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Plate 1. Flowering Fen Violet (*Viola persicifolia*) surrounded by Fen Violet seedlings, on a sunny day at Wicken Fen NNR, Cambridgeshire. 3 June 2014. See article on page 91.



Plate 2. Mossy Stonecrop (*Crassula tillaea*) recorded during the CNHS survey 2014. See article on page 115.

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Cover Illustration: Bracket fungus (*Ganoderma applanatum*) galled by the Yellow Flat-footed Fly (*Agathomyia wankowiczii*). Photograph by the late Oliver Rackham. See obituary on page 143 and article on page 141.

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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)

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EDITORIAL

This year's journal begins with a major review of the flora of Chippenham Fen, by our regular contributor of botanical records (and joint BSBI vice-county recorder), Alan Leslie. This important paper means that we have a much larger issue than usual and we are grateful to Natural England for financial assistance.

In other botanical articles Stephen Tomkins describes the plant community restoration work that continues at Kingfisher's Bridge, and Peter Stroh and colleagues cover the re-appearance of the Fen Violet at Wicken Fen, and the re-introduction of Interrupted Brome in the south of the county. James Cadbury describes the status of Woolly Thistle in the county.

We have two more parts of the Fleam Dyke Invertebrate survey, on Auchenorrhyncha and on Spiders by Jo Darlington and colleagues.

Steven Allain and Mark Goodman write about their 2014 amphibian survey.

Jonathan Shanklin reports on the CNHS 2014 survey work, and Henry Tribe details the early years of the CNHS.

Mark Powell writes of the recording done by the Cambridge Lichen Group and some of the problems lichenologists encounter.

We have the regular reports on Vascular Plants, Bryophytes and Invertebrates, and Book Reviews, Weather Report and Obituaries. The obituaries include one for Ray Symonds, a contributor to this journal and past member of the Editorial Board, and one for Oliver Rackham, whose last book, *The Ash*, is reviewed in this volume. One of his photographs, taken shortly before his untimely death, appears on the front cover

We still need to increase our distribution list (the more copies we sell, the easier it is to keep the journal in a good financial state). Please try and recommend us to anybody you think may wish to become a subscriber, or who has an interest in the natural history of the county.

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Annotated Checklist of the Flora of Chippenham Fen

Alan Leslie



Chippenham Fen lies in a shallow depression, in a triangle formed by the villages of Chippenham, Fordham and Snailwell, and is separate from the main body of Cambridgeshire Fenland. Although the majority falls within the parish of Chippenham, both the other parishes have land within the Fen: Underdown Plantation (cpt 3) being in Fordham parish and the Poors Fen (cpt 4) in Snailwell. The site covers c.115 hectares and has been a National Nature Reserve since 1963; it has long been notified additionally as a Site of Special Scientific Interest, was made a Ramsar site in 1992 and a Special Area of Conservation (SAC) in 2005. It is currently managed by Natural England and is renowned in particular for its vascular plant flora and the associated very rich invertebrate communities.

The Fen is underlain by the Lower Chalk, with a basal chalk marl overlain by an extensive area of Totternhoe Stone, which unlike the marl is well-jointed and permeable and is the source of the springs on the Fen; it is itself exposed in one spot in a ditch along Pigeon Ride. In some areas the Totternhoe Stone is overlain by Grey Chalk. Over this solid geology is a layer of drift from 1-3m in depth, consisting of a chalky downwash or head, which is usually rather dry, in contrast to the overlying peat deposits. The peat, which varies in thickness from a few centimetres to a maximum of c.2m (much shallower than at Wicken Fen), lies directly on the head along the southern and eastern borders of the Fen, but in other areas there is an upper peat layer at the surface, overlying a marly clay which in turn lies above a drier lower peat layer (this account is adapted from Mason, 1990). Parts of the north-western fringe of the Fen are covered by river terrace sands and gravels overlying a bed of Upper Chalk, and these have an important influence on the flora of this part of the Fen.

The Fen is drained to the south-west, across to the River Snail, by the rather grandly named Chippenham River, which runs through the northern part of the Fen having entered from the north-east; it rises as a spring in the lake in Chippenham Park. There are also several springs arising on the Fen, most notably on the southern margin just south of Bullock Hill. Mason (1990) demonstrated that, with few exceptions, the water levels in the current system of ditches throughout the Fen may have little direct effect on the water levels within the compartments, except in areas adjacent to the watercourses themselves. The water table in the bulk of the compartments is largely determined by precipitation and the water retentive abilities of the peat.

The Fen as we see it today was largely shaped by the work undertaken for Thomas Tharp, who had purchased the Chippenham estate from the Earl of Orford in 1791. He commissioned extensive drainage works on the Fen, which are said to have lowered the water levels by 1.5m, and planted mostly coniferous trees over significant areas, notably the areas we see now as Forty Acre Wood and the Jerusalem Plantations. In a letter from Tharp to his son, written in 1803, we can get a glimpse of what he was hoping to achieve, as he says 'If I am right there are many spruce firs planted in the Fen and more will hereafter be there when I return [he was writing from his extensive sugar plantations in Jamaica], but we must have other trees to give beauty and profit to that creation, which when mature will give ample room and cover for all the pheasants Chippenham can support' (taken from Mowl & Mayer, 2013). The conifers did not prosper, although a few remaining Norway Spruce (*Picea abies*) and perhaps some of the Scots Pine (*Pinus sylvestris*) may derive from this period of planting, together perhaps with some oaks and a few other trees and shrubs. There were probably later plantings as well, but at present there seems to be little information about this. More of the past history of the fen drainage and its vegetation can be found in Kassas (1951, 1952), where it is evident that over the years the maintenance of the ditches has waxed and waned. Thus at the end of the nineteenth century, at the end of a period of agricultural depression, the Fen may have been quite a bit wetter than we see today. This is suggested by comments made by H. J. Riddelsdell when he visited the Fen in August 1903 to see the Cambridge Milk-parsley (*Selinum carvifolia*), noting that he 'came across it several times...when 50-75 yards distant from the edge of the fen on wading in 18 inches to 2 feet of water' (Riddelsdell, 1904). Today water levels in the ditches at least are controlled by a sluice on the river and several bund dams in the ditches with associated overspill culverts. There have been concerns about the effect of water abstraction elsewhere in the chalk aquifer reducing the level of flow into the Fen and subsequently there has been an agreement with the Environment Agency which allows aquifer water to be pumped directly into fen ditches along the southern boundary of the Fen.

In the past the Fen was used as a source of at least peat, litter (*Molinia caerulea*) and fen hay, as well as a source of sedge (*Cladium mariscus*), but today only the beds of sedge are harvested and taken as a crop for use in thatching. The North and East Meadows have been used for grazing, but the remainder of the Fen was often too wet for grazing and bones of animals lost in the Fen were unearthed at the time the ditches were first dug. Current management is largely a combination of mowing and grazing, together with some scrub clearance. The rides are regularly mown throughout the season. Ride margins, however, do not get quite so much attention as they might deserve and are now often dominated by Common Reed (*Phragmites australis*), which it is clear would cover most of the Fen if left entirely to its own devices! Those ride margins that do get intermittent mowing (or a combination of mowing and grazing), such as the Baxter Rides, are exceptionally rich botanically. Some areas within most compartments are mown each year, whilst grazing by the small resident herd of water buffalo aids vegetation control in the North and

East Meadows (cpts 1,2 and 13), in the former litter fields of cpts 8,9,10 and 11, as well as in one section of Forty Acre Wood in cpt 7. The buffalo have been on the Fen since 2001. The North Meadow (mostly cpt 1) is also grazed in the summer by a small herd of Suffolk redpoll cattle. Rabbits are additionally a significant factor along the higher ground along the north-west margin of cpt. 1, whilst Muntjac are frequently heard over most of the Fen and may have had a significant effect on some of the flora.

Each of the 13 Fen compartments has its own distinctive combination of features and this variation is reflected in the flora. However, one of the features shared by all the areas apart from Cpt 3, is the often irregular fen surface: there are lots of 'lumps and bumps', which in the list below are referred to as fen islands and these are of considerable importance to the diversity of the fen flora. Some of these derive from banks thrown up in the digging of the drainage ditches, others are the spoil heaps from the various ponds dug over the Fen – although the soil from the largest body of water, Malcolm's Pond, dug in compartment 4 in 1998, was spread out evenly on the surrounding fen. A much larger number of the 'islands' may however be the result of periglacial activity, of which there is considerable evidence over large parts of the south of the county. These processes may have resulted in the head deposits being displaced, resulting in what we now see as irregular mounds, sometimes barely higher than the surrounding fen, or in other cases (such as in cpts 1,9,10 and 13 in particular) as long, low, sinuous mounds. These areas are usually much drier than the surrounding fen and have a rich flora, often rather reminiscent of boulder clay grassland. In the North Meadow the higher ground along the north-west margins also extends down as fans or fingers of higher ground into the lower-lying fen and at least in part these have a strong contribution from the terrace sands and gravels forming the bank which extends beyond and above the Fen margin. At the south-western end of compartment 2 there is another long low bank which has traditionally been known as the 'chalk bank', although it is not clear if this is derived from the nature of its flora or a knowledge of its geology.

The Fen seems to have been little visited by our earlier botanists, and although both Relhan and Babington made a few records in the general area, it seems it was not until W.J. Cross (from Ely) found Cambridge Milk-parsley on the Fen in 1882, that serious attention was paid to its flora. Alfred Fryer and Arthur Bennett in particular made many records in the 1880s and Fryer's listings are often the source of first records for the Fen: he was clearly a careful and thorough recorder. Recording effort seemed to tail off in the early part of the twentieth century, but from the Fen archives it seems that more systematic attempts to record the flora began again in the 1950s and 1960s, notably with the particular interest taken in the Fen by Max Walters. This culminated in the preparation of the first formal (but unpublished) checklists of the fen flora compiled by Martin Musgrave (Musgrave 1977, 1980), the then Senior Warden. A later version of this list (certainly created post 1996) has been in use on the Fen recently, but it is not clear who produced it or exactly when it was put together. Over the last twenty years or so the Fen Management has commissioned a number of reports concerned at least in part with the flora of

parts of the Fen (e.g. Shaw & Wheeler, 1996, Smith & Harding, 2001, Spencer & Stone, 2009, Shaw & Tratt, 2014) and their records have been extracted for this list.

The Fen retains a notable flora, many of its wetland elements being shared with Wicken Fen. There are still large areas dominated by Sedge and Reed (referred to below in the list as tall herb fen) and other areas often dominated by extensive beds of Purple Moor-grass (*Molinia caerulea*), Blunt-flowered Rush (*Juncus subnodulosus*) or species of *Carex*, which are referred to in this account as open fen. The latter have often been described as fen meadows and such communities extend beyond the areas known as the North and East Meadows. For further details on the plant communities on the Fen see Smith & Harding (2001). The Fen holds certainly the largest and perhaps now the only site in the British Isles for Cambridge Milk-parsley. At a regional level it is notable, for example, for its healthy populations of Least Bur-reed (*Sparganium natans*) and Dark-leaved Willow (*Salix myrsinifolia*), both now essentially more northern taxa in the British Isles. The status of the willow is a matter for debate, but it seems a rather unlikely introduction as it has no evident ornamental or practical use. Here too are the only extant sites in the county for Marsh Willowherb (*Epilobium palustre*), *Luzula multiflora* subsp. *multiflora* and *Gymnadenia densiflora*, as well as by far the most extensive population of the Sweetbriar (*Rosa micrantha*). There are also significant populations of a number of locally uncommon sedges, notably Flea Sedge (*Carex pulicaris*), Slender Sedge (*C. lasiocarpa*) and Greater Tussock-sedge (*C. paniculata*), as well as of plants such as Saw-wort (*Serratula tinctoria*), Meadow Thistle (*Cirsium dissectum*), Marsh Fern (*Thelypteris palustris*), Fen Pondweed (*Potamogeton coloratus*), Bog Pimpernel (*Anagallis tenella*) and Black Bog-rush (*Schoenus nigricans*); here too is perhaps our only remaining native site for Bogbean (*Menyanthes trifoliata*). There is also a good list of scarce (or at least rarely recorded) hybrids. Chief amongst these is the previously unknown cross between *Apium nodiflorum* and *Berula erecta*. This was first brought to attention by Max Walters in 1979 and initially attributed to *A. repens*, a species not otherwise recorded in the county. Its poor pollen and lack of mature fruit subsequently led to it being treated as hybrid between *repens* and *nodiflorum*. Latterly it had been identified as a variant of *Berula erecta*! Now thanks to some elegant molecular work undertaken by Stuart Desjardins at Leicester University (Desjardins *et al.*, in press), we know the reason for our confusion.

Some significant species have been lost from the Fen over the years, in some cases probably reflecting the much wetter conditions prevailing at the end of the nineteenth century when they were first recorded and also subsequent changes in use and management. These include several species of Cottongrass (*Eriophorum* spp.) and Bladderwort (*Utricularia* spp.), Round-leaved Sundew (*Drosera rotundifolia*) and Fen Orchid (*Liparis loeselii*). Some locally very notable species persisted until much later e.g. Grass of Parnassus (*Parnassia palustris*) (1980), Marsh Lousewort (*Pedicularis palustris*) (1995) and Common Butterwort (*Pinguicula vulgaris*) (1995) and there is continuing hope that at least some of these might reappear. Nor has the very scarce, pale yellow-

flowered variant of *Dactylorhiza incarnata*, subsp. *ochroloeuca*, been seen on the Fen since 2004 and indeed this species in general now seems to be very scarce indeed on the Fen. Other losses have also occurred in the exceptionally rich communities on the 'chalk bank' in cpt 2 and on the higher ground along the north-western margin of cpt 1. The latter is usually heavily grazed, but in 2014 grazing did not commence until well into the summer which allowed several 'missing' species to be refound, so there is still some hope that plants such as the following may be seen again: Pyramidal Orchid (*Anacamptis pyramidalis*), Harebell (*Campanula rotundifolia*), Basil Thyme (*Clinopodium acinos*), Autumn Gentian (*Gentianella amarella*), Horseshoe Vetch (*Hippocrepis comosa*), Sainfoin (*Onobrychis viciifolia*), Mouse-ear-hawkweed (*Pilosella officinarum*), Burnet-saxifrage (*Pimpinella saxifraga*), Hoary Plantain (*Plantago media*) and Small Scabious (*Scabiosa columbaria*). In compensation for this rather gloomy list of absentees this area has seen more species added to the Fen flora in the current survey than any other!

The recording that forms the core of this report was informally commissioned in late 2011 by Chris Hainsworth, the current Senior Reserve Manager, and has resulted from numerous visits made to the Fen by the author during 2012-2014. I have tried to cover the whole of the area of the Fen, and at all times of the year, but have to admit that some areas of dense Sedge and Reed in compartments 4 & 5 have not had quite the same level of attention as others: these can be daunting areas to traverse, with uncertain footing and vegetation well over head height! Nevertheless I hope this report contains a reasonably thorough picture of the fen flora over this period. The distribution over the 13 Fen compartments given in the list below is based entirely on my records in this period, and the comments mostly refer to finds in this period. The list however also includes a note of any species ever recorded from the Fen and in doing so draws heavily upon the Musgrave lists and Gigi Crompton's magnificent *Catalogue of Cambridge Flora records since 1538* (Crompton, 2001, 2003, 2004 and on www.cambridgeshireflora.com). I have endeavoured to trawl other potential sources, but would welcome notice of any further records which have not yet come to light. A much more detailed set of individual records for many species at individual sites on the Fen has also been compiled during this survey and will also be lodged with the Fen archive. More work needs to be done to fully understand some of the variation encountered on the Fen. In particular the sometimes bewildering variation exhibited by species of *Salix*, *Ulmus*, *Betula* and *Agrostis* would benefit from further study, as would the populations of *Euphrasia* on the Fen. In addition little systematic work has been undertaken on the *Taraxacum* species present and these might well yield interesting results.

In all this list contains notes on 441 taxa that have been accepted as occurring on the Fen, with 403 being noted during the current survey. A further 24 records for other species have been rejected as known or probable errors.

I have attempted to give the date and the name of the recorder for the first record for each species on the Fen: these are listed in brackets after the species name. This poses some problems as many historical records which potentially could have been from the Fen are just listed as 'Chippenham'; these have

generally been omitted. In addition a number of the key early listings are undated: notably many of the records made by Fryer. There seems good reason to suppose that most of the latter were made in the 1880s, but if there was another, dated record, from that decade made by another recorder, then that has been preferred in this list. Some other undated listings might have been earlier than a Fryer record and I would welcome clear evidence of this to amend the list. Any species in the following list in square brackets is not accepted for the Fen flora. The decision to reject any record is not always an easy one and to some extent is a subjective choice based upon knowledge of the site, and of likely identification problems. I should be more than happy to have good evidence to reinstate plants that have been rejected below.

The boundaries of the area recorded are shown in Figure 1. It excludes the fields that adjoin the north-western border of the East Meadow (cpt 13), that part of Underdown Plantation which lies on the north-west side of cpt 2 and the woodland south-east of the ditch running along the south-eastern ride in cpt 11. Divisions between the compartments are taken as running either down the centre of the rides when there are ditches on both sides, or where relevant along the centre of the Chippenhan River; where a solitary ditch separates compartments, the division has usually been taken as being along the centre of the ditch e.g. between cpts 4 and 5 and between 4 and 9, as well as between 10 and 12. However, along the Baxter Rides the division has been run down the centre of the rides. On the exterior borders recording has generally been to the existing fence line, except in cpts 1 & 13 where it has extended to the ditch line along their north-eastern borders.

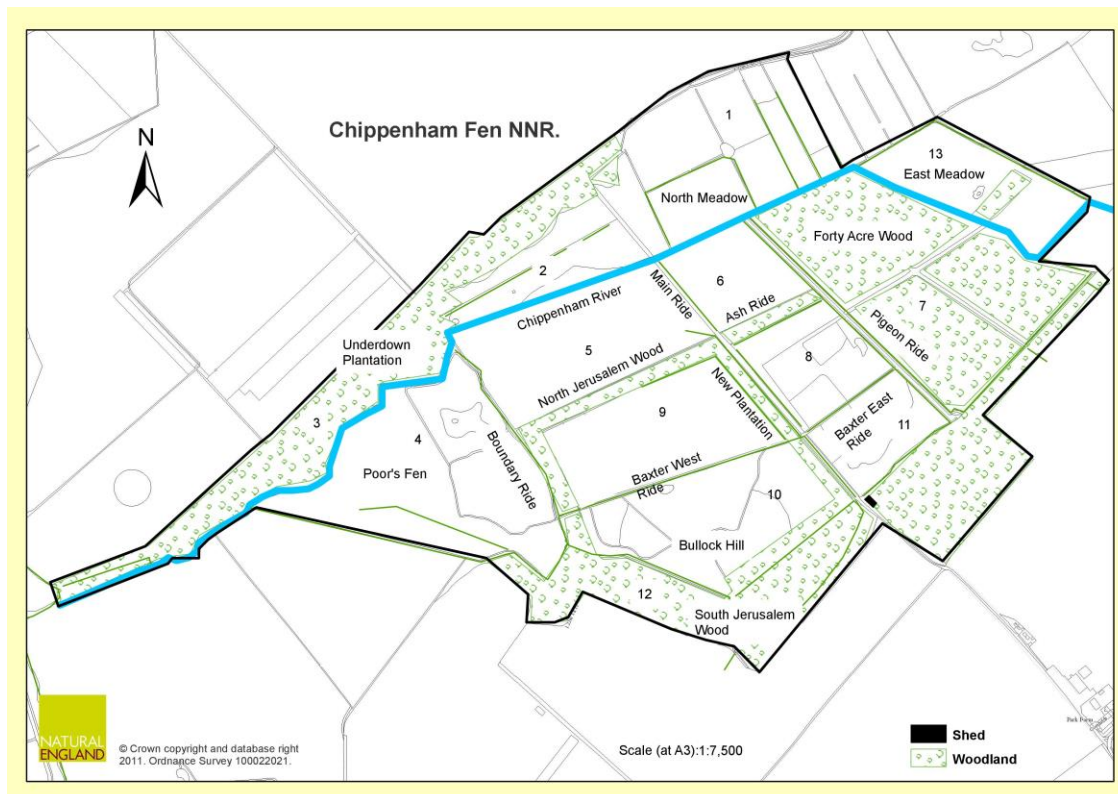


Figure 1 Map of Chippenham Fen, showing area covered with numbered compartments.

With a few deliberate exceptions the botanical nomenclature of this list follows Stace (2010).

If you would like to visit Chippenham Fen NNR then please note that apart from the public footpath running along the Main Ride, access is by permit only. Please contact Chris Hainsworth on 01638 721329 or email: chris.hainsworth@naturalengland.org.uk to discuss access.

Species list

Abies alba (M. Kassas, 1952)

Not seen in the present survey. Reported (as *Picea pectinata*) by Kassas from Forty Acre Wood, a relict of earlier plantings.

Acer campestre (Musgrave list, 1977) Cpt 6,8

Ten trees in woodland either side of Ash Ride; all those seen in fruit are the hairy-seeded var. *campestre*, one also having slightly upcurved wings to the fruit; another has conspicuous red wings in young fruit.

Acer pseudoplatanus (M. Kassas, 1951) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13

Common especially in the drier woodland, some probably planted but most self-sown; a serious woody weed in places; some on the higher ground in Underdown Plantation have noticeably broad and very shallow leaf lobes.

Achillea millefolium (Musgrave list, 1977) Cpt 1,12,13

Very local in drier grassland at wood margins and on some fen island, frequent only on the higher ground along the NW margin of cpt 1.

Aesculus hippocastanum (E.A. George, 1940) Cpt 3,7,10,12

Numerous trees in South Jerusalem Wood, a few scattered in other woodland; most planted but seedlings/saplings in South Jerusalem Wood and Forty Acre Wood.

- Agrimonia eupatoria** (S.M. Walters *et al.*, 1964) Cpt 1,4,13
Fairly frequent on the higher ground along the NW margin of cpt 1, a few on the Boundary Ride and several on the spoil heap for the pond in the East Meadow.
- [Agrostis canina**
Not seen in the present survey. A specimen collected by F.M. Norman in 1910 in the Berwickshire High School Herbarium has recently been redetermined by M. Braithwaite as *A. stolonifera*. The species was listed in Musgrave (1977) but replaced by *A. stolonifera* in 1980. It has been claimed again recently but requires further confirmation.]
- Agrostis capillaris** (Ecological Services Report, 1996) Cpt 1,2
Confined to the well-drained higher ground along the NW margin of cpt 1 and the chalk bank in cpt 2.
- Agrostis gigantea** (ACL, 2013) Cpt 1,2,4,6,7,8,9,10,11
Previously unrecorded but now known to be locally frequent, especially along the ride margins, on woodland borders, and on fen islands. It also grows on arable margins just outside the reserve. On the Fen it flowers at least a couple of weeks later than *A. stolonifera*, with which it often grows.
- Agrostis gigantea x A. stolonifera**
This is strongly suspected to occur on the Fen, but has not yet had expert verification. Other *Agrostis* hybrids probably occur in parts of the North Meadow.
- Agrostis stolonifera** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Common all over the Fen (except in woodland), especially on the rides and on fen islands, but also frequent in open, rushy fen fields. Very variable: in particular, plants in the rushy fen fields are often taller, with broader leaves and pyramidal fruiting spikes: they may involve hybrids with *A. gigantea*.
- Ajuga reptans** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Common throughout the Fen in a wide variety of open or shaded habitats: it can persist in a non-flowering state under tall herb fen vegetation. Several colour variants were noted by Kassar in 1948 and the population on the Fen continues to produce quite frequent pink, pale lavender blue, pale lilac, as well as typical blue-flowered plants.
- Alisma plantago-aquatica** (A. Fryer, probably 1880s) Cpt 1
Only found around the large pond in cpt 1 and in associated ditches to the south-west and north-east.
- Alliaria petiolata** (Revised Musgrave list, post 1996) Cpt 3,4,6,12
Locally frequent in drier woodland, especially in Underdown Plantation (cpt 3) and South Jerusalem Wood (cpt 12), rare in woodland elsewhere.
- Alnus glutinosa** (R. Relhan, 1802) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Common throughout the Fen; in a few places forming limited areas of wet alder carr; it seeds readily into wet open areas of the Fen and onto ditch banks. Plants with very large fruit (var. *macrocarpa*) were collected here by C.E. Moss in 1902 (CGE) and still occur along at least the Main Ride (Cpt 11) and on rides in Forty Acre Wood (Cpt 7).
- Alopecurus geniculatus** (ACL, 2014) Cpt 8,12
Recently recorded on un-mown rides near Bullock Hill, along Ash Ride and on Baxter East Ride: the rides were mown late in 2014 allowing the plants to flower; otherwise not easy to spot!
- Alopecurus myosuroides** (ACL, 2012) Cpt 5
One small plant on an overgrown track into the eastern corner of cpt 5.
- Anacamptis pyramidalis** (G.M.S. Easy, 1970)
Not seen in the present survey. Graham Easy's record is the only one.
- Anagallis arvensis** (Musgrave list, 1977) Cpt 10
Only seen in open disturbed areas and tracks around Bullock Hill, where the water buffalo are over-wintered. Musgrave (1977) reported it from 'meadow and woodland fringe'.

- Anagallis tenella** (R.I. Lynch, 1884) Cpt 2,4,5,8,9,10,11
Very locally abundant, especially on the grazed fen islands in cpt 10, but widespread in usually damp, mown or grazed areas in the centre and west of the Fen; it can persist in a vegetative state in the dense shade of tall herb fen. Flower colour varies from almost white to a good pink.
- Angelica sylvestris** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
A common plant of open fen and on ride margins.
- Anthoxanthum odoratum** (A. Fryer, probably 1880s) Cpt 1,8,10
A few small colonies on ride margins and grazed fen islands.
- Anthriscus sylvestris** (Musgrave list, 1977) Cpt 1,3,11,12
Very local in woodland or on shaded ride margins.
- Apium nodiflorum** (Musgrave list, 1977) Cpt 4,7,12,13
A rather local plant of fen ditches and the Chippenham River, although locally abundant. Sometimes as large submerged colonies.
- Apium nodiflorum** x **Berula erecta** (S.M. Walters, 1979) Cpt 5,10
Now known to occur in two ditches: along the SW side of the Main Ride in cpt 5 and behind the cattle crush at the NE end of cpt 10. Only recently determined as this previously unknown hybrid after molecular work undertaken at Leicester University: these, or similar plants in other ditches along the SW side of the main Ride in the past, have been variously referred to *Apium repens*, *A. repens* x *A. nodiflorum* and *Berula erecta*! The earliest records were of free floating individuals, but the extant populations are all rooted in the ditches.
- Aquilegia vulgaris** (Probably W.J. Cross, 1883) Cpt 4
C.C. Babington (post 1860) recorded it as abundant on the drier parts of the Fen and it was still known in several places in the 1970s, but is now reduced to one tiny plant on a ride margin in the Poors Fen (cpt4). The reason for the decline is unclear, but perhaps deer are responsible.
- Arabidopsis thaliana** (S.M. Walters, 1950-1957)
Not recorded in the present survey.
- Arabis hirsuta** (A. Fryer, probably 1880s; R.I. Lynch, 1886)
Not recorded in the present survey. The last certain record was on 'Chippenham Fen Drove', 1953, S.M. Walters.
- Arctium lappa** (D.A. Wells & G. Crompton, 1994)
Not recorded in the present survey. It occurs just outside the Fen boundary beside Underdown Plantation (cpt 3).
- Arctium minus** subsp. **minus** (Revised Musgrave list, post 1996) Cpt 1,2,3,8,11,12,13
The commonest Burdock on the Fen, in woodland, on woodland margins, along fence lines and on ride margins.
- Arctium minus** subsp. **pubens** (Musgrave list, 1977) Cpt 3,10
Very local in woods or copses; the only population being under alders on the track from Baxter West Ride to Bullock Hill.
- Arenaria serpyllifolia** (S.M. Walters, 1950-1957) Cpt 1
Only seen along the fence line on the higher ground along the NW margin of cpt 1; the plant there is subsp. *serpyllifolia*.
- Arrhenatherum elatius** (S.M. Walters *et al.*, 1964) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
A common plant of the meadows, the fen islands and along the rides.
- Artemisia vulgaris** (Musgrave list, 1977) Cpt 12
One plant seen (with seedlings) in the car park.
- Arum maculatum** (Musgrave list, 1977) Cpt 3,4,12
Only frequent in South Jerusalem Wood (cpt 12); isolated patches in woodland elsewhere.
- Asperula cynanchica** (S.M. Walters *et al.*, 1964)
Not seen in present survey. The earlier records were from the North Meadow.

- Athyrium filix-femina** (C.D. Pigott, 1948) Cpt 9
One small plant seen along mown fence line on the NW margin of cpt 9. Formerly recorded from Forty Acre Wood (1948, C.D.Pigott) and ‘several very fine plants’ in Jerusalem Wood (1968 S.M. Walters & F.H. Perring). Deer are probably the cause for its decrease on the Fen.
- Atriplex prostrata** (Cambridge Flora Group excursion, 1995) Cpt 12
One plant seen in the car park in 2014.
- Avenula pratensis** (SSSI designation for the Fen, 1988) Cpt 10
Seen only in small quantity on the track from Baxter West Ride to Bullock Hill (cpt 10). Also listed from cpt 4 & 9 by Smith & Harding (2001).
- Avenula pubescens** (G. Crompton & D.A. Wells, 1992) Cpt 1,2,10
Locally frequent on the chalk bank (cpt 2) and on fen islands in cpt 10, scattered on the higher ground along the NW margin of cpt 1.
- Baldellia ranunculoides** (A. Fryer & A. Bennett, 1883)
Not seen in the present survey. Formerly in a ditch running SE from the big pond in cpt 1; date of last record uncertain, but listed by Musgrave (1977) as ‘Rare... ditch edge’.
- Ballota nigra** (Musgrave list, 1977) Cpt 1,3,12
Scattered along fence bases at the edge of South Jerusalem Wood (cpt 12) and along the NW margin of cpts 1 & 3.
- Barbarea vulgaris** (ACL, 2012) Cpt 10
One plant on SW side of Main Ride (cpt 10): the only record.
- Bellis perennis** (A. Fryer, probably 1880s) Cpt 1,3,4,6,7,8,9,11,12
Scattered on the rides, on some fen islands and in the car park.
- Berula erecta** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,12
Widespread in ditches; often forming large, submerged, purely vegetative colonies, but also in some areas of wet alder carr. Sometimes found as loose, floating mats of small plants, derived from broken pieces of the slender stolons: these can continue to grow and flower on the water surface.
- Betula pendula** (C.E. Moss, pre-1917) Cpt 1,2,3,4,5,7,8,10,11,12
Scattered widely over the Fen, but most frequent in woodland on the drier ground along the NW margin.
- Betula pendula** x **B. pubescens** = **B. x aurata** (ACL, 2012) Cpt 3,5,6,7,10
Trees with mixed or intermediate characters are widely scattered over the Fen (and probably under-recorded). Those with leaf shape and dentition close to *pendula*, but with densely hairy shoots are particularly convincing. There is wide variation too in habit, trunk characters and in the bracts and seeds in the female catkins.
- Betula pubescens** (C.E. Moss, pre-1917) Cpt 1,2,3,4,5,6,7,8,9,10,11,12
The commonest birch over the Fen, especially in the wetter areas, both in woodland and self-sowing into open fen and along ditches.
- Blackstonia perfoliata** (R.I. Lynch, 1886) Cpt 2,10
Found only on the chalk bank in cpt 2 and on fen islands fringing the woodland just to the NE, and by the track from Baxter West Ride to Bullock Hill (cpt 10).
- [Bolboschoenus maritimus**
Not seen in the present survey. Listed by Spencer & Stone (2009) from several places near Malcolm’s Pond in cpt4. Needs further confirmation.]
- Brachypodium sylvaticum** (M. Kassas, 1952) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Locally dominant in the drier parts of the woodlands, but also found along the rides and around scrub on the fen islands.
- Brassica rapa** subsp. **campestris** (R.I. Lynch, 1904)
Not seen in the present survey. Lynch’s record is the only one.
- Briza media** (M. Kassas, 1952) Cpt 1,2,4,7,8,9,10,11,13
Locally frequent on ride margins, on fen islands and the raised ground along the NW margins of cpts 1 & 2, extending locally into the margins of wetter areas.

- Bromus racemosus** (incl. *B. commutatus*) (Shaw & Wheeler, 1996) Cpt 1,2,5,8,12
Scattered in small quantity along fence bases, on ride margins and areas of disturbed ground.
- Bromus erectus** (J.S.L. Gilmour, 1931) Cpt 1,2
Very few on the chalk bank in Cpt 2, otherwise scattered on the higher ground along the NW margin of cpt 1, often only flowering in the latter area where protected from grazing by hawthorn or rose shrubs.
- Bromus hordeaceus** (Ecological Services Report, 1996) Cpt 1,9
Locally abundant on the higher ground on the NW margin of cpt 1, often in a rather small variant, with stems not quite erect, with slender spikelets in small panicles; also very sparsely on a fen island in cpt 9.
- Bromus ramosus** (M. Kassas, 1952) Cpt 4,7,9
A local plant on the Fen, usually in small quantity on woodland margins, along fence lines and on ride margins.
- Bromus sterilis** (M. Musgrave, 1978-1979) Cpt 1,2,3,5,8,12
Locally frequent along fence lines and in open woodland on drier ground; also scattered on some ride margins and by the car park.
- Bryonia dioica** (Musgrave list, 1977) Cpt 1,12
Only seen climbing up willows at the W end of cpt 12 and along the fence line at the NE corner of cpt 1; perhaps less common than in the past, Musgrave reported it 'locally frequent...rides and woodland fringe'.
- Butomus umbellatus** (A. Fryer, probably 1880s)
Not seen in the present survey and not reported since Fryer's record.
- Buxus sempervirens** (Musgrave list, 1977) Cpt 10,12
Planted in several places in South Jerusalem Wood (cpt 12) and clearly self-sown there and in the adjoining part of cpt 10, some of these self-sown plants now over 5ft tall.
- Calamagrostis canescens** (A. Fryer & A. Bennett, 1883) Cpt 3,4,5,6,7,8,9,10,11
Locally abundant in tall herb fen, on some ride margins and also persistent in fen woodland; absent from the North and East Meadows (cpts 1,2,13). One large clone in the centre of cpt 9 has golden not purplish panicles.
- Calamagrostis epigejos** (E.A. George, 1940) Cpt 2,4,6,7,8,9,10,11
Scattered in tall herb fen, often growing with *C. canescens*, and like it virtually absent from the Meadows; also found on wood margins. A patch on the wooded border of cpt 5/9 has the upper leaf surface with both scattered long and numerous shorter hairs; the leaf surface in this species is usually hairless.
- Callitriche obtusangula** (collector unknown, 1886, CGE) Cpt 7,13
Only found in the Chippenham River where it runs round the southern end of cpt 13 (and the adjacent margin of cpt 7). Formerly more widely recorded and the only species of *Callitriche* to have been confirmed on the Fen.
- [**Callitriche stagnalis**
Not seen in the present survey. Recorded from ditches on the Fen in the past, but probably in error for *C. obtusangula*. Requires confirmation.]
- Caltha palustris** (A. Fryer, probably 1880s)
Not seen in the present survey. Listed as 'Rare...dyke banks' by Musgrave (1980); perhaps lost as more ditch banks have become overgrown.
- Calystegia sepium** (A. Fryer, probably 1880s) Cpt 1,2*,4*,5*,6,7*,8,9,10,11,12,13
Frequent along ride margins, fence lines and ditch banks, but also in open and tall herb fen; some plants have shortly hairy shoots (and white flowers); plants on the ditch bank along the SW side of cpt 13 are strongly toothed across the base of the leaf. This distribution may include some records of *C. sepium* x *C. silvatica* (* above indicates a certain record of *sepium*).

- Calystegia sepium** x **C. silvatica** = **C. x lucana** (ACL, 2014) Cpt 5,8,10,11
Plants on ride and compartment margins, and in tall herb fen, in several areas in the centre of the Fen, have larger flowers, the bracteoles partially overlapping, only slightly inflated and sometimes lobed; they seem best placed here. One colony on the NW/SE ride through Forty Acre Wood (cpt 7) has remarkable very large bracts (as long as the corolla and very broad) and corollas divided almost to the base.
- Campanula rotundifolia** (Musgrave list, 1977)
Not seen in the present survey. Previously listed by Musgrave (1980) as from ‘Meadow and chalk banks’.
- Capsella bursa-pastoris** (Musgrave list, 1977) Cpt 1
Only seen along the fence line bordering the higher ground along the NW side of cpt 1, as well as inside the northern gate to this compartment where all the plants have very finely divided basal leaves.
- Cardamine flexuosa** (Revised Musgrave list, post 1996) Cpt 7,10
A rare plant of ride margins and ditch banks, usually in small quantity.
- Cardamine pratensis** (Musgrave list, 1977) Cpt 1,2,4,5,6,7,8,9,10,11,13
Locally common in and beside rides, along ditch banks and in open fen; benefits from mowing (e.g. along damp fence lines), although not flowering well in such conditions.
- Carduus crispus** (S.M. Walters, 1950-1957) Cpt 2,3,4,10,12
Local on wood borders, margins of clearings and on ditch banks, usually in small quantity.
- Carduus nutans** (S.M. Walters, 1950-1957) Cpt 1
Only seen in small quantity on the higher ground along the NW margin of cpt 1; described as locally frequent by Musgrave (1980).
- Carex acuta** (R.I. Lynch, 1886)
Not seen in the present survey. A later record made by G.C. Brown in 1914 may have been an error; there are no others.
- Carex acutiformis** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Very common on the Fen, sometimes forming large vegetative colonies, both in open and tall herb fen, but also in damp woodland (where it flowers poorly); also on ride margins and on ditch banks.
- Carex distans** (A. Fryer & A. Bennett, 1883) Cpt 1,2,4,6,7,8,9,10,11,13
Locally common on ride margins and in some areas of grazed and mown fen, including the fen islands; usually absent from the tallest fen vegetation. More common on the Fen than *C. hostiana* and sometimes confused with it.
- Carex disticha** (W.J. Cross, 1900) Cpt 1,9,10,13
Local in areas of grazed or mown fen, often forming large vegetative colonies.
- Carex echinata** (C.C. Babington, 1860?)
Not seen in the present survey. Listed by Babington (1860) from ‘Chippenham’. Evans (1911) indicated it was ‘found lately only at Chippenham Fen’ and in his 1939 Flora suggested it was ‘still found in plenty’, although he gives no dates for these records and there is some suspicion the latter account in particular may not have been based on contemporary observations. There are no other records until it was listed from cpt 11 by Shaw & Wheeler (1996). There are no specimens to back up any of these records and there may perhaps be some confusion with variants of *C. lepidocarpa*.
- Carex elata** (A. Fryer, 1884) Cpt 1,2,3,4,5,6,7,8,9,10,11,12
Common over the Fen, sometimes as isolated clumps, but locally abundant, in both open and tall herb fen, but also in wet woodland. A plant on the ditch bank along the Main Ride in cpt 1 has leaf margins variegated with cream.
- Carex elata** x **C. nigra** = **C. x turfosa** (R.W. David, 1988)
Not seen in the present survey. Recorded on the Fen by R.W. David in 1988 and collected by G. Crompton & D.A. Wells in 1992 (CGE), both records probably on a ditch bank, cpt 1.

- Carex flacca** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Very common throughout the Fen, both on wet and drier ground, in open fen, beside the rides, on the fen islands and sometimes in woodland.
- Carex hirta** (R.I. Lynch, 1886) Cpt 1,2,4,5,6,7,8,9,10,12,13
Widely distributed over the Fen, on ride margins, in dry grassland, in open areas of woodland and on wood margins, occasionally in damper ground, but not usually in open fen.
- Carex hostiana** (A. Fryer, 1883) Cpt 1,2,10,11,13
Less widespread than *C. distans*, but locally frequent, usually in areas of damp, mown or grazed fen; also on some ride margins where it may grow with *C. distans* (e.g. along Baxter West Ride, cpts 9/10).
- Carex hostiana** x **C. lepidocarpa** = **C. x fulva** (J.S.L. Gilmour, 1931) Cpt 1,2,10,11
Well-known from the eastern end of cpt 2, but now also known to be particularly frequent in the eastern part of cpt 10; usually growing with both parents.
- Carex lasiocarpa** (A. Fryer & A. Bennett, 1883) Cpt 5,6,10,11
Reported on the Fen, after a very long gap in the official record, by Smith and Harding (2001), although this was not known to a Cambridge Bryology Group excursion in 2009, which also reported it from the same area of very wet mown fen beside the Main Ride in cpt 5; subsequently found in this survey in several large colonies in both cpts 10 & 11, and in smaller quantity in cpt 6. In some cases it flowers poorly if at all, but spreads to from large vegetative colonies. Also reported from cpt 4 by Spencer & Jones in 2009.
- Carex lepidocarpa** (A. Fryer & A. Bennett, 1883) Cpt 1,2,3,4,5,6,7,8,9,10,11
Locally frequent over most of the Fen (except in the wooded cpt 12) and more surprisingly in the East Meadow (cpt 13); also on ride margins, in open fen and sometimes in damp woodland.
- Carex nigra** (A. Fryer & A. Bennett, 1883) Cpt 4,9
A rare plant on the Fen, seen only on the edge of the Boundary Ride (cpt 4) and as a large vegetative colony in wet woodland along the NW margin of cpt 9. There have been a few other recent records scattered over the Fen.
- Carex oederi** (*C. serotina*) (F.J.A. Hort, 1852)
Not seen in the present survey. Material collected on the Fen on 29 July 1852 (**CGE**), collector unknown, was confirmed by R.W. David. Hort's specimen (**ABO**) was collected the same day, as was Babington's (**CGE**) from 'Chippenham Field'. Curiously Babington (1860) only lists it from a pit by Chippenham Avenue.
- Carex otrubae** (M. Musgrave, 1978-1979, as *C. vulpina*) Cpt 3,5,9
Uncommon, but locally frequent: along damp, mown fence lines, in damp woodland and in open fen.
- [Carex pallescens**
Not seen in the present survey. Evans (1911, 1939) reported this as recorded by A. Fryer, but Fryer deleted it from his own records.]
- Carex panicea** (R.I. Lynch, 1886) Cpt 1,2,4,5,6,7,8,9,10,11,13
Locally frequent, especially in damp, open fen, especially in mown or grazed areas, also along some of the rides.
- Carex paniculata** (ACL, 2012) Cpt 3,12
Three plants scattered along the wooded banks of the Chippenham River in cpt 3 and a colony of at least 50 plants in wet alder carr at the western tip of South Jerusalem Wood (cpt 12). Not recorded previously on the Fen and now a rare plant in the county. Also known just downstream in Fordham Woods.
- Carex pendula** (ACL, 2013) Cpt 3,7
One clump in wet woodland near the Chippenham River in cpt 3, and scattered in several places in Forty Acre Wood (cpt 7), including a colony of over 50 plants in the western quarter.

- Carex pseudocyperus** (A.S. Shrubbs, 1919)
Not seen in the present survey. Shrubbs's collection (CGE) is the only record.
- Carex pulicaris** (A. Fryer, 1885) Cpt 1,2,5,9,11
Rather local in damp, more open, often grassy, grazed or mown fen, sometimes on the fen islands; formerly at least on some rides. Easily overlooked when not in fruit and there are additional recent records from cpts 8 & 10.
- Carex remota** (ACL, 2012) Cpt 3,7,9,10,11,12
Locally abundant in damp woodland (e.g. thousands of plants in damp woodland just to the NW of the Chippenham River at the NE end of cpt 3); occasionally also on rides and in open fen.
- Carex riparia** (C.E. Moss, pre 1917) Cpt 3,5,7,8,9,10,11,12,13
Widespread on the Fen, in similar situation to *C. acutiformis*, but not quite so common.
- Carex rostrata** (R. Relhan, 1793)
Not seen in the present survey. Probably last seen on the Fen by C.E. Moss in 1910 (CGE).
- Carex sylvatica** (R.W. David, 1988) Cpt 9,10,11,12
Scattered over the southern part of the Fen, in both dry and damp woodland, on rides and occasionally on fen islands.
- Carex spicata** (ACL, 2014) Cpt 1
One small population on the higher ground along the NW margin of cpt 1.
- [**Carex vesicaria**
Recorded in error by Relhan (1786) and corrected in Relhan (1793).]
Cpt 7,9
- Carpinus betulus** (O. Rackham, 1976) Cpt 7,9
Several old trees in North Jerusalem Wood (cpt 9) and two old trees, both multi-stemmed and fallen apart, in Forty Acre Wood (cpt 7); all perhaps planted. There are also at least six small trees scattered around one of the old trees in the western quarter of Forty Acre Wood which seem to be self-sown.
- Centaurea nigra** s.l. (A. Fryer, probably 1880s) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Common on ride margins, on the fen islands and on the open, higher ground on the NW margin of cpts 1 & 2, sometime extending down into the edges of the open fen. Most plants have a capitulum size within the range of *C. debeauxii* (*C. nemoralis*), but the involucre bract characters in some plants are closer to *C. nigra* s.s. whilst in others they are mixed.
- Centaurea scabiosa** (S.M. Walters, 1964) Cpt 1
Only found as a small population on the higher ground along the NW margin of cpt 1; usually grazed before flowering, but at least one plant is white-flowered.
- Centaureum erythraea** (A. Hosking, 1899) Cpt 2
Only found scattered along the chalk bank in cpt 2.
- Centaureum pulchellum** (A. Fryer, probably 1880s) Cpt 9,10
A good population scattered over buffalo-poached ground by the pond at the east end of cpt 9, and a few plants in winter-wet trampled areas on the track from Baxter West Ride to Bullock Hill. Not refound on the chalk bank (cpt 2) or in other areas of the North Meadow.
- Cerastium arvense** (Musgrave list, 1977)
Not seen in the present survey.
- Cerastium fontanum** (Musgrave list 1977) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Frequent along rides, on fen islands and on higher ground along the NW margin, cpts 1 & 2.
- Cerastium glomeratum** (ACL, 2014) Cpt 12
A few plants in the car park.
- Cerastium semidecandrum** (ACL, 2014) Cpt 1
One plant in short dry turf just inside the wire fence along the NW margin of cpt 1.
- Chaerophyllum temulum** (G. Crompton, C.D. Preston & P.D. Sell, 1987) Cpt 1,2,3,12
Rather local in woodland or under scrub around the margin of the Fen.
- Chamerion angustifolium** (S.C. Shaw & B.D. Wheeler, 1993)
Not seen in the present survey. Listed by Shaw & Wheeler (1996) from cpt 11 in both 1993 and 1995, but does not seem to have persisted.

- Chenopodium album** (Ecological Services Report, 1996)
Not seen in the present survey.
- Chenopodium rubrum** (F.H. Perring & S.M. Walters, 1952) Cpt 13
Seen only in very winter-wet areas that dry out in summer in the East Meadow (cpt 13).
- Circaea lutetiana** (F.H. Perring, 1950) Cpt 1,2,3,4,7,9,10,11,12,13
Quite widespread in often damp woodland, occasionally along the rides, always in small quantity; sometimes persisting under reeds in woodland.
- Cirsium acaule** (A. Fryer, probably 1880s) Cpt 1,2
Only seen on the chalk bank in cpt 2 and scattered over the higher ground along the NW margin of cpt 1.
- Cirsium arvense** (J.L. Crosby, 1938) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Widespread over the Fen on ride margins, under scrub and on woodland margins, as well as scattered in small quantity in open and tall herb fen.
- Cirsium dissectum** (A. Fryer & A. Bennett, 1883) Cpt 1,2,6,8,9,11,13
A local plant of grazed or mown fen, rarely on ride margins; most frequent in parts of cpts 1 & 2.
- [**Cirsium dissectum** x **C. palustre** = **C. x forsteri**
A specimen collected by A.S. Shrubbs in 1886 (**CGE**) was tentatively determined as this hybrid by J.S.L. Gilmour, but seems to be just *C. palustre*. Hybrids have been searched for on the Fen recently but without success.]
- Cirsium palustre** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,13
Common throughout the Fen in open fen and on ride margins, rarer in damp woodland. Plants with white flowers have been recorded in cpts 1 & 13; a pink-flowered plant was also seen in cpt 13.
- Cirsium vulgare** (E.A. George, 1940) Cpt 1,2,4,5,7,9,10,12,13
Scattered over the Fen in better-drained areas, frequent only on the higher ground along the NW margin of cpt 1; also in open woodland, in disturbed areas and on some fen islands.
- Cladium mariscus** (C. Vancouver, 1794) Cpt 1,2,3,4,5,6,8,9,10,11
Dominant in large areas of very wet fen in cpts 4,5,6 & 8; patchily distributed elsewhere, sometimes surviving in damp woodland.
- Clematis vitalba** (G. Crompton, C.D. Preston & P.D. Sell, 1987) Cpt 2,3,4,7,9,11,12
Young plants are fairly frequent on ride margins, on ditch banks and sometimes climbing into reeds; a few much larger older plants occur in areas of drier woodland (e.g. in a woodland clearing near the sluice in cpt 3).
- Clinopodium acinos** (*Acinos arvensis*) (S.M. Walters 1950-1957)
Not seen in the present survey.
- Conium maculatum** (ACL, 2012) Cpt 13
One plant seen along NW margin of the East Meadow (cpt 13).
- Convolvulus arvensis** (Musgrave list, 1977) Cpt.1
Only found scattered over the higher ground along the NW margin of cpt 1. The flowers here are all pure white inside, with pink and white bands on the exterior; none have been seen with darker marks around the eye of the flowers.
- Conyza canadensis** (ACL, 2012) Cpt 1,5
A few small plants found on the higher ground at SE corner of cpt 5, and one along the NW margin of cpt 1.
- Conyza sumatrensis** (ACL, 2012) Cpt 12
Several plants scattered along the fence line bordering the southern edge of South Jerusalem Wood (cpt 12).
- Cornus sanguinea** subsp. **australis** (ACL, 2014) Cpt 2
One young plant on the chalk bank in cpt 2; an alien variant of Dogwood, now spreading rapidly in this country.

- Cornus sanguinea** subsp. **sanguinea** (M. Musgrave, 1978-1979) Cpt 7,8,10,11,12
 Small scattered colonies on ride margins, on ditch banks and on woodland margins in the southern part of the Fen, especially along the edge of the southern quarter of Forty Acre Wood (cpt 7).
- Corylus avellana** (M. Kassas, 1951) Cpt 2,3,4,5,6,7,8,9,10,11,12,13
 Locally frequent in woodland (with some very large stools), also along ride margins and on ditch banks. Many probably planted, but now frequently self-sown. Examples of var. *avellana*, var. *schizochlamys* and var. *grandis* have all been noted recently.
- Cotoneaster dielsianus** (ACL, 2013) Cpt 3
 One bird-sown near base of drier woodland in Underdown Plantation (cpt 3).
- Crataegus laevigata** x **C. monogyna** = **C. x media** (ACL, 2012) Cpt 1,3,13
 A few scattered shrubs, both in woodland and on wood margins, or in old hedge lines.
- Crataegus monogyna** (A.D. Bradshaw, 1948) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
 Locally frequent, especially on wood margins, in scrub, along hedge lines, on the higher ground along the NW margin of cpt 1, and with young plants occurring on the fen islands.
- Crataegus monogyna** x **C. rhipidophylla** = **C. x subsphaerica** (ACL, 2013) Cpt 7,8
 Two bushes on woodland margins have fruit and foliage characters which show the strong influence of *C. rhipidophylla*, a widespread European species not considered native in Britain.
- Crepis capillaris** (A. Fryer, probably 1880s) Cpt 1,2,4,5,7,10,11,12,13
 Scattered plants on fen islands, on ride margins, along fence lines and in the car park.
- Crepis vesicaria** (ACL, 2012) Cpt 1,10,11,12,13
 Most frequent on higher ground along the NW margin of cpt 1, scattered elsewhere on fen islands and in the car park.
- Cynoglossum officinale** (S.M. Walters, 1950-1957) Cpt 1
 One plant on higher ground along the NW margin of cpt 1; also on the public footpath nearby just outside the reserve.
- Cynosurus cristatus** (S.M. Walters *et al.*, 1964) Cpt 1,2,4,8,12,13
 Locally abundant on the higher ground along the NW margin of cpt 1 and on the chalk bank in cpt2; more local elsewhere, mostly on the rides.
- Dactylis glomerata** (S.M. Walters *et al.*, 1964) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
 Widespread on ride and wood margins, on fen islands and generally in better-drained areas.
- Dactylorhiza fuchsii** (A. Fryer, probably 1880s) Cpt 4
 Only a few plants in the SE corner of the Poors Fen (cpt 4), but its influence is seen more widely in hybrids elsewhere in this compartment.
- Dactylorhiza fuchsii** x **D. praetermissa** = **D. x grandis** (S.M. Walters & D.R. Donald, 1980) Cpt 4
 A few plants on ride margins and wet mown areas of fen on the Poors Fen (cpt 4); perhaps the plants noted earlier on the Fen by C.E. Moss in 1913, as '*D. latifolia* x *D. maculata*'.
- Dactylorhiza incarnata** (R.I. Lynch, 1880) Cpt 1,2
 Very few plants seen on low fen islands in cpts 1 & 2: all the flesh-coloured subsp. *incarnata*. The pale yellow-flowered subsp. *ochroleuca* has not been seen on the Fen since 2004, when one plant was seen at the NE end of cpt 2.
- Dactylorhiza incarnata** x **D. praetermissa** = **D. x wintonii** (T. Stephenson, pre-1933)
 Not seen in the present study, but perhaps overlooked; Stephenson's record is given in Godfery (1933) as from 'Chippenham' (assumed to be Chippenham Fen), with the note 'parents plentiful, hybrids very rare'.
- Dactylorhiza praetermissa** (H.C. Gilson, 1930) Cpt 1,2,5,6,7,8,9,10,11,13
 Now uncommon on the rides, but still locally frequent in areas of wet open fen, and on some low fen islands. Some plants have transverse ring spots on the upper surface. Colour variation in the flowers may indicate hybridization with *D. incarnata*. Narrow-leaved plants on the Fen have been distinguished as subsp. *schoenophila*, but these intergrade with subsp. *praetermissa*; they were formerly identified as *D. traunsteineri* or *D. traunsteineroides*.

- Danthonia decumbens** (S.M. Walters, 1946) Cpt 2,10
Scattered over parts of the chalk bank (cpt 2) and a few on the track from Baxter West Ride to Bullock Hill.
- Daucus carota** (A. Fryer & A. Bennett, 1883) Cpt 1,4,12
Frequent over the higher ground along the NW margin of cpt 1, rare elsewhere on ride margins and on one wood margin.
- Deschampsia cespitosa** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
The subsp. *cespitosa* is locally dominant in some areas of wet woodland, and is also frequent in open fen, on rides and on some fen islands; two plants in cpt 9 have golden panicles. Some plants on dry ground under beeches on the SE edge of Forty Acre Wood (cpt 7) have small spikelets in delicate inflorescences and may be referable to subsp. *parviflora*.
- Diplotaxis muralis** (A. Fryer, probably 1880s)
Not seen in the present survey; Fryer's record is the only one.
- Dipsacus fullonum** (Musgrave list, 1971) Cpt 1
Scattered over the higher ground along the NW margin of cpt 1.
- Drosera rotundifolia** (A.S. Shrubbs, 1880)
Not seen in the present survey. The last certain record was c.1913, N.D. Simpson, although Evans (1939) implies it was still on the Fen.
- Dryopteris dilatata** (C.D. Pigott, 1948) Cpt 1,3,4,6,7,9,12
Scattered small plants, often in damp woodland: on tree stumps, on fallen logs or at the base of trees; often in places where access for deer may be difficult.
- Dryopteris filix-mas** (F.H. Perring, 1950) Cpt 1,3
Rare on the Fen, seen only along a fence line across cpt 1, and on an old stump and at a tree base in damp woodland in cpt 3.
- Echium vulgare** (A. Hosking, 1899) Cpt 10
One plant on track from Baxter West Ride to Bullock Hill, 2014. Hosking's report is the only other record.
- Eleocharis palustris** (J.S.L. Gilmour, 1931) Cpt 1,2,4,5,6,9,10,11,13
Locally frequent in and on the margins of rides, in shallow ditches, on pool edges and in other trampled muddy ground. The basis for the recognition of plants at Chippenham as subsp. *palustris* (cf. Crompton, 2004) is unclear. *E. uniglumis*, which is known from the Snailwell meadows, and might be expected on the Fen, has not been reported so far.
- Elodea canadensis** (Musgrave list, 1977) Cpt 1,2,4,5,7,8,9,11,12
Locally frequent in ditches and in parts of the Chippenham River; sometimes persisting in quite deep shade.
- Elodea nuttallii** (J.M. Croft & P. Hollingworth, 1993)
Not seen in the present survey. The only record was from a ditch on the NE side of Pigeon Ride.
- Elymus caninus** (Musgrave list, 1977) Cpt 4,12
Scattered along wood banks along the south-western margin of the Fen.
- Elytrigia repens** (Musgrave list, 1977) Cpt 1,2,3,4,5,6,7,9,10,12,13
Scattered on ride margins, on fen islands and on other areas of raised ground. Both awned and unawned plants are present.
- Epilobium ciliatum** (C.D. Preston, 1990) Cpt 7,9,12
Single plants seen in three places: on disturbed ground in woodland, and in the car park.
- Epilobium ciliatum** x **E. parviflorum** = **E. x floridulum** (C.D. Preston, 1990)
Not seen in the present survey.
- Epilobium hirsutum** (A. Fryer, probably 1880s) Cpt 1,2,5,7,8,10,11,12,13
Scattered along ditch banks and on ride margins, both in woodland and in open areas; some plants on the bank of the Chippenham River in cpt 13 have unusually deeply coloured flowers; others beside the Main Ride in cpt 11 are var. *villosissimum*, with densely villose hairy fruits.

