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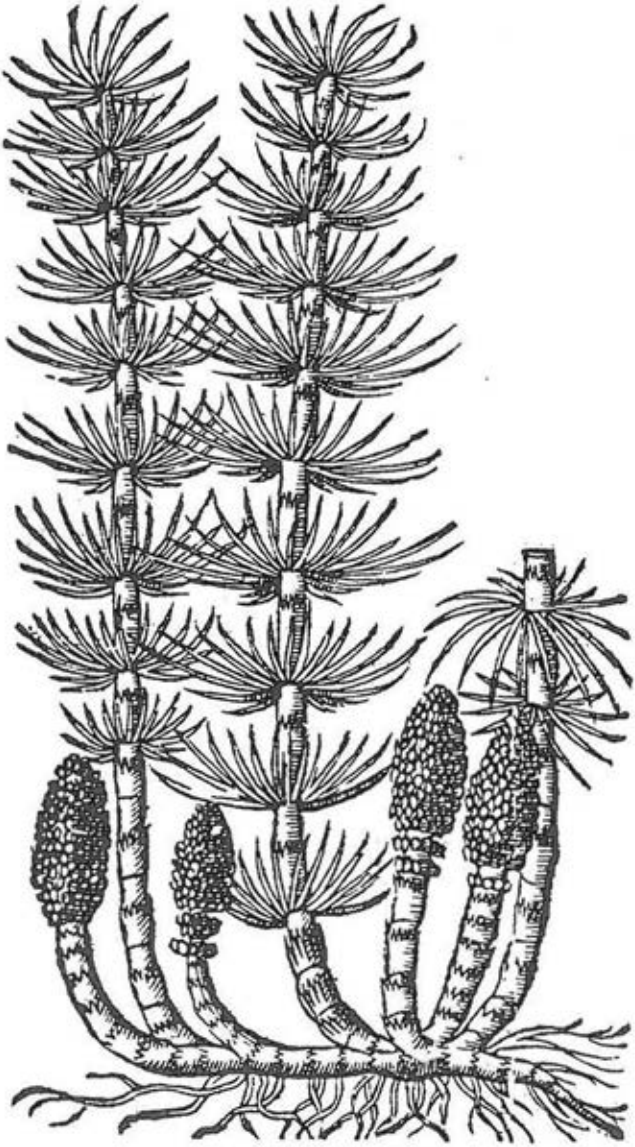

Left: the Cambridge Bryological Excursion to the Fleam Dyke held on Saturday, 7 February 1998, to celebrate sixty years of these events, with Mark Hill in the foreground.
The second excursion, on 19 February 1938, was to this site. See pp. 41–49 and inside cover photos of N. in C., No. 30 (1988) for information about the fiftieth anniversary celebrations.

Below: The late John Faulkner (1904–1997) in the field: see pp. 83–84.

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Cover photograph: "EQVISETVM maius cum asparagis nouellis" – woodcut of Great Horsetail *Equisetum telmateia* in Matthias de Lobel's *Plantarum seu Stirpium Historia* of 1576 (see pp. 10–11) Cambridge University Library

Copies of *Nature in Cambridgeshire* may be obtained from the Herbarium, Department of Plant Sciences, Downing Street, Cambridge, CB2 3EA (price £3.50 by post). Copies of many earlier issues are also available. Articles for consideration for No. 41 should be submitted to the Editor, Mr P.H. Oswald, at 33 Panton Street, Cambridge, CB2 1HL, by 31 January 1999.

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Editorial

For the first time since *Nature in Cambridgeshire* became an independent journal in 1986 we are putting up its price! Copies of this and subsequent issues will cost £3.00 instead of £2.50, and the cost to subscribers who receive their copies by post will be £3.50. The size of this year's issue is the same as last year's and we hope that our readers will regard it as still good value for the money.

Copies of many past numbers are still obtainable from our Membership Secretary, Jane Bulleid, but some have long been unavailable; offers of unwanted copies would be greatly appreciated, as in some cases there is a waiting list.

Once again we express our thanks to Professor Michael Akam, Director of the Cambridge University Museum of Zoology, for the use of facilities to produce this issue.

Philip Oswald

A mare's-nest of horsetails: John Ray's treatment of "Equisetum" in his *Cambridge Catalogue* (1660)

P.H. Oswald & C.D. Preston

Introduction

"Few books of such compass have contained so great a store of information and learning or exerted so great an influence upon the future; no book has so evidently initiated a new era in British botany." C.E. Raven's (1942) summary of John Ray's *Catalogus Plantarum circa Cantabrigiam nascentium* (1660) appears at first to make rather rash claims for a book which was not only small in size but modest in intention. In the *Cambridge Catalogue* Ray simply set out to list the wild and cultivated plants that he (and a few colleagues) had found growing around Cambridge. The species are listed in alphabetical order, usually under names taken from earlier publications. In addition to the primary names he allocated to the species, Ray usually cited synonyms from other works, both English and foreign. In identifying the species he knew in Cambridgeshire he relied particularly on the books of the two brothers Jean and Caspar (or Gaspard) Bauhin, for whose work he had a high regard. (Even the title of the *Catalogus* is modelled on that of *Catalogus Plantarum circa Basileam spontè nascentium*, a list of plants growing wild around Basel published by C. Bauhin in 1622.) Occasionally Ray was not able to match a species he knew with anything described in the published literature, and he then provided a description of his own; if he was doubtful he added critical notes. Ray's aims are simply stated, but his task of identifying the species he found in the field, using the often confused and contradictory literature available to him, must have been immense. His detailed and scholarly work surpassed anything previously published in England and marked the beginning both of Ray's own botanical career and of the writing of 'county Floras'. It was this that led to Raven's assessment of the importance of the *Cambridge Catalogue*.

Ray was writing long before the binomial nomenclature of Linnaeus gave formal recognition to the division of plants into genera and species. Nevertheless, Ray and many of his predecessors and contemporaries recognised what we would call genera today. The first word of a plant's name indicated the genus; where more than one species was recognised, a further word or words were added to describe the species. Ray did not consistently use the word "genus" to refer to a group of species sharing an initial word in their names, but we shall refer to such groups as 'genera' in this paper.[1]

Many of the 'genera' recognised when Ray began his botanical studies were based on single, easily observed characters or on shared herbal or culinary properties. They were often highly artificial, comprising species that we would now place in different families or even different classes. In the *Cambridge Catalogue* Ray accepted these genera, although he sometimes expressed his reservations about their composition. Later in his career he often regrouped the species into genera which provided a more accurate reflection of the true affinities of the species. A good example of the way in which Ray refined the taxonomy that he inherited is provided by the genus "Potamogeiton" (now *Potamogeton*), discussed by Preston (1995, p. 13). In the *Cambridge Catalogue* the species currently placed in *Potamogeton* were scattered in three different genera, "Millefolium" (which included *Potamogeton pectinatus* and a wide range of aquatic plants with finely divided leaves), "Potamogeiton" itself (including *Persicaria amphibia* and *Zannichellia palustris* as well as five true *Potamogeton* species, two previously undescribed) and "Tribulus" (comprising *Potamogeton crispus* and the closely related *Groenlandia densa*). In his subsequent books Ray gradually amended the classification, and by 1696 he had brought together *Potamogeton* and the related genera *Groenlandia* and *Ruppia* into a single genus, from which other taxa were excluded.

In addition to altering the genera, Ray later revised the taxonomy of some of his species as he gained more experience of the plants of Britain and Europe or received further information from correspondents. In a few cases he realised that he had misidentified a Cambridgeshire plant, which later turned out to differ from the species to which he had referred it. He also had cause to separate species which he had initially treated as one or to unite species which he had previously considered distinct. Several authors, notably Martyn (1763), Babington (1860) and Ewen & Prime (1975), have attempted to equate Ray's pre-Linnaean nomenclature to names in the binomial system introduced by Linnaeus. In allocating modern names to Ray's Cambridgeshire plants one has to consider evidence from the *Catalogue* itself, from Ray's later work and from independent studies of the past and present distribution of the species in Cambridgeshire. Many of Ray's names can be equated to modern names beyond reasonable doubt, but there is an element of uncertainty about others. Raven (1942, p. 90), following Babington (1860), suggests that "there is in fact . . . only one species in the Catalogue which defies identification" (though he admits that "there is occasionally room for doubt"), but the identification of Ray's Cambridgeshire plants is not always as straightforward as this implies.

In this paper we look at one group that presents particular difficulties, the species incorporated in Ray's *Cambridge Catalogue* in the genus "Equisetum" (horsetails). Ray included in "Equisetum" a range of flowering plants and cryptogams with whorled branches or whorled, simple or forked leaves.

Equisetum in Britain

The genus *Equisetum* as currently understood is well represented in Britain, where both of the subgenera recognised by Hauke (1974) and nine of the 15 species occur. Subgenus *Equisetum* comprises species with annual green stems which develop in spring and die down in autumn. In most British species, *E. fluviatile*, *E. palustre*, *E. pratense* and *E. sylvaticum*, the cones are borne at the apex of these green stems. However, the green stems of the two remaining British species in this subgenus, *E. arvense* and *E. telmateia*, are solely vegetative and the cones are borne on separate shoots which lack chlorophyll and only persist for a few weeks. The cones of all the species in subgenus *Equisetum* are obtuse at the apex. In subgenus *Hippochaete*, which includes the native British species *E. hyemale* and *E. variegatum* and the naturalised alien *E. ramosissimum*, the stems are perennial and bear at their tips cones with an acute apex. The green stems in both subgenera may be unbranched or bear whorls of branches, the branching varying between and sometimes within species.

Ray's treatment of "Equisetum" in his *Cambridge Catalogue*

The species listed by Ray (1660) are dealt with individually below, starting with Ray's original text. All Ray's botanical works are written primarily in Latin, and historians have long recognised that this made his work accessible to his European contemporaries but has handicapped the appreciation of his work by later generations of his own countrymen. A translation of the *Cambridge Catalogue* is available (Ewen & Prime, 1975), but this is sometimes incomplete or inaccurate (see, for example, note 5). In this paper Ray's own text for each species is followed by P.H.O.'s translation of the parts in Latin, with an expansion of Ray's abbreviations (with asterisks indicating illustrations in the works quoted), and then by our interpretation of the species reported. Translations from Latin are given within single inverted commas, to distinguish them from actual quotations, which are enclosed by double inverted commas. "Equisetum", "Hippuris" and "Polygonum" are translated as their traditional English equivalents – 'Horsetail', 'Mare's-tail' and 'Knotgrass' respectively – even though they do not necessarily correspond to the plants now designated by these names.[2]

Equisetum arvense longioribus setis

"Equisetum arvense longioribus setis *C.B. Park.* segetale *Ger.* Polygonum fœmina *Fuch. ico.* Hippuris minor *Trag. Dod. Thal.* arvensis major *Tab.* Equis. minus terrestre *I.B. Corne Horse-tail*"

'Field horsetail with longer bristles' of Caspar Bauhin (1623, 1658) in *Pinax*, p. 16: IX, and *Theatrum Botanicum*, cols 247–8: IX*, and of John Parkinson (1640) in *Theatrum Botanicum*, p. 1202: 12. 'Corn [horsetail]' of John Gerarde (1597) in *Herball*, p. 956 (pp. 1113–4 in Johnson's 1633 and 1636 editions): 3*. 'Female knotgrass' of Leonhart Fuchs (1545) in *Imagines*, p. 353*.[3] 'Lesser mare's-tail' of Jerome Bock or Tragus (1552, 1553) in *De stirpium*, 2: pp. 693–4* and *Verœ ... imagines*, p. CCXI*, of Rembert Dodoens (1583, 1616) in *Stirpium historiæ pemptades sex*, pp. 72–3*, and of Johannes Thalius (1588) in *Sylva Hercynia*, p. 56 (without any description).

'Greater field [mare's-tail]' of Jacob Theodor Tabernaemontanus (1588) in *Neuw Kreuterbuch*, 1: p. 698: III*. 'Lesser terrestrial horsetail' of Jean Bauhin *et al.* (1651) in *Historia Plantarum Universalis*, p. 730*. *Corne Horse-tail.*

We agree with all earlier commentators, including Babington (1860), that this plant is *Equisetum arvense*. Some of the illustrations cited by Ray are clearly recognisable as *E. arvense*, particularly those of J. Bauhin *et al.* (1651) which show a vegetative stem which is clearly copied from the "Equisetum minus" ('Lesser Horsetail') of Fuchs (1542, p. 323: see note 3) and a separate cone-bearing stem. C. Bauhin's figure (Figure 1) shows fertile and whorled, barren shoots arising from the same rootstock, but one of the latter has what looks like a small cone at its tip.

This species is not only morphologically but ecologically distinct from the other northern European species, as it is the only one which characteristically occurs as a weed of dry ground. This is probably one reason for its early recognition by botanists. As Ray's English name "*Corne Horse-tail*" suggests, the early British botanists regarded it primarily as an arable weed: Gerarde (1597) describes it as "Horse taile which for the most groweth among corne, and where corne hath beene", and Parkinson (1640) found it "growing in the borders of the Corne fields, and often ploughed up when they fallow their grounds, so great, that a stalke hath beene like a small bush". Although it does still occur in arable fields, for example as an associate of *Lythrum hyssopifolia* at its Cambridgeshire sites (Preston & Whitehouse, 1986), nowadays in Britain it is more frequently found in other habitats. Early botanists may have overlooked it in some moist habitats where it is frequent now, but it has doubtless spread into habitats which were not available or less frequent in Ray's time, including disturbed roadsides, railways, canal sides and urban waste ground.

