in 1998, 2001 (*c.* 20,000), 2009 and 2013 (*c.* 11,000), but in 2007, 2008, 2011 and 2015, after dry springs, there was none. Between Whittlesford and Newton Grass-poly has been known from at least six locations in varying abundance since 1958. There were years such as 1993, 1994 and 2001 when at least 10,000 plants occurred in particular pingos.

Grass-poly was first recorded south of Chippenham Park by Charles Babington in 1853; it was seen there again in 1940, 1941 and 1975 and was rediscovered by Alan Leslie and J.L. Sharman in 2001. That year, after a wet spring, it was present in five depressions in a wheat crop. In one of these depressions there were thousands of plants and in another at least one thousand. When I visited the site on 2 October 2015 there was no sign of Grass-poly but the field was very dry by then.

Clearly populations of Grass-poly undergo major fluctuations from year to year. Winter and/or early spring flooding, as well as tilling or similar soil disturbance, seems essential for seedling establishment (Preston & Whitehouse, 1986).

Boulder Clay, Gault and chalky marl

Such soils occur over much of south-west Cambridgeshire and though fertile tend to be difficult to cultivate because of the poor drainage and their hardness

when dry.

Among the more notable plants associated with these soils but also occurring on Chalk are two fluellens, Sharp-leaved (*Kickxia elatine*) (eight sites on clay or chalky marl, one on Chalk) and Round-leaved (*K. spuria*) (12 sites on clay or chalky marl, one on Chalk). Both were still locally frequent on Gault Clay near the Coton Footpath, West Cambridge, in 2015. Dwarf Spurge (*Euphorbia exigua*) (Vulnerable) is fairly widespread in southern Cambridgeshire. I recorded it at 15 sites, nine on clay or chalky marl and six on Chalk. In 2009 I counted 265 plants in a broad bean crop at Grange Farm, Knapwell. In 2015 Dwarf Spurge was very abundant in a poorly grown oil-seed rape crop to the north of Hardwick Wood. Broad-leaved Spurge (*E. platyphyllos*) (with distinctive papillose fruiting capsules) is considerably rarer in Cambridgeshire, though not considered nationally threatened (Stroh *et al.*, 2014). The three sites where I have seen it are all on Boulder Clay (Table 3).

Table 3: Sites and numbers of plants of Broad-leaved Spurge *Euphorbia platyphyllos*

	Grange Farm, Knapwell	Harlton	N. of Hardwick Wood
2000	148 plants	not counted	not counted
2009	285 plants	not counted	not counted
2011	1 plant	10 plants	1 plant
2015	none	none	41 plants

Yellow Vetchling (*Lathyrus aphaca*) (Vulnerable and Nationally Scarce as a native plant) can be only marginally classified as an arable plant. In 2015 it was hugely abundant on Gault Clay along a 500 × 7 m strip between the north side of the Toft–Hardwick road and a wheat crop. It was also plentiful on the south side of the road. Its origin there is somewhat of a mystery. The strips on either side of the road had been tilled, probably two or so years previously, but not sprayed with herbicides, and this may have activated the germination of a seed-bank. There is a well-known site for Yellow Vetchling on the margin of a track at Wood Farm only one kilometre to the north (TL3657), where it has been recorded since the 1950s (Crompton, 2001) and as recently as 2011.

Slender Tare (*Vicia parviflora*) (Vulnerable) was also growing with Yellow Vetchling on both sides of the Toft–Hardwick road in 2015. These two species were also growing on Gault Clay near the Coton Footpath, West Cambridge, in 1980. Yellow Vetchling was on the arable margin but mainly in a small plantation (TL427586) which has since grown up, rendering the site unsuitable for the plant. It has not been seen at this site since 2009. Slender Tare was locally frequent on fallow verges (TL425583 and 425585) in 1980, but in 2015 I could find only one plant and that was on a grassy verge (TL427584).

Peat

Few notable species were seen in 2015 in the peaty arable fields of north-west Cambridgeshire, but such widespread species as Fat-hen (*Chenopodium album*), Common Orache (*Atriplex patula*), Pale Persicaria (*Persicaria*

lapathifolium) and Redshank (*P. maculosa*) were often particularly abundant and lush. Five of six sites for Flixweed (*Descurainia sophia*) were on peat. Soon after the Kingfishers Bridge Wetland near Wicken was excavated on highly productive arable peat, this crucifer was exceedingly abundant in 1996–98. It still occurs annually at the site but is now only occasional. Four of the six sites for Annual Mercury (*Mercurialis annua*) in 2015 were on peat.

About 800 acres of Whitegates Farm south-east of March are managed organically by Clive Martin to grow asparagus, globe artichokes and squashes. Herbicides are not used and as a consequence arable plants flourish in great contrast to the surrounding farmland. A survey that I carried out in mid-October 2015 recorded a total of 51 species, with 28 in three asparagus plots, 21 in a plot with globe artichokes, 40 in four squash plots and 15 in a strip sown with Borage (*Borago officinalis*) and Phacelia (*Phacelia tanacetifolia*) to provide nectar for pollinators. Most of the species were those with a widespread distribution in Cambridgeshire, but Cut-leaved Dead-nettle (*Lamium hybridum*) occurred in five plots. Elsewhere in the Fens it is fairly widespread (from Jonathan Shanklin). I also found Field Woundwort (*Stachys arvensis*) (Near Threatened) on an asparagus plot (TL451950), the only site where I recorded this species in the 2015 survey.

I have seen Large-flowered Hemp-nettle (*Galeopsis speciosa*) (Vulnerable) on peat soils on a drove at the Nene Washes (1991), at Kingfishers Bridge, Wicken (2003), and at Welches Dam, Ouse Washes (2010), but it appeared in none of the 18 sites sampled on peat in 2015. It appears to have suffered a considerable recent decrease and is now rare according to Alan Leslie and Jonathan Shanklin.

Sands

Sites on the sandy soil in the Gamlingay area in south-west Cambridgeshire, close to the Bedfordshire border, proved to be fairly rich in species (22–27 taxa). These included Hare’s-foot Clover (*Trifolium arvense*) and Common Cudweed (*Filago vulgaris*), which were both abundant on a new housing estate at Millbridge Brook Meadow. A fallow field on the Great Heath was the only site in my 2015 survey that produced Corn Spurrey (*Spergula arvensis*) and also the naturalised Gallant-soldier (*Galinsoga parviflora*). Field Pansy (*Viola arvensis*) was abundant and Bugloss (*Anchusa arvensis*) frequent on sandy arable in the area. Five of the nine records of Henbit (*Lamium amplexicaule*) were on sandy soil; the others were on Chalk or limestone.

Close to the eastern border of Cambridgeshire with West Suffolk, the sandy soil on Fordham allotments was also rich in arable annuals (29 species). Among them were Maple-leaved Goosefoot (*Chenopodium hybridum*), Field Penny-cress (*Thlaspi arvense*) (at the only site in the 2015 survey) and the aliens Shaggy-soldier (*Galinsoga quadriradiata*) and Green Nightshade (*Solanum physalifolium*) (abundant). In 2011 about 100 well-grown plants of Sand Catchfly (*Silene conica*) (Vulnerable), a Breckland speciality (Trist, 1979), appeared there and were protected by David Collins. In a sandy field near Freckenham there was more Green Nightshade, Annual Mercury (locally

abundant) and Field Pansy in abundance. At the margin of a sugar beet crop on sandy loam, just east of Fordham, there was a substantial hybrid swarm of Wild Pansy (*Viola tricolor*) (Near Threatened in England) with Field Pansy. Many of these large-flowered plants had the upper petals attractively blotched with violet. It was the only site of the 62 visited where I recorded Wild Pansy or the hybrid in 2015. There was Field Mouse-ear (*Cerastium arvense*) (Near Threatened in England) on flinty ground south-east of Fordham (TL640698).

The Lower Greensand outcrop south-west of Cottenham has a history of Corn Marigold (*Glebionis (Chrysanthemum) segetum*) (Vulnerable) surviving at one of its very few native Cambridgeshire sites. In 2015 there were only five plants in a field margin, but Alan Leslie says that in other years it can be locally abundant. Wild Radish (*Raphanus raphanistrum* subsp. *raphanistrum*) was frequent in the same field.

Goosefoots

Besides Fat-hen – which was one of the most widespread arable plants in Cambridgeshire in 2015, recorded in over half of the 62 sites surveyed (Table 1), and was particularly abundant on peat – four other species were recorded. Fig-leaved Goosefoot (*Chenopodium ficifolium*) occurred at nine sites, five of which were on peat, Red Goosefoot (*C. rubrum*) at five, Many-seeded Goosefoot (*C. polyspermum*) at three and Maple-leaved Goosefoot at three (Shudy Camps, Kennet railway station and Fordham allotments). A particularly large form of Red Goosefoot occurred at Chrishall Grange in 2008 and there were several similarly robust plants on a manure heap between Guilden Morden and Steeple Morden in 2015.

Mayweeds and chamomiles

Where soil has been disturbed these species can be conspicuous when in flower. Scentless Mayweed (*Tripleurospermum inodorum*) was another of the most widespread arable plants in the 2015 survey, occurring in 33 (53%) of 62 sites surveyed (Table 1) and on all soils. Pineappleweed (*Matricaria discoidea*) was present on 12 sites. Scented Mayweed (*M. chamomilla*), with a conical, hollow receptacle to the capitulum, occurred at nine, including in abundance in peaty fallow at Poplar House Farm near Eldernell, north of Hardwick Wood, on Gault Clay in 2011, and near Tydd St Giles in 2015. I came across Stinking Chamomile (*Anthemis cotula*) (Vulnerable) only once and that was on Chalk at Allington Hill in 2015, though there are fairly recent records from close to the Devil's Ditch in 2004, at Chippenham (abundant) and Great Wilbraham (by Alan Leslie) in 2009, and by the Fleam Dyke in 2015 (by Jonathan Shanklin). Corn Chamomile (*A. arvensis*) is now very rare in Cambridgeshire. Alan Leslie recorded it on the bank of the A14 (TL665663) in 2011 and on a sandy ridge on the north margin of Chippenham Fen (TL644697) in 2014 and 2015, with seedlings present in 2016. In early October 2015 I located four plants in the same monad (TL643699) but on set-aside to the north-west of his site. There was a spectacular display of a tall chamomile that was probably *Anthemis austriaca* (rather than *A. arvensis*) in a sown seed mixture at Grange Farm,

Knapwell, in 2015.

Grasses of arable and disturbed ground

Farmers are targeting Black-grass (*Alopecurus myosuroides*) with herbicides, particularly pre-emergent ones, but it is one of the most troublesome weeds of cereal crops in Cambridgeshire because it is becoming resistant to these chemicals. It was recorded at 23 (37%) of the 62 sites surveyed in 2015, mostly on Chalk and clay. Barren Brome (*Anisantha sterilis*) is another serious weed and was noted at 18 sites. Great Brome (*A. diandra*) was present at 12 sites, including four on sandy soils, and appears to be increasing. Botanists visiting arable fields in July and August beware; the barbed seeds of both these bromes all too readily become attached to socks and have to be painstakingly removed. Meadow Brome (*Bromus commutatus*) was seen at eight sites, six of which were in cereal crops; it may be decreasing. Rye Brome (*B. secalinus*) (Near Threatened in England) has suffered a dramatic decline in Britain as a whole. I saw it only once in 2015, having been directed by Alan Leslie to a site beside Haycock Lane, Burwell. It was recorded at another three sites that year by Jonathan Shanklin.

Interrupted Brome (*B. interruptus*) is a British endemic that was particularly associated with crops of Sainfoin (*Onobrychis viciifolia*). It was last recorded in the wild in 1972 but was rescued thanks to the foresight of Dr Philip Smith of Edinburgh University and Cambridge University Botanic Garden, who cultivated the grass. This allowed the reintroduction as seed on Ashley Arbon's farm near Whittlesford in October 2013. There was a healthy population of this special brome on a tilled strip in both 2014 and 2015, when it had spread beyond the original sown plot (Stroh *et al.*, 2015).

Wild-oat (*Avena fatua*) is still widespread in Cambridgeshire. I recorded it at 17 (27%) of the 62 sites surveyed in 2015, but it now only occasionally extends out into the crop itself. An exception was on the south side of the Ten Foot Drain on Upper Knarr Fen, south-east of Thorney, where there were dense patches of Wild-oat in a wheat crop. I identified Winter Wild-oat (*A. sterilis*) at only six sites, four of which were on clay. The *Agrostis* most typically found on arable is Black Bent (*A. gigantea*). It was frequent in a wheat crop near Litlington in 2015. The single record of Fern-grass (*Catapodium rigidum*) was on limestone at Kingfishers Bridge, Wicken, in 2015. A few plants of Dense Silky-bent (*Apera interrupta*) (Nationally Scarce) appeared on a chalky unsprayed strip at Mutlow Hill in 2012. This delicate grass is particularly associated with disturbed sand in Breckland, where it has been increasing (Trist, 1979; Sanford & Fisk, 2010). Cockspur (*Echinochloa crus-galli*) is a casual which has turned up at the margin of maize crops at Kingfishers Bridge and on the Pemberton Estate, Trumpington (2011). It appears to be spreading.

Arable plants that have suffered major declines in Britain

Shepherd's-needle (*Scandix pecten-veneris*) has decreased greatly as an arable archaeophyte and is now considered Critically Endangered (Stroh *et al.*, 2014). It appeared in abundance in a small field at the Cambridge end of the

Coton Footpath in 1980, but when the site became grassed over it disappeared, though Gigi Crompton recorded it near this footpath in 1989. There were thousands of plants along an arable margin west of Upend Green, Kirtling (TL689588–694587), in 2010 (from D.J. Barden), but by 2015 the site had become pasture. In that year Jonathan Shanklin and the Cambridgeshire Flora Group discovered a huge population extending some 300 m along the margin of a wheat crop between Guilden Morden and Steeple Morden, where it produced copious seed by early July. In early September, after a rather wet period, there were thousands of seedlings in the stubble margin. Seeds collected at the site in July and sown in a pot on chalky clay germinated after a month to develop narrow grass-like cotyledons before the finely dissected leaves. By mid-September the potted plants were already flowering and by late October they were in fruit. In Suffolk Shepherd's-needle is now surprisingly widespread and locally abundant on Boulder Clay (Sanford & Fisk, 2010).

Corn Buttercup (*Ranunculus arvensis*) is another arable archaeophyte that has declined dramatically in Britain and, like Shepherd's-needle, is Endangered. It was locally frequent for several years (1980–1982) on Gault Clay beside the Coton Footpath, West Cambridge (TL427587). The conversion of the University Veterinary Farm to a largely pastoral system with grass replacing arable led to the buttercup's demise. However, the seeds are long-lived, so, when the site was temporarily cultivated again, 13 plants appeared in 1989. This coincided with the reappearance of Shepherd's-needle in the vicinity. The last Cambridgeshire records for Corn Buttercup were at Great Eversden (by Richard Cant) and Newmarket (by Graham Easy) in 1991.

Broad-leaved Cudweed (*Filago pyramidata*) is now Endangered in England. It formerly occurred in arable situations but now most of the few remaining sites are on chalky spoil that has been disturbed by quarrying and other excavations (P.J. Wilson, in Wigginton, 1999). It was recorded in damp hollows on chalky marl between Whittlesford and Newton on several occasions – in 1958 (by David Coombe *et al.*), when I saw it, and in 1969 (by M. Rand). The last Cambridgeshire records were at Pampisford in 2004 (by J.C.A. Rathmell) and Snailwell in 2012 (by P.D. Stanley).

Field Gromwell (*Lithospermum arvense*) is also an Endangered archaeophyte in England on account of a substantial decrease. It has been recorded at four sites in Cambridgeshire since 2010. Jonathan Shanklin found at least 100 plants in a barley crop on chalky soil at Allington Hill, north of Six Mile Bottom (TL578586), in 2012. I failed to see it during the 2015 survey, which included Allington Hill. The survival of this plant depends on regular soil disturbance.

Weasel's-snout (*Misopates orontium*) (Vulnerable) was found on a weedy strip of gravelly cultivated ground beside the greenhouse at Girton College, Cambridge (TL424612), in July 2000. There were about 40 plants, along with Yellow-juiced Poppy. Coincidentally a conference on arable weeds was taking place at the college at the time. From seed taken then Weasel's-snout has persisted up until the time of writing (2015) as a naturalised plant in my garden at 93 Barton Road, Cambridge. There are no other recent records in the vice-county.

Spreading Hedge-parsley is now Endangered, having declined from being recorded in 267 10-km squares in Britain before 1970 to 77 in the 1987–99 Atlas survey (Preston *et al.*, 2002). In south Cambridgeshire it has almost disappeared. In 1980 Michael Smith and I recorded it at two sites on Gault Clay south of the Coton Footpath, West Cambridge (TL425585 on fallow and 427585 in the margin of arable). It managed to survive at the latter site until 2014 (from Jonathan Shanklin). Alan Leslie discovered 15 compact and squat plants on a low gravelly bank in Trumpington Country Park in 2015. Jonathan Shanklin’s exploration of the under-recorded north-west of Cambridgeshire that year revealed Spreading Hedge-parsley at four sites on the north (south-facing) banks of drains. In these situations the vegetation was rank with tall grasses – Common Reed (*Phragmites australis*), False-Oat (*Arrhenatherum elatius*) and Common Couch (*Elytrigia repens*).

Table 4: Cambridgeshire’s threatened arable plants

	England (Stroh <i>et al.</i> , 2014)	Cambridgeshire (arable wild sites)*
<i>Agrostemma githago</i>	Waiting list	Sown in all recent sites
<i>Anthemis arvensis</i>	Endangered	3 sites, 2011–15
<i>Anthemis cotula</i>	Vulnerable	About 5 sites, 2004–15
<i>Bromus interruptus</i>	Last seen in the wild in 1972	Reintroduced in 2013, apparently successfully in one site, where it was flourishing in 2015
<i>Bromus secalinus</i>	Near Threatened	4+ sites in south, 2015
<i>Cerastium arvense</i>	Near Threatened	Mostly in S.E.; not typically on arable
<i>Erysimum cheiranthoides</i>	Near Threatened	Widely scattered but in small quantity
<i>Euphorbia exigua</i>	Vulnerable	Widespread in south, sometimes locally frequent
<i>Euphorbia platyphyllos</i>	Least Concern (declining)	About 3 sites in S.W., 2011–15, sporadic
<i>Filago pyramidata</i>	Endangered	Probably extinct in the wild (last recorded in 2012)
<i>Fumaria densiflora</i>	Least concern	Scarce on Chalk and sand
<i>Fumaria parviflora</i>	Near Threatened	9 sites in 2015, mostly on Chalk in S.E.
<i>Fumaria vaillantii</i>	Endangered	3–4 sites on Chalk, 2008–15
<i>Glebionis</i> (<i>Chrysanthemum</i>) <i>segetum</i>	Vulnerable	One area on Greensand; fluctuating population
<i>Iberis amara</i>	Vulnerable	3 sites (locally abundant in one) on Chalk, 2015
<i>Lathyrus aphaca</i>	Vulnerable	One site, very abundant in 2015; not found in another
<i>Legousia hybrida</i>	Least Concern	Local on calcareous soils in S.E.
<i>Lithospermum arvense</i>	Endangered	4 sites since 2010, including one in 2015
<i>Lythrum hyssopifolia</i>	Endangered	9 monads in east, very locally abundant in some years
<i>Misopates orontium</i>	Vulnerable	One site in 2000; subsequently naturalised in a garden
<i>Papaver argemone</i>	Endangered	4 sites in 2015
<i>Papaver hybridum</i>	Least Concern	5+ sites in 2015, on Chalk in S.E.
<i>Ranunculus arvensis</i>	Endangered	Probably extinct in the wild (last recorded in 1991)
<i>Scandix pecten-veneris</i>	Endangered	4 sites since 2010, including 2 in 2015; can be very locally abundant
<i>Silene noctiflora</i>	Vulnerable	8 sites, mostly in south in 2015; small quantity
<i>Spergula arvensis</i>	Vulnerable	Scarce and declining on sand in S.W. and in peaty fens; 17 records since 2000
<i>Stachys arvensis</i>	Near Threatened	One site in 2015
<i>Torilis arvensis</i>	Endangered	11 sites in 2015, mostly in N.W.; very abundant in one
<i>Vicia parviflora</i>	Vulnerable	5 sites in 2015, on clay, mostly in S.W.

* The Cambridgeshire records incorporate those from Alan Leslie, Jonathan Shanklin and others.

One of these sites on the Ten Foot Drain, Upper Knarr Fen, south-east of

Thorney, with thousands of plants extending over 400 metres, must have had one of the largest populations in the country, let alone Cambridgeshire. Another two ditch bank sites near Tydd St Giles, one with many plants, were recorded by Lewis Saunders and seen by me in 2015. None of these sites could be considered arable, though they lie in an intensive arable landscape. There was some evidence that the banks had been mown and the spoil from ditch clearance had been deposited on the banks. The plants were producing spiny, minutely hooked fruits in great abundance. Seeds taken and sown in a pot in late September were germinating by mid-October. As with Shepherd's-needle, the paired cotyledons were grass-like.

Aliens or plants deliberately sown

Corncockle (*Agrostemma githago*) is now almost extinct as a wild arable plant in Britain, though it appears annually on Plantlife's reserve at Ranscombe Farm in north Kent. Jim Clarke, a farmer, sowed seed for several years, such as in 1993, on a chalky cultivated strip beside the Devil's Ditch near Reach. There was a good display from a sown seed mixture with a chamomile, probably *Anthemis austriaca*, Cornflower (*Centaurea cyanus*) and Night-flowering Catchfly in a sown seed mixture plot at the RSPB's Grange Farm, Knapwell, in 2015.

Madwort (*Asperugo procumbens*) is now a very rare alien in Britain but was formerly more frequent. It occurred for many years from at least 1925 on chalky arable south of Cherry Hinton chalk-pit (TL485554) (Crompton, 2003). I saw it there in 1957, but it did not persist for long after that.

Larkspur (*Consolida ajacis*) has virtually vanished as a wild arable weed in Britain and now occurs mostly as a garden escape. However, nine plants appeared in chalky arable beside the approach drive to the RSPB's Fowlmere reserve (TL407460) in July 1981. Its identity was determined by the almost unbranched racemes and the divided bracteoles that did not extend beyond the base of the purplish-violet flowers.

Narrow-leaved Ragwort (*Senecio inaequidens*) is an alien that has recently been spreading in southern England as it has in northern France. In 2015 I saw only a single plant on chalky spoil at Kennet railway station, but it is now known from over 30 sites in Cambridgeshire.