Epilobium montanum (S.M. Walters, 1950-1957)

Not seen in the present survey. Recorded as 'Occasional...open fen' by Musgrave, 1980.

[Epilobium obscurum

Not seen in the present survey and although included in Musgrave (1977), it was omitted from later lists. A rare willowherb in Cambridgeshire and further confirmation is required.]

Epilobium parviflorum (Musgrave list, 1977) Cpt 1,2,4,5,7,8,9,10,11,12,13

Probably the commonest willowherb on the Fen, scattered throughout in both open and wooded areas, on ditch banks and on disturbed ground; also persisting in tall herb fen; curiously rare in cpt 2.

Epilobium tetragonum (Revised Musgrave list, post 1996) Cpt 6,7,10,12

Scattered plants in open areas, or on the margins of woodland, occasionally in tall herb fen.

Epilobium palustre (K. Spencer & J. Stone, 2009) Cpt 9

A good population in tall herb fen in the northern quarter of cpt 9; also recorded by Spencer & Stone from cpt 4. This is probably the only extant site for this willowherb in the county.

Epipactis palustris (A. Fryer & A. Bennett, 1883) Cpt 2,11

Still a good colony in mown fen at the NE end of cpt 2, and a very small one on the mown margin of Baxter East Ride (cpt 11); formerly more widespread on the Fen, especially in parts the North Meadow. The colony of var. *ochroleuca* on a fen island in the East Meadow (cpt 13) has probably been lost to intense grazing by the water buffalo.

Equisetum arvense (G. Crompton, C.D. Preston & P.D. Sell, 1987) Cpt 1,2,4,7,9,10,11,12,13

Widespread on ride margins, under willow scrub, on ditch banks and in rushy fen; sometimes with *E. palustre*.

[Equisetum fluviatile

Not seen in the present survey. Recorded by Spencer & Stone (2009) from cpt 4, but requires further confirmation.]

Equisetum palustre (S.M. Walters, c.1950) Cpt 1,2,4,5,6,7,8,9,10,11,13

The commonest horsetail on the Fen, both in open fen and in damp woodland, sometimes persisting in tall herb fen; very variable in form and sometimes unbranched.

Erigeron acris (ACL, 2012) Cpt 1,2,9,10,12

Scattered plants on the higher ground along the NW margin of cpt 1, on the chalk bank in cpt 2, and locally elsewhere on fen islands, in the car park and on wood/field borders.

Eriophorum angustifolium (A.S. Shrubbs, 1893, CGE)

Not seen in the present survey. The Shrubbs collection is the only authentic record. This species was at one time more widespread in the county.

Eriophorum latifolium (Prof. Potter, 1887)

Not seen in the present survey: Potter's record is the only one.

Eriophorum vaginatum (A.S. Shrubbs, undated, CGE)

Not seen in the present survey. The Shrubbs collection is the only authentic record and was probably made in the late nineteenth or early twentieth century. It is perhaps an unlikely record for the Fen, and the fact that the collection was not dated may raise some doubts about whether the locality was recorded correctly.

Erophila verna (ACL, 2013) Cpt 1

Scattered on the higher ground along the NW margin of cpt 1, especially along the fence line.

Euonymus europaeus (M. Kassas, 1952) Cpt 3,7,8,10,13

Scattered in scrub and on wood margins (especially in cpt 7), as well as in hedges and on ditch banks. One plant in scrub at the SE end of cpt 7 has noticeably narrower leaves (var. *angustifolius*).

Eupatorium cannabinum (J.L. Crosby, 1938) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13

Widespread throughout the damper parts of the fen, locally abundant, both in the open and tall herb fen and in damp woodland, as well as on ride margins and ditch banks. A colony along the Main Ride (cpt 11) has noticeably narrow, more numerous leaf divisions.

- Euphrasia nemorosa** (A.S. Shrubbs, 1919) Cpt 4,5,7,9,10,11,13
 Locally abundant on fen islands (especially in cpt 10), also on ride margins and the spoil heap from the pond in the East Meadow (cpt 13). All collections from the fen in **CGE** have been determined by P.F Yeo as this species (but see below). The aggregate species '*E. officinalis*' had been listed earlier from the Fen by Fryer, probably in the 1880s.
- Euphrasia pseudokernerii** (ACL, 2014) Cpt 2
 Plants on the chalk bank in cpt 2 mostly have larger flowers (8.5-10mm long) and long aristate bract teeth and seem to be this species; its influence may be evident in some of the other populations of *E. nemorosa* on the Fen.
- Fagopyrum esculentum** (A.C. Trueblood, 1939)
 Not seen in the present survey. Only seen on the Fen in 1939 and 1940, perhaps associated with rearing of game birds.
- Fagus sylvatica** (W. Gooch, 1813) Cpt 1,2,3,7,8,9,10
 Quite a number of probably planted trees in North Jerusalem Wood, New Plantation, Forty Acre Wood and the wooded bank along the NW edge of cpt 8 (as well as in the plantation just outside the reserve to the NW of cpt 2), with clearly self-sown plants in most of these areas.
- Festuca ovina** (S.M. Walters, 1950)
 Not seen in the present survey. Last reported in 1987 on the higher ground along the NW margin of cpt 1, but although searched for here all potential candidates turned out to be *F. rubra*.
- Festuca rubra** (S.M. Walters *et al*, 1964) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
 Locally frequent throughout the Fen, especially on ride margins, on fen islands and on other higher ground, but also spreading into all but the wettest area of fen.
- Ficaria verna** (*Ranunculus ficaria*) (ACL, 2012) Cpt 2,3,7,10,11,12,13
 Scattered in woodland, along woodland rides, under scrub or on ditch banks: nowhere very abundant. Both subsp. *fertilis* (cpt 7,11,13) and subsp. *verna* (cpt 2,3,10,12) are recorded, but not all colonies have flowered, making subspecific determination in some cases impossible.
- Filipendula ulmaria** (J.L. Crosby, 1939) Cpt 1,2,3,4,5,6,7,8,9,10,11,13
 Locally frequent throughout the Fen, especially in open fen and on ditch banks; it can also persist in tall herb fen in areas of dense reed and sedge.
- Frangula alnus** (A.H. Evans, 1911) Cpt 2,3,4,5,6,7,8,9,10,11
 Scattered in damp woodland and scrub, as well as along ditch banks and in open fen.
- Fraxinus excelsior** (M. Kassas, 1948) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
 Locally abundant in woodland and scrub, along ditch banks and invading open areas of fen even when these are quite wet (e.g. in thick *Cladium* stands in cpt 5).
- Fumaria officinalis** (Musgrave list, 1977) Cpt 3?
 One non-flowering plant at edge of woodland, Underdown Plantation, in 2012, was probably this species, which was recorded by Musgrave (1980) in dry areas adjacent to arable land.
- Fumaria parviflora** var. **parviflora** (W.J. Cross, 1900)
 Not recorded in the present survey. The Cross record (**CGE**) is the only one. The species still occurs as an arable weed to the NW of the Fen and it is possible Cross's record was near rather than on the Fen.
- Galeopsis angustifolia** (A. Hosking, 1899)
 Not seen in the present survey. Hosking's record is the only one.
- Galeopsis tetrahit** (Revised Musgrave list, post 1996)
 Not seen in the present survey. Also listed by Smith & Harding (2001).
- Galium aparine** (Musgrave list, 1977) Cpt 1,2,3,4,5,6,7,8,9,10,12,13
 Widespread over the Fen, in and along the margins of woods, under scrub, along fence lines and on ride margins; occasionally climbing up reeds at the edge of wet fen; epiphytic on the leaning trunk of a hawthorn in cpt 1.

- Galium album** (*G. mollugo* subsp. *erectum*) (F.H. Perring & S.M. Walters, 1952) Cpt 4,7
Rare on the Fen, only found along the NW/SE ride through Forty Acre Wood (cpt 7) and at fen/scrub edge on the SW margin of the Poors Fen (cpt 4).
- Galium palustre** ('RHG', 1905/1906) Cpt 1,2,3,6
Rare on the Fen and mostly found in damp, open, grazed or mown areas of cpts 1 & 2.
- Galium uliginosum** (A. Fryer, probably 1880s) Cpt 1,2,4,5,6,7,8,9,10,11,13
Locally frequent over much of the open fen, as well as in open damp woodland; occasionally persisting in tall herb fen.
- Galium verum** (Musgrave list, 1977) Cpt 1,2,9,10,11,12,13
Scattered over the fen islands, on the chalk bank (cpt 2) and on the higher ground along the NW margin of cpt 1.
- Gentianella amarella** (A. Fryer & A. Bennett, 1883)
Not seen in the present survey: last reported by S.M. Walters in 1950.
- Geranium dissectum** (ACL, 2012) Cpt 1
Scattered over part of the higher ground along the NW margin of cpt 1; two plants had much paler pink flowers.
- Geranium molle** (Musgrave list, 1977) Cpt 1,3
Scattered along the fence line on higher ground along NW margin of cpt 1 (including some white-flowered plants); one on concreted ground by the sluice in cpt 3.
- Geranium pusillum** (ACL, 2013) Cpt 1
Numerous plants by the gate on the higher ground in the northern corner of cpt 1.
- Geranium robertianum** (S.M. Walters, 1950) Cpt 1,2,3,4,6,7,8,9,10,11,12,13
Widespread in and on the margin of woodland, on ride margins and along fence lines; sometimes in tall herb fen or on fallen tree trunks.
- Geum urbanum** (S.M. Walters *et al.*, 1964) Cpt 2,3,7,12
Scattered along woodland paths, on ride margins and on the borders of woodland.
- Glechoma hederacea** (E.A. George, 1940) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Frequent throughout the Fen, especially in the mown rides, in woodland and under scrub; also sometimes persisting in dense shade under tall herb fen, even where quite wet.
- [Glyceria declinata**
Not seen in the current survey. A specimen in **CGE**, collected by F.H. Perring in 1950, as *G. fluitans*, was determined by P.J.O. Trist as *G. declinata* in 1982, but redetermined by him as *G. notata* in 1992.]
- [Glyceria fluitans**
Not seen in the present survey. Listed by Spencer & Stone (2009) from cpt 9, but requires further confirmation.]
- Glyceria maxima** (ACL, 2012) Cpt 1
One small colony, mixed with *Sparganium erectum*, in the Chippenham River, at the junction with Pigeon Ride.
- Glyceria notata** (F.H. Perring, 1950) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Locally abundant in wet areas along the rides, on other boggy paths and in some ditches.
- Gymnadenia conopsea** s.s. (A.S. Shrubbs, 1886)
Not seen in the present survey. The only record certainly attributable to this more restricted taxon is a specimen (**CGE**) collected by A.S. Shrubbs in 1886 and determined by P.D. Sell in 1992.
- Gymnadenia densiflora** (R.H. Lock, 1900) Cpt 1,2,8,11
Still scattered beside damp mown rides, on fen islands or in other damp mown or grazed area of open fen; the best population is scattered over the NE end of cpt 2 in the North Meadow. It appears to have been more frequent in the past. Lock's record is the earliest certainly attributable to this fen form of Scented Orchid. Fryer & Bennett recorded a *G. conopsea* on the Fen in 1883, but at that time the name could cover both *G. densiflora* and *G. conopsea* s.s.

- Hedera helix** (M. Kassas, 1951) Cpt 1,2,3,4,7,10,11,12,13
 Locally abundant climbing trees in woodland, especially in Forty Acre Wood (cpt 7) and parts of South Jerusalem Wood (cpt 12); more rarely found as ground cover. All plants examined were subsp. *helix*.
- Helminthotheca echioides** (ACL, 2012) Cpt 1,2,4,8,9,10,11,12,13
 Sparsely scattered, often as solitary plants, on ride margins, along fence lines, on fen islands, along ditch banks and other disturbed areas, including the car park.
- Heracleum sphondylium** (A. Fryer, probably 1880s) Cpt 2,4,12,13
 Rare on the Fen, seen in a few places on ride margins and by gates on to the Fen.
- Hippocrepis comosa** (S.M. Walters, 1968)
 Not seen in the present survey. The only record was made by S.M. Walters in 'chalk grassland' in 1968.
- Hippuris vulgaris** (Musgrave list, 1977) Cpt 1,5,6
 Locally abundant in the Chippenham River (cpt1/6), in a ditch just to the south along Pigeon Ride (cpt 6), in the large pond in cpt 1 (and associated ditches), as well as locally in winter wet areas in rushy fen in cpt 1 and in wet tall herb fen along the SE side of cpt 5.
- Holcus lanatus** (M. Kassas, 1952) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
 Common and widespread on the Fen, occurring in even quite wet areas of open fen, sometimes abundant; occasionally seen with flowering stems emerging above stands of *Juncus subnodulosus*.
- [**Holcus mollis**
 Not seen in the present survey. Listed by Shaw & Wheeler (1996) in the open fen at the NE end of cpt 2. A species typically of shady conditions, on acid sandy soils, for which further confirmation is needed on the Fen.]
- Hordeum distichon** (ACL, 2014) Cpt 10
 Several plants in buffalo-poached ground on Bullock Hill; the only record.
- Hordeum murinum** (ACL, 2012) Cpt 1
 Locally frequent along the fence line and under hawthorns on the higher ground along the NW margin of Cpt 1.
- Hordeum secalinum** (ACL, 2012) Cpt 10,11
 Seen flowering in small quantity on a fen island in cpt 10, and on a ride margin in cpt 11; perhaps overlooked elsewhere as a vegetative plant.
- Hottonia palustris** (R.I. Lynch, 1886) Cpt 1,7
 Only seen in the Chippenham River just NE of the junction with Pigeon Ride and in neighbouring ditches to the north and south. It has been reported in other areas in the past.
- Humulus lupulus** (K. Smith & M. Harding, 2001) Cpt 8
 A good colony climbing into reeds and *Frangula* bushes near the large pond on the NE side of cpt 8, clearly the site recorded by Smith & Harding.
- Hydrocotyle vulgaris** (A. Fryer, probably, 1880) Cpt 1,2,6,8,10,11
 Rather local on the Fen, scattered in ditches, on pond margins and running around at the base of rushes and sedges on winter wet areas of open fen.
- Hypericum hirsutum** (H.H.W. Pearson, 1898) Cpt 10
 The only record since Pearson's original report is of several plants near the cattle crush, just off the Main Ride (cpt 11), found by Chris Hainsworth.
- Hypericum perforatum** (ACL, 2012) Cpt 9,10,11
 Very local along parts of Baxter West Ride and on a fen island on the NE side of cpt 11.
- Hypericum tetrapterum** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
 Widespread in open fen, on ditch banks, along rides and in damp, open woodland.
- Hypochaeris radicata** (Cambridge Flora Group, 2010) Cpt 1,2,5,9,10,11,13
 Scattered in small quantity on fen islands and on the higher ground along the NW side of cpts 1 & 2.

- Ilex aquifolium** (ACL, 2011) Cpt 3,8
Rare on the Fen, the only large shrub being on Ash Bank (the wooded ridge along the NW side of cpt 8); small, recent bird-sown young plants are also elsewhere on this bank and in Underdown Plantation (cpt 3).
- Inula conyzae** (E.A. George, 1940) Cpt 2,7,10
Rare on the Fen, seen only in small quantity on fen islands in cpt 10, on ditch banks along the SW side of Forty Acre Wood (cpt 7) and on the edge of woodland by chalk bank, cpt 2.
- Iris pseudacorus** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,12,13
Locally frequent on the Fen, scattered along fen ditches and on pond banks, in damp woodland and in wetter areas of open fen.
- Isolepis setacea** (S.M. Walters, 1957) Cpt 2,7,8,9,10
Rather local in winter wet, often buffalo-poached patches along rides and tracks.
- Juncus acutiflorus** (A. Fryer, probably 1880s)
Not seen in the present survey. Other than Fryer's record there are no other reports until it was listed in an Ecological Services Report (1996), in either cpt 1 or 2; there are no specimens to substantiate either record and further confirmation would be highly desirable.
- Juncus articulatus** (A. Fryer, probably 1880s) Cpt 1,2,4,5,6,7,8,9,10,11,13
Scattered over the Fen, in and on the margins of rides and tracks, in ditches and in open areas of wet fen; occasionally proliferous. Babington's collection from 'Chippenham Field' in 1852 (CGE) may have been from the Fen.
- Juncus bufonius** (A. Fryer, probably 1880s) Cpt 1,2,4,5,7,8,9,10,11,12,13
Locally abundant on often winter wet hollows along rides and tracks, and in other areas of bare, often buffalo-poached ground in open fen.
- [Juncus bulbosus**
Not seen in the present survey. On a list made by S.M. Walters in 1950 and a list of 1978/1979 records from M. Musgrave (but with doubt about the record); some prostrate, proliferous variants of *J. articulatus* on the Fen may have caused confusion and the species requires confirmation.]
- Juncus conglomeratus** (ACL, 2014) Cpt 8
At least six clumps in reeds on old spoil heaps by the pond on the NE margin of cpt 8.
- Juncus effusus** (S.M. Walters, 1964) Cpt 5,7,9,10
Rather local on the Fen and in small quantity, on ride margins, in damp open woodland and in tall herb fen.
- Juncus inflexus** (A. Bennett, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Widespread and locally abundant in open fen, along rides, on ditch banks and in damp woodland; extending on to drier ground than *J. subnodulosus*.
- Juncus subnodulosus** (A. Fryer & A. Bennett, 1883) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Widespread and locally abundant on the Fen, in open and tall herb fen, and sometimes emergent in ditches; plants in ditches along Baxter East Ride (cpt 8) and along Pigeon Ride (cpts 7 & 8) have a strongly glaucous covering to the emergent stems and might be confused with *Schoenoplectus tabernaemontanus*.
- Knautia arvensis** (A. Fryer, probably 1880s) Cpt 1
Two plants under rose bushes on the higher ground along the NW margins of cpt 1.
- Koeleria macrantha** (S.M. Walters, 1953) Cpt 1
One flowering plant seen on the higher ground along the NW margin of cpt 1. Max Walters's record was from Baxter West Ride.
- Laburnum anagyroides** (J.O. Mountford & G.M.B. Smith, 1970) Cpt 9
One spindly tree, which does not look planted, on NE side of New Plantation, beside the Main Ride. Mountford & Smith recorded 'several specimens', but it seems only one now survives.
- Lamium album** (Musgrave list, 1977)
Not seen in the recent survey.

- Lamium hybridum** (ACL, 2014) Cpt.1
One plant along the fence line on the higher ground along the NW margin of cpt 1.
- Lamium purpureum** (ACL, 2014) Cpt 1
Numerous plants on disturbed ground around hawthorns on the higher ground along the NW margin of cpt 1.
- Lapsana communis** (Musgrave list, 1977) Cpt 2,3,7,10,11,12
Rather rare on the Fen, scattered in woodland and around the car park, usually as solitary plants.
- Larix decidua** (W. Gooch, 1813) Cpt 8,9,10
Scattered planted trees in the old plantations of North Jerusalem Wood, New Plantation and on the wooded bank along the NW margin of cpt 8: no evidence of any regeneration.
- [Lathyrus palustris**
Not seen in the present survey. Listed by Spencer & Stone (2009) from cpt 9, but requires further confirmation.]
- Lathyrus pratensis** (Musgrave list, 1977) Cpt 1,2,5,6,8,9,10,11,12,13
Along the rides, on fen islands and in other areas of grassland; also present in rushy fen fields.
- Lemna gibba** (ACL, 2014) Cpt 9,10,12
Carpeting the ditch separating cpt 10 & 12, both NE and NW of Bullock Hill, and in a ditch in woodland at the NW corner of cpt 9. This is a variant with rather large fronds without the bulbous underside, only a thin layer of much larger cells over the lower surface. This also occurs downstream in Fordham Woods.
- Lemna minor** (F.H. Perring & S.M. Walters, 1968) Cpt 1,4?,5,7?,8?,9?,10,11,12,13
Occurs rather sparsely in ditches, in standing water in alder carr, as well as in standing water in the deep shade of tall stands of *Phragmites* or *Juncus subnodulosus* in very wet fen. At least some stands appear to be true *L. minor*, but the identity of those in compartments listed with a query needs checking further. Part of a population in the Chippenham River (between cpt 7 & 13) has consistently tiny fronds and may be *L. minuta*, but also requires further investigation.
- Lemna trisulca** (F.H. Perring & S.M. Walters, 1968) Cpt 1,2,4,7,8,9,10,11,12,13
Common and widespread in ditches and parts of the Chippenham River, often abundant and very shade tolerant.
- Lepidium coronopus** (*Coronopus squamatus*) (Musgrave list, 1977) Cpt 1
One plant on a more-or-less bare bank along an old hedge line across the NE end of cpt 1.
- Leontodon hispidus** (A. Fryer, probably 1880s) Cpt 1,2,7,9,10,11
On the fen islands, on the chalk bank (cpt 2) and on the higher ground along the NW margin of cpt 1; locally frequent. One plant on the chalk bank had scales as well as pappus hairs surmounting its outermost achenes, perhaps suggesting some hybridisation with *L. saxatilis*.
- Leontodon saxatilis** (A. Fryer, probably 1880s) Cpt 1,4,7,9,10,11,13
On the fen islands, on the higher ground along the NW margin of cpt 1, rarely on ride margins; locally frequent.
- Leucanthemum vulgare** (A. Fryer, probably 1880s) Cpt 1,10,12,13
Rather rare on the fen islands and in the car park, but more frequent on the higher ground along the NW margin of cpt 1 and running down from there into the damp grassland below.
- Ligustrum vulgare** (A.S. Shrubbs, 1890) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Scattered in woodland and scrub throughout the Fen, locally frequent, and sometime in surprisingly wet places; often fringing the ditches and sometimes with young plants bird-sown into grassy or rushy fen fields.
- Linaria vulgaris** (R.I. Lynch, 1884)
Not seen in the present survey. Included on the revised Musgrave list, post 1996.
- Linum catharticum** (A. Fryer, probably 1880s) Cpt 1,2,4,5,7,9,10,11,12,13
Scattered over the fen islands, on the higher ground along the NW margin of cpt1, on the chalk bank (cpt 2) and on ride margins.

- Liparis loeselii** (A. Fryer, 1883)
Not seen in the present survey. The last definite record was in 1928. Fryer recorded finding over 100 plants on moorish boggy soil, growing amongst reeds.
- Lithospermum arvense** (R.I. Lynch, 1886)
Not seen in the present survey. Lynch's record is the only one.
- Lithospermum officinale** (A. Fryer & A. Bennett, 1883) Cpt 2,3,4,5,6,7,8,9,10,11,12
Locally abundant on the fen islands, and also found along ride and track margins, sometimes in woodland and along ditch banks.
- Lolium perenne** (Musgrave list, 1980) Cpt 1,2,3,5,6,7,8,9,10,11,13
Scattered on some ride margins, on an excavated soil pile in cpt 2, and on the higher ground along the NW margin of cpt 1; apparently absent from the Poors Fen (cpt 4) and very uncommon on rides in and around Forty Acre Wood (cpt 7).
- Lolium perenne** x **Schedonurus pratensis** = X **Schedolium loliaceum** (ACL, 2012) Cpt 1
A single patch seen on a low fen island at the SW end of cpt 1, both parents nearby.
- Lonicera caprifolium** (ACL, 2013) Cpt 7
Several patches draped over ride-side vegetation, SE end of the NW/SE ride through Forty Acre Wood (cpt 7): a fine sight when in flower in late April/early May. This is a rare alien in Cambs.
- Lonicera periclymenum** ('RHG', 1905/1906) Cpt 3,4,5,6,7,9,10
Locally frequent in woods and on wood margins, also scrambling over ride-side vegetation; in the SE corner of the Poors Fen (cpt 4) it can be found climbing through stands of tall reed.
- Lotus corniculatus** (A. Fryer, probably 1880s) Cpt 1,2,10,13
Rather local, scattered over a few fen islands, on the chalk bank (cpt 2), and on the higher ground along the NW margin of cpt 1.
- Lotus glaber** (A. Fryer, probably 1880s)
Not seen in the present survey. Fryer's record is the only one.
- Lotus pedunculatus** (A.S. Shrubbs, 1886) Cpt 1,2,4,5,6,7,8,9,10,11,13
Locally frequent in damp grazed or mown fen, as well along ride margins; sometimes in tall herb fen or on fen islands.
- Luzula campestris** (ACL, 2012) Cpt 1,13
Scattered on a low, sinuous fen island in the East Meadow (cpt 13) and on part of the higher ground along the NW margin of cpt 1.
- Luzula multiflora** (W. West, Jr, 1898) Cpt 2,9
A few plants seen on a fen island in the western corner of cpt 9, and a few in mown fen towards the eastern end of cpt 2; all plants seen have been subsp. *multiflora* and this is probably now the only site for this subspecies in the county. West's record was for subsp. *congesta*, which is still found at Gamlingay.
- Lycopus europaeus** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Widespread in open fen, on ditch banks and in damp woodland.
- Lysimachia vulgaris** (ACL, 2012) Cpt 7,11
Only found scattered in tall herb fen in cpt 11 and an adjacent part of Pigeon Ride (cpt 7).
- Lythrum salicaria** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,13
Frequent in damp areas of open fen, on ditch banks and along the ride margins.
- Malus sylvestris** (F.H. Perring, 1968) Cpt 1,5
Solitary trees in two places; both have hairy shoots and some hairs on the leaves and calyces; the tree on a bank at the edge of woodland along the southern margin of cpt 5 has typical, small, bitter, yellow-green crab apple fruits; the isolated tree in cpt 1 has slightly larger fruits and perhaps shows some influence from *M. domestica*.
- Malva sylvestris** (Musgrave list, 1980) Cpt 1,12
Occasional plants on the higher ground along the NW margin of cpt 1, and a few along the fence line along the southern margin of South Jerusalem Wood.
- Matricaria discoidea** (Musgrave list, 1977) Cpt 11,12
A few plants seen in gravelly ground in the car park.

- Matricaria chamomilla** (Musgrave list, 1977)
Not seen in the present survey. Previously recorded from by the main south-eastern entry to the Fen.
- Medicago lupulina** (A. Fryer, probably 1880s) Cpt 1,2,8,9,10,11,12,13
Common on the fen islands, on the chalk bank (cpt 2), on the higher ground along the NW margin of cpt 1, as well as along some rides.
- Mentha aquatica** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Frequent throughout open fen, but also in damp woodland, on ride margins, in ditches and by pools; sometimes persisting in tall herb fen.
- Mentha aquatica x M. arvensis = M. x verticillata** (H. Phillips, 1933) Cpt 5,7,10
Several large colonies on damp tracks in cpt 10, very local elsewhere; usually with *M. aquatica*.
- Mentha arvensis** (R.H. Lock, 1901) Cpt 1,12
Only in a winter wet hollow along the NW side of cpt 1 and by the car park.
- Mentha spicata x M. suaveolens = M. x villosa** (C.E. Moss, 1912)
Not seen in the present survey. The Moss record is the only one.
- Menyanthes trifoliata** (A. Fryer & A. Bennett, 1883) Cpt 4,5
Two surviving colonies, both in areas of very wet mown fen: at the SE corner of both cpt 4 and cpt 5. Perhaps the only native site for Bogbean left in the county.
- Mercurialis perennis** (K. Smith & M. Harding, 2001) Cpt 3
One large colony, with a few outliers, on higher ground along the NW margin of Underdown Plantation (cpt 3); both male and female plants present.
- Moehringia trinervia** (G. Crompton, C.D. Preston & P.D. Sell, 1987) Cpt 2,3,9
Very local and in small quantity in woodland, in one case on an old tree stump.
- Molinia caerulea** (A. Fryer, probably 1880s) Cpt 1,2,4,5,6,7,8,9,10,11,13
The dominant plant in some areas of open fen and also found along the rides; persisting in some areas of damp woodland. Most plants are subsp. *arundinacea*, with stems often 4ft or more, and with long panicles that have long branches which may remain spreading in fruit. However, some plants on the fen islands can be less than one foot tall, with less branched narrow panicles and seem to come closer to subsp. *caerulea*; others are intermediate between the two.
- Mycelis muralis** (D.A. Wells, G. Crompton & J. Bulleid, 1994) Cpt 3,4,7,12
Scattered in and on the margins of woodland and scrub, sometimes on old tree stumps or root plates of fallen trees; usually in small quantity.
- Myosotis arvensis** (Collector unknown, 1886, CGE) Cpt 12
Only seen scattered along the fence line at the SW margin of South Jerusalem Wood (cpt 12). Recorded as 'Occasional... meadow and ride sides' in Musgrave (1977).
- Myosotis ramosissima** (ACL, 2014) Cpt 1
A few plants along the fence line on the higher ground along the NW margin of cpt 1. Listed by Musgrave (1977), but omitted from later lists. This recent find may mean that the original record had been correctly identified.
- Myosotis scorpioides** (Musgrave list, 1977) Cpt 1,2,3,6,7,10,12,13
Rather local in damp, open woodland, along ditch banks and around ponds.
- Myosoton aquaticum** (A. Fryer, probably 1880s)
Not seen in the present survey. Listed as 'Occasional... ditches and wet places' by Musgrave (1980).
- Myriophyllum spicatum** (A. Bennett, probably 1880s)
Not seen in the present study. Not reported since Bennett, save for its inclusion in another recent survey report, but this requires further confirmation.
- Myriophyllum verticillatum** (A. Fryer & A. Bennett, 1883) Cpt 1,2,5,6
Locally frequent in the Chippenham River beside the North Meadow (cpts 1 & 2), and in several ditches and the pond in cpt 1.

- Nasturtium microphyllum** (S.M. Walters, 1957) Cpt 1,4,5,7,9,11,12
Locally abundant in ditches and the commonest of the two watercresses on the Fen.
- Nasturtium officinale** (G. Crompton, C.D. Preston and P.D. Sell, 1987) Cpt 13
Only seen in the Chippenham River at the SE end of cpt 13.
- Neottia ovata** (*Listera ovata*) (A. Fryer, 1885) Cpt 1,2,3,7,10,11,13
Scattered over the fen islands, on ride margins, on the higher ground along the NW margin of cpt 1, and occasionally in dry woodland. Sometimes found as very small plants in grazed turf.
- Nepeta cataria** (ACL, 2012) Cpt 12
Two plants on the fence line bordering the western end of South Jerusalem Wood in 2012; a larger colony exists here along the arable field margin just outside the Fen.
- Nymphaea alba** (A. Fryer & A. Bennett, 1883)
Not seen in the present survey and not recorded on the Fen since the nineteenth century.
- Odontites vernus** (A. Fryer, probably 1880s) Cpt 1,5,9,10,13
Scattered on fen islands, on tracks and on the banks of ponds, as well as on the higher ground along the NW margin of cpt 1. All critical determinations of material from the Fen have all been of subsp. *serotinus*.
- Onobrychis viciifolia** (A. Fryer, probably 1880s)
Not seen in the present survey. Fryer's is the only record.
- Ononis repens** (S.M. Walters *et al.*, 1964) Cpt 1,2
Frequent over the higher ground along the NW margin of cpt 1, and also on the chalk bank in cpt 2.
- Ononis repens** x **O. spinosa** = **O. x pseudohircina** (S.M. Walters *et al.*, 1964) Cpt 2?
A few plants on the chalk bank in cpt 2 have some spines, narrower leaves and stem hairs less uniformly distributed than in *O. repens* and might represent this hybrid: they are strongly decumbent. The Walters listing is the only other record.
- Ononis spinosa** (A. Fryer, probably 1880s)
Not seen in the present survey. Formerly at least on the higher ground along the NW margin in cpt 1, and perhaps also on the chalk bank in cpt 2. Last reported in the Ecological Services Report (1996) as rare in the North Meadow.
- Ophioglossum vulgatum** ('JJA', 1946) Cpt 1,2,7,11,13
Scattered over the Fen, on fen islands and in or on the margins of a few rides; occasionally in damper more rushy fen areas; good colonies too in grazed turf on the higher ground along the NW margin of cpt 1.
- Ophrys apifera** (W. J. Cross, 1883) Cpt 1,4,10
Most frequent on fen islands in cpt 10, also scattered on the higher ground along the NW margin of cpt 1 and one along the Boundary Ride (cpt 4).
- Origanum vulgare** (Ecological Services Report, 1996)
Not seen in the present survey; the only record is from the chalk bank (cpt 2) in 1996.
- Orobanche minor** (W. West, Jr., 1898)
Not seen in the present survey. Reported from dry ground, edge of Chippenham Fen, in 1898 – the only record. Now frequent over the sandy bank just to the NW of the Fen.
- Papaver rhoeas** (Musgrave list, 1977) Cpt 1
Scattered along the fence line on the higher ground along the NW margin of cpt 1.
- Parnassia palustris** (A. Fryer & A. Bennett, 1883)
Not seen in the present survey. There were 30 flowering plants in 1949 (S.M. Walters), but only one in 1980 (M. Musgrave), in the east corner of cpt 5, beside the Main Ride. It has not been seen since.
- Pastinaca sativa** (Musgrave list, 1977) Cpt 1,10,12
Frequent over the higher ground along the NW margin of cpt 1; rare and in small quantity elsewhere.

Pedicularis palustris (R.I. Lynch, 1886)

Not seen in the present survey. There is a lack of records between 1897 and 1979, when 20 plants were found on disturbed ground at a site beside the Main Ride in cpt 5; it was last reported from there in 1998 (40 plants seen by J.C.A. Rathmell). It has been seen elsewhere on the Fen and in 1982 was sown on parts of cpt 1 and cpt 11 (using seed of Fen origin) and this may have been the source of plants seen by S.C. Shaw & B.D. Wheeler in 1993 and 1995 in cpt 11; they also found it in cpt 2 in 1995.

Pedicularis sylvatica (A. Fryer, 1883)

Not seen in the present survey. Fryer's record is the only one.

Persicaria amphibia (Ecological Services Report, 1996)

Cpt 1,2

A few plants in two winter wet areas: one in cpt 1, the other in cpt 2.

Persicaria lapathifolia (A.S. Shrubbs, 1919)

Not seen in the present survey. Shrubbs's record is the only one.

Persicaria maculosa (Musgrave list, 1977)

Cpt 1,9,10,13

A few plants in scattered, winter wet, often cattle- or buffalo-poached areas.

Phalaris arundinacea (Musgrave list, 1977)

Cpt 1,2,4,5,6,7,8,9,10,11,12,13

Frequent in open fen and along ditch banks; locally forming large vegetative colonies.

Phleum bertolonii (S.C. Shaw & B.D. Wheeler, 1991)

Cpt 1,2,5,8,11,12,13

More common than *P. pratense* s.s. on the Fen, found on the fen islands, on ride margins, on the chalk bank in cpt 2, and on the higher ground along the NW margin of cpt 1 and in other dry grassland.

Phleum pratense s.s. (S.C. Shaw & B.D. Wheeler, 1991)

Cpt 1,2,10,13

Local in damp grassland and on the margins of ride and tracks. The *P. pratense* aggregate had been recorded earlier on the Fen by S.M. Walters *et al.* in 1964.

Phragmites australis (A. Hosking, 1899)

Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13

Very common and often dominant, including in damp woodland; without mowing or grazing virtually the whole area would be dominated by this species. Oak trees emerging from tall beds of reeds are one of the more bizarre sights on the Fen! Variegated plants were reported by A. Hosking in 1899 and have been seen recently in two place in cpt 2: both plants with bright yellow longitudinal stripes.

Picea abies (W. Gooch, 1813)

Cpt 3,7,8,9,11,12

Scattered planted trees in the woodlands, especially along the SW side of cpt 9; one small self-sown plant behind the machinery shed/office (cpt 11); the very disparate size of the trees in cpt 9 suggests some self-sowing may have taken place there in the past.

Pilosella officinarum (A. Fryer, probably 1880s)

Not seen in the present survey, despite assiduous searches on the higher ground along the NW margin of cpt 1, from where it was last reported in the Ecological Services survey of 1996.

Pimpinella saxifraga (R.I. Lynch, 1884)

Not seen in the present survey. Last reported by A. Hosking in 1903 (CGE).

Pinguicula vulgaris (A. Fryer & A. Bennett, 1883)

Not seen in the present survey. Latterly known from two areas of very wet mown fen (in cpt 4 and 5), and last seen in the latter (in a site beside the Main Ride) in 1984.

Pinus sylvestris (W. Gooch, 1813)

Cpt 3,4,5,7,8,9,10,12

Some veteran planted trees are scattered in the woodlands, whilst a few self-sown plants have been noted recently in cpts 4,5 and 9.

Plantago lanceolata (R.I. Lynch, 1886)

Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13

Frequent on the higher ground along the NW margin of cpt 1, where some plants have much broader, much hairier leaves and resemble *P. media*; also found on the fen islands, along the rides and in the car park.

Plantago major (Musgrave list, 1977) Cpt 1,2,4,5,6,7,8,9,10,11,12,13

Frequent in the mown turf of rides, also in the car park, on the fen islands and on other higher ground (these plants usually subsp. *major*); also in muddy, frequently cattle or buffalo poached ground and these latter plants often resemble subsp. *intermedia*, but often with mixed or intermediate characters with respect to subsp. *major*.

Plantago media (A. Fryer, probably 1880s)

Not seen in the present survey, but also reported in 1940 by E.A. George, in 1964 by S.M. Walters *et al.* and in 1987 by G. Crompton, C.D. Preston & P.D. Sell.

Poa annua (G. Crompton & D.A. Wells, 1994) Cpt 2,3,4,5,6,7,8,9,10,11,12,13

Widespread on rides and tracks, in the car park, as well as in trampled ground by gateways.

Poa nemoralis (G. Crompton, C.D. Preston & P.D. Sell, 1987)

Not seen in the present survey. An earlier listing in Musgrave (1977) was an error for *P. trivialis*.

Poa pratensis s.l. (A. Fryer, probably 1880s) Cpt 1,2,5,6,8,10,11

Scattered over some of the fen islands, as well as on the higher ground along the NW margin of cpt 1 and occasionally on the rides. All those examined critically in this survey have proved to be *P. humilis* (*P. pratensis* subsp. *irrigata*).

Poa trivialis (S.M. Walters, 1950-1957) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13

Widespread along the rides, in open fen in general, as well as in both wet and dry woodland. The tall flowering stems often make conspicuous small patches in mown or grazed rushy fen.

[Polygala calcarea

Not seen in the present survey. Recorded 'On chalk in Chippenham Moor', 1886, A. Fryer, but in the absence of voucher material this record has been regarded as requiring further confirmation.]

[Polygala serpyllifolia

Not seen in the present survey. Recorded on Chippenham Fen, 1884, A. Fryer & A. Bennett (as *P. depressa*), but in the absence of voucher material this record has been regarded as needing further confirmation.]

Polygala vulgaris (R.I. Lynch, 1886) Cpt 1,10,11

Only found on fen islands in cpts 10 & 11, and on parts of the higher ground along the NW margin of cpt 1 (where it is locally abundant). All plants seen have blue flowers.

Polygonum aviculare s.l. (Ecological Services Report, 1996) Cpt 8,10,12

A few plants noted in the car park, in disturbed ground on Bullock Hill and on soil used to fill in ruts along the rides. All plants were probably *P. aviculare* s.s. although in some cases they were not mature enough to be certain.

Populus alba (ACL, 2012) Cpt 7

A single fallen, but still living, female tree, plus sucker growth, by the ride along the SE margin of Forty Acre Wood (cpt 7). Other reports from the Fen are thought to be errors for *P. x canescens*.

Populus alba x P. tremula = P. x canescens (M. Kassas, 1952, as *P. tremula*) Cpt 2,3,4,7,9,12

Forms large vegetative colonies in damp woodland in several areas across the Fen; some particularly fine trees occur around a small clearing by the sluice on the Chippenham River in cpt 3. Most, perhaps all, previous records for *P. alba* and *P. tremula* are thought to belong here.

Populus nigra x P. deltoides = P. x canadensis (F.H. Perring, 1968) Cpt 3,9

Scattered trees, probably all planted, in Underdown Plantation (cpt 3); one, also probably planted, in woodland along the SW margin of cpt 9 and one small, apparently self-sown small tree on the edge of woodland along the NW side of cpt 9.

[Populus tremula

Not seen in the present survey. Earlier records are considered to be errors for *P. x canescens*, which in some forms on the Fen approaches *P. tremula* in appearance.]

- Populus cf. trichocarpa** (ACL, 2012) Cpt 9
Two male trees, now in rather poor condition, and presumed planted, in woodland along the SW margin of cpt 9.
- Potamogeton berchtoldii** (A. Fryer, 1883) Cpt 8,10,13
Locally abundant in the Chippenham River in cpt 13, as well as in a shallow ditch in open woodland in cpt 10, and in a deep ditch running across cpt 8; in the two latter sites accompanied by *Sparganium natans*. It has been recorded more widely across the Fen in the past.
- Potamogeton coloratus** (A. Fryer, 1884) Cpt 1,2,4,5,6,7,8,9,10,12
The commonest pondweed on the fen, locally abundant in ditches (sometimes even when heavily shaded), also in ponds, as well as persisting in a number of places in very wet areas under stands of reed, rush or sedge.
- Potamogeton crispus** (A. Fryer, probably 1880s)
Not seen in the present survey. Fryer's record is the only one.
- [Potamogeton lucens**
Not seen in the present survey. Given in the Musgrave lists, but a number of records made in 1978 by P.A. Wright (recorded in a note in the Fen files) have all subsequently been amended to *P. coloratus*. The latter species can sometimes produce narrowly elliptic leaves and such plants have been seen on the Fen recently. Requires confirmation.]
- Potamogeton natans** (R.I. Lynch, 1886) Cpt 1,4,7,8,9,10
Locally abundant in ditches, but less frequent than *P. coloratus*; however, it is more common in the ponds. There are especially large colonies in the ditch along the NE side of Pigeon Ride and on the north side of Baxter West Ride.
- Potamogeton perfoliatus** (G. Crompton, C.D. Preston & P.D. Sell, 1987)
Not seen in the present survey. The first and only record was of a healthy patch in the ditch on the NE side of Pigeon Ride, but this seems to have been lost, perhaps overgrown by vigorous colonies of *P. coloratus* and *P. natans*.
- [Potentilla anglica**
Given on all the Musgrave lists, but there are no other reports and in the absence of voucher material the records require further confirmation. Confusion with *P. x mixta* or large forms of *P. erecta* is likely.]
- Potentilla anglica x P. reptans = P. x mixta** (P.H. Oswald, D.A. Wells *et al.*, 1995) Cpt 2,9
One patch still on the chalk bank in cpt 2, where it was first seen in 1995; also in several places on a fen island in cpt 9. The plants are entirely seed sterile.
- Potentilla anserina** (A. Fryer, probably 1880s) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Frequent over the Fen, especially on rides and ride margins, but also in winter wet areas in open fen.
- Potentilla erecta** (R.I. Lynch, 1886) Cpt 1,2,4,5,6,7,8,9,10,11,13
Frequent over the Fen on ride margins, in open fen and on the fen islands. Plants in several areas are unusually vigorous, with larger flowers and longer leaflets than normal; they are fertile and Dr Brenda Harold regards them as variants of this species. In cpt 11 it can be found growing on *Schoenus* tussocks.
- Potentilla reptans** (A. Fryer, probably 1880s) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Widespread on ride margins and on fen islands, but also in open fen e.g. with *Hydrocotyle vulgaris* under *Juncus subnodulosus* in cpt 2. A small variant often grows with *P. erecta* and can cause confusion.
- Poterium sanguisorba** (A. Fryer, probably 1880s) Cpt 2
Only three plants seen, on the chalk bank in cpt 2.
- Primula veris** (P.D. Sell, 1950) Cpt 1,2,4,5,6,7,8,9,10,11,13
Scattered along ride margins throughout the Fen, also on the fen islands and on the chalk bank in cpt 2; frequent on the higher ground along the NW margin of cpt 1, occasional on ditch banks and in scrub and open woodland.

Primula vulgaris (Musgrave list, 1977)

Not seen in the present survey. Musgrave listed it as 'Rare...woodland rides'. A rather surprising report, but being such a distinctive plant the record is accepted here.

Prunella vulgaris (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13

Frequent throughout the Fen, especially on and beside the rides, on the fen islands, on the chalk bank (cpt 2), and on the higher ground along the NW margin of cpt 1. A colony of white-flowered plants occurs on the lower edge of the chalk bank.

[**Prunus cerasus**

Not seen in the present survey. Recorded by A. Fryer as introduced on 'Chippenham Moor', 1884: the only record. In the absence of a specimen, this record for a frequently misunderstood species needs further confirmation. Fryer also recorded *P. padus* on the Fen.]

Prunus padus (Prof. Potter, 1887) Cpt 1,3,4,5,6,7,8,9,10,11,12

Locally abundant in and on the margins of damp woodland and on ride margins; more rarely bird-sown into open fen; perhaps a well-naturalised introduction on the Fen rather than a native.

Prunus spinosa (Musgrave list, 1977) Cpt 1,2,3,4,5,7,9,10,11,12,13

Colonies scattered in and on the margin of woodland throughout the Fen, sometimes forming ride-side scrub; one patch, presumably on a low fen island, in the middle of rushy fen in cpt 1.

Pteridium aquilinum (Musgrave list, 1977)

Not seen in the present survey. Musgrave records it as 'Rare...dry woodland'.

Pulicaria dysenterica (Musgrave list, 1977) Cpt 1,2,4,5,7,8,9,10,11,12,13

Widespread over the Fen and locally frequent: on ride margins, on fen islands and sometimes in or on the margin of wetter areas of open fen.

Quercus robur (W. Gooch, 1813) Cpt 1,2,3,4,5,6,7,8,9,10,11,13

Trees of considerable size are found in several woodland areas and may be of planted origin, but self- or bird-sown plants of all sizes are frequent over the Fen, sometimes even in areas of open fen.

Quercus robur x **Q. petraea** = **Q. x rosacea** (G. Crompton, C.D. Preston & P.D. Sell, 1987)
Cpt 4,8

One tree on the southern margin of the Poors Fen (cpt 4) showed pronounced mixed characters, another on the wooded bank along the NW side of cpt 8 just had a few stellate hairs on the lower surface of the leaves, but otherwise resembled *Q. robur*; the one previous record was by the Main Ride not far from the tree noted here in cpt 8.

Ranunculus acris (Musgrave list, 1977) Cpt 1,2,4,7,10,11

Rather local and only found in small quantity on fen islands, on the higher ground along the NW margin of cpts 1 & 2 and on a few ride margins.

Ranunculus bulbosus (Musgrave list, 1977) Cpt 2,10

Single plants seen on the chalk bank (cpt 2) and along a fence base in unusually damp conditions in cpt 10.

Ranunculus flammula (M. Musgrave, 1978-1979) Cpt 1,2

A rare plant of ride margins and a few areas of wet, *Juncus subnodulosus*-dominated fen.

Ranunculus lingua (Musgrave list, 1977) Cpt 4

Only seen on one very wet ride in the southern part of the Poors Fen (cpt 4). The large colony in a ditch at the SE end of the Main Ride (still present in 1995) has now gone.

Ranunculus repens (Musgrave list, 1977) Cpt 1,2,4,5,6,7,8,9,10,11,12,13

Common throughout the Fen, on and beside rides, in damp woodland, on fen islands, and on the higher ground along the NW margin of cpt 1; also locally abundant in winter wet hollows, but occurring more sparsely in open fen. One plant on the higher ground in cpt 1 had most flowers with 4 petals and 4 sepals (as well as one 6-merous flower).

Ranunculus sceleratus (ACL, 2012) Cpt 1,4,5,13

Very local in winter wet areas in open fen and in very wet open woodland.

- Ranunculus trichophyllus** (R.V. Lansdown *et al.* 2006) Cpt 1
Only seen scattered along the ditch running SW from the pond in cpt 1. Lansdown also had it nearby in the Chippenham River. This is probably the '*Ranunculus* sp. (*aquatilis*)' reported by P.A Wright in 1978.
- Reseda lutea** (S.M. Walters *et al.*, 1964) Cpt 1,2,4,5,7,8,9,11
Surprisingly frequent as scattered plants on ride and track margins, on fen islands and on disturbed ground along fence lines.
- Reseda luteola** (S.M. Walters, 1950-1957) Cpt 1
A few plants scattered over the higher ground along the NW margin of cpt 1.
- Rhamnus cathartica** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12
Frequent over the Fen, in and on the margins of woodland, in scrub, on ride margins and occasionally on fen islands or as young plants in open fen. One plant on the south margin of South Jerusalem Wood (cpt 12) is noticeably hairy. Peter Sell recorded a small-leaved variant (var. *ambigua*) along the Main Ride in 1987. There is also considerable variation in leaf shape and petiole length.
- Rhinanthus minor** (A. Fryer, probably 1880s)
Not seen in the present survey. The only other record is a collection made by A.S. Shrubbs in 1890.
- Ribes nigrum** (P.D. Sell, 1950) Cpt 3,7,9,12
Particularly frequent in and on the margins of Forty Acre Wood (cpt 7), but also in wet woodland below Underdown Plantation (cpt 3), and in both South and North Jerusalem Woods (cpts 9 & 12).
- Ribes rubrum** (M. Kassas, 1952) Cpt 2,3,4,7,12
A large population in damp woodland below Underdown Plantation (cpt 3), otherwise scattered plants on ditch banks and on wood margins.
- Ribes uva-crispa** (Musgrave list, 1980) Cpt 7,12
Very local on the Fen, but with several large colonies in the damp woodland of Forty Acre Wood (cpt 7); also on ride margins and ditch banks.
- Rosa arvensis** (O. Rackham, 1976)
Not seen in the present survey. Also reported from Pigeon Ride by Smith & Harding (2001); some other recent records have been errors.
- Rosa caesia x R. canina = R. x dumalis** (ACL, 2012) Cpt 1
Several plants at the NE end of cpt 1 appear to be this hybrid, which may be under-recorded: they have wine red young stems, large clustered fruits with very hispid styles and greyish green, folded leaflets.
- Rosa canina** (S.M. Walters *et al.*, 1964) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Frequent on ride margins and on the higher ground along the NW margin of cpt 1; also on some fen islands, and in both damp and dry woodland. Plants attributed to Group *Pubescentes* and Group *Transitoriae* have been expertly determined from the Fen.
- Rosa canina x R. micrantha = R. x toddiae** (J.M. Croft & D.A. Wells, 1993) Cpt 5,12
Single bushes by the Main Ride (cpt 5) and on the SE margin of South Jerusalem Wood (cpt 12), the latter confirmed by Roger Maskew. Previously recorded from the North Meadow and along the Main Ride.
- Rosa micrantha** (J.M. Croft & D.A. Wells, 1993) Cpt 1,2,3,4,5,6,7,8,9,10,11,12
Widespread on the Fen; most frequent on the higher ground along the NW margin of the Fen, both in the open ground of cpt 1 and in the woodland of cpt 2, as well as in or on the margins of other woodland, even when this is quite damp; also on ride margins, on the banks of ditches and along the Chippenham River, and on fen islands. This is the best site for this species in the county.

- Rosa micrantha** x **R. rubiginosa** = **R. x bigeneris** (C.D. Preston & S.E. Yates, 1996)
Not seen in the present survey. Previously recorded with in the North Meadow and determined by Rev. Primavesi. The only Cambridgeshire record for this hybrid. Both parents are found in the North Meadow.
- Rosa rubiginosa** (S.M. Walters *et al.*, 1964) Cpt 1,6
Scattered over the higher ground along the NW side of cpt 1, locally frequent at the NE end; also one at the base of a *Rhamnus catharticus* on an island in cpt 6. Some earlier records may have been errors for *R. micrantha* which is more widespread on the Fen.
- Rosa stylosa** (ACL, 2013) Cpt 7
One large old shrub in damp woodland towards the NW margin of cpt 7, confirmed by Roger Maskew; the only record.
- Rosa tomentosa** (ACL, 2013) Cpt 7
One bush in a band of scrub along the main NW/SE ride through Forty Acre Wood (cpt 7); the only record.
- Rubus babingtonianus** (ACL, 2012) Cpt 1,2,4,5,6,8,11,13
Widespread on ride and track margins, on ditch banks and on the higher ground along the NW margin of cpt 1.
- Rubus caesius** (S.M. Walters, c.1950) Cpt 1,2,4,6,7,8,9,10,11,12,13
Widespread on ride and track margins, along wood edges and on ditch banks.
- Rubus caesius** x **R. idaeus** = **R. x pseudoidaeus** (ACL, 2013) Cpt 7
A large patch on the ride margin near the gate into cpt 13 from cpt 7.
- Rubus cantabrigiensis** (ACL, 2014) Cpt 1,7
A patch on a woodland edge in the NW corner of cpt 1, and a small plant on a ditch bank along Pigeon Ride.
- Rubus** cf. **conjungens** (ACL, 2013) Cpt 9
A small clump of a pale pink-flowered form on a ditch bank along Baxter West Ride.
- Rubus ulmifolius** (ACL, 2011) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Widespread and locally abundant in woodland and scrub; also along ride margins, on ditch banks and on the fen islands. Probably the '*Rubus fruticosus*' recorded earlier from the Fen (e.g. S.M. Walters, *et al.*, 1964).
- Rubus idaeus** (S.C. Shaw & B.D. Wheeler, 1991) Cpt 4,9
Very local on the Fen: found in two places on ride margins in cpt 4, and in one spot at the NW end of Baxter West Ride (cpt 9).
- Rubus vestitus** (ACL, 2012) Cpt 3,5
Only at the western end of the Fen, both in and on the margin of Underdown Plantation (cpt 3), in the wet woodland below and along adjacent ride margins at the NW tip of cpt 5.
- Rumex acetosa** (Cambridge Flora Group, 2010) Cpt 1
Only found scattered over the higher ground along the NW margin of cpt 1.
- Rumex conglomeratus** (F.H. Perring, 1950) Cpt 1,4,13
Only frequent along the fence line/ditch bank along the NE margin of cpt 13; scattered plants elsewhere on ditch banks and on overgrown ride margins.
- Rumex crispus** (Ecological Services Report, 1996) Cpt 1,10
A few plants scattered over the higher ground along the NW margin of cpt 1 (and in one winter wet hollow); otherwise one plant seen in a ditch in open woodland in cpt 10.
- Rumex crispus** x **R. obtusifolius** = **R. x pratensis** (ACL, 2012) Cpt 1
At least five plants recorded scattered along the NW margin of cpt 1, both on the higher ground and in one winter wet hollow: both parents occur in these areas.
- Rumex obtusifolius** (Musgrave list, 1977) Cpt 1,7,8,12
Very local and probably imported with soil to fill ruts in two places on the rides, also in the car park and in two places near the gates into the NW part of cpt 1.
- Rumex pulcher** (Cambridge Flora Group, 2010) Cpt 1
Scattered along the fence line on the higher ground on the NW margin of cpt 1.

Rumex sanguineus (Cambridge Flora Group, 2010) Cpt 1,2,10,12,13

Rather sparsely scattered in woodland and on ride margins, occasionally on fen islands (in cpt 10).

[Sagina nodosa

Not seen in the present survey. Reported by Shaw & Tratt (2014) as being in the original SSSI citation for the Fen, but this needs confirmation.]

Salix alba (Musgrave list, 1977) Cpt 1,3,4,5,9,10,12

A few large trees in woodland, some of these perhaps planted, but self-sown plants are found scattered in open fen, on ride margins and on ditch banks.

Salix alba x **S. euxina** = **S. x fragilis** (ACL, 2014) Cpt 3

Three trees along a dry ditch in Underdown Plantation; the only record.

Salix aurita x **S. cinerea** = **S. x multinervis** (ACL, 2012) Cpt 2

One large bush in the willow fringe to woodland along the NW side of open fen in cpt 2, confirmed by R.D. Meikle (as a possible backcross to *cinerea*). S. M. Walters collected material for cultivation in the University Botanic Garden of another possible plant in the Poors Fen in 1980, but no trace of this can now be found.

Salix caprea (A. Fryer, probably 1880s) Cpt 4,5,7,9,10,12

Rather uncommon on the Fen, mostly as solitary plants in damp woodland, in tall herb fen and on ditch and ride margins.

Salix caprea x **S. cinerea** = **S. x reichardtii** (P.D. Sell, 1987) Cpt 4,6,7,13?

Confirmed by R.D. Meikle from a ditch bank on the SW margin of the Poors Fen (cpt 4), and seen on a ditch bank in cpt 6, a wood margin in cpt 7 and perhaps along the NE margin of cpt 13. Perhaps under-recorded but many willows on the Fen can be hard to place.