Figure 1: "Equisetum arvense longioribus setis", *Equisetum arvense*, as depicted by Caspar Bauhin (1658)

Figure 2: "Equisetum fœtidum sub aqua repens" of C. Bauhin, *Chara* sp., depicted first in *Prodromus* (1620)

Equisetum fœtidum sub aqua repens

"Equisetum fœtidum sub aqua repens *C.B. I.B. Park.* 8, seu fœtidum sub aqua repens Bauhini *Ger.* minimum aquis cœnosis innatans, vel sub iis occultatum semper, brevissimis et asperis setis ac caulibus lutosum virus olentibus *Lugd. Stinking water Horse-tail.*"

'Fetid horsetail creeping under water' of Caspar Bauhin (1620, 1623, 1658) in *Prodromus*, p. 25: V*, *Pinax*, p. 16: XIII, and *Theatrum Botanicum*, cols 250–2: XIII*, of Jean Bauhin *et al.* (1651) in *Historia Plantarum Universalis*, p. 731*, and of John Parkinson (1640) in *Theatrum Botanicum*, pp. 1201–2: 10*. '8th [horsetail] or Bauhin's fetid [horsetail] creeping under water' of Gerarde (1633, 1636) in *Herball*, p. 1115: 8. 'Least [horsetail] floating in muddy waters or always hidden under them, with very short, rough bristles and stems that smell of muddy slime' of Jacques d'Aléchamps or Dalechampius (1587) in *Historia Generalis Plantarum*[4], p. 1070. *Stinking water Horse-tail.*

It is immediately apparent from the translation of Ray's text that this species must be a *Chara*: no other *Equisetum*-like plant possesses the fetid smell cited in the descriptive phrases that Ray quotes. Indeed, d'Aléchamps (1587) says that the plant he described was called "*chara*" by the people of Lyons. Any doubt is removed once one reads Parkinson's description, adapted from C. Bauhin's (1620) original Latin one, of a plant which is "greene while it is in the water, but taken forth and dryed it becommeth gray and brittle, easie to be rubbed into pouther with ones fingers, . . . and smelling somewhat like unto Brimstone".

The most interesting of the earlier descriptions of *Chara* cited by Ray are those of "Equisetum" 7 and 8 added by Thomas Johnson in the 1633 edition of Gerarde's *Herball*. No. 7 is described thus: "some two or three inches high, . . . the colour of the whole plant is gray, a little inclining to green, very brittle, . . . My friend M[r]. *Leonard Buckner* was the first that found this plant, and brought it to me; he had it three miles beyond Oxford, . . . in the end of August, 1632." Buckner had been one of Johnson's companions on his famous *Iter Plantarum*, a botanising trip to Kent in July 1629 which was the subject of his first botanical publication (Johnson, 1629; Kew & Powell, 1932; Gilmour, 1972). The commonest *Chara* species in southern England is *C. vulgaris* and Johnson's description could certainly refer to this species, which is often encrusted with calcareous matter and therefore grey in colour. The only other small species which is at all frequent, *C. globularis* sensu Moore (1986), now often split into *C. globularis* and *C. virgata*, is perhaps more frequently a purer green in colour.

Johnson reported his other species, "Equisetum 8", from "diuers ditches, as in Saint Iames his Parke, in the ditches on the backe of Southwarke towards Saint Georges fields, &c." and said that "it growes sometimes a yard [91.4 cm] long". The entire account reads as if it is written from Johnson's own field observations. Judging by the size, this plant is *Chara hispida* sensu lato. Moore (1986) gives the maximum length of 90 cm for *C. hispida*; the only other species she describes as exceeding 60 cm is the very rare, predominantly coastal *C. baltica*. It is interesting that Ray selected Johnson's second species ("Equisetum 8") as the synonym of his Cambridgeshire plant. This perhaps suggests that Ray may have seen a large *Chara*, which would almost certainly have been *C. hispida*, in Cambridgeshire. However, he also cited C. Bauhin (1620), who writes of a plant with stems "quandoque cubitalibus" ('sometimes

a cubit [half a yard] long'), and Parkinson (1640), whose description is too brief to do anything other than identify his plant to genus but is accompanied by a slightly simplified copy of Bauhin's original illustration (Figure 2), a somewhat stylised illustration of a plant with naked axes, short internodes and prominent bract-cells which suggests *C. vulgaris*. All that one can reasonably conclude is that Ray's "Equisetum fœtidum sub aqua repens" covers one or more species of *Chara* and that the species he is most likely to have seen in Cambridgeshire are *C. hispida* and *C. vulgaris*.

The above interpretation is more cautious than that of Babington (1860) and Ewen & Prime (1975), who identify Ray's plant unequivocally as *Chara vulgaris*. Rather surprisingly, Groves & Groves (1880) suggest that both the *Chara* species of Gerarde (1633) are probably *C. vulgaris*. However we think there are good grounds for believing that they were distinct taxa.

Equisetum nudum

"Equisetum nudum *Ger.* junceum Tragi *Lugd.* junceum sive nudum *Park.* X, *(i.)* foliis nudum non ramosum sive junceum *C.B. Naked Horse-tail.* In humidis et uliginosis. *Jo. Bauhinus tom.* 3. *lib.* 36. *cap.* 27. hanc speciem cum iis quæ foliis prædita sunt confundit, eorúmque asparagum esse asserit: cui sententiæ et nos etiam suffragamur, siquidem ex eadem, quantum conjicere licuit, radice scapos alios nudos, alios foliis vestitos, alios ex parte duntaxat nudos enatos conspeximus."

'Naked horsetail' of John Gerarde (1597) in *Herball*, pp. 955–6 (p. 1113 in Johnson's 1633 and 1636 editions): 2*. 'Tragus's rushy [horsetail]' of Jacques d'Aléchamps or Dalechampius (1587) in *Historia Generalis Plantarum*[4], pp. 1070–1*. 'Rushy or naked [horsetail]' of John Parkinson (1640) in *Theatrum Botanicum*, pp. 1201–2: 7* (not "X", as quoted by Ray, which is C. Bauhin's, not Parkinson's, number). '[Horsetail] naked of leaves [and] not branched, or rushy' of Caspar Bauhin (1623, 1658) in *Pinax*, p. 16: X, and *Theatrum Botanicum*, cols 248–9: X*. *Naked Horse-tail.* 'In damp and marshy [places].' 'Jean Bauhin [1651, in *Historia Plantarum Universalis*,] Volume III, Book XXXVI, Chapter XXVII [pp. 728–730], unites this species with those that are possessed of leaves and maintains that it is their shoot[5], and we too support this opinion, since we have observed some naked stems, others clothed with leaves and yet others only partly naked arising, as far as one could conclude, from the same root.'

One species of *Equisetum* was of particular economic importance to Ray's predecessors and contemporaries, that for which Ray (1660) adopted Gerarde's name of "Equisetum nudum" and which we know as *E. hyemale*. This is a species in Subgenus *Hippochaete* with erect, unbranched perennial stems. Gerarde (1597) described "Equisetum nudum" as "small or naked Shaue grasse, wherewith Fletchers and Combe makers doe rubbe and polish their worke" and Parkinson (1640) wrote that this species "is more used by sundry workemen to smooth and polish their workes of wood and bone then any other". The illustration in Tragus (1552, 1553) shows a 'scouring ring' like a modern pan-scourer alongside the stems of the species (which, although they are otherwise well drawn, have acquired bizarre stars near the apex!). Dalechampius' drawing of "Equisetum Iunceum, Tragi", cited by Ray (1660), must be copied from this, stars and all, with the addition of two invertebrates

(Figure 3).[6] The illustration in J. Bauhin *et al.* (1651), which is perhaps a degraded version of the same drawing, also shows the scouring ring. As there is no doubt of the identity of the species portrayed by these authors, all later commentators, including Martyn (1763), Babington (1860), Perring *et al.* (1964) and Ewen & Prime (1975), have treated Ray's Cambridgeshire plant as *E. hyemale*, citing it as the first county record of that species.

An examination of the treatment of "Equisetum nudum" in Ray's later works shows that the identification of the Cambridgeshire plant is less straightforward than previous authors have realised. The reason for this is that Ray took the unwhorled stem of *E. hyemale* (his "nudum") as its defining character. He therefore confused this species, which is very uncommon in Britain and which we do not believe to be reliably recorded in Cambridgeshire, with the frequent Fenland plant currently known as *E. fluviatile*, which is variable in its branching and occurs as plants with unbranched and plants with branched stems, even within the same population. Ray's observation of 'some naked stems, others clothed with leaves and yet others only partly naked arising, as far as one could conclude, from the same root' is an exact description of the variation in *E. fluviatile*, if one makes allowance for Ray's 17th-century terminology and interprets his 'leaves' as branches (see note 2). Ray was not the first to include branched plants in his concept of "Equisetum nudum"; he was following the lead of J. Bauhin *et al.* (1651), and it is not altogether surprising that he was unable to resolve the problem in 1660.

The confusion between *E. hyemale* and *E. fluviatile* persisted for thirty years after 1660. The first edition of Ray's *Catalogus Plantarum Angliæ* (1670) has a similar treament of the Cambridgeshire species to that in the *Cambridge Catalogue*. Under "Equisetum nudum" Ray commented: 'This does not differ in appearance from the preceding [species, i.e. *E. telmateia*,] in the opinion of J. Bauhin, and we do not dissent.' In the second edition, however, Ray (1677) wrote: 'This in fact differs in appearance from the preceding one, since it is much rougher and firmer and it is perpetually green, though we, following J. Bauhin, once thought, and wrote, that it was its shoot ["Asparagum" (see note 5)] rather than a different plant. This particularly is the species with whose rushlike branches carpenters polish to a sheen the rough surfaces of many small wooden objects such as combs and handles.' Nevertheless he still marked the plant as occurring in Cambridgeshire and gave the habitat simply as 'In marshes and watery places'. It appears that at this stage he had convinced himself that he had seen both species growing together in Cambridgeshire and that his observation that they seemed to grow from the same root was erroneous. Although Ray separated "E. nudum" from "E. majus" in this edition of *Catalogus Plantarum Angliæ*, he retained from the first edition the sentence under the latter species in which he expressed his approval of J. Bauhin's (1651) action in uniting them. The retention of this part of the text can only have been an oversight.

Ray's next major botanical publication was *Synopsis Methodica Stirpium Britannicarum* (1690), his pioneering British Flora. In it he included a description of "Equisetum nudum" as the plant used for polishing, adding the name "*Shave-grass*", but he still reported it "In palustribus & aquosis", by implication throughout Britain. There is still no place in the main body of the *Synopsis* for the plant we now know as *E. fluviatile*, but the confusion

between this species and "E. nudum" [*E. hyemale*] was finally resolved in an appendix to this work contributed by Samuel Doody. This appendix is made up of notes from Doody which reached Ray after the main text of the *Synopsis* was printed, and at one time Ray "grew anxious about their inclusion" (Raven, 1942, p. 248).

Doody's note (p. 244) introduced a new species of horsetail, "Equisetum nudum lævius nostras" ('Smoother naked horsetail of our own country'): 'This is that naked species which grows commonly in England and is different from that which is brought to us from abroad for the use of craftsmen in polishing their works; for our naked Horsetail hardly surpasses the common ones in roughness, but the other, like a file, wears down wood, bone and even metal. I have long cultivated it in my little garden, where its roughness is not lost.' Thus at last Doody has reached the solution that eluded Ray for so long and split the unbranched form of *E. fluviatile* from *E. hyemale*.

In the second edition of the *Synopsis*, Ray (1696) was able to include "Equisetum nudum lævius nostras" ("*Smooth naked Horse-tail*") in its proper place. He also added as a separate species "Equisetum foliis nudum ramosum" of C. Bauhin (1623, p. 16: XI) with the English name "*Branched naked horse-tail*", reported "*In* Bocking *River plentifully. Mr.* Dale." This must presumably be based on the whorled form of *E. fluviatile*. Finally, Ray was able to report two native sites for the true "E. nudum" in Britain: 'This species is less frequent in England: however Thomas Willisell showed it to us in a certain wet ditch at Middleton, in the County of Warwickshire near the village of Drayton: and indeed very recently, through letters sent to me by my distinguished Friend Master John Aubrey, I have been informed that this kind ["hoc genus"] is found in a certain brook near Broadstitch Abbey in the County of Wiltshire in great abundance.'

The reference to Thomas Willisell here is surprising: Willisell was "an old soldier of Lambert's corps, a man of little education but highly skilled in fieldwork" (Raven, 1947, p. 305) who worked as a professional plant collector. Ray had a high regard for Willisell and travelled with him on a botanising trip to the north of England in 1671 (Raven, 1942, pp. 151–153). Willisell died in Jamaica in 1675. Ray's revised text in the second edition of *Catalogus Plantarum Angliæ* (1677) was perhaps based on the plant Willisell had shown him; he may even have retained a specimen of this "Equisetum nudum" and have therefore been able to identify it as the true species after the separation of "Equisetum nudum lævius nostras" in 1690.

In 1696 Ray did not look back to his *Cambridge Catalogue* and state explicitly which of the segregate species of his 1660 "Equisetum nudum" grew in the county. However, on distributional grounds alone one would be fairly safe in assuming that the Cambridgeshire plant was the common species "Equisetum nudum lævius nostras", and fortunately the detailed note Ray included in 1660 on the variation in that species virtually proves that this was so. We believe that the "Equisetum nudum" of Ray (1660) must be treated as the first county record of *E. fluviatile*, not (as hitherto) as the first record of *E. hyemale*. Relhan (1820) reported *E. hyemale* from "Watery Places" at "Stretham Ferry. Gamlingay Bogs." The former is a most unlikely locality for *E. hyemale* and the Gamlingay record, first published by Relhan (1785), is also very doubtful. These records are likely to be errors for *E. fluviatile*,

which was collected from Gamlingay by C.C. Babington in 1833 (**CGE**). Relhan was the last botanist to claim *E. hyemale* in Cambridgeshire.