An amaranth, probably *Amaranthus bouchonii*, the common one in Cambridgeshire rather than *A. hybridus* (from Jonathan Shanklin), was recorded on peat mounds at Kingfishers Bridge, Wicken (2010–2014), and at Fordham allotments (2015). An unidentified *Amaranthus*, in leaf, occurred at Kirtling (2011), Chrishall Grange (2015) and Burnt Fen north-east of Littleport (2015); at the last site it was associated with a game crop. *Amaranthus* species are becoming increasingly frequent arable weeds in Britain.

Buckwheat *Fagopyrum esculentum*, apparently sown in a seed mixture as a game crop, was seen at Chrishall Grange (2008) and on Burnt Fen (2015). It also occurred at Bury Lane garden centre, Melbourn, in 2015.

Gold-of-pleasure (*Camelina sativa*) was recorded in a game crop along with Millet (*Panicum miliaceum*) on Burnt Fen (2015).

Borage was grown with Phacelia on a plot at Whitegates Farm, March. The Borage was flowering abundantly in mid-October 2015 and had extended 30 m into a neighbouring plot of asparagus. Phacelia was also present as a crop relict at Grange Farm, Knapwell, in 2015.

Dill (*Anethum graveolens*) occurred as a crop relict on a smallholding (Mayfield) on Burnt Fen, north-east of Littleport, in 2015.

Red Champion (*Silene dioica*) occurred at Grange Farm, Knapwell, and at Broad Drove Field, Tydd St Giles, in 2015, but had probably been sown.

Crimson Clover (*Trifolium incarnatum*) was abundant in a clover ley close to Granchester in 2015, along with Italian Rye-grass (*Lolium multiflorum*) (or *L. × boucheanum*) and Alsike Clover (*T. hybridum*).

Discussion

There are several factors which influence the occurrence and survival of arable plants. One is the viability of their seeds. Species such as the smaller fumitories, Corn Buttercup, the poppies, Broad-leaved Spurge, Broad-leaved Cudweed, Spreading Hedge-parsley and Venus's-looking-glass have long-lived seeds which enable them to survive through a number of years when conditions are unfavourable. An example is the reappearance of Corn Buttercup beside the Coton Footpath after seven years under grass.

Another factor is whether the crop is autumn- or spring-sown. Wheat is now predominantly autumn-sown. Broad-leaved Spurge, Spreading Hedge-parsley and Shepherd's-needle need the opportunity for the seed to germinate in the autumn, the last as early as September. The smaller fumitories, Night-flowering Catchfly, Venus's-looking-glass, Small Toadflax, Weasel's-snout and Corn Marigold are all associated with spring-sown crops. The seeds of poppies can germinate in either spring or autumn.

The soil has already been shown to influence the distribution of arable plants. The smaller fumitories, Rough Poppy, Venus's-looking-glass and Night-flowering Catchfly are mainly associated with fields on Chalk or limestone. Grass-poly is more or less confined to pingos in chalky marl. The heavier clay soils are the habitat of the two fluellens, Broad-leaved and Dwarf Spurge and Slender Tare. Peat is favoured by Flixweed, Cut-leaved Dead-nettle and Large-flowered Hemp-nettle, as well as such widespread species as Fat-hen, Redshank and Pale Persicaria. Light sandy soils that are more acidic are local in Cambridgeshire. They support Corn Marigold, Corn Spurrey, Common Stork's-bill (*Erodium cicutarium*), Hare's-foot Clover, Bugloss and the two naturalised *Galinsoga* species.

A striking feature of crops, especially wheat and barley, in 2015 was their purity, with a virtual absence of weeds, even within the 'tramlines' created by crop-spraying machinery and in many instances in the crop margins. This seemed to be largely due to the use of pre-emergent herbicides such as Pendimethalin, used to check Black-grass. The best chance of finding arable plants was often in the headlands of fields that were less accessible to spray booms. This was in striking contrast to the organically farmed Whitegates Farm near March, where arable plants flourished in the absence of herbicides.

Apart from this organically managed farm, the sites where arable weeds survived best were broad strips that had been tilled but deliberately left untreated with herbicides. Morden Grange Farm near Ashwell (2000, 2009 and 2015), Mutlow Hill adjacent to the Fleam Dyke (2012 and 2015), Chrishall Grange (2008 but not 2015) and Stanmoor Hall Farm between Whittlesford and Newton (2015) were examples. Pingos, such as those around Fowlmere and Whittlesford, tend to flood in winter and are therefore difficult to cultivate; they support considerable populations of Grass-poly in some years and certain bryophytes, notably three scarce terrestrial liverworts, *Riccia cavernosa*, *R. glauca* and *R. subbifurca* (recorded by Harold Whitehouse, Chris Preston and others). Fallow fields, such as at Poplar Farm near the Nene Washes and the Great Heath, Gamlingay, can allow arable annuals to flourish temporarily. Allotments, such as those at Fordham, and smallholdings also provide refuge for these plants.

Research by the Game and Wildlife Conservation Trust has shown the importance of arable plants for invertebrates such as the chrysomelid Knotgrass Beetle (*Gastrophysa polygoni*) (Potts, 2012). In turn these and seeds of certain plants such as Black-bindweed (*Fallopia convolvulus*) and the fumitories feature in the diet of the highly threatened Grey Partridge (*Perdix perdix*) (Potts, 2012) and Turtle Dove (*Streptopelia turtur*) (Murton *et al.*, 1964). During my survey in 2015 I came across seven pairs of Grey Partridges and a single bird at five sites, but I have rarely seen these elsewhere in the county. The only Turtle Doves that I encountered in Cambridgeshire that year were at Mutlow Hill and close to the RSPB's Fowlmere reserve, both sites with a fairly rich arable flora. The Corn Bunting (*Emberiza calandra*) has suffered a decline in its breeding population during the 40 years from 1970 to 2010 (Balmer *et al.*, 2013). The change from spring- to autumn-sown cereals has reduced the availability of weed-rich stubbles for winter feeding of this species (Donald, 1997) and other seed-eating finches and buntings.

With the unlikelihood of herbicide treatment of crops being reduced and organic farming gaining substantial ground, the loss of arable plants will continue. Some of Britain's most threatened plants have suffered severe declines as a result of efforts to control a very limited number of truly damaging weed species. The situation has been reached when steps must be taken to actively encourage farmers to set aside broad conservation headlands or strips that are **tilled**, particularly in early spring and, most importantly, are **not subject to herbicides** directly or to spray drift. These need to be not less than 20 m wide. The sites should be selected carefully with an eye to finding those that are likely still to hold seed-banks of threatened arable annuals.

Already Cambridgeshire has probably lost Corn Buttercup and Broad-leaved Cudweed. Few-flowered Fumitory, Broad-leaved Spurge, Field Gromwell, Large-flowered Hemp-nettle, Shepherd's-needle, Corn Chamomile, Corn Marigold and even Grass-poly, one of the vice-county's special plants, could follow.

Acknowledgments

I am much indebted to Alan Leslie and Jonathan Shanklin for so helpfully providing information on sites to visit and sharing their extensive knowledge of Cambridgeshire's flora in recent years. Jonathan took a great deal of trouble commenting on and correcting a draft; for that I am extremely grateful. Ashley Arbon kindly showed me *Bromus interruptus* at its reintroduction site on his farm. I welcomed Clive Martin's invitation to visit his organically managed farm near March. Philip Oswald most carefully vetted a late draft of this paper. The RSPB generously gave me the freedom to undertake this study in 2015.

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Table 5: Gazetteer of sites surveyed for arable plants in Cambridgeshire

Chalk: 18 sites in 2015, two in other years only			
Jurassic (Oxfordian) limestone: one site in 2015			
1	Allington Hill, Six Mile Bottom	TL575586 – 579586	2015
2	Ashwell – Morden Grange Farm	TL311393 – 313395	2000, 2009, 2015
3	Burwell – Haycock Lane	TL600678 – 606675	2015
4	Cherry Hinton – Lime Kiln Road	TL481553 – 483553	1957, 2015
5	Chrishall Grange	TL452430	2008, 2015
6	Fowlmere – Foxcote, Melbourn Road	TL399460	2011, 2015
7	Guilden Morden – Steeple Morden	TL276411 – 278407	2015
8	Kenet – railway station	TL698673	2015
9	Litlington – Highfield Farm to railway	TL328402 – 330403	2015
10	Little Wilbraham – green drove	TL523587	2015
11	Melbourn – Bury Lane garden centre	TL374447	2015
12	Mutlow Hill – adjacent to Fleam Dyke	TL547545	2012, 2015
13	Mutlow Hill – adjacent to A11	TL547538	2012, 2015
14	Orwell – Fox Hill	TL364512	2011, 2015
15	Reach – adjoining Devil’s Ditch	TL578651 – 580648	1993, 2015
16	Reach – near disused railway	TL571652	1990, 1997, 2015
17	Saxon Street – near Kirtling Road	TL684589 – 688591	2015
18	Shudy Camps – near disused railway	TL604449	2014
19	Tadlow – Clopton Way	TL278478	2015
20	Wandlebury – east	TL501532	1982
21	Wicken – Kingfishers Bridge (Oxfordian limestone)	TL548739	2002, 2015
Clay and chalky marl: 13 sites in 2015, two in 2011 only			
22	Chippenham Park – to the south	TL658664	2015
23	Fowlmere – north of RSPB reserve (chalky marl)	TL409460 – 412461	1994 – 2015
24	Foxton – near railway crossing (chalky marl)	TL406495	2009, 2011, 2015
25	Gamlingay – adjacent to Gamlingay Wood (Gault)	TL241538	2015
26	Grantchester – to the north (chalky marl)	TL434564	2015
27	Graveley – to the east	TL252639 – 254637	2011
28	Hardwick – Highfields (Gault)	TL362592	2011
29	Hardwick Wood – to the north (Gault)	TL357581	2011, 2015
30	Harlton – to the south (chalky marl)	TL484510	2011, 2015
31	Knapwell – Grange Farm	TL428631	2000, 2009, 2015
32	Toft – Hardwick Road (Gault)	TL363564	2015
33	Trumpington – Country Park, Addenbrooke’s (chalky marl)	TL455548	2015
34	West Cambridge – Coton Footpath (Gault)	TL423586 – 426584	1980, 2015
35	Whittlesford – Ashley Arbon’s farm	TL468476	2015
36	Whittlesford to Newton – Stanmoor Farm	TL455487	2015
Fenland silt: two sites + three drain banks, all in 2015			
37	Eastrea – Angle Bridge, Whittlesey Dike	TL31089529 <i>Torilis arvensis</i>	2015
38	Thorney – south side of Ten Foot Drain, Upper Knarr Fen	TF297029	2015
39	Thorney – north bank of Ten Foot Drain, Upper Knarr Fen	TF296028 – 299030 <i>Torilis arvensis</i>	2015
40	Tydd St Giles – Broad Drove West	TF390138	2015
41	Tydd St Giles – Broad Drove East	TF406151 <i>Torilis arvensis</i>	2015
Fenland peat: 18 sites in 2015			
42	Chatteris – Horseway, How Hill	TL421867	2015

43	Chatteris – Horseway, How Hill	TL421867	2015
44	Chatteris – Horseway, How Hill	TL419867	2015
45	Eastrea – Angle Bridge, Whittlesey Dike	TL312955	2015
46	Eastrea – Church Bank Farm, Whittlesey Dike	TL319951	2015
47	Eldernell – Poplar House Farm	TF354001	2015
48	Eldernell – Poplar House Farm	TF354002	2015
49	Eldernell – Poplar House Farm	TF353003	2015
50	Littleport – Burnt Fen	TL587890	2015
51	Littleport – Mayfield, Burnt Fen	TL585887	2015
52	Mepal – Black Fen	TL432820	2015
53	March – Whitegates Farm (asparagus)	TL451950, 453948, 450951	2015
54	March – Whitegates Farm (globe artichokes)	TL451949	2015
55	March – Whitegates Farm (squashes)	TL452950, 449950, 44952, 448953	2015
56	March – Whitegates Farm (Borage & Phacelia)	TL449951	2015
57	Nene Washes – Whittlesey Washes	TL285994	2015
58	Stretham – adjacent to railway crossing	TL526728	2015
59	Wicken – Kingfishers Bridge	TL543730	2015
Sand: eight sites in 2015			
60	Cottenham – Oakington	TL440667 – 443666	2015
61	Fordham – S.E. of church (allotments)	TL634706	2011, 2015
62	Freckenham – Chippenham Road	TL656714	2015
63	Gamlingay – Great Heath, south of road	TL221516	2015
64	Gamlingay – Great Heath, north of road	TL220517	2015
65	Gamlingay – Great Heath, north of Potton	TL217512	2015
66	Gamlingay – Millbridge Brook (edge of housing estate)	TL243520	2015
67	Chippenham Park – to S.W.	TL659684	2015
Loam: two sites in 2015			
68	Fordham – S.E. of Trinity Hall Farm (flinty)	TL640598	2015
69	Fordham – east of Trinity Hall Farm (sandy loam)	TL637703	2015

In all, 62 sites were surveyed in 2015 and four sites in other years only. Excluded from the total of 62 sites are three drain-bank sites with *Torilis arvensis*.

An introduction to the Harvestmen (Arachnida: Opiliones) of Cambridgeshire

Brian Eversham

Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire, The Manor House,
Broad Street, Great Cambourne, Cambs CB23 6DH

Introduction

The harvestmen or harvest-spiders are a rather species-poor but distinctive group, currently with 28 British species, of which 20 have been recorded in Cambridgeshire (vice-county 29) and a further five in nearby counties. As an order of arachnids, the Opiliones are eight-legged, like the true spiders (Arachnida: Araneae), but differ in having a body apparently in one piece (not divided into a cephalothorax and an abdomen, as in true spiders), and in most

species, a single pair of often large, sideways-pointing eyes set on a small turret, the ocularium, on top of the body (whereas spiders have six or eight small eyes, variously arranged in different families). The most familiar species are also distinguished by their spectacularly long legs: in one of the commonest species, *Leiobunum rotundum*, with an adult head-and-body length of only 3-6mm, the leg span can reach 120mm.

Harvestmen are a familiar group among naturalists, and most of the British species can be identified in the field with the naked eye or a x8 hand lens. Despite this, and a workable handbook having been available for over 40 years (Sankey and Savory, 1974), harvestmen have been strangely neglected. The combined index of the first fifty-five volumes of this journal contains not a single reference to harvestmen or Opiliones. The other portion of modern Cambridgeshire has fared a little better: an account of the harvestmen of Huntingdonshire (vice-county 31) has been published (Eversham, 1990)

It is hoped that this short account will encourage readers to pay more attention to the group, at least half of which may be found in a moderate-sized and not-too-tidy garden. Some species, including the one with the largest body of all British harvestmen, *Odiellus spinosus*, is commoner in gardens than in the countryside.

Ecology and behaviour

Unlike spiders, harvestmen produce neither silk nor venom. They are generalist feeders, including a very wide range of small invertebrates in their diet, ranging from small earthworms, to millipedes, woodlice, spiders, mites, springtails, a wide range of insects - and other harvestmen (Hillyard and Sankey, 1989). Although much of their prey is caught alive, they are also avid scavengers on dead invertebrates, including robust or aggressive ones such as ants, centipedes and beetles, which would be beyond the force or ingenuity of harvestmen when alive. They also feed on a very wide range of organic material, including soft fruit, fungi and bird droppings. A few species, such as *Anelasmacephalus cambridgei*, are specialist predators of small snails.

Harvestmen can be roughly divided into short-legged, medium-legged and long-legged. The short-legged species tend to spend most of their time on the ground or walking over mosses and low vegetation. Long-legged species clamber over herbaceous and shrubby vegetation, or climb trees. Species with medium length legs may do either, and in some species, the juveniles live at ground level but the adults climb higher in the vegetation. Some, especially the longest-legged, are gregarious as adults, clustering on the trunks of trees, or on walls.

It is possible to find and identify harvestmen in all months of the year. Some species become adult in spring and remain so during summer; many species mature in the autumn and are active into winter, and a few species are adult all year round.

Changing species distributions

For a group of animals with no obvious means of long-distance dispersal, harvestmen have proven remarkably good colonists. Several species have expanded their range rapidly northward across Europe in the last few decades, perhaps as a result of climate change (Wijnhoven, 2009; Chadd and Eversham, 2010). In the twentieth century, two species, *Nelima gothica* and *Dicranopalpus ramosus* arrived in Britain and became widespread: the latter is now probably the most frequently recorded harvestman over most of England. A third, *Opilio canestrinii*, was first recorded in Britain in 1999 (Hillyard, 2000), and has subsequently become abundant over much of the country, at least in towns and gardens; and *Nemastomella bacillifera* was found at a handful of quarry sites in southwest England and is probably also a recent introduction.

Since 2000, a further three species have been confirmed as British: *Leibunum tisciae* (previously considered doubtful), *Platybunus pinetorum*, and a long-legged and strikingly green-black metallic *Leiobunum* sp. which has yet to be named. In the Netherlands, a country with 36 species compared with Britain's 28, there are 12 species currently not recorded here, and seven which appear to have arrived in the Netherlands since 1991. Given the likelihood of several new species colonising Britain in future years, it is very helpful that the modern Dutch guide (Wijnhoven, 2009). is available in an English translation (free to download).

The mechanism by which harvestmen travel long distances is unproven, but the horticultural movement of soil containing their eggs has been suggested for some species (Chadd and Eversham, 2010), and quarry and forestry equipment and materials may also have assisted some.

Identification guides and online resources

The more distinctive species of harvestman can be identified as small juveniles, but some are best identified when adult. The most up-to-date and comprehensive identification guide, and the easiest to use, is Richards (2010), a laminated colour chart, illustrated with clear photographs and with a tabulation of key features. A wider selection of photographs by Richards is available online at <https://www.flickr.com/photos/invertimages/sets/72157632884119929> which has the advantage that the images may be enlarged greatly to show finer details.

Keys and excellent drawings are provided by Hillyard (2005), who covers all but the three most recently discovered species, *Platybunus pinetorum*, *Leiobunum tisciae*, and the as-yet-unnamed *Leiobunum* sp. The previous edition, Hillyard and Sankey (1989), is also useful, but also omits *Nemastomella bacillifera* and *Opilio canestrinii*, though the authors predicted the addition of the latter to the British fauna.

As noted above, the Dutch guide by Wijnhoven (2009) may be of use in recognising species which colonise Britain in the future, and an English translation is available at http://srs.britishtspiders.org.uk/resource/De_Hoogiwagons_1st_revision140615.pdf

This beautifully presented volume, with excellent drawings and photographs, omits five of the current British species, so should be used with caution as a stand-alone identification guide.

Unfortunately, harvestmen are generally omitted from guides to spider identification, or only a selection of species is included (e.g. Jones, 1983).

Other online identification aids are also available. The Spider Recording Scheme's website <http://srs.britishspiders.org.uk/> includes photographs and the latest distribution maps of many species plus ecological analyses. Nineteen species are described and illustrated with excellent photographs on the <http://www.eakringbirds.com/eakringbirds3/harvestmen.htm> website, which includes the undescribed *Leiobunum* sp., which extend its range in the next few years. There is also a friendly and helpful Facebook group: <https://www.facebook.com/groups/1460150090961032/> which will assist with identification from photographs.

Clear accounts of the biology of harvestmen are provided by Hillyard (2005), Hillyard and Sankey (1989), and Wijnhoven (2009).

Species recorded in Cambridgeshire

In the following checklist, all localities are listed for species which have been found in five or fewer locations.

Anelasmaocephalus cambridgei (Westwood, 1874) Named after the Victorian arachnologist, the Rev. Octavius Pickard-Cambridge. A flat-bodied, very slow-moving species confined to calcareous soils, found in leaf-litter, moss and grass, in open woodland and scrubby grassland. The animal's legs and body are often covered in soil or dust, and it tends to stay motionless when disturbed, so is often difficult to see and is likely to be under-recorded. Known from Devil's Dyke, Fleam Dyke and Cambridge City.

Dicranopalpus ramosus (Simon, 1909) First recorded in Britain in 1945, this species was largely confined to the south and south-west coast of Britain until the early 1990s, when it began spreading rapidly northward, and is now recorded as far north as Inverness. A very distinctive species, which often sits conspicuously on walls and tree trunks with its long, banded legs held out sideways, it has conspicuous long forked palps, unlike any other species so far recorded from Britain. The first Cambridgeshire record appears to have been from Devil's Dyke near Stetchworth in 1999, and it is now found in most gardens and woodlands throughout the county.

Homalenotus quadridentatus (Cuvier, 1795) A distinctive species, its body with four rows of conical spines on the dorsal surface, the hindmost four jutting out at the tail tip. A ground-living species found in leaf litter, grass tussocks, under stones and logs, in Cambridgeshire it is known from calcareous grassland (Devil's Dyke at Burwell, Cherry Hinton West Pit), woodland (Devil's Dyke at Stetchworth, Overhall Grove) and wetland (Shepreth L-moor).

Lacinius ephippiatus (C. L. Koch, 1835) A nondescript ground-living species, fairly frequent in woodlands, fens and damp grassland throughout the county, and able to colonise new habitats (occasionally abundant in rough grassland at Cambourne).

Leiobunum blackwalli Meade, 1861 A long-legged species with a small, round body, often found on tall herbage or low scrub along woodland rides and edges. Widespread but less abundant than *L. rotundum*.

Leiobunum rotundum (Latreille, 1798) Another long-legged species found among tall herbs and scrub, abundant in woodland, scrub, gardens and rough grassland, and on brownfield sites. One of the commonest species in the county.

Lophopilio palpinalis (Herbst, 1799) A rather small, ground-living species which is most active in early winter, so may be under-recorded. Found in a wide range of habitats in the county, including chalk quarries and grassland, ancient and secondary woodland, willow carr, dry reedbeds, hedgerows, and occasionally on arable land.

Megabunus diadema (Fabricius, 1779) One of the most attractive and distinctive harvestmen, its body is marbled in greys and greens (supposedly to provide camouflage against lichen-covered tree trunks) and it has two rows of very long spines on the ocularium. Uncommon in the county, it is apparently absent from the east of the county and from much of Suffolk and Norfolk. Recorded from Gamlingay Wood, Hayley Wood and Overhall Grove.

Mitopus morio (Fabricius, 1779) A very common and widespread species in a wide range of habitats, including woodland, fen, dry and wet grasslands, and hedgerows.