Salix caprea x **S. myrsinifolia** = **S. x latifolia** (ACL, 2014) Cpt 4,5

Candidates for this combination have been seen on ride margins in the northern corner of the Poors Fen (cpt 4) and the adjacent NW corner of cpt 5 (with both parents present in this part of the Fen); perhaps elsewhere too as young plants in open fen in Cpt 4.

Salix cinerea (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13

Widespread and common throughout the Fen, in and on the margins of damp woodland, in scrub, on ride margins and on ditch banks; young plants are frequent in open fen. Very variable, with the interpretation of some plants not fully understood. Both subsp. *cinerea* (cpt 2,3,4,5,6,7,8,9,10,11,12) and subsp. *oleifolia* (cpt 1,2,4,5,7,8,9,10,12) occur, but many plants are hard to place and may be hybrids between them or with other species.

[Salix cinerea x **S. viminalis** = **S. x holosericea**

Not seen in the present survey. Collected by P.D. Sell from the North Meadow in 1987, but the specimen in CGE is not convincing for this hybrid and is similar to narrow-leaved variants of *cinerea* from the Fen determined as such by R.D. Meikle.]

Salix cinerea x **S. myrsinifolia** = **S. x puberula** (Cambridge Flora Group, 2010)

Cpt 1,2,3,4,5,6,8

Confirmed by R.D. Meikle from the SW end of cpt 2; strong candidates for this hybrid are widely scattered in damp woodland, in open fen, on ditch banks and on ride margins, especially within the main area of distribution of *S. myrsinifolia* in the west of the Fen, and more rarely in scattered sites elsewhere.

Salix myrsinifolia (V.G. Chapman, 1933) Cpt 2,3,4,5,6

The oldest plants are mainly in damp scrub and woodland along or near the Chippenham River at the SW end of cpt 2 and all along the lower-lying ground in cpt 3; also along a broad ditch along the SW side of the Poors Fen (cpt 4); young plants are particularly frequent on parts of the Poors Fen and in the NW part of cpt 5. Male and female plants occur. The status here of this now predominantly northern willow is uncertain: it is at least potentially a native.

Salix purpurea (S.M. Walters, 1950-1957) Cpt 1,2,4,6,7,13

Scattered in various places along or near the Chippenham River, and in a few places elsewhere on ditch banks.

Salix repens (A. Fryer, probably 1880s)

Not seen in the present survey. Fryer's record is accepted here, although with some reservation, as there are no specimens to substantiate this or any other claims for this species on the Fen, and there is evidence that recent claims are errors for dwarf, small-leaved plants of *S. cinerea*; these often occur in mown or grazed fen and sometime produce new vigorous shoots with normal leaves.

Salix viminalis (ACL, 2014) Cpt 5

Two plants in dense stands of *Phragmites* and *Cladium* in cpt 5: the first records for the fen.

Sambucus nigra (M. Kassas, 1951) Cpt 1,3,4,5,6,7,10,11,12,13

Scattered over the Fen, mostly on wood margins and on ditch banks.

Samolus valerandi (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,7,8,9,10,11,13

Widespread on the Fen, especially on ditch banks, in winter wet hollows, by ponds and on other muddy, often cattle- or buffalo-poached areas.

Scabiosa columbaria (Musgrave list, 1977)

Not seen in the present survey. Musgrave (1980) recorded it as 'Occasional... meadow and shooting stands'.

Schedonorus arundinaceus (*Festuca arundinacea*) (S.M. Walters, 1950-1957)

Cpt 1,2,4,5,7,8,9,10,11,13

Widespread over the Fen, especially on the fen islands and along ride margins; the fen island plants are often short, with small delicate, sometimes nodding inflorescences. This may at least in part represent the plant collected here by P.J.O Trist in 1984 as var. *strictior*.

Schedonorus giganteus (*Festuca gigantea*) (Revised Musgrave list, post 1996)

Cpt 2,3,4,7,8,9,10,11,12,13

Locally frequent on track and ride margins, in and on the margins of woodland and along trimmed fence lines.

Schedonorus pratensis (*Festuca pratensis*) (E.A. George, 1940) Cpt 1,2,6,9,10,11,13

Scattered over the Fen, especially on ride margins, on the fen islands and on the higher ground along the NW margin of cpts 1 & 2.

Schoenoplectus lacustris (A. Fryer & A. Bennett, 1883)

Not seen in the present survey. The Fryer and Bennett record is the only one.

Schoenoplectus tabernaemontani (K. Spencer & J. Stone, 2009) Cpt 1,4,9,10,13

Mostly in or on the margins of ponds, but also found in low-lying areas of open fen.

Schoenus nigricans (R.I. Lynch, 1884) Cpt 2,5,6,8,9,11

Scattered over the central section of the Fen, most frequent in areas of regularly mown or grazed open fen; virtually dominant in a small area in the NE quarter of cpt 11, where the prominent tussocks have an extensive epiphytic flora; occasional plants found in tall herb fen and on fen islands.

Scorzoneroideis autumnalis (*Leontodon autumnalis*) (A. Fryer, probably 1880s) Cpt 1,5,7,12,13

Scattered in small quantity on wood and ride margins, on the higher ground along the NE margin of cpt 1, and on the spoil heap from the pond in cpt 13.

Scrophularia auriculata (A. Fyer, probably 1880s) Cpt 2,4,5,6,7,8,9,10,11,13

Fairly frequent along ditch banks, along the Chippenham River and occasionally in tall herb fen. A plant in *Juncus subnodulosus*-dominated fen in cpt 6 was unusually hairy.

Scrophularia nodosa (Musgrave list, 1977)

Not seen in the present survey. Recorded as 'Locally frequent...dyke banks' by Musgrave (1977). Also listed by G. Crompton, C.D. Preston & P.D. Sell in 1987. However, another more recent record is known to have been an error for *S. auriculata*.

Scutellaria galericulata ('RHG', 1905/1906) Cpt 3,4,5,6,7,8,10

Locally frequent on ride margins, but also in damp woodland and occasionally in areas of wet open fen.

Sedum acre (A. Fryer, probably 1880s)

Not seen in the present survey. Fryer's record is the only one.

- Selinum carvifolia** (W.J. Cross, 1882) Cpt 1,2,6,8,9,10,11,13
Perhaps now the only remaining site for this species in the British Isles. It continues to flourish here, especially on some of the fen islands and in areas of usually mown or grazed open fen, as well as on some fen ride margins, and occasionally persisting in tall herb fen. Flowering numbers can be very variable, from a few hundred to many thousands in any one year.
- Senecio aquaticus** (A. Fryer, probably 1880s)
Not seen in the present survey. Listed as 'Rare...open fen' by Musgrave (1980) and reported by D. Wood & M. Woods in 2003 and listed from cpt 4 by Spencer & Stone (2009). Ragworts in areas of wet fen often turn out to be *S. erucifolius* growing on low fen islands.
- Senecio erucifolius** (S.M. Walters, 1950-1957) Cpt 1,2,4,7,9,10,13
Scattered on fen islands, on the open higher ground along the NW margin of the Fen, on ride margins and on ditch banks; occasional plants in open or tall herb fen, usually on low fen islands.
- Senecio jacobaea** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,7,8,9,10,11,12,13
Scattered over the Fen, mostly on ride margins, on fen islands and on the open higher ground along the NW margin of the Fen; also on ditch banks, and the banks of the Chippenham River.
- Senecio vulgaris** (S.C. Shaw & B.D. Wheeler, 1992) Cpt 1,2,8,9,10
Scattered in small quantity on disturbed or bare areas along tracks and rides, on the open higher ground along the NW margin of the Fen, as well as on one muddy pool margin.
- Serratula tinctoria** (A. Fryer & A. Bennett, 1883) Cpt 1,2,6,9,10,11
Locally frequent in mown or grazed open fen, on the fen islands (especially in cpts 1 & 2) and on a few ride margins (notably Baxter West Ride).
- Silaum silaus** (A.S. Shrubbs, 1886) Cpt 1,2,8,9,10,11
Perhaps most frequent in cpt 2 (on the chalk bank and in several areas of more grassy open fen at the NE end); scattered elsewhere, mostly on ride margins and on fen islands.
- Silene flos-cuculi** (*Lychnis flos-cuculi*) (A. Fryer, probably, 1880s) Cpt 9
One clump seen in open fen at the SW end of cpt 9. Musgrave lists suggest it was previously also in the North Meadow.
- Silene latifolia** (*S. alba*) (A. Fryer, probably 1880s) Cpt 1
Scattered along or near the fence line on the higher ground along the NW margin of cpt 1.
- Silene vulgaris** (A. Fryer, probably 1880s) Cpt 1
Individual plants seen in two places on the higher ground along the NW margin of cpt 1.
- Sinapis arvensis** (A. Fryer, probably 1880s) Cpt 1,4,6,9,10,11,12
Scattered plants on fen islands, by gateways, on ride margins and ditch banks, as well as in other areas of ground disturbed by the water buffalo.
- Sisymbrium officinale** (Ecological Services Report, 1996) Cpt 1,12
Scattered along the fence line on the higher ground along the NW margin of cpt 1, and along the fence line on the south margin of South Jerusalem Wood.
- Solanum dulcamara** (W. West, Jr, pre 1901) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
A common plant in wet woodland, on ditch banks and on ride margins, sometimes scrambling in tall herb fen.
- Solanum nigrum** (Ecological Services Report, 1996) Cpt 10
One plant seen on the track from Baxter West Ride to Bullock Hill in cpt 10.
- Sonchus arvensis** (Musgrave list, 1977) Cpt 1,2,4,5,7,9,10,11,12,13
Scattered on ride margins and on ditch banks, as well as along fence and hedge lines.
- Sonchus asper** (G. Crompton, C.D. Preston & P.D. Sell, 1987) Cpt 1,2,4,8,9,10,11,12,13
Widely scattered, usually in small quantity, on track and ride margins, on fen islands and on the higher ground along the NW margin of cpt 1; also on cattle- or buffalo-poached ground around ponds and along the Chippenham River, with an occasional plant in open fen.

- Sonchus oleraceus** (S.C. Shaw & B.D. Wheeler, 1991) Cpt 1,7,9,12
 In similar places, but much less common than *S. asper*, such as along fence lines on the higher ground along the NW margin of cpt 1, and in buffalo-poached ground by a pond in cpt 9; always in small quantity.
- [Sorbus aria**
 Not seen in the present survey. S.M. Walters noted this in July 1960, with *Prunus padus*, on the margin of Forty Acre Wood (cpt 7), but it seems likely this was a slip for *Sorbus aucuparia*, which he had in the same area in 1954. There are no other records from the Fen.]
- Sorbus aucuparia** (S.M. Walters, 1954) Cpt 7
 Single, small, fruiting trees seen in three places at the margins of the western quarter of Forty Acre Wood (cpt 7), all apparently bird-sown: all have lost their tips or are bent over. Probably the area from which Max Walters recorded two small trees in 1954. Smith & Harding (2001) also reported it from the New Plantation, but this cannot be refound. A rare plant as a potential native in the county.
- Sparganium emersum** (A. Fryer & A. Bennett, 1883) Cpt 8
 Several patches in the pond on the NE margin of cpt 8 and some in the ditch bordering Pigeon Ride immediately to the NE.
- Sparganium erectum** (A. Fryer, probably 1880s) Cpt 1,6,7,9,10,12
 Rather local, but found scattered along parts of the Chippenham River and in some ditches and ponds.
- Sparganium natans** (collector unknown, 1885, CGE) Cpt 1,4,8,9,10
 There are flourishing colonies in several ditches (especially in cpts 8 & 10), sometimes surviving in considerable shade or despite bathing water buffalo! Occasionally seen in ponds or in very wet areas of open fen. A very rare plant now in the south of England and not seen recently elsewhere in the county.
- Stachys palustris** (S.M. Walters, 1950-1957) Cpt 4,6,7,12
 A few sites on damp woodland or ride margins, on ditch banks and rarely in tall herb fen.
- Stachys palustris** x **S. sylvatica** = **S. x ambigua** (ACL, 2014) Cpt 12
 A single colony on the margin of the ride running south from Bullock Hill (cpt 12); growing with *S. sylvatica*, and with *S. palustris* nearby.
- Stachys sylvatica** (Musgrave list, 1977) Cpt 2,3,7,9,10,11,12,13
 Scattered in and along the margins of woodland and along ride margins.
- Stellaria media** (Musgrave list, 1977) Cpt 1,10
 Frequent along the fence line and in cattle-trampled ground under hawthorns on the higher ground along the NW margin of cpt 1, and a few plants in bare areas disturbed by water buffalo on Bullock Hill (cpt 12).
- Stellaria pallida** (ACL, 2014) Cpt 1
 A small population along the fence line on the higher ground along the NW margin of cpt 1.
- Succisa pratensis** (A. Fryer, probably 1880s) Cpt 1,2,5,7,8,9,10,11,13
 Locally abundant, especially on the fen islands, on the chalk bank (cpt 2) and in some areas of grazed or mown open fen (especially in cpt 2), occasionally on ride margins and on ditch banks. In one large population in open fen at the NE end of cpt 2 some plants have pale blue flowers and one had pink-budded white flowers.
- Symphytum officinale** (A. Fryer, probably 1880s) Cpt 6,7,8,9,10,11,13
 Scattered along ditch banks, on track and ride margins, in open fen and in damp woodland, mainly in the south and east of the Fen.
- Tamus communis** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
 Never abundant, but scattered throughout the Fen, mainly in woodland or climbing over shrubs along ride margins and ditch banks; also found climbing into dense reeds along some rides. A plant along the Main Ride (cpt 2) had particularly large berries (13 x 13mm).
- Taraxacum** sect. **Erythrosperma** (ACL, 2013) Cpt 1
 One plant under fence line on the higher ground along the NW margin of cpt 1.

- Taraxacum** spp. (Musgrave list, 1977) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Scattered along ride margins, on some fen islands and on the higher ground along the NW margin of cpt 1. Dandelions are not very common on the Fen, but their diversity has yet to be investigated, although there appear to be no representatives of sect. *Spectabilia* or sect. *Palustria*.
- Taxus baccata** (P.D. Sell, 1961) Cpt 3,7,8,9,12
Scattered trees in woodland, perhaps all planted; no young plants have been recorded.
- Tephrosia palustris** (R. Relhan, 1799)
Not seen in the present survey. Described by Relhan (1802) as from 'Chippenham; in a Ditch, on the Edge of the Moor, next to the Park'. Not reported here by any later botanists and now extinct in the British Isles.
- Thalictrum flavum** (F.R. Tennant, 1900) Cpt 1,2,3,4,6,7,8,10,11,13
Widely scattered and very locally frequent in open or tall herb fen, as well as along the Chippenham River, on ditch banks and in damp woodland.
- Thelypteris palustris** (ACL, 2013) Cpt 4
A colony over c. 20 x 20ft of very wet alder carr, at the southern tip of cpt 4. Not previously recorded on the Fen; the only other extant site in the county is at Wicken Fen.
- Thesium humifusum** (R. Relhan, 1802)
Not seen in the present survey. Relhan's record from 'Chippenham Moor' is the only one.
- Thymus pulegioides** (A. Fryer, probably 1880s)
Not seen in the present survey. Max Walters recorded it on Baxter West Ride in 1953 but it has not been reported since.
- Thyselfium palustre** (*Peucedanum palustre*) (A.S. Shrubbs, 1921)
Not seen in the present survey. The only record is based on a specimen in **CGE** which was originally named as *Selinum carvifolia*. Frequent at Wicken Fen, where *Selinum* does not occur.
- Torilis japonica** (Revised Musgrave list, post 1996) Cpt 1,2,12
A few plants in woodland in cpt 2, along a wood margin in South Jerusalem Wood (cpt 12), and in an open hedge line in cpt 1.
- Torilis nodosa** (ACL, 2012) Cpt 1
Numerous plants along the fence line on the higher ground along the NW margin of cpt 1.
- Tragopogon pratensis** (Musgrave list, 1978-1979) Cpt 1,10
A few plants along the fence line on the higher ground along the NW margin of cpt 1, as well as on a fen island in cpt 10.
- Trifolium arvense** (Musgrave list, 1977)
Not seen in the present survey, although still present on the sandy bank just NW of the Fen.
- Trifolium campestre** (ACL, 2014) Cpt 1
A few plants scattered over the higher ground along the NW margin of cpt 1.
- Trifolium dubium** (S.M. Walters *et al.*, 1964) Cpt 2,4,8,9,12
Scattered over the Fen, especially on ride margins (notably in cpt 4), on fen islands and in the car park.
- Trifolium fragiferum** (Ecological Services Report, 1996) Cpt 1,2,5,6
Several patches along the NW end of the Main Ride, where it divides cpts 1/2 and 5/6: the flower heads often mown off so it can be hard to spot! Also reported by the Ecological Services Report (1996), but this may have been in fields just to the NE of cpt 1.
- Trifolium pratense** (S.M. Walters *et al.*, 1964) Cpt 1,2,4,6,7,9,10,12,13
Locally frequent on fen islands, over the higher ground along the NW margin of cpt 1, on the chalk bank (cpt 2), and along ride margins. Plants all seem to be referable to the native var. *pratense*.
- Trifolium repens** (S.M. Walters *et al.*, 1964) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Frequent on tracks and rides, in gateways, on fen islands and the open higher ground along the NW margin of the Fen (cpts 1 & 2). A pale pink-flowered variant occurs on the Main Ride between cpts 5 & 6.

- Triglochin palustris** (A. Fryer & A. Bennett, 1883) Cpt 1,2,4,5,6,7,9,10
Locally abundant in and beside wet tracks and rides, in other winter wet sites, and occasionally in open fen.
- Trisetum flavescens** (A. Fryer, probably 1880s) Cpt 1,2,4,12,13
Rather local, but found on the chalk bank (cpt 2), on the higher ground along the NW margin of cpt 1, on ride margins, along fence lines and on one woodland border.
- Tussilago farfara** (S.M. Walters *et al.*, 1964) Cpt 3,4,5,7,9,10,11,12,13
Widespread, but usually in small colonies, in damp or boggy woodland, on ride and pond margins, occasionally in open fen; a colony in a ditch in South Jerusalem Wood (cpt 10/12) grows and flowers in six inches of water.
- Typha angustifolia** (C. Hainsworth, ACL & T. Pankhurst, 2011) Cpt 9
Only seen in the large shallow pool at the eastern end of cpt 9.
- Typha latifolia** (S.M. Walters, 1950-1957) Cpt 1,2,4,5,6,7,9
Scattered over the Fen in ponds and ditches, on wet ride margins and in some wet areas of tall herb fen; usually in small quantity.
- Ulmus glabra** (M. Kassas, 1952) Cpt 3,6,7,8,9,10,11,12
The commonest elm on the Fen, scattered through both dry and damp woodland, along the ride margins and on ditch banks; most are young tree or saplings.
- Ulmus glabra** x **U. minor** = **U. x hollandica** (ACL, 2014) Cpt 3?,7?,12
Two very convincing small trees in South Jerusalem Wood (cpt 12); other possible clones on the NW margin of Underdown Plantation (cpt 3) and in Forty Acre Wood (cpt 7) – perhaps overlooked elsewhere.
- Ulmus minor** (ACL, 2014) Cpt 13
At least some of the elms in the woodland strip across cpt 13 are this species, which seems genuinely rare on the Fen.
- Ulmus procera** (Musgrave list, 1977) Cpt 7
A small clone on the edge of woodland along the NW/SE ride through Forty Acre Wood (cpt 7) is convincing material of this species.
A number of other elm clones across the Fen cannot readily be placed in any of the above taxa: some show evidence of being **U. procera** x **U. minor** and **U. glabra** x **U. procera**, but they need further study.
- Urtica dioica** (M. Kassas, 1952) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Widespread, but nowhere abundant; mostly in damp woodland, on ditch banks and occasionally in tall herb fen. No stingless or unusually narrow-leaved plants have been noted (i.e. subsp. *galeopsifolia*); these have been recorded in the past, but this taxon is not always readily separable from subsp. *dioica*.
- Utricularia intermedia** (A.S. Shrubbs, 1898)
Not seen in the present survey. Shrubbs's record is the only one and is supported by a specimen in CGE.
- Utricularia minor** (R. Relhan, 1795)
Not seen in the present survey. Probably last recorded on the Fen in the 1890s.
- Utricularia vulgaris** (R.I. Lynch, 1880)
Not seen in the present survey. Probably last seen on the Fen in the 1800s, although in 1978 P.A Wright, in a note in the Fen archives, mentions that it had been 'recently rediscovered in a ditch just outside the NNR in North Meadow'.
- Valeriana dioica** (A. Fryer & A. Bennett, 1883) Cpt 1,2,4,5,6,7,8,9,10,11,13
Locally frequent in open fen, especially in mown and grazed areas, also on ride margins, on ditch banks and along the Chippenham River. Several patches in open fen in the NW part of the East Meadow (cpt 13) have pure white buds and flowers. Often in full flower by mid April.

- Valeriana officinalis** (Musgrave list, 1977) Cpt 2,6,8,10,11
More local than *V. dioica* and usually in small quantity, on damp woodland margins and in open rushy fen; occasionally in tall herb fen and on ride margins.
- Verbascum nigrum** (Musgrave list, 1977)
Not seen in the present survey. Formerly by the main SE entrance to the Fen.
- Verbascum thapsus** (S.M. Walters, 1950-1957) Cpt 4
One plant seen on a fen island towards the western end of cpt 4.
- Verbena officinalis** (D.E. S(treeter?), 1945) Cpt 11,12
Two plants seen in the car park (the compartment boundary runs between them).
- Veronica anagallis-aquatica** (E.F. Warburg, 1941) Cpt 4,9
Colonies seen in two places: a very wet ride at the SE corner of the Poors Fen (cpt 4) and in a ditch at the NW end of the New Plantation (cpt 9).
- Veronica arvensis** (Musgrave list, 1977) Cpt 1,12
Scattered in short turf on the higher ground along the NW margin of cpt 1, along the southern fence line bordering South Jerusalem Wood (cpt 12), and in the car park.
- Veronica beccabunga** (A. Fryer, probably 1880s) Cpt 1,2,4,6,7,8,9,10,11,12,13
Locally frequent in ditches, in wet patches along rides and tracks, and in other areas trampled by cattle and water buffalo.
- Veronica catenata** (S.M. Walters, 1953) Cpt 1
Frequent along the SW/NE ditch draining the pond in cpt 1; probably the same area from which it was first recorded by Max Walters in 1953.
- Veronica chamaedrys** (A. Fryer, probably 1880s) Cpt 1,2,3,7,11,12
Scattered over the higher ground along the NW margin of cpts 1 & 2, as well as on woodland margins, along some rides and in the car park.
- Veronica filiformis** (ACL, 2012) Cpt 10
Scattered over damp tracks, along fence lines, in scrubby woodland and woodland glades, in the eastern half of cpt 10. A rather surprising alien to be found on the Fen.
- Veronica hederifolia** (ACL, 2012) Cpt 2
A small population below the fence line on the higher ground along NW margin of cpt 1. These plants were all subsp. *lucorum*.
- Veronica persica** (D.A. Wells *et al.*, 1996) Cpt 1,7,12
Scattered plants on the higher ground along the NW margin of cpt 1, as well as in the car park, and on an earth heap at the fen entrance; also seen on soil used to fill ruts along Pigeon Ride.
- Veronica scutellata** (Musgrave list, 1977)
Not seen in the present survey. Listed as 'Rare...open fen' by Musgrave (1980) and noted by Smith & Harding (2001) in cpt 11, and in cpt 9 by Spencer & Stone (2009).
- Veronica serpyllifolia** (ACL, 2012) Cpt 6,7,8,11,12
Scattered on rides and in the car park.
- Viburnum opulus** (A. Fryer, probably 1880s) Cpt 1,2,3,4,5,6,7,8,9,10,11,12,13
Widespread and locally frequent, especially on damp wood margins and along rides, also on ditch banks and along the Chippenham River; sometimes seen as young plants in open fen or in tall herb fen. Often exhibiting glorious autumn colour along the fen rides.
- Vicia cracca** (A. Fryer, probably 1880s) Cpt 1,2,4,5,6,7,8,9,10,11,12,13
Scattered over the higher ground along the NW margin of cpt 1, and on some fen islands, but also quite frequent in open fen (sometimes climbing through stands of *Juncus subnodulosus*), also along the ride margins.
- Vicia sativa** (Musgrave list, 1977) Cpt 1
A few plants on the higher ground towards the NE end of cpt 1; all rather intermediate between subsp. *segetalis* and subsp. *nigra*.

- Viola hirta** (ACL, 2012) Cpt 7,11
 One small clump in the centre of a mown ride along the SE margin of cpt 11, and one small plant on a bank below beech trees on raised ground at the SE end of Forty Acre Wood (cpt 7); another population along the fence line on the south side of South Jerusalem Wood (cpt 12) may be *V. hirta* x *V. odorata*, but needs further investigation. A rather surprising addition to the flora of the Fen.
- Viola odorata** (M. Musgrave, 1978-1979) Cpt 3,11
 Several plants on a bank near the Chippenham River in Underdown Plantation (cpt 3), and one clump beside the machinery shed/office (cpt 11); none seen in flower.
- [Viola canina**
 Not seen in the present survey. Listed in Musgrave (1977), but omitted from later lists and is assumed to have been an error.]
- [Viola persicifolia**
 Not seen in the present survey. Listed from the Fen in 1893 by A.S. Shrubbs, in his annotated copy of Babington's *Flora of Cambridgeshire*; there are no other records and its occurrence here requires further confirmation.]
- Viola riviniana** (ACL, 2012) Cpt 9
 Several plants on the Main Ride: the only site.
- Zannichellia palustris** (ACL, 2012) Cpt 13
 Only found in the deep pond dug for the water buffalo in the East Meadow (cpt 13); this best matches subsp. *palustris*, although not all the diagnostic characters are uniform.

Acknowledgments

I am indebted to Chris Hainsworth for providing Figure 1, for allowing me access to, and copies of, papers from the Fen archive, and for his initial suggestion to undertake this work. I am also grateful for the hospitality and encouragement shown to me by both Chris and the Reserve Manager, Mike Taylor, who both have extensive knowledge of the Fen and its wildlife. The text has also benefited from a critical appraisal by Chris Preston whose comments have resulted in significant improvements, not least preventing one species from being entirely omitted!

References

- Babington, C.C.** (1860). *Flora of Cambridgeshire*. London.
- Bennett, A.** (1899). Notes on Cambridgeshire plants. *J. Bot.* **37**:243-247.
- Crompton, G.** (2001-2004). *Catalogue of Cambridgeshire flora records since 1538*: part 1 (2001), part 2 (2009), part 3 (2003). See <http://www.cambridgeshireflora.com>
- Ecological Services Ltd Report** (1996). *National Vegetation Classification (NVC) survey of Chippenham Fen NNR/SSSI. North and East Meadows, Cambridgeshire.* (Unpublished).
- Evans, A.H.** (1911). A Short Flora of Cambridgeshire. *Proc. Camb. Phil. Soc.* **16** (3):197-234.
- Evans, A.H.** (1939). *A Flora of Cambridgeshire*. London.
- Godfery, H.M.** (1933). *Monograph & iconography of native British Orchidaceae.* Cambridge.
- Gooch, W.** (1813). *General view of the agriculture of the county of Cambridge*. London.
- Kassas, M.** (1951). Studies in the ecology of Chippenham Fen.
 1. The fen water-table. *J. Ecol.* **39**:1-18.

2. Recent history of the fen from the evidence of historical records, vegetational analysis and tree- ring analysis. *J. Ecol.* **39**:19-32.

- Kassas, M.** (1952). Studies in the ecology of Chippenham Fen
3. The Forty Acre Wood. *J. Ecol.* **40**: 50-61.
4. Tree and bush colonization in South Chippenham Fen. *J. Ecol.* **40**:62-73.
- Mason, G.H.** (1990). *The hydrology of Chippenham Fen, Cambridgeshire. An assessment of the impact of the Lodes-Granta groundwater scheme.* (Unpublished).
- Mowl, T. & Mayer, L.** (2013). *The Historic Gardens of England. Cambridgeshire and the Isle of Ely.* Bristol
- Musgrave, M.** (1977). *Chippenham Fen National Nature Reserve. Vascular plant check-list* (Unpublished).
- Musgrave, M.** (1980). *Chippenham Fen National Nature Reserve. Vascular plant check-list.* Revised, 1979. (Unpublished).
- Musgrave, M.** (post 1996). *Chippenham Fen National Nature Reserve. Vascular plant check-list.* Further revised (certainly post 1996). (Unpublished).
- Perring, F.H., Sell, P.D. , Walters, S.M. & Whitehouse, H.L.K.** (1964). *A Flora of Cambridgeshire.* Cambridge.
- Relhan, R.** (1785). *Flora Cantabrigiensis.* Cambridge. First supplement (1786), third supplement (1793).
- Relhan, R.** (1802). *Flora Cantabrigiensis.* Second edition. Cambridge.
- Riddelsdell, H.J.** (1904). *Selinum carvifolia* , Linn. *The Botanical Exchange Club of the British Isles*, **2**:19
- Shaw, S.C. & Tratt, R.** (2014). *Observations on Schoenus nigricans-Juncus subnodulosus mire (M13) sites on selected East Anglian fens, 2013: Chippenham Fen.* (Unpublished).
- Shaw, S.C. & Wheeler, B.D.** (1996). *Chippenham Fen NR. Botanical, invertebrate and hydrological monitoring 1991-1995. Appendix 2. Vegetation monitoring.* (Unpublished).
- Smith, K. & Harding, M.** (2001). *Wetland plant communities of Chippenham Fen NNR, Cambridgeshire.* (Unpublished).
- Spencer, K. & Stone, J.** (2009). *Wetland plant communities of Chippenham Fen NNR, Cambridgeshire. Compartments 4 & 9.* (Unpublished).
- Stace, C.A.** (2010). *New Flora of the British Isles*, third edition. Cambridge.
- Vancouver, C.** (1794). *General view of the agriculture in the county of Cambridge.* London.

A monitored restoration of a fenland plant community

Stephen P. Tomkins, Roger C. Beecroft, C. James Cadbury, Philip H. Oswald & Charles Turner

This is the second of two *Nature in Cambridgeshire* articles that specifically address the restoration of fenland plant species and plant communities at Kingfishers Bridge, near Wicken, Cambridgeshire. Three of the present authors (Beecroft, Cadbury & Tomkins, 2013) reported in *N. in C.* No. 55 on the mixed

success with three species – *Teucrium scordium* (Water Germander), *Selinum carvifolia* (Cambridge Milk-parsley) and *Senecio paludosus* (Fen Ragwort). The first was, so far, a dramatic success, the second was very encouraging though still tenuous, and the third was discouraging and requires further work.

The conservation managers and volunteers at Kingfishers Bridge have been attempting, amongst other projects, to redevelop a fenland plant community. By a ‘fen’ we mean a mixed plant community on base-rich peat with a high water-table and managed by cutting or rough grazing. In contrast to the three rare fenland plant species listed above, the focus of this article is on those less endangered species that predominate in and characterise the historic fenland communities. These are now rare in Cambridgeshire, though they once dominated our fenland region; however they are still present at Wicken, Chippenham, Woodwalton and Holme Fens.

Since its inception, in 1995/96, this project has been deliberately experimental. In 1996 two Dutch restoration ecologists (Wassen & Grootjans) had suggested that “for sedges and wet meadow species the dispersal of propagules to restored wetlands is slow and may pose a serious problem for the re-establishment of these species”. One of the present authors, RCB, designed and implemented the experiments here with such knowledge and observations of his own in mind, importing seed from Chippenham Fen so as to explore whether an interesting herb-rich plant community could be established. As in the previous paper we aim to evaluate those methods that the Kingfishers Bridge project has employed to re-establish a fen community on this post-agricultural farmland artificially. It was well known at the time that water quality is key to such wetland regeneration. ‘The Fen’ at Kingfishers Bridge is supplied with water by channelled flow of ground-water from the adjacent Corallian Limestone. It is not fed by lower-quality water from the adjacent River Cam. Hydrology, topography and management were all expected to have a role in how the site developed. The hydrology included options for control of water levels and the inclusion of seepage zones.

With experiment and innovation as our aim, we have been trying to gain a clearer answer to these four questions.

1. Do such assisted introductions for fen creation work at all?
2. Are successful introductions sustained by the right management?
3. How successful is independent spread to such a site through the normal dispersal of plants?
4. How fast is the natural succession once a site is established?

These are important questions for fenland naturalists and conservation managers striving to expand the little islands of native Cambridgeshire fenland.

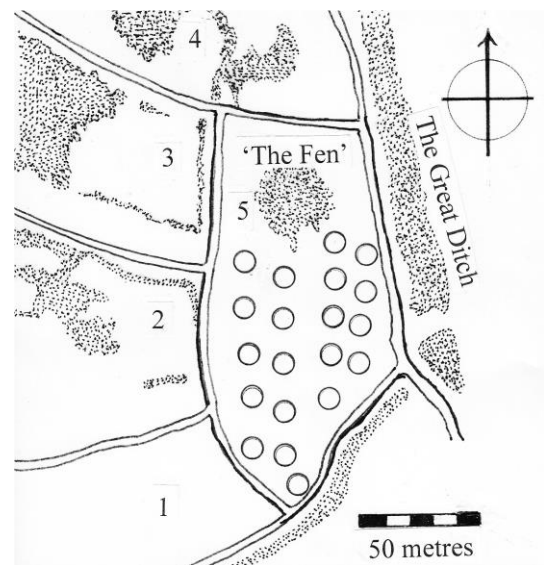
‘The Fen’ at Kingfishers Bridge

Kingfishers Bridge Reserve was developed on a fenland edge with a peaty soil that had been farmed for at least two centuries. Just before 1995 it was certainly intensively farmed. At the beginning of the ‘fen re-creation’ there was little evidence of any ancient fenland seed-bank, but a huge explosion of ruderal (weed) communities did occur initially (Tomkins, 1998). This was no great

surprise and had indeed been expected. The project was planned and carefully engineered so that one quarter of the initial reserve area was devoted to creating a series of adjacent reedbeds. Flooding these areas quickly eliminated the agricultural weeds and so prepared the fen peat for a very successful seeding by *Phragmites australis* (Common Reed). As a result most of this area (9.4 ha) is now totally dominated by reeds. However, one south-eastern block of this larger area (Compartment 5) was deliberately chosen for a different treatment owing to its sloping topography giving a range from winter damp and summer dry to permanent standing water, with additional seepage zones. This was designated as ‘the Fen’ and was not reed-seeded like the first four. Here a roughly rectilinear one hectare plot which slopes down to pools on the northern edge is bounded with four low banks, which serve both as footpaths around it and as its defining boundary on the ground (see Figure 1).

Figure 1. ‘The Fen’ at Kingfishers Bridge

‘The Fen’ is the smallest of five compartments to the south-east of what are now four larger reedbeds dominated by *Phragmites australis*. The site is adjacent to the Great Ditch (TL547733). The circles indicate roughly the distribution of introductions, on north–south transect lines, at the drier southern end of this area of about one hectare. The stippled areas are open water and the double lines are the boundary banks with footpaths on them.



The small wetter pools at the north end now have a *Phragmites* community. The initial methods of establishment that were employed have been detailed previously (Tomkins, 1999, pp. 91–93) but there is much more to report since these beginnings.

Here we set down further details of the introductions to ‘the Fen’ and the subsequent recording and monitoring. Fuller, but elsewhere unpublished, details on this are also available in the reports written and edited by two of the present authors, R.C. Beecroft *et al.* (1996–2002) and C.J. Cadbury (2005–2014), and may also be obtained from the Kingfishers Bridge Warden, James Page (<http://www.kingfishersbridge.org/>). None of this development would have been possible without the support of the reserve owners, Andrew C. Green and his family. Recent recording and monitoring have been carried out by the authors and Alan Leslie. We acknowledge the initial botanical recorders of ‘the Fen’ – Karen Buckley, Mike Crewe, Simon J. Dunsford, Mark Gurney, Philip W. Lambdon and John Oates – who worked under the direction of Roger Beecroft. We are also grateful to Owen Mountford for his helpful comments on a draft of this paper.

Since 1996, when recording began on the bare peat, 138 vascular plant species have been recorded from this one hectare (32% of the whole reserve's recorded flora). At least 39 fenland species from a known source (Chippenham Fen) were introduced as seed in a closely recorded and monitored framework. Although this at first seemed doubtfully successful, because of initial lack of germination and survival, we have achieved a higher percentage species survival (64%) from this one source after ten years than we initially expected. This is our key finding. Where introductions have faltered, as several have, it is probable that conditions for that species' survival have not been met.

The introductions

As previously reported, hay cut in the late summer of 1996 from Chippenham Fen (Compartments 1, 10 and 11) was spread on the bare peat of 'the Fen'. Apart from the more intensive seeding and plantings (in initially marked quadrats on the site) very little successful fen vegetation developed in 1997. Nonetheless, we were confident that at least *Prunella vulgaris* (Selfheal), *Centaurea nigra* (Common Knapweed) and *Schedonorus arundinaceus* (Tall Fescue) became established from this hay-spreading as well as from the more intensively sown quadrat plots. Also in the late summer of 1996 seed-heads were collected by Mike Crewe from those species at Chippenham Fen listed in Table 1. These were sown in peat-filled seed-trays that autumn and, if they had germinated successfully, were planted out the following spring and summer in 20 densely planted 4 m² quadrats. The peat mix and ungerminated seed in the trays were also planted out in this confined area. These quadrats were closely monitored for five years (until 2002) and since then the whole area has been thoroughly monitored on four occasions between 2007 and 2014.

It is now clear that many plants have germinated successfully from dormant seed spread on this site in 1996/97 and that a majority of the species deliberately introduced have persisted. *Galium palustre* (Marsh Bedstraw) was indicated as the species of this genus originally collected and then recorded in 1998 as established on the site, but since 1999 *G. uliginosum* (Fen Bedstraw) has been the only species recorded (see Table 1). Both grow in Chippenham Fen, so perhaps *G. palustre* failed and *G. uliginosum* (which is now widespread) succeeded. We acknowledge that grass species are likely to have been under-recorded.

Table 1. Recorded introductions of fen flora species from Chippenham Fen NNR at Kingfishers Bridge Reserve, showing their persistence. Years of actions and surveys are shown (1996–2013).

Key

g = seed successfully germinated in trays (though some seed did not germinate)

h = spread as hay

s = seedlings planted out

u = ungerminated seed planted out on the site in peat mix

+ = healthy plants recorded as growing in ‘the Fen’

	‘96	‘97	‘98	‘99	‘00	‘01	‘02		‘07		‘10		‘12	‘13
<i>Agrostis canina</i>		u												
<i>Angelica sylvestris</i>	g	s	+	+	+	+	+		+		+		+	+
<i>Brachypodium sylvaticum</i>		u												
<i>Calamagrostis epigejos</i>	g	s	+	+	+	+	+				+		+	+
<i>Carex flacca</i>	g	s							+					+
<i>Carex lepidocarpa</i>	g	s	+											
<i>Centaurea nigra</i>	g	s	+	+	+		+		+		+		+	+
<i>Cirsium dissectum</i>	g	s	+											
<i>Cirsium palustre</i>	g	s	+		+	+	+		+		+		+	+
<i>Cladium mariscus</i>		u												
<i>Dactylorhiza praetermissa</i>		u					+		+		+		+	+
<i>Eupatorium cannabinum</i>	g	s		+	+	+	+		+		+		+	+
<i>Filipendula ulmaria</i>		u					+		+		+		+	+
<i>Galium palustre</i>	g	s	+											
<i>Galium uliginosum</i>	?	?	?	+		+	+		+		+		+	+
<i>Holcus lanatus</i>		u		+	+	+	+		+		+			+
<i>Hypericum tetrapterum</i>	g	s	+	+	+		+						+	+
<i>Juncus articulatus</i>	g	s	+	+	+		+		+		+			+
<i>Juncus subnodulosus</i>	g	s	+	+	+	+	+		+		+		+	+
<i>Linum catharticum</i>		u												
<i>Lycopus europaeus</i>	g	s	+	+	+	+	+		+		+		+	+
<i>Lythrum salicaria</i>		u		+			+		+		+		+	+
<i>Mentha aquatica</i>		u	+	+	+	+	+		+		+		+	+
<i>Molinia caerulea</i>	g	s												
<i>Potentilla erecta</i>	g	s												
<i>Prunella vulgaris</i>	g	s	+	+	+		+				+			
<i>Pulicaria dysenterica</i>	g	s	+				+		+		+		+	+
<i>Schedonorus arundinaceus</i>	h		+	+			+		+		+		+	+
<i>Selinum carvifolia</i>	g	s	+						+		+		+	+
<i>Serratula tinctoria</i>	g	s							+		+		+	+
<i>Silaum silaus</i>	g	s												
<i>Sonchus arvensis</i>		u	+	+		+							+	+

<i>Succisa pratensis</i>	g	s												
<i>Symphytum officinale</i>		u								+				+
<i>Thalictrum flavum</i>	g	s				+	+		+	+		+	+	
<i>Triglochin palustre</i>		u												
<i>Vicia cracca</i>	g	s	+			+	+		+	+		+	+	
Total species persisting			18	15	12	12	21		20	22		21	24	

Natural arrivals

To the untutored eye Kingfishers Bridge Reserve would be seen now as almost ‘natural’ with its very large numbers of typical fenland plants that have arrived there and spread. We continue to record such arrivals and some are clearly independent of the early introductions. In the reserve as a whole many species have colonised naturally and spread locally. For example, *Potamogeton coloratus* (Fen Pondweed) is locally common in the shallow water of just one reedbed area, Compartment 3 (CJC). The focus of this article, however, is on ‘the Fen’ only.

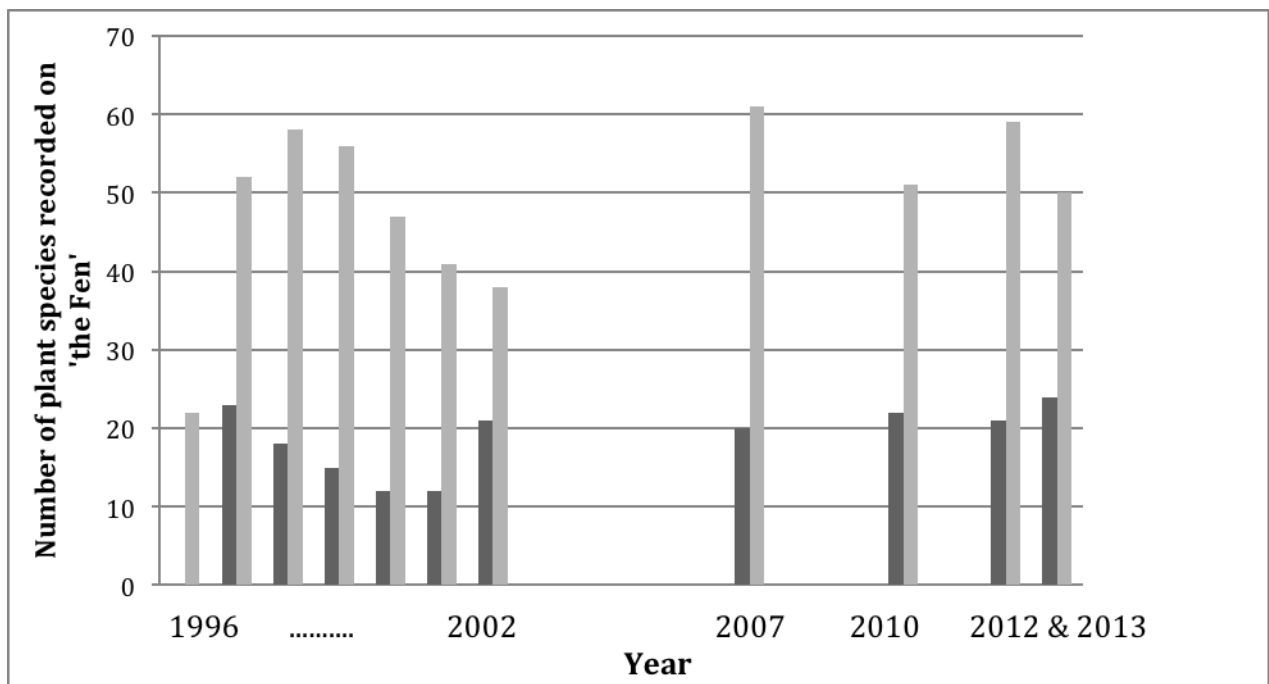


Figure 2. Species counts: the proportion of intentionally introduced plant species ■ relative to the total number of recorded plant species ■ per year from 1996 to 2013 on the one hectare area of ‘the Fen’. It is of course possible that some plant species counted as ‘introduced’ have arrived by their own agency. In total 138 species have been recorded between 1996 and 2014.

This bar chart shows an initial surge in the number of recorded native species. This first wave of increase was an explosion of ruderal species. Some of the introduced plants will have been suppressed by competition from these native weeds. Interestingly, 14 of these ruderal weed species present in the first two years (1996–1998) have not been recorded in ‘the Fen’ again. The number of species counted in Figure 2 (the species diversity) is not at all the same as the number of individual plants. This bar chart does not show the increase in the number of plants of any species but does illustrate the persistence of more than 20 of the introductions in a community where the majority of species have not been deliberately introduced. Seemingly natural arrivals also occur. Thus by 2006 *Typha angustifolia* (Lesser Bulrush or Lesser Reedmace) had arrived unassisted at the north pool in ‘the Fen’ and also at the adjacent south-west pool of the limestone pit where Sand Martins nest. Likewise *Nasturtium microphyllum* (Narrow-fruited Water-cress) appeared two years later in 2008.

Relative cover-abundance and spatial distributions in ‘the Fen’

A mature fen litter-field which is cut annually, like those at Wicken Fen, is characterised by a great uniformity of appearance in the vegetation but by a high species diversity in a small area. Because colonisation of ‘the Fen’ at Kingfishers Bridge was both through localised introductions and through a large amount of natural spread there is so far a considerable patchiness in the cover-abundance of species. Thus some species such as the less common *Carex* sedges, *Dactylorhiza praetermissa* (Southern Marsh-orchid), *Serratula tinctoria* (Saw-wort), *Selinum carvifolia*, *Thalictrum flavum* (Meadow Rue) and *Pulicaria dysenterica* (Fleabane) are obviously clumped in distribution. Other species such as most of the grasses, the thistles, *Galium uliginosum*, *Vicia* species (vetches) and *Epilobium hirsutum* (Hairy Willowherb) are now more evenly spread. There is for example evidence for a slow spread of *Selinum carvifolia*. Some species such as *Juncus subnodulosus* (Blunt-flowered Rush) and, in wetter areas, *Phragmites australis* now locally dominate the sward. The distribution of species also varies with how they react to the local hydrology. Table 2 gives some indication of the relative cover-abundance of species.

Fen management

In the first decade no regular cutting took place in ‘the Fen’. When surveys were reinstated in 2007 Water Buffalo were introduced for the first time to graze the area. The grazing has generally been in spring and early summer, with the animals removed in time to permit the flowering and seeding of *Selinum carvifolia* to succeed and to allow sufficient light onto the ground to enable seeds to germinate. Most recently, in autumn 2013, the south-west quarter was cut and the hay removed, as it was thought to be undergrazed. In 2014 this was repeated on the whole of the southern half of ‘the Fen’. The cut material was removed and heaped at the periphery, following the Wicken Fen pattern of sedge-fen ‘spider piles’, which we know benefit other wildlife. The present intention is to continue with experimental management by cutting or grazing.

Table 2. The relative cover-abundance of the flora of ‘the Fen’ in 2014

No species is considered ‘Abundant’ or even ‘Common’ on the ACFOR scale in the whole one hectare area. The tabulation below is subjective but is given here to give some indication of the quantities of each species present on the site. The asterisked species were not knowingly introduced to ‘the Fen’.

Frequent	Occasional	Rare
* <i>Agrostis stolonifera</i>	<i>Angelica sylvestris</i>	* <i>Artemisia vulgaris</i>
<i>Centaurea nigra</i>	<i>Calamagrostis epigejos</i>	* <i>Eleocharis palustris</i>
* <i>Deschampsia cespitosa</i>	<i>Carex flacca</i>	* <i>Elytrigia repens</i>
* <i>Epilobium hirsutum</i>	* <i>Carex otrubae</i>	<i>Hypericum tetrapterum</i>
* <i>Juncus inflexus</i>	* <i>Cirsium arvense</i>	<i>Lycopus europaeus</i>
<i>Juncus subnodulosus</i>	<i>Cirsium palustre</i>	<i>Lythrum salicaria</i>
<i>Mentha aquatica</i>	<i>Dactylorhiza praetermissa</i>	* <i>Nasturtium microphyllum</i>
* <i>Persicaria amphibia</i>	<i>Eupatorium cannabinum</i>	* <i>Ranunculus sceleratus</i>
* <i>Phragmites australis</i>	<i>Filipendula ulmaria</i>	* <i>Schoenoplectus tabernaemontani</i>
<i>Pulicaria dysenterica</i>	<i>Galium uliginosum</i>	<i>Serratula tinctoria</i>
	<i>Holcus lanatus</i>	<i>Selinum carvifolia</i>
	* <i>Poa trivialis</i>	<i>Symphytum officinale</i>
	<i>Schedonorus arundinaceus</i>	* <i>Typha angustifolia</i>
	<i>Sonchus arvensis</i>	* <i>Urtica dioica</i>
	<i>Thalictrum flavum</i>	* <i>Vicia tetrasperma</i>
	<i>Vicia cracca</i>	

Notes on individual vascular plants

Agrostis canina (Velvet Bent): This grass seemingly failed to germinate or become established. The soil is possibly too base-rich.

Agrostis stolonifera (Creeping Bent): A robust form, one metre tall, with long panicles was noted in ‘the Fen’ by CJC from 2007. The normal form was previously recorded (CT, 1992) from local washland before the project’s inception and also regularly by the recorders from the earliest monitoring of ‘the Fen’ (1996–2001). This species was not recorded as an introduction, but it has a wide eco-hydrological amplitude. Hence, when the hydrology of a site is disrupted, it is often already present and through rapid vegetative growth is able to colonise space vacated by those species unable to tolerate the new conditions.

Calamagrostis canescens (Purple Small-reed): This grass was not knowingly introduced from Chippenham to ‘the Fen’ and is seemingly absent there, but CJC has recorded two patches at other places in the reedbeds, both in Compartment 3, in 2007 and 2008. This species seems to be a natural immigrant; it is abundant in Wicken Fen.

Calamagrostis epigejos (Wood Small-reed or Bush-grass): This grass was introduced in 1996 and has persisted. Although it was definitely not recorded at Kingfishers Bridge initially, CJC found two large patches at the north of the reedbed in 2006 and a large stand north-east of the lake shore in 2007. These arrivals could represent a natural dispersal from other fenland sites or from the introduced plants in ‘the Fen’.

Carex lepidocarpa (Long-stalked Yellow-sedge): This sedge did not persist beyond one year. It is a calcicole which grows in base-rich fens but perhaps has exacting requirements.

Cladium mariscus (Great Fen-sedge or Saw Sedge): Although this species was introduced as seed in 'the Fen' in 1997, no germination was achieved and the introduction was unsuccessful. It should be noted however that there was an early record for *Cladium* at Upware North Pit, which is on the reserve, though it is seemingly not there today; this is mentioned in the SSSI notification (http://www.sssi.naturalengland.org.uk/citation/citation_photo/1002481.pdf). Nevertheless, one small clump was found in 2005 elsewhere on the Kingfishers Bridge site, at TL 544733, and a clump was also recorded in 2008 by CT and PHO in the neighbouring limestone quarry pits of Francis Flower (Eastern). This seems therefore to be a species with some natural mobility from the rich nearby sources at Wicken and Chippenham but perhaps requiring exacting (but unknown) conditions for its germination.

Dactylorhiza praetermissa (Southern Marsh-orchid): This fenland orchid has the capacity for long-distance dispersal, but, as it now grows exclusively but abundantly in a small part of 'the Fen' where peat containing ungerminated seed was dispersed, this seems the most likely source for it; it took five years to appear (2002). However it has since appeared at a nearby site at the end of the Great Ditch (2008) and similarly in some abundance on the south bank of the reedbed in Compartment 1 (2008–2014), most probably from wind-borne seed from 'the Fen'.

Filipendula ulmaria (Meadowsweet): If this species was introduced as seed, which seems likely, it had a long dormancy; it is still limited in its distribution but is spreading.

Galium uliginosum (Fen Bedstraw): This species is now spreading to other areas nearby to 'the Fen' (CJC).

Juncus subnodulosus (Blunt-flowered Rush): This is achieving increasing dominance and it is hoped that the increased cutting regime will reduce its vigour.

Linum catharticum (Fairy Flax): This is a species of base-rich grasslands which was seeded from Chippenham Fen but failed to germinate. Possibly it is too wet for it or there is too much competition from more vigorous species in 'the Fen'.

Lythrum salicaria (Purple-loosestrife): This species was introduced but was also noticed early as a fen plant in many parts of the reserve. It may have been there originally in the Great Ditch but is now certainly increasing in abundance.

Molinia caerulea (Purple Moor-grass): The Chippenham-sourced introduction failed completely. The site may be too base-rich. This grass is found at several fen sites in Cambridgeshire including Wicken Fen and Sawston Hall Fen.

Nasturtium microphyllum (Narrow-fruited Water-cress): This was recorded in 'the Fen' in 2008 but is not a known introduction.

Selinum carvifolia (Cambridge Milk-parsley): This important introduced rarity has recently been recorded annually, with a maximum of 107 plants in 2012. Its future management may need special attention for it to persist. The grazing programme was planned to meet this species' requirements, as regular mowing will not provide the same conditions. See *N. in C.* No. 55: 65–67.

Serratula tinctoria (Saw-wort): This is an increasingly uncommon plant, very local in Cambridgeshire, and we are fortunate to have it now successfully established at Kingfishers Bridge. It is still very weakly distributed within ‘the Fen’.

Succisa pratensis (Devil’s-bit Scabious): Residual fertility of the formerly agricultural land may have prevented establishment of this species. It is found on dry chalk downland and in Sawston Hall Fen, demonstrating a wide range of pH and hydrological tolerance.

Thalictrum flavum (Common Meadow-rue): This species was not recorded anywhere at Kingfishers Bridge before it first appeared in ‘the Fen’ in 2001, but it is now much more widespread, even locally frequent. Seedlings were planted out in 1997, but it is possible that it was always present in the original farm’s ditch flora.

Thyselium palustre (Milk-parsley): Two plugs of 2–5 plants from Stalham Fen, Norfolk, were introduced by RB to the south-east corner ditch in ‘the Fen’ in August 2010. One plant only remained in 2013 and none ever flowered. This is a key fenland species and the larval food plant of the Swallowtail butterfly *Papilio machaon*.

Triglochin palustre (Marsh Arrowgrass): Seemingly this did not germinate. It has not been recorded elsewhere on the reserve, but it is known from the Ouse Washes and Wicken Fen.

Typha angustifolia (Lesser Bulrush or Lesser Reedmace): This had arrived by 2006 in ‘the Fen’ of its own accord and was also later discovered in Compartment 3 of the reedbed and adjacent limestone pits. Being wind-dispersed, it is capable of long-distance natural spread into new wetland sites, especially those with open ground and thus low initial competition.

Urtica dioica (Common Nettle): Alan Leslie has noted that, in addition to the normal form, the fenland *U. dioica* subsp. *galeopsifolia*, well known at Wicken, is also present in ‘the Fen’.

Valeriana dioica (Marsh Valerian): Ten plants were recorded in ‘the Fen’ in 2008, most probably from Chippenham Fen, where this species is common, though, surprisingly, it was not deliberately introduced; it has not been seen since.

Conclusion

Disentangling what species were introduced from those that have arrived of their own accord cannot be totally precise. We should try, however, to define here what we have now achieved and then evaluate the restoration process. The National Vegetation Classification (NVC) is a system for describing and classifying natural habitat types in Great Britain according to the vegetation that they contain (Rodwell, 1991, 2006). The intention at Kingfishers Bridge was to explore whether interesting plant communities could be developed. In ‘the Fen’ we have so far achieved something like an M22 ‘fen-meadow’ community (*Juncus subnodulosus*–*Cirsium palustre*) with possible elements of an M23 ‘rush-pasture’ (*Juncus effusus/acutiflorus*–*Galium palustre*) and perhaps the wetter M27 ‘mire’ (*Filipendula ulmaria*–*Angelica sylvestris*). Given the varied management provided and the varied topography of the site and the annually variable water-table, we have achieved some success.

In answer to our originally posed questions we would at present reply as follows.

1. Such assisted introductions may be successful, especially if initial weed competition is reduced and the habitat requirements are well enough met. Long seed dormancy is certainly characteristic of many of the species introduced. This is a common plant survival strategy. We believe that initially ungerminated seeds were an important contributor to success. Plants subsequently derived from these seeds sometimes may persist undetected in low numbers. Not all introductions succeed.