Equisetum palustre brevioribus foliis polyspermon

"Equisetum palustre brevioribus foliis polyspermon *C.B.* alterum brevioribus foliis *Park.* Polygonum fœmina *Matth. Eric. Cord. Gesn. Dod. Amat. Ang. Cast. Lugd. Tab.* fœmina Dioscoridis *C.B.* Equiseti facie Polygonum fœmina *I.B. Female Horse-tail. In the rivulet that runs by Paper mils, and in that which comes from Trumpington in many places.*"

'Many-seeded marsh horsetail with shorter leaves' of Caspar Bauhin (1623, 1658) in *Pinax*, pp. 15–16: IV, and *Theatrum Botanicum*, cols 242–4*. 'Second [horsetail] with shorter leaves' of John Parkinson (1640) in *Theatrum Botanicum*, pp. 1200–1: 4*. 'Female knotgrass' of Pierandrea Matthioli (1558) in *Commentarii*, p. 485*, Euricius Cordus (1534), Conrad Gesner (1541) in *Historia Plantarum*, pp. 213–4 (as "Sanguinaria fœmina"), Rembert Dodoens (1583, 1616) in *Stirpium historiæ pemptades sex*, p. 113*, Lucitanus Amatus (1553), Aloysius Anguillara (1561), Castor Durantes (1585), Jacques d'Aléchamps or Dalechampius (1587) in *Historia Generalis Plantarum*[4], p. 1072*, and Jacob Theodor Tabernaemontanus (1588) in *Neuw Kreuterbuch*, **2**: p. 505*. 'Dioscorides' female [knotgrass]' of Caspar Bauhin (1623) in *Pinax*, p. 15: IV. 'Female knotgrass with the look of a horsetail' of Jean Bauhin *et al.* (1651) in *Historia Plantarum Universalis*, pp. 731–2*. *Female Horse-tail. In the rivulet that runs by Paper mils, and in that which comes from Trumpington in many places.*

This "Equisetum" is the plant now known as *Hippuris vulgaris*. As Ray's list of authorities shows, it was a plant which was well known to earlier botanists, often under the name "Polygonum fœmina". In fact, the same long list of works from which Ray cites this name appears in C. Bauhin (1623), and Ray probably copied it without checking them all: he states in his preface that he has 'taken synonyms from C. Bauhin's *Pinax* or from J. Bauhin's *Historia* when the works themselves were not to hand'.[7] Matthioli (1558), Dodoens (1583, 1616), d'Aléchamps (1587) and J. Bauhin *et al.* (1651) all include easily recognised illustrations of this species. In Matthias de Lobel's (1581, 1591) *Plantarum seu Stirpium Icones*, the illustration (T. 967b; Figure 4 in this paper) of "Polygonon femina semine vidua" ('Female knotgrass bereft of seed'), used again by Dodoens (1583, 1616) and by Thomas Johnson in his revised editions of Gerarde (1633, 1636, p. 1114: 6, where it is labelled "*Cauda equina fœmina.* Female Horse-taile."), even shows its lax submerged leaves as well as its smaller aerial leaves.

Equisetum primum

"Equisetum primum *Matth. Lac.* majus *Lob. Ger.* majus palustre *Park.* majus aquaticum *I.B.* palustre longioribus setis *C.B.* Hippuris major *Brunf. Dod. The greater marsh Horse-tail.* Ad rivulos et in aquosis."

'First horsetail' of Pierandrea Matthioli (1558) in *Commentarii*, p. 514*, and of Andres de Laguna (1552) in *Pedacio Dioscorides*, pp. 402–3*. 'Greater [horsetail]' of Matthias de Lobel (1576, 1581) in *Plantarum seu Stirpium Historia*, p. 461*, and *Icones*, T. 968*, and of John Gerarde (1597) in

Herball, pp. 955–6 (pp. 1113–4 in the 1633 and 1636 editions): 1*. 'Greater marsh [horsetail]' of John Parkinson (1640) in *Theatrum Botanicum*, p. 1200: 1*. 'Greater water [horsetail]' of Jean Bauhin *et al.* (1651) in *Historia Plantarum Universalis*, pp. 728–730*. 'Marsh [horsetail] with longer bristles' of Caspar Bauhin (1623, 1658) in *Pinax*, p. 15: II, and *Theatrum Botanicum*, cols 241–2: II*. 'Greater mare's-tail' of Otho Brunfels (1531, 1536) in *Novum Herbarium*, Appendix to Vol. II, p. 125/241, and of Rembert Dodoens (1583, 1616) in *Stirpium historiæ pemptades sex*, pp. 72–3*. *The greater marsh Horse-tail.* 'By brooks and in watery places.'

This entry again appears to deal with a species which was well known to the early herbalists. For example, Matthioli (1558, 1570) describes and illustrates a plant which is clearly that known today as *Equisetum telmateia*.[8] Laguna (1563), de Lobel (1576, 1581, 1591), Dodoens (1583, 1616), Gerarde (1597, 1633, 1636), Parkinson (1640) and C. Bauhin (1658) all include the same or similar illustrations of this species, which show both the young, cone-bearing stems and the broad vegetative stems of this species arising from the same rhizome (see cover illustration). Ray's record of "Equisetum primum" has therefore been taken by Babington (1860), Perring *et al.* (1964) and Ewen & Prime (1975) as the first Cambridgeshire record of *E. telmateia*.

There is, however, a major complication lurking in the synonymy of Ray's "Equisetum primum". Ray lists as a synonym "Equisetum majus aquaticum I.B.". This cites one of the two extended treatments of *Equisetum* which were published posthumously in the 1650s on the basis of the work of the Bauhin brothers. Caspar Bauhin (1560–1624) had published an outline of his classification in his *Pinax* of 1623, in which he recognised 13 species of "Equisetum". These were described in much more detail in the first and only volume of *Theatrum Botanicum*, published in 1658 by his son Jean Gaspard.

Figure 3: Dalechampius' drawing of "Equisetum Iunceum, Tragi" (1587), *Equisetum hyemale*, embellished with a scouring ring and two insects

Figure 4: "Polygonon femina semine vidua" of Matthias de Lobel (1581), *Hippuris vulgaris*, a figure used by Thomas Johnson in Gerarde (1633)

C. Bauhin's 13 species included *E. arvense, E. hyemale* and *E. telmateia*, and in the posthumous work the illustrations of these species are instantly recognisable; *E. palustre* is also described but not illustrated. Ray cites this work in the *Cambridge Catalogue*, even though it was published only two years earlier. However, he chose to follow Jean Bauhin (1541–1613), whose radically different treatment in *Historia Plantarum Universalis*, edited by Dominic Chabrey, was published in 1651 (Arber, 1938). Here Bauhin *et al.* included both unbranched plants of "Equisetum nudum" and branched plants which they thought belonged to this species in a single taxon, "Equisetum majus aquaticum". Furthermore, they went even further in expanding their circumscription of this species, commenting: 'But, since we have quite often observed Rushy Horsetail to be leafy ["foliaceum"], we do not separate it from Matthioli's First Horsetail [*E. telmateia*]. As for de Lobel's [1581, 1591, T. 970a] Marsh Horsetail [*E. palustre*], we suspect it to be a sport of nature.'

Thus J. Bauhin's species is extremely heterogeneous, including unbranched plants referable to *E. hyemale*, unbranched and branched plants presumably referable to *E. fluviatile*, plants illustrated by de Lobel (1581, 1591) which are *E. palustre*, and the very different plant *E. telmateia*. It is illustrated by three figures, one of the familiar "Equisetum nudum" with stars and scouring ring, one of an unbranched plant with a terminal cone which might also be *E. hyemale*, and the third of a branched vegetative plant clearly copied from "Equisetum longius" of Fuchs (1542, p. 322: see note 3) which, although clearly an *Equisetum*, lacks specific characters to identify it with any certainty.

In 1660 Ray separated off the branched and unbranched plants like *E. hyemale* as "Equisetum nudum"; the question that remains is whether his "Equisetum primum" is *E. telmateia* or whether he was so influenced by J. Bauhin's broad species concept that he included other branched plants in it. Two lines of evidence might help resolve this question, Ray's subsequent treatment of the species and evidence of the distribution and habitat of *E. telmateia* in Cambridgeshire.

In *Catalogus Plantarum Angliæ* Ray (1670) made no significant changes to the three species he recognised from Cambridgeshire. *E. arvense* is treated without comment, but he expresses the view that the other two species might be the same. Under "E. majus" [*E. telmateia*] he comments that 'J. Bauhin [1651, p. 729] places Horsetails II [*E. telmateia*], III [*E. palustre*] and X [*E. hyemale*] of C. Bauhin [1623, pp. 15-16] under this heading and so reduces the number of species, and indeed rightly so in my opinion.' As we have seen, he changed his opinion about *E. hyemale* in the second edition (1677), where he implies that he now regards the branched plants previously included in *E. hyemale* as *E. telmateia*. It is not until 1690 that the treatment of *E. telmateia* (as "Equisetum majus") suggests a clearer concept of the species, with the note that 'It differs from other species in the size and height of the unbranched scapes and also in the very long and numerous bristles around the joints.' Although *E. telmateia* is a very distinctive species, which was well illustrated by Matthioli (1558) and several later authors, there is no evidence that Ray had a clear concept of the species in 1660. As late as 1677 he was attempting to place all the British species we now place in *Equisetum* in four taxa, *E. arvense*, *E. hyemale*, *E. telmateia* and *E. sylvaticum*, the last a plant which he did not regard as occurring in Cambridgeshire.

The distribution of *E. telmateia* in Cambridgeshire is best considered with reference to records made in or after Babington's (1860) *Flora*, when the species was well understood. Babington reported two localities, one discovered by W.W. Newbould "by a water-course between Eversden Wood and a clunch-pit in that parish" and the second at Ely, found by J.S. Henslow. Babington indicated that he had himself confirmed the identity of both plants *in situ* or as a specimen, and there is a specimen in **CGE** collected at Ely by Henslow in September 1833. The species was rediscovered in the Eversden area in 1971, when A. Worland found it in ditches between Eversden and Toft (TL 353548), and a very large population was found in Barrington chalk pit by G.M.S. Easy in 1973. *E. telmateia* has also been rediscovered at Ely: it was found by P.H.L. Cook in 1969 at Roswell Pits, where it is still present in quantity, and since 1986 it has been known from the edge of the Ely by-pass (A10). The only other post-1860 records from the vice-county are specimens in **CGE** collected by A. Shrubbs at Milton in June 1888 and by P. Stebbings at Reach Lode in 1992, from a large colony he discovered in 1990. Thus all recent evidence suggests that *E. telmateia* is a very local but in places remarkably persistent species in the vice-county. Ray's description of "Equisetum primum" as present 'by brooks and in watery places' implies (by its lack of specific localities) that the species was widespread in Cambridgeshire. This is not consistent with the more recent records. There is little reason to think that this species has declined in the county, and it seems more likely that Ray's records were misidentifications.

All the above evidence leads us to conclude that Ray's (1660) record of "Equisetum primum" cannot be accepted as a record of *E. telmateia*, nor can it be ascribed with confidence to any single species.

Equisetum palustre ramosum aquis immersum, seu Millefolium aquaticum equisetifolium.

"Equisetum palustre ramosum aquis immersum, seu Millefolium aquaticum equisetifolium. Radice est fibrosa, caulibus tenuibus admodum pro plantæ magnitudine, rotundis, geniculatis, infirmis, fragilibus, cubitalibus et longioribus, in plures cauliculos branchiatis. Folia ut in equiseto genicula circumstant viridia, fragilia, singula primò in duo velut cornua divisa, et utrumque ferè cornu denuo in alia duo, extuberantiis quibusdam ad latus pronum veluti denticulata. Flores ad genicula caulibus utrinque arctè adhærent glomerati, muscosi. *Horse-tail water Mill-foil.* In aquis pigrioribus ferè ubique: quò magis miramur apud nullum autorem quem consuluimus extare, aut saltem sedula indagatione a nobis non potuisse inveniri. An Hippuris lacustris foliis mansu arenosis *Gesn*?"

'Branched marsh horsetail immersed in the water, or Horsetail-leaved water milfoil. It has a fibrous root and very slender stems in proportion to the size of the plant which are rounded, jointed, weak, fragile, two feet or more long, and branched into several small stems. As in a horsetail, the leaves encircle the joints and are green, fragile, single at first and then divided into two, like horns, and usually each horn is divided again into two more, with certain swellings on the front edge, as it were furnished with small teeth. The flowers cling closely to the stems on both sides at the joints in clusters and are mossy.' *Horse-tail water Mill-foil.* 'In more sluggish waters almost everywhere: so that we are the more surprised that it appears in the work of no author that we have consulted,

or at least that we have not been able to find it despite careful investigation. Is it Lake mare's-tail with leaves sandy to the teeth [if "mansu" is a misprint for "morsu" (literally 'with biting')] of [Conrad] Gesner?'[9]

This is one of the species that Ray described afresh, as he failed to find a convincing account of it elsewhere. It is clearly *Ceratophyllum demersum*, and it is interesting that even in 1660 Ray reported this species of eutrophic waters 'almost everywhere'. Ray later recognised that the plant had been described (but not accurately illustrated) elsewhere, as first shown by the following note in the "Emendanda" of the second appendix (Ray & Dent, 1685) to the *Cambridge Catalogue*: 'The description of horned water milfoil of J. Bauhin [*et al.*, 1651] fits this plant in every respect, although the illustration, which is C. Bauhin's, does not correspond, as neither does its description in his [the latter's] *Prodromus*.' In the first edition of the *Synopsis* (1690, p. 35) Ray again accepted J. Bauhin's description, but in the second (1696, p. 280), where he said that this plant occurred 'especially around Cambridge', he appended a question mark to the attribution, adding: 'The description corresponds in most respects, but the illustration, which is C. Bauhin's, very little.'[10]

Conclusion

The species we now include in the genus *Equisetum* are not easy to identify: the vegetative stems of many species are superficially similar, one needs to see the plants in spring and summer to appreciate the difference between the two sorts of fertile stems, and the cones themselves offer few taxonomic characters. Even today many field botanists are occasionally troubled by the variability of *E. arvense*, and the hybrids we now recognise in the genus are easily overlooked and difficult to identify with certainty. Ray was doubtless handicapped by the fact that he taught himself botany in Cambridgeshire, where only three species are at all frequent. It was perhaps this that led him to favour J. Bauhin's treatment of the genus, rather than that of G. Bauhin, which recognised more species and which we now know was much closer to the real situation. His confusion was compounded by the fact that one of the more frequent Cambridgeshire species, *E. fluviatile*, was not described accurately in the continental literature and is variable in its branching, a character then regarded as of great taxonomic importance. In the event it took Ray over thirty years to produce a serviceable account of the true *Equisetum* species. In the second edition of the *Synopsis* (1696) most of the British species are described (*E. arvense*, *E. fluviatile*, *E. hyemale*, *E. palustre*, *E. sylvaticum* and *E. telmateia*); the only native species which are not included are the nationally scarce *E. pratense* and *E. variegatum*.