Mitostoma chrysomelas (Hermann, 1804) A small, ground-living species, characteristically with palps up to twice as long as the body. Easily overlooked, but widespread in many habitats, including woodland, fens, damp grassland and tussocky meadows.

Nelima gothica Lohmander, 1945 A small-bodied, long-legged species, not easy to identify but often with pale leg joints. It is probably a late colonist to Britain, the first record being in 1900. Until the 1990s it was mainly recorded from the south and west of Britain, since when it appears to have spread rapidly and become established in Cambridgeshire. It has been recorded in reedbeds at Wilbraham Fen, among tall sedge at Shepreth L-Moor, and among dry tussocks of Wood Small-reed at Norwood Road, March.

Nemastoma bimaculatum (Fabricius, 1775) This unmistakable small, short-legged, ground-living species is black with two silvery-white spots on the front of the body. It is very common and often abundant in woodland, scrub,

grassland, marshes, quarries and on road verges, most easily found under logs and debris.

Odiellus spinosus (Bosc, 1792) The largest-bodied British harvestman, though rather short-legged, this species is common in gardens, often gathering on walls below window sills, and it is occasionally found in woodlands, grasslands and fens.

Oligolophus tridens (C.L. Koch, 1836) Often found among tall herbage in woods and gardens, this species also climbs trees and walls. Fairly common throughout.

Opilio canestrinii (Thorell, 1876) A distinctive species, with orange pigment on the large body, pale orange leg-bases and much darker legs, this is a very recent arrival in Britain, first record 1999 (Hillyard, 2000). I first saw it locally in Swavesey, in gardens, in 2012, and it is now also found in gardens in Ely, Cambridge and Cambourne. In the latter, it also occurs among nettles and other tall herbage in woodland. Its future spread, and potential impact on *O. parietinus*, will be interesting to follow: in the Netherlands, the first record of *O. canestrinii* was in 1991, and by 2009, it was ubiquitous in built-up areas and the formerly common *O. parietinus* appeared to be extinct in the Netherlands because of the spread of the ‘strong, offensive newcomer’ (Wijnhoven, 2009).

Opilio parietinus (De Geer, 1778) Another large-bodied, long-legged species, largely synanthropic, most often seen on walls in gardens, but also found among herbaceous and shrubby vegetation in open woodland and rough grassland. It is, or was, widely scattered through the county. However, I have not seen it in Swavesey in 2014 or 2015, so it may be in decline (see *O. canestrinii*).

Opilio saxatilis C. L. Koch, 1839 A smaller species than the preceding two, usually with a narrow pale stripe down the full length of the middle of the back. Commonest in dry grasslands and on heathland, it is scattered but infrequent in the county, in chalk grassland, in open woodland, in gravel pits, and on railway sidings. The Dutch experience suggests it may coexist with the invasive *O. canestrinii* more successfully than *O. parietinus*.

Paroligolophus agrestis (Meade, 1855) A fairly small species with medium-length legs, often with a pale stripe down the back which stops short of the tip of the abdomen. Probably the most abundant harvestman in Cambridgeshire, found in woodlands, grasslands, wetlands and gardens, from soil level to high up trees.

Phalangium opilio Linnaeus, 1758 One of the most commonly recorded species, large and long-legged, the males have a pair of upwardly-curved yellow-orange forward-pointing horns on the chelicerae (mouthparts), which are apparently used in contests for mates. Common and widespread in most habitats, perhaps most often seen in summer when males wander over short grass in daylight.

Platybunus triangularis (Herbst, 1799) A ground-living species which is active as half-grown juveniles in winter, and becomes adult in April and May, recognisable by its distinctive palps, which have triangular projections from two segments. Common in woodland, scrub, grasslands of all kinds, and occasional in gardens.

Species recorded from neighbouring counties, which may be found in Cambridgeshire

Leiobunum sp. This extremely long-legged species, with metallic green-black patches on the upper surface of the body, is recorded from a handful of sites in the north midlands. However, it has spread rapidly elsewhere in Europe, and may be expected to do the same in Britain.

Oligolophus hanseni (Kraepelin, 1896) A nondescript species rather similar to *O. tridens*, which may be overlooked. Most often found on Scots Pine, but also beaten from other trees in open woodland, gardens and parkland, it is frequent in Suffolk Breckland and on the Greensand of Bedfordshire, and has been recorded on ivy near Brampton in Huntingdonshire (Eversham, 1990).

Paroligolophus meadii (Pickard-Cambridge, 1890) A rather scarce species found among leaf-litter on heathland, calcareous grassland, and sand dunes, with a scatter of records from Breckland and from heathland on the Bedfordshire greensand.

Platybunus pinetorum C.L. Koch, 1839 A recent arrival in Britain, known from a few conifer plantations in Scotland, and from Harlestone Firs in Northampton. In the Netherlands, it is also recorded from broadleaf woodland. A large, long-bodied species with blackish markings on the body and distinctive white teeth on the underside of the palps. Adult only from April to July.

Trogulus tricarinatus (Linnaeus, 1758) A flat-bodied, very slow-moving species confined to calcareous soils, found in leaf-litter and grassland. Similar to *Anelasmacephalus cambridgei*, it is likewise often covered in soil, and stays motionless when disturbed, so is difficult to see. Most records are on the chalk in Kent and Sussex, but with a scatter of records as far north as Yorkshire and Lancashire. It could occur on the chalk east of Cambridge.

Acknowledgments

I am grateful to Phil Ricketts of the Cambridgeshire and Peterborough Environmental Records Centre for providing access to the records held there; and to Louise Bacon for suggesting this paper.

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Traditional orchards – an overlooked habitat for wildlife.

Val Perrin, Cambridgeshire Orchards Group

Introduction

Only comparatively recently has it been discovered that traditional orchards, for long considered just as fruit-producing concerns, represent valuable habitats in their own right for wildlife. Yet as we begin to uncover their species richness they are disappearing before our eyes – victims of neglect, and worse still, destruction. Traditional orchards are those groves of veteran standard or half-standard fruit trees, widely spaced with over-arching crowns and managed non-intensively. Their trunks harbour numerous invertebrates, their dead wood hosts fungi and saproxylic insects, while birds and bats use their hollows, splits and gnarled, flaking branches for nests and refuge. The other components of old orchards, the grassland floor and surrounding hedgerows, add to the habitat mix, while in some orchards, ponds and other natural and man-made structures such as old wooden buildings provide additional sites for different suites of wildlife.

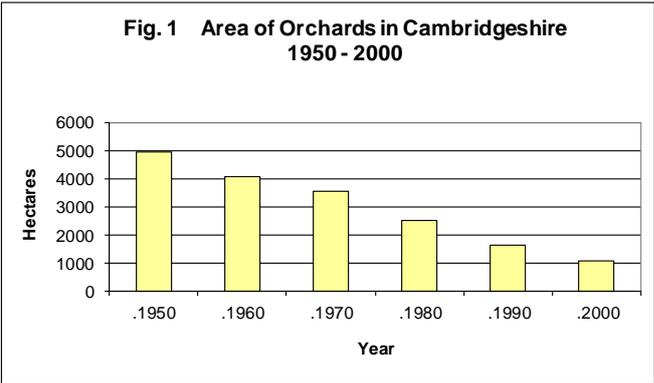
Back in the early 1990s the charity Common Ground first drew the public's attention to the intrinsic value of old orchards as sites enshrining the cultural histories of fruit-growing, social customs and folklore, as well as being of value

for wildlife and, in their own right, as attractive landscape features and peaceful sanctuaries for people to visit and enjoy.

For all these reasons a growing network of people has taken up the cause to save and restore a number of traditional orchards around the country. In-depth surveys of their wildlife have shown that these sites are as important as ancient woodlands, holding equally impressive lists of species covering many taxa. However, such efforts, although valuable, have not been able to stem the tide of orchard loss, as owners, many of them becoming too old to manage their holdings adequately, allow them to fall into overgrown, light-impoverished wildernesses, or be sold off to developers.

With the emergence of habitat and species action plans covering many of our best-known and precious wildlife sites in the early years of the present century, the one for traditional orchards came into being from English Nature comparatively late, in 2007 (Maddock, 2008).

Against this background of a growing understanding of the worth of old orchards, the Cambridgeshire Orchards Group (an offshoot of the Cambridgeshire and Peterborough Biodiversity Partnership) was set up in 2003 with a view to finding out about the locations and condition of the remaining traditional orchards in Cambridgeshire. This was particularly pertinent given the strong historical tradition of orchard fruit-growing in the county and the fact that these sites had not previously been studied either for their fruit varieties, or for their wildlife potential. Official figures had shown that the area of land covered by orchards in Cambridgeshire in 2000 had shrunk to around one-fifth of that occupied 50 years before (Figure 1). A survey by English Nature at the time found that orchard loss in the 10-km OS grid square TF40 (covering the important orchard region around Wisbech) was around 10% over the period 1997-2003.



The Cambridgeshire orchards project was divided into three phases, with differing aims. This paper outlines the methods and results from these three surveys that were organised and conducted by the Cambridgeshire Orchards Group and their partners in the county between 2004 and 2012 and places the results in the context of similar work elsewhere in other orchard-rich counties of England. This has thrown a spotlight on a precious resource that we are in

danger of losing. All three of the survey reports are available online for download (Lever 2006, Perrin 2010, 2012).

The surveys

The Phase I survey ran from October 2004 for one year. Its aims were to assess the distribution and condition of all types of orchard in Cambridgeshire and Peterborough and to locate the remaining traditional orchards, with a view to targeting these sites for further study. Aided by the East of England Apples and Orchards Project (EEAOP), the survey was co-ordinated by the Cambridgeshire Orchards Group (Lever, 2006). The sites selected were identified from Ordnance Survey 1:25,000 maps. These maps only show the larger orchards and it was appreciated that a number of the smaller sized orchards were missed, and that some marked on the maps would no longer exist. The survey was designed to be conducted from public roads and footpaths using locally recruited and trained volunteers. Orchards were placed in at least one of three categories: intensive (high density planting in spindle or other centre leader tree forms), extensive (medium density plantings, in large spindle or half-standard forms) and traditional (low density plantings in standard or large half-standard forms). In a very few cases it was impossible to view the orchard from public rights of way. In these cases, online aerial photography was used to determine whether the orchard appeared to exist or not.

Following identification of traditional orchard sites in the county from the Phase 1 survey, the Phase 2 survey, conducted between 2006-09 (Perrin, 2010) gathered data from those sites. It sought to establish details of ownership of the sites with a view to obtaining permission to conduct internal surveys. These surveys recorded information on the fruit trees themselves, along with information on the ground layer, other habitats within the orchard and the boundaries and surrounding habitats. The wildlife was not specifically investigated in detail in Phase 2 but surveyors were asked to record sightings of any wildlife observed incidentally during their visit. Any known or perceived threats to the future integrity of the orchard were noted, with help from the owner where possible.

Based on earlier detailed surveys of wildlife within orchards, both in Cambridgeshire and elsewhere in the country, a Phase 3 survey (2009-11) was planned of a number of the Phase 2 sites (Perrin, 2012). This concentrated on specialist surveys of the bryophytes, lichens, fungi, invertebrates, birds and bats present. In addition, a specialist survey of fruit varieties was conducted in a number of these orchards in the autumn of 2011. The choice of sites for Phase 3 work was made for the various taxa by the Phase 2 surveyors, and the selection is hopefully fairly representative of the range of old apple, pear and plum orchards found in the county.

It was originally intended to conduct these Phase 3 surveys in a similar number of orchards for each wildlife group but, due to availability of expert surveyors and time constraints imposed by funding and season, different numbers of sites were surveyed for each speciality.

In addition, an expert in fruit identification from EEAOP, who was also a member of the Cambridgeshire Orchards Group, surveyed the fruit varieties in a subgroup of the Phase 2 traditional orchards. The Phase 3 work commenced in 2009 and was completed in 2011, with a detailed report being generated the following year.

The methodologies for each taxon group surveyed are outlined, and the results summarised after the results from Phases 1 and 2 are described.

Phase 1

Of 343 sites identified in the survey, six proved to be inaccessible to surveyors. One quarter of the orchards had been lost and one third were classified as commercial orchards (sites with half-standard trees or spindles, planted at close density and managed intensively). Traditional orchards made up a further quarter of the total, while just under 14% were remnant orchards only (contained only a very small number of remaining fruit trees, where land use could not be considered as orchard, such as a few scattered trees on field margins, or isolated in gardens of residential properties) (Table below). Considered as a whole, 52% of mapped orchards had been reduced in size or lost altogether. Most of the loss had been due to arable conversion, grazing for horses or used for residential development.

<i>CATEGORY</i>	<i>NO OF SITES</i>	<i>%</i>
<i>Lost</i>	87	25
<i>Commercial orchards</i>	114	33
<i>Traditional orchards</i>	89	26
<i>Remnants only</i>	47	14
<i>Unknown</i>	6	2
TOTAL	343	

About half the remaining orchards were found in areas used traditionally as such, in three main locations (Cambridge-Ely-Huntingdon triangle, Wisbech area and Melbourn-Meldreth area). Some replanting was taking place, but this was very limited. In fact, 69% of Cambridgeshire's traditional orchards are located in just 12 parishes within these geographical areas. Although it was impossible to determine fruit species present in 18% of the orchards because of restricted access or poor views, apple proved to be the most widespread orchard tree (in 54% of all orchards / remnants surveyed), with plum being the next most frequent type (30% of all sites, and being a particular feature of orchards in the Huntingdon area). Pears were recorded on 15% of sites, while cherry was only recorded at one site in Somersham.

Signs of orchard management were frequent (95%) in intensively managed commercial orchards. Traditional orchards fared less well, with only 48% showing signs of tree management. A total of 32% of traditional orchards had trees that were overgrown, and 23% showed signs of dereliction.

The orchard ground sward was least diverse in intensive commercial orchards, as expected, where 88% showed signs of herbicide use and 98% had very short mown grass swards. By contrast, only 8% of traditional orchards had evidence of herbicide use, while 33% had areas of unmanaged sward beneath the trees. Areas of long grass occurred in 51% of traditional orchards; evidence of grazing was only seen in 8%, while one third (33%) contained at least some scrub, and native woodland species had appeared in 14% of these orchards.

Finally, it was observed that the majority of traditional orchards were located adjacent to agricultural land and 56% were close to residential areas, often on the edge of villages, making them susceptible to loss through housing development or conversion to grass paddocks for horse grazing. Only 20% were close to other traditional orchards, while 21% were isolated 'islands' of habitat in arable land, with no other related habitat (e.g. orchards, woodland, hedgerows, grassland to form wildlife 'corridors') nearby.

Phase 2

Some of the traditional orchards identified from Phase 1 could not be visited for Phase 2 due to the difficulty of tracing ownership or gaining access permission. Four sites had been grubbed up or were in the process of being so, or were impenetrable. However, an additional 19 sites to those from Phase 1 had been identified meanwhile. In total, therefore, 87 traditional orchards in 36 parishes were identified for potential Phase 2 survey and 83 sites were actually visited. The majority of these (91%) were in private ownership, with only seven having full or partial public access.

The DAFORN (Dominant, Abundant, Frequent, Occasional, Rare, None) scale was used to grade the presence and approximate incidence of the veteran characters of the fruit trees, which in turn provides an indication as to their potential value as wildlife habitats. For example, the presence of dead wood, whether on live trees or fallen, can be extremely important for saproxylic invertebrates. Hollow trunks, branches, flaking bark and deep knotholes may provide shelter or roosting sites for birds and bats in larger trees, while rot holes may host hoverfly larvae and sap runs may attract insects to feed.

Dead wood was frequent to rare across all fruit tree types in up to 42% of orchards, while similar frequencies applied in the case of hollow trunks or branches, standing dead trees and where fallen dead wood was present. In those better managed orchards, such characters are often pruned away or tidied up and a balance needs to be struck between leaving veteran features for their wildlife value while allowing adequate access for work to be conducted, safety reasons and the possible limitation of the spread of fungal diseases.

Rot sites and holes were occasional to frequent in up to 38% of sites, whereas sap runs were found rarely in surveyed orchards. The presence of flaking bark partly depends on the type of fruit tree, being a prominent feature of old Bramleys, for example. It did occur on all three fruit tree types with broadly similar incidence categories from 'frequent' to 'rare'. Only a minority of orchards had no trees with flaking bark.

It is important, however, not to view each of the veteran tree features in isolation as it is the overall combination of different features in an orchard, tree type and probably bark chemistry that will dictate its real value for wildlife. This could form a whole research project in itself! An attempt was made to identify those orchards with trees having four or more selected veteran features present overall at 'frequent' or 'occasional', as in no cases were the veteran features 'dominant' or 'abundant'. This revealed 17 orchards with at least four out of five chosen veteran tree characters on apples and 16 orchards in the case of plum trees, while only five pear tree orchards qualified on these grounds. It must, however, be remembered that pears formed a smaller proportion of the overall orchard tree 'mix'.

Of interest, mistletoe is an important plant in its own right and can harbour its own suite of rare insects. However, it is surprisingly rare in the traditional Cambridgeshire orchards surveyed, 92% possessing no mistletoe at all, while it was 'rare' in three sites and 'occasional' in two sites. This contrasts with orchards in the west of England, or those on the near-continent, where it is often frequent on the apple trees.

For a total of 22 orchards where tree management information was gathered, 29% had no signs of any recent tree management, 53% had evidence of recent pruning, 10 had evidence of tree felling and 27 (36%) had recent tree plantings. Overall, the impression was that owners were lightly managing their fruit trees, with old and diseased trees and branches being taken out and new trees being planted, although the latter practice was by no means extensive. Apart from the sites where no apparent tree management was taking place, the approach for the conservation of many sites was commensurate with retaining their value both as providing fruit crops and also benefiting wildlife.

Ground layer management consisted mostly of grass-cutting, varying from keeping paths open to cutting of the whole sward on an annual basis. Twenty sites were not cut at all and grazing was used currently in just 10 orchards (sheep, cattle or horses). Grazing of the grass sward by wild rabbits was more prevalent; poultry were used at three sites.

Ponds were found in 14 orchards, with one Bluntisham orchard having five ponds. Most had been created by owners to increase the benefit of their sites for other wildlife. The old community orchard at Orwell, a former site of cress beds, still has a spring and chalk stream running through it. A range of other non-fruit trees was found in many orchards (29 species). Most of these had been planted as ornamental varieties, although some native species had seeded spontaneously. It was unusual that crab apple was only recorded in one orchard as this has been used as a pollinator for other apples trees in old orchards elsewhere.

Information on likely threats to the future integrity of the orchards was compiled for virtually all sites. No current threats were apparent at 32 sites, while abandonment (27 sites), development (20 sites) and grubbing-up (14 sites) formed possible threats in other cases. Some sites faced more than one type of threat. In a few cases the orchard had already been sold to a developer or was even in the process of being cleared. As there is no legal protection for traditional orchards currently, this means an uncertain future.

Phase 3

Bryophytes

At each site as many trees as possible were examined for their bryoflora in the available time, up to a limit of 50. Normally ten trees were sampled from five rows or part rows. Young trees (<30 years old) were not recorded systematically, but simply scanned for interest, since previous experience had shown that such trees harbour few bryophytes, and only of the more common species.

Across the 20 orchards a total of 60 epiphytic bryophyte species was recorded,. The most common moss species in all the orchards were *Hypnum cupressiforme*, *Brachythecium rutabulum*, *Bryum capillare*, *Orthotrichum affine* and *O. diaphanum*, usually being found on the majority or all of the apple trees sampled. However, there were some marked variations in the abundance of these common species between sites. Some of these common species were also noticeably less frequent on plums, supporting the overall finding that these fruit trees are relatively poor for bryophytes compared with apples.

In terms of the number of bryophyte species per tree, the best example was an unknown cultivar apple at Franklin's old orchard, Cottenham, which had 17 species.

Several notable discoveries were made during this bryophyte survey. Six species of *Orthotrichum*, four of which were very rare, together with *Pylaisia polyantha* and *Syntrichia laevipila*, were recorded at Garner's orchard, Wisbech. One species, *Orthotrichum speciosum*, was only the second English record, the first also having been from Cambridgeshire. Normally this species occurs in the Highlands of Scotland. Most of the rare species were usually confined to single trees in the orchards surveyed. The excellent Rummers Lane orchard at Wisbech St Mary also boasted two new county records when surveyed in 2004: *Sanionia uncinata* and *Pylaisia polyantha*. *Leucodon sciuroides* was notable here as it was on the decline in southern England; however, the number of recent discoveries in orchards (and elsewhere) appear to indicate that it is making a recovery.

The best orchards for bryophytes were at Rummers Lane, Wisbech St Mary (43 species) Popple Drove, Gorefield (pear orchard, 39 species), and Garner's orchard at North Brink, Wisbech and Dairy Crest west at Elm, (35 species each). There were seven other sites with 30 or more species. Smaller orchards could be almost as species-rich as larger orchards. For example, the tiny 0.25 ha orchard at Cottenham hosted 32 species, almost as many as a 15.3 ha orchard at Haddenham, with 33 species. Rummers Lane and its bryophytes have featured in a more in depth article (Stevenson 2006)

Lichens

Most lichen species were identified in the field using a hand lens and, if necessary, spot chemical tests. The more critical species were collected, if

present in sufficient quantity, by the removal of a suitably small sample which would not endanger the colony. No specific sampling regime was utilised.

Mature orchards in Cambridgeshire appear to typically yield lists of thirty to forty lichen taxa on their fruit trees. No species that are rare in a local or national context were found, though the abundance of lichens in some orchards produces a very attractive feature. The surveyor's impression of the lichen flora at Rummors Lane was one typical of an invasion phase following a long period of atmospheric pollution by sulphur dioxide, since this site historically had been in an area of relatively high dry deposition of sulphur. As a consequence, the lichen community was poor in relation to other parts of the country, being composed almost entirely of the most common epiphytic species.

There were no clearly discernible differences in the lichen communities present on apple, pear or plum trees except that plums seemed often to bear more than their fair share of interesting lichens. This is the converse of the case for bryophytes, where apples are far better hosts than plums. The mature bark of plum trees is hard and relatively impervious and does not 'soak up' nutrients so readily as the bark of apple and pear trees. Mature plum bark is also relatively acidic and a survey of Heath Fruit Farm orchard at Bluntisham recorded *Lecanora conizaeoides* from plum trees. This species is an acidophyte that was formerly much more common in the period of sulphur dioxide pollution but which has become rather rare in the past couple of decades.

The most interesting features of old orchards for lichens may well prove to be associated structures such as weathered sheds, wooden gates and fence posts. There is always a danger of these structures being tidied away with the loss of important substrates.