2. Successful introductions are dependent on the right soil conditions and the right management. We recognise that we might have mowed or grazed the site more consistently and indeed earlier than we did. Plug-planting into established vegetation might be tested. This should reduce the weed competition that we experienced initially. We recognise that ‘seeding’ is not just a question of sowing seeds. The successful establishment of species on former farmland may well depend on there being a supportive microbial soil community present. The hydrological and soil nutrient conditions, together with the existing vegetation and seed-bank, form what may be considered an ‘ecological sieve’ which will select those species that may grow successfully.

3. Independent spread through the normal dispersal of plants to such a site by aerial or animal vectors is evident, but unquestionably introducing a suitable range of target species is an accelerator of the process of developing a fenland plant community. Thus we have no doubt that assisting the establishment of rare plants such as *Selinum carvifolia* (Cambridge Milk-parsley) and local ones like *Serratula tinctoria* (Saw-wort) has been worthwhile. They would have been very unlikely to arrive here on their own by dispersal from elsewhere. It will be instructive to compare developments here with those on the less interventionist restoration on the nearby Wicken Fen Vision land.

4. Natural succession readily occurs in a new community and within a relatively short time-frame. However, we would expect it to take many decades of consistent traditional management such as mowing, removal of litter and grazing to achieve a plant community of the complexity of those found in our established National Nature Reserves. This long time-frame for re-creation of mature fen contrasts with the rapid results of wetland creation for birds or dragonflies, which quickly select their own appropriate habitat. Classic fen communities are not readily rebuilt from scratch, but herb-rich communities with significant wildlife interest can be established on former agricultural land and conservation managers should not be put off from creating fens just because classic fen communities will not be established in the short term.

References

- Beecroft, R.C. et al.** (1996–2002). Kingfishers Bridge Vegetation Monitoring Reports (unpublished). Wildlife and Countryside Services, Creeting St Mary, Suffolk, IP6 8QE.
- Beecroft, R.C., Cadbury, C.J. & Tomkins, S.P.** (2013) Towards a recovery programme for wetland plants at the Kingfishers Bridge Reserve. *Nature in Cambridgeshire* No. 55: 60–71.

- Cadbury, C.J.** (2005–2014). Bird and other Wildlife Recordings for Kingfishers Bridge, Wicken, Cambridgeshire (unpublished). Available from CJC, 93 Barton Road, Cambridge, CB3 9LL.
- Rodwell, J.S. (ed.)** (1991). *British plant communities. Volume 2. Mires and heaths.* Cambridge University Press, Cambridge.
- Rodwell, J.S.** (2006). *National Vegetation Classification: Users' handbook.* Joint Nature Conservation Committee, Peterborough.
- Tomkins, S.** (1998). The Kingfisher's Bridge Wetland Creation Project: a report from the project's inception to autumn 1996. *Nature in Cambridgeshire* No. 40: 37–52.
- Tomkins, S.P.** (1999). Kingfisher's Bridge revisited (autumn 1996 to autumn 1998). *Nature in Cambridgeshire* No. 41: 88–95.
- Wassen M.J. & Grootjans Ab P.** (1996). Ecohydrology: an interdisciplinary approach to wetland management and restoration. *Vegetatio* **126**: 1–4.

Invertebrate Survey on the Fleam Dyke S.S.S.I., Cambridgeshire. II. Leafhopper and planthopper bugs (Hemiptera, Homoptera, Auchenorrhyncha)

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Introduction

The Fleam Dyke is a 5 km long linear earthwork running from near Fulbourn to near Balsham. The last phase of construction dating from the sixth and seventh centuries consists of a steep-sided massive earth bank with a flat-bottomed ditch on the West side up to 4 m deep and 8 m wide. It has been levelled in a few places, but most of it has never been cultivated. The vegetation appears to have been chalk grassland grazed by sheep and rabbits, probably for hundreds of years. Sheep grazing had declined by the early twentieth century; and after the reduction of rabbits by myxomatosis in the 1960s the site became overgrown with scrub. The land on both sides of the Dyke is now arable with no significant areas of chalk grassland remaining. Current management by the Friends group aims to restore the rare chalk grassland on the Dyke wherever possible. This involves clearing the scrub and treating the cut stumps, and subsequently mowing and raking the regrowth.

The purpose of the Invertebrate Survey was to provide baseline data to follow changes in invertebrate populations resulting from management. It was carried out at a particularly interesting time, when some parts of the survey area already had well-established chalk grassland, other parts had been cleared more or less recently, and yet others were still wholly or partly covered in scrub. An account of the scuttleflies (Diptera, Phoridae) has already been published (Disney and Darlington 2013).

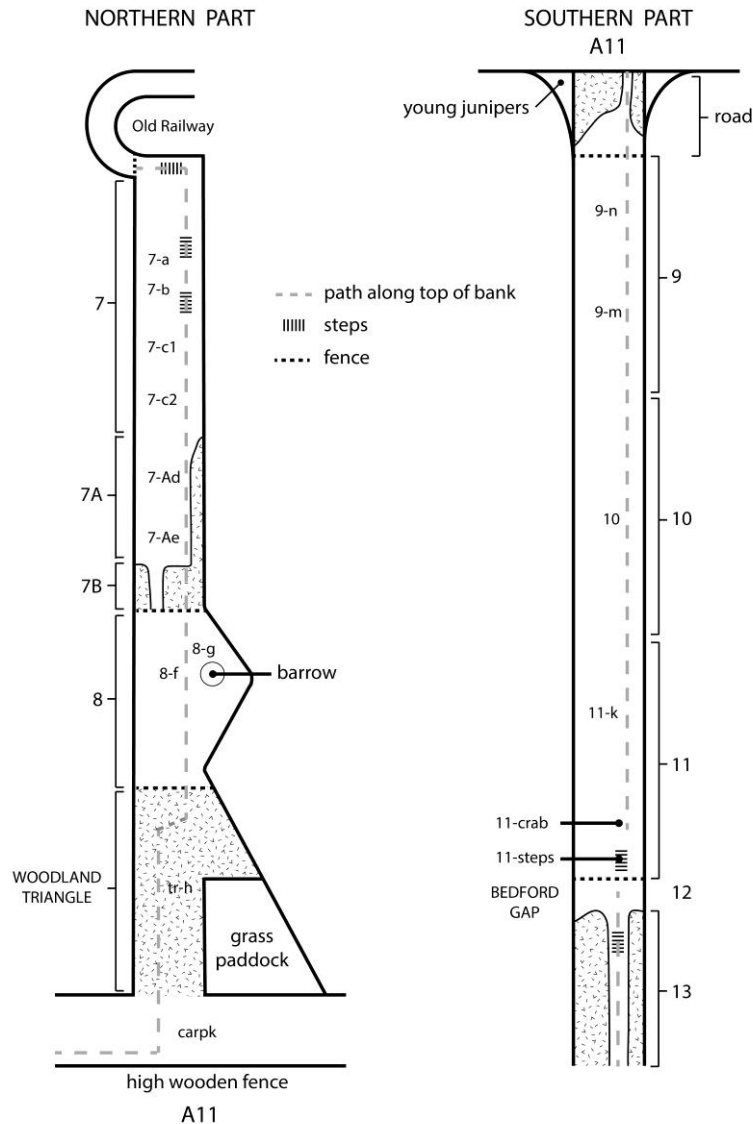


Figure 1 Map of survey sites

Layout of the Invertebrate Survey.

Only the central part of the Dyke was surveyed. The original numbering system of the Wildlife Trust was used, with a few un-numbered sections being given names for the purposes of the Invertebrate Survey.

The Invertebrate Survey covered sections 7 to 13 inclusive. The part north of the A11 consisted of sections 7 and 8, the woodland triangle (tr-h) and the car park (carpk). The part south of the A11 consisted of the path near the road, sections 9, 10 and 11, Bedford Gap =12, and 13. The two parts are connected by a footbridge over the A11.

Description of survey sites.

The sites used in the survey are shown on the map (Fig. 1). All the sites were along the top of the bank, except where it has been levelled (i.e. in 8, the woodland triangle tr-h, carpk, and 12 = Bedford Gap). During the survey, three replicate samples were taken at fixed points in each site, on each sampling date (Table 1).

Northern Part

7-a to 7-c2 were located in an area of long-established chalk grassland grazed by rabbits, and managed by mowing and raking at intervals.

7-a was on the steps leading down to a lowered part, in short grass.

7-b was on the lowered part, in short grass.

7-c1 was on top of the bank, in an area of short grass.

7-c2 was on top of the bank, in an area of long grass.

7A-d and 7A-e were in a section where the East slope of the bank was still covered in dense scrub. The West slope had been cleared, the bottom of the ditch and the slope beyond were overgrown with tall herbs, scrub and a few large trees.

7A-d was at the top of the West slope of the bank covered in coarse herbs, regrown after clearing.

7A-e was at the top of the West slope, very recently cleared of scrub, and consisting of bare soil colonised by Ground Ivy (*Glechoma hederacea*) which flowered prolifically in March 2003 (survey 1) followed by a dense stand of Garlic Mustard (*Alliaria petiolata*) flowering profusely in April and May (Surveys 2, 3 & 4).

7B was on the slope down to the gate onto Mutlow Hill. Both sides of the bank were covered in un-cleared scrub, including a lot of bramble (*Rubus fruticosus* agg.) This area was not included in the survey sampling series, but netsweeps and other samples were collected here.

8 was the fenced area enclosing Mutlow Hill and the Bronze Age barrow on top of it, and the large beech tree at the foot of the barrow. Bank and ditch have been levelled. The ground vegetation was disturbed and patchy, some of it coarse tufty grass, a lot of it clogged with Old Man's Beard (*Clematis vitalba*). This is not chalk grassland.

8-f was under the canopy of the beech tree.

8-g was among coarse grass in the open.

tr-h = woodland triangle. Bank and ditch have been levelled. Scrub and trees on both sides of the path make it shady, and there is dense cover of Ivy (*Hedera helix*) on the ground. On the East side was a grass paddock used for ponies.

carpk = car park. Bank and ditch have been levelled. There is a broad strip of frequently-mowed grass turf along a high wooden fence bordering the A11. This is not chalk grassland.

Southern Part

road = path through scrub, which is continuous with the hedges alongside the A11. It ends at a transverse sheep fence with a kissing gate.

Sections 9, 10, and 11 are equal lengths of the bank, which is covered in continuous grassland that is regularly mowed and raked. In each of 9-n, 9-m, 10 and 11-k. the three replicate sampling sites were well spaced, but the catches are combined for purposes of analysis. The East side of the bank is bounded by a farm track and a barbed wire fence. The unmanaged ditch on the West side is overgrown with tall grass and herbs, bounded on the West by a neglected, thin, intermittent hedge.

Site 11-k includes a large badger set in the West-facing slope of the bank. There were two additional sampling sites in the South end of section 11 :-

11-crab = near to a group of Crab-apple trees (*Malus sylvestris*), and a rabbit warren, both on the East-facing slope of the bank.

11-steps = sampling traps were set on the steps down into Bedford Gap.

12 was Bedford Gap itself, which seems to be a favoured route for flying insects, and a funnel for the wind. One sample was taken at each of three sites laid out across the gap, with no further replicates.

13 consisted of a narrow grass strip along the footpath kept clear by cutting, the bank and ditch being completely overgrown with scrub.

Sampling methods.

The survey consisted of water traps set at fixed points along the top of the bank, or along the footpath where the bank has been levelled. The catching period was a minimum of four hours, two before noon and two after i.e. 10 am to 2 pm in winter, 11 am to 3 pm during British Summer Time. This period is suitable for sampling Auchenorrhyncha which are active by day. The four hours while the traps were catching were spent in general collecting using a butterfly net for flying insects and a sweepnet for invertebrates on vegetation.

During the survey, three replicate samples were taken at fixed points in each site, on each sampling date (Table 1). The data from the three replicates at each site were combined. Each trap consisted of a small white blown-polystyrene dish containing water with a dash of detergent. These simple traps mainly catch flying or hopping insects that touch the water surface and drown. The dishes were 15 cm in diameter at the mouth and eight cm in diameter at the base. The water was only a few millimetres deep, to enable large insects such as bumblebees and grasshoppers to escape easily.

Insects are most active when it is sunny, warm and not too windy. The actual sampling date was chosen by reference to the BBC five-day weather forecast. Survey dates were about three weeks apart in summer and five weeks apart in winter. In high summer the catches were large, and took so long to process that the two parts had to be sampled on separate days, first the northern part then the southern part.

Fourteen complete surveys were made between 28 March 2003 and 17 April 2004, involving 21 days in the field. Two further surveys, of the northern part only, were made on 22 May and 16 June 2004 (Table 1). Only data from Surveys 1 – 12 from the main sampling series are included in the Invertebrate Survey for purposes of analysis.

Invertebrates from the traps were labelled and preserved in 70% alcohol in the field. Later they were sorted and catalogued, before being identified by PK.

Results

Auchenorrhyncha are sap-sucking bugs, many of them very small. Adults are mobile, able to hop and fly (with the exception of brachypterous morphs in a few species) and nymphs are also able to hop. A total of 52 species was collected, of which 40 occurred in surveys 1 – 12. Two major families

predominated in our collections, the Cicadellidae (81 %) and the Delphacidae (19 %).

Cicadellidae A total of 39 species was collected, 34 during the survey and five by other means (Table 2, and Appendix). Combined data for all species and both sexes are presented in Table 3. Of the total of 338 adult bugs in the survey, 203 (60 %) were collected in the northern part and 135 (40 %) in the southern part. Males greatly outnumbered females overall (M:F = 6.4:1), as is usual in these bugs where the males are smaller and more active than the females.

Bugs were collected on every survey date throughout the year. Numbers were low during the winter but substantially higher in summer, with a broad peak in surveys 5, 6 and 7 (mid June, July and early August) in the northern part, and survey 7 (early August) in the southern part; and a further peak in survey 10 (October) in both parts.

The three most abundant species were *Arthaldeus pascuellus* (43 adults collected), *Euscelis incisus* (45 adults) and *Zyginidia scutellaris* (41 adults), with *Eupelix cuspidata* as runner-up (31 adults). These four (totalling 160 adults) which together make up 47 % of the total Cicadellidae, are the only ones for which there is enough data to analyse their distribution in space and time.

Arthaldeus pascuellus (Table 4) A total of 43 adult bugs (12.7 % of total Cicadellidae), was collected, 34 males and nine females, giving a sex ratio of M:F = 3.8:1. In the northern part it occurred in sites 7-b, 7-c1 and 7-c2 on old chalk grassland with no shade. In the southern part there were small numbers all the way along, especially in the open grassland sites 9-n to 11-k. Adults did not appear until surveys 5 and 6 (mid June - July), which perhaps suggests that they overwinter as juveniles or eggs. Their numbers dipped, then peaked again in surveys 9 and 10 (September - October), which could mean one or two generations per year. In Germany there is only one generation per year (Biedermann and Niedringhaus 2009).

Euscellus incisus (Table 5) A total of 45 adult bugs (13.3 %), was collected, 39 males and six females, giving a sex ratio M:F of 6.5:1. In the northern part it occurred mainly in grassy areas, especially in 8-g which has coarse, non-chalk grassland. In the southern part it occurred everywhere except in heavy shade. Overwintering adults appeared very early, in surveys 1 and 2 (March and April); none were collected in surveys 3, 4 and 5 (early May to mid June); adults appeared again in surveys 6 to 9 (early July to mid September). This suggests two generations in the year. For comparison, in Germany there are one or two generations per year (Biedermann and Niedringhaus 2009), but two would be expected in the milder climate of Britain.

Zyginidia scutellaris (Table 6) A total of 41 adults was collected (12.1 %), 36 males and five females, giving a sex ratio of M:F = 7.2:1. In the northern part it occurred mainly in old chalk grassland with no shade. In the southern part it was caught only in the south, in sections 10, 11-k, 11-crab and 11-steps. In the

northern part adults were caught in surveys 5 and 6 (mid June and early July); none were caught in 7, 8 or 9, but there was a second peak in 10 (October). This looks like two generations in the year. However, in the southern part there was a single prolonged peak from survey 4 (late May) to 7 (early August), which looks more like a single generation. In Germany this species is thought to have a single generation (Biedermann and Niedringhaus 2009). But although it has a good, if prolonged, summer peak, adults can occur at any time of year including the middle of winter, making the idea of one generation per year rather difficult to believe.

Eupelix cuspidata (Table 7) is a relatively large species that is easy to recognise even as a juvenile, having a sharp pointed front and a marked horizontal flange around the head. A total of 31 adults was collected (9.1 %), 29 males and two females, giving a sex ratio of M:F = 14.5:1, and also 11 juveniles. In the northern part it occurred only in sites 7-a, 7-b and 7-c1, on old chalk grassland grazed short by rabbits. In the southern part it was found towards the South end adjacent to Bedford Gap. Adults appeared in survey 3 (early May), peaked in 4 (late May), declined in 5 (mid June) and were last seen in 6 (early July). One juvenile was caught in survey 4 (late May), one each in surveys 7, 8 and 10, and a maximum of 4 in survey 9 (September). None was caught over the winter, but a total of 30 adults re-appeared in survey 15 (25 May 2004, of the northern part only) and 8 more in 16 (mid June 2004). Thus the species appears to have a single annual generation, overwintering as late nymphs or adults; with the adults becoming active in May to July. However, in Germany this species is semivoltine, with a two-year life cycle (Biedermann and Niedringhaus 2009), which is unusual amongst hoppers. Our present data do not enable us to distinguish between univoltine and semivoltine life cycles.

Delphacidae A total of ten species was collected, nine of them during the survey (Table 2). Of a total of 77 adult bugs, 28 (34 %) were collected in the northern part and 51 (66 %) in the southern part. There were 47 (61 %) males and 30 (39 %) females in total, giving a sex ratio M:F = 1.6:1. Catches were distributed over the whole year.

Hyledelphax elegantulus (Table 8). A total of 43 adult bugs was collected, representing 56 % of all the Delphacid bugs caught during the survey. Of these, 11 (25.6 %) were collected in the northern part and 32 (74.4) in the southern part. There were 28 (65 %) males and 15 (35 %) females, giving a sex ratio M:F = 1.7:1. It occurred in small numbers along the whole sampling transect. Adults were caught between surveys 3 and 7 (early May to early August) which looks like a single generation. However, in Germany this species has two generations (Biedermann and Niedringhaus 2009).

Table 1. Invertebrate Survey of the Fleam Dyke. List of Survey numbers (first column, in bold) followed by sampling dates, showing the parts sampled in each survey.

Survey number	Northern & Southern parts	Northern part only	Southern part only
1	28 March 2003		
2	17 April 2003		
3	7 May 2003		
4		28 May 2003	29 May 2003
5		16 June 2003	17 June 2003
6		7 July 2003	9 July 2003
7		4 August 2003	5 August 2003
8	25 August 2003		
9	13 Sept 2003		
10	11 October 2003		
11	14 December 2003		
12	20 February 2004		
13	30 March 2004		
14	17 April 2004		
15		25 May 2004	
16		16 June 2004	

Table 2. Classified list of species of Auchenorrhyncha collected on the Fleam Dyke in 2001 and 2003-04. Each species name is followed by the authority and year of publication. Notable B and Local species are as designated in the Auchenorrhyncha Recording Scheme checklist, all others are Common. The numbers in the three right hand columns are total males M, total females F, and the combined total collected in surveys **1** to **12** of the Invertebrate Survey. Species where no numbers are given were caught at other times or by other means. All identifications were made by Peter Kirby.

Auchenorrhyncha

Aphrophoridae Spittlebugs

Philaenus spumarius (Linnaeus, 1758)

Cercopidae Froghoppers

Cercopis vulnerata Rossi, 1807

Cicadellidae Leafhoppers

Agalliinae

Agallia brachyptera (Boheman, 1847) Notable B

Agallia consobrina Curtis, 1833

Anaceratagallia ribauti (Ossiannilsson, 1938) Local

Anaceratagallia venosa (Geoffroy, 1785)

Anaceratagallia sp.

Aphrodinae

Anoscopus albifrons (Linnaeus, 1758)

Anoscopus serratulae (Fabricius, 1775)

Aphrodes makarovi Zakhvatkin, 1948

Deltocephalinae

Arthaldeus pascuellus (Fallén, 1826)

Cicadula sp.

Deltocephalus pulicaris (Fallén, 1806)

M	F	Total
2	1	3
1	-	1
18	-	18
19	-	19
-	4	4
4	-	4
2	-	2
14	1	15
34	9	43
-	-	-
18	3	21

	<i>Doratura stylata</i> (Boheman, 1847)		2	-	2
	<i>Euscelidius variegatus</i> (Kirschbaum, 1858)	Notable B	-	-	-
	<i>Euscelis incisus</i> (Kirschbaum, 1858)		39	6	45
	<i>Macrosteles variatus</i> (Fallén, 1806)	Local	-	-	-
	<i>Mocycdia crocea</i> (Herrich-Schäffer, 1837)		20	4	24
	<i>Mocydiopsis attenuata</i> (Germar, 1821)		4	-	4
	<i>Psammotettix confinis</i> (Dahlbom, 1850)		1	-	1
	<i>Psammotettix nodosus</i> (Ribaut, 1925)		2	-	2
	<i>Psammotettix</i> sp.		-	1	1
	<i>Rhytistylus proceps</i> (Kirschbaum, 1868)		3	-	3
	<i>Turrutus socialis</i> (Flor, 1861)		3	-	3
Dorycephalinae					
	<i>Eupelix cuspidata</i> (Fabricius, 1775)		29	2	31
Iassinae					
	<i>Batrachomorphus irroratus</i> Lewis, 1834	Local	5	1	6
Megophthalminae					
	<i>Megophthalmus scanicus</i> (Fallén, 1806)		5	-	5
Typhlocybinae					
	<i>Dikraneura variata</i> Hardy, 1850		13	1	14
	<i>Empoasca decipiens</i> Paoli, 1930		1	-	1
	<i>Empoasca vitis</i> (Goethe, 1875)		-	1	1
	<i>Eupteryx artemisiae</i> (Kirschbaum, 1868)	Local	-	-	-
	<i>Eupteryx atropunctata</i> (Goeze, 1778)	Local	-	-	-
	<i>Eupteryx aurata</i> (Linnaeus, 1758)		-	2	2
	<i>Eupteryx florida</i> Ribaut, 1952	Local	1	1	2
	<i>Eupteryx notata</i> Curtis, 1837		11	1	12
	<i>Eupteryx urticae</i> (Fabricius, 1803)		-	-	-
	<i>Eupteryx vittata</i> (Linnaeus, 1758)		4	-	4
	<i>Fagocyba cruenta</i> (Herrich-Schäffer, 1838)		-	-	-
	<i>Lindbergina aurovittata</i> (Douglas, 1875)		1	-	1
	<i>Ribautiana tenerrima</i> (Herrich-Schäffer, 1834)		1	-	1
	<i>Zygina flammigera</i> (Geoffroy, 1785)		-	2	2
	<i>Zyginidia scutellaris</i> (Herrich-Schäffer, 1838)		36	5	41
Cixiidae					
	<i>Cixius nervosus</i> (Linnaeus, 1758)		-	-	-
	<i>Tachycixius pilosus</i> (Olivier, 1791)		-	-	-
Delphacidae					
Plant hoppers					
	<i>Criomorphus albomarginatus</i> Curtis, 1833		1	1	2
	<i>Eurysa lineata</i> (Perris, 1857)	Local	-	-	-
	<i>Hyledelphax elegantula</i> (Boheman, 1847)		28	15	43
	<i>Javesella dubia</i> (Kirschbaum, 1868)		3	-	3
	<i>Javesella pellucida</i> (Fabricius, 1794)		7	-	7
	<i>Javasella</i> sp.		-	3	3
	<i>Kosswigianella exigua</i> (Boheman, 1847)	Local	7	4	11
	<i>Muellerianella fairmairei</i> (Perris, 1857)		-	4	4
	<i>Stenocranus minutus</i> (Fabricius, 1787)		2	-	2
	<i>Xanthodelphax straminea</i> (Stål, 1858)	Local	-	3	3
Total of all bugs			341	75	416
As % of total – males 84.0 %, females 16 %					
Sex ratio M:F = 5.25:1					
Total Cicadellidae			293	45	338
As % of total - males 88.8 %, females 11.2 %					
Sex ratio M:F = 7.94:1					
Total Delphacidae			48	30	78
As % of total – males 62.5 %, females 37.5 %					
Sex ratio M:F = 1.67:1					

Discussion

Our results show that the Auchenorrhyncha were most abundant in grassland, which is to be expected since most of them feed on grass sap. The structural diversity of the vegetation may be beneficial in providing shelter for their overwintering stages, but the data are inadequate to show this. Our sampling protocol, confined to the top of the bank where present, or along the footpath, i.e. the least sheltered sites, would be unlikely to reveal any such effect. The poorly-maintained hedges on both sides of the Dyke North of the A 11, and on the West side of the Dyke South of the A 11, may also provide seasonal shelter, and might reward further study.

The literature provides some data for comparison. Morris (1990) reported an experiment in which he sowed mixtures of grasses on chalky soil at Royston, on flat farmland that had previously been used for growing cereals. He collected 22,405 adult Auchenorrhyncha by vacuum sampling on mown plots over a period of two years from November 1973 to December 1975 (38 sampling dates). He recorded 50 species, the five most abundant making up 90 % of the total catch. This compares to our 52 species, with the five most abundant species making up 49 %. That we collected almost the same number of species in a much smaller sample (total 416 adults) over half the time suggests that the Fleam Dyke fauna is substantially more diverse than that at Royston. This is perhaps not surprising, as the Royston plots were designed to be as uniform as possible. Our study area, although small, and isolated in intensively cultivated farmland, is very diverse in topography (bank top, ditch bottom, steep slopes between, a few levelled areas) and in habitats (managed chalk grassland, non-chalk grassland, dense scrub, cleared areas with more or less regrowth, and newly cleared areas with the early stages of succession). Management is patchy in nature and in timing, which increases the heterogeneity of the vegetation.

Morris (1990) listed the ten most abundant species at five sites on calcareous soils. Two sites were near to Cambridge; the sown grass plots on chalk soil at Royston, and Castor Hanglands on oolitic limestone, where experiments were conducted on the effects of different cutting regimes on the fauna. The three other sites were on long-established chalk grassland. All these sites had similar numbers of species, but the actual species present (totalling 100 at all five sites combined) and the comparative abundance of particular species varied. *Zyginidia scutellaris* was the only species present in the top ten at all five sites, and was third most abundant in our survey. *Arthaldeus pascuellus* was the most abundant species at Royston (61 % of the total catch) and third most abundant at Castor Hanglands, but was not listed at the other three sites. In our data it was almost equal in numbers to *Euscelis incisus*, our most abundant species, which did not appear in the top ten at any of the five sites. Our fourth ranking cicadellid *Eupelix cuspidata* was not listed in the top ten at any of the five sites. *Hyledelphax elegantulus*, the most numerous delphacid in our collection, was listed seventh in one of the old grassland sites but was otherwise absent. *Javasella pellucida* was listed in the top ten at three of the five sites, but was well down in our list.

Some of the variability might be due to the presence or absence of particular food plants. Prestidge and McNeill (1983) examined the fauna on monocultures of five (later six) different grass species in sowed plots on non-calcareous soil at Silwood Park, Ascot. They found that most species of Auchenorrhyncha occurred on all the grasses, but each grass had a particular dominant fauna. They collected 28 species, some of which were associated with varying levels of nitrogen found during flowering, seeding or senescence of the grass species. Because of the high mobility of these bugs (Waloff 1973), their populations may be constantly varying.

The Fleam Dyke Auchenorrhyncha fauna is most similar to the Royston and Castor Hangland faunas but appears to be richer in species than either of them. The general impression is that Auchenorrhyncha faunas vary considerably in response to changing conditions, but draw upon the same diverse, widespread, mobile pool of species. We would expect the Fleam Dyke assemblage to vary over time (months or years) in response to variations in management, as well as seasonally.

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Table 3. Total numbers of adult Cicadellidae collected in the Invertebrate Survey. Columns are the sampling sites along the Dyke. Rows contain Survey numbers in bold (for corresponding dates see Table 1) followed by the total number of bugs collected at each site, and overall.

Survey	7-a	7-b	7-c1	7-c2	7A-d	7A-e	8-g	8-f	tr-h	car pk	road	9-n	9-m	10	11-k	11c	11s	12	13	sum
1	1	-	-	/	2	4	3	-	-	-	-	-	1	-	1	-	-	-	-	12
2	-	-	-	/	-	-	4	-	1	-	-	-	-	2	-	-	-	-	-	7
3	3	1	1	/	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	8
4	1	6	1	-	1	-	2	-	-	1	-	-	1	2	-	3	7	-	-	25
5	5	5	3	7	-	4	-	-	-	2	1	2	-	2	-	1	2	-	-	34
6	3	8	7	5	-	1	-	2	2	8	1	3	7	3	11	11	2	5	-	79
7	8	14	6	4	-	-	4	1	6	1	-	2	2	1	5	2	-	2	-	58
8	1	1	1	-	-	4	-	1	1	2	-	-	-	-	-	1	-	1	-	13
9	-	1	1	1	-	-	-	-	-	11	-	5	4	1	-	4	-	1	-	29
10	11	6	9	-	7	-	2	3	1	3	-	5	3	5	11	6	2	-	-	74
11	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
12	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Total	33	42	30	17	10	13	11	7	12	28	2	17	20	16	29	28	13	10	0	

Overall total 338

Northern Part 203 = 59.9%

Southern Part 135 = 40.1%

Table 4. Total numbers of adult *Arthaldeus pascuellus* collected in the Invertebrate Survey. Columns are the sampling sites along the Dyke. Rows contain Survey numbers in bold followed by the total numbers of male and female bugs collected at each site, and overall.

	7-a	7-b	7-c1	7-c2	7A-d	7A-e	8-g	8-f	tr-h	carpk	road	9-n	9-m	10	11-k	11-crab	11-steps	12	13	Sum
1	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	1m	-	-	-	-	-	1
5	-	-	-	1m,1f	-	1m,1f	-	-	-	-	1m	1m,1f	-	-	-	-	-	-	-	7
6	-	1f	-	1m,1f	-	-	-	-	-	1m,2f	-	-	-	2m	-	-	-	1m	-	9
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	1m	-	-	-	-	-	-	-	1m	-	2
9	-	-	1m	-	-	-	-	-	-	1m	-	4m	3m	-	-	2m,1f	-	-	-	12
10	-	-	-	-	-	-	1m	-	-	-	-	4m	1m,1f	1m	1m	3m,2f	1m	-	-	15
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sum	0	1	1	4	0	2	1	0	0	5	1	10	5	4	1	8	1	2	0	

Total adults 43 (34m 9f) Northern Part 11 = 25.6 %, Southern Part 32 = 74.4 %

Table 5. Total numbers of adult *Euscelis incisus* collected in the Invertebrate Survey on Fleam Dyke. Columns are the sampling sites along the Dyke. Rows contain Survey numbers in bold followed by the total numbers of male and female bugs collected at each site, and overall.

Survey	7-a	7-b	7-c1	7-c2	7A-d	7A-e	8-g	8-f	tr-h	carpk	road	9-n	9-m	10	11-k	11-crab	11-steps	12	13	
1	1m	-	-	/	1m	4m	2m,1f	-	-	-	-	-	-	-	-	-	-	-	-	9
2	-	-	-	/	-	-	3m,1f	-	-	-	-	-	-	1m	-	-	-	-	-	5
3	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
6	-	-	-	-	-	-	-	-	1m	2m	-	1m	5m	-	-	4m	1m	1m	-	15
7	1m	3m	-	1m	-	-	2m	-	-	-	-	1f	2m	-	1f	1m	-	-	-	12
8	-	1m	-	-	-	-	-	-	-	-	-	-	-	-	-	1m	-	-	-	2
9	-	-	-	-	-	-	-	-	-	-	-	1f	1f	-	-	-	-	-	-	2
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Sum	2	4	0	1	1	4	9	0	1	2	0	3	8	1	1	6	1	1	0	

Total adults 45 (39m, 6f) Northern Part 24 = 53.3 %, Southern Part 21 = 46.7 %

Table 6. Total numbers of adult *Zyginidia scutellaris* collected in the Invertebrate Survey. Columns are the sampling sites along the Dyke. Rows contain Survey numbers in bold followed by the total numbers of male and female bugs collected at each site, and overall.

	7-a	7-b	7-c1	7-c2	7A-d	7A-e	8-g	8-f	tr-h	carpk	road	9-n	9-m	10	11-k	11-crab	11 steps	12	13	sum
1	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
3	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
4	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	1m	-	-	1
5	3m,1f	1m	2m	5m	-	-	-	-	-	2m	-	-	-	1m,1f	-	1m	1m,1f	-	-	19
6	-	-	1m	-	-	-	-	-	-	1m	-	-	-	-	2m	1m	-	-	-	5
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1m	1m	-	-	-	2
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	2m,1f	1m	4m	/	2m	-	1m	-	-	2m	-	-	-	-	-	-	-	-	-	13
11	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	1f	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sum	7	2	8	5	2	0	1	0	0	5	0	0	0	2	3	3	3	0	0	

Total adults 41 (36m 5f) Northern Part 30 = 73.2 %, Southern Part 11 = 26.8 %

Table 7. Total numbers of adult *Eupelixa cuspidata* and juveniles (in brackets) collected in the Invertebrate Survey. Columns are the sampling sites along the Dyke. Rows contain Survey numbers in bold followed by the total numbers of male and female bugs collected at each site, and overall.

	7-a	7-b	7-c1	7-c2	7A-d	7A-e	8-g	8-f	tr-h	carpk	road	9-n	9-m	10	11-k	11-crab	11 steps	12	13	sum
1	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
3	3m	-	1m	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
4	1m	4m	1m	-	-	-	-	-	-	-	-	-	1m	-	3m	6m(2)	-	-	-	16 (2)
5	1m	3m	1m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
6	1m	-	1f	-	-	-	-	-	-	-	-	-	-	-	3m,1f	-	-	-	-	6
7	-	-	-	-	-	-	-	-	-	-	-	-	-	(1)	-	-	-	-	-	(1)
8	-	(1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(1)
9	-	-	(1)	-	-	-	-	-	-	-	-	-	-	(2)	(1)	-	-	-	-	(4)
10	-	-	-	-	-	-	-	-	-	(1)	-	-	-	-	-	-	-	-	-	(1)
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Sum	6	7 (1)	4 (1)	0	0	0	0	0	0	(1)	0	0	1	(1)	7 (1)	6 (2)	0	0	0	

Total adults 31 (29m, 2f), 10 juvenile. Northern part 17 = 54.8 %, Southern part 14 = 45.2 %

Table 8. Total numbers of adult *Hyledelphax elegantulus* collected in the Invertebrate Survey. Columns are the sampling sites along the Dyke. Rows contain Survey numbers in bold followed by the total numbers of male and female bugs collected at each site, and overall.

	7-a	7-b	7-c1	7-c2	7A-d	7A-e	8-g	8-f	tr-h	carpk	road	9-n	9-m	10	11-k	11-crab	11-steps	12	13	sum
1	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2	-	-	-	/	-	-	-	-	-	-	-	-	-	3m	-	-	-	-	-	3
3	-	2f	1m	/	-	1m	1m,1f	-	-	-	-	-	1m,1f	1m,1f	-	-	-	-	2m	12
4	-	-	-	-	-	1m	-	-	-	-	-	1m	1m	-	-	-	-	-	-	3
5	-	-	-	-	-	1m	-	-	-	-	-	-	-	-	-	-	-	-	-	1
6	-	-	-	-	1m,1f	-	-	-	-	-	1f	2m,1f	2m	1m,1f	-	1m,1f	-	-	2m,1f	15
7	-	-	-	-	-	-	-	-	1m	-	2m,1f	1f	-	-	-	1m,1f	-	-	1m,1f	9
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
sum	0	2	1	0	2	3	2	0	1	0	4	5	5	7	0	4	0	0	7	

Total adults 43 (28m, 15f) Northern Part 11 = 25.6 %, Southern Part 32 = 74.4 %

References

- Biedermann, R. and Niedringhaus, R.** (2009). The planthoppers and leafhoppers of Germany – identification key to all species. Publ. Scheessel: WABV 409 pp.
- Disney, R.H.L. and Darlington, J.P.E.C.** (2013). Invertebrate Survey on the Fleam Dyke S.S.S.I., Cambridgeshire. I. Scuttleflies (Diptera, Phoridae). *Nature in Cambridgeshire* No. 56, 32-48.
- Morris, M.G.** (1990). The Hemiptera of two sown grasslands. III Comparisons with the Auchenorrhyncha faunas of other grasslands. *J. Appl. Ecol.* 27, 394-409.
- Nickel, H.** (2003). The leafhoppers and planthoppers of Germany (Hemiptera, Auchenorrhyncha), patterns and strategies in a highly diverse group of phytophagous insects. *Pensoft Series Faunistica*, 28. 460 pp.
- Prestidge, R.A. and McNeill, S.** (1983). Auchenorrhyncha-host plant interactions: leafhoppers and grasses. *Ecological Entomology* 8, 331-339.
- Waloff, N.** (1973). Dispersal by flight of leafhoppers (Auchenorrhyncha; Homoptera). *J. Appl. Ecol.* 10, 705-730.

Appendix. Details of Auchenorrhyncha collected on the Fleam Dyke, mostly during the period of the Invertebrate Survey, 30 March 2003 to 16 June 2004, and a few on earlier dates. Line numbers in bold are the Survey numbers, from **1** to **16**, followed by their dates. Occurrence data specifies collection site and is given as combined data from three replicate samples at each site. This is followed by number of males M, number of females F, and for one species only, number of nymphs, ny. (Nymphs of other species were not identified, and are not reported here). Records that were not part of the main Invertebrate Survey are given in curly brackets { } and include a note of the catching method used.

Aphrophoridae

Philaenus spumarius

- 5** 28.v.2003. {7A, netsweep, 1F; 7B, netsweep, 4F; tr-h, netsweep, 1M, 6F;}
6 9.vii.2003. {11, netsweep over bedstraw, 1M;}

Cercopidae

Cercopis vulnerata

- 30.v.2001. {7A netsweep over houndstongue, 1F;}

Cicadellidae

Agalliinae

Agallia brachyptera

- 6** 7.vii.2003. 7-a, 1M; {7-a/b, trap, 4M;}
7 4.viii.2003. 7-b, 1M;
8 25.viii.2003. 7A-e, 1F;

Agallia consobrina

- 9** 13.ix.2003. 12, 1M;

Anaceratagallia ribauti

- 6** 7.vii.2003. 7-b, 4M; 7-c1, 2M; 7-c2, 1M; carpk, 1M;
7 4.viii.2003. 7-b, 1M;
9 13.ix.2003. 7-b, 1M;
10 11.x.2003. 7-a, 2M; carpk, 1M; 10, 3M; 11-k, 2M

Anaceratagallia venosa

- 7** 4.viii.2003. 7-a, 6M; 7-b, 7M; 7-c1, 4M; 7-c2, 2M;

Anaceratagallia sp. f

- 1** 28.iii.2003. 9m, 1F;
5 16.vi.2003. {7-a/b trap, 1F;}
9 13.ix.2003. 11crab, 1F;
10 11.x.2003. 11-k, 2F;
14 17.iv.2004. 7-a, 1F; 7-b, 1F;
16 16.vi.2004. 7-c1, 1F;

Aphrodinae

Anoscopus albifrons

- 6** 9.vii.2003. 9-m, 1M; 11-steps, 1M;
7 4.viii.2003. 7-b, 1M;
8 25.viii.2003. 7-a, 1M;

Anoscopus serratulae

- 6** 16.vi.2003. carpk, 1M;
7 5.viii.2003. 9-n, 1M;

Aphrodes makarovi

- 6** 7.vii.2003. 8-f, 1M;
7 4.viii.2003. 8f, 1M; tr-h, 4M; // 5.viii.2003. 10, 1M; 11-k, 2M; 12, 2M;
8 25.viii.2003. 7A-e, 2M, 1F; tr-h, 1M;

Deltocephalinae

Arthaldeus pascuellus

- 4 28.v.2003. {7 netsweep over grass, 1M;} // 29.v.2003. 10, 1M;
5 16.vi.2003. 7-c2, 1M, 1F; 7A-e, 1M, 1F; // 17.vi.2003. road, 1M;
9-n, 1M, 1F;
6 7.vii.2003. 7-b, 1F; 7- c2, 1M, 1F; //
9.vii.2003. 10, 2M; 12, 1M;
8 25.viii.2003. carpk, 1M; 12W, 1M;
9 13.ix.2003. 7-c, 1M; carpk, 1M; 9-n, 4M; 9-m, 3M; 11-crab, 2M, 1F;
10 11.x.2003. 8-g, 1M ; 9-n, 4M; 9-m, 1M, 1F; 10, 1M; 11-k, 1M; 11-crab,
3M, 2F; 11-steps, 1M;
16 16.vi.2004. 7-c2, 1M; {netsweep between 7-c2 and 7A, 1F;}

Cicadula sp.

- 5 16.vi.2003. {7-netsweep, 1F;}

Deltocephalus pulicaris

- 5 16.vi.2003. 7A-e, 1M;
6 7.vii.2003. 7-a, 1M; carpk, 3M; // 9.vii.2003. 9-n, 2M; 11-crab, 2M;
7 4.viii.2003. carpk, 1M;
8 25.viii.2003. carpk, 1F;
9 13.ix.2003. carpk, 8M, 2F;

Doratura stylata

- 6 9.vii.2003. 10, 1M; 11-k, 1M;

Euscelidius variegatus

- 5 16.vi.2003, {7-netsweep, 1 ;}

Euscelis incisus

- 1 28.iii.2003. 7-a, 1M; 7A-d, 1M; 7A-e, 4M; 8-g, 2M, 1F;
2 17.iv.2003. 8-g, 3M, 1F; 10, 1M;
6 7.vii.2003. tr-h, 1M; carpk, 2M; // 9.vii.2003, 9-n, 1M; 9-m, 5M;
{11-bedstraw, 1F;} 11-crab, 4M; 11-steps, 1M; 12, 1M;
7 4.viii.2003. 7-a, 1M,; 7-b, 3M; 7-c2, 1M; 8-g, 2M; // 5.viii.2003. 9-n, 1F;
9-m, 2M; 11-k, 1F; 11-crab, 1M;
8 25.viii.2003. 7-b, 1M; 11-crab, 1M;
9 13.ix.2003. 9-n, 1F; 9-m, 1 F;
13 30.iii.2004. 9-m, 1M;
14 17.iv.2004. 7A-e, 2M; carpk, 2M; road, 1M; 9-m, 2M; 10, 1F;

Macrosteles variatus

- 5 16.vi.2003. {7A netsweep, 1 ;}

Mocydia crocea

- 1 28.iii.2003. 7A-d, 1F; 11-k, 1F;
3 7.v.2003. 7b, 1M;
4 28.v.2003. {7, netsweep over grass, 1F; 7A-d, trap, 1F; 7A-e, trap, 1F;}
8 25.viii.2003. 7-c, 1M;
10 11.x.2003. 7-a, 1M; 7-b, 3M; 7-c, 4M; 7A-d, 5M; 8-f, 2M; 9-m, 1M;
11-k, 1M, 2F; 11-crab, 1M;
13 30.iii.2004. 7-b, 2F;
14 17.iv.2004. 7A-e, 1F;
16 16.vi.2004. 7A-d, 1F; {netsweep over grass between 7-c2 and 7A, 2F;}

Mocydiopsis attenuata

- 10 11.x.2003. 7-b, 2M; 9-n, 1M; 10, 1M;

Psammotettix confinis

- 4 28.v.2003. carpk, 1M;

Psammotettix nodosus

- 9 13.ix.2003. 10, 1M;
10 11.x.2003. 11-steps, 1M;

Psammotettix sp. f

- 5 16.vi.2003. 7A-e, 1F

Rhytistylus proceps

- 7 4.viii.2003. 7-c1, 1M; 7-c2, 1M; 11-k, 1M;

Turrutus socialis

- 6 7.vii.2003. 7-c1, 1M,
9 13.ix.2003. 7-c2, 1M;
10 11.x.2003. 7-c1, 1M

Dorycephalinae

Eupelix cuspidata

- 3 7.v.2003. 7-a, 3M; 7-c1, 1M; {7, netsweep over grass, 1M;}
4 28.v.2003. 7-a, 1M; 7-b, 4M; 7-c1, 1M; // 29.v.2003. 9-m, 1M;
{9, netsweep over hawkweed, 1 ny;} 11-k, 3M; 11-crab,
6M,2ny;
5 16.vi.2003. 7-a, 1M; 7-b, 3M; 7-c1, 2M;
6 7.vii.2003. 7-a, 1M; 7-c1, 1F teneral;
// 9.vii.2003. 11-k, 3M, 1F teneral;
7 5.viii.2003. 10, 1 ny;
8 25.viii.2003. 7-b, 1 ny;
9 13.ix.2003. 7-c, 1 ny; 10, 2 ny; 11-k, 1 ny;
10 11.x.2003. carpk, 1 ny; 11-k, 1 ny;
15 25.v.2004. 7-a, 2M; 7-b, 4M; 7-c2, 23M; 7A-d, 1M;
16 16.vi.2004. 7-c1, 1M; 7-c2, 7M;

Iassinae

Batrachomorphus irroratus

- 6 7.vii.2003. 7-c1, 2M; 7-c2, 2M;
7 4.viii.2003. 7-a, 1F; 7-c1, 1M;

Megophthalminae

Megophthalmus scanicus

- 6 7.vii.2003. 7A-e, 1M; 8-f, 1M; // 9.vii.2003. 11-crab, 2M;
7 4.viii.2003. tr-h, 1M;

Typhlocybinae

Dikraneura variata

- 2 17.iv.2003. 10, 1F;
3 7.v.2003. 9-m, 2M; 11-k, 1M;
4 28.v.2003. {7 netsweep over grass, 1F;} // 29.v.2003. 9-m, 1M ;
6 9.vii.2003. road, 1M; 9-m, 1M; 11-k, 5M; 11-crab, 2M;

Empoasca decipiens

- 10 11.x.2003. tr-h, 1M;

Empoasca vitis

- 13 30.iii.2004. 7-b, 1F;

Eupteryx artemisiae

- 30.v.2001. {7B top of cleared bank, 1F;}

Eupteryx atropunctata

- specimen and data missing

Eupteryx aurata

- 4 27.v.2003. {7A-e, water dish, 1M;}
6 7.vii.2003. tr-h, 1F; 12, 1F;

Eupteryx florida

- 4 28.v.2003. {8-g trap, 1M;}

- 6** 9.vii.2003. {11, netsweep over horehound, 6M, 13F;} 12, 1M+1F, in cop. ;
Eupteryx notata
4 27.v.2003. 7-b, 2M;
6 7.vii.2003. 7-b, 3M;
7 4.viii.2003. 7-a, 1F ; 7-b, 1M ;
10 11.x.2003. 7-a, 5M;
Eupteryx urticae
5 29.v.2003. { tr-h, netsweep, 1F;}
Eupteryx vittata
4 28.v.2003. 7A-d, 1M teneral; {7A-e, water dish, 5M;
7B, water dish, 1M;} 8-g, 2M;
7 4.viii.2003. tr-h, 1M;
Fagocyba cruenta
5 16.vi.2003. {11-k, netsweep over bedstraw, 1M teneral;}
6 9.vii.2003. {11-k, netsweep over bedstraw, 1M teneral;}
Lindbergina aurovittata
10 11.x.2003. 8-f, 1M;
Ribautiana tenerrima
5 16.vi.2003. 7-b, 1M;
Zygina flammigera
2 17.iv.2003. tr-h, 1F;
11 14.xii.2003. 12, 1F;
Zyginidia scutellaris
4 29.v.2003. 11-steps, 1M;
5 16.vi.2003. 7-a, 3M, 1F; 7-b, 1M; 7-c1, 2M; 7-c2, 5M; {7A-net, 1M} //
17.vi.2003. carpk, 2M; 10, 1M, 1F; 11-crab, 1M; 11-steps,
1M, 1F;
6 7.vii.2003. 7-c1, 1M; carpk, 1M; // 9.vii.2003. 11-k, 2M; 11-crab, 1M;
7 5.viii.2003. 11, 1M; 11-crab, 1M;
10 11.x.2003. 7-a, 2M, 1F; 7-b, 1M; 7-c, 4M; 7A-d, 2M; 8-g, 1M;
carpk, 2M;
12 20.ii.2004. 7-c, 1F;
16 16.vi.2004. 7-b, 1M; 7-c2, 5M;
- Cixiidae**
- Cixius nervosus*
30.v.2001. {7B top of cleared bank, 1F;}
16 16.vi.2004. {netsweep between 7-c2 and 7A, 1M;}
Tachycixius pilosus
4 28.v.2003. {netsweep in tall grass, 1F;}
- Delphacidae**
- Criomorphus albomarginatus*
3 7.v.2003. 9-m, 1F;
4 29.v.2003. {9-n, netsweep by birch tree, 2F;}
5 16.vi.2003. 7-c2, 1M;
Eurysa lineata
4 29.v.2003. {9-n, netsweep by birch tree, 1M;}
Hyledelphax elegantula
2 17.iv.2003. 10, 3M all teneral; {7A, netsweep, 1M;}
3 7.v.2003. 7-b, 2F ten.; 7-c, 1M; 7A-e, 1M; 8-g, 1M, 1F teneral;
9-m, 1M, 1F; 10, 1M, 1F; 13, 2M teneral;
4 28.v.2003. {7, netsweep, 1F;} 7A-e, 1M; // 29.v.2003. 9-n, 1M, 9-m, 1M;
5 16.vi.2003. 7A-e, 1M;
6 7.vii.2003. 7A-d, 1M, 1F; // 9.vii.2003. road, 1F; 9-n, 2M, 1F; 9-m, 2M;

- 10, 1M, 1F; 11-crab, 1M, 1F; 13, 2M, 1F;
7 4.viii.2003. tr-h, 1M; // 5.viii.2003. road, 2M, 1F; 9-n, 1F;
11-crab, 1M, 1F; 13, 1M, 1F;
15 25.v.2004. 7-c2, 1F;
- Javesella dubia*
3 7.v.2003. {7B, water dish, 1M;} 13, 1M;
4 28.v.2003. 7A-e, 2M; // 29.v.2003. {12, large water trap, 1M;}
- Javesella pellucida*
3 7.v.2003. 7A-e, 1M;
6 9.vii.2003. 11-k, 1M;
7 4.viii.2003. 7A-e, 1M; 8-g, 1M; tr-h, 1M; // 5.viii.2003. 9-m, 1M; 10, 1M;
- Javesella* sp. f
3 7.v.2003. {7B water dish, 1F;} 8-g, 1F;
6 7.vii.2003. {11 netsweep over bedstraw, 1F;}
7 4.viii.2003. 7-c2, 1F; // 5.viii.2003. 10, 1F;
- Kosswigianella exigua*
1 28.iii.2003. 7A-e, 1M
3 7.v.2003. 9-m, 1M; 10, 1M; 11-k, 1M;
6 9.vii.2003. 9-m, 2M, 1F; 10, 1F; 11-k, 1M, 2F;
{11-k, netsweep over bedstraw, 1M;}
- Muellerianella fairmairei*
6 7.vii.2003. tr-h, 3F; // 9.vii.2003, 11-crab, 1F;
- Stenocranus minutus*
1 28.iii.2003. 7A-e, 1M;
3 7.v.2003. 13, 1M;
13 30.iii.2004. 10, 1M;
- Xanthodelphax stramineus*
3 7.v.2003. 9-n, 1F;
4 28.v.2003. 7-b, 1F;
7 5.viii.2003. 11-steps, 1F;

Invertebrate Survey on the Fleam Dyke S.S.S.I., Cambridgeshire.

III. Spiders.

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Introduction

The Fleam Dyke is a large Anglo-Saxon linear earthwork consisting of a ditch on the West side and a bank on the East. It is 5 km long and has never been cultivated. For hundreds of years the Dyke and adjacent areas were covered in chalk grassland grazed by sheep and rabbits, but sheep farming declined by the early 20th century, and the surrounding land was cultivated. After myxomatosis hit the rabbit population in the 1950s, much of the Dyke was invaded by dense scrub.

Recent and current management by the Friends of the Roman Road and Fleam Dyke aims to selectively remove scrub and restore the chalk grassland. In 2003-4 a baseline survey of invertebrates was carried out by JPECD. All the spiders collected were identified as far as possible by RJS, and the present paper is an account of this work.

Methods

For the Invertebrate Survey, samples were taken at fixed points along the top of the bank, or along the footpath where the bank has been levelled. Three replicate samples were collected at each sampling site, and the catches combined. The sites are described in Disney and Darlington (2013) and in Kirby and Darlington, this volume (see page 54), which includes a map of the sampling sites.

Samples were collected passively over four hours in water traps 8 cm in diameter. These traps catch small flying insects efficiently, but very few spiders. While the traps were catching, general collecting was carried out opportunistically at various sites within the survey area using nets and large water traps. Most of the spiders were caught in sweepnets over grass or stands of flowering herbs. A few were caught in pitfall traps set overnight. The spiders were immediately preserved in 70 % alcohol.

Results

All identifiable spiders are listed in Table 1, and also in the Appendix together with full collection data and some notes. There were 41 species fully identified, and five more belonged to genera not otherwise represented, giving a total of at least 46 species. Half of them (23 species) were represented by a single individual (and seven of these were juveniles), which suggests that many

more species remain to be found, by more thorough or more appropriate collecting.

Because of the varied nature and locations of the general collecting, the actual numbers of spiders caught are of no significance except as indicators of relative abundance (Table 1) and of activity at different times of year (Tables 2, 3 and 4). The behaviour of individual species makes them more or less susceptible to being caught, but in some cases there is also some collector bias. For example the little black-and-white jumping spider *Heliophanus flavipes* Hahn (Salticidae) is represented by only four individuals in the whole collection, but was common in the grassland of area 7. Being easily identified on sight, it was frequently noted but rarely collected.

The only spiders that were at all abundant were the wolf-spiders (Lycosidae) and these were also the only ones that were readily caught in water traps, because they hunt running on the ground surface. Of six species collected, two were caught in relatively large numbers, namely *Pardosa pullata* (Clerck) and *P. prativaga* (L. Koch). Data for *P. pullata* are summarised in Table 2, where collection site is tabulated against survey number. Adults were present throughout the summer; males predominated in early spring, Surveys 2 and 3 (mid April and early May) but females outnumbered them in Surveys 4 to 7 (late May to early August). These are all likely to have overwintered from the previous year. *P. prativaga* (Table 3) shows a rather different pattern, with adults caught only in Surveys 1 to 3 (late March to early May), with males outnumbering females by more than 8 to 1. These will be overwintered adults that bred early in the year, then died off. Juveniles could not be identified to species, so are listed as *Pardosa* sp. in the Appendix. They could be any of five or more species, but are most likely to belong to one of the three most abundant species; *P. pullata*, *P. prativaga* and *P. palustris* (Linnaeus). Nearly all (92 %) were caught in Surveys 7 to 10 (early August to 11 October) (Table 4). They overlapped considerably with adults of *P. pullata* and *P. palustris*, but not at all with those of *P. prativaga*. They represent the year's crop of young spiders, which would overwinter as adults or juveniles and breed the following year. This appears to show univoltine development, with a single annual generation.

Discussion

Spiders in general do not appear to show a preference for particular prey species and this results in flora and fauna diversity being less important to their success than structural diversity of the habitat. This will of course be affected by different management regimes (Harvey, Nellist & Telfer, 2002).

Of the species found in this survey, some are ubiquitous and found in a wide range of habitats, but the majority are spiders that show stronger habitat preferences. The results include species normally associated with areas of woodland and scrub, others that prefer tall herbage or grassland, ground living species that prefer tussocks and moist areas, and those that prefer more open ground. Some details are given as annotations in the Appendix.

Our 46 species would be a meagre spider fauna for what is quite a heterogeneous environment, and the list is certainly incomplete. No doubt this is

largely because the collecting methods were chosen to sample other kinds of invertebrates and were not effective for spiders.

Historical records include those published by Bristowe (1929) (Table 5) and the Cecil Warburton Collection donated to the University Museum of Zoology, Cambridge, in about 1900 (Table 6). Bristowe listed 27 species from the Fleam Dyke and Warburton nine, six of these being additional to Bristowe's list. Of these 33 species only nine appeared in our collection, together with species in three other genera that may be the same.

There is clearly much more to be discovered about the spiders of the Fleam Dyke. However, the Invertebrate Survey has made some significant discoveries including the Nationally Notable species *Syedra gracilis* (Menge). The discovery of *Atypus affinus* Eichwald draws attention to the importance of management at this site. The national Spider Recording Scheme has highlighted that although recorded from 50 hectads since 1992 there has been a large apparent decline in this species, which is vulnerable to inappropriate management. Without management to control scrub, open habitat will disappear. On the other hand, trampling, intensive grazing and the cutting of grassland is also likely to destroy colonies of the spider. Occasional management to control scrub would seem to be most appropriate (Dawson, Harvey, Merrett & Russell-Smith, in prep.).

The results of this baseline survey, incomplete though it is, have drawn attention to the importance of the Dyke as a spider habitat that is clearly worthy of further investigation.