It is rather surprising that in his treatment on the plants in Cambridgeshire Ray always regarded *E. arvense* as a distinct species and that his confusion centred around the much more distinctive *E. hyemale* and *E. telmateia*. We attribute this to the ecological rather than morphological differences between *E. arvense* and the other species. Although Ray recorded *E. arvense* and *E. fluviatile* (as "E. nudum"), he never reported the third species which is frequent in Cambridgeshire, *E. palustre*. This was not included in the *Catalogus* of 1670 or 1677, but it is well described in the *Synopsis* of 1690, where Ray points out the crucial distinction: 'It differs from Corn Horsetail in the floriferous little heads or catkins at the tips of the stems, which in that

species come up separately, very like Asparagus shoots, in the Spring before the leafy stems appear.'

We have seen that the genus *Equisetum* as treated by Ray in 1660 was remarkably heterogeneous. As early as 1675 Ray outlined a character which he was to use to delimit the genus in a more natural way. In a note in *Philosophical Transactions of the Royal Society* discussing some recently discovered fossils, Ray commented that "the leaves of some sort of *Equisetum* are *jointed*, as well as the stalk; else I know no plant that hath jointed leaves, except some sort of *Rush-grass*, though those bristles of *Equisetum* surrounding the stalk, neither these reported leaves of *Rush-grass* can properly be called leaves, being round and having no difference of upper and lower superficies" (Gunther, 1928, p. 65). In the *Synopsis* (1690, 1696) he defined the genus thus: 'Horsetail has leaves like bristles, arising at the joints like wheels around the stems: both the stem and the leaves are divided into joints in box-like fashion.' In this restricted genus he included both the true *Equisetum* species and the charophytes. Although he retained *Hippuris vulgaris* as "Equisetum palustre brevioribus foliis polyspermum", he commented: 'It differs from the rest of the Horsetails in its short, flat leaves, which are not terete but striate, and in its seeds being situated at the joints, so that it in fact forms a separate genus [see note 1].' He removed *Ceratophyllum demersum* from *Equisetum* completely, treating it in the genus "Millefolium". (Even in 1660 he had presented this as an alternative genus.) Further revisions of the genera into which these species were divided were made by J.J. Dillenius in the third edition of Ray's *Synopsis*, published in 1724 after Ray's death. Dillenius separated *Hippuris vulgaris* as "Limnopeuce" (literally 'Pool-pine', an apt name!) and he also removed *Ceratophyllum demersum* to the genus "Hydroceratophyllon". Furthermore Dillenius followed Vaillant (1721), who had placed charophytes in the separate genus "Chara". In this edition the genus "Equisetum" is therefore defined in its modern sense.

The difference between the treatment of *Equisetum* in Ray's *Cambridge Catalogue* of 1660 and that in the third, posthumous, edition of the *Synopsis* in 1724 is remarkable. It illustrates how much progress was made in the study of the British flora in just two generations. It was John Ray who, in a lifetime of botanical work, made the major contribution to this advance in knowledge.

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We thank Mrs G. Crompton for details of modern records of *Equisetum telmateia* in Cambridgeshire and the Syndics of Cambridge University Library for the use of illustrations from a number of 16th- and 17th-century herbals. The staff of its Rare Books Room, Mr R. Savage at the Department of Plant Sciences library and Miss G. Douglas, Librarian of the Linnean Society of London, gave us valuable help with rare books. It is a pleasure to dedicate this paper to Dr D.E. Coombe in gratitude for all that he has taught us over many years of botanical friendship.

Notes

1 The inconsistency of terminology is illustrated by Ray's (1696) use of the word "genus" to describe both a species, "Equisetum nudum" (p. 43), and a genus in the modern sense (p. 42; and see earlier on this page). A similar inconsistency has been noted in the writings of John

Locke. It does not arise because of any vagueness in their concept of the genus and species – indeed Ray is credited with devising the modern concept of the species – but because they use the terms in the sense in which they are used by logicians rather than taxonomists (Cain, 1996, 1997).

2 We have sometimes found it difficult to interpret the terminology used by 17th-century botanists to describe the vegetative parts of "Equisetum". The primary whorls on the stem are termed leaves ("folia") in the descriptions of *Hippuris vulgaris* (where modern botanists still regard them as leaves) and of some true *Equisetum* species (where they are now treated as branches). Thus Bauhin *et al.* (1651) say that "Equisetum maius aquaticum" has '*stems*, mostly naked ["plerumque nudi"] but sometimes rayed from the joints, which produce *leaves*, not flattened as in Female Knotgrass [*Hippuris vulgaris*] but fistulose and furnished with many jointed sections'. However, the whorled branches of "Equisetum" species may be called 'bristles' ("setæ"), as in Ray's (1660) name for *E. arvense*, 'Field horsetail with longer bristles'. These two words are brought together in Ray's (1690) diagnosis of the genus: 'Horsetail has leaves like bristles arising from joints in a circle like a wheel around the stems.' Stems lacking primary whorls are described as 'naked' ("nudus"), as in Gerarde's 'Naked Horsetail' or more explicitly in Ray's (1660) observation that what he took to be "Equisetum nudum" had 'some naked stems, others clothed with leaves . . .'. Naked stems are also described as rushy ("junceus"). A particular "Equisetum" taxon is often referrred to as branched ("ramosum") or unbranched ("non ramosum"), and this apparently refers not to the presence of whorls but to a different sort of branching. Thus Ray (1690) says that *Equisetum telmateia* 'differs from other species in the size and height of the unbranched scapes and also in the very long and numerous bristles around the joints'. We interpret "ramosum" as referring to plants whose main axis is branched or to those with branches which, although in whorls, are so few or so long that the whorled pattern is obscured. The evidence for this interpretation includes two facts – that the only "Equisetum" species which Ray (1660) describes as branched is that now placed in *Ceratophyllum* and that C. Bauhin (1658, cols 249–250: XI) illustrates his "Equisetum foliis nudum ramosum" by a bushy plant with branches which are several times longer than the internodes, so that one has to look carefully to see that they are whorled. Versions of this illustration appear in several earlier works (see note 6) and the toothed sheaths suggest that it is based on an *Equisetum*, almost certainly *E. arvense*, although its 'jizz' is not unlike that of an *Ephedra*. Thomas Johnson interpreted it as "Corne Horse-taile" and replaced Gerarde's (1597) figure of *E. arvense* with a version of it in his edition of 1633 (p. 1114: 3), but Parkinson (1640, p. 1201: 8) used a portion of it to illustrate "Branched Rush Horse taile".

3 The illustration originally captioned "EQVISETVM LONGIVS" on p. 322 of Fuchs' (1542) *Commentarii* is here incorrectly ("aperto lapsu": Matthioli (1558)) attached to "Polygonum fœmina", the plant today called *Hippuris vulgaris*. The situation is complicated by the fact that Fuchs (1542) had already reversed the captions ("figurâ transpositâ": C. Bauhin (1623)), labelling the figure conforming to his description of "Equisetum longius" with "EQVISETVM MINVS" on p. 323 and *vice versa* on p. 322.

4 Ray uses the abbreviation "*Lugd.*" because this work was published at Lyons (Lugdunum).

5 The Latin "asparagus" has been used for an asparagus-like sprout or shoot (as well as for asparagus itself) since the time of Pliny the Elder (died 79 A.D.) at least. This passage is an example of misleading translation by Ewen & Prime (1975, p. 61), who render it as "he asserts that asparagus belongs to this species".

6 Dalechampius' text equates 'rushy Horsetail' of Tragus with Matthioli's (1571) third species, but he has separate figures, that headed "*EQUISETVM Iunceum, Tragi*" unbranched

apart from the 'stars' near the tips of the shoots (see Figure 3), but the one copied from Matthioli and headed "*EQVISETVM Tertium, Matthioli*" a version of that later used by C. Bauhin (1658) to illustrate "Equisetum foliis nudum ramosum" (see note 2).

7 We ourselves have not traced those works that are not listed in our references.

8 Matthioli writes: 'When this first breaks forth from the earth, it produces a certain very tender sprout, which is oblong, not unlike the catkin of walnut trees. This is what our [Sienese] country people commonly call *patrufalo*, and they adopt it as food at the time of the lenten fast. Indeed they boil it first and then sprinkle it all over with flour, and next they fry it in oil in a frying-pan and eat it in place of fish. From this food their bowels are sometimes so bound up and constipated that they readily incur torture of the colon. There are people who preserve this first sprout of Horsetail dry through the year and use it from time to time in summer for dysentery. In fact they soak it in hot water overnight and cook it in the way already described and serve it as food over a long period.'

9 We have been unable to trace the original reference, which is not in Gesner (1541).

10 J. Bauhin accurately describes the leaves as 'somewhat rigid' and 'split into filaments resembling the branched division at the end of stags' antlers', but he refers to 'small *seeds*, joined four at a time', whereas the single-celled achenes are in fact solitary in the whorls of leaves. His illustration is a redrawn, reversed version of a bizarre figure on p. 73 of C. Bauhin's (1620) *Prodromus*, which, like part of C. Bauhin's description, is apparently derived from an aquatic *Ranunculus* species.

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(Generally the names of authors of 16th- and 17th-century works are given in the text in their vernacular forms, but here they are presented in the form printed on the title-page, usually in Latin. Authors' names in square brackets do not appear on the title-page.)

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A sighting of a 'Monarch' butterfly in Cambridgeshire

O.D. Cheesman

Bennett (1988) and Bennett & Perrin (1994) observed that Cambridgeshire has not, at least in the last 50–100 years, been a county notable for butterflies. The latter authors also recorded the reported sighting of a Monarch butterfly *Danaus plexippus* L. at Wicken Fen in 1992 as one of the most extraordinary butterfly records associated with the 1985–1992 survey of v.c. 29. I wish to record a similarly 'extraordinary' butterfly sighting from 1995.

On 16 July 1995, a warm and sunny day, I was surveying vegetation and associated insects on a small patch of waste ground between a road embankment and arable farmland (TL 415609). Here, I observed a single *Danaus* butterfly nectaring on Creeping Thistle *Cirsium arvense* before taking flight. The specimen was in poor condition, but it was unmistakably a 'Monarch'.

Most reports of 'Monarch' butterflies in the U.K. refer to *Danaus plexippus* (the Monarch or Milkweed butterfly), and such records were unusually common in southern England later in 1995 (Coombes *et al.*, 1996). However, the distinct transverse white spots close to the apices of the upper fore-wings of this specimen were more representative of forms of *D. chrysippus* L. (the Plain Tiger or African Monarch) or other *Danaus* species (cf. D'Abrera, 1990). Although known from Mediterranean Europe, *D. chrysippus* is not a recognised U.K. vagrant (Tolman, 1997).

Sparks & Smith (1995) reported unusual observations of the Swallowtail butterfly in the same general area of Cambridgeshire, at Girton, in 1994 and concluded that these could be accounted for by the escape of exotic stock held by a local resident. This may provide a clue to the origins of the butterfly described above, which may equally have liberated itself from one of the region's Butterfly Farms (see Bennett, 1988). However, I have now learned that the escape of 30 'Monarchs' in July 1995 reported by Coombes *et al.* (1996) may have occurred in Northamptonshire (Mark Parsons of the Natural History Museum, pers. comm.). This may provide the most likely source of this record, although the particular species involved in the escape has yet to be confirmed.

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A provisional atlas of bush-crickets, grasshoppers and allied insects in 'old' Cambridgeshire

Adrian Colston
Vice-county Recorder for Orthopteroids

Introduction

This article reviews the status, past and present, of the orthopteroids – Orthoptera (bush-crickets, crickets, ground-hoppers and grasshoppers), Dictyoptera (cockroaches) and Dermaptera (earwigs) – in 'old' Cambridgeshire (vice-county 29). Collectively these orders, together with the Phasmida (stick insects), are known as orthopteroids. No stick insects have been recorded in the wild in the vice-county.

The standard reference text for this group of animals is Marshall & Haes (1988). Ragge (1965), though dated today, is also still an excellent source of information, whilst Mahon (1988) and Brown (1990) offer cheap useful introductions to the Orthoptera. Bellmann (1988) provides a photographic field guide to the grasshoppers and crickets of Northern Europe and Sterry (1990) a good introduction to the identification of British grasshoppers, whilst Sterry (1991) covers the British bush-crickets. Grasshoppers, crickets and bush-crickets have very distinctive songs produced by stridulation, that is the rubbing of one part of the body against another; these are a very useful guide to species identification. A tape of these songs (Ragge, 1988) and, very recently, a book and compact disc (Ragge & Reynolds, 1998) have been produced.

Last year saw the publication of the new *Atlas of Grasshoppers, Crickets and Allied Insects in Britain and Ireland* (Haes & Harding, 1997). This book updates the original work on the distribution of orthopteroids in the British Isles as published by Skelton (1974) and subsequently updated within Marshall & Haes (1988). The new atlas clearly highlights the shortage of records from Cambridgeshire for a number of common species such as all species of bush-cricket and Meadow and Field Grasshoppers. This paucity of records from this vice-county and the adjacent ones of Huntingdonshire (v.c. 31) and Northamptonshire (v.c. 32) led to a request for additional records to fill these gaps from the national Orthoptera Recording Scheme organiser (Widgery, 1996b). At this point I volunteered to act as recorder for the three vice-counties, collecting new records, encouraging others to submit records and organising training courses on the identification of orthopteroids. Since then 204 new records (69% of the post-1980 records) have been collected, but unfortunately they were too late to meet the copy deadline for the new atlas. This paper therefore updates the new atlas with respect to species in v.c. 29.