Fungi

Five orchard sites were visited once each, in autumn 2010, by the Huntingdon Fungus Group with the aim of establishing a representative list of the most typical macro-fungi of old orchards in the county, and any obvious micro-fungi were also recorded. Approximately half a day was spent at each orchard in total.

The survey showed that the fungus flora of these sites (fruit trees, grassland and hedgerows) was relatively poor, with between 10 and 27 species present on all substrates, although weather conditions at the time of the survey were excellent for fungal fruiting. Overall, a total of 59 species of macro- and micro-fungi was identified, but it is likely that this is an underestimate of the actual fungal diversity. The best site at Harston had more species than the sites which were more actively managed such as Coton, Over and Swavesey, where more tree pruning to remove obvious diseased tree limbs had taken place. In addition, the woodchip habitat added a few additional species at this site. Obviously the sites chosen in the present survey were poorer than the Rummors Lane site at Wisbech St Mary, where 54 species had previously been found over several visits (Lush et al, 2009), but allowance must be made for each site in the present survey having only been visited once.

Fungi associated with ageing trees such as *Inonotus hispidus* were a striking feature of the apple trees at Colne, although this species was less common elsewhere. At the Over site *Phellinus tuberosus* was present on almost all the ageing plum trees. The rust of plum, *Tranzschelia discolor* was abundant on trees in Baker's Orchard, Swavesey and present, though less frequent, at other sites. A very unusual ink-cap, collected from the rotting stump of a branch on a large apple tree at Colne, was determined as probably *Coprinopsis gonophyllus* by the genus referee, Dr Derek Schafer, to whom the specimen was sent for confirmation.

The fungi of the grassland layer under the fruit trees were more varied between sites, with very little overlap in species. None of the species could be described as orchard specialists, being found in diverse other habitats.

Invertebrates other than lepidoptera

Two orchards were surveyed for their invertebrate fauna during May 2011; Sandpit Pond Farm orchard at Over and Barton orchard, west of Cambridge. Both were sampled under good weather conditions.

2011 proved to be an early season, with many summer species appearing early and the spring species going over quickly. Few insects were found at flowers by mid-May, probably due to lack of nectar from plants under drought stress, and this made searching flowers for adult insects unproductive, though this technique is normally a good way to find saproxylic, or dead wood species, in spring.

Beating samples were taken onto a sheet for 15 minutes per sample from a mature apple tree (with two trees sampled at each of Over and Barton). Most time was spent in actively searching old fruit trees, netting insects from trunks, branches and foliage as well as searching bark, hollows and tree bases to capture individual insects. This technique was generally productive for Coleoptera, Diptera and aculeate Hymenoptera. The total sampling time spent was about six hours and the total number of old trees inspected (some repeatedly) was about 60 at each site.

Both orchards surveyed support rich insect assemblages that are of significance in a county context and were broadly comparable, with 71 species at Over and 64 at Barton. The fauna included seven Nationally Scarce (NS) species (five beetles and two flies, three at Over and four at Barton) which are associated with old trees, as well as an interesting assemblage of aculeate Hymenoptera.

The Nationally Scarce insects were mostly species found in rot holes or heartwood, and comprised, from Over, *Ampedus quercicola* (Coleoptera: Elateridae), a red click beetle with larvae living in the rotten heartwood of deciduous trees, *Pseudocistela ceramboides* (Coleoptera: Tenebrionidae), a darkling beetle with larvae in dead wood and *Criorrhina ranunculi* (Diptera: Syrphidae), a hoverfly with larvae also in dead wood. For Barton the NS species were: *Tillus elongatus* (Coleoptera: Cleridae), a chequered beetle whose larvae feed on wood-boring beetles, *Scolytus mali* (Coleoptera: Curculionidae), the Large Fruit Bark Beetle whose larvae occur under the bark of fruit trees,

Mycetochara humeralis (Coleoptera: Tenebrionidae), a darkling beetle with larvae in dead wood and *Macronychia polyodon* (Diptera: Sarcophagidae), whose larvae develop as kleptoparasites in the nests of a range of aculeate Hymenoptera including sand wasps (Sphecidae) of the genera *Crossocerus*, *Crabro*, *Oxybelus*, *Pemphredon* and *Ectemnius*, or the bumble bee *Bombus terrestris* (Apidae).

The results achieved from beating samples from apple trees were less than would be expected in terms of the numbers of Coleoptera, Hemiptera and Psocoptera found, due to weather factors, although a reasonable list of species was accumulated with this technique. Conversely, the species richness of aculeate Hymenoptera was probably higher than expected, particularly for Sphecidae nesting in beetle holes, etc. in old fruit trees. The old fruit trees present include many with interesting features for invertebrates, such as heart rot, fungi, beetle exit holes and dead branches and twigs. As many as possible of these old fruit trees should be retained to maintain the associated habitats for saproxylic invertebrates.

Lepidoptera

Two orchards (Over and Coton) were surveyed for butterflies during summer 2009 which revealed a range (14 species) of the commoner butterflies of open countryside and rough grassland. No unusual or uncommon species were found. The use of mercury vapour lamps to attract moths, a recognised survey technique, had been utilised at Harston community orchard three times, June or July dates in 2001, 2004 and 2008, for five to six hours on each occasion. This revealed 157 species of macro- and micro-moth to be present. This therefore represented a cross section of species present, as trapping was not conducted throughout the year. Few of these were fruit-tree specialist species. The finding of one nationally notable (Nb) micro-moth *Ethmia dodecea* and 11 localised species (*Metzneria lappella*, Small Emerald, Large Twin-spot Carpet, Dark Umber, Scorched Wing, Poplar Kitten, Maple Prominent, Orange Footman, Scarce Footman, Sycamore and Beautiful Hook-tip) was noteworthy.

In addition, a daytime survey of 13 orchards for Red-belted Clearwing moth (*Synanthedon myopaeformis*) (Plate 6) was undertaken using pheromone lures. Red-belted Clearwing is a small day-flying moth, classified as Nationally Scarce B, associated with old apple trees. The lure was suspended from a branch of various apple trees about 1-2 m above the ground, at the hottest part of fine days for an average of between 5-20 minutes in each tree, although this was not standardised, since the insect, if present, normally arrives at the lure within a few minutes. A note was made of the numbers of moths attracted and the time the lure was deployed and it was found in 11 sites. The age or type of apple tree in which the lure was hung did not appear to make a difference in attracting the moth, although trees in open, sunny conditions were favoured. This preliminary survey on Red-belted Clearwing moth has revealed that it is probably more widely present in orchards than hitherto supposed before the advent of specific pheromone lures, but much more work needs to be done to understand its ecology and whether it can act as an 'indicator' species for orchard quality.

Birds

This Phase 3 survey was the first systematic survey of birds in traditional orchards in Cambridgeshire and 13 orchards were surveyed; each site was visited twice over the period 2009-10 to gain an idea of the potential for avifauna. The summer survey in 2009 spanned the period early May to early July, to cover the main breeding period of both resident and migrant species. For some sites the second visit took place the following spring (2010) in March and early April in order to gain further information on species that overwintered, plus information on resident early breeders, such as woodpeckers.

In general, a rough sketch map of the orchard site was made, and the presence of birds and their behaviours were noted down using the British Trust for Ornithology (BTO) field survey code system. A full report on this survey has been published (Lea 2009)

Across all 13 sites a total of 67 bird species was recorded, with a range of species per site of 20-43. In broad terms the number of species was greater the larger the site, but habitat diversity of the orchard also played a role, with sites having a range of trees of different ages, and additional habitats such as scrub, surrounding hedges, or ponds providing opportunities for more species of birds to be present

The range of orchard birds found can best be discussed in terms of their habitat requirements. Seven species can be considered as ubiquitous and generalist inhabitants of gardens and wider countryside, whilst several other species are also distributed widely and hence are found in orchards too. Although not all these species use orchard habitats for nesting, they may do so for feeding or foraging, as this habitat can provide a range of food sources.

The bird species which are more closely associated with the orchard habitat include the hole-nesters, while the second group may be termed scrub dwellers.

The hole-nesting species include Blue and Great Tits, as well as Coal and Marsh Tits, Green and Great Spotted Woodpeckers, Kestrel, Tawny and Little Owls, Stock Dove, Starling, Jackdaw and Tree Sparrow. At Rummers Lane orchard, Wisbech St Mary, an intriguing record came in the form of a pair of Shelduck exhibiting distinctive breeding behaviour. The pair flew repeatedly round the orchard, calling and landing several times (always out of sight). This orchard has enormous hollow apple trees and the species has been known to use such sites previously. Four of the orchards surveyed had Little Owls present, with up to four birds being recorded at each of the two orchards surveyed in Wisbech St Mary, and at one site, two Little Owl nests were found about 100 m apart. (Plate 5, back cover)

Another very notable find was the colony of Tree Sparrows occupying numerous small holes in the old plum trees at one Somersham Orchard. The Tree Sparrow is an uncommon bird in today's countryside, having suffered major declines (87%) over the last quarter of the twentieth century, so it was exciting to find a thriving colony in what is still a commercially-worked old orchard.

The second main habitat type of value to birds in orchards is scrub. Old orchards that are somewhat neglected allow mixed scrub to develop between the fruit trees, with plum tree suckers, hawthorn, blackthorn and bramble growing up from the ground, or from the surrounding hedgerows, providing nesting, shelter and foraging opportunities for another range of birds. This habitat is often absent from the general countryside, especially in Cambridgeshire, where regular flail-mowing of hedges, or their abandonment to woodland, are common practices. Scrub-dwelling bird species include Dunnock, Song Thrush, Long-tailed Tit, Sedge Warbler, Willow Warbler, Chiffchaff, Whitethroat, Lesser Whitethroat, Blackcap, Garden Warbler, Jay, Bullfinch, Wren and Linnet. Those sites where abundant scrub occurred in a large diversity of ages and sizes held large numbers of warblers and other species.

Lighter scrub, with adjacent areas of grass and more open habitat around isolated fruit trees at Over held numbers of Turtle Dove, itself now a rare summer visitor to Britain compared with formerly. This species was also recorded at four other orchard sites.

The most valuable orchard sites for birds proved to be those where there was the greatest habitat diversity and larger size, and which were also lightly managed. The best sites held good bird numbers in all the main habitat categories discussed above. The better orchards had a good mix of veteran fruit trees, with holes of different sizes and hollows, together with areas of light to medium scrub and grassland of varying heights. Bare areas around the base of fruit trees could harbour an array of weed species, and areas of both rank and mown grass all provided a range of ground-feeding opportunities. The more commercial orchards tended to prune their trees more keenly, eliminating most of the scrub and cutting the grass sward regularly to an even short height, with, in some cases, herbicide spraying around the bases of the fruit trees. Although these practices in themselves are not conducive to the best habitats for birds, some surprises were seen, in terms of the Tree Sparrow in old plum trees, with Starlings in the older apple trees at one site.

The best orchard habitat balance for birds appears to comprise a mixture of light to medium scrub growth. Habitat connectivity with other natural sites outside is also important in this mix, as is orchard size and minimum human disturbance.

Bat survey

Three orchards (Wisbech St Mary, Haddenham and Orwell) were surveyed in the latter part of 2010 by the Cambridgeshire Bat Group. A number of veteran fruit trees in each orchard were inspected for features that might be suitable for temporary bat roosts (holes, hollow branches / trunks, splits, flaking bark). Two bat detectors were operated (Batbox 3 and Duet) more or less continuously while walking round the sites and also while standing at several intersections between tree rows at frequent intervals. Sound recordings were made on the Duet detector when bat activity was heard and these were later analysed using appropriate software to identify animals to species level.

Bats were detected at two of the sites, although the weather during the survey at the third site may have been responsible for the negative result there. At the other two sites only four bat species were detected, with Common and Soprano Pipistrelles forming the majority of the observations. Only single records of Brown Long-eared and a *Myotis* species, possibly Daubenton's bat, were made. Of the bats observed, most seemed to be overflying or using the boundaries of the orchards for foraging, rather than the interior of the orchards themselves, and no definite signs of tree roosts were found. The findings in this rather limited Cambridgeshire bat survey were similar to those of the Wyre Forest orchards (Smart & Winnall, 2006).

Orchard fruit survey

Sixteen orchards were surveyed for fruit varieties by Bob Lever, from EEAOP. Where it was permissible and practical, an attempt was made to visit every unknown tree on each site, to examine and identify the fruit variety. If a variety was not readily identifiable, samples were collected to enable further study. In a number of cases, there were no fruits on a tree, nor identifiable remnants beneath the tree. This was a particular problem on sites towards the south of the county, where late spring frosts had destroyed the blossom and developing fruitlets on many trees. In a few cases, the orchard owner was able to give a full or partial list of varieties that they knew to be on the site. This was particularly useful in cases where trees had not produced fruit, or where the varieties were very early and too decayed for identification at time of survey. In two cases, this information was also useful for dating veteran trees. Samples that were not identified at the time of survey, or shortly afterwards, were referred for comment to other fruit identifiers.

Sixty-six known and named apple and nine confirmed named pear varieties were positively identified during the surveys. The survey of plum trees was severely hampered by a very poor fruit set in the year of the survey (2011), following widespread spring frosts. This was a particular problem on sites in the south of the county. Twenty-eight plum and gage varieties were, however, identified. Of these, only nine plums occurred on more than two sites. In addition to the plums and gages, damsons or damson/plum hybrids were found on seven sites. Myrobalan (cherry plums) were found on five sites, these were almost certainly grown-out rootstock suckers. Quince and Medlar occurred on just one site, as young trees, at Somersham. Cherries were found at just two sites (Childerley and Colne). Colne orchard also had young apricot trees and a peach.

Discussion

The total area of orchards in Cambridgeshire has been reduced to less than 20% of its 1950s extent and this loss is still continuing, despite the growing public awareness of the importance of traditional orchards for their heritage, fruit varieties and wildlife. The majority of the remaining traditional orchards are in private ownership and about a quarter of them are estimated to be at least 100 years old. These surveys have demonstrated that traditional orchards play host to a wide range of wildlife and indeed can rival ancient woodlands for the

richness of biodiversity within them. It is considered that the results of the Cambridgeshire surveys, although very much in keeping with other traditional orchard surveys (Common Ground and English Nature, 1999; Lush et al, 2009; Smart & Winnall, 2006), are an underestimate of the full range of wildlife taxa present, since further specialised survey work would undoubtedly reveal more suites of species dependent on the habitat mix provided by traditional orchards.

To counter the continuing loss of orchards, mainly by abandonment and development, the Cambridgeshire habitat action plan (HAP) for traditional orchards (Anon, 2008) and a national biodiversity action plan (BAP) by Natural England (Burrough et al, 2010) have provided a framework and targets for maintaining and restoring these habitats. The listing of several of the county's better orchards as County Wildlife Sites and the placement of others in some form of stewardship have also helped raise awareness to owners to care for their sites. Leaflets on the importance of traditional orchards have also been produced following the surveys for local planning authorities, although sadly there is still no statutory protection for orchards in this country, save occasionally on amenity grounds.

None of the above measures are guaranteed to safeguard the long-term future of traditional orchards and we must remain vigilant to the loss of individual sites. It is hoped that the data emanating from the Cambridgeshire surveys will go some way towards keeping traditional orchards and their wildlife in the public eye.

Conclusions

The importance of traditional orchards with their mix of veteran trees, grassland, hedgerows and other associated features for biodiversity, has been clearly shown by the Cambridgeshire surveys. The results from these have been in keeping with those from earlier surveys, both in Cambridgeshire and further afield. However, it is considered that these surveys are an underestimate of the full value of orchard habitat for wildlife, as many more species would be revealed by further surveys.

Many of the existing traditional orchards are unmanaged and in decline. Public awareness should continue to be raised over the importance of conserving and safeguarding existing sites. Moreover, the need to plant local fruit varieties on suitable rootstocks in orchards is paramount to ensure continuity of this resource into the future in Cambridgeshire.

The Cambridgeshire surveys have served to highlight the need for additional work to examine the habitats and wildlife of traditional orchards in more detail. By this means it is to be hoped that the quality of these habitats for wildlife is better understood and appreciated more widely.

Acknowledgments

I would like to thank all the orchard owners who kindly allowed access to their sites for the purposes of the surveys and to all the surveyors, expert and non-expert alike, who carried out the work so diligently in their chosen fields. Special thanks must also go to Dr Heather Robertson, formerly of English

Nature, who gave much appreciated advice and encouragement during the planning of the Phase 2 and 3 surveys.

Thanks also to the Cambridgeshire and Peterborough Biodiversity Partnership for providing funding and to the Cambridgeshire Orchards Group for their support throughout. Louise Bacon assisted by editing the first version of the paper.

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Water Voles along Cherry Hinton Brook

Monica Frisch

Water Voles (*Arvicola amphibius/Arvicola terrestris*) are described by the Wildlife Trust as “Britain's fastest declining wild mammal” which has

disappeared from many parts of the country. The main causes of the decline are habitat loss and predation by American Mink (*Neovison vison*). However, there is evidence that the population is recovering in the Cambridge area, partly as a result of Mink control.

Two papers in *Nature in Cambridgeshire* in 2004 looked at changes in populations of Water Voles in Cambridgeshire. One paper (Jefferies, Strachan & Strachan) gloomily reported on a catastrophic crash in the Water Vole population between 1987 and 1997. However, the other, by John Green and Martin Baker, reported on later surveys which showed a more encouraging spread of records. This paper looks at records since 2013 on one Cambridgeshire chalk stream which, in the words of Peter Pilbeam of the Cambridgeshire Mammal Group, who surveyed it on 25th May 2015, now supports “a particularly healthy Water Vole population”.

Cherry Hinton Brook is a chalk stream which arises from springs at Giant's Grave at the junction of Cherry Hinton Road and High Street Cherry Hinton, about 5 km from the centre of Cambridge. It flows north-west reaching the river Cam near Stourbridge Common. Along the stretch from Cherry Hinton Hall to Sainsbury's on Coldham's Lane is a variety of trees: mainly willows, ash and hawthorn. Snakey Path, a well-used pedestrian and cycle route, borders the south-eastern bank and on the opposite side, a narrow strip of land separates the Brook from three lakes, formerly quarries, which currently have no public access. The Brook is one of several City Wildlife Sites in the area.

In 2009, concerns about the litter and rubbish in and around the Brook led to the formation of Friends of Cherry Hinton Brook. Since then awareness of the wildlife importance of the Brook has increased and the Friends are now focusing on improving the Brook as a chalk stream habitat. Those involved became aware that not only were there ducks and Grey Squirrels (*Sciurus carolinensis*) but also Kingfishers (*Alcedo atthis*) and Water Voles. In around 2013 I decided both to collate the anecdotal reports we were receiving and to encourage people walking along the Brook to let Friends of Cherry Hinton Brook know if they saw Water Voles, or other interesting wildlife. We ask people to record the locality by noting the nearest lamppost on Snakey Path, as these are numbered between Dawes Lane and Burnside, and the house numbers on Burnside.

This is not a scientific survey as we do not know how many people see Water Voles but do not send in records, nor how systematic people are in looking for them. My personal experience is that the more alert I am the more voles I see. Sometimes it is simply a bit of sedge moving unexpectedly that leads to a sighting; I remember on one evening looking at a shadow on the far bank wondering whether it was a vole – when it moved I concluded it was. But what is clear is that more sightings are being reported.

In 2013 I received eleven reports of Water Vole sightings, a few with photos, compared with about 90 in 2014. In 2015, I received 72 records. Various factors may explain why this is slightly less than in 2014. It may reflect fewer people sending in records; people getting out less frequently – certainly I have not got out as often as I would have liked; and voles being less visible because of dense vegetation. Peter Pilbeam's survey in May 2015 recorded plenty of signs of

Water Voles: at least four latrines; several feeding stations and probable vole holes; as well as five sightings.

There is evidence of voles and reports of sightings from the length of Cherry Hinton Brook from the entrance to the grounds of Cherry Hinton Hall downstream to Sainsbury's. However, our records suggest that there are clusters in certain locations and also that the vole population may have spread along the Brook. In 2014 sightings were mainly from the central stretch of the Brook, especially near the strip of land separating two of the lakes, between lamp posts 11 and 13, where there were 34 reports of voles. In 2015 this concentration had apparently dispersed with only a few records of voles there but 32 reports of voles between lamp posts 3 and 8, as well as more from the stretch between Burnside and Sainsbury's.

What is notable about many of the records is that the voles seem remarkably tolerant of people and will often continue their behaviour despite the presence of pedestrians, cyclists and even dogs.

In May 2015 we received the following account: *"I saw one today at about midday just before I got to Sainsbury's. About three-quarters of the way between Brookfields and Sainsbury's there are a couple of large trees on the path side. I saw the vole climb out of the water onto the bank opposite the trees, where it sat for a while entirely unperturbed by my presence (I stayed still!). It then climbed back in the water, swam about 6 feet up stream and then disappeared into the undergrowth on the same opposite bank. Seemed remarkably tame, or maybe it just didn't see me. A real pleasure to catch a glimpse of them."*

Also in May, one of our committee members saw two near the wooden bridge near Cherry Hinton Hall: *"The first was a very large vole near the wooden bridge near Cherry Hinton Hall at 8.50 pm today. I watched it for a few minutes happily munching on various plants in the brook and swimming around - it didn't seem at all bothered about my presence, even when Sidney (my dog) started barking! Eventually it swam under a tree trunk growing out of the far side of the brook just before you get to the bridge (if walking towards Cherry Hinton Hall). A few seconds later a tiny vole - the smallest I've seen (its body looked about the size of my little finger!) - swam out from under the tree trunk, swam around briefly and then disappeared back under and then came out briefly again. I think there must be a hole under the trunk leading to their burrow."*

A record from August 2015 said *"A vole was munching the cow parsley lying in the brook. It was totally unafraid and carried on eating for several minutes as I watched, then it took a large bramble leaf in its mouth and swam towards the cover of the far bank to eat it"*.

Later in the year another observer reported: *"Adult 'sunning' him or herself on the far bank. Then swam a short distance picking up a very unappetising yellow leaf en route which it proceeded to eat. Totally unconcerned by the fact that my dog Jess and I were watching it."*

Friends of Cherry Hinton Brook will continue its collation of records of sightings and encourages people to continue sending in details of sightings, with date, time and location. We have also been lent a trail camera from RiverCare

and some of the video footage of water voles is on YouTube at <https://www.youtube.com/watch?v=92YDU-WMlnQ&feature=youtu.be>

With funding initially from Natural England and now from the Biodiversity Partnership, the Friends are working with the City Council, RiverCare and volunteers to increase water flow by installing flow deflectors, improve light levels by clearing scrub, and stabilise the banks. We hope that this work will benefit the voles as well as wildlife generally.