Acknowledgments

Permission to collect in the S.S.S.I. was obtained from English Nature (now Natural England) through the good offices of Donna Radley, who also assisted in obtaining the consent of the landowners. Russell Stebbings of the University Museum of Zoology, Cambridge, kindly carried out Survey 10 on 11 October 2003 while JPECD was away.

All the spiders from the Invertebrate Survey are in the personal collection of RJS. The collection data has been entered into the Spider Recording Scheme, administered jointly by the British Arachnological Society and the Biological Records Centre; and into the database of the Cambridge and Peterborough Environmental Records Centre. Ray Symonds was still collecting on the Fleam Dyke up to the time of his death. It is expected that his personal collection will eventually be deposited in the University Museum of Zoology, Cambridge (UMZC).

References

- Bristowe, W.S.** (1929). The spiders of Cambridgeshire. *Cambridge Natural History Society Fauna List no. 2*. 25 pp
- Disney, R.H.L. & Darlington, J.P.E.C.** (2013). Invertebrate Survey on the Fleam Dyke S.S.S.I., Cambridgeshire. I. Scuttleflies (Diptera, Phoridae). *Nature in Cambridgeshire* No. 56, 32-48.

- Dawson, I.K., Harvey, P.R., Merrett, P. & Russell-Smith, A.R.** (in prep.). A review of the scarce and threatened spiders (Arachnida: Araneae) of Great Britain. B.A.S.
- Harvey, P.R., Nellist, D.R. & Telfer, M.G.** eds. (2002). Provisional atlas of British spiders (Arachnida, Araneae), Volumes 1& 2. Huntingdon: Biological Records Centre.
- Kirby, P. & Darlington, J.P.E.C.** (2014). Invertebrate Survey on the Fleam Dyke S.S.S.I., Cambridgeshire. II. Leafhopper and planthopper bugs (Hemiptera, Homoptera, Auchenorrhyncha). *Nature in Cambridgeshire* No. 57, 56 -75
- Merrett, P. & Murphy, J.A.** (2000). A revised check list of British spiders. *Bull. Br. Arachnol. Soc.* 11, 345-358.

Table 1. Classified list of identifiable spiders collected during the period of the Invertebrate Survey, 28 March 2003 to 20 February 2004. Columns on the right give total numbers of adult males M and females F, and immatures j.

	M	F	j
Atypidae			
<i>Atypus affinis</i> Eichwald			
2nd record for the county	-	-	1
Dysderidae			
<i>Dysdera crocata</i> C.L. Koch	-	1	
Theridiidae			
<i>Steatoda</i> sp.	-	-	1
<i>Achaeranea</i> sp.	-	-	1
<i>Theridion sisyphium</i> (Clerck)	1	-	
<i>Theridion impressum</i> L. Koch	1	1	
<i>Enoplognatha ovata</i> (Clerck)	2	5	
? <i>Robertus neglectus</i> (O.Pickard-Cambridge)	-	1	
Linyphiidae			
<i>Walckenaeria unicornis</i> O.Pickard-Cambridge)	1	-	
<i>Milleriana inerrans</i> (O.Pickard-Cambridge)	1	1	
<i>Erigone atra</i> Blackwall	-	1	
<i>Syedra gracilis</i> (Menge)	1		
Nationally Scarce (Notable B)			
<i>Bathyphantes gracilis</i> (Blackwall)	-	3	
<i>Lepthyphantes tenuis</i> (Blackwall)	5	5	
<i>Lepthyphantes flavipes</i> (Blackwall)	3	-	
<i>Linyphia hortensis</i> Sundevall	1	-	
<i>Nerienne clathrata</i> (Sundevall)	1	-	
<i>Nerienne peltata</i> (Wider) Common	-	1	
<i>Microlinyphia pusilla</i> (Sundevall)	-	1	
Tetragnathidae			
<i>Tetragnatha montana</i> Simon	-	1	
<i>Pachygnatha degeeri</i> Sundevall	6	3	
<i>Metellina segmentata</i> (Clerck)	-	1	
<i>Metellina mengei</i> (Blackwall)	-	1	
Araneidae			
<i>Araneus diadematus</i> Clerck	2	1	

<i>?Agalenatea redii</i> (Scopoli)	-	1	9
<i>Araniella cucurbitina</i> (Clerck)	1	1	
<i>Araniella opisthographa</i> (Kulczynski)	2	-	
<i>Cyclosa conica</i> (Pallas)	-	-	1
Lycosidae			
<i>Pardosa palustris</i> (Linnaeus)	10	4	
<i>Pardosa prativaga</i> (L. Koch)	41	5	
<i>Pardosa pullata</i> (Clerck)	32	37	
<i>Pardosa nigriceps</i> (Thorell)	2	-	
<i>Pardosa saltans</i> Töpfer-Hofmann	5		
<i>Alopecosa pulverulenta</i> (Clerck)	11	1	
Pisauridae			
<i>Pisaura mirabilis</i> (Clerck)	-	1	5
Dictynidae			
<i>Dictyna arundinacea</i> (Linnaeus)	-	1	
<i>Dictyna uncinata</i> Thorell	-		
Gnaphosidae			
<i>Drassodes</i> sp.	-	-	
<i>Zelotes latreillei</i> (Simon)	-	-	1
Zoridae			
<i>Zora ?spinimana</i> (Sundevall)	-	-	2
Philodromidae			
<i>Philodromus cespitum</i> (Walckenaer)	-	2	2
<i>Philodromus ?dispar</i> (Walckenaer)	-	-	1
Thomisidae			
<i>Xysticus cristatus</i> (Clerck)	2	3	
<i>Ozyptila</i> sp.	-	-	1
Salticidae			
<i>Heliophanus flavipes</i> Hahn	1	3	
<i>Euophrys</i> sp.	-	-	1

Table 2. Numbers of adults of the spider *Pardosa pullata* (Lycosidae) collected during the period of the Invertebrate Survey on the Fleam Dyke, 28 March 2003 to 20 Feb. 2004. The first column gives the number of the Invertebrate Survey in bold. Subsequent columns are the sampling sites along the Dyke, with total numbers in the right hand column. The rows are Survey numbers in bold followed by the total number of spiders collected at each site; males m, females f.

	7-a	7-b	7-c1	7-c2	7A-d	7A-e	8-g	tr-h	road	9-n	9-m	10	11-k	11-crab	12	13	sum
1	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	
2	-	-	-	/	-	-	-	-	-	-	-	3m	-	-	-	-	3m
3	-			/	-			-	-	3m, 1f	6m		2m	-	1m, 2f	2m	14m, 3f
4	-	1m	-	-	1m		1m	-	1f	2m	2m	6f	-	5f	3m	-	10m, 12f
5	1f	1f	-	-	-	1m, 2f	-	-	-	-	1f	-	-	-	-	-	1m, 5f
6	-	-	-	-			2f	1m, 2f	2m, 2f		2f	1f	-	3f	1m, 1f	1f	4m, 14f
7	-	-	-	-	-	-	-		3f		-	-	-		-	1f	4f
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
																	32m, 38f

Total spiders 70, of which 15 (21%) were in the Northern Part and 55 (79%) in the Southern Part.

Table 3. Numbers of adults of the spider *Pardosa prativaga* (Lycosidae) collected during the period of the Invertebrate Survey on the Fleam Dyke, 28 March 2003 to 20 Feb. 2004. Columns as in Table 2 above.

	7-a	7-b	7-c1	7-c2	7A-e	7B	8-f	8-g	tr-h	9-n	9-m	12	13	sum
1	-	-	-	/	-	-	-	-	-	-	-	-	-	
2	-	-	-	/	-	-	-	-	-	-	-	-	-	
3	-	-	-	/	1m	1m		3m	2m	3m, 1f	1m	10m	1f	21m, 2f
4	-	-	-	-	-	8m, 1f	3m, 1f	-	-	-	-	9m, 1f	-	20m, 3f
5	-	-	-	-	-	-	-	1m	3m	-	-	-	-	4m
6	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	-	-	-	-	-	-	-	-	-	-	-	-	-	
10	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	-	-	-	-	-	-	-	-	-	-	-	-	-	
														45m, 5f

Total spiders 50 of which 24(48%) were in the Northern Part, 26 (52%) in the Southern Part
Sex ratio – males 90%, females 10% M:F = 9:1

Table 4. Numbers of immature spiders of the genus *Pardosa* (Lycosidae) collected during the period of the Invertebrate Survey on the Fleam Dyke, 28 March 2003 to 20 Feb. 2004. The first column gives the number of the Invertebrate Survey in bold. Subsequent columns are the sampling sites along the Dyke, with total numbers in the right hand column. The rows are Survey numbers in bold followed by the total number collected at each site.

	7-a	7-b	7-c1	7-c2	7A-d	8-g	tr-h	carpk	road	9-n	9-m	10	11-k	11-crab	11-steps	12	13	sum
1	-	-	-	/	-	-	-	-	-	1	-	-	-	-	-	-	-	1
2	-	-	-	/	-	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	-	-	/	-	-	1	-	-	-	-	-	-	-	-	-	-	1
4	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7	11	-	-	1	2	1	-	-	-	-	-	1	-	-	-	2	2	20
8	-	-	-	-	-	-	1	-	-	-	-	2	-	1	-	-	3	7
9	-	1	1	-	-	1	-	-	-	2	2	2	1	-	-	2	1	13
10	-	-	-	2	-	-	-	-	-	-	1	-	1	-	-	-	-	4
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
sum																		47

Overall total 47, of which 23 (49%) were in the Northern Part and 24 (51%) in the Southern Part

Table 5. List of spiders recorded from the Fleam Dyke FD or the Devil's Dyke DD by Bristowe (1929). The modern names are given first, followed by those used by Bristowe, if they differ.

Atypidae	<i>Atypus affinis</i>	DD		
Dysderidae	<i>Dysdera crocata</i>	DD		
Mimetidae	<i>Ero furcata</i>	FD		
Theridiidae	<i>Theridion mystaceum</i>	FD	= <i>Theridion denticulatum</i>	
	<i>T. sisyphium</i>	DD		
	<i>Neottiura bimaculata</i>	DD	= <i>Theridion bimaculatum</i>	
	<i>Enoplognatha thoracica</i>	FD		
	<i>Pholcomma gibbum</i>	DD		
	Lynyphiidae	<i>Leptyphantes ericaeus</i>	DD	
		<i>Meioneta saxatilis</i>	DD **	= <i>Microphantes saxatilis</i>
		<i>Walckenaeria atrotibialis</i>	DD	= <i>Wideria melanocephala</i>
		<i>Cnephalocotes obscurus</i>	DD	= <i>Nematogmus obscurus</i>
		<i>Erigone atra</i>	DD	
<i>Dismodicus bifrons</i>		FD, DD		
<i>Pocadicnemis pumila</i>		FD **	normally a heath species; perhaps confused with <i>P. juncea</i> ?	
	<i>Peponocranium ludicrum</i>	DD		
	<i>Baryphyma pratense</i>	DD		
Tetragnathidae	<i>Tetragnatha extensa</i>	DD		
Araneidae	<i>Araneus quadratus</i>	FD	= <i>Epeira quadrata</i>	
	<i>Agalenatea redii</i>	FD	= <i>Epeira redii</i>	
	<i>Araniella opisthographa</i>	DD	= <i>E. cucurbitina</i> var <i>opis</i> .	

Lycosidae	<i>Pardosa pullata</i> FD 29.v.21	= <i>Lycosa pullata</i>
	<i>P. nigriceps</i> FD 29.v.21	= <i>Lycosa nigriceps</i>
	<i>Alopecosa pulverulenta</i> FD	= <i>Tarentula pulverulenta</i>
Pisauridae	<i>Pisaura mirabilis</i> FD	
Agelenidae	<i>Agelena labyrinthica</i> FD	
Hahniidae	<i>Hahnia nava</i> DD	
Dyctinidae	<i>Lathys humilis</i> FD 29.v.21	
	<i>Dictyna arundinacea</i> FD, DD	
Liocranidae	<i>Phrurolithus festivus</i> FD	
Clubionidae	<i>Clubiona neglecta</i> FD 29.v.21, under grass **	
	<i>C. pallidula</i> FD	
	<i>C. diversa</i> FD	
	<i>Cheiracanthium erraticum</i> FD, DD	= <i>Ch. carnifax</i>
Gnaphosidae	<i>Haplodrassus signifer</i> DD	= <i>Drassodes troglodytes</i>
	<i>Zelotes latreillei</i> FD 29.v.21 under moss.	
	<i>Z. subterraneus</i> FD	
	<i>Drassyllus pusillus</i> FD	= <i>Drassyllus pusillus</i>
	<i>Micaria pulicaria</i> near FD, under bark of trees in wood.	
Zoridae	<i>Zora spinimana</i> FD, DD	= <i>Zora maculata</i>
Philodromidae	<i>Philodromus aureolus</i> DD	
	<i>Tibellus oblongus</i> DD	
Thomisidae	<i>Xysticus cristatus</i> FD, DD	
	<i>Ozyptila simplex</i> FD	= <i>Oxyptila simplex</i>
Salticidae	<i>Salticus cingulatus</i> FD 29.v.21	
	<i>Heliophanus flavipes</i> FD, DD	
	<i>Euophrys frontalis</i> FD 29.v.21, DD	

** These are not included in current British Archnological Society records. If changes to nomenclature, or species having been divided, render the reliability of early records suspect, the BAS omit them.

Table 6. Records of spiders from the Fleam Dyke recovered from labels in the collection of Cecil Warburton, dating from about 1900 and presented to the University Museum of Zoology in 1938. RJS curated the collection in 2010, so all the names are current. (Records without dates must have been collected before 1938).

Theridiidae	? <i>Epsinus angulatus</i> 1900 1M, 6F sub-adults & juvs.
Lynphiidae	<i>Centomerus sylvaticus</i> 1F
	<i>C. sylvaticus</i> 10.1900 6M, 1F
	<i>Dismodiscus bifrons</i> 1900 2M
	<i>Gonatium rubens</i> 27M, 29F
	<i>Pocadicnemis juncea</i> 05.1900 18M, 1F
	<i>Walckenaera obtusa</i> 10.1900 1F
	<i>W. acuminta</i> 1F
	<i>Phrurolithus festivus</i> 06.1900 1M
Thomisidae	<i>Ozyptila simplex</i> 06.1900 9M, 10F, 2M & 5F sub-adults (This is the record listed by Bristowe for Fleam Dyke)

Note from RJS :-

I find it difficult to believe that all of the above specimens were collected in the field - did Warburton really collect 56 specimens of *Gonatium rubens*? I strongly suspect he bred some in captivity.

Appendix. Details of all identifiable spiders collected on the Fleam Dyke during the period of the Invertebrate Survey, 28 March 2003 to 16 June 2004. Species name and authority, annotated from Merrett & Murphy (2000). The notes on the species are based on the 'Species Summaries' from The British Arachnological Society's Spider and Harvestman Recording Scheme website. Line numbers in bold are the Survey numbers, followed by their dates. Occurrence data specifies collection site, sampling method if not part of the Invertebrate Survey, number of males M, number of females F, number of immatures j.

Atypidae

Atypus affinis Eichwald Lives inside a silk tube. Associated with old and undisturbed habitats particularly grassland and heathland. Widespread in Southern Britain but generally scarce and very local. Large populations have been recorded but it is likely that much of our modern landscape supports only small isolated colonies. Second record for the county; recorded on Devil's Dyke by Bristowe in 1928
1 28.iii.2003. 9-n, 1j

Dysderidae

Dysdera crocata C.L. Koch Nocturnal hunter, eating mainly woodlice. Common and abundant in suitable habitats in much of southern lowland Britain.

4 28/29.v.2003. 7A-d pitfall trap, 1M;

Theridiidae

? *Steatoda* sp.

9 13.ix.2003. 7A netsweep over uncleared vegetation, 1j;

Achaeranea sp.

3 7.v.2003. 12W, 1j;

Theridion sisyphium (Clerck) Constructs an inverted cup-shaped retreat, which it covers with plant debris. Below its retreat the spider spins a tangle web. Widespread and common.

4 28.v.2003. 7A netsweep, 1M;

Theridion impressum L. Koch Constructs a similar retreat and web to that of *T. sisyphium*. Widespread in central southern England and may be locally frequent.

6 7.vii.2003. 7A netsweep over catmint *Nepeta cataria*, 1 F;

7-c2, netsweep over tall grass, 1M

Theridiids, unidentified juveniles

4 28.v.2003. 7A netsweep, 2 j;

7 4.viii.2003. 7 netsweep over short grass, 1 j;

8 25.viii.2003. 7A/B netsweep, 1 j;

9 7A netsweep over cleared vegetation, 1 j; 7A over uncleared vegetation, 2 j;

Enoplognatha ovata (Clerck) Widespread and an extremely abundant species wherever it occurs.

4 28.v.2003. 7A netsweep, 1j;

5 16.vi.2003. tr-h, 2M;

6 9.vii.2003. 11 netsweep over white bedstraw *Galium mollugo*, 2F; 11 netsweep over horehound *Ballota nigra*, 2F; 12 netsweep, 1F;

? *Robertus neglectus* (O.P.-Cambridge) A ground living spider. Widespread but uncommon. In southern England, there is possibly some suggestion that the species may be more frequent on calcareous soils.

4 28/29.v.2003. 7-a pitfall trap, 1 F;

Linyphiidae

Walckenaeria unicornis O.Pickard.-Cambridge Usually amongst detritus, moss and grass. Widespread but generally infrequent.

4 28/29.v.2003. 7A-d pitfall trap, 1M;

Milleriana inerrans (O.Pickard-Cambridge) Widespread, locally frequent, although perhaps generally rather uncommon.

5 16.vi.2003. 7A netsweep, 1F;

6 9.vii.2003. 9-n, 1M; (ID ? – det. difficult)

Erigone atra Blackwall Usually found at ground level and on low vegetation. Often dispersing aeronautically by letting out a line of silk and being lifted on the wind in late summer and autumn. Widespread, one of the commonest spiders.

7 4.viii.2003. carp, 1F;

Syedra gracilis (Menge) Uncommon, very local, mainly in calcareous grassland and grazing marsh, especially tall grass. Recently found in leaf litter in coppice woodland.

Nationally Scarce (Notable B)

Recorded from only 35 10Km squares in Britain; 21 since 1992.

Second record for the county, the other being from Hayley Wood.

7 4/5.viii.2003, 8-f pitfall trap, 1M;

Bathyphantes gracilis (Blackwall) Found in grassland and undergrowth of all kinds. Widespread and common.

5 16.vi.2003. 7-c1&2 netsweep, 1F;

6 9.vii.2003. 11-k, 1F;

7 4.viii.2003. tr-h, 1F;

Lepthyphantes tenuis (Blackwall) Common, one of Britain's most ubiquitous spiders.

4 28.v.2003. tr-h, 1F; // 28/29.v.2003, 7A-e pitfall trap, 1M;

6 7.vii.2003. 7A netsweep over grass rim, 1M; //

9.vii.2003, 11 netsweep over bedstraw, 1F;

7 4.viii.2003. 7A netsweep over grass rim, 1M; 8-f, 3M, 1F;

8 25.viii.2003. 12E, 1F;

Lepthyphantes flavipes (Blackwall) Generally found at ground level predominantly in woodland but also in grasslands, heaths and marshes. Widespread and common.

6 7.vii.2003. 8-f, 3M;

Lepthyphantes sp.

6 9.vii.2003. 12E, 1j;

7 4.viii.2003. 7 netsweep over short grass, 3j; 7-a, 1j; 7-c1, 2j;

10 11.x.2003. road, 1j;

Linyphia hortensis Sundevall Normally found on low vegetation, mostly but not exclusively in woodland. Widespread in England and Wales. Fairly common.

3 7.v.2003. tr-h, 1M;

Linyphiid, unidentified juvenile

8 25.viii.2003. 7A netsweep over grass rim, 1j;

Nerienne clathrata (Sundevall) Found in a wide range of habitats where it occurs in litter, vegetation and low undergrowth. Widespread and common.

1 28.iii.2003. tr-h, 1M;

Nerienne peltata (Wider) Found on low vegetation and bushes, normally associated with woodland, scrub and hedgerows. Widespread and common.

4 28.v.2003. tr-h netsweep, 1F;

Microlinyphia pusilla (Sundevall) Widespread and common particularly in grassland.

4 28/29.v.2003. 7-a pitfall trap, 1F;

Tetragnathidae

Tetragnatha montana Simon Orb webs found on low vegetation, bushes and trees.

Widespread in southern Britain and common,

5 16.vi.2003. 7B netsweep, 1F;

Tetragnatha sp.

2 17.iv.2003. tr at S end, netsweep, 2j;

7 4.viii.2003. 7-c2 netsweep over tall grass, 1j; 7A over grass rim, 3j;

8 25.viii.2003. 7-c2 netsweep over tall grass, 2j; 7A over grass rim, 9j;

- 9 13.ix.2003. 7A netsweep over uncleared vegetation, 2j; 13, 1j;
Pachygnatha degeeri Sundevall Widespread, very common, in humid micro habitats. For example on grassland they are often near crevices in the ground or in tussocks.
- 3 7.v.2003. 7B netsweep, 1F; 12 large water trap, 1M;
 4 28.v.2003. 7B netsweep, 2M, 1F; 8-f, 1M, 1F; // 28-29.v.2003. tr-h pitfall trap, 2M;
 6 7.vii.2003. tr-h, 1F in moult
- Metellina menzei* (Blackwall) Like *M. segmentata* this species occurs in almost any habitat, and can be collected in large numbers by sweeping in grassland or in woodland understorey. Widespread and common, orb web spinner.
- 5 16.vi.2003. 7B netsweep, 1F;
Metellina segmentata (Clerck) Common, orb web spinner
- 9 13.ix.2003. 7A netsweep over cleared vegetation, 1F;
- Araneidae**
- Araneus diadematus* Clerck The ‘Garden cross spider’, its large and conspicuous orb web can be found on all types of woodland, scrub and other vegetation. Common and widespread.
- 8 25.viii.2003. 7-c2 netsweep over tall grass, 1M; 7A over grass rim, 1M
- Araneus* sp. unidentified juveniles
- 8 25.viii.2003. 7-c2 netsweep over tall grass, 5j; 7A over grass rim, 1j;
- ?*Agalenatea redii* (Scopoli) Found in rough grassland, heather and gorse, usually below one metre above ground. Widespread but very local where it may be numerous in suitable habitat.
- 7 4.viii.2003. 7-c2 netsweep over tall grass, 6j; 7A over grass rim, 2j;
 // 5.viii.2003. 9 netsweep over grass in open, 1j; 11 near crab, netsweep, 9j;
- Araniella cucurbitina* (Clerck) Found mostly on trees and bushes as well as on nearby low vegetation. Common in England and Wales.
- 4 28.v.2003. 7A netsweep, 1F;
 5 16.vi.2003. 7A netsweep, 1M;
- Araniella opisthographa* (Kulczynski) Occurs in similar habitats to *A. cucurbitina*, with which it is often, but not always, found. Common in most parts of England.
- 4 28.v.2003. 7A netsweep, 1M;
 5 16.vi.2003. 7A netsweep, 1M;
- Araniella* sp.
- 4 28.v.2003. 7A, 1M subadult;
 8 25.viii.2003. 7-c1 netsweep over short grass, 2j; 7A over grass rim, 1j;
- Cyclosa conica* (Pallas) Widespread but local, in dark moist woodland.
- 9 13.ix.2003. 7A netsweep over uncleared vegetation, 1j;
- Araneids, unidentified juveniles
- 3 7.v.2003. 7A netsweep, 1j;
 5 16.vi.2003. 7 netsweep, 1j;
 6 7.vii.2003. 7-c1 netsweep over short grass, 2j; 7-c2 over tall grass, 1j; 8-f, 1j;
 9 13.ix.2003. 7-c2 netsweep over tall grass, 2j;
- Lycosidae**
- Pardosa palustris* (Linnaeus) Occurs in open sparsely vegetated and bare ground. Widespread and common.
- 3 7.v.2003. 9-n, 3M;
 4 28/29.v.2003. 7-a, pitfall trap, 1M; // 29.v.2003. carpk, 1M; road, 1F; 9-n, 1M; 11-k, 1F; 12, 1M, 1F;
 5 16.vi.2003. 7A-e, 1M; // 16/17.vi.2003. 7-a/b, pitfall trap, 1M;
 6 9.vii.2003. 9-n, 1F; 11-k, 1M;
- Pardosa prativaga* (L. Koch) Occurs on open ground and herbage in various open habitats. Widespread and may be abundant locally.
- 3 7.v.2003. 7A-e, 1M; 7B netsweep, 1M; 8-g, 3M; tr-h, 2M; 9-n, 3M, 1F;

- 9-m, 1M; 12 large water trap, 3M; 12E, 7M; 13, 1F;
4 28.v.2003. 7B, 8M, 1F; 8-f, 3M, 1F; 8-g trap, 1M; tr-h, 2M; //
 28-29.v.2003. tr-h pitfall trap, 1M; // 29.v.2003. 12E, 9M, 1F;
- Pardosa pullata* (Clerck) Occurs in various open habitats as previous *Pardosa* species.
 Widespread and common.
- 2** 17.vi.2003 10, 3M;
3 7.v.2003. 9-n, 3M, 1F; 9-m, 6M; 11-k, 2M; 12 large water trap, 1M, 1F;
 12E, 1F; 13, 2M;
4 28.v.2003. 7-b, 1M; 8-g large water trap, 1M; // 28/29 pitfall trap, 1M; //
 29.v.2003. road, 1F; 9-n, 2M; 9-m, 2M; 10, 6F; 11-crab, 5F; 12E, 3M;
5 16.vi.2003. 7-b, 1F; 7A-e, 1M, 1F; // 16/17.vi.2003. 7-a/b pitfall trap, 1 F; //
 17.vi.2003, 9-m, 1F;
6 7.vii.2003. 8-g, 2F; tr-h, 1M, 2F; //
 9.vii.2003. road, 1M, 1F; 9-m, 1M, 1F; 10, 1F; 11-crab, 3F; 12E, 2F; 13, 1F;
7 4.viii.2003. 7-c2, 1M; // 4/5.viii.2003. 7-a/b pitfall trap, 1F; //
 5.viii.2003, road, 3F; 13, 1F
- Pardosa nigriceps* (Thorell). Habitat preferences as other *Pardosa* species but tends to
 live higher in the vegetation, including on bushes. Widespread and common.
- 3** 7.v.2003. 11-k, 1M; 12E, 1M;
- Pardosa saltans* Topfer-Hofmann Described as a distinct species from *P. lugubris* in
 2000. A woodland species but sometimes in nearby grassland and hedgerows. It seems
 to be largely restricted to old and ancient woodland sites. Widespread but may be
 localised, but usually found in numbers.
- 6** 9.vii.2003. 13, 5F;
- Pardosa* sp. unidentified juveniles
- 1** 28.iii.2003. 9-n, 1j;
3 7.v.2003. tr-h, 1j;
7 4.viii.2003. 7-c2, 1j; 7A-d, 2j; 8-g, 1j; // 4/5.viii.2003, 7a/b pitfall trap, 11j; //
 5.viii.2003. 10, 1j; 12W, 1j; 12E, 1j; 13, 2j;
8 25.viii.2003. tr-h, 1j; 10, 2j; 11-crab, 1j; 13, 3j;
9 13.ix.2003. 7-b, 1j; 7-c1, 1j; 8-g, 1j; 9-n, 2j 9-m, 2j; 10, 2j; 11-k, 1j; 12W, 2j; 13,
 1j;
10 11.x.2003. 7-c2, 2j; 9-m, 1j; 11-k, 1j;
- Alopecosa pulverulenta* (Clerck) Found in many open habitats. Widespread and
 common.
- 2** 17.iv.2003. 10, 1M;
3 7.v.2003. 9-n, 1M; 9-m. 3M;
4 28-29.v.2003. 7A-d pitfall trap, 1M; //
 29.v.2003. road, 2M; 9-n, 1M; 10, 1M; 11-crab, 2M;
5 16.vi.2003. 7A-e, 1F;
- ? *Alopecosa* sp.
- 8** 25.viii.2003. 10, 1j;
- Pisauridae**
- Pisaura mirabilis* (Clerck) Adults tend to occur in reasonably tall vegetation in habitats
 such as rough grassland, woodland rides, field edges and verges. The female
 constructs a tent-like web in tall herbage where her young are raised. Common in the
 southern half of Britain.
- 4** 28.v.2003. 7A-d, 1F;
7 5.viii.2003. 10, 1j;
8 25.viii.2003. 7A netsweep over grass rim, 1j;
9 13.ix.2003. 7A netsweep over uncleared vegetation, 1j; road, 1j;
10 11.x.2003. 11-crab, 1j;

Dictynidae

Dictyna arundinacea (Linnaeus) Found on low, especially dry or dead vegetation in rough grassland or herbage growing at the edges of fields, hedges and woodland rides. Widespread and common but more scattered in the west and north of Britain.

6 7.vii.2003. 7-c2 netsweep over tall grass, 1F;

Dictyna uncinata Thorell A species that seems to be found higher in the vegetation than *D. arundinacea*, commonly found in scrub, hedgerows or woodland edges. Common and widespread in England.

6 7.vii.2003. 7B netsweep, 1F;

Gnaphosidae

Drassodes sp.

7 4-5.viii.2003. 7A-d pitfall trap, 1j;

Zelotes latreillei (Simon) Seems to show a preference for open areas such as chalk downland and heaths. Often found under stones and in short vegetation. On sunny days can be seen running over the ground. Widespread in the southern half of Britain but local.

3 7.v.2003. 9-m, 1F;

Zoridae

Zora ?spinimana (Sundevall) Typically a grassland spider. Widespread in southern Britain but scattered elsewhere, common.

8 25.viii.2003. 7-cs netsweep over tall grass, 2j;

Philodromidae

Philodromus cespitum (Walckenaer) Often associated with scrub and herbage but is sometimes found on trees. Widespread in southern Britain but scattered in the north, common.

5 16.vi.2003. 7B netsweep, 2F;

Philodromus ?dispar Usually found in a variety of wooded habitats. Common in the south.

6 7.vii.2003. 7A netsweep over grass rim, 1j;

?*Philodromus* sp.

1 28.iii.2003. 8 netsweep, 1 j;

Thomisidae

Xysticus cristatus (Clerck) Occurs in almost every habitat type, but is shade intolerant and rare in woodlands and closed canopy habitats. Widespread and common.

3 7.v.2003. 13, 1F;

4 29.v.2003. road, 1M; 10, 1M;

7 4.viii.2003. 7-c2 netsweep over tall grass, 1F; 7A over grass rim, 1F;

Xysticus sp. or ? *cristatus*

6 9.vii.2003. 11 netsweep over yellow bedstraw *Galium verum*, 2j;

7 4.viii.2003. 7-c1 netsweep over short grass, 3j; // 5.viii.200. , 9 netsweep, 1j;

8 25.viii.2003. 7-c1 netsweep over short grass, 1j; 13, 1j; 7A over grass rim, 1j; 11-crab, 1j; 13, 1j;

9 13.x.2003. 7-c2 netsweep over tall grass, 1j; 7A over cleared veg., 1j; 11-crab, 1j; 13, 1j;

Ozyptila sp.

7 4.viii.2003. 7-c1 netsweep over short grass, 1j;

Salticidae

Heliophanus flavipes (Hahn) A species collected from a wide range of habitats where it may occur in the field and shrub layer. Widespread in the southern half of Britain but local. Apart from the pre 1929 records by Bristowe at Wicken, Fleam and Devil's Dykes there has only been one other record in Cambridgeshire and that was from Waterbeach Barracks in 2011.

4 28.v.2003. 7A-e netsweep, 1M, 1F; // 29.v.2003, 9 over hawkweed *Crepis* sp., 1F;

- 8 25.viii.2003. 7-c1 netsweep over short grass, 1F;
Heliophanus sp.
6 9.vii.2003. 11 netsweep over yellow bedstraw, 2j;
7 4.viii.2003. 7-b, 1j; 7, 9j; 7A netsweep over grass rim, 2j // 5.viii.2003, 11-steps, 1j;
8 25.viii.2003. 7-c1 netsweep over short grass, 3j; 7-c2 over tall grass, 3j;
9 13.ix.2003. 7-b, 1j; 8-g, 1j;
Euophrys sp.
4 28.v.2003. 7A-e netsweep, 1j;

Woolly Thistle (*Cirsium eriophorum*) in Cambridgeshire (v.c. 29)

C. James Cadbury

Abstract

A fairly comprehensive survey of post-1990 known sites of the Woolly Thistle (*Cirsium eriophorum*) in Cambridgeshire (v.c. 29) was undertaken by the author in 2014. Of the 26 sites visited the species was present at 20, in ten 10-km squares. In all 3306 plants were recorded but only 1029 (31.1%) were flowering; the rest were non-flowering rosettes one or two years old. Malton golf course near Shepreth had by far the largest population with 1376 plants. There were five populations of between 167 and 511 plants; eight sites had less than 20. Coarse dry ungrazed grassland on calcareous soils was the main habitat. This included two large recently created grasslands. The chalky bank of a major road, two dismantled railways and a disused clunch (chalk) quarry were among other habitats. Woolly Thistle has been lost from at least six sites since 1990, but it seems to be holding its own in Cambridgeshire and several large populations may be increasing.

Introduction

This robust biennial or short-lived perennial with clusters of several large flowering heads, each with a dense cottony involucre, and deeply pinnatifid comb-like leaves, is arguably the most striking of Britain's native thistles (Plate 5, back cover). While Melancholy Thistle (*Cirsium heterophyllum*), another handsome species, has a northern distribution, Woolly Thistle occurs largely in central southern England, extending north to County Durham and west to South Wales. It is not Nationally Scarce, having been recorded in 307 10-km squares in the 1987–99 Atlas survey (Preston *et al.*, 2002). Cambridgeshire is near the eastern limit of its present range in Britain. It is now very rare in Suffolk (Sandford & Fisk, 2010) and has occurred in Norfolk only as a rare casual (Beckett & Bull, 1999). Since 1970 it has been lost from many 10-km squares in its former range in eastern England. This paper aims to review the current status of Woolly Thistle in Cambridgeshire (v.c. 29).

Methods

The basis of the survey was the records collected by Gigi Crompton on her invaluable website that extend to 2000 (Crompton, 2004) together with more recent surveys, particularly those of Alan Leslie, Jonathan Shanklin and the author. A fairly comprehensive survey of post-1990 known sites for Woolly Thistle in Cambridgeshire was undertaken by the author between 21 July and 7 October 2014. The number of both flowering and non-flowering plants was counted and an eight-figure grid reference was recorded with the use of GPS. Associated vascular plants in the close vicinity were recorded.

Distribution in v.c. 29

The attribution of the first record of this species to Samuel Corbyn in 1656 (Crompton, 2004) is incorrect; the plant that he recorded was Meadow Thistle (*Cirsium dissectum*). John Ray observed Woolly Thistle in many ‘closes’ about Madingley and Kingston (Ray, 1660; Oswald & Preston, 2011). Interestingly, he mentioned Childerley too and W.W. Newbould recorded it there also before 1860 at Bird’s Pastures where Jonathan Shanklin refound it in 2014. Woolly Thistle has occurred since 1987 (the first year of the most recent national Atlas survey) in ten out of 40 10-km squares in v.c. 29 and at about 30 sites. Of the 26 sites visited by the author in 2014 it was still present at 20 in ten 10-km squares (Table 1A). The current distribution is in the south-west of the country (Tadlow, Caxton, Croydon, Bassingbourn, Shepreth, Wimpole, Highfields, Knapwell, Foxton, Haslingfield) and the south-east (Magog Down, Six Mile Bottom, Balsham, Shudy Camps). Woolly Thistle had apparently disappeared since 1992 from six sites, including one on the south-eastern outskirts of Newmarket. The species has been lost from ten 10-km squares, including two since 1987. Eight of the 24 pre-1987 sites where Woolly Thistle is now missing were lost before 1960 and it disappeared from another ten between 1961 and 1986.

There are two post-1986 sites where the thistle appears to have been no more than a casual – disturbed ground from the construction of a new roundabout onto A14 north of Boxworth (TL357655) in 2001 and waste ground at Milton Science Park, the site of a former army camp (TL463615), in 1990. Previously it appeared on a rubbish dump on the Newmarket road in Cambridge (TL45) in 1973 and on waste ground at Oakington (TL415649) between 1973 and 1977. None of these sites was examined in 2014.

Gigi Crompton’s (2004) compendium and Jonathan Shanklin’s observations (pers. comm.) have allowed more recent historical records for some of the extant sites of Woolly Thistle to be traced – Tadlow (since 1991), the Croydon area (1860 and since 1945), Wimpole Park (west) (since 1995), Wimpole Park near the folly (since 1987), Haslingfield quarry (since 1987), A11 at Six Mile Bottom (since 1993) and the dismantled railway at Shudy Camps (since 1970). Last records for sites visited in 2014 where the thistle was no longer present were obtained from the same sources (Table 1B).

Habitat

As elsewhere in Britain, Woolly Thistle in Cambridgeshire is essentially a plant of dry ungrazed grassland on calcareous soils, including boulder clay. Extensive dry grasslands (more than 3 ha) still supporting the species are Caxton Moats, Clopton Way, Wimpole Park, Malton golf course, Bassingbourn Camp, Magog Down (created 1998) and Chilford Hall between Linton and Balsham (newly created). The thistle occurs on two smaller grasslands on steep slopes at Croydon, on the chalky margin of Foxton Wood and in a herb-rich grassland in the disused clunch quarry at Haslingfield. A dismantled railway is its habitat at both Hayley Wood and Shudy Camps (on chalk). It grows on the verge of a farm road at Tadlow, a steep chalky bank of A11 near Six Mile Bottom, an abandoned scrub-invaded grassland near Highfields, roadsides at Knapwell and near Shudy Camps and an overgrown bridleway verge on damp clay near Childerley.

Populations

By far the largest population of Woolly Thistle in Cambridgeshire is on Malton golf course, where a total of 1376 plants was counted in the unmown rank grassland between the fairways. There were seven sub-populations including one of 647 plants. Elsewhere there were five populations of over 150 plants – at Wimpole Park north-west of the Hall (511), Wimpole Park (west) (327), Caxton Moats (252), Magog Down (225) and Clopton Way (167). Eight sites each had less than 20 plants – Tadlow, Hayley Wood, Foxton Wood, Highfields, Knapwell, Haslingfield quarry, Chilford Hall and A11 near Six Mile Bottom (Table 1A).

Out of a grand total of 3306 plants, only 1029 (31.1%) were flowering. The rest were non-flowering rosettes, probably in their first or second year. Such plants were largely growing within a few metres of flowering ones. At Malton golf course the highest densities of non-flowering plants and the highest ratio of non-flowering to flowering ones were in the partial shade of trees. At the three locations at Shudy Camps, out of 93 plants only 15 (16.1%) were flowering. It is possible that shade from trees reduces the ground sward cover, enabling seedling thistles to thrive; scattered outlying plants did occur but were rare. There were four plants with white capitula in Wimpole Park.

The Woolly Thistle is the tallest of the eight native thistle species (*Cirsium* and *Carduus*) in Cambridgeshire and several plants over 2 m tall were seen at Malton golf course. This species and Dwarf Thistle (*Cirsium acaule*) are the latest to flower. This was a help when scanning for the purple flower-heads at a distance; however by early September Woolly Thistle had largely finished flowering.

Associated vascular plants

The coarse grassland in which Woolly Thistle was growing was in most instances dominated by False Oat-grass (*Arrhenatherum elatius*) (N.V.C. community M1). Ribwort Plantain (*Plantago lanceolata*) was frequent to abundant along with Cock's-foot (*Dactylis glomerata*), Red Fescue (*Festuca*

rubra), Common Bent (*Agrostis capillaris*), Agrimony (*Agrimonia eupatoria*), Common Knapweed (*Centaurea nigra* sensu lato), Creeping Cinquefoil (*Potentilla reptans*) and two ragworts, Hoary (*Senecio erucifolius*) and Common (*S. jacobaea*). Tufted Hair-grass (*Deschampsia cespitosa*) was dominant at the poorly drained Childerley site. On chalky sites there were calcicoles such as Upright Brome (*Bromopsis erecta*), particularly in Wimpole Park, Hedge Bedstraw (*Galium mollugo*), Hairy Violet (*Viola hirta*), Wild Basil (*Clinopodium vulgare*), Rough Hawkbit (*Leontodon hispidus*), Fairy Flax (*Linum catharticum*) and Field Scabious (*Knautia arvensis*). Salad Burnet (*Poterium sanguisorba*) was abundant at Shingay Hill, Croydon. White Clover (*Trifolium repens*) was abundant where non-flowering plants of the thistle occurred in heavily grazed pasture at Wimpole Park (west). Scrub, with Bramble (*Rubus fruticosus* agg.), Hawthorn (*Crataegus monogyna*), Dogwood (*Cornus sanguinea*) and Dog-rose (*Rosa canina*), was beginning to invade several sites.

At Magog Down there were two inflorescences (one 60 cm tall) of a large broomrape (*Orobanche* species) apparently parasitic on a non-flowering plant of Woolly Thistle (TL 48745310). This seemed to be different from the Common Broomrape (*O. minor* var. *minor*) parasitising Red Clover (*Trifolium pratense*) and was probably var. *compositarum*.

Visitors to the plants

The large capitula of Woolly Thistle are attractive to bumble-bees. Most frequently noticed were *Bombus pascuorum* workers. *B. lucorum* was less frequent and a queen of *B. bohemicus*, a cuckoo bumble-bee, was seen once. Rather surprisingly no butterflies were recorded visiting the flowers, but two moths, Six-spot Burnet (*Zygaena filipendulae*) and Dusky Sallow (*Eremobia ochroleuca*), a noctuid, were seen nectaring.

Two parties of Goldfinches (*Carduelis carduelis*) were seen feeding on the fruiting heads at Wimpole Park at the beginning of September.

Management

Woolly Thistle is a reasonably good competitor and thrives in tall unmown or ungrazed coarse grassland, often in situations where the vascular plant diversity is low. It can tolerate partial shade of trees and shrubs. Close mowing, as at Shingay Hill, Croydon, prevents flowering. At two sites, Magog Down and Chilford Hall, Woolly Thistle has colonised fairly newly sown conservation grasslands. It can tolerate reasonably intensive rabbit-grazing, as at Caxton Moats and on the dismantled railway near Shudy Camps. Non-flowering rosettes have survived in a pasture heavily grazed by cattle and Hebridean sheep at Wimpole Park (west).

At sites where Woolly Thistle has been recently lost, the hedge has grown up along a bridleway at Crane's Lane, Eversden Wood; the bridleway verges on Wimpole Road, Great Eversden, have been narrowed by ploughing; Varley's Field, Wandlebury, has received agricultural improvement and grazing by Highland cattle; the field on the Duchess Park Estate, Newmarket, is now an intensively mown race-horse paddock (Rockingham Yard); and most of the

dismantled railway between Bartlow and Shudy Camps is dense woodland. Invading Hawthorn scrub is eliminating suitable habitat at a site near Highfields. Several roadside verge sites, such as at Comberton and Gransden Lodge near Hayley Wood, had supported only very small populations of Woolly Thistle which were probably not able to sustain frequent mowing or competition from an expanding hedge or scrub.

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References

- Beckett, G., Bull, A.L. & Stevenson, R.** (1999). *A Flora of Norfolk*. Privately published.
- Crompton, G.** (website 2004). *Cambridgeshire Flora Records since 1538: Part III*. <<http://www.cambridgeshireflora.com/>>
- Preston, C.D., Pearman, D.A. & Dines, T.D.** eds (2002). *New Atlas of the British & Irish Flora*. Oxford University Press, Oxford.
- Oswald, P.H. & Preston, C.D.** (2011). *John Ray's Cambridge Catalogue (1660)*. Ray Society, London.
- [Ray, J.]** (1660). *Catalogus plantarum circa Cantabrigiam nascentium*. Cambridge.
- Sandford, M. & Fisk, R.** (2010). *A Flora of Suffolk*. Privately published.

Table 1: Woolly Thistle (*Cirsium eriophorum*) in Cambridgeshire (v.c. 29)

A: Recorded in 2014					
Site	10-km square	Grid ref.	Flowering	Non-flowering	Total
Tadlow (New England Farm)	TL24	278481	5	13	18
Hayley Wood (disused railway)	TL25	294534	–	2	2
Caxton Moats	TL25	295587	43	209	252
Clopton Way	TL34	301409–303489	74	93	167
Croydon Hill	TL34	307492	15	20	35
Shingay Hill, Croydon	TL34	312495	3	40	43
Bassingbourn Camp	TL34	330457–331456	57	32	89
Malton golf course, Shepreth	TL34	363430–365483	337	1039	1376
Wimpole Park (W.)	TL35	327508–331509	78	249	327
Wimpole Hall (N.W. of Hall)	TL35	331510–333510	161	350	511
Wimpole Park (N.W. of folly)	TL35	334522	15	31	46
Highfields–Hardwick	TL35	356583	3	2	5
Knapwell	TL36	333621	1	5	6
Bird’s Pastures, Childerley	TL36	343605–344606	32	27	59
Foxton Wood	TL44	413478	1	7	8
Haslingfield quarry	TL45	408517	5	14	19
Magog Down	TL45	488530–488532	180	45	225
Chilford Hall, Balsham	TL54	568487	2	8	10
A11 at Six Mile Bottom	55	571561	2	13	15
Shudy Camps	64	603449–607448 (3 locations)	15	78	93
20 sites			1029 (31.1%)	2277	3306

B: Sites visited in 2014, but no <i>C. eriophorum</i> seen				
Site	10-km square (TL)	Grid ref.	Last record	Reason for loss
Gransden Lodge, Hayley Wood	25	286536	1992	Roadside verge
Crane's Lane, Eversden Wood	35	338531	1992	Hedge grown up
Wimpole Road, Great Eversden	35	355528–360531	2011	Bridleway verges ploughed
Lane north of Comberton	35	386573–388570	2012	Roadside verge
Varley's Field, Wandlebury	45	496535	2000	Grazed by Highland cattle
Disused railway between Bartlow and Shudy Camps	64	599450–603448	1975	Suitable habitat much reduced by woodland
Duchess Estate, Newmarket	66	660622	2009	Race-horse paddock

Emerging from slumber – Fen Violet (*Viola persicifolia*) at Wicken Fen National Nature Reserve, Cambridgeshire

Peter A. Stroh & Jane M. Croft

Introduction

Fen Violet (*Viola persicifolia* Schreber) is a perennial plant of open peaty base-rich fens and former river valleys in Britain and of turloughs in western Ireland. It is distinguished from other violet species found in similar habitats by its narrow lanceolate light-green, almost translucent leaves, a green corolla spur which is less than twice as long as the sepal appendages and its habit of creeping underground roots sending up stems at intervals (Stace 2010). It is listed on Schedule 8 of the Wildlife and Countryside Act 1981 and is assessed as *Endangered* in Great Britain (Cheffings & Farrell 2005), but has recently been assessed as *Critically Endangered* in England (Stroh *et al.* 2014). In Britain, Fen Violet was originally known from about 20 locations across England, but is now found at only three: Otmoor Site of Special Scientific Interest (SSSI), Wicken Fen National Nature Reserve (NNR) and Woodwalton Fen NNR. Only the Otmoor population is currently thriving (following recent scrub clearance work

in 2012), and there had been no sightings of Fen Violet at either Woodwalton or Wicken in recent years despite intensive searches at both reserves. This article focuses on the history of Fen Violet at Wicken Fen NNR and the discovery of a small population of Fen Violet plants there in 2014 after an absence of 15 years.

A brief history of Fen Violet at Wicken Fen

Fen Violet has a remarkable recorded history at Wicken. It was known as an abundant species in the mid-19th century (Babington 1860) but then steadily declined in numbers, leading to a ‘final’ record “near Drainers Dyke, Verralls Fen” in 1916 (Rowell *et al.* 1982). After an apparent absence of 64 years, a single plant germinating from a soil sample taken from Verralls Fen in 1980 gave hope that a long-lived seed bank still persisted at the site. Then in June 1982, many thousands of flowering Fen Violet plants (growing with a small number of the equally rare *V. canina* subsp. *montana*) were found on the ridges between old peat diggings in an area of Verralls Fen that had been cleared of scrub in the spring of 1981 and cut with tractor-mounted machinery in mid-May 1982 (Rowell 1984).

In 1993, the newly formed English Nature commissioned the Institute of Terrestrial Ecology at Monks Wood, Huntingdonshire, to carry out research and set up experimental plots under funding from the Species Recovery Programme (SRP) in an attempt to understand more about the ecology of the species. Although no Fen Violet plants were found in the areas at Verralls Fen where they appeared in 1982, in June 1994 66 plants and additional seedlings were found nearby in a wet area dominated by Blunt-flowered Rush (*Juncus subnodulosus*), growing on slightly raised ground above waterlogged areas. Later in the same year, an additional 300 Fen Violet plants were found. Seventeen quadrats were set up at these locations and details of number of branches, height, flowers and capsule production were recorded over the next few years. The results of this monitoring work, as well as experimental work concerning the effects of waterlogging on the growth of roots and young shoots, the creation of suitable conditions for germination (including disturbance plots), establishing and monitoring naturally occurring and reinforcement populations, and the setting up of seed burial experiments, were presented in a number of reports to English Nature (Wells *et al.* 1995; Croft & Preston 1996; Croft *et al.* 1997; Croft 1998, 1999, 2000a; Palmer 2006) and also in Croft (2000b). Unfortunately, despite hand-cutting of the surrounding vegetation within the quadrats each year, a gradual decline in the number of plants was recorded and a series of very wet springs created adverse conditions for germination, leading once again to an absence of plants at Wicken Fen by 1999.

Site description: Verralls Fen

Verralls Fen is located at the western edge of Wicken Fen NNR in Cambridgeshire. For management purposes the NNR is sectioned into a series of numbered compartments, with Verralls Fen comprising compartments 1 to 4. The area is named after George Henry Verrall, a notable dipterist and president of the Entomological Society (1898-1899). Verrall was a keen advocate of the

newly created Wicken Fen nature reserve and gifted substantial tracts of land to the National Trust to expand the reserve's boundaries.

Soils in the area comprise undrained peat overlying clays, with the peat often reaching depths of 3 metres or more. In many areas the black peat profile is interrupted by a 5 - 10 cm layer of white, freshwater shell marl located about 20 - 30 cm below ground level. This calcareous marl was formed under lacustrine conditions in the past and has an influence on the pH of the peat above and consequently on the composition of the vegetation in these areas (Tansley 1949).

The area is bounded by water bodies on all sides and contains approximately 56 hectares of a complex mosaic of terrestrial and aquatic habitats that now include stonewort-dominated ditches, short sedge-rich grassland, rush pasture, tall-herb fen, *Phragmites australis* reed bed, *Cladium mariscus* sedge beds, *Salix* carr and other scrub habitats. Scrub communities dominated Verralls Fen for much of the twentieth century, but small glades persisted and were kept open by mowing operations. Following substantial scrub clearance operations across Verralls Fen from 2000 to 2004, a decision was taken by the National Trust to instigate for the first time a grazing regime using a free-roaming herd of Polish Konik horses, and latterly (from 2012), a small number of Highland cattle, with the animals chosen because of their resilient immune system, tolerance for harsh and wet conditions and ability to graze coarse vegetation. It was originally hoped that a combination of grazing and the disturbance created by scrub clearance and livestock poaching would result in the reappearance of Fen Violet, but despite searches each year, no plants were found.

The latest rediscovery of Fen Violet at Wicken Fen

In 2001, a rare plants group under the guidance of Dr Stan Woodell established a small committee, *The Fen Violet Steering Group* (FVSG), with regular meetings discussing the ecology and management of the species led by Dr Camilla Lambrick following Dr Woodell's death in 2004. On May 19th 2014 a meeting of the FVSG was held at Wicken Fen, with members accompanied on site by the National Trust's Countryside Manager, Martin Lester, who has an intimate knowledge of the area both before and after scrub clearance. First impressions of the site were encouraging, with the vegetation appearing to be 'well grazed' in places, and there were plenty of bare patches of peat. The consensus between the members of the group was that the area appeared suitable for Fen Violet, although such optimistic observations had been made in previous years by botanists searching in the same area for this elusive species without any plants being found. Then, near to one of the dipwells, tiny seedlings of Fen Violet were spotted, and soon afterwards small flowering plants were found growing on the warm, damp peat (Plate 1, inside front cover). Rather remarkably, the plants found were at precisely the same location as the main population studied in the 1990s; fragments of plastic labels which were used to mark the plants in the study quadrats during the SRP work were found next to the seedlings! A visit to the site two days later led to an estimate of population size and a record of associated species, along with percentage of bare ground and sward height (Table 1).

The area where the plants were discovered would appear to closely correspond with the location of management works in the winter of 2013/14, when a number of scrub piles left over from clearance operations in the early 2000s were removed using heavy machinery. To protect the site from vehicle damage (and to stop the machine from sinking into the fen), several large mats were placed on the ground, with the vehicle using the mats as a make-shift track.

Table 1: *Population estimate of Viola persicifolia at Verralls Fen, associate species and mean % cover calculated from seven 1m x 1m quadrats recorded where V. persicifolia plants were present. Recorded on 21st May 2014; TL 5483 7018 ± 3m*

<i>Viola persicifolia</i> (21st May 2014)			
Number of seedlings		114	
Number of flowering plants		10	
Mean bare ground (%)		76	
Mean sward height (cm)		9	
Associated species	mean % cover	Associate species	mean % cover
<i>Carex panicea</i>	5	<i>Filipendula ulmaria</i>	1
<i>Agrostis stolonifera</i>	5	<i>Holcus lanatus</i>	1
<i>Juncus subnodulosus</i>	3	<i>Carex lepidocarpa</i>	1
<i>Mentha aquatica</i>	3	<i>Eupatorium cannabinum</i>	1
<i>Lycopus europaeus</i>	3	<i>Phragmites australis</i>	1
<i>Calamagrostis canescens</i>	2	<i>Angelica sylvestris</i>	+
<i>Lysimachia vulgaris</i>	2	<i>Cirsium palustre</i>	+
<i>Hydrocotyle vulgaris</i>	1	<i>Galium uliginosum</i>	+
<i>Molinia caerulea</i>	1	<i>Lysimachia vulgaris</i>	+
<i>Hypericum tetrapterum</i>	1	<i>Phalaris arundinacea</i>	+
<i>Iris pseudacorus</i>	1	<i>Plantago major</i>	+
<i>Thalictrum flavum</i>	1	<i>Prunella vulgaris</i>	+
<i>Epilobium tetragonum</i>	1	<i>Samolus valerandi</i>	+

An analysis of the quadrat vegetation using the programme Modular Analysis of Vegetation Information System (MAVIS; Smart 2000) indicated that the associated vegetation had affinities to M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow and M24 *Molinia caerulea-Cirsium dissectum* fen meadow, and also a weaker affinity to S24 *Phragmites australis-Peucedanum palustris* (now *Thyselium palustre*) tall-herb fen. Previous surveys in the same area recorded in August 1994 by Wells *et al.* (1995) report a similar if slightly

wetter assemblage, notably with abundant areas of Lesser Spearwort (*Ranunculus flammula*). Whilst this species was not present within the 2014 quadrats, it was a component of the surrounding vegetation, as was Meadow Thistle (*Cirsium dissectum*). The MAVIS output also calculated Ellenberg indicator values, helping to characterise the conditions in which the recorded vegetation grows. Plants noted within the quadrats were associated with open (Ellenberg Light = 7.3), damp (Ellenberg Moisture = 7.9), weakly basic (Ellenberg Reaction = 6.3) and nutrient-poor (Ellenberg Nutrient = 4.5) conditions.

The location was visited one month later on 19th June. No flowering plants were visible, only four could be found with intact seed capsules, and it is probable that some seedlings that we had expected to persist to flowering had been trampled and destroyed by the grazing animals, as they appear to use the area as a 'thoroughfare'. However, livestock also contribute to the retention of suitable conditions by keeping the vegetation short and creating poached areas of bare ground, and many hundreds of seedlings were recorded on this second visit, with the majority located on the margins of the 'thoroughfare'. On a third visit to the site on 14th July, several plants with either dehisced capsules or cleistogamous (i.e. non-opening, self-pollinated) flowers were found, as well as numerous seedlings and new germinants on the edges of recently poached peat. However, it is slightly concerning that the numbers of flowering (chasmogamous) plants recorded in 2014 pale in comparison to the numbers found in past 'rediscoveries'.

Conclusions and recommendations

It would appear that disturbance in the form of scrub clearance, later followed by grazing and poaching by both ponies and cattle, contributed to conditions suitable for the germination of long-lived Fen Violet seed. However, superficially similar conditions have been present for at least the past eight years without seedlings or flowering plants being sighted. The possibility remains that small seedlings or cleistogamous plants were overlooked in each of these years, although concerted efforts were made to find the species each year in the same location where plants appeared in 2014. It is likely, therefore, that alongside small-scale disturbance bringing viable seeds to the surface, suitable conditions for the germination and establishment of Fen Violet in 2014 arose as a consequence of weather, with the mild winter of 2013/14, wet spring and, crucially, prolonged warm spells in late April and early May leading to a drawdown of the water table and the creation of areas of bare, damp, warm peat. It may be that the placement of matting for management works in the autumn of 2013 also led to additional small-scale disturbance, the suppression of otherwise vigorous rushes and grasses, and the creation of bare ground.