Low recording in Cambridgeshire, Huntingdonshire and Northamptonshire is curious in view of the high numbers of potential recorders living in the three vice-counties. Many other vice-counties have made considerable progress and their local atlases have been published – for example, for Bedfordshire, Rands (1977), updated annually (e.g. Sharpe, 1995); for Devon, Davies (1987); for Berkshire, Buckinghamshire and Oxfordshire, Paul (1989); for Norfolk, Richmond & Irwin (1991); and, most recently, for Essex, Wake (1997). A provisional atlas for v.c. 31 will be published in 1998 (Colston, in press).

Historical data for 'old' Cambridgeshire

The first published account for Cambridgeshire is by Malcolm Burr (1904), based largely on the earlier fieldwork of the Victorian naturalist the Revd Leonard Jenyns. He describes 23 species: of these 20 are native, two are introductions and one is a migrant. His account provides an old record of the Short-winged Earwig and records for the Woodland Grasshopper, the latter now acknowledged as misidentifications.

The next published accounts are of Orthoptera occurring in Wicken Fen (Lucas, 1925, 1928) and of Cambridgeshire Dermaptera and Orthoptera by E.B. Worthington (1927), including recent records by himself, M. Perkins, W. Farren and others. The Victoria County History includes an updated summary (Worthington, 1938) of the last of these.

The formation of the Biological Records Centre in 1964 led to a renewed interest in recording and by 1980 195 records for orthopteroids in the vice-county had been received. Seven people contributed 85% of these records. Since 1980 a further 262 records have been added.

The systematic list

The systematic list which follows details the past and present status of species in the vice-county. In addition to the text, the tetrad maps show the post-1980 distribution of species. Table 1 summarises the 10-km records for Cambridgeshire – both pre-1980 and post-1980. Records made before 1980 are not included on the maps on account of the major land-use changes that have occurred in the vice-county and the known effect these have had on all types of wildlife (see Colston, 1997, for example). Figure 1 shows the actual number of records per species made in the vice-county since 1980. The national conservation status of each species is as given by Haes & Harding (1997), based upon Shirt (1987) and Ball (1986, 1994). Those species listed in *Cambridgeshire's Red Data Book* (Colston, Gerrard & Parslow, 1997) are labelled "CRDB".

Greenhouse Camel-cricket *Tachycines asynamorus* Adelung

Conservation status: not native; post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 1.

Colonies of this species become temporarily established in heated greenhouses when it has been imported from abroad on plants. It is thought to have originated from southern China (Marshall & Haes, 1988).

There is a single anonymous record from v.c. 29, near Newmarket in 1913. The Botanic Garden in Cambridge is a potential source for future records.

Oak Bush-cricket *Meconema thalassinum* (De Geer) Map 1 (•)

Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 7; 10-km squares where not recorded since 1980: 9.

This is a petite light green insect up to 17 mm long, with a yellow dorsal stripe. Nationally the Oak Bush-cricket is regarded as a common species (Haes & Harding, 1997); however, as it does not stridulate, it can often be difficult to locate and therefore to record. It is attracted to light and therefore often comes into people's homes at night and is caught in moth-traps. The species is probably under-recorded in the vice-county and is likely to occur throughout it.

Table 1: Distribution of pre-1980 (0) and post-1980 (1) records of Cambridgeshire orthopteroids by 10-km squares

	TF	TF	TF	TF	TF	TF	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL		
10 km squares	31	41	20	30	40	50	29	39	49	59	38	48	58	68	37	47	57	67	25	36	46	56	66	76	15	26	35	45	55	65	75	24	34	44	54	64	23	33	43	1980+	-1980
Greenhouse Camel-cricket																							0																	0	1
Oak Bush-cricket			1			1	1				0					1	0			0		0	0			0	1	1		1				0	0	0				7	9
Great Green Bush-cricket												0	0			1				0	0												0	1						2	5
Dark Bush-cricket										1		1			1	1	1			1		1	1			1	1	1	0	0				1	0	1				13	4
Roesel's Bush-cricket													1			1	1				1	1				1	1	1	1				1	1						11	0
Short-winged Cone-head																	1					0	1						1											3	1
Speckled Bush-cricket						1									1		1			1	0	0	1			1	1	1	1				1	1	0		1			13	3
House-cricket																				0								0												0	2
Tree-cricket																												1												1	0
Mole Cricket																																		0						0	1
Capera's Ground-hopper							1																																	1	0
Slender Ground-hopper						1	1					1	1				1					0	1			1	0	0	0					1						8	4
Common Ground-hopper			1				1			1		1					1					1	1			1		1	1											10	0
Large Marsh Grasshopper																	0					0																		0	2
Stripe-winged Grasshopper																												1												1	0
Common Green Grasshopper						1											1						0			1		1	0	1				1						6	2
Field Grasshopper							1					1	1		1		1			0		1	0			1	1	1		0				1	0		1			11	4
Meadow Grasshopper		0			0	1	0						1		1		1					1	1			1	1	1	0					1						10	4
Lesser Marsh Grasshopper		0	0	0	0		1	0	1	1	0	1	1	0	0	1	1				0	0				1	1	1	0				0	0						10	14
Mottled Grasshopper									1								0						0			0		0												1	4
Common Cockroach																												0												0	1
Australian Cockroach																												0												0	1
German Cockroach																												0												0	1
Lesser Earwig																1	0				0							0												1	3
Common Earwig						1	1		1	1		1				1	1			1	0	1	0			1		1	0	1			1	1						14	3
Lesne's Earwig							1																																	1	0
Number of species / 10km	0	0	1	1	0	6	8	0	3	4	0	6	5	0	4	7	11	0	0	3	1	6	6	0	0	10	7	12	4	4	0	0	3	9	0	1	2	0	0		

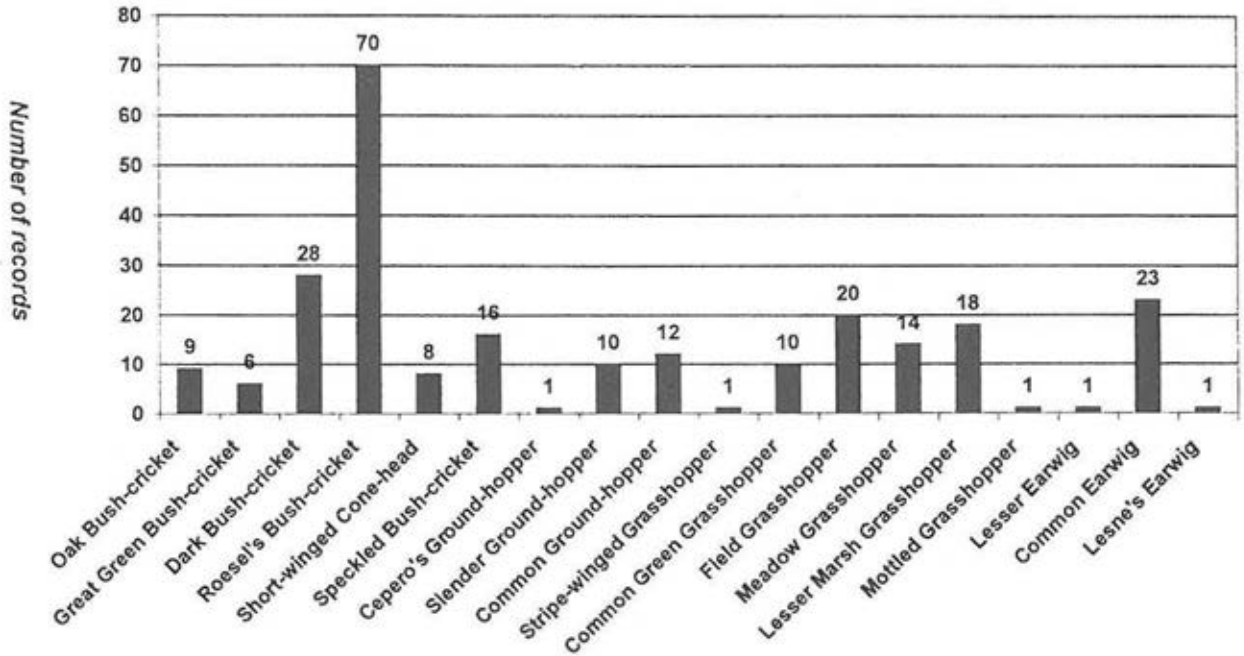


Figure 1: Numbers of records of orthopteroid species in 'old' Cambridgeshire since 1980

Great Green Bush-cricket ***Tettigonia viridissima*** **L.** Map 1 (o)
Conservation status: nationally local and CRDB; post-1980 10-km squares in v.c. 29: 2; 10-km squares where not recorded since 1980: 5.

This large bush-cricket (up to 54 mm) has a loud and distinctive song and it is unlikely that there are many (if any) undiscovered colonies in the vice-county.

Burr (1904) quoted Jenyns as describing the Great Green Bush-cricket as very common in the fens and elsewhere but said it appeared to be less common than formerly, while Worthington (1938) described it as formerly abundant in v.c. 29. Since 1980 it has been recorded in four separate sites.

Dark Bush-cricket ***Pholidoptera griseoaptera*** **(De Geer)** Map 2 (•)
Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 13; 10-km squares where not recorded since 1980: 4.

The Dark Bush-cricket is a stout animal reaching a size of up to 20 mm. It is common in the south of Britain, and in Cambridgeshire it is reaching the edge of its northern limits. It is common in hedges and patches of scrub and will probably be found throughout v.c. 29 once more fieldwork has been done.

Recent studies from Norfolk (Richmond, 1994) have shown that this species is found only in 'Ancient Countryside' (Rackham, 1986), containing habitats such as old hedges and commons, and is absent from 'Planned Countryside' (i.e. the fens and intensively cultivated areas). In Cambridgeshire it is found on the clays and in the fens, i.e. in 'Planned Countryside'.

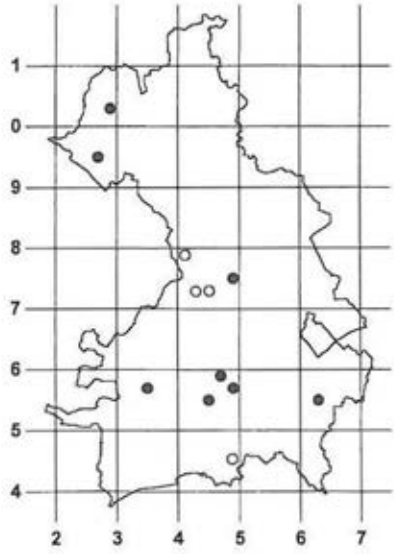
Roesel's Bush-cricket ***Metrioptera roeselii*** **(Hagenbach)** Map 3 (•)
Conservation status: nationally scarce (B) and CRBD; post-1980 10-km squares in v.c. 29: 11; 10-km squares where not recorded since 1980: 0.

Roesel's Bush-cricket is a very attractive insect, brown in colour with a distinctive yellow arc and three yellow spots on the side of the pronotum/ abdomen. It was formerly restricted to the Essex coast and the Thames estuary (Ragge, 1965), but it is currently undergoing an expansion of range in England, spreading west and north (see Haes, 1995, and Widgery, 1996b, for details).

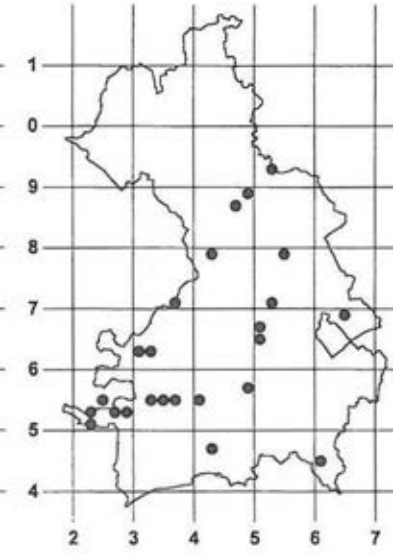
The insect is best located by listening for its song. It has a very distinctive call which has been described as the sound emitted from under a high-tension electricity pylon in the rain! However weather conditions need to be still and hot to hear the song. This species was first recorded in 1996 at Upware by R. Fowling and by the end of 1997 a further 69 records had been received from 11 10-km squares. As can be seen in Figure 1, Roesel's Bush-cricket has over three times as many records as any other species – not bad for a species which has only been known in the vice-county for two years. It is to be hoped that this flurry of records also reflects an upturn in interest in the recording of Orthoptera generally. It will be interesting to see how far north the species spreads in the coming years and whether this range expansion will prove permanent or temporary.

Short-winged Cone-head ***Conocephalus dorsalis*** **(Lat.)** Map 4 (•)
Conservation status: nationally local and CRDB; post-1980 10-km squares in v.c. 29: 3; 10-km squares where not recorded since 1980: 1.