More details of the activities of Friends of Cherry Hinton Brook can be found on its website at <http://www.friendsofcherryhintonbrook.org.uk>

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Some Uncommon Plants of Hayley Wood

Monica Frisch

Hayley Wood is an ancient woodland of about 52 hectares (128 acres) and designated in 1955 as a Site of Special Scientific Interest, for its botanical importance. The SSSI citation currently states “Hayley Wood is one of the largest Oxlip (*Primula elatior*) woods on the chalky Boulder Clay in Britain. Most of the wood is primary and has a recorded history of over 700 years.” It became the local wildlife trust's first reserve in 1962. It has been well studied by the late Professor Oliver Rackham and others. Professor Rackham's book on Hayley Wood, first published in 1975, is an invaluable source of information, particularly on the different zones of vegetation, which vary primarily with drainage. A friend, Meg Clarke, and I have been visiting Hayley Wood eight or nine times a year since 2009, both to enjoy it and to observe and record changes in the vegetation.

While the Oxlip display is one of the highlights of the wood and a joy to see in March and April, we have been taking an interest in some of the less abundant and less common woodland plants. Rackham's book includes a list of all the plants, and indeed many of the animals, recorded in the wood, with comments on some species. The list contains many plants typical of ancient woodlands, such as Dog's Mercury (*Mercurialis perennis*), Bluebell (*Hyacinthoides non-scripta*), and Greater Stitchwort (*Stellaria holostea*), which are well-distributed throughout the wood. But other species have much more patchy distribution so we have been noting where they appear. For this article I am concentrating on plants in the Triangle and the ancient woodland proper. There are other plants of interest on the old railway line, along the north-western edge of the wood, and

on the margins of the wood, some of which Rackham considers at length in his book. These are not discussed in this article.

Some of the rare plants listed for Hayley Wood by Rackham have not been seen recently, while others are still present but rare in Cambridgeshire as a whole. These warrant a separate article but require further research to ascertain when they were last recorded and their current distribution in the county.

Herb Paris (*Paris quadrifolia*) is described by Rackham as 'unexpectedly rare' and he noted 'four colonies recently seen'. Meg Clarke and I have doubled that number, though it is not always clear how to define a colony. We cannot comment on whether the colonies we have found are new ones or ones which had not previously been recorded. We monitor seven patches of Herb Paris on both sides of the Pond Ride, from the Roundabout north-west to the Great Pond. These patches are mostly not visible from the ride, being among the prickly undergrowth (roses, brambles and hawthorn) one to five metres inside the tree line. The largest patch grows around a heap of rotting logs on the south side of Pond Ride, while another patch to the east of the Main Ride just within the coppice plots is also associated with a log pile. There are other small colonies in the coppiced areas but these can be hard to locate in the changing habitat of managed coppice. An important factor for growth of Herb Paris in Hayley Wood may be the amount and depth of shade due to the distance from the narrow linear clearing of the path. We notice it growing among Dog's Mercury on the eastern edge of Keeper's Path, but in other areas it appears within the Mercury zone but not directly amongst it. Although generally considered a spring plant, and certainly at its best in May, we have found recognisable plants as early as late March. More surprising was discovering that not only were plants still visible in late August 2011 but that there were large plants still in flower.

Goldilocks' Buttercup (*Ranunculus auricomus*) is another species which Oliver Rackham comments is 'unexpectedly rare' and he notes it from zone 2, which he describes as dominated by Oxlip with sparse Meadowsweet (*Filipendula ulmaria*). We have found the plant at two locations within the wood itself, and also on the footpath leading to the cottage. The latter is possibly the location described by J.C.A. Rathmell as "30 yards in from main entrance" where he recorded the plant in 1994 and 1995. There is also a large colony on Longstowe Road and it is not uncommon in suitable habitat in Cambridgeshire. The locations we know are very near the foot of the Hide, on either side of the path. In 2014 we found two small colonies, of up to five plants, there. The other location is on the north of the ride leading from the Hide to Pond Ride. On April 16th 2011 during a very dry spring we noted seven buds and an open flower on one of these, but the other had already gone over. But in 2015 while small colonies of two or three plants near the bird hide and the corner of Pond Ride have persisted they had not done well with only one plant in each location flowering. We were unable to find the single plant on the footpath into the wood, and the swathes of Goldilocks on the verge in Longstowe were almost non-existent in 2015, possibly because the spring had been wetter and cooler than the previous year. *Ranunculus auricomus* is an aggregate of hundreds of microspecies, as it is apomictic, reproducing without fertilisation. We have not

studied the Hayley Wood plants sufficiently to ascertain whether or not they are all the same microspecies.

Orpine (*Sedum telephium*) is an unusual woodland plant being a succulent, and more familiar as a garden plant. The New Atlas says about its distribution: “A perennial herb, found on wood-borders, hedge banks, roadsides, rocky banks and in limestone pavement, often in very small but very persistent colonies. It also occurs as an uncommon ancient woodland plant, but sometimes fails to flower in this habitat.” There are about a dozen records of it from Cambridgeshire. It was first recorded in Hayley Wood in 1951 and Oliver Rackham notes 'three colonies in the East section. Never known to flower'. However the colony on either side of the path through the coppice plots flowered in September 2010 after that coppice plot had been cut, and for several subsequent years but not in 2015. It would appear that the extra light resulting from coppicing enabled it to flower but that once the regrowth had become denser it could no longer do so. There is a very large patch in the uncoppiced woodland to the south-east of the coppice plots. While we have never seen any sign of flowering here, the patch is healthy and there is evidence of vegetative propagation. In October 2014 we observed that the wilted plants had collapsed and that new plantlets, with small clusters of tiny leaves giving the appearance of rosettes, were appearing at intervals along the wilting stems. (Plate 3)

Bird's-nest Orchid (*Neottia nidus-avis*) is an inconspicuous woodland orchid whose brownish colouring – it has no green leaves and does not photosynthesise, depending upon a relationship with mycorrhiza – makes it hard to spot among the leaf litter in which it grows. It has been recorded within the last 100 years from about a dozen Cambridgeshire woods. Oliver Rackham gives 1939 as the first record, though Gigi Crompton's invaluable online “Cambridgeshire Flora records since 1538” gives a record from 1926. It is found mostly in the Triangle, which was grassland in 1922. We have only once found it outside the Triangle, in 2009 when we found a seed capsule near the roundabout in Hayley Wood. Richard Dowsett reports that a single specimen growing in the shade of coppice plot 1 has not been seen since 1996. Populations seem to fluctuate considerably. In May 2009 we counted about 28 specimens, including a pure white one which has not reappeared, but in 2014 we found only three fresh plants and some seed capsules from the previous year. The population recovered in 2015 when we found over two dozen fresh orchids in the Triangle, mostly growing in groups of three to six. These have been mapped accurately using GPS so we can check whether they reappear in 2016. Several of the plants were found near Hazel (*Corylus avellana*) and some were growing in clear lines, probably associated with the tree roots. We also think that they tend to grow on the ridges of the old ridge and furrow, hence in slightly better-drained conditions than in the furrows. All were in leaf litter in shady areas with occasional dappled sunlight, i.e. not total shade. The single spike in the eastern part of the Triangle reappeared in 2015, but no trace was found of the spike previously found near the roundabout, or the white spike found in 2009.

Greater Butterfly Orchid (*Platanthera chlorantha*) is another species which Oliver Rackham commented was 'unexpectedly rare' adding that it seldom

flowers. Although we have been told by Charles Turner and Richard Dowsett where it used to grow, just north-west of the Great Pond, we have never found it. However, it is possible that the plant will reappear, following tree work in the Pond Glade, though in 2015 the grass was very lush making it hard to find low-growing plants.

The little atypical fern, Adder's Tongue (*Ophioglossum vulgatum*) is found both at the south-eastern end of Pond Ride, in a few places along it and on the corner of Pond Ride and the ride leading to the Hide. Richard Dowsett reports that he and Charles Turner found some north-west of the Great Pond. It appears to favour the low-lying damp areas in shade, and in Hayley Wood is found amongst thick undergrowth near paths on the edge of a ditch or rut. Elsewhere in Cambridgeshire it is found in damp grassland, and there are records in the Cambridgeshire Flora of the plant on roadside verges near Hayley Wood. Oliver Rackham refers to six colonies but we only know of five locations. In 2015 we found it hard to locate the plants on either side of the south-eastern end of Pond Ride as the vegetation was very lush. It may easily be confused with a young Lords and Ladies plant, but closer inspection shows the single frond has no veins and is thicker and fleshier than a leaf of *Arum maculatum*. When the spike emerges from the base of the frond, the reason for the plant's common name is obvious.

Some of the plants mentioned above have been known from Hayley Wood for many years. Herb Paris was first recorded there by Babington in 1860 and Bird's-nest Orchid in 1928. Greater Butterfly Orchid was first noted in 1939 while Adder's-tongue Fern was recorded in 1950. But records of of Orpine date from 1980 while those of Goldilocks Buttercup are relatively recent (1994). Few areas of vegetation remain unchanged over the decades and it may be that some plants are in decline, or have apparently disappeared from Hayley Wood. Equally, new plants may appear and spread. Pendulous Sedge (*Carex pendula*), though noted in 1940 by E F Warburg, has become considerably more abundant this century. Clearly, repeated visits are necessary to ascertain whether populations of particular plants are growing, shrinking or just fluctuating. I remember Oliver Rackham, in a talk on fungi of ancient woodlands, commenting that even after studying fungi in Hayley Wood for over sixty years he did not have enough data to say which species were associated with ancient woodland, because so many species of fungi do not produce fruiting bodies every year. As Meg and I have only been visiting Hayley Wood for seven years there is still potential for us to discover and learn more about its flora.

Acknowledgments

Many thanks to Meg Clarke who has accompanied me on so many visits to Hayley Wood and who did some of the research for this article, and to Richard Dowsett and Charles Turner for their information about Hayley Wood, its history and its vegetation. Meg and Richard also commented on drafts of this article as did Jonathan Shanklin and Philip Oswald.

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Coe Fen

A report on the CNHS field studies for 2015

Jonathan Shanklin

The decadal cycle of Cambridge Natural History Society field studies moved on to look at how the area including Coe Fen, Sheep's Green, Lammas Land and Paradise Local Nature Reserve had changed since the Society visited the area in 2005. This report documents some of the changes seen since then, and notes some of the rare or unusual species found in the area. In the main the monthly visits focussed on vascular plants, but in the autumn we tried to cover lichens, fungi and bryophytes.

Introduction

The general area was described in the report in Nature in Cambridgeshire (Shanklin & Hartley, 2006) and has changed surprisingly little over the last ten years. Sheep's Green and Coe Fen became Local Nature Reserves (LNR) in 2012 and significant work has been carried out in Paradise LNR. We made some changes to the recording units for the 2015 field studies, simplifying them to focus on the Local Nature Reserves and the Botanic Garden, and including all parts of the two Ordnance Survey monads (grid squares) TL4457 and TL4557; these are described in more detail below. As has been the case throughout the CNHS surveys, the participants tended to concentrate on recording vascular plants, with only casual records being made of other phyla. If you would like to see a change in this balance do come along on future outings and add your expertise.

The vascular plant records are in the Botanical Society of Britain & Ireland database, those of the bryophytes in the British Bryological Society database and all the other records have been lodged with the Cambridgeshire and Peterborough Environmental Records Centre (CPERC). In this report species counts refer to counts of separate entries of taxa in the MapMate Taxa Library. Short reports giving further details of the monthly visits are on the CNHS web page.

Management plans for the LNRs have been written by the Wildlife Trusts in conjunction with the City Council. The City Council is responsible for their management, with some tasks being carried out by community groups. In particular the Cambridge City Greenways Project Tuesday Conservation Group (the “Tuesday Volunteers”) has carried out conservation work in Paradise LNR and New Bit LNR.

Paradise LNR

Major work was carried out in 2013 to remove piles of bark chippings and to clean out part of the open, sedge covered, marshy area to provide deeper water, with some alterations to the drainage flow. The area cleared of bark chippings was seeded with a wild-flower mix (Emorsgate EM5). Regular conservation work by the “Tuesday Volunteers” takes place in the reserve, and because records were noted during their work parties the Society did not make extensive recording visits to the reserve. Although 65 vascular plant species were not noted from the 2005 survey, 79 new species have been recorded in the reserve since 2010. The reasons for plants not being noted vary from some simply not being recorded although still present (e.g. Duckweed *Lemna* spp), some being recorded under slightly different names (e.g. Couch as *Elytrigia repens* and *Elytrigia repens* agg.), some being casuals (e.g. Garden Pansy (*Viola x wittrockiana*)) and some having been lost (e.g. Bladder-sedge (*Carex vesicaria*) last seen in 1860). The reasons for the additions include many of those given for the losses, some new arrivals (eg Evergreen Oak (*Quercus ilex*)), the new habitat and disturbance from the creation of the lake (e.g. Toad Rush (*Juncus bufonius*)) and the deliberate introduction of the meadow plants (e.g. Oxeye Daisy (*Leucanthemum vulgare*)). Most notable of the additions to the current species list was Round-fruited Rush (*Juncus compressus*), which appeared at the margins of the new lake, though was probably noted near the same location by Max Walters in 1957. There may be further additions in the future as half of the 24 species from the Emorsgate mix have yet to be recorded. The most significant recent loss is Water-pepper (*Persicaria hydropiper*), which used to grow at the edge of a fishing spot on the river bank. The visit concentrating on bryophytes recorded a couple of notable additions to the site: a large colony of the liverwort *Cololejeunea minutissima* and the moss *Orthotrichum striatum*. Ash Dieback (*Chalara fraxinea*) was affecting some young Ash saplings.

Coe Fen LNR

Coe Fen lies on the east side of the river Cam, closest to the main part of the city. The Coe Fen and Sheep’s Green LNR has a management plan, however this is not currently on the Council web pages. The plan makes suggestions for the requisite grazing and mowing regime, particular in connection with the BAP priority planthopper *Ribautodelphax imitans*, however it perhaps allowed too much latitude. The Council contractors mowed the entire area in August, when the intention had been to have the site largely grazed to support the tussocky grass required by the planthopper, but with topping of Cow Parsley, Nettle and Thistle when necessary. Many of the smaller ditches are increasingly over-

shaded and stagnant and there is increased growth of bramble along several of them. A short term change was an area of disturbed ground near the northern entrance to the fen, created during building work at Peterhouse (College). There were hopes that an interesting array of ruderal species would appear here, but we were disappointed! Weld (*Reseda luteola*) came up in abundance, but in general there was a restricted range of species, though a surprise was Annual Clary (*Salvia viridis*) in addition to the well known Wild Clary (*Salvia verbenaca*). By the end of the year Green Alkanet (*Pentaglottis sempervirens*) seemed to be becoming the dominant species. Re-appearing after a long absence was Whorlgrass (*Catabrosa aquatica*) in the southern part of Coe Fen in a scalloped area of the central ditch, which was originally cut in the mid 19th century. In the vice-county the plant is only known from this site and Coldham's Common. Peter Sell recorded the hybrid willow *Salix x forbyana* "near stream at side of river close to bridge over Fen Causeway" in 1975 and Alan Leslie spotted it still growing in the same place. Nearby we found the rarely recorded hybrid between Common and Marsh Ragwort (*Senecio x ostenfeldii*), which Alan and Alison Smith had recorded near here in 1977. We failed to re-find Pink Shepherd's-purse (*Capsella rubella*), which was last seen here in 2010, when a few plants were seen by the side of the footpath; its appearances are intermittent and it will almost certainly appear again.

Sheep's Green LNR

Sheep's Green is on the west side of the Cam and has changed little since the 2005 Survey. A few trees have fallen and there is more bramble along the mill leat (Snobs Stream). Several of the ditches and streams, particularly south of Fen Causeway have become degraded. On this occasion we did not specifically record the location of Purple Toothwort (*Lathraea clandestina*), although a casual observation saw it growing well away from any present willow and presumably on the remains of a root system. Green-flowered Helleborine (*Epipactis phyllanthes*) has been known from Robinson Crusoe Island since at least 1896 when reported there by A S Shrubs. It was still there in 2015, despite a rough sleeper having erected a tent on top of the main patch. Notable was the discovery of an alien bramble *Rubus niveus* on January 1, which was its first record in the wild. It had most likely seeded from plants in the Botanic Garden.

New Bit LNR

New Bit is an eastward extension of Coe Fen and for recording convenience we took the boundary with Coe Fen as the monad boundary. Mark Hill recalls that when he was child it was covered in Nissen Huts for Polish airmen and their families who planted Daffodils (*Narcissus* agg) there. It is very different in character compared with the rest of Coe Fen as it is higher (by around 3m!), and is likely to change further in the future, although the City Council are somewhat ambiguous about the direction of change. On one hand it is being turned into a "Coronation Meadow" with seed and plants introduced from Chettisham Meadow near Ely. On the other hand the City Council has a tree planting programme which in the long term will shade out the new meadow plants. The

effects and balance of these changes may be visible when the Society returns to the area in 2025. Vicar's Brook forms the southern boundary of the LNR, and this had significant clearance carried out along it in 2009, with minor work in subsequent years, which may have allowed growth of ferns such as Soft Shield-fern (*Polystichum setiferum*).

Botanic Garden

The Society collectively only visited the Garden for its annual fungal survey. Jonathan Shanklin made approximately monthly visits to record those vascular plants that were growing as weeds, although it was often difficult to decide on what the exact status was. Perhaps the most notable weed recorded was Interrupted Brome (*Bromus interruptus*), which had escaped a little way from its trial bed. It was also interesting to see Welsh Groundsel (*Senecio cambrensis*) in these beds, and we can perhaps hope that it will make its way onto a Cambridge street. An interesting find at the bottom of some basement steps was self-sown Tender Brake (*Pteris tremula*). There are only seven records for it in England and this is the most northerly. Canadian Waterweed (*Elodea canadensis*) was noted from the Garden in 1848, but hasn't been seen in TL4557 since, and indeed was last seen on Coe Fen in 2010. Altogether 309 species were recorded from the Garden.

Monad TL4457

Coe Fen, Sheep's Green and Paradise all lie within the 1km Ordnance Survey grid square. Outside of these, only Lammas Land was covered in the 2005 survey, but this time we covered the entire monad. In the main the area is urban with some managed open space. The neighbours of our President gave permission to visit their large garden, which backs onto the river. Here we found several species of older grasslands such as Yellow Oat-grass (*Trisetum flavescens*), Field Wood-rush (*Luzula campestris*) and Lady's Bedstraw (*Galium verum*), and probably many other similar gardens would retain some relict species. A few interesting species occur on the University Sidgwick Site, most notably the moss *Pogonatum urnigerum*, growing on the second of its two sites in the city (and county), both on granite hoggin. Having previously been found close to where local botanists live, Four-leaved Allseed (*Polycarpon tetraphyllum*), was noted in Champneys Walk. Overall the monad has 594 vascular plant species records in the MapMate database and only six of these have not been seen since 2000. These six, Lesser Water-plantain (*Baldellia ranunculoides*) (1860), Frogbit (*Hydrocharis morsus-ranae*) (1863), Water-soldier (*Stratiotes aloides*) (1894), Fan-leaved Water-crowfoot (*Ranunculus circinatus*) (1920), Early Marsh-orchid (*Dactylorhiza incarnata*) (1958) and Dwarf Elder (*Sambucus ebulus*) (1958, though a dubious record), are unlikely to be re-found, all being plants of good quality river or river bank habitat.

Monad TL4557

New Bit and the Botanic Garden lie within the monad. We did not visit the Leys School grounds, Downing College ground or Fenners. Most of the rest of

the area is urban, with Cambridge Place and council flats off Coronation Street among the more interesting areas. This monad has 460 vascular plant species records in the MapMate database and only 11 of these have not been seen since 2000. Several of these lost species were plants grown in the Botanic Garden, and the overall total was certainly boosted by plants that were in the Botanic Garden, but had escaped from their original location. A few of the lost plants are likely to be re-found, for example Many-seeded Goosefoot (*Chenopodium polyspermum*).

Plants

The alien (in its strict sense) plant population of the entire area is evidently in a state of flux, and different recorders have different views and abilities, so it is unwise to make definitive comparisons between plants found in one year and not in another. Altogether we recorded 551 species in 2015 compared to 386 in 2005, largely because we covered a wider area in 2015.

Other phyla

We made records, mostly casual and non-localised, of fungi, mosses, liverworts, lichens, odonata, butterflies, moths, other invertebrates, birds, and other vertebrates. These have been lodged with CPERC. The fungal foray in October recorded nearly 30 species, although none were particularly notable. It seemed that Sheep's Green was richer in species than Coe Fen and we recorded Snowy Waxcap (*Hygrocybe virginea*) in the former. Fourteen liverworts are known from the two monads, although two of these are aliens in the Botanic Garden glasshouses. This puts the area amongst the most diverse for liverworts in the county, with only the Gamlingay tetrad TL25W having more. This may reflect the fact that the tetrads near Cambridge have been more thoroughly studied than more distant ones, or that the variety of habitats near Cambridge promotes diversity.

Acknowledgments

Thanks are due to Monica Frisch, Steve Hartley, Mark Hill and Alan Leslie for comments on the draft report.

Further Reading

For background on monads see for example <http://www.bto.org/volunteer-surveys/birdatlas/methods/correct-grid-references>
Coronation Meadows <http://coronationmeadows.org.uk/> (Accessed 2016 January)

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Chafers on my chimney

Toby Carter

I was standing in my garden in Bottisham at sunset on one of the last evenings in June in 2015 when I was buzzed by a large insect. Surprised, I looked around and noticed several of these large insects flying about. They were concentrated around the chimney of the house, landing on the brickwork and also on the side of the roof. They were also making flights across the garden, around the garage and around my wife and me. Indeed some landed on both of us on a number of occasions, one of them actually alighting on my lips. I had never seen this phenomenon before and, intrigued, I was able to catch one of them. It turned out to be a Summer Chafer (*Amphimallon solstitiale*), also known as the European June Beetle. In terms of the numbers of insects I started counting them and was able to count a minimum of 12 flying above the roof of my house at any one time. I fetched my binoculars and started looking around the neighbourhood. Every house I could see had a similar display above the roof and around the chimney, on at least a dozen houses. The trees in the neighbourhood had a haze of chafers flying around their foliage. The next night the display was, if anything, even more numerous, but on the third night it was reduced to one or two individuals. The flying started just before sunset and lasted for about half an hour.