It is perhaps worthwhile emphasising the observation that germination was still taking place on recently disturbed ground into mid-July. Indeed, Croft (2000b) had already noted that Fen Violet seed could be produced from cleistogamous flowers from spring until the first frosts of autumn. We therefore

recommend that surveys for this species are undertaken at the ‘classic’ time of mid-late spring, but also later in the year when circumstances allow.

Numerous plants noted as small seedlings in mid-June had, by mid-July, produced cleistogamous flowers, demonstrating that the development of young Fen Violet plants can progress rapidly. Such characters, along with a long-lived seed bank and a low tolerance for competition, fit well with those of a ruderal perennial herb (*sensu* Grime 1979). So Fen Violet is typical of nutrient-poor, periodically disturbed habitats where change is cyclical rather than successional. Consequently, and depending on the size of the site, site management should not necessarily aim for flowering Fen Violet plants each and every year, but should instead focus on producing a short sward by the end of each growing season, provide small-scale disturbance and areas of open, moist peat – especially in the spring and early summer – and maintain a low soil nutrient status. It may also be of interest to investigate the size and viability of *in situ* seed banks, particularly in areas across Wicken Fen and Woodwalton Fen where there are historical records and where vegetation, soil and hydrology still appear suitable.

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References

- Babington, C.C.** (1860). *Flora of Cambridgeshire*. London.
- Cheffings, C.M., Farrell, L. (eds), Dines, T.D., Jones, R.A., Leach, S.J., McKean, D.R., Pearman, D.A., Preston, C.D. Rumsey, F.J. & Taylor, I.** (2005). *The Vascular Plant Red Data List for Great Britain*. Species Status 7. Joint Nature Conservation Committee, Peterborough.
- Croft, J.M.** (1998). *Species Recovery Programme: fen violet (Viola persicifolia Schreber)*. Report for 1997. Report to English Nature. Institute of Terrestrial Ecology, Huntingdon.
- Croft, J.M.** (1999). *Species Recovery Programme: fen violet (Viola persicifolia Schreber)*. Report for 1998. Report to English Nature. Huntingdon: Institute of Terrestrial Ecology.
- Croft, J.M.** (2000a). *Species Recovery Programme: fen violet (Viola persicifolia Schreber)*. Report for 1999. Report to English Nature. Institute of Terrestrial Ecology, Huntingdon.
- Croft, J.M.** (2000b). Fen violet *Viola persicifolia* at Wicken Fen: a reinforcement population. *Nature in Cambridgeshire* 42: 27-33.
- Croft, J.M. & Preston, C.D.** (1996). *Species Recovery Programme: fen violet (Viola persicifolia Schreber)*. 3rd progress report. Report to English Nature. Institute of Terrestrial Ecology, Huntingdon.
- Croft, J.M., Preston, C.D., & Appleby, V.J.** (1997). *Species Recovery Programme: fen violet (Viola persicifolia Schreber)*. Final report. Report to English Nature. Institute of Terrestrial Ecology, Huntingdon.
- Grime, J. P.** (1979). *Plant strategies and vegetation processes*. John Wiley and Sons, Chichester.

- Palmer, M.A.** (2006). *Fen violet Viola persicifolia Schreber: a review of conservation work carried out under English Nature's Species Recovery Programme 1993-2005*. English Nature Research Report No. 676.
- Rowell, T.A.** (1984). Further discoveries of the Fen Violet (*Viola persicifolia* Schreber) at Wicken Fen, Cambridgeshire. *Watsonia* 15: 122-123.
- Rowell, T.A., Walters, S.M. & Harvey, H.J.** (1984). The rediscovery of the Fen Violet (*Viola persicifolia* Schreber) at Wicken Fen, Cambridgeshire. *Watsonia* 14: 183-184.
- Smart, S.M.** (2000). *Modular Analysis of Vegetation Information System (MAVIS) Plot Analyser, version 1.00*. CEH, Merlewood, Cumbria.
- Stace, C.A.** (2010). *New Flora of the British Isles*. Third edition. Cambridge University Press, Cambridge.
- Stroh, P.A., Leach, S.J., August, T.A., Walker, K.J., Pearman, D.A., Rumsey, F.J., Harrower, C.A., Fay, M.F., Martin, J.P., Pankhurst, T., Preston, C.D. & Taylor, I.** (2014). *A Vascular Plant Red List for England*. Botanical Society of Britain and Ireland, Bristol.
- Tansley, A.G.** (1949). *The British Islands and their Vegetation. Volume II*. Cambridge University Press, Cambridge.
- Wells, T.C.E., Preston, C.D., Mountford, J.O. & Croft, J.M.** (1995). *Species Recovery Programme: Fen violet (Viola persicifolia Schreber). 2nd progress report*. Report to English Nature. Institute of Terrestrial Ecology, Huntingdon.

If at first you don't succeed: the reintroduction of Interrupted Brome (*Bromus interruptus*) in Cambridgeshire

Peter A. Stroh, Ashley Arbon, Fred J. Rumsey & Pete Michna

Interrupted Brome (*Bromus interruptus* (Hack.) Druce) is an English endemic with a mainly southern and eastern distribution, first collected at Odsey on the Cambridgeshire/Hertfordshire border in 1849 (Perring, 1962) and last recorded in the wild at Pampisford, Cambridgeshire, in 1972 (Donald, 1980). It is assessed as 'Extinct in the Wild' by Stroh *et al.* (2014). Seed protein (Smith, 1972, 1980), allozyme (Oja, 1998) and nuclear DNA sequence studies (Ainouche & Bayer, 1997) have all shown a very close similarity to the widespread *B. hordeaceus* L., from which *B. interruptus* is therefore believed to have originated through mutation. Whether this occurred in the British Isles or elsewhere is still open to debate, although contrary to many sources the species has never been found outside England except for two twentieth-century casual occurrences in the Netherlands (Rumsey, 2014).

Individual plants are identified by a stiff compact panicle with spikelets arranged alternately on the main axis (Plate 3, inside back cover). Groups of spikelets are often well spaced, giving an interrupted appearance, although Rich & Lockton (2002) observed that many herbarium specimens have a more or less continuous arrangement of spikelets. The most reliable characters are the contracted inflorescence, long glumes and split (or bifid) paleas. It is a winter – or occasionally spring – annual with the main flowering period from May to July but with flowering spikes sometimes observed as late as September. Seeds are dispersed close to the parent plant but are short-lived in the soil (Lyte &

Cope, 1999). It was formerly associated with hay fields and arable fields and margins, mainly on light chalky soils, found growing with Sainfoin (*Onobrychis viciifolia*), Perennial Rye-grass (*Lolium perenne*), clovers (*Trifolium* spp.) and other fodder plants, with whose seeds it was almost certainly spread beyond its native range (Cope & Gray, 2009). The demise of Interrupted Brome has been linked to improved seed-cleaning techniques, a decline in the sowing of fodder crops, poor competitive ability and a transient seed bank, alongside the general ‘intensification’ of arable farming and widespread use of broad-spectrum herbicides (Rich & Lockton, 2002; Cope & Gray, 2009).

Seed from the last known population of Interrupted Brome was collected and stored at Cambridge University Botanic Garden (CUBG), but in 1975, after a failure to find any plants at Pampisford, the material was found to be no longer viable. This appeared to be the end of the story for our endemic grass, but in 1979, at a conference of the Botanical Society of the British Isles (BSBI) in Manchester, Dr Philip Smith of Edinburgh University, an expert in the genus *Bromus*, produced plants grown from seed that he had collected in 1963 from the Pampisford population and subsequently grew on in pots on his window-sill. After this revelation, seeds were distributed to the Botanic Gardens of Edinburgh, Kew, Ness and Cambridge, as well as to numerous botanists more unofficially.

At the end of the twentieth and early in the twenty-first century detailed accounts of the history, taxonomy, identification and ecology of this species in Britain were published (Lyte & Cope, 1999; Rich & Lockton, 2002) with a view to stimulating interest in surveying historical sites and providing information for any future reintroduction programme. The baton was taken up by Dr Stewart Henchie (RBG Kew), Dr Ron Porley (English Nature), Dr Tim Upson (CUBG) and Dr Tim Rich (National Museum of Wales) under the auspices of the Species Recovery Programme, and seed was cultivated at CUBG and Paignton Zoo Botanical Garden in readiness for an introduction. Although all the material used arose from just one collection, genetic finger-printing undertaken at Kew confirmed that the level of genetic variation was high and there had been minimal genetic drift.

Introductions of Interrupted Brome in the early 2000s

In February 2003 seed was sown onto an arable margin overlying chalky loam topsoil at the first of three introduction sites at Whittlesford, Cambridgeshire, less than 5 km from the last recorded site. Germination was recorded in March 2003, and panicles appeared in late August, with good numbers of seeds recorded in September. Germination of self-sown seeds was observed in December and by mid-July 2004 a healthy second generation had become established. Two additional reintroduction sites were selected in Wiltshire (Cholderton Estate) and Oxfordshire (Aston Rowant National Nature Reserve), and, although no germination was recorded at Cholderton (F. Rumsey, pers. comm.), several hundred plants were recorded in summer 2005 at Aston Rowant. Unfortunately this excellent start to the introduction programme was not sustained, the retirement of both project leaders shortly after the

introductions being a contributing factor. An investigation of the current health of Interrupted Brome populations at the three introduction sites in 2013 after questions about its current status by members of the Species Status Assessment Group (SSAG) revealed that no plants had survived at any of the locations. No details are available for a last record at the Oxfordshire introduction site (see Rumsey, 2014), but it is known that there was a healthy population of plants at the Cambridgeshire location until 2008, after which there was a sudden disappearance, possibly linked to the residual action of Simazine applied to the abutting bean crop. This herbicide is now banned from use throughout the European Union.

Introduction of Interrupted Brome: 2013–2015

Fortunately a plentiful seed source of Interrupted Brome was still available thanks to the foresight of staff at CUBG who had retained the plant in cultivation. Tests conducted in 2013 on seed collected and dry-stored in 2010 found 95% viability, and so, after discussion with Ashley Arbon, the landowner of one of the original introduction sites, plans were put in place to meet up at Whittlesford and start anew at the same headland location. On 1 October 2013 approximately 5000 seeds provided by CUBG were sown by broadcasting a sandy-soil/seed mixture onto a freshly ploughed margin at Fosters Field (TL4675847638) within a 10 m × 3 m area. In addition, dry-stored seed collected by Ashley from the sown margin in 2008 was broadcast nearby. The sown area was then lightly raked. Germination of the CUBG seed was observed about seven days after sowing, with flowering recorded in early June 2014. No germination was observed within the area sown with the dry-stored seed collected in 2008.

On 1 May 2014, while it was still possible to recognise individual ‘clumps’ of plants, population size was estimated by using ten randomly placed 40 cm × 40 cm quadrats within the sown area (30 m²). A bootstrap analysis of the observed data calculated the 95% confidence interval for the mean and, by using the total area and the area of the sample size, it was then possible to come up with a lower and upper estimate for the entire population, assuming that 100% of the habitat was suitable for the species. This calculation gave us a range of between 612 and 1440 plants for the sown area, with a population mean of 1004 plants – in short a success rate of roughly one seed in five.

A monitoring visit to the introduction site on 19 June 2014 to check on progress found a healthy population of Interrupted Brome growing with a number of locally uncommon arable plants, including Round-leaved Fluellen (*Kickxia spuria*), Sharp-leaved Fluellen (*K. elatine*), Venus’s-looking-glass (*Legousia hybrida*) and Rough Poppy (*Papaver hybridum*). Although some rabbit damage to the introduced plants was recorded, it was decided not to fence the area, and, despite the allure of a new delicacy and the absence of protection, the vast majority of the population of Interrupted Brome progressed to flowering and seed-setting.

A visit to the introduction site on 3 May 2015 confirmed that Interrupted Brome was still present within the margin, arising from seed after scarification

of the surface with a multi-point spring-loaded very light harrow in October 2014. No fertiliser was applied to the plots in 2014. A new headland location on chalky loam topsoil with significant gravel content near to the original introduction site at Stonehill Field (TL45694723) was sown on 21 February 2015 with seed collected from CUBG plants. A third introduction site in a large field on organic rich loamy top-soil near Moat House, Whittlesford, became available in January 2015 and a mixture of Interrupted Brome and Sainfoin was broadcast over half of the plot. All three sites will be monitored this year, with progress reported to Natural England and the SSAG.

Recommendations

Introductions of threatened species are rarely straightforward and often fail. In our opinion the long-term retention of introduced plants requires, as a minimum, (i) knowledge of the specific ecological niche or an experimental design aimed at determining the ecological niche. (ii) the selection of apparently suitable introduction locations, (iii) the active engagement of a dedicated and ecologically aware landowner, (iv) regular contact between the partner organisations and the landowner, (v) a long-term monitoring strategy, (vi) regular site visits, (vii) adequate funding, and (viii) publication of methods and results so that others may learn from failure and/or success.

Acknowledgments

Ashley Arbon, through his enthusiasm, knowledge and dedication, has been the driving force behind the successful introduction of an extinct English endemic. We thank Mrs Sarah Williamson of Moat House, Whittlesford, who has taken an active interest in the conservation of this species and very generously given permission for us to sow Interrupted Brome within a margin of one of her fields.

References

- Ainouche, M.L. & Bayer, R.J.** (1997). On the origins of the tetraploid *Bromus* species (section *Bromus*, Poaceae): insights from internal transcribed spacer sequences of nuclear ribosomal DNA. *Genome* **40**: 730–743.
- Cope, T.A. & Gray, A.** (2009). *Grasses of the British Isles*. BSBI handbook No.13. Botanical Society of the British Isles, London.
- Donald, D.** (1980). *Bromus interruptus* (Hack.) Druce. Dodo or phoenix? *Nature in Cambridgeshire* **23**: 48–50, 51 (drawings).
- Lyte, B. & Cope, T.A.** (1999). Plants in Peril: 25 *Bromus interruptus*. *Curtis's Botanical Magazine* **16**: 296–300.
- Oja, T.** (1998). Isoenzyme diversity and phylogenetic affinities in the section *Bromus* of the grass genus *Bromus* (Poaceae). *Biochemical Systematics and Ecology* **26**: 403–413.
- Perring, F.H.** (1962). *Bromus interruptus* (Hack.) Druce. A botanical dodo? *Nature in Cambridgeshire* **5**: 28–30.
- Rich, T.C.G. & Lockton, A.J.** (2002). *Bromus interruptus* (Hack.) Druce (Poaceae) – an extinct English endemic. *Watsonia* **24**: 69–80.

- Rumsey, F.J.** (2014). *The Conservation of Section 41 plants: A review of conservation actions for Bromus interruptus (Hack.) Druce with recommendations for future progress.* Unpublished report to Natural England.
- Smith, P.M.** (1972). Serology and species relationships in annual bromes (*Bromus* L. sect. *Bromus*). *Annals of Botany (London)* n.s. **36**: 1–30.
- Smith, P.M.** (1980). Chemical characters and variation in annual bromes. *Watsonia* **13**: 77.
- Stroh, P.A., Leach, S.J., August, T.A., Walker, K.J., Pearman, D.A., Rumsey, F.J., Harrower, C.A., Fay, M.F., Martin, J.P., Pankhurst, T., Preston, C.D. & Taylor, I.** (2014). *A Vascular Plant Red List for England.* Botanical Society of Britain and Ireland, Bristol.

Cambridgeshire Amphibian Survey Report 2014

Steven J. R. Allain & Mark J. Goodman

Introduction

The Cambridge Amphibian Survey 2014 was a larger scale continuation of a smaller pilot study carried out in 2013, wherein a number of bodies of freshwater were surveyed for signs of amphibians. From the 2013 pilot, we deemed the three sites surveyed that year were suitable for further study. We also carried out a number of surveys at four new locations; these were discovered by following up reports we had received.

The surveys were designed to meet standardised guidance protocols (Griffiths *et al.*, 1996; Sewell *et al.*, 2013) and were carried out weekly (weather permitting). On nights when it was extremely windy or there was heavy rain, surveying did not take place because the disturbance of the water surface obstructed the view of the surveyors. This precaution was also taken for the surveyors' safety. The surveys were carried out weekly to help provide more extensive information on the population sizes of native amphibians within Cambridgeshire. Amphibians within Cambridgeshire are under recorded so one aim of this study was to educate local residents on the importance of recording local species.

Seven sites (Figure 1) were surveyed, mostly after nightfall by torchlight, and the detected presence of amphibian species was recorded, along with the occurrence of fish and the number of frog spawn clumps. Other factors that were also analysed were the pond's suitability to sustain Great Crested Newts.

All seven sites surveyed contained evidence of amphibians but not all of them were suitable for further study. The sites were surveyed with the help of trained volunteers who were members of the Cambridgeshire and Peterborough Amphibian and Reptile Group (CPARG).

The species focused on in this study were the most common of the native amphibian species found in Cambridgeshire, the Common Frog (*Rana temporaria*), the Common Toad (*Bufo bufo*), the Smooth Newt (*Lissotriton vulgaris*) and the Great Crested Newt (*Triturus cristatus*).

Methods

Survey locations (see Figure 1)

Site 1: Cambridge City Crematorium (TL39906258)

The City Crematorium has a total of six ponds, of which we only surveyed four on a regular basis. The four surveyed were the same as those the year before. Two are 12 x 16 feet and the other two are 16 x 16 feet. Although they are all concrete lined with small areas of refugia in the corners, they support a high diversity of pond life.

Site 2: Cherry Hinton Brook (TL47715728)

Cherry Hinton Brook, as its name suggests runs through Cherry Hinton, behind the Hall. We focused on the stretch between Burnside Road and the allotments just past St. Bede's Infant School. This site had been surveyed the year before as part of the pilot, where toads were found.

Site 3: Chesterton (TL46485957)

This site consists of a man-made waterway that has been built behind a block of flats on the old Phillips/Simocco site. We were alerted to the presence of newts at the site by some friends who had seen some dead Smooth Newts on a path nearby. After some further investigation we found the man-made waterway which appeared to have a healthy population of amphibians. The site is not very far from the River Cam or Logan's Meadow LNR.

Site 4: Cottenham Amenity Pond (TL44866834)

The Amenity Pond was discovered using maps when trying to find out more about the moat nearby in Cottenham. Some other bodies of water including drainage ditches which are close by were also inspected but these were deemed unsuitable for sustaining amphibians. The pond has a high abundance of emergent vegetation around its perimeter, as well as submerged vegetation within the pond.

Site 5: Cottenham Moat (TL44936807)

Cottenham Moat was investigated further after reports from a friend that he had seen Great Crested Newts at the site when he used to live close by. On further investigation it was discovered that the site did support a population. The moat is a broken 'U' shape, contains no fish and is sometimes covered by a film of duckweed.

Site 6: Logan's Meadow LNR (TL46385925)

Logan's Meadow LNR is located in Chesterton, along the River Cam and quite close to our already established Chesterton newt population. We decided to survey the site after discovering that it contained two ponds and that those ponds were partially connected to the Chesterton population of newts by ditches.

Site 7: Stow-cum-Quy Fen (TL51366270)

Stow-cum-Quy Fen is located between Waterbeach and Horningsea, off Harcamlow Way. Again, this site is one that we surveyed the year before as part of the 2013 pilot. We had been unable to detect any adults in the previous year but we did discover a large population of tadpoles and so decided to investigate further.

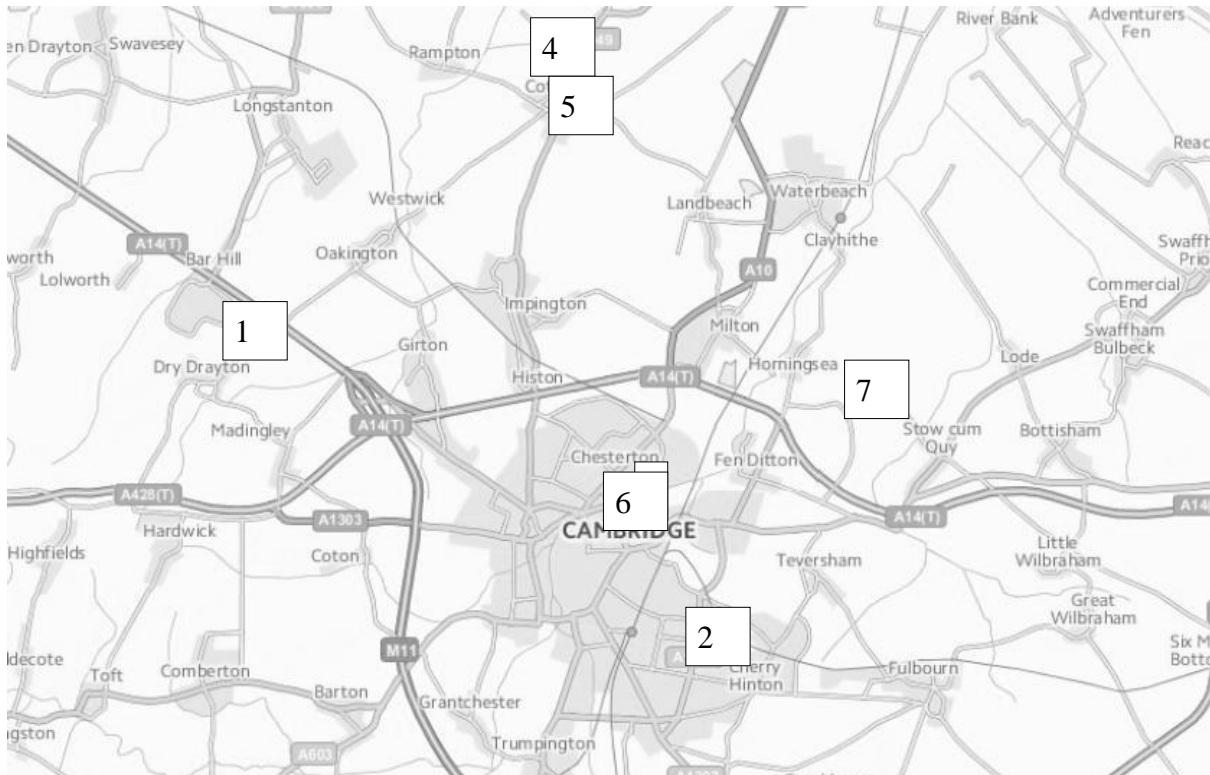


Figure 1. Map of Cambridge, numbers indicate where the seven sites are located.

Survey Protocol

On arrival at the sites after dark, volunteers were run through the risk assessment for each site before any surveying was undertaken. Once everyone was aware of the risks and knew what to be on the lookout for, one person among the group was elected to be the data recorder. They were given a clipboard with a data recording form and a pencil; from now on they would be noting down any sightings other volunteers would be gently calling to them.

All of the sites were surveyed by shining 160 lumen torches from the bank and into the water. The torches were shone up to about 3m into the pond (if it was large enough) where the light allowed amphibians to be detected at the water's surface. Closer to the bank, the torch beams cut much more deeply into the water and so more amphibians were likely to be detected. This method was reliable for detecting newts and other amphibians within ponds that had little vegetation or those that were shallow. For deeper areas, two or more torches

were used to converge the beams to give the column of light a better chance of penetrating the surface.

At sites where there is only a single body of water, these were approached from a bottom corner closest to the point of entry, e.g. a footpath. From this corner, the perimeter of the body would be surveyed including up to 3m away from the bank. At locations where there was more than one body of water, the ponds the furthest away ponds were scanned first. This was designed to help minimise our effect on ponds which had not yet been surveyed. Any amphibians found within a 3m 'buffer zone' were also included in the counts.

At some sites where the vegetation grows close to the banks, or when the ponds were shallow due to evaporation, egg-searching was undertaken. This involves searching submerged vegetation for folded leaves indicating presence of newt eggs.

A 4 in 1 multifunctional environmental tester was used to gather water and air temperature data at the sites surveyed (when available).

Results

Signs of amphibians were discovered at all seven of the survey sites in the form of adults. At six of the sites these included visual evidence of frogs and at the last site, Cottenham Amenity Pond, the evidence of frogs was their calls. As a sizeable proportion of the pond was not surveyed due to the growth of reeds and other aquatic vegetation, it was decided that the pond was not suitable for any further visual analysis in coming years.

Large numbers of frog spawn clumps were observed at two of the sites, Chesterton (see Fig. 2) and Stow-Cum-Quy Fen, but there were still no signs of any toad spawn, despite observing numbers of pairs of toads in amplexus. It is therefore possible that as we have missed toad spawn two years in a row that the toads lay their spawn more discreetly than Common Frogs do at the sites we have been monitoring. Alternatively toad spawn may have been consumed by predators such as the Great Crested Newt between our weekly site visits. Despite observing newts performing egg laying behaviours at Cambridge City Crematorium and Cottenham Moat, no newt eggs were discovered through our searches.



Figure 2. The Chesterton site at night on the evening we came across 181 clumps of frog spawn.

Peak Count Data

Date	Species	Peak Count	Avg. Air Temp (°C)	Avg. Water Temp (°C)
19/06/2014	Common Frog	8	11.2	14.4
24/02/2014	Common Toad	93	10.0	7.3
24/02/2014	Great Crested Newt	156	10.0	7.3
24/02/2014	Smooth Newt	55	10.0	7.3

Table 1. Summary of data collected at Site 1, Cambridge City Crematorium. Average air temperature is based on data collected from the four ponds on a single evening.

Date	Species	Peak Count	Air Temp (°C)	Water Temp (°C)
07/03/2014	Common Frog	11	5.0	10.6
07/03/2014	Common Toad	9	5.0	10.6

Table 2. Summary of data collected at Site 2, Cherry Hinton Brook.

Date	Species	Peak Count	Air Temp (°C)	Water Temp (°C)
12/03/2014	Common Frog	220	7	9
06/03/2014	Common Toad	8	9.6	9.1
28/04/2014	Smooth Newt	56	10.3	11.8

Table 3. Summary of data collected at Site 3, Chesterton.

Date	Species	Peak Count	Air Temp (°C)	Water Temp (°C)
13/03/2014	Common Frog	1	3.9	8
27/04/2014	Common Toad	1	12.2	13.6
22/02/2014	Great Crested Newt	142	N/A	N/A
13/03/2014	Smooth Newt	94	3.9	8

Table 4. Summary of data collected at Site 5, Cottenham Moat.

Date	Species	Peak Count	Avg. Air Temp (°C)	Water Temp (°C)
28/04/2014	Smooth Newt	12	10	11

Table 5. Summary of data collected at Site 6, Logan's Meadow LNR.

Date	Species	Peak Count	Avg. Air Temp (°C)	Avg. Water Temp (°C)
11/03/2014	Common Frog	5	3.5	8.5
24/03/2014	Common Toad	81	N/A	N/A
11/03/2014	Smooth Newt	4	3.5	8.5

Table 6. Summary of data collected at Site 7, Cambridge Stow-Cum-Quy Fen.

HSI Scores

The Habitat Suitability Index (HSI) is a scoring system that analyses 10 points of a habitat in order to establish whether or not that habitat is suitable for great crested newts (Oldham *et al.*, 2000). The scoring system works by giving the 10 points listed below a number between 0 and 1. The mean of these are then calculated to give the HSI of the pond or water body being studied.

SI1 = The pond's/water body's geographical location.

SI2 = The surface area of the pond/water body.

SI3 = The permanence of the pond/water body.

SI4 = The water quality of the pond/water body.

SI5 = The total area of shading on the pond/water body.

SI6 = The number of waterfowl on the pond/water body.

SI7 = The occurrence of fish in the pond/water body.

SI8 = The density of ponds surrounding the one you are studying.

SI9 = The proportion of newt friendly habitat surrounding the pond being studied.

SI10 = The total macrophyte cover in the pond/water body.

The equation used to work out the HIS for a pond using these 10 points is:

$$HSI = (SI1 \times SI2 \times SI3 \times SI4 \times SI5 \times SI6 \times SI7 \times SI8 \times SI9 \times SI10)^{1/10}$$

Location	Score	Rank
Cambridge City Crematorium*	0.66	Above Average
Cherry Hinton Brook*	0.71	Good
Chesterton	0.77	Good
Cottenham Amenity Pond	0.86	Excellent
Cottenham Moat	0.81	Excellent
Logan's Meadow LNR	0.66	Above Average
Stow-Cum-Quy Fen*	0.79	Good

Table 7. Table showing the HSI scores and ranks of the seven locations surveyed. Scores were calculated using knowledge of the ponds location and ecology that was built up over the duration of the survey period. Locations labelled with an asterisk mean the HSI scores have been taken from the 2013 Cambridge Amphibian Report.

Discussion

Using Table 4, we can clearly see that Cottenham Moat contains a large population of Great Crested Newts. Cottenham Moat also has the second highest calculated HSI score; the highest is held by the Cottenham Amenity Pond. The two bodies are quite close and so the Amenity Pond could have been colonised by newts from the moat. Due to the large quantities of emergent vegetation described above it was extremely difficult to survey the pond; if we manage to survey the pond earlier in the seasons to come when the plants haven't grown as much we may find evidence of Great Crested Newts.

All of the sites had HSI scores above average, meaning that potentially they are all suitable for Great Crested Newts to inhabit; one of the main limiting factors will be the presence of fish (Oldham *et al.*, 2000). Later on in the surveys, sticklebacks were seen at the Chesterton site for the first time, it is possible that they had been introduced by the flooding of one of the brooks that run alongside, into the Cam.

Another factor that will affect the distribution of amphibians is the permanence of ponds, as permanent sites are needed for amphibians to breed (Semlitsch, 2008). At Logan's Meadow LNR, one of the two ponds repeatedly dried out despite large amounts of rainfall. The other pond however was permanent and we were able to carry out our weekly survey on it.

During 2013, MJG thought he might have seen a Smooth Newt whilst surveying at Cherry Hinton Brook but, as he had never seen one there before, he assumed it was a fish. During one of the 2014 surveys, we checked Burnside Road for signs of amphibians by checking the road for dead individuals. It was then that we noticed a dead Smooth Newt that had been hit by a car. Although it was through a dead individual, Smooth Newt presence at Cherry Hinton Brook has now been confirmed.

On investigation, the dead newt our friend reported at Chesterton to us wasn't the only one. Cyclists had managed to kill around a dozen within a short period of time. This is an area of study that we would like to pay more attention to in

the future, along with surveying more sites for amphibians and attempting to reconfirm old reports of amphibians at a number of locations.

At the end of the project all records were submitted to the Cambridgeshire and Peterborough Environmental Records Centre (CPERC).

Acknowledgments

The continued surveying and monitoring of amphibians at the sites mentioned in this report couldn't be done without the dedicated volunteers that have supported us no matter what the weather. We would like to thank them for their continued effort and professionalism when in the field. We would also like to thank our network of friends who continually surprise us with information leading to the discovery of potential new survey sites.

References

- Griffiths, R. A., Raper, S. J., & Brady, L. D.** (1996). *Evaluation of a standard method for surveying common frogs (*Rana temporaria*) and newts (*Triturus cristatus*, *T. helveticus* and *T. vulgaris*)*. JNCC Report No. 259. Joint Nature Conservation Committee, Peterborough.
- Oldham, R. S., Keeble, J., Swan, M. J. S., and Jeffcote, M.** (2000). Evaluating the suitability of habitat for the great crested newt (*Triturus cristatus*). *Herpetological Journal*, **10** (4), 143-156.
- Semlitsch, R. D.** (2008). Differentiating migration and dispersal processes for pond-breeding amphibians. *The Journal of wildlife management*, **72**(1), 260-267.
- Sewell, D., Griffiths, R. A., Beebee, T. J., Foster, J., & Wilkinson, J. W.** (2013). *Survey protocols for the British herpetofauna*. [Date accessed: 25th January 2015], Available at: http://narrs.org.uk/documents/Survey_protocols_for_the_British_herpetofauna.pdf

Lichenology in Cambridgeshire – progress and problems with particular reference to the lichens of Orwell church and churchyard

Mark Powell and the Cambridge Lichen Group

Introduction

The Cambridge Lichen Group (CLG) was formed in 2008 with the primary aim of surveying sites in this formerly neglected area. In our first six years we have witnessed surprisingly rapid changes, especially in the lichen communities on tree bark. We have strayed into neighbouring counties including Hertfordshire where *Lecania coeruleorubella*, one of Natural England's 'lost species', was found in the mortar courses of a parish church. Our initial aspiration was limited to conducting competent surveys of local sites but we have found that our observations and specimens have also contributed to the taxonomic understanding of common lowland lichens. *Verrucaria ochrostoma* was considered to be a rare species in Britain before we learned how to recognise it and showed that it is actually a common colonist of calcareous substrata. It was tempting to think, on the publication of the new British lichen

'Flora' (Smith *et al.* 2009), that the lichens of Britain were then well understood and their characteristics well explained. The reality is that an enormous amount of work remains. Even in the modern world of molecular taxonomy, amateur field recorders can help to uncover semi-cryptic taxa, test the published keys and refine the descriptions. This work is within the scope of any observant naturalist and the CLG willingly provides training during its excursions.

Orwell (church and churchyard of St Andrew, TL362504) – a case study

Orwell churchyard was visited in 1994 by Tom Chester who recorded 63 lichen taxa. Our survey in November 2013 yielded a list of 107 taxa. For a fair comparison we need to remove our 12 corticolous records as Tom apparently limited his survey to saxicolous and lignicolous species. A 34% increase over 19 years at Orwell could be considered broadly comparable with a 39% increase over 34 years (1975-2009) for Chippenham Fen (Powell 2011). However the reasons for the increases are very different in these two cases. The corticolous records at Chippenham Fen comprise mainly well-understood species and the increase in records signifies a real increase in lichen diversity due to new colonists. Saxicolous communities, especially those of limestone, have not changed their composition in such a dramatic way and the increase at Orwell is largely due to advances in our understanding of saxicolous crusts. We now know of, and can recognise, significantly more taxa and a start has been made in splitting semi-cryptic groups.

A good example of recent splitting involves the *Caloplaca citrina* group. Up until the turn of the millennium, yellow blastidiate crusts on stonework were clumped together and recorded as *C. citrina* s. str. In the early years of this century *C. arcis* and *C. dichroa* were described as new to science and the subspecies *flavocitrina* was promoted to specific status. Anything that did not fit into those three species was then considered to be *C. citrina*. Our group noticed that at least two taxa appeared to be involved, having subtly different morphology and dramatically different responses to copper contamination. Powell & Vondrák (2011) showed that the pale taxon which shunned copper was actually *C. limonia* while the bright yellow one which shows metallophytic tendencies is an, as yet, undescribed species which we are calling *C. austrocitrina* for temporary convenience. We currently have no evidence of the true *C. citrina* occurring in Britain at all. Will churchyard recorders eventually recognise other potential taxa within this yellow powdery group and be able to provide material for molecular taxonomists to investigate?

Lecanora horiza is given an IUCN Threat Category of Near Threatened by Woods & Coppins (2012) and is supposed to be Nationally Scarce. During the British Lichen Society's Bedford meeting (October 2012) members of our group were surprised when Henk Timmerman, visiting from Holland, pointed at glossy, chestnut-coloured apothecia on calcareous gravestones and called them *L. horiza*. British field recorders had hitherto considered that such material is what *L. campestris* looks like when growing on vertical surfaces. Fortunately Jiří Malíček was working on the *L. subfusca* group, of which these lichens are a part, in the Czech Republic and was prepared to sequence some of our British

gravestone material (collected from a particularly strong colony on a marble headstone at Riseley in Bedfordshire). The Riseley material was shown to be *L. horiza* (Malíček & Powell 2013). We now recognise that *L. horiza* is present in many Cambridgeshire churchyards. Its separation from *L. campestris* is tricky and some specimens cannot be reliably named in the field. When it is well-developed, *L. horiza* is rather beautiful, having large glossy discs which appear as if almost falling out of the white crumbly thallus. Edwards *et al.* (2009) imply that *L. horiza* is primarily a corticolous species but hint that saxicolous occurrences were formerly recognised: “Also on rock, esp. vertical gravestones and brick of churches.” However the possibility of such occurrences had been lost from the consciousness of British lichenologists until Henk Timmerman sparked our recent investigations. Unfortunately the British literature is incorrect in stating that the epithecium has crystalline granules (these are absent) and that it shows only an indistinct yellow thalline reaction with potassium hydroxide (the reaction is as intense as in *L. campestris*).

Rinodina calcarea is present in exceptional quantity at Orwell; normally if it occurs at all in a churchyard it is present on just one or two of the oldest headstones and usually lacks fruits. Members of the CLG spent many months trying to work out the identity of this sterile material before eventually finding it fertile at Sudborough in Northamptonshire. At Orwell it grows on south-facing buttress slopes, several limestone headstones and an impressive coped tomb. In the latest Conservation Review of British lichens (Woods & Coppins 2012) *R. calcarea* is categorized as Nationally Rare, having been recorded in less than sixteen British hectads. This is likely to be a considerable underestimate as it is easily overlooked when sterile but it remains a lichen of considerable conservation importance as it is usually associated with stonework of some antiquity. Even back in 1994, when this lichen was poorly known in Britain, Tom Chester recognised the exuberant material at Orwell.

Verrucaria ochrostoma is one of the most overlooked of British lichens. Up until September 2013 this species had only been recorded in eight British hectads and it is considered to be Nationally Rare. William Borrer described *V. elaeina*, *V. ochrostoma* and *V. polysticta* in the first half of the 19th century. He seems to have been way ahead of his time. All three were subsequently lost to view until Alan Orange revived two of them in recent decades. It was during intensive surveys of Hertfordshire churchyards that a windowsill dominated by *V. ochrostoma* was found at Datchworth Church in 2013. This allowed a sufficiently good collection to be made and gave us the confidence to name our previous specimens. Our confidence was boosted by a visit to London to examine Borrer’s type specimen. It was amusing to find that *V. ochrostoma* was one of the dominant species on the coping of low walls just outside the main entrance into the museum where it has flaunted itself unnoticed on the ‘doorstep’ of British lichenology. *V. ochrostoma* is actually quite common, at least in the east of England, but the colony on Orwell church is about as good as you get.

Sometime in the latter part of the 20th century, churchyard recorders started to use the name *Lecanora conferta* for those specimens of the *Lecanora dispersa*

group with an orange reaction to calcium hypochlorite. Jack Laundon, when he examined the type specimen of *L. conferta*, found that it did not resemble the churchyard material and described *L. antiqua* as new to science (Laundon 2010). How many other familiar lichens are we giving an inappropriate name through relying on the literature rather than referring back to type specimens? The genus *Lecania* is particularly in need of such a review. Tom recorded *L. turicensis* on Orwell church and we also thought it was present until microscopic examination showed that the spores were too long and narrow for that species. So we used the name *L. hutchinsiae*, following the example of other lichenologists but without knowing for sure if it really is that species. *L. turicensis* is over-recorded, not helped by the fact that the images in some commonly used field guides appear to show a pruinose member of the *Lecanora dispersa* group.

Up until very recently churchyard recorders have tended to use the name *Verrucaria baldensis* for any of the immersed Verrucariaceae which redeposit calcite forming a smooth, marble-like cortex. Our work has shown that this species is rather rare in lowland churchyards and Tom's record is almost certainly attributable to *V. calciseda* (which is well-represented at Orwell). These two species are subtly different in morphology but distinctly different in anatomy and have different spore sizes. Many churchyard lichens are still misunderstood due to the difficulty of collecting without damaging stonework. Our group has pioneered the (rather simple) technique of scraping crustose lichens from their substratum and gluing the resulting scrape straight onto card to facilitate subsequent microscopic examination.

Examples from other sites

The invasion of species into Cambridgeshire shows no sign of completion. In February 2015 dark patches on two *Fraxinus* trunks near Grafham in Huntingdonshire were investigated and found to be *Catillaria fungoides*, new to Britain. Its identification required detailed microscopic examination. Not all of the invaders are 'microlichens' (a vague but useful term used for crustose lichens that generally require microscopy for confirmation). *Normandina pulchella* is a distinctive foliose species comprising tiny squamules with up-rolled margins giving it a resemblance to tiny ears. Any observant naturalist could easily learn to recognise *N. pulchella*; it requires no microscopy or chemical tests and a photograph is sufficient as a voucher. *N. pulchella* has spread rapidly in the Netherlands where it is now found even in city parks, its spread there preceding that in eastern England by almost a decade. *N. pulchella* was first recorded in Bedfordshire in 2012, Cambridgeshire in 2013 and Huntingdonshire in 2014. It will be worth keeping in touch with our Dutch colleagues to help predict future changes. *Flavopunctelia flaventior* has been recorded the other side of the Channel, is unknown so far in Britain, and provides just one example of a conspicuous macrolichen which anyone hopeful of adding taxa to the British list might look out for.

Lichenologists (more so than mycologists) have traditionally studied lichen parasites (lichenicolous fungi) and these organisms are a rich source of unexplored diversity. The CLG is making a start on the study of parasites but the

relevant literature is widely dispersed and there are many taxa which do not seem to fit the draft British keys. *Unguicularis thallophila* produces brown, crumpled apothecia on the thallus of *Lecanora chlarotera*; its first record in this region was from Gamlingay Wood in 2011, several years after its host became widespread and frequent here. Three host-specific parasites are known to infect *Normandina pulchella* in Britain but so far the first colonists of the host in this region appear to be free of them. It will be interesting to see if the parasites follow their host. Host-specific lichenicolous fungi are, naturally, good taxonomists and they are often better than the human eye at recognising their host amongst look-alikes. We are investigating whether parasites will be of any use in separating those specimens of *L. horiza* and *L. campestris* which closely resemble one another. So far we have found the black dots of *Vouauxiella verrucosa* only in the apothecia of *L. horiza*. Others have reported *V. verrucosa* from *L. campestris* but can we be sure that those authors could reliably recognise the identity of the host? We need to make many more observations before we can be sure that the presence of *V. verrucosa* confirms the identity of *L. horiza*.

Acarospora nitrophila is supposed to be common and probably overlooked throughout the British Isles. We have found convincing material on paving slabs affected by lead-contaminated water at Wimpole Hall but suspect that many records of this species on gravestones are in error for sterile thalli of *Polysporina simplex*. The genus *Acarospora* in general contains many species which are difficult to identify and poorly understood in Britain. Other genera which still present many unresolved issues include *Caloplaca*, *Lecania*, *Lecanora* and *Verrucaria*. Our understanding of *Verrucaria* has been greatly aided by a recent Polish review of the genus (Krzewicka 2012) and this allowed the recognition of *V. sphaerospora*, new to Britain, from a slate roof in Somerset. The most recent example is from one of our member's recent forays to Oxfordshire where large colonies of an unfamiliar pyrenocarp were growing on windowsills. It was nearly dismissed as atypical material of *V. macrostoma* but it has now been identified as the first British record of *V. obfuscans*. How many more species are we overlooking because of a tendency to shoehorn them into our concepts of regularly recorded taxa?

Even genera which contain only a few conspicuous macrolichens, such as *Xanthoria*, are not without their problems. *X. candelaria* s. lat. is supposed to comprise *X. candelaria* itself, *X. ucrainica* and possibly another entity (the tiny, dark orange material of east-facing walls). Molecular work will be required to determine whether we should be recording '*X. candelaria*' as one, two or three distinct taxa.

References

- Edwards, B., Aptroot, A., Hawksworth, D.L. & James, P.W. (2009). *Lecanora*. In *The Lichens of Great Britain and Ireland*. (C.W. Smith, A. Aptroot, B.J. Coppins, A. Fletcher, O.L. Gilbert, P.W. James & P.A. Wolseley, eds). London: British Lichen Society. pp. 465-502.
- Krzewicka, B. (2012). A revision of *Verrucaria* s.l. (Verrucariaceae) in Poland. *Polish Botanical Studies* 27: 82-84.

- Laundon, J. R.** (2010). *Lecanora antiqua*, a new saxicolous species from Great Britain, and the nomenclature and authorship of *L. albescens*, *L. conferta* and *L. muralis*. *Lichenologist* **42**: 631-636.
- Malíček, J. & Powell, M.** (2013). *Lecanora horiza* and other surprises in the *Lecanora subfusca* group. *Bull. Brit. Lichen Soc.* **112**: 66-71.
- Powell, M.** (2011). Changes in the lichens of Chippenham Fen, 1975 – 2010. *Nature in Cambridgeshire* **53**: 62-71.
- Powell, M. & Vondrák, J.** (2011). *Caloplaca citrina* and *C. lactea* are incorrectly understood in the British Isles. *Bull. Brit. Lichen Soc.* **109**: 25-30.
- Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. J. & Wolseley, P. A.**, (eds) (2009). *The Lichens of Great Britain and Ireland*. London: British Lichen Society.
- Woods, R. G. & Coppins, B. J.** (2012). *A Conservation Evaluation of British Lichens and Lichenicolous Fungi. Species Status 13*. Joint Nature Conservation Committee, Peterborough.

Appendix: Lichens recorded at Orwell church and churchyard

Nomenclature follows Smith *et al.* (2009) except for some recent changes to species concepts and name changes.

In front of the species name is the standard British Lichen Society number (not given for those species only recorded by Tom Chester).

Following the species name are conservation designations: LC = Least Concern, NT = Near Threatened, NS = Nationally Scarce, NR = Nationally Rare (not given for those species only recorded by Tom Chester).

BLS No	Species name		2013	1994
10	<i>Acarospora fuscata</i>	LC	x	x
212	<i>Amandinea punctata</i>	LC	x	x
49	<i>Anisomeridium polypori</i>	LC	x	
69	<i>Arthonia radiata</i>	LC	x	
103	<i>Aspicilia calcarea</i>	LC	x	x
107	<i>Aspicilia contorta subsp. contorta</i>	LC	x	x
113	<i>Aspicilia contorta subsp. hoffmanniana</i>	LC NS	x	
	<i>Aspicilia radiosa</i>			x
148	<i>Bacidia fuscoviridis</i>	LC NS	x	
	<i>Bacidia rubella</i>			x
165	<i>Bilimbia sabuletorum</i>	LC	x	
200	<i>Buellia aethalea</i>	LC	x	x
219	<i>Buellia ocellata</i>	LC	x	x
2442	<i>Caloplaca arcis</i>	LC NS	x	
239	<i>Caloplaca aurantia</i>	LC	x	x
2613	<i>Caloplaca austrocitrina</i>		x	
242	<i>Caloplaca cerinella</i>	LC	x	
	<i>Caloplaca citrina s. lat.</i>			x
250	<i>Caloplaca decipiens</i>	LC	x	x
2443	<i>Caloplaca dichroa</i>	LC NS	x	
259	<i>Caloplaca flavescens</i>	LC	x	x
2315	<i>Caloplaca flavocitrina</i>	LC	x	
2527	<i>Caloplaca holocarpa s. str.</i>	LC	x	x
2607	<i>Caloplaca limonia</i>		x	
264	<i>Caloplaca marmorata</i>	LC	x	
2461	<i>Caloplaca oasis</i>	LC	x	

275	<i>Caloplaca ruderum</i>	LC	x	
277	<i>Caloplaca saxicola</i>	LC	x	x
281	<i>Caloplaca teicholyta</i>	LC	x	X
284	<i>Caloplaca variabilis</i>	LC	x	X
291	<i>Candelariella aurella f. aurella</i>	LC	x	X
296	<i>Candelariella medians f. medians</i>	LC	x	
298	<i>Candelariella vitellina f. vitellina</i>	LC	x	X
306	<i>Catillaria chalybeia var. chalybeia</i>	LC	x	
	<i>Catillaria lenticularis</i>			X
384	<i>Cladonia fimbriata</i>	LC	x	
463	<i>Collema fuscovirens</i>	LC	x	X
491	<i>Diploicia canescens</i>	LC	x	X
496	<i>Diplotomma alboatrum</i>	LC	x	X
500	<i>Dirina massiliensis f. sorediata</i>	LC	x	X
511	<i>Evernia prunastri</i>	LC	x	
1125	<i>Hyperphyscia adglutinata</i>	LC	x	
613	<i>Lecania cyrtella</i>	LC	x	
616	<i>Lecania erysibe s. str.</i>	LC	x	X
1625	<i>Lecania hutchinsiae</i>	LC	x	
1707	<i>Lecania inundata</i>	LC NS	x	
1708	<i>Lecania rabenhorstii</i>	LC	x	
	<i>Lecania turicensis</i>			X
627	<i>Lecanora albescens</i>	LC	x	
635	<i>Lecanora campestris subsp. campestris</i>	LC	x	X
1685	<i>Lecanora campestris subsp. dolomitica</i>	LC NS	x	
639	<i>Lecanora chlarotera</i>	LC	x	
643	<i>Lecanora conizaeoides f. conizaeoides</i>	LC	x	X
644	<i>Lecanora crenulata</i>	LC	x	X
646	<i>Lecanora dispersa</i>	LC	x	X
649	<i>Lecanora expallens</i>	LC	x	X
621	<i>Lecanora hagenii</i>	NE	x	
1764	<i>Lecanora horiza</i>	NT NS	x	
661	<i>Lecanora muralis</i>	LC	x	X
757	<i>Lecanora orosthea</i>	LC	x	
1837	<i>Lecanora pannonica</i>	LC	x	
667	<i>Lecanora polytropa</i>	LC	x	X
675	<i>Lecanora saligna</i>	LC	x	
610	<i>Lecanora semipallida</i>	LC NS	x	
688	<i>Lecanora symmicta</i>	LC	x	
796	<i>Lecidella carpathica</i>	LC	x	
797	<i>Lecidella elaeochroma f. elaeochroma</i>	LC	x	
802	<i>Lecidella scabra</i>	LC	x	X
803	<i>Lecidella stigmatea</i>	LC	x	X
811	<i>Lempholemma chalazanellum</i>	LC NS	x	
1974	<i>Lepraria incana s. str.</i>	LC	x	X
1604	<i>Lepraria vouauxii</i>	LC	x	X
843	<i>Leptogium plicatile</i>	LC	x	
1020	<i>Melanelixia subaurifera</i>	LC	x	
	<i>Micarea denigrata</i>			X
25	<i>Myriospora smaragdula</i>	LC	x	
1022	<i>Parmelia sulcata</i>	LC	x	
	<i>Phaeophyscia nigricans</i>			X
1107	<i>Phaeophyscia orbicularis</i>	LC	x	X
1112	<i>Physcia adscendens</i>	LC	x	X

1114	<i>Physcia caesia</i>	LC	x	X
1116	<i>Physcia dubia</i>	LC	x	X
1120	<i>Physcia tenella</i>	LC	x	
1127	<i>Physconia grisea</i>	LC	x	X
1492	<i>Placopyrenium fuscellum</i>	LC	x	X
732	<i>Placynthiella icmalea</i>	LC	x	X
1167	<i>Polysporina simplex</i>	LC	x	X
1690	<i>Porpidia soledizodes</i>	LC	x	
572	<i>Porpidia tuberculosa</i>	LC	x	X
1189	<i>Protoblastenia rupestris</i>	LC	x	X
1200	<i>Psilolechia lucida</i>	LC	x	X
1266	<i>Rhizocarpon reductum</i>	LC	x	
1801	<i>Rinodina calcarea</i>	LC NR	x	X
1289	<i>Rinodina oleae</i>	LC	x	X
	<i>Rinodina teichophila</i>			X
1306	<i>Sarcogyne regularis</i>	LC	x	
1322	<i>Scoliciosporum umbrinum</i>	LC	x	X
630	<i>Tephromela atra</i> var. <i>atra</i>	LC	x	
1415	<i>Toninia aromatica</i>	LC	x	X
692	<i>Trapeliopsis flexuosa</i>	LC	x	X
	<i>Trapeliopsis granulosa</i>			X
	<i>Verrucaria baldensis</i>			X
1480	<i>Verrucaria calciseda</i>	LC NS	x	
1495	<i>Verrucaria hochstetteri</i>	LC	x	
1519	<i>Verrucaria macrostoma</i> f. <i>furfuracea</i>	LC	x	
1502	<i>Verrucaria macrostoma</i> f. <i>macrostoma</i>	LC	x	
1507	<i>Verrucaria muralis</i>	LC	x	X
1510	<i>Verrucaria nigrescens</i> f. <i>nigrescens</i>	LC	x	X
2514	<i>Verrucaria nigrescens</i> f. <i>tectorum</i>	LC	x	
1511	<i>Verrucaria ochrostoma</i>	DD NR	x	
1820	<i>Verrucaria polysticta</i>	LC NS	x	
1518	<i>Verrucaria viridula</i>	LC	x	X
1005	<i>Xanthoparmelia mougeotii</i>	LC	x	
1526	<i>Xanthoria calcicola</i>	LC	x	X
2364	<i>Xanthoria candelaria</i> s. <i>str.</i>		x	X
1530	<i>Xanthoria parietina</i>	LC	x	
1531	<i>Xanthoria polycarpa</i>	LC	x	

West Cambridge and the Coton Footpath

A report on the CNHS Field Studies area of 2014

Jonathan Shanklin

The Cambridge Natural History Society decided in 2002 to embark on a local project to study wildlife along the Coton Footpath. The Society returned to the area in 2014 as part of its field studies series which evolved out of this original project. The aim was to monitor change in this part of Cambridge, and, as before, to introduce beginners to the wildlife of our local area. The interests of the regular participants led to an emphasis on systematic botanical recording,

however casual records were made of a wide range of other taxa. Finds included many vascular plants on the draft County rare plant list and a new lichen, moss and vascular plant for the County.

Introduction

The Cambridge Natural History Society (CNHS) decided in 2002 to embark on a local project to study wildlife along the Coton Footpath. The aim of this was in part to study local wildlife and in part to get beginners involved in identifying flora and fauna. The scope of the project was extended when we discovered that the footpath was located in the tetrad that the Botanical Society of the British Isles (now the Botanical Society of Britain & Ireland) was surveying as part of their Local Change project and we therefore decided that walks would cover the entire tetrad (a 2km x 2km OS grid square). This first survey was carried out over three years, noting flowering plants on a monthly basis, in part because phenology was also an interest. Recording was on a tetrad basis, with some indication of around 10 specific sites. The project evolved to cover additional areas of Cambridge on an annual basis, with the aim of returning to each area after ten years, which brought us back to West Cambridge in 2014. A report on the first survey was published in *Nature in Cambridgeshire* (2005) and this report documents some of the significant changes that have occurred since then. The style of recording changed for the repeat survey, with plants recorded on a monad basis and everything else generally recorded on a tetrad basis. Recording was done on a site specific basis for the Adams Road Sanctuary, the Ascension Cemetery and the British Antarctic Survey (BAS). An introduction to the area is given in this earlier report, with an illustrated version available on the CNHS web page.

Landscape changes

The major change in the area has been the continuing development of the Cambridge University West Cambridge Site. This has led to the loss of several interesting brown-field areas and a great increase in the built environment. The development has not been entirely negative, as part of the work has included construction of a new lake and other landscape features, including roll-out wet meadows, which have been situated on the highest part of the site. It is however the case that over the last ten years, the management of the site has not had biodiversity in mind. A quote from a meeting of the West Cambridge Site Committee held in June 2008 illustrates this: “The recent works to the fields west of the Institute of Manufacturing site not only improve the appearance of the area but also reduce the ability of species to gain hold which could impede development. The area has been harrowed and drilled and will be used for growing silage.” Despite not having biodiversity in mind, the development has been instrumental in the accidental introduction of many interesting plants, and these are discussed further later in this report.

Development of the North-West Cambridge Site, part of which is included in the tetrad was just beginning during the year. Preliminary work has included some tree felling, which may have affected Purple Hairstreak (*Neozephyrus*

quercus) butterflies on the borders of the Park & Ride site. Road works in connection with installation of new infrastructure certainly had a big impact on traffic into and out of Cambridge, but did not produce many interesting ruderal species on the disturbed ground. Development at the Institute of Astronomy also produced many accidental introductions, and a possibility that some native plants had emerged from a long-lived seed bank. Elsewhere not a great deal has changed. In the farmland fields intensive agriculture has continued, with some pasture converted to arable. One notable change is access – in 2004 it was usually possible to walk through college grounds, but ten years later security concerns had led to the gating of most of them.

Highlights of the area and vascular plants

There are several City (CiWS) or County (CWS) Wildlife Sites in the tetrad – The Adams Road Sanctuary, the Ascension Cemetery, the M11 scrub, and hedgerows near and along the Coton Footpath. There is also a geological SSSI at the Travellers Rest Pit, though the features that it was designated for are not currently visible. The Adams Road Sanctuary was a particular focus for several visits, as a management plan is being drawn up and knowledge of its diverse biota will help target the management. The invertebrate survey showed an astonishing fauna with many Red Data Book species. Botanically there was less of note, though there is a patch of ground with introduced arable weeds such as Corncockle (*Agrostemma githago*), and Alan Leslie noted a rosette of introduced Hemlock Water-dropwort (*Oenanthe crocata*) in a glade by the lake. Ascension Cemetery still supports locally rare plants such as Ivy Broomrape (*Orobancha hederarum*) and nationally declining plants such as Deadly Nightshade (*Atropa belladonna*). The cemetery is however suffering from well intentioned neglect due to cutting practices that show lack of knowledge of best practice for sustaining biodiversity. The Coton Footpath itself has also suffered, with the verges being cut at inappropriate times, to the extent that Yellow Vetchling (*Lathyrus aphaca*) was not found this year. An arable field margin along one of the hedgerows still supported a population of Spreading Hedge-parsley (*Torilis arvensis*), along with Dwarf Spurge (*Euphorbia exigua*), Broad-leaved Spurge (*Euphorbia platyphyllos*) and Slender Tare (*Vicia parviflora*). Wrinkled Peach Fungus (*Rhodatus palmatus*) was still present on dead elm in the M11 scrub site, with some large freshly emerged fruiting bodies present on the occasion of the bryological visit.