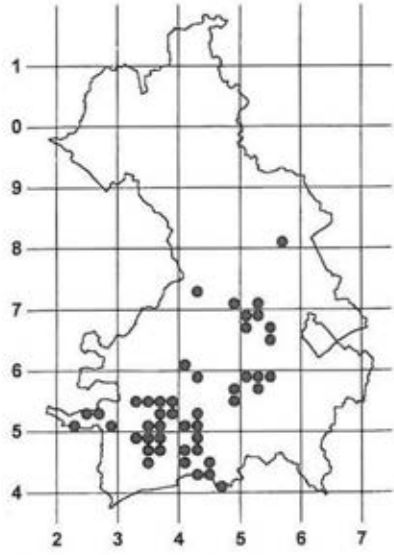
The Short-winged Cone-head is a small green bush-cricket (11–18 mm) with a brown dorsal stripe which inhabits marshes and fens. Its song is very



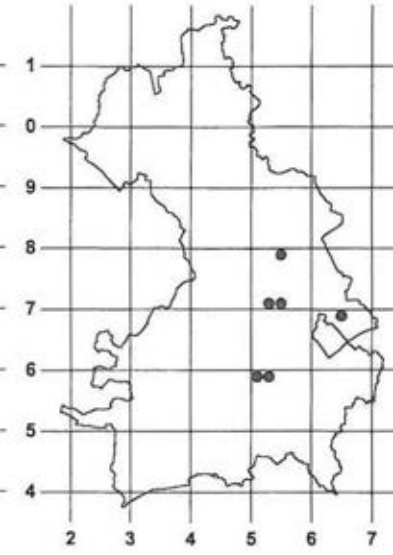
Map 1: ● Oak Bush-cricket
○ Great Green Bush-cricket



Map 2: ● Dark Bush-cricket



Map 3: ● Roesel's Bush-cricket



Map 4: ● Short-winged Cone-head

Distribution maps of Cambridgeshire orthopteroids (post-1980)

high-pitched and most people cannot hear it. However, if a bat detector is used, its presence can be quickly established.

This is another species undergoing a range expansion, sometimes over quite extensive distances. Indeed it does not seem to require extensive areas of marsh in which to survive, the colony on St Agnes in the Isles of Scilly being restricted to a marsh of less than one acre (personal observation). It is therefore worth surveying suitable habitat in Cambridgeshire to see if it is colonising new areas here as well. Currently the Short-winged Cone-head is found in six sites in the vice-county.

Speckled Bush-cricket *Leptophyes punctatissima* (Bosc) Map 5 (•)
Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 13; 10-km squares where not recorded since 1980: 3.

The Speckled Bush-cricket is a small (9–18 mm) dirty green animal with a distinctly arched back. It has a simple and almost inaudible song, but it can be located by beating bushes; it is also attracted to lights in houses and to moth-traps.

The species appears to be common in the south of Cambridgeshire, but there are no recent records from the north. Future recording will have to determine whether this is a real distribution pattern or merely an artefact of under-recording.

House-cricket *Acheta domesticus* (L.)
Conservation status: not native; post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 2.

The House-cricket is a small brown creature (up to 20 mm in size). It is not a native of Britain and is thought to have been brought to this country from the Middle East by knights returning from the Crusades. House-crickets can only survive in artificially heated conditions but can temporarily flourish in the wild during hot summers or in heat generated in rubbish tips. In the past the species was common, living in houses, bakeries, hospitals, etc., but, with improved hygiene procedures and intensive pest control, it is in rapid decline.

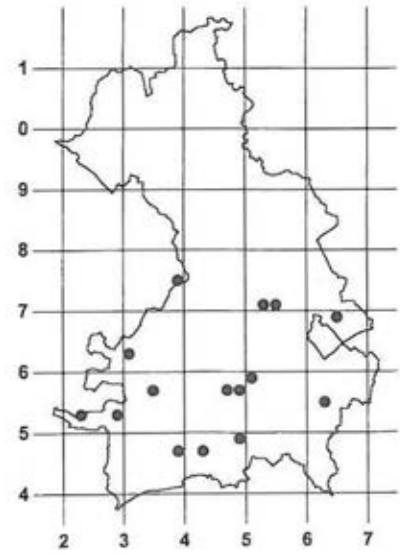
This species was last recorded in Cambridgeshire at Boxworth in 1973. House-crickets are now sold widely in pet shops as food for various carnivorous pets and occasionally escape.

Tree-cricket *Oecanthus pellucens* Fischer
Conservation status: not native; post-1980 10-km squares in v.c. 29: 1; 10-km squares where not recorded since 1980: 0.

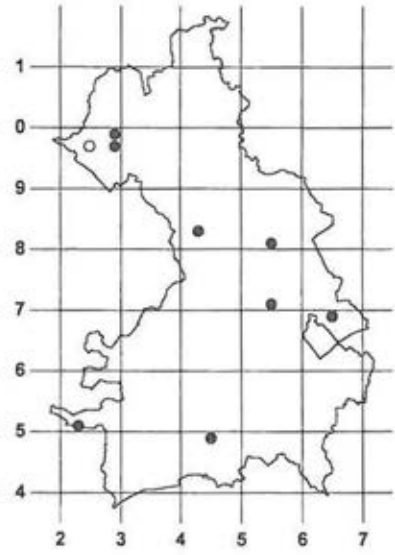
This species was first recorded in Britain in a large garden backing onto a lake with many mature trees in Barton Road, Cambridge, on 11 October 1996 by Lucy Cadbury. A tape of the song was sent to Chris Haes and Mike Edwards, who confirmed it as that of a tree-cricket, almost certainly *Oecanthus pellucens*. This is a widespread and common species in southern France.

Mole Cricket *Gryllotalpa gryllotalpa* (L.)
Conservation status: RDB1 (endangered); post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 2.

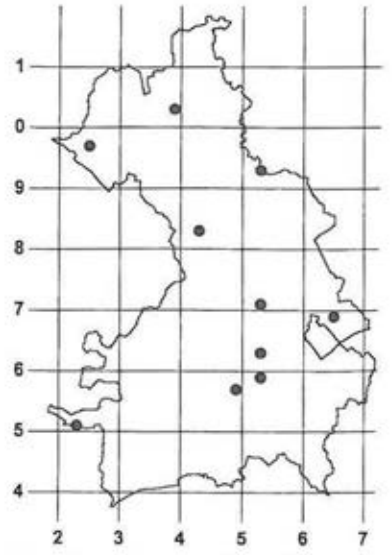
Burr (1904) reports that the Revd L. Jenyns described the species "In plenty at Fulbourn; in the park at Bottisham near the canal" early in the 19th century. There have been no further records and the species is presumed extinct.



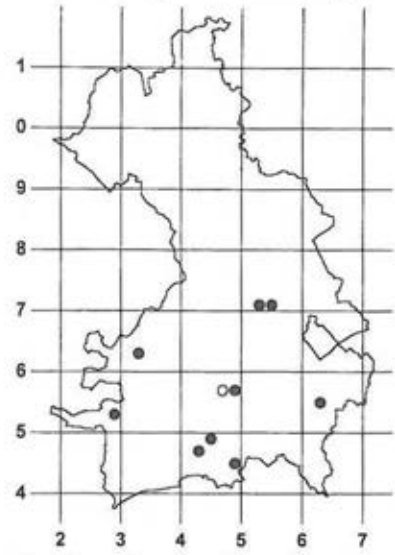
Map 5: ● Speckled Bush-cricket



Map 6: ● Slender Ground-hopper
○ Cepero's Ground-hopper



Map 7: ● Common Ground-hopper



Map 8: ● Common Green Grasshopper
○ Stripe-winged Grasshopper

Distribution maps of Cambridgeshire orthopteroids (post-1980)

The Mole Cricket is an endangered species in Great Britain and as a result is protected under section 5 of the Wildlife and Countryside Act 1981. It also forms part of English Nature's Species Recovery Programme and is on the shortlist of the U.K. Biodiversity Action Plan (Anon, 1995).

As a result of a recent conversation with one of the researchers on the Mole Cricket Species Recovery Programme, Bryan Pinchen, it has been suggested that searches of extensive intact areas of fen in the vice-county should be undertaken to look for the species, as it is believed that it may still be present. Apparently Mole Crickets can be extremely difficult to find and the adult males may only sing for one evening each year, so some detailed searches will be carried out in suitable habitat over the coming years.

Cepero's Ground-hopper *Tetrix ceperoi* (Bolivar) Map 6 (o)
Conservation status: nationally scarce (A) and CRDB; post-1980 10-km squares in v.c. 29: 1; 10-km squares where not recorded since 1980: 0.

This insect is normally considered to be a coastal species from southern Britain, but Peter Kirby found it in north Cambridgeshire near Whittlesey in 1995 – over 140 km north-west of any previous record and well inland (Widgery, 1996a). The site is a former brick-pit which experiences saline intrusions as a result of the underlying geology. The survival of the area is uncertain as it may in the future be threatened with infill.

This species is very difficult to separate from the Slender Ground-hopper and new records will only be accepted by the National Organisers of the Orthoptera Recording Scheme if a voucher specimen is provided.

Slender Ground-hopper *Tetrix subulata* (L.) Map 6 (•)
Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 8; 10-km squares where not recorded since 1980: 4.

The Slender Ground-hopper is a small insect (up to 14 mm) which inhabits areas of bare mud or other unshaded damp places. Care needs to be taken that immature Slender Ground-hoppers (which still have short undeveloped wings) are not misidentified as Common Ground-hoppers.

This species is widely distributed in the vice-county but is still under-recorded. In v.c. 29 it is reaching the northern limits of its British distribution.

Common Ground-hopper *Tetrix undulata* (Sowerby) Map 7 (•)
Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 10; 10-km squares where not recorded since 1980: 0.

The Common Ground-hopper is generally smaller than the Slender Ground-hopper, reaching only 11 mm. It is characterised by a pronounced dorsal keel on the pronotum (even in immature specimens). The insect requires open habitats containing mosses but lives in both wet and dry conditions. Its known distribution in Cambridgeshire is patchy as a result of under-recording.

Large Marsh Grasshopper *Stethophyma grossum* (L.)
Conservation status: RDB2 (vulnerable); post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 2.

The Large Marsh Grasshopper is the largest species of grasshopper in Britain, reaching 36 mm. It is a wetland species which formerly inhabited the

great fen basin. Unfortunately it is now extinct in Cambridgeshire and East Anglia and is found today in Britain mainly on the Dorset heaths and in the New Forest.

The stronghold of this species in Cambridgeshire was Whittlesey Mere and fens around Ely before their drainage in the 19th century. At the current time major efforts are being made to restore a number of the ancient fen sites and it may prove feasible in the future to reintroduce the species to suitably restored nature reserves.

Stripe-winged Grasshopper *Stenobothrus lineatus* (Panzer)
Map 8 (o)

Conservation status: nationally local and CRDB; post-1980 10-km squares in v.c. 29: 1; 10-km squares where not recorded since 1980: 0.

The Stripe-winged Grasshopper is a medium-sized grasshopper, up to 23 mm in length, which usually has a white stripe on the wing. It is a species of dry grasslands and is a good indicator of species-rich chalk grassland.

The species has only ever been recorded from one site in the vice-county, near Cherry Hinton, where it still persists today. The site is a small area of chalk grassland which is being invaded by scrub, though recent work by the Wildlife Trust should help to restore more suitable areas of habitat. The nearest colonies of the Stripe-winged Grasshopper are in the Breckland in Suffolk.

[Woodland grasshopper *Omocestus rufipes* (Zett.)

This species was recorded as common at Wicken Fen by G.T. Porritt (Burr, 1904), but it has subsequently been established that it was misidentified and the insects were actually Common Green Grasshoppers (Pickard, 1956; Kevan, 1961).]

Common Green Grasshopper *Omocestus viridulus* (L.) Map 8 (•)

Conservation status: CRDB; post-1980 10-km squares in v.c. 29: 6; 10-km squares where not recorded since 1980: 2.

This species grows up to 22 mm; it has a variety of colour forms but is most commonly green. It has a very characteristic prolonged song. It is an insect of unimproved wet meadows and wet woodland rides and is the most widely distributed species of grasshopper in the British Isles.

Common Green Grasshoppers have formerly been described as common; however there are only 10 post-1980 records (from nine sites) for the vice-county, despite extensive searching during recording of other more common species. The species may have undergone or is now undergoing a major decline resulting from the loss of wet meadows. As a result it is highlighted in *Cambridgeshire's Red Data Book* (Colston, Gerrard & Parslow, 1997) and efforts should be made to determine its current distribution in the vice-county and then to monitor its future progress.

Field Grasshopper *Chorthippus brunneus* (Thunb.) Map 9 (•)

Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 11; 10-km squares where not recorded since 1980: 4.

The Field Grasshopper can reach sizes of up to 25 mm; it is usually brown and has a characteristically marked pronotum. It is widespread and common in

the British Isles, generally favouring dry habitats including road verges. It is no doubt much more common in Cambridgeshire than the records would suggest and further survey is needed to establish its current status.

Meadow Grasshopper ***Chorthippus parallelus*** **(Zett.)** Map 10 (•)
Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 10; 10-km squares where not recorded since 1980: 4.

This is another widely distributed grasshopper, which can reach a length of 22 mm. The females have very reduced wings, which are diagnostic. The species appears to be common in the vice-county, being found in rough grassland including road verges, often in damper habitats than those used by the Field Grasshopper. It is no doubt much more common in Cambridgeshire than the present records indicate, but further survey work is required to show this.

Lesser Marsh Grasshopper ***Chorthippus albomarginatus*** **(De Geer)** Map 11 (•)
Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 10; 10-km squares where not recorded since 1980: 14.

The Lesser Marsh Grasshopper is superficially similar in appearance and size to the Meadow Grasshopper. Haes & Harding (1997) state that the species has undergone a considerable range expansion over the past 30 years, spreading westwards from the east coast.

It was recorded in Cambridgeshire during the 19th century. Burr (1904) states: "This species occurs in a few scattered localities, but is usually numerous where it does occur." The first records after this are from Mark Skelton in the 1970s. The insect is now common in v.c 29 (being probably its commonest grasshopper) and the main expansion is now occurring in Northamptonshire and beyond to the west. There is some evidence to suggest that the increase of the Lesser Marsh Grasshopper may lead to the decline of Field and Meadow Grasshoppers. Rands (1991) showed that in Bedfordshire this grasshopper was displacing both the other species as it expanded its range: in 1991 it had become the second most widespread species after the Field Grasshopper.