This behaviour has been reported before but has become increasingly rare in recent years. Oddly enough I asked whether it had occurred elsewhere and the nearby villages had few if any reports of this activity. They were spotted in Cherry Hinton Chalk Pits Nature Reserve (Stanier 2015). I had never seen this before in my 15 years in and around Cambridge so was intrigued as to why it should happen in this way, and in such numbers.

As you might expect, it is all about sex. The flying chafers are males looking for a mate, with the females usually perched on foliage waiting for the males to arrive (Tolasch *et al* 2003).

Will it happen in 2016? Probably not. It seems that the mass flights of Summer Chafers are something of a periodic phenomenon, perhaps related to the lifespan of the grubs in the soil, which can be up to three years. Interestingly Summer Chafers are mostly recorded in recent literature because of their status as lawn pests, and efforts to keep lawns neat and clear may explain their low numbers in recent years. This is perhaps a good thing as historical records of Summer Chafer swarms indicate they can defoliate entire trees (the adults feed on leaves and other vegetable matter), or even woods, as Gilbert White recounted happening in Selbourne in 1770 (Marren & Mabey 2010).

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Toby Carter

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Vascular Plant Records 2015

A.C. Leslie

These annual lists of selected records made in Cambridgeshire (v.c. 29) often include a raft of records for alien plants and this year is no exception. Indeed there are perhaps more than ever this time. Some botanists have mixed feelings about recording such plants and in some cases the individual plants will be ephemeral; others may take hold and be very persistent where they have arrived, whilst a proportion will spread gradually over the county. A tiny minority might become serious pests. Some ephemeral plants may only be seen once and never appear in the county again, but in other cases they may be repeatedly introduced and seen in many different places over the years. On occasions the fate of the same species may be quite different at different times or in different places. It seems, for instance, that *Puccinellia distans* (a native coastal grass, but with us only occurring naturally along the tidal River Nene) was a local introduction in southern Cambridgeshire in the late eighteenth and early nineteenth century, often associated with dunghills. Several of our subsequent Floras have cast doubt on these records, but David Coombe (1994) set them in a context of other nineteenth century inland records in central and eastern England and drew attention to the records for it in central Europe ‘in places soaked with liquid manure, on roads, on dunghills, and near stables’. The species did not persist in such sites in the county and it was not until the latter part of the twentieth century that it began its explosive spread along our main roads.

Bound up with an appreciation of alien records is the question of just what we mean by native and alien. This is becoming more and more a contentious issue and dogmatic statements appear on all sides. As the example given above shows, the status of individual species may vary in time and space and increasingly we find examples of what are widely considered to be native plants occurring in places where there is a very high probability that they have arrived inadvertently by the hand of man. In these annual lists I have always endeavoured to select only those records which represent individual plants that have not been deliberately planted or sown, irrespective of whether they are considered native or alien or whether they may be casual or naturalised. Some in the following list, such as *Arachis hypogaea* (Peanut) and *Eriobotrya japonica* (Loquat), may have already been lost from the individual sites concerned, but even in such cases they may be seen in a more interesting context when one reads that, for instance in Belgium, Loquat is being recorded as reproducing from seed in urban habitats (basement walls, rough ground and pavements) and ‘seems to persist well’ (Verloove & Lambinon, 2014). Our seemingly trivial record is thus part of a wider trend in records for this species.

In this list we also have several examples of species that have recently spread more widely over the county, such as *Erodium moschatum* and *Valerianella carinata* (both of which Lewis Saunders has now found well north of previous records, in Wisbech) and *Carduus tenuiflorus* (which Neil Crossman has reported on a flood bank along the Ouse south of Earith and Jonathan Shanklin

on the embankment of the Ouse Washes north of Mepal, both well away from our other records on roadsides and in arable fields). Who knows which of the others may do likewise in the future, and will even those which are currently so successful persist or eventually die out? We need to keep recording them to be able to answer these questions. The *Erodium* is in fact another species for which we have very early reports from the county, but which then disappeared and has only recently spread extensively on lightly mown road verges.

Another question that often exercises recorders is how plants which are not native in an area arrive there in the first place. The answers can be many and varied. Sometimes a garden source is evident or at least suspected (such as in the *Rubus niveus*, *Eryngium bourgatii* and *Allium porrum* records below), sometimes an origin in bird-seed may be evident, and increasingly, as we have seen in these reports in recent years, arrival with vehicles and soil/sand/gravel at construction sites may be involved. Others such as *Erodium moschatum* might have originally been introduced with grass seed or as contaminants in other crops. This year it seems likely that the surprising appearance of *Turritis glabra*, discovered by Jonathan Shanklin on the West Cambridge site, owes something to the soil, mulch or nursery stock that has been introduced to new shrub beds, but how does one explain the appearance of a new variant of parsnip (*Pastinaca sativa* subsp. *urens*) along the A14? There have been suggestions the latter is native on the Suffolk coast, but others point out how it is has spread across Europe. It is easy for plants in such little botanised habitats as main road verges to get missed and credit is due to Joe Sharman for drawing attention to this remarkable arrival which has surely been overlooked elsewhere.

Most new records for rare or otherwise interesting species usually come in small numbers each year, but for one species, *Torilis arvensis*, this has been something of an *annus mirabilis*. Indeed in this case there have been too many new records to list them all here in detail. This species was once a more frequent cornfield weed in the county and seemed to be in severe decline, but in recent years more records have been surfacing in Fenland. In 2015, largely due to the recording efforts of Jonathan Shanklin and Lewis Saunders, we have had numerous records for Spreading Hedge-parsley primarily on ditch and drain banks alongside arable land, and especially in the north-west of the county around Thorney, Whittlesey, Haroldsbridge and Tydd St Giles, with other records from Padnal Fen near Ely, near Dam Bank Bridge west of Aldreth and even further south at Great Kneighton, on the southern outskirts of Cambridge. These records come from 10km squares: TF20, 30, 32, 41 and TL 39, 45, 47, 58. This is a plant which has often been treated as a native, but which many now regard as an ancient introduction.

There have also been reports of a number of new or interesting naturally occurring hybrids, notably involving species of docks, thistles and willowherbs, whilst next year I will be reporting on some new *Agrostis* hybrids. Who said weeds were dull? In last year's report the unexpected determination of a hybrid between *Berula erecta* and *Helosciadium (Apium) nodiflorum* was noted and this has now been named as *x Beruladium procurrans* (Desjardins *et al.*, 2014). Chippenham Fen is the only place in the world where this hybrid is known to be

extant. Thanks to determinations made by BSBI referee John Richards this Fen also now has records for 13 dandelion species, two of which are reported here as new to the county. We still badly need a champion for this genus in the county: there are more than 80 species now on record, but in most cases we know little about their overall distribution.

I would like to thank all those who have submitted their records and would welcome hearing about any other new finds. Even if your finds are not highlighted in this report, they are all of value and interest and thanks to Jonathan Shanklin they will all find their way into the BSBI database. We are particularly grateful to Owen Mountford and Jonathan Graham for sharing with us their records made in recording for their new flora of Fenland. On this occasion the following list includes mention of 19 recorders or recording groups, with reports made in every month except December and the records cover twenty 10km squares. 'Recent' in the context of these records implies post 1987.

Allium christophii One plant, in churchyard turf, Kingston TL3455, P.J. Reynolds, 21 June 2015. First v.c. record for a popular ornamental onion, grown for its large heads of purplish pink flowers; not cultivated in the churchyard, but known to be in nearby gardens; it readily self-sows. A native of Turkey and central Asia.

Allium porrum One self-sown plant, on field margin, south-east of gardens along Crane's Lane, Kingston, TL3454, P.J. Reynolds, 18 March 2015. First v.c. record for a self-sown Leek; several of the adjacent gardens have vegetable patches, where leeks have been left to go to seed.

Althaea officinalis One plant, growing next to a horse trough, in a paddock adjacent to stables, Graveley, TL24666424, P. Stroh, 27 July 2015. This was considered not to have been deliberately introduced and is our second recent record for Marsh Mallow, both of which may owe their origin to cultivated sources.

Anethum graveolens Formerly grown as a crop and now self-sown on Mayfield small holding, Burnt Fen, Littleport, TL585.887, C.J. Cadbury, 2015. A rarely reported and usually casual alien in Cambridgeshire. It is the culinary herb Dill.

Arachis hypogaea One plant, growing out of a road drain in front of 73 Abbey Road, Cambridge, TL461590, A.C. Leslie, 28 August 2015. First v.c. record for Peanut (or Groundnut): considering how widely these are used as bird food, it is surprising that this has not been reported before as a garden weed or on refuse tips.

Armeria maritima One plant, c.30cm across, at edge of west side of A505, on the eastern half of the Royston bypass, TL36924142, A.C. Leslie, 10 May 2015 (CGE), presumed to be the plant reported by I. Carle in May 2014 (in *Hertfordshire Flora Group Newsletter* 25:5 2015)); another plant, c.23cm across, on the south-eastern margin of the central reservation of the A505, towards the western end of the same bypass, TL34004104, found the same day. This is the second set of records of Thrift as an apparent maritime invader on Cambridgeshire roadsides, Philip Oswald having reported it from along the M11 between Trumpington and Duxford in 2005. Last seen by the tidal River Nene in 1930.

Beta trigyna Long known as a naturalised alien, in very small quantity, on a small section of bank on the north-east side of the A1307 on the Gogmagogs, just south of Cambridge. In 2015, following the creation of a broader cycle/footpath, the colony had expanded along the

bank in both directions with at least 10 plants present (extending at least as far as the former public house just to the north-west). Further north-west, at the roundabout by Caius Farm, the disturbed verges of the path mostly in the northern quadrant of the roundabout (e.g. TL47895419), held at least 36 more plants, some of which were flowering; most were subsequently mown and it remains to be seen if this expanded population can maintain itself. All records from ACL, 13 May 2015.

Bidens cernua One plant, in an almost dried out ditch, on the north-west side of the Bedford Barrier Bank, beside Ouse Fen Wash, between Over and Brownhill Staunch, TL36577184, A.C. Leslie, 8 August 2015 (CGE); both *Bidens tripartita* and *B. frondosa* were also present in the ditch. Now a very rare plant in the county, our only other recent record being from Isleham Wash (2006, N.S. Cooper).

Bromus madritensis (*Anisantha madritensis*) Locally frequent in a raised bed under a London Plane tree, in the sunken area of the roundabout at the southern end of Elizabeth Way, Cambridge, TL461588, CNHS excursion, 2 July 2015 (CGE, coll. ACL, 15 July 2015, conf. T. Cope). A rarely recorded alien in Cambridgeshire, previously seen under newly planted trees at Landbeach in 1992 and near the railhead corn silo at Newmarket in 1989 and 1991; its mode of origin at this latest site is unclear.

Carduus tenuiflorus (a) Old Bedford Barrier Bank, north of Mepal, a 2m patch at TL45068322 and a few plants at TL45148333, J.D. Shanklin, 25 May 2015; (b) population over 6 x 4m, on the south-eastern side of the Bedford Barrier Bank, near Earith, TL37897412, N. Crossman, 4 July 2015; (c) Four plants, in ploughed but unsown arable margin, west side of Long Road, north of Comberton, TL38855772, A.C. Leslie, 17 July 2015; (d) One plant, in a rape crop, east of Cold Harbour Farm, south-west of Steeple Morden, TL27524116, A.C. Leslie (joint CFG/Hertfordshire Flora Group excursion), 21 June 2015. Further evidence of the continued spread of this usually coastal species throughout the county.

Carex arenaria A small vegetative colony, on sandy ground beside the car park in front of the David Lloyd Fitness Centre, in an old chalk pit off Coldham's Lane, Cambridge, TL48265730, A.C. Leslie, 16 October 2015 (CGE). Growing with *Trifolium arvense* and other plants presumed introduced with the sandy soil. Sand Sedge has recently been seen as an introduction at Wisbech, March and Milton and still just persists as a native on the sands on our Breckland fringe.

Cirsium eriophorum x *C. vulgare* (*C. x grandiflorum*) A single plant, with both parents, on the eastern verge of Long Road, just south of Highland Farm, Comberton, TL38855772, A.C. Leslie, 17 July 2015 (CGE). A very convincing plant, intermediate in many characters between the two parents. This seems to be a genuinely rare hybrid; some doubt has been cast recently on the identity of our only other accepted record, at Croydon in 1945.

Cordyline australis One large plant, with several crowns, at the base of the river side of the flood barrier along the Nene, North Brink, Wisbech, TF45500910, A.C. Leslie (CFG excursion), 18 July 2015 (CGE). First v.c. record for a widely grown, evergreen New Zealand shrub, which has begun to be recorded as a self-sown alien elsewhere, although this example is more likely to have been dumped or perhaps planted.

Corylus colurna Two clearly bird-sown plants, both c.30cm tall, in scrub along the edge of the long-disused St Ives railway line where it runs beside the now disused Chesterton Sidings, Cambridge, TL4760, A.C. Leslie, 24 September 2015 (CGE). Second v.c. record for the Turkish Hazel, sometimes now planted as a street tree and occasionally self- or bird-sown in gardens and on streets from such sources; these two plants were far from any evident parent.

Epilobium ciliatum x *E. hirsutum* (*E. x novae-civitatensis*) Several plants, with both parents, at edge of narrow pavement beside the Cherry Hinton Brook, Burnside, Cambridge, TL47655735, A.C. Leslie, 2 August 2014 (CGE, conf. G.D. Kitchener). First confirmed record for this hybrid; earlier reports having been subsequently redetermined as other hybrids or species.

Epilobium lanceolatum Scattered over the northern half of the disused Chesterton railway sidings, Cambridge, in lightly vegetated areas and around the edges of clearings in scrub and light woodland, e.g. TL47676115, 47696108, 47616101, A.C. Leslie, 9 July 2015 (CGE). A rarely recorded species in the county, with no permanent populations in clearly natural sites; there is, however, a history of sporadic records in Cambridge, the last one being in 2011 on the Bramblefields nature reserve; this latter site is close to the sidings, and suggests it may in fact have been persistent in this general area for several years.

Equisetum telmateia (a) Ditch banks on both sides of B1167, near Pigeons' Off Farm, Thorney, TF3104, J.O. Mountford, 6 September 2014; (b) West Corner Farm, Thorney, TF30B, T. Inskipp, 2014; (c) Dominating a long section of new drain adjoining south grass verge of new slip road to A47 Thorney bypass, near Corner Farm, just east of Thorney, TF31110432, J. Graham, 29 May 2015. Clearly now well established in an area to the east of Thorney. This species has been spreading in the county in recent years, initially around Ely and a few other places in the south of the county, but is now becoming more widespread in the northern Fens, with other recent records from Elm and Whittlesey.

Eriobotrya japonica One young plant, either bird-sown or from discarded fruit, at base of railings bordering small urban park, York Street, Cambridge, TL46315873, A.C. Leslie, 10 February 2014 (CGE), still there June 2015, but subsequently removed. First v.c. record for a Loquat, which is occasionally grown now as a handsome evergreen shrub, but rarely gets a chance to fruit before the frosts.

Erodium manescavii One self-sown flowering plant, at the base of the fence in front of 320 Coldham's Lane, Cambridge, TL47435807, A.C. Leslie, 7 June 2015. First v.c. record for a Pyrenean perennial, grown in gardens for its large purple flowers; there is a large population in a garden on the other side of the road.

Erodium moschatum Around the edges of a large area of amenity grassland, Edinburgh Drive, Wisbech, TF462108-462107, L.M. Saunders, 15 June 2015. Although now widespread in the south of the county, this is first recent record for Musk Stork's-bill in the far north, where it was formerly known in the nineteenth century (but does not seem to have persisted).

Erucastrum gallicum One plant, at the edge of a wheat crop, by a track off Little Hasse Drove, The Hasse, Soham, TL61137576, C. Turner (CFG excursion), 28 May 2015 (CGE). A rarely reported alien; this site lies between those for two records made by Graham Easy in 1991, at Soham and at Isleham (but not reported since). For many years it used to be naturalised by the Devil's Ditch near the A1304 and it still persists on arable margins near Litlington.

Eryngium bourgatii Three young plants, self-sown into decayed tarmac of pavement in front of 34 Roseford Road, Cambridge, TL4460, P.J. Reynolds, 20 April 2015. First v.c. record for a popular garden plant, grown for its deeply cut, grey-green foliage and heads of bluish flowers, with the inflorescence branches also usually suffused blue as well. The probable parent plants were in the adjacent garden.

Geranium purpureum A small population on an area of concrete rubble and clinker, Whitemoor marshalling yards, March, TL412984, S. Lambert, 12 July 2003; subsequently reported in other areas of these old sidings, by the same recorder, in 2006, 2007, 2008, 2012 and 2013; there was a population of 30 plants on clinker on a disused section of the track between the North and South Bunds in 2006 (TL416983), where it was growing with *G. robertianum*. First v.c. records for a very local plant, native to mostly coastal areas in southern and south-western Britain and southern Ireland; clearly an introduction with us, which presumably arrived with material being transported on the railway.

Helianthus annuus x *H. decapetalus* (*H. x multiflorus*) On a spoil heap, King's Delph, TL248953, J.D. Shanklin, 19 September 2015. First v.c. record for a perennial garden hybrid, usually seen with double flowers.

Hypericum maculatum Scattered plants, along the edge of recently cleared ride margins, Borley Wood, TL57814872, TL58224801, TL58184788, CFG excursion, 9 August 2015 (CGE). These were all of our usual subsp. *obtusiusculum*. This is a very local plant in the county and has not previously been reported from this comparatively well-worked wood, which just goes to show that good new plants can still be found in supposedly well-known areas. The rides in Borley Wood on the same day also produced *Centaureum pulchellum*, another new record for the wood.

Iberis amara A patch consisting of 'a couple of dozen plants' (over 1.0 x 1.0m), in the middle of the disused railway track, Hayley Wood, TL29325339, M. Frisch, M. Clarke & R. Dowsett, 3 June 2015. The recorders suggest that this might have originated with the Wildlife Trust landrover which had also been used in the areas on the chalk near Ashwell & Morden station where this species is locally abundant (cf. also last year's report of this species from the Fleam Dyke).

Isotoma axillaris (*Solenopsis axillaris*) One flowering plant, self-sown at the junction of the front wall and pavement, 8 Trafalgar Street, Cambridge, TL45385943, A.C. Leslie, 24 September 2015 (CGE). First v.c. record for a pretty, potentially perennial, but non-hardy Australian member of the *Campanulaceae*, sometimes grown as a window box or pot plant for its numerous blue, starry-faced flowers, with long narrow tubes.

Ophrys apifera var. *chlorantha* One plant with two flowering stems, on the north-east verge of the Snailwell Road, just south of its junction with the A143, north-west of Snailwell, TL63316850, A.C. Leslie, 12 June 2015. An attractive but rarely reported variant of Bee Orchid, with white sepals and a two-toned lemon yellow labellum. A population of this variant is known on a reservoir bank at Elsworth.

Parentucellia viscosa Four plants, in a sown meadow rich in *Lotus corniculatus*, between the railway and the guided busway, just west of Addenbrooke's Hospital, Cambridge, TL45655521, C.J. Cadbury, 10 July 2015 (CGE, coll. ACL, 12 July 2015, when 6 plants were detected). Second v.c. record for Yellow Bartsia, a native of mostly coastal areas in southern and western Britain (and in Ireland); perhaps arriving here in this case as a seed impurity.

Pastinaca sativa subsp. *urens* (a) A large colony, on and at the base of the bank on the north side of the A14, just north-east of the bridge for the north-bound carriageway of the A1304 that loops over the A14, north-east of Newmarket, TL67106660, J.L. Sharman, August 2015 (CGE, det. A.C. Leslie); (b) Scattered on the north side of the A14 between the Quay roundabout and the Wilbraham Road bridge over the A14, TL52105979, A.C. Leslie, 3 September 2015; (c) A few plants, on the east side of Milton Road (A1309), just south of the

roundabout at its junction with the A14, south of Milton, TL46976194, A.C. Leslie, 24 September 2015 (CGE). In each case growing with or near populations of subsp. *sylvestris*, but remarkably distinct in its more slender, more branched habit, fewer umbel rays, smaller terminal umbels and with the stems lacking the very deep ridging found in subsp. *sylvestris*. First v.c. records for a variant of Parsnip, native to southern and eastern Europe, which has now spread up to the French Channel coast and which Peter Sell collected over a period of 20 years on the Suffolk coast.

Persicaria minor Locally frequent on damp ground beside the ditch on the north side of the Bedford Barrier Bank, just west of Earith, TL38817468 to at least 38847468, A.C. Leslie, 8 August 2015 (CGE), accompanied by a few *P. mitis* and abundant *P. hydropiper*. A significant new population for a rare plant in the county; most of our recent records coming from the Ouse Washes or along the Ouse above Earith.

Phytolacca polyandra Amongst ornamental shrubs, especially along the western boundary with the hospital, Wisbech Park, Wisbech, TF465097, L.M. Saunders, 22 August 2015, conf. ACL. All our records for Pokeweeds with erect racemes and carpels completely fused in fruit have been placed under this species, which up to now have only been reported from Cambridge, Histon and Ely. *P. acinosa*, which has fruits joined only at the base in fruit, is more common as a naturalised alien in Wisbech.

Poa bulbosa Scattered in rather bare ground under three mature London Plane trees, along the north-east border of Alexandra Gardens, Cambridge, TL44855944, A.C. Leslie, 5 April 2015, seen in flower 3 May 2015 (CGE) when it showed itself to be var. *bulbosa*. Yet another apparently long-established but overlooked site for this grass, and another associated with parkland trees. See article on this species elsewhere in this journal (page 25).

Portulaca oleracea Frequent around the margin of a basketball court in the play area at the edge of Coldham's Common, beside Coldham's Lane, Cambridge, TL47085851, A.C. Leslie, 22 August 2015 (CGE). An alien which has previously been reported as a persistent weed in Trinity College Great Court, on an allotment at Milton and on a roadverge at Gamlingay.

Potentilla tabernaemontani In the rough between the 6th and 7th fairways on the Old Course, Gogmagogs golf course, on the chalk just south-east of Cambridge, TL49155373 (one small plant), TL49125375 (one small plant) and with one good patch at TL49155374, S. Hartley & A.C. Leslie, 14 May 2015. Spring Cinquefoil does not seem to have been reported from this site since 1988, when C.D. Preston *et al.* found 6-10 flowering clumps in the same general area; it was searched for but not refound in other areas on the Course. Our only other extant site is on Newmarket Heath.