Two other areas are of particular note. Contractors at the Institute of Astronomy used sand from a possible Breckland source to make good an area of lawn. With this sand, as we have found elsewhere in Cambridge, came notable species such as Bur Medick (*Medicago minima*), Bird's-foot (*Ornithopus perpusillus*), Rough Clover (*Trifolium scabrum*), Knotted Clover (*Trifolium striatum*) and Spring Vetch (*Vicia lathyroides*). A nearby area had been cleared down to the underlying Observatory Gravels to provide a base for the contractors' temporary accommodation, though it is not thought that any introduced material was used. One plant of Silver Hair-grass (*Aira caryophyllea*), last seen in Cambridge on the "Hill of Health" (probably the low

ridge extending from the Observatory towards Girton) in the first half of the nineteenth century was recorded here. Astonishingly we also found Mossy Stonecrop (*Crassula tillaea*) (Plate 2, inside front cover) and Smooth Rupturewort (*Herniaria glabra*). Neither of these has been recorded from Cambridge previously, so the question remains as to whether they were accidental introductions from machinery used by the contractors, or whether the plants were actually in the seedbank awaiting an opportunity. Further details of the more notable of these species are given in the section on Vascular Plant Records in this issue of Nature in Cambridgeshire.

The works being done on the West Cambridge Site provided many short-lived sites for casuals, though some sites may last. The banks of a pond by the Institute for Manufacturing (an unauthorised feature, not on the original plans!), gave rise to Henbane (*Hyoscyamus niger*) and Thorn-apple (*Datura stramonium*). Other banks produced aliens such as Mexican Aster (*Cosmos bipinnatus*) and Pot Marigold (*Calendula officinalis*). The “canal”, the main watercourse running down the centre of the site, provided a hot-spot for unintended introductions and spreading planted aliens. Most notable here was the Schedule 8 BAP species Jersey Cudweed (*Gnaphalium luteoalbum*), which is cropping up across Cambridge, and in the tetrad was also found on the paving of the Park & Cycle facility. Perhaps the most interesting section was at the westernmost end, which had been planted with Flag Iris (*Iris pseudacorus*) and Purple Loosestrife (*Lythrum salicaria*). However in addition there was an astonishing range of oddities including amongst others Beggarticks (*Bidens frondosa*), Trifid Bur-marigold (*Bidens tripartita*), Hairy Finger-grass (*Digitaria sanguinalis*), Water-pepper (*Persicaria hydropiper*), Small Water-pepper (*Persicaria minor*) and Narrow-leaved Ragwort (*Senecio inaequidens*) (now spreading widely across the county). Amongst the features provided for public benefit were some ornamental beds, which included roll-on strips of wet meadow. These meadows provided a colourful display in their first year, though location and management are not conducive to their long term survival. One Buttercup at first glance appeared to be Bulbous Buttercup (*Ranunculus bulbosus*), however when it was still flowering in July this seemed unlikely and a closer inspection of the achenes confirmed it as St Martin's Buttercup (*Ranunculus marginatus*).

Our first visit to the area, on a rather bleak New Year's Day, got us off to a good start, with the find of Henry's Honeysuckle (*Lonicera henryi*), an addition to the vice-county list, at the edge of the ditch running along the footpath. Other surprise finds in the area included White Helleborine (*Cephalanthera damasonium*) growing on grass verges along Storey's Way. This marks a significant westward extension of the range of this Vulnerable plant, known particularly at its stronghold of the Beechwoods. The motorway verges were generally not explored, however the triangle of land by the slip road onto the Madingley Road had a nice area of Yellow-wort (*Blackstonia perfoliata*) and Common Centaury (*Centaureum erythraea*) with a species of bolete under pine trees.

In addition to the Yellow Vetchling already mentioned, some threatened vascular plant species were not refound. Quaking Grass (*Briza media*) (Near Threatened) was seen at the Travellers Rest Pit in 2003, but not subsequently, although it may still be present. Pennyroyal (*Mentha pulegium*) (Endangered) grew by the Cavendish Pond in 2003, but its precise location was not well enough known and despite precautions the site was lost during remodelling of the pond banks. Corn Spurrey (*Spergula arvensis*) (Vulnerable) was seen at the Travellers Rest pit in 2004, however the area where it was seen was covered in bark chippings in 2014. Hoary Mullein (*Verbascum pulverulentum*) (Nationally Scarce, but Least Concern on the England Red List) grew near the M11 scrub for several years, but has not been recorded since 2005.

Bryophytes

The bryophyte flora of the tetrad was largely unsurprising apart from the Polytrichales as the excursion account written by Chris Preston and Jonathan Shanklin reveals.

“A month or so previously to the bryophyte excursion on November 30, Jonathan Shanklin had found a potentially interesting polytrichaceous moss in the car park of the West Cambridge Residences, so we detoured through them to see if we could confirm its identity. We were just coming to the end of the car park when Steve Hartley called out "What's this?" It turned out not to be what we were looking for but another member of the Polytrichaceae, Urn Haircap (*Pogonatum urnigerum*), new to the county. This was growing on granite hoggin surfacing a narrow, 8 m long island separating parking bays. It was particularly frequent under three small standard beech trees, but whether it appreciated the shade or was simply less frequent on the trampled ground between them was difficult to say. Jonathan Shanklin then re-found his plant, which turned out to be Juniper Haircap (*Polytrichum juniperinum*), growing in a similar habitat at the west end of the car park with much Redshank (*Ceratodon purpureus*). This calcifuge is rare in Cambridgeshire; we have seen it in only five sites since 2000, three of them railway sidings and the other two rotting tree stumps in parkland and woodland. Later, a walk along the path surrounding the Observatories, which is lined by mature beech trees planted on the Gravels, revealed a substantial patch of Bank Haircap (*Polytrichastrum formosum*) and a patch of Common Smoothcap (*Atrichum undulatum*), seen despite failing light and much leaf cover. Three species of Polytrichaceae have been recorded on a single day in the county on at least 13 occasions, but this is the first day on which we have found four.”

During the day 62 species of moss and six liverworts were recorded. In total twelve species of liverworts have been found by Jonathan Shanklin in the tetrad since 2000, which puts it in the top ten of liverwort tetrads in the County. One particular surprise was the occurrence of Fringed Heartwort (*Ricciocarpus natans*) in the pond at the British Antarctic Survey. Jonathan Shanklin had found the plant on drying mud of a pond near Wrexham, North Wales, and having identified it under the microscope discarded the desiccated fragments in the pond. Some seven months later whilst looking in the pond he was astonished to find that it had multiplied many thousand-fold and was carpeting the pond. As a

postscript, Jonathan Shanklin visited the Residences site again on the last day of the year and found the two Polytrichaceae growing in another car park some 200m from the first.

Lichens

Although the original plans for a lichen field study meeting in September fell through, the Cambridge Lichen Group did visit the area in mid December and, thanks to the comprehensive knowledge of Mark Powell, a new lichen was added to the County list. In total 69 species were recorded during the day. Mark contributed the following report on the visit:

“The overall impression was of rather impoverished lichen communities in this western side of the city. Just as we were giving up on finding any decent corticolous communities we came across some mature ash trees on the Observatory site and here we found *Candelaria pacifica*, a lichen species new to vc29 (Cambridgeshire). While rich sites are a treat to visit, recording mediocre sites is certainly not wasted effort. For instance the dearth of foliicolous lichens at Adams Road Sanctuary is the reality at the moment; the situation may change in future decades with differing climatic and pollution regimes.

Adams Road Sanctuary Evergreen leaves (mainly Ivy and Holly) are present in quantity and humid sites generally have a tendency to produce richer foliicolous lichen communities than dry ones. Nevertheless, such lichens are still rather rare in Eastern England and so it is not a great surprise that the only example we found was *Phylloblastia inexpectata*.

Elder bushes were carefully scrutinized for the tiny species which are sometimes found on their shaded trunks. Our searching was rewarded with the discovery of the minute orange fruits of *Piccolia ochrophora*. Smith et al. (2009) state that it is ‘rare’ and give its distribution as: “S.W. British Isles, with some eastern occurrences, local.” Our recording in the region has shown that *P. ochrophora* is actually fairly frequent but requires careful searching to find it. [Unfortunately the bushes were mistakenly cut down by enthusiastic volunteers a few days later. JDS]

In the last three decades the lichenological landscape has changed beyond recognition. As recently as the 1970s the “pollution lichen” (*Lecanora conizaeoides*) dominated tree bark and siliceous stonework across lowland England (including Cambridgeshire); now it clings on in small quantity on weathered fences and sandstone headstones, having all but disappeared from trees. A small colony of *L. conizaeoides* was found on a wooden bench seat in Adams Road Sanctuary. The sulphur dioxide pollution which favoured *L. conizaeoides* was toxic to most other species of lichen. The decline of sulphur dioxide levels over recent decades has allowed a spectacular re-colonisation by successive waves of lichen species. Some of the species appearing in our eutrophicated landscape are the “new” species, not newly evolved, but formerly so rare that no trace of

them was detected before the 1980s. Around the turn of the Millennium there was a flurry of papers in *The Lichenologist* describing these species as new to science. Several of these lichens are now familiar members of our local lichen communities. One example is *Lecanora barkmaniana* which is present on a wooden bench seat in the Sanctuary.

Cambridge Observatory The limestone walls and windowsills of the old Observatory building support a range of common calcicoles. *Verrucaria ochrostoma* is present in various places and is particularly well developed on a windowsill on the east side of the building where it grows mixed with *Verrucaria nigrescens*. *Verrucaria ochrostoma* is one of the most overlooked of British lichens. Up until September 2013 this species had only been recorded in eight British hectads (NBN Gateway) and is classed as Nationally Rare. Brian Coppins (pers. comm. October 2013) has the following to say: “Funny how some things “take off” and others don’t in terms of being recorded. For decades, I was concerned about *V. ochrostoma* (or rather my and others inability to recognize it), it being described so long ago and with such confidence by Borrer! I guess the same was true with *V. elaeina* - Borrer was clearly way ahead of his time.” [William Borrer (13 June 1781 – 10 January 1862), was an English botanist noted for his extensive and accurate knowledge of the plants of the British Islands. In 1813 he commenced, in conjunction with Dawson Turner, a work on British lichens which was finally published in 1839]. *Verrucaria ochrostoma* is actually rather common on calcareous substrata (including concrete), at least in Eastern England. A small area of undisturbed gravel close to the old Observatory building supports a good population of *Collema tenax* while *Bacidia egenula* was collected as the dominant species on one of the small pebbles. Some of the thalline granules were very pale and gave the impression of white pycnidia. Pycnidia were found to be present on this specimen but were buried in the granules and had dark pigment around the ostioles. Smith *et al.* (2009) state that the pycnidia of this species are “rare, ± immersed, white.”

The corticolous communities at the Observatory site are generally poor but ash trees towards the western side have a good show of lichens including foliose and fruticose species. Of particular interest is the presence of *Candelaria pacifica*, a recently recognised species which has previously been included in the concept of *C. concolor*. *C. pacifica* forms smaller and sparser lobes and colonies of it are easily overlooked as *Candelariella reflexa*. The most obvious characteristic feature is the lack of a lower cortex to the lobes and this generally requires scrutiny under a stereomicroscope rather than being reliably observed in the field.

An area of ground, reinforced with plastic mesh, has been capped with sand from Breckland. On this sand were found several thalli of cyanolichen with abundant apothecia and scarcely any lobes. There was excitement as it bore some resemblance to some members of the genus *Lempholemma* and a specimen was collected with the hope that its spores would be simple.

Microscopic examination thwarted this suggestion and the spores were found to be 3-septate (to sub-muriform). We now think that this is simply a form of *Collema tenax* with reduced lobes and emphasises the great variability shown by this species.

Additional general records for TL45J *Caloplaca flavocitrina* is present on concrete close to the south end of Wilberforce Road. When the areoles of thallus are reduced this species can be very difficult to separate from *C. austrocitrina* which also has very fine, bright yellow blastidia.

Kerb stones of acid rock type are present at the southern end of Wilberforce Road. These are well-covered with inconspicuous crustose lichens including extensive sheets of *Lecidella stigmatea*. There are also occasional thalli of *Lecidella carpathica* recognised by their better-developed thallus with warted areoles.

Wooden fence rails near the south end of Wilberforce Road support a rather limited suite of lichens but including very well-developed examples of *Micarea denigrata*. This species is often reduced to a blackish crust with white-tipped pycnidia. When well-formed, apothecia and a warted thallus are also present as seen here.”

Fungi and myxomycetes

A few casual records of fungi were made during the year, but the main recording effort was during the CNHS fungal foray weekend in October. The party visited the Adams Road Sanctuary and the Observatory grounds. The best find was the final one of the day, when we found the Earthstar (*Geastrum pectinatum*) under Leyland Cypress at the Observatory. We had found the species *Geastrum striatum* there in 2008 under a different patch of Cypress, where the young finder described it as something that “Looked like a Persian tower”. During the bryophyte excursion the following month we found Wrinkled Peach Fungus, which grows on dead elm trunks, at the M11 scrub CiWS. This was once red-listed in some counties, but is now more common thanks to Dutch Elm Disease. In total 51 different fungi were seen during the year, though not all were identified to species level.

Invertebrates

Peter Kirby carried out a comprehensive study of the invertebrate fauna of the Adams Road Sanctuary, and recorded over 1600 species in this small site. Our records are much sparser! Seven species of Odonata were noted, with Small Red-eyed Damselfly (*Erythromma viridulum*) reported from the new lake during the summer. Sixteen species of butterflies, four moths, nine ladybirds, including the 24-spot (*Subcoccinella 24-punctata*) and Adonis (*Hippodamia variegata*) (so the tetrad does support more than half the ladybird species known for the UK as suspected by Peter Kirby), and 34 other invertebrates were recorded.

Vertebrates

A Common Lizard (*Lacerta vivipara*) was noted in July, but although Grass Snakes (*Natrix natrix*) were sighted in 2013 they were not seen this year. Four species of amphibians were seen, with Great Crested Newt (*Triturus cristatus*) present in the Adams Road Sanctuary pond that was dug to provide habitat for them. No species of fish were noted, though both Common (*Cyprinus carpio*) and Crucian (*Carassius carassius*) Carp are known to be in the Sanctuary lake. The Sanctuary Club noted 51 species of birds at the reserve during the course of the year, with 76 species seen there since 2010. Birders at the British Antarctic Survey noted 60 species, including amongst others Cuckoo (*Cuculus canorus*), Firecrest (*Regulus ignicapillus*), Hobby (*Falco subbuteo*), Lesser Whitethroat (*Sylvia curruca*), Little Owl (*Athene noctua*) and Red Kite (*Milvus milvus*). Our casual sightings of 47 species added Marsh Tit (*Poecile palustris*), giving a total of 87 species for the tetrad since 2010. Seven species of mammal were noted during the year, though no specific effort was made at recording mammalian species and bats are certainly present in the area. Since 2010 twelve species have been recorded from the area, including Otter (*Lutra lutra*).

Conclusions

Jonathan Shanklin travelled or worked in the area on an almost daily basis for much of the decade, so had recorded some additional species since 2004. With the more intensive visits of the field studies, further botanical finds were likely, but expected to be of the order of dozens. In the event, we added around another 200 vascular plant species to the tetrad list, bringing the total ever recorded in it to over 850. This will put it 2nd in the country according to the BSBI Distribution Database, behind tetrad SU96P in Sunninghill, Berkshire, which has an astonishing 1473 species. Around 110 species have not been recorded since 2010 and probably no more than 25% of our additions will persist. Because only casual or incomplete recording of other phyla was carried out, it is difficult to assess what changes have occurred in their distribution. Full species lists and highlights of the walks are available on the CNHS web page at <http://www.cnhs.org.uk>.

Looking forward to 2024, change is likely to continue. The University will continue to develop the West and North-West Cambridge sites, though hopefully with a greater sensitivity towards native biodiversity than it has shown in the last decade. It seems likely that some of the finds of this year will be casuals that do not persist, but others are likely to consolidate and become more widespread. Climate change is expected to become more significant and this may bring with it species previously found in currently warmer climates. There is beginning to be a realisation that unfettered trade in plants from exotic locations does not always bring economic benefit when pests come with them, but it will probably take the arrival of further aggressively invasive species before any significant action is taken. I wonder which of them will become a problem in TL45J?

The field studies programme benefits from having many people helping to find the flora and fauna in the area and sharing their expertise. Our collective experiences show that this tetrad on the edge of Cambridge has perhaps the largest species count of any in the County. It is guaranteed to rise further!

Acknowledgments

Thanks are due to Mark Powell and Chris Preston for their reports of specialist visits, which are reproduced here. Short reports on the other monthly visits are on the CNHS web page. Thanks are due to Monica Frisch, Steve Hartley, Mark Hill and Alan Leslie for comments on the draft report.

Further Reading

For background on tetrads, monads etc see for example <http://www.bto.org/volunteer-surveys/birdatlas/methods/correct-grid-references>
The tetrad for West Cambridge is TL45J.

References

CNHS Coton Footpath web page: http://www.cnhs.org.uk/coton_footpath.htm (Accessed January 2015).

Shanklin, Jonathan Wildlife along the Coton Footpath, Nature in Cambridgeshire, 2005 or <http://www.cnhs.org.uk/wildlife%20along%20the%20coton%20footpath.pdf> (Accessed January 2015)

Shanklin, Jonathan Rare Plants in West Cambridge, Unpublished <http://www.cnhs.org.uk/rare%20plants%20in%20west%20cambridge.pdf> (Accessed January 2015).

The Beginnings of the Cambridge Natural History Society: the Nineteenth Century

Henry Tribe

As still printed on every Programme Card, the Cambridge Natural History Society was founded as the Cambridge Entomological Society in 1857. Canon Raven in his centenary article on the Society (*Cambridge Review*, Oct 12, 1957) stated that its early record was meagre with the first minute book covering the years 1884 to 1892 but most fortunately this is incorrect. The earliest minute book, Vol 1, covers the years 1857 to 1866 and must have been mislaid when he wrote his article.

There are three more Victorian minute books in the Society's possession, labelled Vol 2, 1883-1892; Vol 3, 1892-1896 and Vol 4. 1896-1900. All books were collected together and entered in a card index by Ken Joysey circa 1960.

Entitled 'The Note Book of the Cambridge Entomological Society' the first minute in the first book recorded that at a Meeting on 15 May held in Mr Sealy's rooms with eight persons being present a Society should be formed for promotion of the study of Entomology in the University and Town of Cambridge. On 29 May its officers were elected: Charles Cardale Babington FRS as President, Messrs F. Barlow, J.W. Dunning and T. Brown Vice-Presidents and Mr A.F. Sealy Secretary and Treasurer. A draft of rules (Laws) of

the new Society was set out in June, discussed, entered into the minute book and accepted. These first officers were elected for a period of nearly one year. A date was proposed, the first Friday in February, for an 'Anniversary Meeting' when the existing officers would resign and new officers be elected, a report on the previous year be read and the accounts inspected.

Most meetings were held in an officer's rooms at 8pm and consisted of exhibitions of entomological specimens. Minutes recording these often went into considerable detail. Sometimes papers were read. New members were formally proposed and seconded at one meeting and elected at the next. Field days were held during the collecting season. A Library was kept by the Secretary and later an office of Librarian was created. The Library kept going until 1947 when at the AGM on 9 May the President [Dr C.S. Carter] put to the Society the proposals adopted by Council concerning the Society's Library. These were, briefly:- that since the collection "could no longer be kept in the Entomology Dept." the valuable books and periodicals be made over to the Balfour Library under certain terms, and the others be disposed of unless alternative accommodation could be obtained. During the ensuing discussion certain objections to the scheme were presented, chiefly the question of access to the books in the future by outside members. Finally an amendment was proposed and carried to the effect that the matter should be referred back to the Council for decision in the Michaelmas Term, with power to act on their decision. No further minute on this matter is to be found in the minute books so far examined but the office of Librarian was omitted from Council from 9 May 1947 and never reinstated.

Ten to 12 approximately monthly meetings were held each year, decreasing to seven to nine in 1861-3. The meetings in December 1861 and January 1862 were "postponed in consequence of the absence of the president, secretary and most of the members" and in November "attendance was so scanty that the meeting broke up at an unusually early hour".

At the Anniversary Meeting of 2 Feb 1866 the propriety was considered of attaching the study of Botany to that of Entomology in the Society. The Secretary (Linnaeus Cumming) would consult botanists in Cambridge and report to Council at a special meeting. This was on 11 Feb: he began by apologizing for its revolutionary character which affected "the very constitution of the Society" and followed by proposing "That the design of this Society be extended to embrace all branches of natural science particular attention being paid to the fauna and flora of the district and be called the Cambridge Entomological Society & Field Naturalists Club". The amendment was put to the meeting and carried unanimously.

The minute book or books from 1866 - 1883 have been missing at least since Ken Joysey made his card index list of all existing minute books. Indeed a highly interesting document turned up when in July 2014 I found a letter, loosely inserted in Vol 3 of existing minutes (1892-1896). It was a handwritten black-edged card addressed from Montevideo (probably a house-name), Weymouth dated 20 Dec 1887. The content deserves transcription in full:

“Dear Sir, I am afraid I have had possession of the two enclosed old minute books of the Camb.Ento.Soc. since I left Cambridge. I am very sorry that I should have kept them so long but am glad to be able to send them back to you. Perhaps you will kindly give them to the Secretary of the Society when you have an opportunity, I have been doing a good deal of collecting in Portland this last year - it seems a good locality though a very rough one to work. I should be interested to hear how the C.E.S. is going on. Hoping that you & your brother are well, believe me,
Yours truly Nelson M. Richardson”

I believe this letter refers to two missing volumes between 1866 and 1883. There is reference in W. Farren's Report of 1892-3 (see below) to Nelson Richardson in 1875. Four members had put new life into the Society and “these were reinforced in 1875 by Mr N.M. Richardson”.

Did the latter go down soon after 1875 and keep the volumes up to 12 years until December 1887? If he did we must presume that ‘Dear Sir’, whose name is not given (though if we accept the reference to his brother as a clue was probably John Brown) found no opportunity of contacting the Secretary of the Society and left them somewhere in the Cambridge Museum of Zoology, possibly in the Library. There they may still be waiting for re-discovery 118 years later! Worth a good look!

The second oldest minute book now in the Society's possession, entitled 'Cambridge Entomological Society & Field Naturalists Club', is that of 1883 to 1892. Looking through the exhibitions and papers very few were other than entomological and at the Anniversary Meeting of 1885 ‘Field Naturalists Club’ was dropped from the minute heading. The minutes began reasonably well, though with only six approximately monthly meetings between 1884 and 1885. They then got briefer and ceased altogether between the Anniversary Meetings of Feb 1886 and Feb 1887. Later they became increasingly sketchy with year-dates omitted until 1892, when William Farren became Secretary, and restored order to the Society.

William Farren, 1865-1952, who had his taxidermy business in Cambridge (Morris, *Nature in Cambridgeshire* (2005) 47. 83-4) became Secretary & Treasurer 1892 to 1896 and then again with a few breaks from 1900 until 1933. He was President 1924-26. His father, also named William (1836-1887) was a founder member of the Society and a principal exhibitor and speaker at many early meetings. His son, a third William (1892-1970) achieved much in the field of aeronautical engineering, becoming Sir William Farren FRS.

In 1892 William Farren gave a short history, so far as he knew and could glean from the books, of the Society since its foundation in 1857. For the first 14 years of its existence the Society had kept going without a break although the number of members varied considerably. After 1871 came a blank until early 1873 when Messrs Wheeler, Fletcher, Meyrick and Raynor put new life into the Society, reinforced by Mr N.M. Richardson in 1875. The Society flourished until 1880 when came another relapse and from the end of 1881 until the end of 1883 there were only three entries of the election of new members. Thereafter

for two years the Society was itself again but by 1887 “the fatal downhill journey commenced” and ceased altogether in 1889 when until 1892 the Society “slumbered peacefully, which in so far as Societys are concerned is an unhappy state”.

In January 1892 there had appeared in the *Granta* a letter from the entomologist Mr A.M. Moss suggesting the forming of an Entomological Society. He was at once acquainted with the fact that there was already the remains of one on hand. The prospect of reviving the Society was fully discussed at a meeting with 6 present. Its liabilities were found to be £2 6s 9d in excess of the funds on hand. The deficiency was by agreement made up by Messrs Bryan, Theobald, Jones & Farren and the title “Cambridge Entomological & Natural History Society” was substituted for “Cambridge Entomological Society”.

Thereafter the Society revived well with 11 meetings taking place in 1892-3, average attendance of about twelve, mostly with exhibitions, five ‘fine papers’ read and two excursions. At the end of the year there were 35 resident members. A substantial list of journals and books was added to the Library. The financial position was fairly satisfactory with a balance in hand of £2 9s 8½d, even though many members were in arrears with their subscriptions.

Soon after was another slack period and the Society was pulled together again by the new President, David Sharp FRS, Curator of the University Museum of Zoology. He was followed in 1897-8 by Sidney Harmer FRS, Superintendent of the Museum. Harmer had edited, together with Arthur Shipley, the first volume of a very substantial work entitled Cambridge Natural History, beginning in 1895. The work was planned in ten volumes to treat the animal kingdom from protozoa, via molluscs, crustaceans, insects and many other invertebrate groupings to amphibia, reptiles, birds and mammals. It was prepared for those without scientific training yet it combined a popular treatment with the latest scientific research and was thus useful to serious students of these subjects.

The volumes were printed in the order in which they were ready, with two in 1895, one in 1896, two in 1899, thence 1901, 1902, 1904, 1906 and 1909. The 1909 volume on crustacea and their allies was very late due to death of a key author. Its appearance was said to “complete the work the Editors embarked upon some 16 years ago. It coincides with the cessation of an almost daily intercourse since the time when they ‘came up’ to Cambridge as freshmen in 1880”.

The Society’s former President David Sharp had written the complete text on insects by 1899 and both Sidney Harmer and Arthur Shipley wrote several texts in several volumes. Arthur Shipley would be elected FRS in 1904. He became President of the Society from 1905 to 1911 for the seven years following removal of the one-year tenure of the presidency which had prevailed from the Society’s beginning. The linkage between the Society and the University Museum of Zoology had become extremely close.

A magnificent scrap-book containing reviews of the volumes of the Cambridge Natural History is kept in the Society's archives. Pages are 16½ x 11

inches in size (approximately A3) and filled with reviews cut with scissors from many journals and newspapers. The reviews were pasted in as each volume was published, the first being Vol 3 of 1895. Thirty Vol 3 reviews were pasted on to nine pages, some very long, from scientific journals including *Nature*, *British Medical Journal* and *Zoologisches Centrallblatt* to newspapers including *Times*, *Manchester Guardian*, *Scotsman*, *Sheffield Evening Telegraph* and even a very short one in *Household Words*. Other titles included the *Cambridge Review*, *Oxford Magazine*, *Pall Mall Gazette* and *The Athenaeum*. Fourteen years later reviews of the other nine volumes filled some 70 more pages.

The century passed with good attendance at the nine meetings, six papers to the year, exhibitions at every meeting and “remarkably satisfactory finances” - a balance of £5 7s 0½d compared with the past year’s £2 13s 9½d. The List of Officers, though incomplete during the years of the missing minutes is given in the appended Table 1. Hopefully the missing minutes will eventually be found.

For the next period, the Edwardian, see my article in *Nature in Cambridgeshire* 50, 113-6, 2008.

Table 1: Early Officers of Cambridge Natural History Society

Vol	Year(s)	President	Secretary & Treasurer	Vice Presidents etc.
1	1857-8	C.C. Babington FRS	A.F. Sealy	
	1858-9	C.C. Babington FRS	A.F. Sealy	J.W. Dunning, Frederick Barlow; Thos. Brown
	1859-60	J.W. Dunning	A.F. Sealy	C.C. Babington, Rev.E.H. Perowne, Thos. Brown
	1860-1	Frederick Barlow	A.F. Sealy	C.C. Babington, John Brown, Francis Archer
	1861-2	Alfred Pretor	George Wilks*	C.C. Babington, T. Brown, F. Barlow
	1862-3	George R. Crotch	G. Wilks	C.C. Babington, John Brown, A. Pretor
	1863-4	Frederick Barlow	G. Wilks	G. Crotch, M.N. Williamson, H. Newton
	1864-5	Rev Charles Grinstead	G. Wilks to Apr 29 then Frank Alderson	F. Barlow, Linnaeus Cumming, J.M.C. Davies
	1865-6	George Crotch	L. Cumming	J. Brown, F. Alderson, C. Grinstead
1866	Frederick Barlow	L. Cumming	G. Crotch, A.E. Eaton, T. Brown	
Vol 1 of Minutes (Cambridge Entomological Society). Stamped with C.E.S. Logo (belt and buckle)				
Vol	Year(s)	President	Secretary & Treasurer	Vice Presidents etc.
2	1883	Greenwell Lax	J.H. Leech	J. Brown, G.H.M. Bryan, G.H. Raynor
	1884-5	J. Brown	J. Cropper	J.H. Leech, G.H. Raynor
	1885-6	W.F.H. Blandford	J. Cropper	J. Brown, J.E. Tarbat
	1886-7	John Cropper	W. Blandford Sec., A. Robinson Tres.	J. Brown, A. Jones
	1887-8	G.H. Bryan	C.B. Holman Hunt Sec, J. Brown Tres, A. Jones Libn	A. Jones, A. Robinson
	1888-9	G.H. Bryan	F.V. Theobald Sec & Tres	A. Jones, J. Brown
	1889-90 1890-1 1891-2	"The Society slumbered peacefully"		1892 Report Minute
Vol 2 of Minutes (Cambridge Ent.Soc & Field Naturalists Club) Stamped Cambridge Entomological and Natural History Society (unknown date)				
Vol	Year(s)	President	Secretary & Treasurer	Vice Presidents etc.
3	1892-3	A.M. Moss	W. Farren Sec & Tres, A. Jones Libn.	V-P G.H. Bryan
	1893-4	F.V. Theobald	W. Farren Sec & Tres., A Jones Libn	V-P A.M. Moss Three Members G.H. Bryan, J.C. Rickard, M. White
	1894-5	J.C. Rickard	W. Farren S&T, A. Jones Libn.,	V-P C.G. Lamb Council G.H. Bryan, A.M. Moss, W.E.H. Porter

	1895-6	C.G. Lamb	W. Farren S&T, then W.H. Stokes; A. Jones Libn,	V-P R.Farren Council G.H.Bryan, J.C.Rickard, W.H.Stokes
Vol 3 of Minutes (Cambridge Entomological and Natural History Society) Stamped Cambridge Entomological and Natural History Society (unknown date)				
Vol	Year(s)	President	Secretary & Treasurer	Vice Presidents etc.
4	1896-7	David Sharp (FRS 1890)	C.J. Wilkinson Sec, A. Jones Libn.	V-Ps C.G. Lamb, J. Rickard Council W.H. Stokes, J. Brown, Hon N.C. Rothschild
	1897-8	Sidney F. Harmer (FRS 1898)	Mr Doncaster Sec, A. Jones Libn	V-Ps D. Sharp, J. Brown, C.J. Wilkinson Council C.J. Lamb, J. Rickard, Mr Turner
	1898-9	Francis Gayner	A.F.R. Wollaston Sec, A. Jones Libn.	V-P Dr Harmer Council Dr Sharp, Messrs Brown & Lamb
	1899-1900	W. Bateson (FRS 1894)	A. Wallis S&T	V-Ps Dr Harmer, A. Jones, L. Doncaster Council Dr Sharp, Messrs Pope and Rickard
	1900-01	J.J. Lister (FRS 1900)	Mr Wallis S&T; Mr Farren from 2 Nov 1900	V-Ps Mr Bateson, Mr Doncaster, Mr Farren Council Mr Rickard, Dr Sharp, Dr Harmer
Vol 4 of Minutes (Cambridge Entomological and Natural History Society)				Unstamped

*also Librarian here onward

Vascular Plant Records 2014

Alan Leslie

These reports detail some of the most interesting vascular plant records that have come to light over the past year in Cambridgeshire (v.c. 29). Every year I wonder if our recorders can really find more for me to write about in such a supposedly well-worked county. Every year they do! Although there are no species native to Cambridgeshire recorded here for the first time, there are new or updated records for several rare natives, some of which were feared lost in the county; there is also the usual raft of new or scarce aliens, plus records for a few interesting variants and some records of unusual hybrids. Moreover some of these records come from well-known sites, such as Chippenham Fen and Newmarket Heath, demonstrating that even the botanical honeypots are still worth searching carefully. More exceptionally though there is one hybrid new to science to report: *Apium nodiflorum* x *Berula erecta*.

In fact the plants now determined to be this hybrid have been known at Chippenham Fen since 1979, when they were first discovered by Max Walters. However, as the account in the record below suggests, their attribution has always been somewhat controversial, and it is largely thanks to the use of modern molecular techniques that we now have the unequivocal, if rather unexpected, answer to their identity. There are no other confirmed natural intergeneric hybrids in the *Apiaceae* (*Umbelliferae*) known in Europe, and they are very rare elsewhere in the world. The hybrid will be named in due course. So far Chippenham is the only place from which molecular confirmation of this

combination has been reported, but there are two nineteenth century specimens in the Cambridge University Herbarium (CGE), which appear morphologically to be identical. One of these is from Haddington, near Edinburgh, but the other is a Cambridgeshire specimen that was collected by Prof. Babington (as *Helosciadium repens*) from a 'quarrey near Upware', in 1857. Although this hybrid is seed and pollen sterile, it is a perennial and is vegetatively vigorous, quite capable of creeping over long distances. It should be looked for again in both these areas and probably occurs elsewhere too.

In the last report I speculated that we might be missing other sites where native plants more typical of the sands on our Breckland fringe were being accidentally introduced with building and construction work, presumably with movement of soil or sand and gravel. Nick Millar has shown that this is indeed the case and, whilst most of the previous records have been in and around Cambridge, he has extended their occurrence out to Cambourne, where he has been assiduously recording the flora of this fast expanding new community. Here car parks and mown road verges have produced unexpected records for *Medicago minima* and *Trifolium scabrum*, as well as *T. striatum* and *T. micranthum*, none of which one would expect to see naturally in this area of heavy boulder clay. However, Cambridge was not to be outdone and produced one of the most sensational sites yet, revealed last spring by Jonathan Shanklin and other members of the Cambridge Natural History Society. This was on ground around the Observatory off the Madingley Road where areas around new building had apparently been made up with imported soil and an area of meadow below the telescopes had been stripped of its top soil and then used by the construction workers. At first sight the latter looked rather barren but turned out to be a little goldmine of unexpected records, highlighted by *Crassula tillaea* and *Herniaria glabra*, but there was a great deal else, including some garden aliens and later in the year an abundance of small plants of *Chenopodium rubrum*. In all a strange mixture and one would love to be able to unravel the history of how the components reached this site.

Native British plants occurring here as apparently accidental introductions are quite a feature of these records. *Fumaria capreolata*, for example, continues to turn up in unexpected places, with Lewis Saunders's record from Wisbech being the first from the northern half of the county. Perhaps even more unexpected was the single plant of *Sagina subulata* which Jonathan Shanklin and Ashley Arbon reported from the drive to Madingley Hall. Also in this category is *Parapholis incurva*, a decidedly inconspicuous little grass, a native on the coasts of the British Isles, but an invader with us, which has recently been extending its range along our salted main road verges. Finally, the CNHS survey of the fast-developing West Cambridge Site revealed a good colony of *Persicaria minor*, which is a known county rarity, but is occurring here in a new ditch on former arable land in an area from which we have had no previous records: we concluded that it had come in either with soil or as a weed with other planted material.

Rather less welcome is the report of a number of rare Cambridgeshire natives, generally in quite new areas, where the balance of evidence would

suggest they may have been recent deliberate introductions. The records listed below for *Iberis amara*, *Dipsacus pilosus* and *Eriophorum angustifolium* appear to fall into this category. If this is the case, and I must stress this is a matter of judgement, a balancing of the probabilities, and not certain fact, then it would be welcome if those responsible would at least record what they have done, so that those coming on after them do not then draw unwarranted conclusions regarding the presence of these plants, muddying other scientific observation. These are by no means the first such suspected cases and in a few earlier instances we do have confirmation that plants have been sown or planted.

On a more positive note the confirmation of the continued occurrence of *Potentilla tabernaemontani* on Newmarket Heath was something of a relief, as a number of other searches here and in other past native sites in the county had produced only negative results. Getting out on to the Heath early in the season to look for it also resulted in the discovery of a significant population of *Conopodium majus*, never before noted from the Heath, and both are in the same general area in which *Saxifraga granulata* was found for the first time only a few years ago. These finds not only confirm the richness of this stretch of turf between the Devil's Ditch and the Rowley Mile grandstand, but how easy it is to miss plants such as the saxifrage and the *Conopodium* which flower early and then disappear below ground. Of course it is also possible to miss very large plants, if they are in superficially unpromising places or in areas awkward to access, and the records noted below for the numerous, 7/8ft tall clumps of *Sonchus palustris*, growing along a long stretch of the Forty Foot, might fall in to this category.

There are records below from every month except February, November and December: indeed the first new plant for the county last year, *Lonicera henryi*, was found on 1 January. The records come from seventeen 10km squares that are well scattered over the county, and concern eighteen individual recorders or recording groups. As ever the Cambridgeshire Flora Group and Cambridge Natural History Society excursions have been very productive and we have been pleased to have a significant increased participation in the CFG excursions in the last year. Thank you to all the people who have made records and, just as importantly, have reported them: the effort is much appreciated. If the county recorders occasionally query a record please do not be offended: it is part of our role to try and ensure the accuracy of all Cambridgeshire records that are entered on local and national databases and nothing will please us more than to receive confirmation of a good record.

It might be worth drawing attention here to the entries below in which an indication is given that there is a voucher specimen for the record in **CGE**. It is essentially good practice to have such material for at least the first record for all new native or alien plants in the county, as well as for anything that might be regarded as a critical plant (e.g. unusual hybrids, or members of apomictic groups). It means that should any doubt arise over identification or if taxonomic treatments change, there is some evidence available to reassess the record, and as demonstrated by the Babington example quoted above, such specimens can still have relevance 158 years later! There are, of course, sometimes

conservation concerns to be considered in collecting such material, of which recorders need to be aware and should respect.

Finally, I am happy to report that the Flora of Cambridgeshire project has progressed well over the last year. The accounts for *Asteraceae* (*Compositae*) have been completed and my aim is to complete the final batch, the monocots, during this coming year. My thanks are due to all those who have helped with my enquiries.

Agrostis castellana One patch, on rough ground between the guided busway and the cycle/foot path, just to the south of Long Road, Cambridge, TL45655561, A.C. Leslie, 5 October 2013 (CGE) conf. T. Cope. Second v.c. record for an introduced grass (Highland Bent), of Mediterranean origin, which is used in some amenity grass mixtures; a hybrid with

A. capillaris may also be common in such mixtures, but has not yet been detected in the county. Identification relies on the morphology of the terminal lemmas on each branchlet of the inflorescence: further records will need to be accompanied by voucher material.

Allium oleraceum A colony of c.25 flowering plants, along the grassy margin of the south side of the track between Wood Barn Farm and Wood Farm, just east of Hardwick Wood, TL35765723, M. Frisch (CFG excursion), 20 July 2014. A new locality for Field Garlic, otherwise seen recently only on tracksides or road margins at Little Abington and Guilden Morden. A surprising find in such a well-visited area, but it is easily overlooked; it is worth looking twice at any garlic with both flower and bulbils.

Althaea officinalis One plant, on the verge of the east side of the south-bound carriageway of the A11, just east of Pampisford, TL51694829, A.C. Leslie, 29 June 2014 (CGE). Last recorded as a native in the far north of the county by Frank Perring, near Newton, in 1959. In this new site it may be of horticultural origin, although it is growing near large stands of the maritime grasses *Parapholis strigosa*, *P. incurva* and *Hordeum marinum*.

Apium nodiflorum x *Berula erecta* Colonies in two places in ditches to the west of the Main Ride, Chippenham Fen, TL64806957 (compartment 5) and TL65066918 (compartment 10), A.C. Leslie, 2014 (CGE). Plants now attributed to this combination have been known on the Fen since at least 1979, when they were first collected by Max Walters. They have previously been assigned variously to *A. repens*, *A. repens* x *A. nodiflorum* and *Berula erecta*, but recent molecular research undertaken by Stuart Desjardins at Leicester University (Desjardins *et al.*, in press) has shown conclusively that they belong to this, previously unrecorded combination.

Arabis blepharophylla One flowering plant, self-sown at base of drain pipe on street-front wall of 58 Kingston Street, Cambridge, TL46355797, A.C. Leslie, 27 March 2014. First v.c. record for a bright pink-flowered, clump-forming, Californian perennial, grown as a garden ornamental and perhaps derived here from a past window box display elsewhere in the street.;

Asplenium ceterach (*Ceterach officinarum*) Four small plants, on a wall outside 25 Station Road, Melbourn, TL38174480, I. Webb, 6 June 2014. Rustyback Fern is still a rare fern in the county, but can seemingly crop up anywhere on suitable walls. The only other extant site south of Cambridge is a much reduced population at Hinxton, but it was formerly on an old wall at Royston station.

Bidens frondosa Several plants, mixed with *B. tripartita*, in a new but dry ditch on the West Cambridge Site, Cambridge, e.g. TL42375880, CNHS excursion, 31 August 2014, det. ACL (CGE), with another found later in a nearby flower bed (J.D. Shanklin, October, 2014).

Second v.c. record for an American alien known as Beggarticks; our only previous record was in a ditch by the Ouse near Over in 1984, where again it was accompanying *B. tripartita* (and is easily overlooked in such company). Now spreading more widely in the British Isles.

Calendula arvensis Four self-sown plants, distributed along the street-front walls of 39, 43 and 47 Argyle Street, Cambridge, TL464576, A.C. Leslie, 27 April 2014 (CGE). Probably the first v.c. record for a small-flowered relative of the Pot Marigold, *Calendula officinalis*, which is a much more frequent alien. There is one other unconfirmed report from Chatteris in 1991.

Carex arenaria A large patch, on scrape by lake, White Hall Farm, West Fen Drove, Isleham, TL62857576, J.D. Shanklin, 5 May 2014. An exciting new find, as Sand Sedge has been known as a native plant only on our Breckland fringe around Chippenham and Kennett and has not been reported there since 1980. This colony lies just to the north of this area, in ground described by the recorder as a chalky marl/gravelly sand. There have been other recent records of it as an introduction, from Cambridge, March and Wisbech.

Carex comans (a) One clump, at south margin of new lake, West Cambridge Site, Cambridge, TL42585868, A.C. Leslie (CNHS excursion), 31 August 2014 (CGE); (b) At least seven clumps, scattered on damp margin of pond on southern border of the West Cambridge Site, TL42935876, A.C. Leslie (CNHS excursion), 31 August 2014. First v.c. records for a New Zealand sedge now often grown as an ornamental in gardens; apparently an accidental introduction here, perhaps arriving as a weed with other planted native and alien plants: it seeds around freely in cultivation.

Carex echinata Three fruiting clumps and four non-flowering, smaller plants, in boggy woodland on the slope above a small stream, just north-west of the Trust Meadow at Gamlingay, TL21955121, A.C. Leslie, 5 July 2014 (CGE). As a plant of acid, boggy ground, Star Sedge has always been a rarity in the county. It was last reported in the county in 1978, from the Trust Meadow, but recent searches there for it have been unsuccessful.

Carex hostiana x *C. lepidocarpa* (*C. x fulva*) One large old clump, in southern field, Sawston Moor, TL49104898, A.C. Leslie, 21 June 2014 (CGE), with another near the western margin of the south-eastern field. Both parents are present, but at least at the present time much less common here than *C. distans*. This hybrid has not been recorded previously at Sawston, and has otherwise only been recorded recently at Chippenham Fen, where it is locally frequent.

Carex lasiocarpa Chippenham Fen (a) A small patch in water beside Main Ride in compartment 6, TL64766959, 23 May 2014 (b) Three colonies in open fen in compartment 10, TL64976922, 17 April 2014 (CGE), TL64696919, 13 June 2014 and TL64866924, 13 June 2014 (c) Two large patches in open fen in north-eastern half of compartment 11, TL65216936 and TL65186935, 17 April 2014, all records made by A.C. Leslie. Only recently refound on the Fen and thought to be restricted to one colony in compartment 5. In several cases these new colonies had few if any inflorescences and were purely vegetative, but were extending over wide areas.

Cephalanthera damasonium About 30 plants, under limes on grassy banks of access road to Fitzwilliam College, off Storey's Way, Cambridge, TL43925941, CNHS excursion, 27 April 2014, with about 16 further plants under a pine on the lawn of a property just to the south along Storey's Way, opposite Churchill College, at TL4391.5937. New sites for White Helleborine, a local orchid in Cambridgeshire, but one which surprisingly has another extant Cambridge city population, on the recreation ground in Nightingale Avenue.

Chenopodium probstii Several flowering plants, on the slope below the north-east side of the A1307 and above the slip road on to the east-bound carriageway of the A14, Girton, TL41766139, A.C. Leslie, 23 October 2014 (CGE). First confirmed record for a very late-flowering, alien goosefoot (all the accompanying *C. album* was in ripe fruit), with tall stems, which like the leaves are flushed purple. The slope appeared to have been covered in a layer of new soil, perhaps derived from sugar beet washings, and this species may be being overlooked as a weed in Fenland.

Cirsium eriophorum At least 11 creamy white-flowered plants, amongst over 500 plants in parkland to the west of Wimpole Hall, Wimpole, TL33065075, C.J. Cadbury & A.C. Leslie, 28 August 2014. Our only other record of a white-flowered Woolly Thistle is of one plant noted by Thomas Martyn 'by the road to Madingley' on 3 August 1759.

Conopodium majus At least seven colonies on Newmarket Heath, between the Devil's Ditch and the Rowley Mile grandstand, TL6162, A.C. Leslie, 18 May 2014 (CGE). A very local Cambridgeshire plant, more usually found in our boulder clay woods, but occasionally seen in old grassland, such as at Histon and Gamlingay. Never before recorded from the Heath, but like *Saxifraga granulata*, which was also only recently discovered there, it flowers earlier than most botanical visitors venture out onto the Heath and then disappears below ground.

Crassula tillaea Bare gravelly ground, stripped of turf and used recently by construction workers, between the Observatory and Madingley Road, Cambridge, TL43235927, J.D. Shanklin (CNHS excursion), 4 May 2014 (CGE). Subsequent searches over this area revealed at least 27 small plants; it is assumed to have been introduced with construction materials. A remarkable find, our only previous record being on a warren between Chippenham and Kennett in 1930.

Cyperus eragrostis One plant, self-sown in road gutter, adjacent to 13 St Thomas' Close, Comberton, TL38615682, R. Horton, 4 September 2014 (CGE), det. ACL. A tropical American species, but fully hardy here and sometimes grown as an ornamental in gardens, where it can seed very freely. Previously recorded from Cambourne and Ickleton.

Dipsacus pilosus Several plants, scattered in planted woodland (c.20 years old), Gault Wood, March, TL399945, P. Ricketts & J. Andrews-Gauvain, 20 October 2012. There is no history of records in this area and the Small Teasel here is probably an unfortunate deliberate introduction. It was definitely this species and not its rather similar alien relative, *D. strigosus*.

Eriophorum angustifolium Several patches, in or beside a shallow ditch outside the bund surrounding the new lake, Great Kneighton country park, just south of Cambridge, TL45565469, A.C. Leslie, 11 July 2014. The circumstances (a new development on former arable fields) and the nature of the accompanying flora, suggest this may be an unfortunate deliberate introduction.

Euonymus europaeus f. *albus* One large bush, in hedge at north-west end of meadow, south-east of Chilford Hall, Linton, TL56804879, A.C. Leslie, 30 October 2014. Our only other records for this white-fruited variant of Spindle are both in the same area of the county: in Little Abington in 1984 and on the easternmost of the Hildersham Furze Hills in 1992. The species is particularly frequent in hedges in this area.

Fumaria capreolata Growing up a chain link fence of an industrial unit in New Bridge Lane, Wisbech, TF45210765, L.M. Saunders, 23 May 2014. There has been a number of records for this handsome fumitory in and around Cambridge in recent years, but this is the first record from the north of the county; it is considered an introduction in Cambridgeshire.

Gladiolus communis Two flowering stems, perhaps accidentally introduced with soil, on rough ground by the East Forum, West Cambridge Site, Cambridge, TL42435887, J.D. Shanklin, 19 May 2014. First v.c. record for a popular garden plant, which is well naturalised in parts of south-west England; the usual cultivated and naturalised plant is subsp. *byzantinus*, to which this record is assumed to belong.

Herniaria glabra One plant, on bare gravelly ground stripped of turf and used recently by construction workers, between the Observatory and Madingley Road, Cambridge, TL43225924, A.C. Leslie, 10 August 2014 (CGE). Like the *Crassula tillaea*, noted above, this is presumed to be an accidental introduction here, although perhaps from a native source; some other recent records have been of probable horticultural origin. It may persist as a native in an old gravel pit at Kennett, where it was last reported in 2007.

Hypochaeris glabra (a) Eleven flowering plants, on gravelly ground beside the cycle/foot path beside the guided busway, just south of Long Road, Cambridge, TL45655558, A.C. Leslie, 22 May 2014 (b) At least 20 plants, on a mound of imported soil outside the new MRC Laboratory of Molecular Biology, west of the Addenbrooke's Hospital site, Cambridge, TL45975517, A.C. Leslie, 22 May 2014, including one very large but fully fertile plant (CGE) (c) One plant in arable stubble, just south-west of the A1307, east of Great Abington, TL54064808, A.C. Leslie, 30 October 2014 (CGE). In the first two sites almost certainly introduced accidentally with soil or sand and gravel (and accompanied by a number of other Breckland annuals); in the last site the mode of origin is unknown. As a native it still flourishes on our Breckland fringe at Chippenham.

Iberis amara In three places in bare areas on the south-west face of the vallum, Fleam Dyke (between the A11 and the Bedford Gap), TL55285370 (26 plants), 55215377 (seven plants) and 55185380 (23 plants), the first two found by S. Hartley, the last by M. Frisch, 7 June 2014. There are no previous records for Wild Candytuft on the Dyke and no recent records any nearer than just north of Royston. It seems most likely that this is an unfortunate deliberate introduction.

Juglans nigra (a) A young plant (c.4ft tall), and clearly not planted, in scrub at base of railings on the west side of Hobson's Conduit, Trumpington Road, Cambridge, TL45175743, A.C. Leslie, 30 May 2013, (CGE), another also present in 2014; there is a large tree, which can fruit prolifically, in the University Botanic Garden a few hundred yards away (b) One small plant (c.2ft tall), clearly not planted, in shrubbery beside Brandon Court, Adam & Eve Street, Cambridge, TL45785837, A.C. Leslie, 18 September 2014 (c) Several self-sown plants, along the north-eastern roadside edge of the Cambridge Road, just north-west of its junction with the St Neots Road, south-east of Madingley, TL412595, A.C. Leslie, 21 October 2014, the adjoining woodland strip has several large planted trees of this species. First v.c. records for the Black Walnut, a large North American tree, valued more as a specimen tree, and for its wood, than for its edible nuts.

Linaria dalmatica Three plants on the south bank of a large rectangular sunken area, in front of Cancer Research UK building, Addenbrooke's Hospital site, Cambridge, TL46215533, C.R. Stevenson, 1 September 2014 (CGE, det. & coll. ACL). First v.c. record for an ornamental toadflax from south-eastern Europe, sometimes grown in gardens for its large yellow flowers and broad, glaucous leaves.

Lonicera henryi One apparently bird-sown young plant, climbing through brambles on the north side of the Coton footpath, just west of the University Tennis Club, Cambridge, TL43275870, M. Frisch (CNHS excursion), 1 January 2014, det. ACL. First v.c. record for an

evergreen climber, of Chinese origin, which is sometimes grown in gardens, although its horticultural value is far from obvious.

Medicago minima (a) Frequent around new sand pits, West Fen Drove, Isleham, TL62857576, J.D. Shanklin, 5 May 2014, a possible new native site ; (b) Scattered over made up ground around telescopes and on soil-stripped ground just below, at the Observatory, Madingley Road, Cambridge, TL432592, first reported here by J.D. Shanklin, 30 April 2014 (c) A small patch, in car park in Business Park, Cambourne, TL31676007, N.P. Millar, 11 June 2014, in sand-filled plastic mesh used for extra parking (d) A single patch, very close to roadside edge, west verge of the north-bound carriageway of Cambourne Road (just north of the roundabout), Cambourne, TL31835993, N.P. Millar, 13 June 2014. The last three records are presumed to be accidental introductions with soil/sand and gravel.

Mimulus guttatus (a) Three plants, self-sown along base of wall of the Coronation Street frontage of the Perse School for Girls, Cambridge, TL453575, P.H. Oswald, 23 April 2014 (b) One plant, self-sown at wall base, Pepys Court, Chesterton, Cambridge, TL464596, A.C. Leslie, 14 July 2013 (c) Two plants, in new flower bed, West Cambridge Site, TL4258, J.D. Shanklin, 30 June 2014. Monkey Flower has always been a rare alien in the county, most records probably representing deliberate introductions around bodies of water, but these three recent records all appeared to have arrived on their own; the first two at least will probably only be casuals.

Miscanthus sinensis x *M. sacchariflorus* (*M. x giganteus*) (a) Scattered in small groups, at about half-a-dozen sites, along low embankment dominated by tall, rough vegetation, south side of old St Neots Road, just opposite New Inn Farm, Knapwell, TL325601 to 329600, N.P. Millar, 3 September 2014; it has been grown as a crop on the farm for several years (b) Scattered plants, on grassed area by A428, Caxton Gibbet, TL296606, J.D. Shanklin, 13 September 2014. First and second v.c. records for hybrid developed as a biomass crop. The origin of the plants in both sites is not clear: this hybrid is a sterile triploid, from which plant breeders have had trouble raising any seed progeny.

Oenanthe silaifolia At least 73 plants in fruit, scattered along the base of the north-west side of the Bedford Barrier Bank, south-west of Earith, TL37617388-38697465, A.C. Leslie, 17 July 2014 (CGE). Most occurred singly, a few in small groups. With the recent loss of a large population in a field on Mare Fen, just to the south, at Swavesey, it was feared that Narrow-leaved Water Dropwort had been lost to the county. This new population occurs across the river from Bury Fen (v.c.31, Hunts) where this species still occurs in abundance.

Origanum laevigatum cf. *Nature in Cambridgeshire* 54:75 (2012). The specimen in CGE has now been redetermined by ACL as a variant of *O. vulgare*, so *O. laevigatum* should be deleted from the list of county records.

Parapholis incurva Numerous patches, along the east side of the south-bound carriageway of the A11, between the junction with the A505 and the Brent Ditch, just east of Pampisford, e.g. TL51694829, A.C. Leslie, 29 June 2014 (CGE). Growing here with even more frequent *P. strigosa*. A native grass, but with us a maritime invader of salted roadverges, previously only seen in very small quantity on the A14 at Quy and the A505 at Royston.

Persicaria minor (*Polygonum minus*) Numerous plants, in a new but dry ditch, West Cambridge Site, Cambridge, TL42335880, CNHS excursion, 31 August 2014 (CGE). A surprising record for a very rare plant in the county, with no previous records in this immediate area. It has perhaps been accidentally introduced here with soil or with other plants that have been deliberately introduced on the site.

Phuopsis stylosa (a) Edge of lawn, churchyard, Horningsea, TL493626, A.C. Leslie, 3 August 2003 (b) edge of lawn, Barnwell Leper Chapel, Cambridge, TL471594, J.D. Shanklin (CNHS excursion), 7 August 2014 (c) a patch in a grassy field, off Glenfields Road, Whittlesey, TL26209791, J.O. Mountford & J. Graham, 8 June 2014. We have only one previous record for this Caucasian perennial, related to the bedstraws, and valued in gardens for its tight heads of pink flowers.

Polystichum aculeatum Self-sown on the shaded banks of the First Public Drain, Cambridge Science Park, TL46576164 (one plant, 4 April 2014), TL47086128 (one plant, 22 May 2014) and TL47136123 (one plant, 22 May 2014), all records made by I. Webb. A very rare Cambridgeshire fern, otherwise only seen recently along a similar drain on Coldham's Common and along the steep banks of the Bin Brook at Coton.

Potamogeton compressus Floating material on the south side of the Forty Foot, north-east of Puddock Bridge, south-east of Benwick, TL35328805, J.O. Mountford (CFG excursion), 14 September 2014. Further evidence of the spread of this species, which only returned to the county in 2004 and has been recorded subsequently from the Nene, Bevill's Leam, the King's Dyke and the Twenty Foot.