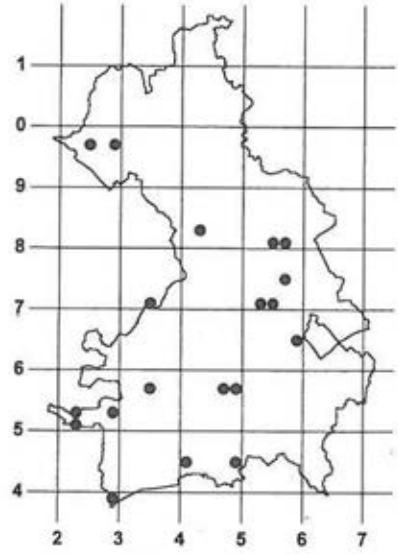
Mottled Grasshopper ***Myrmeleotettix maculatus*** **(Thunb.)** Map 10 (o)
Conservation status: CRDB; post-1980 10-km squares in v.c. 29: 1; 10-km squares where not recorded since 1980: 4.

The Mottled Grasshopper is a small species (12–19 mm) with characteristic clubbed antennae. It is an insect of dry sunny places on sand, gravels or chalk.

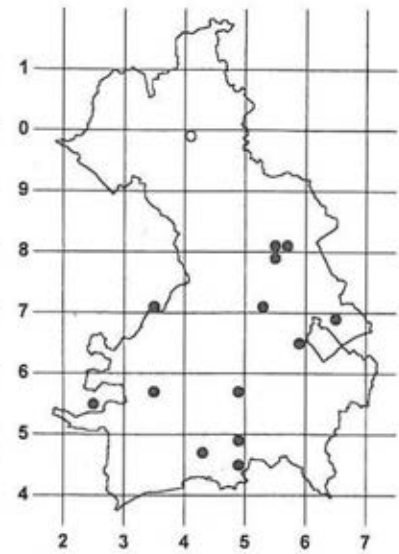
There are early records by Jenyns from the Devil's Ditch, Newmarket Heath, Gamlingay and Wilbraham Temple (Burr, 1904) and from Wicken (Worthington, 1927), but the only recent record is by Brian Eversham from the disused railway sidings in March in 1997. Further surveys should be carried out to determine whether this species occurs elsewhere in the vice-county.

Common Cockroach ***Blatta orientalis*** **L.**
Conservation status: not native; post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 1.

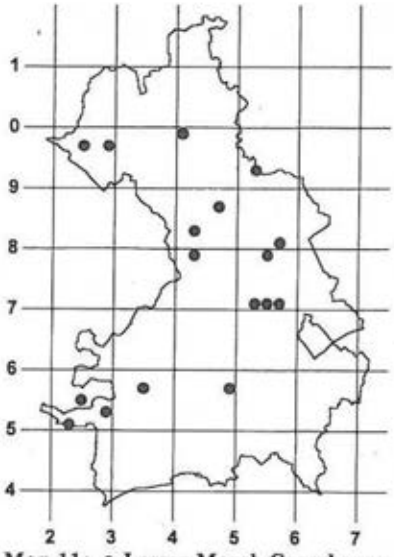
The Common Cockroach is not native to the British Isles, but it does become established from time to time in places where there is permanent heating such as



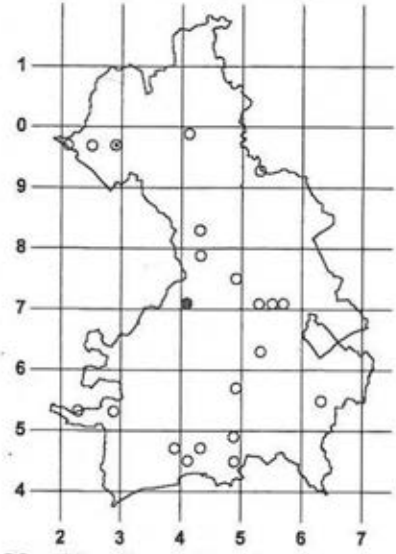
Map 9: ● Field Grasshopper



Map 10: ● Meadow Grasshopper
○ Mottled Grasshopper



Map 11: ● Lesser Marsh Grasshopper



Map 12: ● Lesser Earwig
○ Common Earwig
• Lesne's Earwig

Distribution maps of orthopteroids

restaurants; factories and hospitals. However, increased hygienic standards ensure that populations rarely survive permanently. There are no records for the vice-county since 1945 (BRC record), though no doubt it has been reported since then to Environmental Health Officers as opposed to ecologists.

Australian Cockroach *Periplaneta australasiae* (Fabricius)
Conservation status: not native; post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 1.

This species is a large reddish cockroach usually found in the British Isles in horticultural hothouses. There is a single Cambridgeshire record from 1893, by D. Sharp from the Botanic Garden in Cambridge.

German Cockroach *Blattella germanica* (L.)
Conservation status: not native; post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 1.

The status and occurrence of the German Cockroach mirrors that of the Common Cockroach. It has not been recorded in the vice-county since 1970, when it was reported from the New Museums Site, Cambridge (BRC record).

Lesser Earwig *Labia minor* (L.) Map 12 (•)
Conservation status: CRDB; post-1980 10-km squares in v.c. 29: 1; 10-km squares where not recorded since 1980: 3.

This is the smallest earwig in Europe, reaching only 6 mm in length. It can be mistaken for a small or immature Common Earwig, as its small folded wings protrude from under the elytra, but Hawes (1997) gives a clear method of separating the two species based on the shape of the second tarsal segment, which in the Lesser Earwig is not expanded. His paper also includes a superb colour photograph by Chris Timmins of a Lesser Earwig about to fly.

This insect has been recorded from only four localities in the vice-county, most recently from Willingham by Peter Kirby in 1981, though Burr (1904) described it as "Common in the summer, often seen on the wing in company with *Staphylinidae*, over flower beds and dungheaps."

It is considered that this species is greatly under-recorded, as it appears to reside in dungheaps in farmyards and stables. Widgery (1997a, 1997b) details a method of surveying for it, using a trowel, which has proved very successful in Gloucestershire, where the success rate was nearly 100%, with 14 new 10-km records added in two weeks. No doubt the Lesser Earwig is more widespread in Cambridgeshire than current records indicate.

Short-winged Earwig *Apterygida media* (Hagenbach)
Conservation status: nationally scarce (B); post-1980 10-km squares in v.c. 29: 0; 10-km squares where not recorded since 1980: 1.

This species, also known as the Hop-garden Earwig, is reddish-brown with a body length of up to 10 mm. It was formerly found in hop gardens but today is found in sunny thickets and woodland edges.

There is a single 19th-century record for Cambridgeshire in Burr (1904), by Professor C.C. Babington in Cambridge. Today it is a rare species recorded only from Kent and Suffolk. It is possible that isolated colonies still remain in the vice-county undiscovered.

Common Earwig *Forficula auricularia* L. Map 12 (o)
Conservation status: not threatened; post-1980 10-km squares in v.c. 29: 14; 10-km squares where not recorded since 1980: 3.

The Common Earwig is familiar to everyone with its characteristic pincers. It can reach a length of 15 mm. It is found in a wide variety of situations including houses, under stones and logs, and in rough grassland. With more thorough surveying it will no doubt prove to be ubiquitous throughout v.c. 29.

Lesne's Earwig *Forficula lesnei* Finot Map 12 (•)
Conservation status: nationally scarce (B) and CRDB; post-1980 10-km squares in v.c. 29: 1; 10-km squares where not recorded since 1980: 0.

Lesne's Earwig is a small species (up to 7 mm) which can be distinguished from Common and Lesser Earwigs by the absence of hindwings. It is a very elusive species which lives in oak woodland, chalk scrub, hedgerows and nettle beds and is best located by beating bushes. There is a single record for Cambridgeshire, by Peter Kirby at Lattersey in 1986. It is likely that with more survey work the species will be found to be more common, although very local.

Table 2: Conservation action for Cambridgeshire's orthopteroids

Species of national importance targeted for action in the U.K. Biodiversity Action Plan (Anon, 1995)	**Mole Cricket** • Wildlife and Countryside Act 1981, Schedule 5. • Biodiversity Action Plan shortlist – priority sp. • Species Recovery Programme. • may be extant in v.c. 29, but possible candidate for reintroduction.
	Large Marsh Grasshopper • RDB2 (vulnerable). • Biodiversity Action Plan middle list – priority sp. • possible candidate for reintroduction to v.c. 29.
Species of local importance targeted for action in Cambridgeshire's Biodiversity Action Plan (Anon, 1997)	**Great Green Bush-cricket** • Protect existing sites.
	Roesel's Bush-cricket • Monitor range expansion.
	Short-winged Cone-head • Protect existing sites, search for new sites and create new wetlands.
	Cepero's Groundhopper • Protect existing site and search for new sites.
	Stripe-winged Grasshopper • Protect and manage existing site.
	Common Green Grasshopper • Protect existing sites and create new wet grasslands.
	Mottled Grasshopper • Protect existing site and search for new sites.
	Lesne's Earwig • Protect existing site and search for new sites.

Conservation

The systematic list shows that a number of species have undergone declines in distribution and that others appear to be intrinsically rare and are therefore in need of conservation. Other species which are now extinct in Cambridgeshire could in the future be reintroduced if suitable habitats could be restored. The conservation of our orthopteroids is fortunately now being addressed as a result of the upsurge in invertebrate conservation initiatives largely resulting from the publication of the U.K. Biodiversity Action Plan (Anon, 1995) and Cambridgeshire's local version (Anon, 1997). Table 2 summarises the species that it is hoped will benefit from national and local conservation action.

The future

It is clear from the above text and the maps that there is great potential for further recording of this group in Cambridgeshire, particularly in the north of the vice-county. It is also clear that the status and distribution of orthopteroids in the country is fluid, with many changes to be expected in the future, and that conservation action for a number of species is required.

Several species appear to be undergoing range expansions, such as Roesel's Bush-cricket and the Short-winged Cone-head. The Long-winged Cone-head *Conocephalus discolor* (Thunb.) is also undergoing a range expansion and is now common in Hertfordshire and within 500 metres of the Cambridgeshire vice-county boundary (Widgery, 1998 and pers. comm.); it is most likely that this species will be recorded in the vice-county during 1998. There are also, of course, all the obvious gaps still to fill for the common species.

Finally, it is useful also to put Cambridgeshire into a national perspective. Table 3 compares the orthopteroid faunas of Cambridgeshire, Huntingdonshire, Northamptonshire and Dorset and shows how species number is related both to recording effort and to latitude. Dorset is a well-recorded vice-county which also enjoys a southerly climate, a coastline and a number of rich habitat types. Cambridgeshire, Huntingdonshire and Northamptonshire, on the other hand, are less well recorded, lack coastlines, are further north and have also lost proportionately more species-rich habitat. With additional recording and conservation effort a vice-county such as Cambridgeshire might expect some new species (such as Long-winged Cone-head, Mole Cricket and Large Marsh Grasshopper), but it will never be as species-rich as Dorset.

Table 3: Comparison of orthopteroids in Cambridgeshire, Huntingdonshire, Northamptonshire and Dorset

Vice-county	Native species recorded post-1980	Percentage of 34 mainland native species
'Old' Cambridgeshire, v.c. 29 (this paper)	18	53%
Huntingdonshire, v.c. 31 (Colston, in press)	14	41%
Northamptonshire, v.c. 32 (BRC and personal records)	13	38%
Dorset, v.c. 9 (Mahon, 1992)	31	91%

BRC recording cards (RA4B and GEN7) can be obtained from the Biological Records Centre, Monks Wood, Abbots Ripton, Huntingdon, PE17 2LS. Completed cards should be sent to me, Adrian Colston, The National Trust, Wicken Fen N.N.R., Lode Lane, Wicken, Ely, Cambridgeshire, CB7 5XP. I am also happy to identify specimens if required. In addition to future records I should be very pleased to receive details of any other published records of orthopteroids in Cambridgeshire which I have missed.

Details of the Orthoptera Recording Scheme for Great Britain and Ireland can be obtained from the national co-ordinator John Widgery, 21 Field View Road, Potters Bar, Hertfordshire, EN6 2NA.

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The Kingfisher's Bridge Wetland Creation Project: a report from the project's inception to autumn 1996

Stephen Tomkins

Introduction

The Kingfisher's Bridge Wetland Creation Project is a pioneering undertaking to restore to native wildlife an extensive fenland area where, until recently, arable agriculture was practised. The project was first conceived after a visit by the late Sir Peter Scott a decade ago; a feasibility study was begun in 1993 and the actual excavation started in 1995. The enterprise has few national parallels as yet. It might be compared to other post-industrial land-restoration projects in that the intention is to return an exploited site to a greater diversity of plant and animal life characteristic of a period much earlier in its history. The long-term future of our farmed fenland is anybody's guess. Peaty soils will be further lost and sea levels are likely to rise. In this context there should be much to learn from this restoration enterprise. As will be seen, the enrichment of Cambridgeshire's wildlife is being well served by it already.

Mr Andrew C. Green is the architect of the project, and he and his sons Patrick and Robin Green are joint owners of the 160-acre (65-hectare) site. A public footpath runs along the south-western and western boundaries. At present there is no public access to the site itself, but one of the aims of the project is that controlled public access should be allowed in the future to the hides along the western boundary. The Green family particularly welcomes contact from experienced naturalists who are willing to contribute to the future monitoring of the venture.

This is the first of a series of articles that will record the progress of the project for readers of *Nature in Cambridgeshire*. Detailed reports for the first few years of the project may be purchased from Mr Roger Beecroft, Wildlife and Countryside Services, Fen Cottage, Creeting St Mary, Ipswich, Suffolk, IP6 8QE.