Pteris tremula Two plants, self-sown in a small basement area at the base of access steps, below the garden front of the University Botanic Garden offices, 1 Brookside, Cambridge, TL4557, J.D. Shanklin, 21 May 2015 (CGE, coll. ACL, 12 July 2015, conf. F.J. Rumsey). First v.c. record for a rather tender Australasian fern, which has found a very sheltered niche in this spot; it has not been traced as a currently cultivated plant in the Botanic Garden.

Rubus niveus One mature, apparently bird-sown plant, in a patch of nettles and accompanied by bird-sown *Rosa canina*, near east bank of Newnham mill pool, Sheep's Green, Cambridge, TL44605783, CNHS Excursion, 1 January 2015 (CGE). First v.c. record for a Chinese bramble with tall, erect, burnished mahogany-coloured stems, pinnate leaves, tiny deep pink petals and hairy fruits. Perhaps derived from the large planting of this species in the Winter Garden of the University Botanic Garden.

Rumex conglomeratus x *R. hydrolapathum* (*R. x digeneus*) One tall plant, on the edge of the ditch on the north-west side of the Bedford Barrier Bank, south-west of Earith, TL37177344, A.C. Leslie, 8 August 2015 (CGE, conf. G.D. Kitchener). First v.c. record for a rarely recorded hybrid; both parents were present in the vicinity.

Rumex crispus x *R. pulcher* (*R. x pseudopulcher*) One plant, with several wiry, much-branched stems, in grazed meadow grassland by cycle/footpath, Ditton Meadows, Cambridge, TL47556017, A.C. Leslie, 20 November 2015 (CGE, conf. G.D. Kitchener). The only recent record for a local hybrid, which may perhaps be overlooked on other Cambridge Commons where *R. pulcher* (and other *pulcher* hybrids) occur, although mowing sometimes makes it difficult to find the plants!

Scandix pecten-veneris A large colony, extending several hundred metres the trackside edge of a wheat field, south-east of Cold Harbour Farm, south-west of Steeple Morden, TL27624106-27804076, Joint CFG and Hertfordshire Flora Group excursion, 21 June 2015. A new site for a generally decreasing arable weed, the plants here occurring as a dense band extending at least a couple of metres into the crop in some places.

Sedum stoloniferum At wall base and on one grave in churchyard, Burwell, TL58986604, J.D. Shanklin, 15 February 2015 (CGE, coll. ACL, March 2015). First v.c. record for a pink-flowered, evergreen, creeping perennial species, sometimes seen in gardens, but less common than *S. spurium* which is also more commonly recorded as an alien. Native of the Caucasus.

Senecio aquaticus x *S. jacobaea* (*S. x ostenfeldii*) Several plants, with both parents, near the edge of the ditch on the north-west side of the Bedford Barrier Bank, north of Over, TL36597187, A.C. Leslie, 8 August 2015. Often in a zone between *S. aquaticus*, which is in or on the margin of the ditch and the more abundant *S. jacobaea* on the adjacent grassland. It was also refound during a CNHS excursion in 2015 on Coe Fen, in Cambridge, near where it was last recorded in 1977. A rarely recorded hybrid in the county, but perhaps overlooked, especially in Fenland.

Stellaria neglecta Several plants under a short stretch of hornbeam hedge, behind flats at 26-45 Rustat Avenue, Cambridge, TL46395723, A.C. Leslie, 1 May 2015 (CGE). A native species, but one which has never seemed to maintain any persistent populations in the county and may always be a casual introduction with soil or other plants; most of our records have been in or near Cambridge, the last being at Shelford (1992, S.M. Walters).

Taraxacum trilobatum Grazed grassland on raised ground at the north-western end of compartment 13, at the north-eastern end of Chippenham Fen, TL65296989, A.C. Leslie, 17 April 2015 (CGE, det. A.J. Richards). First v.c. record for a member of the sect. *Ruderalia*, which is scattered throughout Great Britain.

Taraxacum undulatum In the car park at the southern edge of Chippenham Fen (compartment 12), TL6569, A.C. Leslie, 23 April 2015 (CGE, det. A.J. Richards). First v.c. record for a member of the sect. *Ruderalia*, which is scattered through the British Isles.

Thalictrum minus Two small patches, about 8m apart, on the grass verge immediately adjacent to a copse south of Heath Farm, south-east of Borley Wood, Linton, TL58604708, N.P. Millar, 9 August 2015. A new site for a local plant, which the recorder considered to be the segregate taxon *T. babingtonii* (the segregate taxon to which all our native plants probably belong). Lesser Meadow-rue was reported from Linton in Ray (1660), but there had been no recent records from this area until it was reported from the Roman Road north of Chilford

Hall (2007, J.D. Shanklin) and by Chilford Hall itself (2014, ACL); it can be remarkably persistent, even in some otherwise uninspiring places along field borders over the chalk.

Trifolium purpureum One large plant and several smaller ones, at edge of “wild flower” meadow, Murrow, TF39550592, J.D. Shanklin, 29 August 2015 (CGE). First v.c. record for a robust Mediterranean annual with long heads of reddish purple flowers and long narrow leaflets. The meadow had been sown 12 years previously, but the owners had not seen such plants before.

Turritis glabra (*Arabis glabra*) One plant, in recently planted shrub bed, West Cambridge site, Cambridge, TL 42415881, J.D. Shanklin, 29 May 2015 (CGE, coll. ACL, 31 May 2015); subsequent investigation revealed at least 13 plants scattered around the south-western end of the site, mostly associated with new ornamental plantings. An unexpected occurrence of a native plant, last seen in the county at Gamlingay in 1995; clearly an unintended introduction here, perhaps with soil/mulching material brought from a source in Breckland, where this species is still very locally common.

Valerianella carinata On a rough road verge bordering derelict land, Russell Street, Wisbech, TF46111011, L.M. Saunders, 29 April 2015. Whilst this is now quite frequent around Cambridge and some other areas in the south, this is our first record from the far north of the county; it is generally rare in the Fens.

Vicia benghalensis One plant, apparently imported on to a smallholding with sandy soil used in building work, Birch Tree Farm, south-east of Whittlesey, TL 329935, B. Dobson (comm. J.D. Shanklin), 27 June 2015 (CGE); the sweepings had been thrown into a garden flower bed, the single seedling noted and then potted up by the owners. First v.c. record for a usually annual Mediterranean species, with racemes of very attractive, reddish purple flowers which have black tips.

Vicia lathyroides (a) Numerous plants, in mown sandy turf of lawn on south side of flats, on south side of Rustat Avenue, Cambridge, TL46365724, J.D. Shanklin, 29 April 2015, another example of plants more typical of a Breckland flora being introduced around new developments, here accompanied, for example, by *Myosotis ramosissima* and *Rumex acetosella* var. *tenuifolius*; (b) One plant on sandy ground above south-western end of old pit, north-east side of West Fen Drove, Isleham, TL62897578, A.C. Leslie (CFG excursion), 28 May 2015, here in company with *Arabis hirsuta*, *Vulpia ciliata* subsp. *ambigua* and a range of other Breckland species, in what appears to be an overlooked natural locality on our Breckland fringe (cf. last year’s listing for *Carex arenaria* and *Medicago minima* at this site).

Acknowledgments

I am grateful to Jane Bulleid, Nick Millar and Jonathan Shanklin for their assistance in preparing this account

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Bryophyte records

M. Burton and C.D. Preston

Like last year, the records from Cambridgeshire (v.c. 29) and Huntingdonshire (v.c. 31) come from a range of habitats. Most were made on the BBS Cambridgeshire Group Bryophyte Excursions, including the particularly remarkable record of *Plasteurhynchium striatulum* from Milton Country Park. All interested botanists, whether bryological beginners or experts, are invited to attend these field meetings, which take place fortnightly during the winter months.

Mosses

Abietinella abietina **29**: scattered groups of stems in small area of short trampled turf with *Carex flacca*, *Pilosella officinarum*, *Thymus polytrichus*, *Ctenidium molluscum*, *Homalothecium lutescens* and *Oxyrrhynchium hians*, Devil's Ditch, TL60216290, 6.2.2016, J.J. Graham. This is only the second place where this declining species has been seen on the Devil's Ditch since 2000.

Brachythecium salebrosum **31**: acid peat around edge of dried up reservoir, Rymes Reedbed, Trundle Mere, TL20199078, M. Burton & M.O. Hill, 12.12.2015, det. M.O.H. This is the first record from v.c. 31 since 1993, and a rather unusual habitat for the species.

Bryum algovicum **31**: sandy clay bank, Little Paxton Pits, TL195624, J.J. Graham, 14.11.2015. Only the second v.c. record for this *Bryum*, which is under-recorded as the capsules needed to identify it are at their best in summer. The first record was at Molesworth in 1977.

Bryum subapiculatum **31**: acidic peat near one of the new pools on Rymes Reedbed, Trundle Mere, TL201907, M.O. Hill, 12.12.2015. An uncommon species in v.c. 31, last recorded in 1991.

Didymodon acutus **31**: base-rich stony ground in disused quarry yard close to Visitor Centre, Little Paxton Pits, TL19856291, M.O. Hill, 14.11.2015, BBSUK, conf. T.L. Blockeel. First vice-county record.

Leptobarbula berica **29**: with *Tortula marginata* on base of north wall of church, Madingley, TL394603, C.D.P., 24.1.2016. On this excursion we were unable to find *Leptobarbula* on the stonework of the fountain by Madingley Hall where it has been collected since 1951, but we discovered it at this nearby site.

Orthotrichum stramineum **31**: on hazel, North Wood, Folksworth, TL132898, M.O. Hill, 21.2.2016. The second record from v.c. 31 of this expanding epiphyte, first found in the county in March 2015. It has subsequently (7–8.3.2016) been found by M.J. Wigginton in two sites near Great Gidding, on a fallen hawthorn at TL114829 and on a willow at TL117827.

Orthotrichum tenellum **31**: on two ash trees, North Wood, Folksworth, TL133898, J.J. Graham, 21.2.2016. The third record from v.c. 31 of another epiphyte which has expanded in recent decades following the reduction in SO₂ pollution.

Plagiomnium ellipticum **29**: forming an almost pure carpet below a mixed community containing *Berula erecta*, *Eupatorium cannabinum*, *Galium palustre*, *Iris pseudacorus*, *Lythrum salicaria*, *Phragmites australis*, *Rumex hydrolapathum*, *Solanum dulcamara*, *Teucrium scordium* and *Typha latifolia*, Upware North Pit SSSI, TL54457286, M.O. Hill & C.D.P., 17.10.2015, BBSUK, conf. T.L. Blockeel. Only the second record from Cambridgeshire, the first being a specimen which was collected at Wicken Fen by R.E. Parker in 1953 but not identified until after the publication of the 1964 Flora. (Plate 4)

Plasteurhynchium striatulum **29**: shaded lump of concrete near shallowly flooded depressions in wooded former gravel workings, Milton Country Park, TL48196242, M.O. Hill, 20.3.2016, BBSUK, conf. T.L. Blockeel. New to v.c. 29. A most remarkable occurrence of a moss which is primarily found in Britain on Carboniferous Limestone in England and Wales, although it also occurs on the southern chalk. It does not usually colonise artificial substrates and is hitherto unknown in East Anglia.

Pterygoneurum ovatum **29**: south-facing slope of Devil's Ditch, on open, chalk soil at TL59026393 and TL59036392, J.J. Graham, D. Seilly *et al.*, and on chalk soil under tree roots, TL59896317, R.J. Fisk, 6.2.2016. This chalkland ephemeral was first recorded from the Devil's Ditch in 1933 but not found again until 2008; the records from a grazed section of the Ditch suggest that it has benefitted from recent management.

Tortula lanceola **29**: with *Barbula unguiculata* on concrete sand bag in culvert near Green Drove Farm, Thorney, TF28090746, S. Hartley, 2.4.2016, det. M.O. Hill. This species is usually found on disturbed chalky soil, so this record from arable Fenland is unexpected. It has been recorded since 2000 from Whittlesey brick pits, but the only other records from the northern half of the county are much older (Wisbech *c.* 1800 and Gorefield in 1960).

Weissia longifolia hybrid **29**: chalky soil on south-facing slope of Devil's Ditch, TL604626 and 609622, C.D.P., 6.2.2016. These plants had short arcuate setae and at least partially infertile capsules and were presumably a hybrid between *Weissia longifolia* var. *angustifolia*, which has sessile capsules, and a species such as *W. brachycarpa* and *W. controversa* with a longer seta. Such plants were also reported from the Devil's Ditch in 2006.

Liverworts

Riccia fluitans **29**: frequent round lower lake margin, Madingley Hall, TL3960, A. Arbon & J. Shanklin, 28.6.2014; refound growing with *Lemna minuta* at outflow of lake, TL39476057, S. Hartley, 24.1.2016. There are several recent records of this floating liverwort from Fenland, but this is the first record south of the Fens since 1960.

Nowellia curvifolia **29**: in almost pure patches on four soggy, decorticated logs, mixed with small amounts of *Kindbergia praelonga* and *Lophocolea heterophylla*, Papworth Wood, TL29146305, TL29166305 and TL29206305, M.O. Hill, 29 November 2015. At least one of the logs (and perhaps all four) was a fallen elm. The fifth record in v.c. 29 for this predominantly western liverwort. This is a well-established population; plants extended for at least 2 m along one of the logs.

OBITUARIES

Norman Winfrid Moore (1923–2015)

Norman Moore, who died in October, has been variously described as ‘one of the 20th century giants of nature conservation’, ‘one of the most influential figures in nature conservation over half a century’ and ‘one of the principal architects of present day policies of wildlife conservation in Britain’. He was a keen naturalist from boyhood, keeping a diary from the age of six until he died. In his teens he became fascinated by dragonflies, which he called the ‘bird-watcher’s insect’, and published his first paper on ‘Rare Lepidoptera and Odonata in East Sussex’ in 1934. The son of a doctor, Sir Alan Moore, he went to Eton, ‘before it became the preserve of the very rich’. With two friends, including David Snow, he formed what they called the Eton Ornithological Union, and spent their free time bird-watching at the Slough sewage farm. In 1940, he went up to Cambridge at 17 to read Natural Sciences and joined the Cambridge Bird Club where he immediately became secretary as the existing secretary was called up. In this capacity, he again became a frequent visitor to the local sewage farm, and also to Wicken Fen and Adventurers’ Fen.

He joined up in 1942 and trained as a mountain gunner in the Cairngorms, ostensibly in preparation for attacking the German heavy water plant in Norway – but then being glidered into the Low Countries in 1944 to join the assault on Germany. Here he was wounded and captured and spent time in a German prison camp, mainly for Russians with hundreds dying every day from starvation. The story of his unit is beautifully recalled by a fellow officer, Geoffrey Tudor, in *Hoofprints in the Clouds – Jeep Tracks in the Mud* in which Norman first appears on page 3 where he is credited with saying, ‘We’ve got two hours before dinner at eight, come and look for some capercaillie’.

After the war Norman returned to Cambridge to complete his degree, meeting and later marrying Janet Singer who was doing her Ph.D. After a three month zoological trip to The Gambia, he took up a lectureship at Bristol. His research on dragonflies led to a Ph.D. in 1953, and later to joint authorship of a *New Naturalist* on dragonflies. He was offered a post as Regional Officer in the Nature Conservancy covering south-west England from Herefordshire to the Isles of Scilly, and here he was responsible for selecting the first National Nature Reserves to protect habitats such as the Dorset heathlands, which were threatened with tree planting; a commemoration stone is now erected to him there, and his landmark paper on the fragmentation of Dorset heathlands was later published in 1962. With the help of the British Trust for Ornithology, Norman undertook a study of the Buzzard whose populations had been declining. He showed that this was largely due to persecution from gamekeepers and not just to the reduction in Rabbit populations from myxomatosis.

During the 1950s, there was increasing concern about the effects of some new pesticides such as Schradan and DNOC killing partridges. The Nature Conservancy was also becoming concerned about the use of herbicides by some county councils to manage road verges. The Director General invited Norman to

head a Toxic Chemicals and Wildlife Section in a new research station to be built near Cambridge, and Norman was on the committee that chose Monks Wood as the site for this. I was the first member of his section in 1960. On one occasion I noticed a letter addressed to Sir Norman Moore and when I pointed this out he coughed apologetically and explained that he had indeed inherited the title when his father died, but that he didn't wish to adopt it; Laurie Friday has described a similar gentle correction in her first contact with him.

His first task was to visit places like the Fisons and ICI pesticide research stations to decide which chemicals posed the most significant wildlife problems. The director of Monks Wood, Kenneth Mellanby, later said that Norman had a genius for picking those problems that would yield the greatest benefits from research. But at the time the pesticide industry claimed that Norman had been appointed 'to do placatory research' and need not be taken seriously. His modest demeanour, however, belied a steely resolve backed by firm belief in the importance of nature conservation backed by good science. He saw the chlorinated hydrocarbons (as they were then known), such as aldrin, dieldrin and heptachlor, as the most important candidates for research because of their persistence. From the outset, though, Norman wanted to demonstrate that the Nature Conservancy was not against pesticides *per se*. He saw that herbicides could be a valuable tool for curbing scrub growth in nature reserves, and so he set up two experiments to examine the side effects of treating cut stumps, in Wicken Fen and at High Halstow in Kent. I was involved with both of these where we compared the plant diversity and the soil faunas in replicated plots.

The next few years saw a burgeoning of research staff at Monks Wood. Norman put together a multidisciplinary team of zoologists, botanists, toxicologists and chemists. The personal affection and unified efforts that he generated made the station one of the most stimulating and productive research environments in the country. He was acutely aware that agriculture itself was changing the face of the countryside through the loss of hedgerows, and that one must evaluate this against the use of pesticides. He appointed Max Hooper and Ernie Pollard to look into this question and set up a series of experimental hedges in the fields beside Monks Wood, which were used to study nesting birds and insect colonisation in relation to hedge management – and years later to study spray drift. Together they wrote a New Naturalist book on hedges, the first comprehensive study of one of the most important agricultural habitats.

In 1965 he obtained funding from NATO for an international conference on pesticides and wildlife at Monks Wood. The topic had now become international news through the publication in 1962 of Rachel Carson's seminal book *Silent Spring*, but this was the first time that many scientists in America and Europe had met each other. Norman's main role during the following years was feeding the results of his team's research into the government's interdisciplinary Advisory Committee on Pesticides. It took years of constant argument to persuade the committee that DDT and other organochlorines should be phased out 'on the precautionary principle': one could not wait for absolute proof before taking action. Derek Ratcliffe's independent work on the effects of DDT on eggshell thinning and on the consequent decline of the peregrine falcon was

immensely significant at this juncture in persuading the government to take action, though even these results faced violent criticism from vested interests.

Concerned over the widening gulf between farmers and conservationists, Norman organised a conference at Silsoe in 1969 and helped to found the Farming and Wildlife Advisory Group (FWAG), encouraging farmers to make the most efficient use of their land while protecting wildlife interests. Gradually, several regional Advisors were appointed and Norman became the first chair and judge for the Silver Lapwing Award for conservation.

Norman always believed strongly in the value of constantly talking over research ideas and policy questions with other members of staff during informal times such as lunch breaks. This often occurred while walking along the southern edge of Monks Wood, and it was during these walks that he started making regular counts of butterflies. His 'butterfly transects in a linear habitat' were subsequently developed by Pollard and widely adopted in the country-wide Butterfly Monitoring Scheme. Likewise, he initiated a study on the numbers of bird species in relation to woodland size. Ever open to new initiatives, Norman spotted an opportunity to monitor the effects of building the new town of Bar Hill on the fauna and flora, and the results of his 23-year study were published in this journal in 1990. He continued his interest in dragonflies with the digging of 20 ponds at Woodwalton Fen to study colonisation and published the results of a long term study in 1991 and 2001; and when he retired, he asked for a large pond to be dug in his field at Swavesey, which provided information for his last book *Oaks, dragonflies and people*.

Meanwhile Janet Moore had joined New Hall (now Murray Edwards College), Cambridge, in 1971. She was a world authority on nemertine worms, and wrote an acclaimed textbook *An introduction to the invertebrates*. She loved teaching and her warmth, enthusiasm and dedication as Director of Studies and Senior Tutor at New Hall, and provider of informal pastoral care to graduate students, made her a greatly loved figure. She died in 2014.

In 1973 the Nature Conservancy was split into a government advisory body, the Nature Conservancy Council (NCC), with land management and advisory responsibilities, and a research body, the Institute of Terrestrial Ecology, under the Heath government's 'customer – contractor' principle. Norman fought hard against this as he believed passionately that the two should go together. Within the new NCC Norman was given a specially created post as Chief Advisory Officer until he retired in 1983. Here he produced guidelines on the designation of sites of special scientific interest (SSSI), which still underpin the protection of sites in the UK, and he developed the NCC strategy towards agriculture, which strongly influenced the shape of the Wildlife and Countryside Act of 1981.

On retirement, Norman was offered an OBE but considered that this was inappropriate for a civil servant 'just doing his job'. He published his personal philosophy towards science and nature conservation as an obligation to future generations in *The Bird of Time*, which was runner up for the Sir Peter Kent Conservation Prize in 1987. He chaired meetings of the Odonata specialist group in the IUCN Species Survival Commission, and locally of the Wicken Fen management committee. Here his long knowledge of the fen was critical in

setting proposals in a historical context. Laurie Friday, who succeeded him as chair, says that ‘he steered the Committee through some distinctly bumpy times with an authority that was extraordinarily wise and gentle, but also firm and decisive’. He was very keen to re-establish Water-soldier (*Stratiotes aloides*) and then the Norfolk Hawker (*Anaciaeschna isoceles*) at Wicken. The rest of the committee considered this doubtful but he ‘pursued his dream right to the end of his long and wonderful life’.

Norman and Janet remained our close friends for 55 years. They are survived by three children and eight grandchildren. I thank Jeremy Greenwood, Ernie Pollard, Laurie Friday and William Foster for their contributions to this obituary.

Brian N. K. Davis

Select bibliography (compiled by B.N.K. Davis and C.D. Preston)

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Brian O. C. Gardiner: (1923-2014)

Many readers of *Nature in Cambridgeshire* will remember Brian Gardiner for his perennial presence at the CNHS *Conversazione*; what number of children fell under the spell of his kindly owl-like gaze and avid enthusiasm for anything from the insect world? Fewer readers will have known his immense contribution to entomology, locally (for over 50 years) and nationally (over a long lifetime); he died recently in Cambridge aged 91. To those lucky enough to remember him, Brian Gardiner fully bridged that gap between those avid Edwardian butterfly and moth collectors and our present anxious conservation endeavours. In these activities he was not one to lose enthusiasm or dedication.