Potentilla tabernaemontani (a) About 20 plants or patches of plants, on Newmarket Heath, between the Devil's Ditch and the Rowley Mile grandstand, TL61626223, 61636223, 61636224, 61626224, 61606225, A.C. Leslie, 19 & 20 April 2014, with two further patches found by S. Hartley on 28 April at 61756224 and 61746224. Spring Cinquefoil was last reported in this general area of the Heath in 1997 (strictly speaking this is Burwell Heath), but repeated searches in more recent years had proved fruitless and it was thought it might have been lost. It was formerly also on the Beacon Course and Round Course, but cannot be refound there or in any other former native site in the county (b) At least eight clumps, apparently self-sown from garden, on grass verge outside 58 King Street, Rampton, TL42346790, A.C. Leslie, 11 April 2014, (CGE). These plants formed very dense, tight mats with small leaves and flowers and may be the garden variant 'Nana', which probably represents a distinct wild taxon from this apomictic group.

Ranunculus marginatus Two plants, on rotavated hedge margin, Histon community orchard, Histon, TL43446336, J.D. Shanklin (CNHS excursion), 17 July 2014. Second v.c. record for an alien, annual buttercup, which has persisted on the Magog trust land for several years. It is said not to have been a stated constituent of the Emorsgate seed mix sown in the orchard.

Rosa obtusifolia One large bush, in the hedge on the north side of a track leading south-east from Brownhill Staunch, north of Over, TL37097263, A.C. Leslie, 12 July 2014, conf. R. Maskew. A very local rose in the county, more usually associated with the boulder clay.

Rumex palustris x *R. obtusifolius* (*R. x steinii*) One plant, with both parents, at edge of broad ditch on the north-west side of the Bedford Barrier Bank, just south-west of Earith, TL37907415, A.C. Leslie, 17 July 2014 (CGE). Second recent record for a hybrid dock that may be overlooked in the Fens.

Rumex sanguineus var. *sanguineus* Scattered plants, along a bank of imported soil, Wild Tracks activity centre, in old sand pits, Chippenham, TL68806911, CFG excursion, 12 June 2014. First confirmed record for a striking variant of Bloody Dock, with beetroot red stems and leaf veins, which is grown in gardens as an ornamental and comes true from seed. It is the type of the species, but our usual native variant is var. *viridis*.

Sagina subulata One plant, on the north side of the drive up to Madingley Hall, Madingley, TL393604, J.D. Shanklin, 28 June 2014 (CGE), conf. N. Jardine. Another remarkable find and the first v.c. record for Heath Pearlwort, a British native perennial of dry sandy, gravelly or rocky places, which is presumed to be a chance introduction here, perhaps with sand or gravel or on vehicles. Pearlworts are often overlooked or ignored by recorders and we have found recently that many pavement populations, which are generally assumed to be *S. procumbens*, are in fact *S. apetala* or *S. filicaulis*, which may sometimes be prostrate in pavement cracks.

Saponaria ocymoides One sprawling plant, apparently self-sown at junction of lawn and pavement, in front of 3 Newport Avenue, Fordham, TL64287079, J.D. Shanklin, 11 May 2014, det. ACL (CGE). A pretty, pink-flowered rockery plant, from southern Europe, for which we have few other records.

Sedum kamtschaticum One plant, apparently self-sown, on the top of a tall brick wall, along the west side of the churchyard, Trumpington, TL44265491, A.C. Leslie, 5 October 2014 (CGE). First v.c. record for a very variable, clump-forming and yellow-flowered species, which is occasionally grown in gardens.

Sonchus palustris One clump, on the north side of the Forty Foot, just north-east of Puddock Bridge, south-east of Benwick, TL35368808, CFG excursion, 14 September 2014, this must be very close to where David Dupree reported one clump in 1953, although there had been no subsequent reports from here. Further investigation by ACL on 19 September showed that there were at least 58 clumps scattered along the north bank of the Forty Foot, from between the county boundary just to the south-west of Puddock Bridge and extending up to just east of Leonard Childs Bridge, north of Chatteris (TL38408855); they are often rather hidden in the tall fringe of *Phragmites* along the water's edge and hence have been overlooked. Marsh Sowthistle used to be a rare native of the Fens, but our current populations are all thought to derive from natural dispersal from plants introduced to Woodwalton Fen in 1912.

Trifolium resupinatum One plant, on a bank of imported soil, Wild Tracks activity centre, in old sand pits at Chippenham, TL6869, J.D. Shanklin (CFG excursion), 12 June 2014 (CGE), det. ACL. Second v.c. record for an alien annual clover, with small heads of pink flowers each of which is held 'up-side-down', i.e. with the standard as the lowermost petal. Our only other record was made by A.J. Wilmott, pre 1939, along Mill Road in Cambridge.

Trifolium scabrum (a) Two large plants, on a track through the field between the Madingley Road and the Observatory, Cambridge, TL43205929, A.C. Leslie, 1 June 2014 (b) A single plant, in grassland close to the road, western verge of the north-bound carriage way of Cambourne Road, Cambourne, TL31786002, N.P. Millar, 11 June 2014 and also frequent in a 4m strip next to the kerb beside the roundabout along the same road, TL31835991, N.P. Millar, 13 June 2014. Further examples of where this rare Cambridgeshire clover has been accidentally introduced with soil/sand and gravel.

Verbena rigida Two plants, self-sown along wall base, in front of 3 & 4 Clarendon Street, Cambridge, TL455584, A.C. Leslie, 17 September 2014 (CGE). First v.c. record for a South American perennial, sometimes used as a bedding plant and valued for its heads of often deep purple to magenta flowers.

Vicia lathyroides One plant, on new lawn, developed on ground made up with sandy infill, at the Observatory, Madingley Road, Cambridge, TL43185931, J.D. Shanklin, 30 April 2014. A very local native plant of our Breckland fringe, which has also been found as an accidental introduction in recent years on the Cambridge Science Park.

Viola persicifolia Ten flowering plants and over 100 seedlings, Verrall's Fen, Wicken Fen, TL548700, Fen Violet Steering Group (comm. P. Stroh), 19 May 2014. This is a welcome reappearance for the Fen Violet, the first since 1999, and on the site where it was last seen occurring naturally on the Fen. This sporadic appearance may be characteristic of the species, which in Cambridgeshire is now confined to Wicken Fen.

I should like to thank Jane Bulleid, Gigi Crompton, Nick Millar and Jonathan Shanklin for their assistance in the production of these notes.

Bryophyte records

M. Burton and C.D. Preston

The records for the 2014-1015 season include species with a greater range of habitats than has been the case in some earlier years. Most have been made on the bryological excursions jointly organised by Mark Hill and M.B.; thanks are due to Mark both for this and for his determination of some of the mosses reported below.

Towards the end of the season we were saddened by the death of Oliver Rackham. He was a regular attender at our meetings on those occasions when we visited ancient woodland and was always an enthusiastic supporter of our work. He joined us on our visit to Barnwell, Northamptonshire, on 31 January 2015, shortly before his death, when he entered enthusiastically into our attempts to interpret the landscape at a site which was new to most of us. Fittingly, he was also present at the lichen group meeting at Madingley Wood on 7 February, when Jonathan Shanklin discovered *Nowellia curvifolia*.

Mosses

Dialytrichia mucronata **31**: On concrete around water level, R. Great Ouse downstream of the lock at the old paper mill, Little Paxton, TL1861, M.B., 22.10.2014. This Mediterranean-Atlantic species has only been recorded previously in v.c. 31 by the River Kim at Hail Weston Ford in 2011; the Kim flows into the River Great Ouse a short distance upstream of this lock.

Dicranum tauricum **29**: with *Dicranoweisia cirrata* on Conference Pear in orchard, Evergreen Venture Park, Wisbech St Mary, TF43510817, S. Hartley, 2.11.2014. This is the first record of this distinctive calcifuge species from an orchard, despite Robin Stevenson's many detailed surveys of orchards in recent years, and only the second from the Cambridgeshire Fenland; it has usually been found in ancient woodland, fen woodland and parkland.

Orthotrichum stramineum **31**: several tufts on sloping ash trunk, Ash Wood, Perry Woods SSSI, TL138662, C.D.P., 15.3.2015, BBSUK, conf. T.L. Blockeel. The first record from v.c. 31 of an expanding epiphyte.

Pogonatum urnigerum **29**: an 8 m long patch on granite hoggin surfacing an 'island' separating parking bays, and particularly frequent under the shade of three beech trees rather than the trampled ground between them, University Residences car park, West Cambridge, TL42795885, S. Hartley, 30.11.2014, BBSUK, det. T.L. Blockeel & M.O. Hill. Patch of scattered small plants in an area 40 x 40 cm in light shade of ornamental birches on an

apparently identical hoggin of pulverised granite near Criminology Department, Sidgwick Site, Cambridge, TL44295798, J.D. Shanklin, 26.2.2015. This is a pioneer species of gritty or gravelly, infertile acidic substrates in the north and west. In *The mosses and liverworts of Mid-West Wales* (2015), Jeff Bates describes how it has spread recently along the proliferating network of forest and farm tracks in the west, but it is an unexpected find in Cambridgeshire. The specimen collected by C.D.P. at the West Cambridge site shed most of its leaves soon after collection, suggesting that it might be the variant with caduous leaves which has hitherto been recorded only once in Britain.

Polytrichum juniperinum **29**: with much *Ceratodon purpureus* and some *Pseudocrossidium hornschurchianum* on granite hoggin, W. end of University Residences car park, West Cambridge, TL42755887, J.D. Shanklin, 30.11.2014; found in both the western and the eastern divisions of the car park by J.D.S., 31.12.2014. This calcifuge is rare in Cambridgeshire; we have seen it in only five sites since 2000, three of them railway sidings and the other two rotting tree stumps in parkland and woodland.

Pottiopsis caespitosa **29**: on disturbed chalky soil, Orwell Clunch Pit, TL36395070, C.D.P., 28.2.2015, det. M.O. Hill. A very scarce species nationally and one of the rarest Cambridgeshire bryophytes, recorded only at Devil's Ditch in 1962 and Fleam Dyke in 1984. Much scrub has been cleared at the Orwell site since we last visited it in 2000. The material there differed from the usual British plant in having immature fruits with longer setae (c. 8 mm rather than c. 3 mm) and strongly corkscrew-twisted cells in the capsule lid; it may be the variant formerly known in Europe as *Trichostomum triumphans* but now regarded as conspecific with this species.

Rhynchostegium megapolitanum **31**: top of a buttress supporting the old gatehouse of Ramsey Abbey, TL290850, S. Hartley, 13.12.2014, det. M.O. Hill. The fourth record of this species from v.c. 31; it is probably overlooked in grassland on well-drained soils, but this is an unusual habitat.

Sciuro-hypnum populeum **29**: amongst *Hypnum cupressiforme* on ash stool, Charcoals Wood, TL65865752, M.B., 28.3.2015, conf. M.O. Hill. The scattered sites at which this species has been recorded in v.c. 29 have little in common; this is the third locality at which it has been seen since 2000, the others being an asphalt path in a Victorian churchyard and an apple tree in an orchard.

Ulota crispa sens. str. **29**: fruiting on oak in wood converted into a plantation of well-spaced oaks, Great Chitlings Wood, TL654574, C.D.P., 28.3.2015. Both *U. bruchii* and *U. crispa* grew on these oaks; the former is now relatively frequent in Cambridgeshire but the latter is much rarer.

Weissia brachycarpa var. *brachycarpa* **31**: fruiting plants on muddy ride in fragment of ancient woodland, Meagre Wood, TL1564, R.H. Carter, 16.03.2014, BBSUK, conf. T.L. Blockeel. With maturing capsules in a grassy ley between Ash Wood and Perry Wood, TL13946650, M.O. Hill, 15.3.2015, grown on and confirmed by M.O.H. and S.D.S. Bosanquet, 13.4.2015. These are typical habitats for var. *brachycarpa*, which has not hitherto been recorded in v.c. 31 (or indeed in 100-km square TL); var. *obliqua* is more frequent and tends to grow on more calcareous and drier soils.

Liverworts

Lophocolea semiteres **31**: patch of male plants spreading over a small stump near entrance to Compartment 1a, Monks Wood NNR, TL20528051, J.D. Shanklin, 10.1.2015, BBSUK, conf.

S.D.S. Bosanquet. A new vice-county record of an alien liverwort, known from Sandy in Bedfordshire and Breckland but not yet recorded in Cambridgeshire; as it is a calcifuge it is never likely to become frequent in our area but this record shows that it can colonise acidic habitats in ancient woodland.

Lophozia perssonii **29**: two patches on bare chalk on narrow path, Ickleton Pit, TL492426, J.D. Shanklin, 14.1.2015. The fourth site in which this nationally scarce species has been seen in v.c. 29 since 2000.

Metzgeria consanguinea **29**: with *M. violacea* on dead branch of field maple, Madingley Wood, TL39975964, J.D. Shanklin, 7.2.2015, conf. D.G. Long. Although *Metzgeria violacea* has increased greatly in frequency in eastern England in recent years, *M. consanguinea* is still a predominantly western species. However, it could easily be overlooked when growing with *M. violacea* or gemmiferous *M. furcata*.

Nowellia curvifolia **29**: three patches on a fallen log and another patch on an adjacent log, Compartment D1, Madingley Wood, TL40145953, J.D. Shanklin, 7.2.2015. The colony included fruiting plants and was accompanied by fruiting *Cephalozia bicuspidata*, and the record provides only the fourth site in v.c. 29 for this predominantly western liverwort of rotting wood.

Invertebrate report 2014

Louise Bacon

It felt like there was a lot going on during a really long summer during 2014. The mild winter led into a hot but not droughty summer, with a dull patch in August but still warm at Hallowe'en. For several groups of insects this gave a good season, a pleasant change over the previous two years. Below are a few selected highlights.

In June 2014, Chris Thurogood, a novice moth-trapper, was examining his catch in Trumpington, and spotted a moth a bit like a White or Buff Ermine, but not right. Putting it aside for later, and still not resolving its identification, he liaised with John Dawson, the county recorder, who was also puzzled. Finally, in late 2014 the mystery has been resolved. He had the first British specimen of the Autumn Webworm (*Hyphantria cunea*). Another specimen from Hertfordshire had already been identified, but from the autumn, making ours the first. This American species had not crossed the Atlantic to get here, but was probably an immigrant from well-established European populations originating from an accidental introduction to Hungary in the 1940s.

Generally, moths seem still to be reduced in numbers, based mostly on comments from regular moth-trappers, who can compare with earlier years. Probably two poor years have had a significant effect, and recovery is not swift.

Another species new to the UK was a butterfly, and again Cambridgeshire was lucky enough to have one of several recorded in eastern England. The Scarce or Yellow-legged Tortoiseshell (*Nymphalis xanthomelas*) was recorded in small numbers, mostly on the eastern coast (Norfolk, Suffolk, Essex), but one

was noted and photographed in Rutland, and another was seen in Barton, Cambridgeshire. This species is similar to a Large Tortoiseshell, being bigger than a Small Tortoiseshell. This natural influx is part of a dramatic spread of this insect which is only found in eastern Europe, and seemed to be getting scarcer. However, in summer 2014 large numbers were noted in the Netherlands, rather surprisingly, and, as with expanding populations, a small proportion headed off out to sea to colonise anew. It is thought that these individuals entered hibernation quite early, and further sightings can be expected in the spring, assuming any have survived their hibernation.

Several other butterflies have colonised the county over the past few years – Silver-washed Fritillaries are now readily seen in most of our ancient woods, and its grassland cousin, the Dark Green Fritillary is becoming established on Devil's and Fleam Dykes. The other colonist is the Purple Emperor, which now seems to be resident in six or seven woods. However, the most reliable views seem to be at the Rothschild Bungalow in Woodwalton Fen, providing good photo opportunities for the last three years.

Not vc29, but still modern Cambridgeshire, the Ramsons Hoverfly (*Portevinia maculata*) was recorded in the county in early May (L. Bacon, V. Lea, confirmed by P. Herkenrath). This distinctive spring hoverfly (slaty blue-grey and black rather than the expected yellow-black patterns) is to be found on patches of Ramsons, and has never been recorded in the rest of the county. A concerted search last spring in Norfolk, following an appeal to county naturalists, produced records from several sites, so it is well worth looking for in future springs in our woodlands.

Staying in Diptera, Brian Eversham had probably the first record in the county of the Yellow Flat-footed Fly (*Agathomyia wankowiczii*) in Waresley Wood in 2013. Although the fly itself has not yet been seen, it is unique in that it is a gall-causing insect of fungi, making its gall on the woody bracket fungus *Ganoderma applanatum*. This is the only insect known to make galls on bracket fungi, and the underside produces a distinctive set of udders. The fly itself pupates in the ground, so collecting pieces of the infected fungi to rear the fly is to no avail. Further specimens appear to have been seen at Anglesey Abbey (undated, NBN Gateway) and a record from February 2015 from Madingley Wood (L. Bacon, O. Rackham) seems to be the third record. A photograph taken by Oliver Rackham can be seen on the front cover of this journal. Further information and pictures can be found online here:

<https://www.buglife.org.uk/bugs-and-habitats/yellow-flat-footed-fly>.

This species looks set to spread further, so one to look for in our local woods. There are few records anywhere in the UK and eastern England seems to be at the edge of this pioneering species' colonisation.

The final featured insect this year is the Tansy Beetle (*Chrysolina graminis*). This wetland species had been thought extinct in the county for many decades, and the sole British population was remaining in Yorkshire, on the banks of the Yorkshire Ouse. Peter Kirby was carrying out surveys on Woodwalton Fen, in the ditches in the newer, Great Fen project lands on the edge of the existing NNR, and when a Tansy Beetle caught his eye – this insect is about 9 mm long

and bright metallic green. There seems to be a healthy population on site, and it is thought that a tiny relic population clung on, and has now had the opportunity to expand with favourable management over a much wider area of what was once Whittlesey Mere.

OBITUARIES

Oliver Rackham (1939–2015)

Professor Oliver Rackham PhD OBE FBA, who died unexpectedly on 12 February 2015 after a cardiac arrest, in Papworth Hospital, was a figure of national and indeed international fame for his research into and publications about the history and ecology of woods and the landscape as a whole. There have already been over twenty published tributes to him, including obituaries (with photographs) in four national newspapers and notices in several Greek papers. His funeral in Corpus Christi College Chapel on 3 March was attended by over 300 people. We hope to devote part of next year's issue of *Nature in Cambridgeshire* to a fuller tribute to this distinguished and respected botanist, ecologist, mycologist and historian. This obituary will therefore concentrate on Oliver's work in this county, especially on its ancient woods, and his contributions to this journal over 44 years – a record comparable to John Clarke's for his weather reports (1959–2007).

Oliver was born near Bungay in Suffolk and then lived in Norwich. In 1958 he won a scholarship from Norwich School to Corpus Christi College to read Natural Sciences, intending to specialise in physics but switching to botany by his final undergraduate year. After obtaining a doctorate concerning photosynthesis he was elected a Fellow of Corpus and appointed a Demonstrator in the Department of Botany in 1964. He moved in 1968 to work at the Plant Breeding Institute in Trumpington on the impacts of drought on barley. Meanwhile he began to study, originally in his spare time, the topic in which he was to become an international figure – the historical ecology of woodlands. From 1972 onwards, while remaining a Fellow of Corpus, he worked independently in this field, broadening it to encompass the whole countryside of Britain and subsequently the Mediterranean region and especially Crete. I took him to the monastic peninsula of Mount Athos in Greece in 2001, 2002 and 2003 and benefited from his perceptive insights into this unique area. He became an Honorary Professor of the University in 2006 and Master of his college for a year in 2007.

Dr Donald Pigott, a University Lecturer from 1960 to 1964, has described in *N. in C.* **49** (2007): 37–38 how CAMBIENT, the predecessor of the Wildlife Trust, acquired Hayley Wood as its first nature reserve in 1962. He wrote that, when he departed to a professorship at Lancaster, “Oliver took over with energy and enthusiasm”. Indeed in 1975 Oliver compiled and wrote most of *Hayley Wood: its history and ecology*, published by CAMBIENT, the first of a number of influential books of which he was to be the author or co-author. Opening a

copy at either end, one is immediately confronted by one of Oliver's unmistakable hand-drawn maps, and several more are distributed through the book.

Clearly Oliver had by this time already become an expert in both historical and current ecology. He wrote: "In 1251 Hugo de Northwold, Bishop of Ely, caused a great survey of his estates to be made. This is known as the Coucher Book of Ely and we find the following entry: *De Bosco. Est ibi vnus boscus qui vocatur heyle ...*". In *N. in C.* **42** (2000): 37–44 and 61–67 he wrote a full account of this, "one of the most important documents in historical ecology", for its "three-quarters millennium", acknowledging that "to Hugo de Northwold I owe my life's work". Oliver was early in recognising the damaging effects of Fallow Deer both on the regeneration of coppiced Ash and on the flowering of Oxlips, of which "at a conservative estimate a million inflorescences disappear each year". He even included a chapter on tree diseases, about which he was to write again in his last book, *The Ash Tree*. There he said that they were something that he had been "rabbiting on about for years without anyone listening. The greatest threat to the world's trees and forests is globalisation of plant diseases:"

Oliver's first two contributions to this journal were in 1968 in **11**: 22–27, a comparison of woodland areas in 1279 and currently – beginning "Rats devoured most of the voluminous statistics collected by Edward I in 1279" but then explaining that fortunately "much of Cambridgeshire is covered by the fragments printed in *Rotuli Hundredorum* (1818)" – and an account of the mysterious 3–6-armed ponds of Cambridgeshire, most of which disappeared in the 19th century, with a rare survivor in Hayley Wood. He also published important accounts of three other Cambridgeshire woods – Knapwell Wood (where he was a member of CAMBIENT's management committee) in **12** (1969): 25–31, Gamlingay Wood in **34** (1992): 3–15, and in **38** (1996): 27–54 – jointly with Dr David Coombe, who "introduced me to the world of wonder and delight that was the Cambridgeshire boulder-clay woods (then unravaged by deer)" – Madingley Wood. This last paper includes a series of historical maps and lists of the flowering plants and ferns, annotated for the 17th to 20th centuries, and of the plants lost from the wood. Writing about it in an obituary for David Coombe in **42** (2000): 71–73, Oliver said that this collaboration had reminded him "of the almost superhuman standards that he [David] set himself and his colleagues".

Other articles published by Oliver in *Nature in Cambridgeshire* were in **19** (1976): 32–34 about the Hayley Wood deer count – beginning "All is not well with Hayley Wood." and ending "Culling has already started." – and in **41** (1999): 73–87, entitled 'The woods 30 years on: where have the Primroses gone?', including descriptions of the past and present populations of Primroses and Oxlips in Knapwell, Hardwick, Madingley, Gamlingay, Buff and Hayley Woods and in Overhall Grove, with revealing maps of four of them.

Two of Oliver's books, *The history of the countryside* and *Woodlands*, have been reviewed in *N. in C.* **29** (1987): 42–44 and **49** (2007): 105–108

respectively, and perceptive book reviews by him have appeared in **35** (1993): 78–79, **48** (2006): 100, **49** (2007): 104–105 and **54** (2012): 84–85.

Until 1982, while *Nature in Cambridgeshire* was published by CAMBIENT, accounts of field meetings were included. Traditionally the last of these each year was a fungus foray. Oliver led these from 1978 to 1982 and wrote brief accounts of them in the next years' issues, in **22**: 14, **24**: 16, **25**: 15 and **26**: 13. These are notable for the vivid descriptions of fungi (e.g. “the spectacular blood-red *Boletus erythropus*, which turns instantly blue at a touch”) and for the comparisons made between the species found at the sites visited and in Hayley Wood. Dr Harry Hudson wrote in *The Times* on 3 April 2015: “Oliver ... attended my lecture course on mycology when he read Part II Botany at Cambridge in the early 1960s, although his knowledge of fungi in the field was far superior to mine even at that stage. ... His knowledge of fungi was quite phenomenal and, if he found one which he could not name, he was prepared to spend many hours, even days, scanning the literature in English, Latin, German or French until he could identify it.” Oliver was indeed a polymath, with a remarkable facility for languages and an exceptional photographic memory.

However these fungus forays illustrate another of Oliver's qualities. As the Revd James Buxton, Dean of Chapel at Corpus, said at his funeral, “He regarded everyone in the same light, no matter what their achievements, their wealth or their occupation.” He never stood aloof from local activities – working with conservation volunteers, attending bryologists' and lichenologists' excursions to ancient woods, lecturing to and leading field visits for naturalists' groups, and entrancing children with the wonders of nature.

I give the last word to his friend and co-author Dr Jennifer Moody, who said at his funeral: “Oliver Rackham was a prodigious intellect with dashes of Peter Pan and Father Christmas, and our world is diminished without his lively presence.”

Philip H. Oswald

Ray Symonds (1947 –2014)

Ray Symonds, who died last year only weeks after being diagnosed with pancreatic cancer, will have been well known to many readers of *Nature in Cambridgeshire* as a talented and enthusiastic naturalist. For many years Ray was an Honorary Warden at Hayley Wood, where he was involved in regular deer counts, among other activities, and he had a long association with the Wildlife Trust. More recently, Ray had become interested in the natural history and systematic biology of spiders and had converted space at his home to allow work on spiders during his retirement.

Ray retired in 2009, after a working life spent entirely in the University's Department of Zoology, where he served under no fewer than five Heads of Department. He joined the Department in 1964 as electronics technician, acting as assistant to Dennis Unwin, himself a gifted naturalist with a special interest in

flies. Ray spent 21 years in electronics, during which time he became highly valued in the community of neurophysiologists, particularly for his expertise in building electronic apparatus to the requirements on individual workers. In 1985, however, he joined the Museum of Zoology as Senior Technician, under the Directorship of Ken Joysey, thus taking a professional role among the collections that he came to love.

During his time in the Museum, Ray completed an Open University degree in biological sciences while maintaining a full commitment to both job and family. When Michael Akam took up the Directorship of the Museum he lost no time in getting Ray appointed as the first holder of the post of Collections Manager in 1998, a post in which Ray served with great distinction until his retirement in 2009. For the last two years of that period, it became possible for Ray to work (as ‘Special Registrar’) alongside his successor, Mathew Lowe, thus ensuring continuity in what had become a very demanding job. A large part of those demands concerned the creation of a digital electronic catalogue of the collections, a project to which Michael Akam had committed the Museum, recognising that this was a pressing need for the future care and use of material in a museum of international standing. Ray threw himself into this task, enthusiastically working on both the choice and design of the cataloguing system, its implementation and the completion, with the aid of many volunteers, of the hundreds of thousands of individual records of specimens. Over its lifetime, so far, the Museum’s collections have been meticulously documented by three outstanding figures – S.F. (later Sir Sidney) Harmer, in the early decades of the twentieth century, R.D. (‘Doug’) Norman in the 1950s to the 1970s, and Ray. During all this time, Ray was sustained partly by his love of the natural world. There were yearly holidays in Scotland, from which he would return with news of natural history matters, usually including a bulletin on the birds of prey and the otters.

Ray served on the Editorial Board of this journal from 1988 to 2001 and contributed a number of articles. These included a survey of deer in v.c. 29 (*N. in C.* **26** (1983): 52–60) and two papers on deer in Hayley Wood (**22** (1979): 15–20 and **45** (2003): 49–61). Ray also collaborated with Tim Sparks in an article on 40 years of John Clarke’s weather notes in the journal (**42** (2000): 97–103) and most recently contributed a gracious obituary note about Ken Joysey (**55** (2013): 139–140). Philip Oswald vividly remembers how, when he was the Editor, he and an invariably good-natured Ray shared many late-night sessions in the Museum of Zoology creating the camera-ready copy for the journal!

There is no doubt that Ray’s professional legacy is assured, but he leaves a considerable personal legacy too. As a colleague, Ray was a delight. He was modest and unassuming, kind and considerate, with a generally positive approach to all aspects of life. His rare episodes of obvious pessimism were almost always connected with reports of the loss of natural habitat and the extinction of species. We shared an eventual reluctance to open our copies of *Oryx*, with its relentless and responsible reporting of such events. It is a great sadness to all of Ray’s many friends that he died as he was still settling into a fulfilling retirement in Balsham with Judy, his wife. Ray was too much of a

biologist, and had seen too much of the natural world, not to know that, if you get a life, then you will get a death (indeed, he said so quite explicitly), but the rest of us are left saddened by his rapid departure and missing his personality and expertise. Our condolences go to Judy and to Paul and Becky, his children.

Adrian Friday

Bridget Smith (1931–2014)

Bridget was born and brought up in Devizes, Wiltshire. She gained a BSc in Horticulture at Studley College, Warwickshire, then worked at the Wellesbourne National Vegetable Research Station and later at the Tropical Products Institute. In 1976 she moved to Hemingford Grey, when she took up the new post of Head of Training and Educational Advisory Section with the Nature Conservancy Council (NCC) at Huntingdon, being responsible for staff training as well as external educational work. The NCC later relocated to Peterborough; Bridget continued to work there, latterly as Head of Policy Branch, until she retired in 1991 soon after the NCC in England became English Nature (now Natural England).

Her ‘retirement’ was very active, engaging her not only as a botanist but also as a local historian, gardener, and energetic and forthright campaigner for human and wildlife concerns. She served as a Parish Councillor for Hemingford Grey for many years, wrote a history of the village’s Reading Room to celebrate its centenary (1998), and made national headlines in 1994 over her campaign to save Hemingford Grey’s red telephone box. (The then local MP, John Major, wished to have it removed.) She belonged to the St Ives Civic Society and was its Chairman from 1999 to 2004, being honoured with the St Ives Community Challenge Award for this service to the town. She represented the Civic Society at a Public Inquiry into the building of the Guided Busway. Once this became a reality she was a regular user, on trips to Cambridge to attend University of the Third Age lectures or to shop at the Daily Bread store in Arbury.

Bridget especially enjoyed poetry inspired by the natural world and was particularly attracted to the poems of John Clare. She was an enthusiastic member of the John Clare Society, regularly attending its annual festivals in his native village, Helpston, where she made several new friendships.

Between Bridget’s home and the centre of St Ives lies the floodplain of the Great Ouse, with extensive meadows, historically managed for grazing, hay and flood control. Bridget spent nearly 20 years researching the history and biodiversity of these meadows, particularly Hemingford Grey Meadow (also known as the Great Meadow), gave talks, conducted visits, and wrote several pieces about it, including a booklet, *The Great Meadow* (2007, published by the Hemingfords Local History Society), and an article in the Huntingdonshire Fauna and Flora Society’s 2008 Report. Now much more is known about the meadow’s biodiversity and ecological value and how it should be managed as a public amenity. Bridget was appointed a Meadow Reeve, a traditional office of stewardship of the land on behalf of the owner, to help protect the area. She also

worked with the Huntingdonshire Local History Society to preserve the unique New Bridges Causeway, which crosses part of the meadow.

Bridget was an active member of the Hemingford Gardening Society. She enjoyed showing many visitors around her own garden, with its large and varied collection of trees, shrubs, herbaceous plants, culinary herbs and vegetables, offering advice to others and giving away plants and produce. Her conservatory was always crammed with cuttings and seedlings and was frequently raided for gifts.

The Cambridge U3A Botany Group benefited from Bridget's botanical and teaching skills at its meetings. She cared deeply about the countryside and wildlife, and she was an active member of the Wildlife Trust. She was a keen rambler, enjoyed walking, and made several trips in the UK and abroad to enjoy botanising and cultural pursuits. She was a good photographer too.

Bridget was a staunch supporter of *Nature in Cambridgeshire*, an occasional contributor (to No. 41, about Coploe Pit, Ickleton, and No. 44, with memories of her friend Ruth Richens, who helped her to read the 17th- and 18th-century records of the Manor Court of Hemingford Grey), and a distributor of copies to the U3A Botany Group, recruiting a number of new readers and subscribers.

Bridget was a very caring and generous person and a kind and loyal friend; her death on New Year's Eve 2014, after a short illness, was a shock to her many friends, and she is greatly missed.

Jane Bulleid

Dedication of the Leonard Jenyns commemorative windows St Mary's, Swaffham Bulbeck 14 December 2014

Laurie Friday

In May 1823, shortly after his 23rd birthday, the young curate of Swaffham Bulbeck stood up to conduct his first service. The Vicar himself had been absent for years, living in Wisbech. This young man must have understood very well what he was taking on - his father was Vicar of Swaffham Prior and the family home was at Bottisham Hall. When, four years later, he became Vicar, he faced quite a different proposition from the challenges faced by the current vicar, who has five parishes to deal with, although many of the demands of the job were very similar: conducting the services, baptising babies, burying the dead, visiting the sick, repairing the church roof.

But he was exercised by some features of parish life that the present vicar might well be very pleased *not* to have to deal with. There had been no resident Vicar for 130 years and standards of behaviour in church and in the village were in need of considerable improvement. The conduct of the congregation, even on the part of the churchwardens, was shocking to say the least. He set about instilling some discipline. He walked out on a wedding when the young couple ignored his entreaties to stop giggling and take the ceremony seriously and came back only when they promised to behave.

He also successfully opposed all proposals to increase the number of public houses in the village - Swaffham Bulbeck had only three, while Bottisham had more than 20. Showing true grit and grim determination, he rescued the village school from an indolent schoolmaster, set it on a firm footing, and arranged for a new schoolroom to be built next door to the old schoolhouse.

Over a period of 30 years, he provided the village with strong leadership and a much-needed moral compass.

By any standards, Leonard Jenyns was an excellent vicar. But what is truly remarkable is the way he managed simultaneously to pursue a second career, at which he was, if anything, even more spectacularly effective: as a naturalist.

Jenyns had, since early childhood, been completely gripped by the natural world. He was a quiet, self-contained child who entertained himself by collecting 'bugs' and watching birds, and meticulously recording what he saw. At University, and as a young clergyman, he collected voraciously around Bottisham and Swaffham Bulbeck. Surrounded as he was by country sportsmen, this quiet man never fired a gun in his life and depended on a wide network of friends to bring him bird specimens. He traded beetles with Charles Darwin, and many others, who sought him out at the Vicarage. And Jenyns was first choice to accompany Captain Fitzroy on the *Beagle* on the surveying voyage to South America: Jenyns thought about it for a day, decided he was too busy with his parish, and declined. The young Darwin went instead. How different history might have been had Jenyns accepted the offer.

There were very many good 19th century naturalists, and indeed many country vicars who 'did' natural history, but what was so remarkable about Jenyns was the consistency of his recording of all aspects of nature - weather, plants and animals. His notebooks are a treasure trove of information about how the world was in the first half of the 19th century in a pocket of the Cambridgeshire countryside. The accuracy and detail in his records make it possible for us to see how things have changed over the past 200 years, and because he left us weather data as well as species records, we can begin to speculate on why things have changed. Anyone who sets out in Jenyns' footprints to record natural phenomena today will soon realise just how extraordinary his commitment and stamina must have been to continue to do this systematically over a period of decades.

And Jenyns seems to have been a very nice, modest man, too. Charles Darwin asked him how he managed it. Jenyns' recipe was simple - to paraphrase his response to Darwin: he got up early, turned all leisure hours to good account, and never attempted two things at once, but threw his whole mind into whatever he was doing at the time, as if there was 'nothing else to attend to'.

Leonard Jenyns was something of a legend in his lifetime in scientific and natural history circles, and interest in his work has continued fitfully ever since. However, until recently, rather few people in Swaffham Bulbeck, the most notable exception being Gigi Crompton, would probably have thought much about him. But two things happened at once in 2012: Gigi's nephew Bill Walston started writing a series of articles about Jenyns for the *Bulbeck Beacon*, and Richard Preece and Tim Sparks brought out an updated version of Jenyns'

notes on the fauna of Cambridgeshire (Preece and Sparks, 2012). This attracted a certain amount of attention.

It seemed a great shame, then, when the radio and television crews descended on Swaffham Bulbeck in search of Leonard Jenyns, not to be able to point to anything in the village that provided evidence that he had ever been here. Even the list of vicars that normally hangs in the back of the church had been taken away to have our new vicar's name put on it. I thought how good it would be to commemorate him in the church. The Church Council agreed, and we commissioned a pair of small windows for the north porch, overlooking his home, the vicarage. Bill Walston and I have also produced a leaflet (Friday & Walston, 2014) for the church and school about Jenyns' life and work.

The windows have been beautifully engraved by Lesley Pyke. We hope they will constantly remind us of our excellent 'priest naturalist' by reflecting his character and life:

they are quietly understated;

the script is a near match to Jenyns' own lovely clear handwriting;

the inscription is the opening verse of the *Benedicite*, the 'canticle of creation';

there is a *shrew* - Jenyns described and named a chestnut variety of the Common Shrew *Sorex araneus* from a specimen he found at Bottisham Hall; and they are in the porch, the bridge between the church and the natural world outside.

Preece, R.C. & Sparks T.H. (eds.) (2012). *Fauna Cantabrigiensis The vertebrate and molluscan fauna of Cambridgeshire by the Rev. Leonard Jenyns (1800–1893): transcript and commentaries*. The Ray Society.

Friday, L.E. & Walston W. (2014). *The Reverend Leonard Jenyns, Vicar of Swaffham Bulbeck: a Naturalist for our Time*. Swaffham Bulbeck PCC.

BOOK REVIEWS

The Ash Tree. Oliver Rackham. Little Toller Books, Toller Fratrum, Dorset, 2014. Hardback. 178 pages. ISBN 978-1-908213-14-3. £15.

The late Professor Rackham was well-placed to write a book on the Ash (*Fraxinus excelsior*), drawing on his personally amassed wealth of knowledge on the historical development of the countryside and in particular woodland, often within Cambridgeshire. This book is one of several titles in a series of Toller monographs related to new writing attuned to the natural world. In size it is small; at 190 x 135 x 20 mm it can fit well on any bookcase. Within the preface and six chapters are four tables, and the 92 figures are mostly in colour.

Rackham's writing style ensures that the facts are easily absorbed and understood, and his frequent inter-weaving facts on other tree species makes the content all the richer; there is something of interest for readers from any background. Chapter 1 describes the behaviour, general biology and ecology of

the Ash. In subsequent chapters Rackham delves into its prehistory and history; veteran, ancient and exceptional trees; its place in human culture, its role in medicine and spiritual healing; and discusses pests and diseases both currently present in the UK, and those that threaten us from beyond our borders. He finishes with an overview of its recent past and future.

Ash is one of the most productive hardwoods in Europe, and is one of our commonest trees in Britain. Rackham reveals how its strength and elasticity are qualities that even our Neolithic ancestors recognised while building their tracks across the marshlands of Somerset, and describes why products have been made from it through the centuries. He explores how it co-exists with wildlife. For instance on page 52 his observations of elephant damage to Ash trees at Whipsnade Zoo leads him to speculate that sprouting of Ash [after coppicing, which is a type of damage] could be a successful defence mechanism. He describes “notable trees”, including one so large that a school was housed within its hollow interior! We discover that poets and playwrights were not especially partial to Ash in their writings; Shakespeare mentions it only once compared to 31 times for Oak. And after finishing the section on the magical Ash in Chapter 4, I know now that a tree in Richmond Park (about 400 years old when it finally collapsed in the Great Storm of 1987) was called a “Shrew-Ash” – Shrew-Ashes had a live Shrew walled within them to which people came with their children for healing.

It is within the final two chapters that Rackham becomes most passionate as he presents his arguments that globalisation of nursery trade, travel, and movement of wood-products and soil is now the single greatest threat to the world's trees and forests: on page 117 he writes: “*This book is a response to the eruption of public interest in Ash in October 2012, following the announcement of a ‘new’ and ‘terrible’ disease. The disease was not very new: it should have been seen coming for 20 years*”.

The disease that Rackham is referring to is “Ash Dieback” caused by the basidiomycete fungus *Hymenoscyphus fraxineus* (synonym *Hymenoscyphus pseudoalbidus*, this latter name being used by Rackham before *H. fraxineus* became the formal name). The asexual morph (anamorph) of *H. fraxineus* is *Chalara fraxinea*, which was published as a fungus new to Science as recently as 2006 – hence the scientific name for the disease is “*Chalara dieback*”. Rackham refers to the disease on page 8 as “Ash Dieback”; thereafter he always calls it “Ash Disease”. In his chapter on pests and disease, Rackham adequately covers a range of organisms that do harm to the Ash, then focuses in depth on all aspects of the Dieback itself. He notes that it was first discovered in or around Latvia c.1990 and was then observed to spread relentlessly westwards. It was first confirmed in Great Britain in a nursery in 2012, and later in that same year in the “wider environment” (woodland) in Norfolk. Rackham makes it clear that he believes that the cases at tree nurseries could be explained by infected plants being inadvertently imported from the Continent for growing-on, but acknowledges that incidence in the “wider environment” could possibly be independent of imports, perhaps resulting from direct spore dispersal over the North Sea.

A few developments have occurred since Rackham made his researches. Detailed morphological studies by light microscopy in combination with molecular work have now shown that a confusion species, *H. albidus*, can be differentiated on morphological grounds from *H. fraxineus* with certainty. Testing has shown that between July 2013 and March 2015, confirmed sites have increased in total from 549 to 1055. *C. fraxinea* is rarely found to sporulate in nature and conidial production does not appear to play any role in the infection process. It is now known that natural infection of seed occurs, an obvious concern to protection authorities in dieback-free countries but eradication hot water treatments experimentally have shown promise.

Rackham condemns the “bureaucrats” who allowed conditions of trade to be such that the pathogen was able to enter Britain; he mentions the Press’ outcry at the time that it was a “man-made disaster” and a “scandal that should have been avoided”. This is a mite unfair to the authorities: plant passport procedures were in place for the importation of living Ash trees according to EU regulations. However, Rackham eloquently explains why these would not prevent *Chalara*. Rackham is still more concerned about another threat to the UK Ash, the insect pest *Agrilus planipennis* – the Emerald Ash Borer – which he describes as “one of the most feared beetles on earth”. Considered to have entered North America in a shipment of Japanese car parts, it is causing serious fatal losses there. Rackham muses, “what happens when Emerald Ash Borer reaches Britain” (note *when*, not *if*, it reaches us), which again reflects his belief in the inevitability that intercontinental trade in its current situation goes hand in hand with the globalisation of diseases and pests.

Rackham puts across his message using ample evidence from numerous introductions of diseases and insect pests in various countries. We may need to start with greater regulation of plant imports, but Rackham is actually pleading for a radical shift in attitudes to commerce to go some way in protecting his woodlands from further destruction.

Michael F Foley

An illustrated guide to the land snails of the British Isles F. Naggs, R.C. Preece, R. Anderson, A. Peiris, H. Taylor & T.S. White, 2014. Joint Conchological Society / Malacological Society Publication, SRP Ltd., Exeter. Published in association with the Natural History Museum and the University Museum of Zoology, Cambridge. 12 page laminated fold-out, colour-illustrated. ISBN 0 565 09363 0. £2.00

The diagnostic key, used to identify most groups of animals and plants, has not really caught on for molluscs. So malacologists (proper mollusc biologists) and us conchologists (shell collectors) generally use pictures in books and on web sites to identify shells. But not fold-out charts which are more often used by beginners, amateurs and often children to get a feel for the common or plants or

animals of a particular habitat. So my first reaction at seeing this 12-panel fold-out chart to all land snails of the British Isles was: ‘there are too many of them and it will not work’.

But it does work! This laminated sheet, smaller than a tabloid newspaper, has high definition and glorious colour images of all 110 native and established alien shelled land gastropods of the British Isles. All of them! And most are photographed from two or three different angles to really get to grips with proper identification. The layout is clear, not cluttered and nicely labelled. But, practical and good quality production is only part of the story.

For most people identification and taxonomy are ‘difficult’ and ‘strictly for the professionals’. Yet here is a complete guide to an entire ‘group’ of the British fauna on one folding sheet. There is no terminology, no key, indeed almost no words to explain the shells. The crisp, nicely detailed and flat-lit images with no shiny highlights do the explaining far better than mere description. You immediately see all of our snail shells in one vista and get a real feel for what is potentially out there, or in your hand, or under your hand lens or microscope. The presentation is taxonomic, but not so that it becomes ‘specialist’ or even daunting for the beginner. Indeed there is a sleight of hand here – with different panels of the guide devoted to ‘tall’ or ‘flat’ or ‘really small’ shells, you get an instant feel for the types of snail shells and then (another sleight of hand) for their taxonomy. Absolutely anybody, and I mean anybody, can use the chart.

So, with a bit of experience or patience you could work out you were perhaps looking at ‘*Trochulus hispidus*’, or you may be a beginner but understand you evidently have a ‘some species of *Trochulus*’, and equally exciting, a school child on a field course using a hand lens for the first time and see **your** snail is on the page of ‘Hygromidae’. All three of you have an appropriate answer from one sheet of pictures. Job done. But if you want to know more, the guide tells you which books, journals, societies or web sites are the best next steps to find out more about snails; which is how we become content and conchologists or (even) malacologists.

So who *needs* this chart? The professional ecologist or malacologist will find no monograph so comprehensively illustrated. The interested beginner, amateur naturalist or conchologist will find no guide book so economical and useful. The university, college, field centre or school will find no animal identification resource with so few barriers to learning or teaching.

Copies of this guide can be ordered from either the Conchological Society (www.conchsoc.org) or Malacological Society (www.malacsoc.org.uk), whose sales are being handled through the NHBS at <http://www.nhbs.com>.

Philip Pugh, Anglia Ruskin University, Cambridge.

Atlas of British & Irish Bryophytes edited by T.L. Blockeel, S.D.S. Bosanquet, M.O. Hill & C.D. Preston. Pisces Publications, 2014. Hardback, 1250pp. Volume 1:ISBN 978-1-874357-61-2, Volume 2:ISBN 978-1-874357-62-9. £75.

I had visualised the Atlas as being atlas sized, perhaps A4 or a little larger such as the New Atlas of the British & Irish Flora. The package that arrived on my desk was much chunkier – could this be it? It was, and whilst the blurb does say that the book is 240x170mm, it omits the x80mm total depth and the hardback covers mean that it stands a little larger than the page size. The amount of highly detailed information to impart combined with the page size being used has forced a small font size and this may make reading difficult for some.

Volume 1 begins with six chapters introducing the Atlas, the methodology and the conclusions that can be drawn from the observations. The meat of the Atlas comprises the distribution maps, with over 1000 pages, each devoted to a single species, sub-species or variety. These show clearly the distribution of the bryophyte being discussed, and its altitudinal preferences. Where the maps rather fail is in showing expansion or decline, though this can be obscured by the patchiness of recording effort. Records are divided into three date classes, which are shown in shades of black and white. The problem is that the shading for the most recent and middle classes is difficult to distinguish at a glance. Given that the entire Atlas was printed in colour, different colours could have been used for each date class. Indeed a better visualisation was used for a few example maps in Chapter 5, although these only show two date classes. Expansion or contraction of range could be shown by using “recent on top” or “earliest on top” as appropriate. As well as the maps, there is a description, and often a picture, of the typical habitat, some comments on the distribution and reproductive biology, any issues with identification and notes on the wider distribution. These make the Atlas a very useful companion to the British Bryological Society Field Guide.

What key points does the Atlas show for our area? First it is a well recorded part of the country in part due to the presence of generations of Cambridge based bryologists. The southern part of the county is relatively rich in species for a lowland area, whilst the northern fens are species poor, particularly for liverworts. For some species, large expanses surrounding our county without dots on the map suggest that we are extremely unlikely to ever see them, but others are frequent not that far away and so might be found, particularly if their range is expanding. Inevitably in this respect the Atlas was out of date as soon as it was published as the new bryophyte records found in this issue show. This is only to be expected as the Atlas reveals that approximately 1 out of every 367 records is a new county record. Two likely liverwort additions for vc29 that have been found not far away are *Lophocolea semiteres* (found in vc31 in January 2015) and *Microlejeunea ulicina*. Transport of building materials moves aggregates across the country and trade in plants covers the globe. Aliens are therefore likely to appear from time to time, perhaps some not even listed in the Atlas. The discovery of *Pogonatum urnigerum* in West Cambridge in 2014

illustrates a species that has probably arrived as a result of movement of materials.

Whilst the Atlas can give some hints as to which new species might be found to occur in Cambridgeshire, serendipity, experience and diligent observation will also play their parts in finding them. The regular Cambridgeshire Bryology Group outings during the winter months are a good way to help build experience. If by chance or by diligent observation you do find a bryophyte that doesn't appear to be known from Cambridgeshire do send a sample to the county recorders. You will soon be contributing dots for the next Atlas!

Jonathan Shanklin

Route and Branch. Bill Clark. Milton Contact Limited, Milton, Cambridge. 2013. Paperback. 354 pages. ISBN 978-0-9571959-3-6 £16

I was unsure about agreeing to review this book. I am not a fan of autobiographies, often preferring a more scientific or factual account of sites or histories, but I took the plunge for the purposes of review. However, I really enjoyed this book, essentially two stories in one. The first half is Bill's personal account of agriculture in lowland England during and after the Second World War, and the more enjoyable of the two halves for me. The second half covers Bill's time at Wandlebury, from 1973 until his retirement in 1998. There were many direct reference points in this half of his narrative for me, having lived on the Gogs but two hills away in the mid 1990s; I recall the wasp venom collecting box detailed so well, working in the same department as those researchers and having them visit our lawn that summer, too, and recall walking at Wandlebury myself in that time, often bumping in to Bill.

Returning to the first half, this would make a great study for anyone interested in agricultural change, and it is clear that teenagers were far more valuable on the land rather than at school (and probably had a better time, despite the hard work). The sheer hard work of the average farm worker in the 1940s and '50s is probably so remote to most people today that we wonder how on earth that much work was ever done by anyone, but that is how the land was made productive. My favourite anecdote from this half was of a visit by bicycle to an agricultural auction by Bill, his father and uncle, and the subsequent transportation home (about 10 miles away!) of a 15m long, 100kg thatching ladder, beautifully made from a single ash expertly split along its length, with oak foot-treads – it sounds an amazing piece of craftsmanship. The two adults cycled it home on their shoulders, with the teenage Bill being too short to be of use on the ladder but dutifully employed ahead checking for traffic at junctions, etc. Just imagine two cyclists having the skill and strength to carry a ladder, cycling at an even speed and separation for several miles. This would surely be impossible on our modern roads, without serious chaos ensuing.

Lots of anecdotes of angry bulls, destruction of hedges, working with landgirls, bunking off school and going rabbiting are the core of the first section.

The 1960s saw a spell of civil engineering – Bill helped build the M1, but an increasing awareness of the increasing intensification of farming, the damage it was doing and the impact of hedgerow removal etc. saw him move first to a smallholding in Essex and then to Wandlebury, where the next stage of this book begins.

Battles with bureaucracy loom large and often in the Wandlebury phase. There is lots of cutting down trees here, necessary to preserve the life of trees in the long term, but also after the drought of 1976, where Wandlebury was closed for many weeks to avoid people being injured by randomly-dropping beech branches, and then the storm of 1987 and the significant aftermath, and the sheer logistics of tidying up many tens of fallen trees – Bill’s quick-thinking made sure he was ahead of many in the queue for timber contractors and chainsaw spares which must have been significant in October 1987!

In amongst the trees, there are also bats – with their specially built tunnel, and one landing on a terrified contractor carrying out some emergency work to a damaged tree, and bees, Bill’s other passion. The filming of beehives for an advert is a fine example of just how long film crews can take to go over and over the same ground, and just how annoyed bees can get with repeated interference in their hive, and its consequences! Grassland management, balancing the needs of visitors, pollinators and flowers also recur several times, also with a dig at generalised, one-size-fits-all grassland management practises which are so often the norm these days.

Nature is interspersed in this narrative, and Bill cites *Nature in Cambridge* as an excellent journal (and why wouldn’t he?), as is archaeology, and the real and imagined archaeological significance of the site, with its real Bronze age site and its imaginary white figure in the chalk.

One of the final sections, somewhat unchronological, unlike the rest of the tale, relates an analysis of how far he walks in a year and therefore how many miles per boot one gets from cheap or well-made footwear of various types!

A well-written but very personal history of rural life in lowland England in the second half of the 20th century, with some natural history and a local angle thrown in for good measure, *Route and Branch* covers a wide range of topics, broken down into very readable short chunks – ideal for dipping in and out of rather than having to read all in one go, although you will probably find yourself engrossed in at least parts of the book once you start, just to find out what happens next!

Louise Bacon

Weather notes from Cambridge University Botanic Garden for 2014

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2014 was a wetter than average year with 617.7mm of measurable rain. We had a mild and wet winter with some localised flooding across the garden. Spring was early and dry through March and April. In March there was a sustained dry period where no rain fell for two full weeks and the ground was cracked in places. Summer was warm, but often quite wet, which meant lush vegetation up until September, which heralded a dry autumn. The mild weather continued until the end of November before we had any severe frosts and winter was upon us once again.

January was wet, mild and stormy. We had 83.8mm of rain and it was the wettest January since 1995 with only five wetter Januarys on record. Three thunderstorms occurred along with several instances of hail and there were consistent light ground frosts throughout the month.

February turned mild and very wet which pushed us into an early spring. After January's wet month, February rain totalled at 60.9mm and a fall of 23.1mm on the 6th cause localised flooding within the garden and across the nation. There were also several storms and gales throughout the month causing the garden to close on the 14th and 15th.

March was mixed but warm and much drier than average with only 16.6mm of measurable rain and a maximum temperature reading of 20.2°C. Several heavy hail showers passed through that lay on the ground until the following day but the dry weather caused the ground to dry out and crack.

April extended the mild and dry spring with only nine days of measurable rain and a total of 14.5mm. The ground continued to be cracked and dry even with light falls of rain.

May proved fine and mild with a heat wave mid-month during which we recorded a maximum temperature of 25.5°C on the 19th. It was a wetter than average month with 71.7mm of measurable rain.

June was consistently warm and sunny with a maximum temperature reading of 26.9°C on the 9th. Three thunderstorms passed through with average rainfall.

July was the hottest month of the year with three readings of 29°C and the year's maximum of 31.0°C on the 18th, as well as the highest air minimum of 19.2°C in the same evening. With all this heat came six instances of thunder, though not all the thunder storms passed directly over the garden.

August was wetter than normal with 91.9mm of measurable rain. This included the wettest day of the year when 33.7mm of rain fell on the 8th. It was cooler than normal and there were three thunder storms and one hail shower.

September was dry and mild with the highest maximum reaching 26°C and an average of 21°C and only 18.1mm of rain fell.

October was very mild with an average maximum of 17.4°C and a high of 21.5°C. The garden suffered its first ground frost at the start of the month where the grass reached -1.2°C though the air stayed above freezing. Rainfall was average 59.7mm over 17 days of measurable rain and one day of very heavy rain on the 12th in which 20.3mm fell in one night.

November was a very warm month with average maximums of 12.6°C and an overall high of 21.5°C and only three light air frosts. It was slightly wetter than normal with 21 days of measurable rain, bringing the monthly total to 63mm. This included three days when the reading was over 10mm and there were several days where parts of the paths around the Garden were flooded.

December was a drier than average month with mixed weather. Rainfall measured 39.7mm in total, of which most fell in one go on the 27th when 15.3mm was measured. This fell as sleet and rain while most of the more northerly parts of the UK had snow. The last week gave us a taste of proper winter with a succession of hard frosts. Overall we had eight air frosts, the coldest being on the 30th at -3.4°C, and 20 ground frosts, the coldest being -8.8°C.

	Mean max temp		Mean min temp		Highest temp	Lowest temp	Rainfall (mm)	
	(°C)	<i>diff</i>	(°C)	<i>diff</i>	(°C)	(°C)	(mm)	<i>diff</i>
January	9.7	2.6	3.0	1.7	13.1	-3.1	83.8	39.5
February	10.2	2.4	3.9	2.9	14.1	0.8	60.9	28.1
March	13.7	3.1	3.5	0.8	20.2	-2.3	16.6	-23.5
April	16.4	3.4	6.5	2.5	21.2	-0.2	14.5	-28.2
May	17.5*	0.6	8.6*	1.9	25.2*	1.2*	71.7	27.4
June	21.0*	1.2	10.9	1.2	26.5*	6.4	46.9	-6.9
July	25.4	2.8	13.9	2.0	31	7.7	50.9	9.2
August	21.6	-0.9	11.1	-0.6	26.5	4.7	91.9	43.6
September	21.0	2.0	11.3	1.6	26	5.0	18.1	34.2
October	17.4	2.5	9.6	2.8	21.5	1.2	59.7	5.4
November	12.3	1.9	6.0	2.5	17.6	-1.9	63.0	11.3
December	8.8	0.9	2.4	0.3	13.9	-3.4	39.7	-10.9
Total:							617.7	60.8

The 'diff' columns show the difference between the 2014 value and the 1971-2000 mean.



Plate 3. Close-up of Interrupted Brome (*Bromus interruptus*) at the re-(re)-introduction site in Whittlesford. 19 June 2014. See article on page 97.



Plate 4. Memorial window for Rev Leonard Jenyns. See article on page 148.



Plate 5. Woolly Thistle (*Cirsium eriophorum*). See article on page 85.