Born in Enfield in 1923 he benefited from a good schooling. He published, when aged only 16, his first note in *The Entomologist* on his observations of the *Convolvulus* Hawk-moth. During the War years (1941-45) he studied medicine at St Bartholomew's Hospital, but declining a career in medicine on graduation, went straight to a junior post at the British Museum of Natural History under Norman Riley. This introduced him to entomological publishing and the curation of insect collections. Professor Sir Vincent Wigglesworth then invited him to Cambridge in 1951, where he worked under the auspices of the Agricultural Research Council Unit of Invertebrate Chemistry and Physiology, initially in Storey's Way and later on the top floor of the Department of Zoology. It was from there that, in his own time, he became an 'amateur'

authority on the lepidoptera of Cambridgeshire and, in particular, of Monks Wood and Wicken, Holme, Chippenham and Woodwalton Fens.

The 'B.O.C Gardiner' of innumerable entomology records was, most of all, a genial and courteous family man who just adored his pursuit of natural history. He was also a talented and industrious scientist whose scholarship and recording enthusiasm for everything to do with insects was, in his time, well known. He was not only an accomplished lepidopterist, recorder, editor and collector but also known for his work in insect taxonomy, museum curation and, importantly, insect livestock husbandry and culture. In so doing, he also tackled professional entomological challenges in the fields of pest control and conservation. He wrote many papers, having acquired a detailed knowledge of pertinent aspects of insect physiology, genetics, virology and pest control. Of his 238 listed publications some 26 related to Cambridgeshire entomological records, including four contributions in early numbers of this journal, the most important being those in 1958 and 1963. Those were the days, more than 50 years ago, of netting and collecting, long before our present ease with photographic recording, and before the British Butterfly Conservation Society (now *Butterfly Conservation*) was even born. Brian Gardiner served on the scientific committees involved in the management of many Nature Reserves, including Woodwalton and Wicken, and on the Council of CambIENT (the Wildlife Trust). He was very proud of having successfully reared the Swallowtail butterflies that were used in the earliest attempts at that species' recovery at Wicken; although these released insects bred, in the wild on the Fen, they did not persist long for want of Milk Parsley for egg-laying females. All such attempts have so far defied success. He would urge us now not to give up.

For one butterfly, the Large White (*Pieris brassicae*), Gardiner would have been the world's acknowledged 'Mastermind' winner. This species was the exclusive subject of 41 of his scientific papers. The Large, or Cabbage, White is of course an economic pest and one to cause both oathing and loathing amongst allotment holders - viewing with dismay their denuded brassicas. He studied not only pest control of the Large White, by means of viral pathogens, parasitoid wasps and insecticides, but also that species' own genetic variants, including interestingly the rare gynandromorphs - the adults being a mosaic of male one side and female the other. He was the authority on the global spread of this pest species, to the Americas, even publishing one such paper written in Japanese, for a Tokyo entomology journal, on an irruption of the Large White in Chile! To carry out many of his researches and to supply University practical classes year round he became expert on feeding larvae with substitutes for cabbage leaves, in the understanding and breaking of the dormancy of pupae and in devising imitation perspex 'flowers' to supply the needed sugar for the adult nectaring butterflies. With Dame Miriam Rothschild he co-authored four papers on pigments and toxins in butterfly pupae. He was well aware that the colour feeding of butterfly larvae could produce variable colours in the imago; this was something exploited by unscrupulous salesmen, whom he delighted in exposing when they tried to convince the ignorant of their 'discovered' and pinned

butterfly ‘rarities’. This did not stop him from breeding his own discovered *genuinely* yellow, blue and albino Large White mutant varieties.

In the 1960s *Pieris* became a study organism nationally for many schools studying Nuffield Biology. Doubtless, Brian Gardiner must have experienced some conflicts of time allocation as he also operated an insect supply business from his garden shed (Cambridge Biotech Supplies) - rearing locusts, cockroaches and silk moths, as well as butterflies. He was once able to supply as many as 30,000 larvae for one school practical examination. In the summer of 1969, Gardiner, the quiet but immensely busy ‘butterfly man’, achieved one moment of popular celebrity. During a memorial gig for the deceased *Rolling Stones*’ guitarist Brian Jones, Gardiner, at a pre-arranged signal from Mick Jagger, personally released, from a number of large cardboard boxes below the stage, 3,000 Large White butterflies which took off into the vast pop-concert crowd in Hyde Park!

Brian Gardiner was an avid collector of entomology books and latterly became a skilled bookbinder. Although he sold many of his books on e-bay, late in life, he was not constrained from buying an almost equal number that he could not resist.

In his earliest paper in *Nature in Cambridgeshire*, **1**. pp 21-24 (1958), he recorded the loss of ‘some 60 species’ from the Cambridgeshire Lepidoptera list over the previous century (1858-1958). Although the losses included many fenland moths, the brunt of the loss was borne by the butterflies, with the local extinction of 19 out of 59 species. Of the 40 species of county butterflies supposedly then remaining (in 1958) we now have 36 species (2016). Conservation of course need not be a losing game. Field, Perrin, Bacon and Greatorex-Davies (2006), who acknowledged the early work of Brian Gardiner in this relatively recent *Butterflies of Cambridgeshire*, paint a picture of a decelerating rate of decline and even possibly some reverses (see also ‘Woodland Butterflies’, in this issue, page 15). The enduring sadness for all naturalists is that both the loss of those larval food plants (upon which Gardiner was an expert) and the indiscriminate use of insecticides still impoverish our fauna today.

Brian Gardiner’s son, Chris Gardiner, is currently the Senior Reserves Manager, for Natural England, for three of our county’s National Nature Reserves (Castor Hanglands, Barnack Hills & Holes and Monks Wood). I gratefully acknowledge his help in my writing this obituary on his father.

Stephen P. Tomkins

BOOK REVIEW

Cuckoo. Cheating by Nature Nick Davies Bloomsbury Publishing 2015
Hardback. 320 pages. ISBN 9781408856567. £16.99. (2016 Paperback. 320
pages. ISBN 9781408856581. £9.99)

There is a lot of science, a lot of natural history and a lot of Cambridgeshire in this narrative. It is a book for anyone interested in the interplay of Cuckoos and their brood host birds. It has a lot to do with Cambridgeshire as the author has spent much of his academic life unravelling the world of Cuckoos and Reed Warblers at Wicken Fen; hence the fen looms large in many of the chapters.

Reading this book will not teach you much about Wicken Fen, but it will reveal, through the reeds swaying along the water's edge at Wicken, how the Reed Warbler becomes host to the enormous chick of the Cuckoo, forfeiting the chance to rear any of its own young that season, how the Cuckoo chick hatches at the right time to remove the Reed Warbler brood and gain the sole feeding rights of the parents and how the female Cuckoo is an ace nest-finder, watching patiently the egg laying activities of the Reed Warbler in her territory, waiting to lay her egg in that nest at just the right time. The experiments looking at how similar a fake or cuckoo egg has to be to that of the reed warbler are amazing - it seems that the warbler needs the whole clutch to be able to compare them all to look for an odd one - at the stage where there are only two eggs, it cannot tell, but given five or six to compare it appears that the warbler finds it easier. The constant evolution of patterning on eggs within host species such as Reed Warbler and Meadow Pipit and alongside that of the Cuckoo shows that the host bird is probably more aware than we initially thought that the potential for cuckoo eggs to appear in their nest exists. Dunnocks apparently, with their plain, bright blue eggs, do not notice or care if a spotty brown egg of about the same size is put in their clutch of eggs - Nick will tell you why if you read the book. The key to all of these events is that the Cuckoo (or experimenting scientist) has to remove one of the host's eggs - birds can count - they KNOW how many eggs they are supposed to have; adding an extra one will cause them to abandon.

It is written in an easy style, taking the reader on a journey through the life of the Cuckoo, and you are barely aware that you are reading about one of the experiments conducted by Nick and colleagues, or the original discoverer of Cuckoo habits, Edgar Chance in the 1920s, such is the skill of weaving the subtle fake egg experiments and many other pieces of research into the tale.

Inevitably, the book does move away from Wicken for a while, partly to look at the other habitats and host species used by the Cuckoo, such as moorland Meadow Pipits, where the same general principles of Cuckoo parasitism apply, and more importantly to look at Africa, where the British Cuckoo spends the winter, but where there are also other cuckoo species utilising hosts.

There are many other fascinating insights into the world of the Common Cuckoo and its relatives within this book, and also some amusing anecdotes, such as attracting the attention of the local police whilst behaving suspiciously

on a moorland site – it is clearly not easy to explain that you are not an egg thief but are in fact adding eggs to nests - well, does that sound likely to you?

The book finishes with some of the pioneering research underway using modern satellite technology, which is helping to reveal the migration routes of the Cuckoo across Europe and Africa, and where the issues of survival are occurring. The sad fact that the Common Cuckoo is no longer common, especially at Wicken Fen where diminishing numbers of returning females are making Nick's research harder, is something we are all starting to become aware of.

Cuckoo was voted best bird book of the year by the British Trust for Ornithology and British Birds journal, and is one of the most well-written narratives bringing a fascinating piece of science understandably to a wide naturalist audience. And much of the research was done in Cambridgeshire, at one of the best studied Fens in the county.

Louise Bacon

ANNOUNCEMENT

A Natural History of Cambridge

Mark Hill

Introduction

The natural history of British towns is full of interest (Fitter, 1945; Goode, 2014; Trueman, Poulton & Reade, 2013). The city of Cambridge includes grand buildings, new and old houses, streams, lakes, gardens, recreation areas, the river Cam, and many other features. Articles on aspects of the city's natural history have appeared in *Nature in Cambridgeshire*, but there has never been an overview.

In 2015 the Cambridge Natural History Society (CNHS) decided that the time was ripe for a substantial project to fill this gap. Starting with a discussion in December 2015, the project has begun to take shape. It is non-political and will not be used as a platform to campaign on issues related to site protection or environmental benefit. It has two main objectives.

To create a snapshot of the flora and fauna of Cambridge City and its immediate environs in a historical context.

To increase public awareness of the diversity of plants, animals and fungi in the city.

The study area is an 8 km square centred on the junction of Mill Road and Covent Garden (grid reference TL460580). It is bounded in the north by the A14 and in the west by the M11. It includes Trumpington in the south and Cherry Hinton in the east. The 64 1 km squares in the study area are named according to prominent features (Figure 1).

Project outputs

Recording will run to December 2019, after which books and papers will be

written. Records from the decade 2010-2019 are the main focus, but earlier records will provide historical background. Videos of Cambridge wildlife, a bibliography of Cambridge natural history and a database of species records will be prepared on the way. We intend to produce one relatively long book of 110,000 words aimed at a readership with some knowledge of natural history, and another shorter book for non-specialists.

TL4261 Girton S, Girton Coll N, A14	TL4361 NIAB land, A14	TL4461 Orchard Park, King's Hedges Sch, allotments	TL4561 King's Hedges Rec Grnd, Camb Regional Coll	TL4661 Science Park	TL4761 Sewage Wks, railway sidings	TL4861 River S of Baits Bite	TL4961 Horningsea farmland
TL4260 NW Cambridge Site, Girton Coll S	TL4360 Girton SE & NIAB	TL4460 Arbury W, Histon Road	TL4560 Arbury E, N Cambridge Academy	TL4660 Chesterton	TL4760 Ditton Meadows, river, new rail station	TL4860 Fen Ditton	TL4960 A14, farmland
TL4259 Conduit Head, Madingley Road P&R	TL4359 Ascension Burial Grnd, Chrchill Coll, Obsrvatries	TL4459 Castle Hill, Jesus Grn W	TL4559 Midsummer Common, Jesus Grn E	TL4659 Stourbridge Common	TL4759 Stourbridge, Ditt Mdows, Barnwell Lake	TL4859 City Cemetery	TL4959 Newmarket Road P&R
TL4258 Coton Footpath & Countryside Reserve	TL4358 Adams Rd, Cavendish Laboratory	TL4458 City centre and Backs	TL4558 Christ's & Parker's Pieces, Midsummr C	TL4658 Mill Rd Cemetery	TL4758 Coldham's Common	TL4858 Airport	TL4958 Teversham
TL4257 Laundry Farm	TL4357 Newnham, Bolton's Pit	TL4457 Sheep's Green, Coe Fen, Lammas Land	TL4557 Botanic Gdn, Newtown, Downing Coll	TL4657 Rail station, Coleridge Rec Grnd, Clifton Rd	TL4757 Cherry Hinton Brook, TA Pit	TL4857 Coldham's Lane, lakes	TL4957 Cherry Hinton, Teversham
TL4256 Grantchester to M11	TL4356 Grantchester Meadows	TL4456 Camb Lakes Golf Course, River Farm	TL4556 Empty Common	TL4656 Homerton Coll, Cherry Hinton Rd W, allotments	TL4756 Cherry Hinton Rd E, St Bede's Sch	TL4856 Cherry Hinton W, Cherry Hinton Hall	TL4956 Cherry Hinton E, Fulbourn Hospital
TL4255 Grantchester W, M11	TL4355 Grantchester E	TL4455 Trumpington Hall and village	TL4555 Clay Farm N, Long Road	TL4655 Addnbrke's, Nightingal Pk W, Perse Sch	TL4755 Nightingale Park E, Netherhall Sch	TL4855 East & West Pits	TL4955 Peterhouse Technology Park, farmland
TL4254 Cantelupe Farm, M11, Bourn Brook	TL4354 Byron's Pool, Trumpington Meadows	TL4454 Trumpington S, P&R, Anstey Hall	TL4554 Clay Farm S, incl. country park	TL4654 Nine Wells	TL4754 Babraham Rd P&R	TL4854 Beechwood, Gogs Golf Course W	TL4954 Roman Rd, Gogs Golf Course E

Initial naming by Louise Bacon, with subsequent tweaks by Mark Hill

	Cambridge city
	Cambridge city with some countryside
	Countryside outside city

Figure 1. Monads (1-km squares) of Cambridge, with grid reference and short names
Organization and publicity

The project will be fronted by a website and online database, with publicity generated by a Facebook page and Twitter account. We shall use the abbreviation NatHistCam and have registered the name

www.NatHistCam.org.uk. The project will be launched at the CNHS Conversazione 2016. We have an informal committee: Louise Bacon, Rosie Earwaker, Monica Frisch, Mark Hill, Bob Jarman, Duncan Mackay, Chris Preston and Jon Shanklin. We shall expand this by co-opting new members and setting up a panel of specialists.

For further information, visit our website or e-mail info@NatHistCam.org.uk.

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Weather Notes from Cambridge University Botanic Gardens for 2015

Sally Hughes

January threw us some cold weather and some surprisingly warm days. With the dawn of the new year, the first few weeks were very standard - mild, damp and altogether very average for January. However, the latter end of the month saw some severe frosts, snow showers and even some storms passing through. Though Cambridge got off lightly in regards of snowfall in comparison to the rest of the UK, we still managed four snowy days and two days when the snow lay on the ground, though it was very shallow and melted quickly.

We also had one storm pass through which meant that the Garden had to close for a few hours on the 28th. This brought extremely strong winds, thunder and hail. Though it passed through very quickly, wind gusts regularly exceeded 40mph for another hour after the storm passed and one small tree was blown down. The cold weather brought some severe frosts throughout the month and, overall we had 13 air frosts and 22 ground frosts, the hardest on the 23rd where we had -5.5 in the air and -9.8 on the ground. Rainfall was very average at 46.7mm.

February was an average month overall. We had average maximums between 11.5°C and 3.4°C, minimums between 6.2°C and -2.6°C and rainfall measuring 31.0mm. These all created a very average month. We had 10 air frosts and 22 ground frosts. However we did get some snow! Snow fell on three days in the first week of February, and lay on the ground for two days. The heaviest snowfall measured 3.8cm

March was a moderately dry month with rainfall of 19.1mm which is under the monthly average of 38mm. Along with the dryness, we had several instances of high winds over 40mph and the garden had to shut, both at the start of the month and the end. This persistent wind, coming predominantly from the northwest, kept most days fresh, though there was a scattering of days where the maximum reached above 10°C, the highest being on the 8th at 17.0°C. We had 14 ground frosts and five light air frosts.

April was a warm month with little rain. We only had 20.4mm of measurable rain falling over just ten days. This lack of rain saw the ground dry and sometimes cracked for the latter half of the month. Though we had 10 ground frosts, the coldest being -3.2°C , we escaped any air frost. The highest maximum recorded was on the 16th with 23.4°C .

May was a mild and average month. We had warm days with moderate rainfall and a couple of brief gales. The two occurrences of gale force winds were on the 5th and 6th of May.

On the 19th a squall hit the Garden bringing some thunder and hail, though this was short lived.

Our last ground frost of the spring came on the 21st, reading -0.1°C and our highest maximum was on the 11th with 21.7°C . Our total measurable rainfall was 43.4mm which fell over 16 days.

June was a fine, dry month that had very little rain. We measured 14.5mm over 10 days, the largest recording being 3.1mm on the 4th. Our highest maximum temperature reading was on the 30th with 28.6°C , however we did have cooler days and our lowest maximum was read on the 13th with 15.0°C . Our lowest minimum was 4.9°C on the 7th and the highest minimum 14.2°C on the 13th.

July, in contrast to June, was a very wet month with mixed weather and fluctuating temperatures. We had 152.8mm of measurable rain that fell over 14 days, and three instances where the rain measured was in double figures: 11.3mm was recorded on the 3rd, 31.2mm on the 24th and a whopping 87.1mm was recorded on the 16th that mostly fell overnight in an isolated thunder and hail storm. We had one other instance of thunder on the 4th. The hottest day of the year was on 1st July, when we recorded 35.0°C . This is very close to the Garden's own record high for July of 35.6°C . However, the temperatures fluctuated a lot and we recorded a maximum of only 17.1°C on the 26th. Our highest minimum was on the 4th with 16.9°C and the lowest minimum at 6.0°C was noted on the 31st.

August was a slightly wetter than average month with 66.9mm of measurable rain recorded over 14 days. There were two recordings of rain that measured double figures: 10.5mm on the 13th and 10.9mm on the 24th. We had our highest minimum recording of the year with 18.4°C on the 21st of the month; the lowest minimum of 8°C occurred on both the 1st and the 28th. Our highest maximum on the 22nd was 29.9°C and the lowest maximum was 19.2°C on the 18th.

September was a slightly cooler than average month with some days reaching only 15.1°C as a maximum and 2.9°C as a minimum, however, our highest maximum recorded was 22.1°C on the 11th and again the 13th.

We had 13 days of measurable rain totalling 43.9mm, which is only slightly below average. One rainfall was particularly heavy on the 17th in which 20.4mm was recorded. We had one instance when thunder was heard in the distance on the 2nd, though this did not pass our way.

October was a dry and mild month with 43.1mm of measurable rain over 13 days, most falling on three occasions: the 6th, 7th and the 20th. The mild

weather gave us an average maximum of 15.5°C, with our overall max 19.6°C. However we did have our first touches of ground frost on three occasions, the lowest being -2.0°C on the 25th. The air minimum fluctuated between highs of 14.6°C and lows of 1.5°C, creating an average of 7.5°C, so cooling was at a steady slow rate.

November was a very mild and windy month with several gales and few frosts. We had eight recordings of gale strength on the 9th, 12th and 13th, 15th, 17th, 18th and 19th, 29th and 30th. During these winds there was some tree limb damage throughout the garden. The temperatures were mostly very mild with an average maximum of 13.5°C and high of 17.4°C, while our average minimum was 6.5°C. We had three air frosts and seven ground frosts, the coldest reaching -3.6°C in the air and -7.1°C on the ground. There was one snow day on the 21st, however the flakes mixed with rain and didn't settle. We had an average amount of rainfall, 55.4mm that fell over 22 days.

December was one of the mildest Decembers on record with an average amount of rain and only four light ground frosts. On the 18th, we had our highest maximum of 16.0°C which is our very own record high for December since records began in 1910. This is over 8°C warmer than our average high (7.7°C). We had only four slight ground frosts, the coldest being -3.2°C on the 9th. There were no air frosts and our minimum air temperature was 2.6°C, also on the 9th. While the rest of the UK experienced major flooding and unrelenting rain, Cambridge and East Anglia escaped with just 48mm of measurable rain, falling over 18 days.

This brought our year's total of rain to 577.1mm which is an average amount of rainfall for the Botanic Garden.

	Mean max temp		Mean min temp		Max temp	Min temp	Rainfall		Rain days >1mm	
	(°C)	<i>diff</i>	(°C)	<i>diff</i>	(°C)	(°C)	(mm)	<i>diff</i>	No.	<i>diff</i>
January	8.3	1.0	0.8	-0.8	14.8	-5.5	46.7	0.1	13	2
February	7.8	0.1	1.2	-0.1	11.5	-2.6	31.0	-3.5	8	0
March	11.5	0.9	3.0	-0.1	17	-2.0	19.1	-19.2	5	-5
April	15.8	2.5	4.0	-0.3	23.4	0.0	20.4	-20.8	5	-4
May	17	0.1	7.1	0.0	21.7	0.6	43.4	-2.6	9	1
June	21.1	1.2	9.7	-0.5	28.6	4.9	14.5	-37.0	6	-3
July	23.2	0.4	12.1	-0.3	35.0	6.0	152.8	105.3	9	2
August	22.7	0.1	12.6	0.2	29.9	8.0	66.9	16.1	10	3
September	18.6	-0.7	7.9	-2.5	22.1	2.9	43.9	-9.6	8	-1
October	15.5	0.6	7.5	-0.1	19.6	1.5	43.1	-15.9	7	-2
November	13.5	3.2	6.5	2.3	17.4	-3.6	55.4	2.6	15	5
December	13.4	5.9	7.5	5.6	16	2.6	48.0	1.6	12	2
2015	15.7	1.3	6.6	0.2	35.0	-5.5	584.1	16	107	-1

The 'diff' columns show the difference between the 2015 value and the 1971 – 2000 mean.



Plate 3. Plantlets on wilting Orpine (*Sedum telephium*) stems. See article on page 76. (Photograph: Monica Frisch)



Plate 4. The moss *Plagiomnium ellipticum*, seen in Cambridgeshire in 2015 for the first time for over 60 years. See article on page 98. (Photograph: Stephen Tomkins.)



Plate 5 Little Owl (*Athene noctua*). A hole-nesting species that uses old orchard trees. See article on page 59. (Photograph: Val Perrin)



Plate 6. Red-belted Clearwing (*Synanthedon myopaeformis*). A species associated with old apple trees. See article on page 59. (Photograph: Nigel Russell)