The site of the new Kingfisher's Bridge Wetland lies at High Fen, Wicken, about 16 km north-west of Cambridge and 8 km south of Ely, to the north of the A1123 road from Stretham to Wicken and just to the east of the River Cam (Figure 1). The Kingfisher's Bridge Project takes its name from a very small brick bridge (TL 544728) adjacent to the recently built house of the same name. The bridge carries a public path over a cut channel linking the River Cam with a pit. This quarry pit dug in the Upware Rock, perhaps at the end of the 18th century, was a source of quarried limestone, which would have been readily ferried away by barge down the cut to the river. The Upware North Pit (itself a Wildlife Trust reserve) is now the only site in East Anglia where Water Germander *Teucrium scordium* is to be found, and the site is therefore designated as an SSSI. Just a few hundred metres to the south is a major industrial working of the same limestone rock, where open quarry excavations for limestone cover a few hectares and are currently 10–12 metres in depth. The future potential of this site as a wildlife refuge is significant.

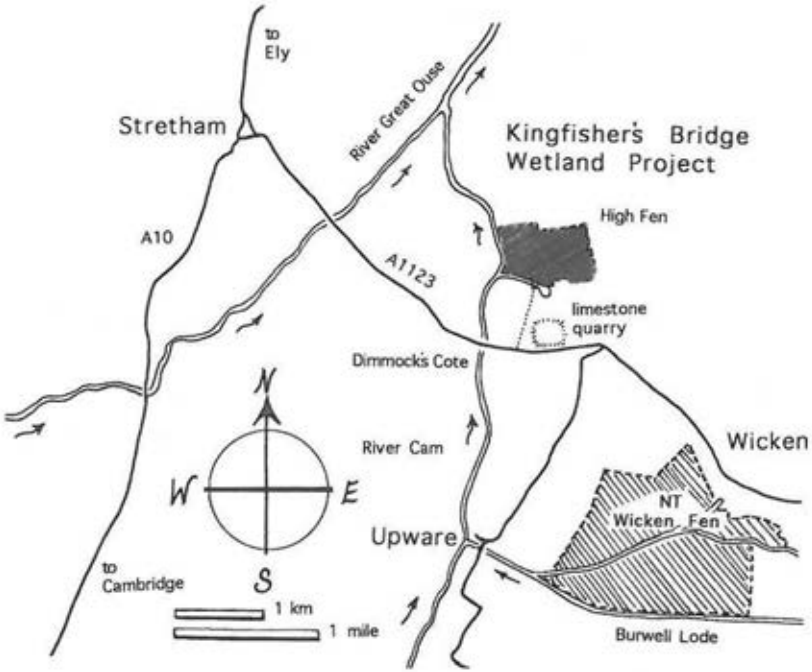


Figure 1: Map showing the location of the Kingfisher's Bridge Wetland

Project aims and philosophy

Andrew Green planned the project with three particular advantages in mind. First, the site, now partly agricultural set-aside, includes substantial areas of limestone and peat terrain, with part of the latter below sea level, providing an opportunity for some of it to be returned to fenland as managed reed-swamp. Secondly, the site lies adjacent to the River Cam and to valuable washland used at present by wildfowl, particularly at migration seasons; it also abuts the Upware North Pit SSSI and is situated within three kilometres of the National Trust's National Nature Reserve at Wicken Fen. The area is on a major wildfowl corridor across Britain, between the Severn and the Wash. It thus adds to an important conservation region. Thirdly, the project is providing an opportunity to design and practise the creation of a wide variety of habitats *de novo* and may thereby be an incentive to others, whether Government, non-Government organisations or private individuals, to redress the present imbalance between wetland and commercial land-use and hence protect and enhance a greatly weakened part of our wildlife heritage. Philosophically, the project is being carried out more for wildlife survival than for public education or recreation. The intention is to 'manage' the wildlife actively, to optimise the rate of establishment and diversity of wetland environments and to make judicious introductions in order to speed the process.

Geology, geography and site history

The topography of the site before excavation is shown in Figure 2. Much of the area is actually close to or below present sea level, but running through the eastern side of the site on an axis slightly east of north is a ridge formed by an outcrop of Jurassic Corallian Limestone, described locally as Upware Rock. This ridge slopes down gently northwards from High Fen Farm, where it reaches 5 m above Ordnance Datum. (O.D. is mean sea level.) The Corallian Limestone in this area consists of a soft oolitic limestone at maximum some 15 m in depth, capped by a harder bed of fossil-rich coral rag. This deposit was once interpreted as an ancient coral reef, but is now regarded as sediments laid down "in shallow turbulent water in an area which was probably at times a series of small patch reefs and at times a shoal of skeletal sand/oolite" (Gallois & Cox, 1977). The Upware Rock is fully porous to ground water, which is significant here, because water high in calcium ions is essential for alkaline fen formation. Water from the ridge drains naturally north-westwards onto the site where fenland re-establishment is being attempted.

The outcrop of Corallian Limestone and indeed the ridge itself are the surface expression of an anticline in the underlying geological strata, the result of folding during the Cretaceous Period. Immediately to the west the rocks plunge down to form the corresponding syncline on a parallel axis,

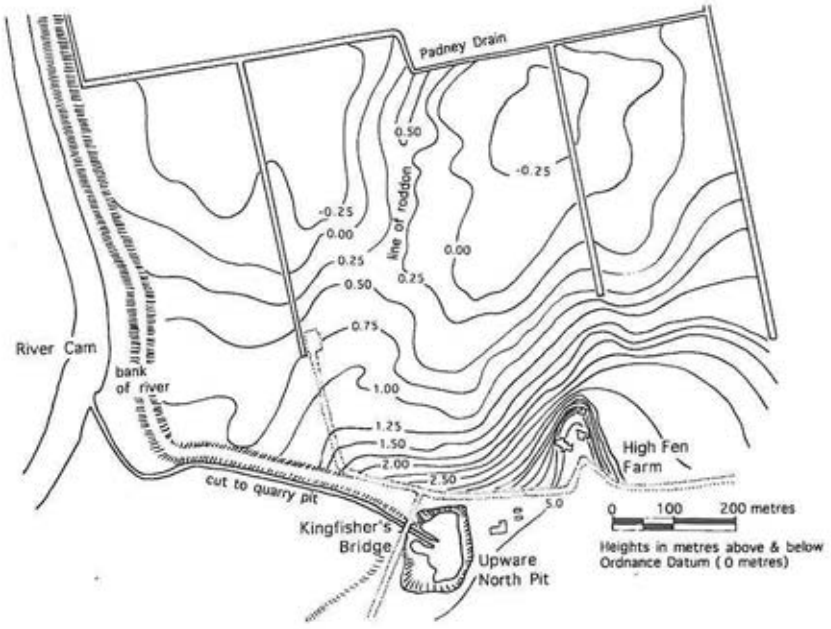


Figure 2: Topography and drainage of High Fen before the excavations (from a survey by Mott MacDonald)

approximately underlying the present course of the River Cam. Within the syncline a considerable thickness of the Ampthill and Kimmeridge Clays is preserved, overlain by a thin cover of Cretaceous Lower Greensand. The lower, western part of the site is underlain by these clays, which thin out against the higher limestone ridge but form an impermeable layer beneath the residual fen peats that still constitute the surface deposits covering all the low-lying parts of the Fenland around Wicken and Upware.

The Fenland region, as we know it today, has a much younger geological history, beginning about 480,000 years ago with invasion of the area by the earliest and most extensive of the ice sheets of the Quaternary Ice Age. The ice excavated a huge basin in the soft Jurassic clays before flowing up and over the chalk hills of Suffolk, Essex and south Cambridgeshire. Since that time, through the glacial and interglacial cycles of the Pleistocene, the area has been a constant battleground between land and sea. About 11,500 years ago rapid climatic warming brought an end to the most recent glacial stage, the Devensian, and prompted the onset of the Holocene or Post-glacial. Tundra-like vegetation was replaced by birch woodland and later by forest with pine and temperate deciduous trees such as oak, elm, hazel and alder. World sea levels rose slowly as a huge ice-sheet covering most of Canada gradually melted and, about 8,300 years ago, flooding of the southern part of the North Sea basin cut Britain off from the European mainland. The rise of the North Sea impeded river drainage in the Fenland basin, causing widespread flooding. This killed off the high forests of oak, elm, lime and pine which had become established there. Instead, a mosaic of reed and sedge swamp and open meres developed, forming dark, calcium-rich fen peats which rapidly enveloped the fallen timber or 'bog oaks' (Godwin, 1978). Over several thousand years, up to four metres of peat accumulated in the Wicken area, at some horizons incorporating remains of willows and alders or even oak, ash, yew and birch, representing periods of drier climate when fen woods could develop on the peat surface. It is the drainage and ploughing of these peat deposits which has produced our rich Cambridgeshire and Isle of Ely fen soils, and in many places in the Fens piles of black 'bog oaks' can be seen, pulled from the peat to the edges of the fields. The natural drainage of the Fenland in these early times was by a network of sluggish rivers that meandered through the swamps. However these were tidal, and the incoming tidal waters were often laden with silt, which floored the channels and built up low banks or levées, as in modern tidal deltas. As the peat surface has shrunk or been eroded, these silt deposits now stand out above the surrounding areas as meandering banks or 'roddons', the marine origins of the silts being clear from the fossil micro-fauna they contain. At Kingfisher's Bridge one of these silty clay roddons runs north-north-east across the site, giving evidence of a small river that once ran northwards here and parallel to the present River Cam towards Ely.

From the 17th century, this site, like much other fenland, slowly came under managed grazing and arable cultivation. The clay embankment of the River Cam, forming a marked topographic feature to the west of the site, originated as a raised levée but was much built up when the river was effectively canalised in the 18th century. The land east of the river bank was originally drained by a wind-pump situated on the river bank (shown on maps from 1770 to 1844). This was replaced by another wind-pump on the north

side by the late 19th century, as shown on a map in the County Record Office dated 1886. Free drainage into the Padney Drain is a management option that has been retained on the north side of the new wetland.

As elsewhere in the Fens, the level of the peatland surface fell relative to both sea and river levels as the peat began to waste; wasting is a combination of processes of drying out, oxidising and blowing away. This wastage lowered the farmland even further below the level of the rivers, restrained within their clay embankments, and indeed to below sea level in many places. Evidence for peat wastage at Kingfisher's Bridge is well shown by the land contours in Figure 2, and in particular by the roddon with its the broad bed of silt running northwards at present sea level.

As with most such fen areas, there are limited records of its early drainage for agriculture. A fine map of the whole site, dated 1770, when it was owned by the Earl of Besborough, shows approximately the 1995 pattern of drainage ditches (see back cover). The reclaimed land may well have been used for grazing initially, but over the past two centuries it has seen much arable farming.

The rainfall in this area of the Fens is typically 500 mm per annum, but it has been 20% below this level for much of the mid 1990s. The typical mean monthly rainfall is close to 40 mm, with wetter times in May and September and least rain on average in March. Because evaporation and transpiration are greatest from April to September (85%) and least from October to March (15%), winter flooding is always likely. Such flooding is countered on the drained fens by considerable water-pumping in the winter months, but winter inundation was always a feature of traditional fenland and is an expected feature of this site.

The site excavation (September to November 1995)

In September 1995 construction work started on a plan devised by Andrew Green and Roger Beecroft, the conservation management consultant (see Beecroft, 1998). Great care was taken over the design of the site, with the specific intention of providing as broad a seasonal range of fenland habitats as possible (Figure 3).

By the end of November the area had been fully reprofiled, with about a quarter of a million cubic metres of material moved. A complex series of watertight bunds with pipe sluices was constructed to ensure the best use and control of the available water. As a result of peat wastage a third of the area was below O.D., but at the finish of excavation approximately half the site was below O.D. The soils of the site and its landform dictated most of the design.

Initially, large amounts of peat were removed from above the clay to the west of the roddon and from the limestone east of the roddon. Large heaps of the peat were made at the extreme south side of the site. Some of this fen-peat soil will be sold, but the intention is to retain at least one of these small hills as a viewing platform. This north-facing vantage point is high, at 12 m above sea level, and provides a commanding view of the whole area. The heavy silt from the roddon has now been put to use as a walkway, with raised banks, on the edge of the excavated lake, so preventing visitors from being seen by waterfowl. The best heavy blue clay for making watertight bunds came from below the peat of the lake on the western side. Great care was taken in

instructing the vehicle operators to follow the excavation design of the water channels, drains, ditches and the lake itself. The boundaries of the lake meander, increasing the length of the shoreline. Here are several islands constructed for nesting birds, with one artificial Otter holt, some small areas of deeper water (2 m below O.D.) and much shallower water at the edges for waders. A second artificial holt has been built beside the Cam. The islands in the lake were intentionally situated at the north-east side to break the force of waves driven to the perimeter by prevailing south-westerly winds.

During the course of operations the opportunity was taken to examine more closely the peat deposits exposed by these excavations. Although large amounts of peat had been scraped off some areas, particularly to form the lake, over much of the lower part of the site 1–2 m of peat remain. These were sampled by Charles Turner, using a peat-borer. It was shown that open-water organic muds and occasional beds of marl (rich in remains of the alga *Chara* and with abundant shells of freshwater molluscs) had been followed by layers of fibrous peats. Sometimes these had the characteristic orange-coloured rhizomes and abundant fossil fruits of the Great Fen-sedge or Saw-sedge *Cladium mariscus*. Thus at one time the area must have had open water and later resembled the sedge-fields of Wicken Fen. Fossil timber was present both within the basal muds, probably representing the early Post-glacial forest, and more obviously as trunks, branches and smaller fragments lying on the excavated surface, some clearly *in situ* in the peat, others perhaps derived from excavation of lower levels. Thin-sectioning and examination of wood structure under the microscope led to the identification of remains of oak, alder, willow and yew. Richard Preece confirmed the presence of at least 15 species of freshwater molluscs, washed from the palaeobotanical samples. These are the lake limpet *Acroloxus lacustris*, the ramshorn snails *Anisus vortex*, *Bathyomphalus contortus*, *Hippeutis complanatus* and *Planorbis planorbis*, the pond snails *Lymnaea palustris*, *L. peregra* and *L. stagnalis*, other freshwater gastropods, *Bithynia leachi*, *B. tentaculata*, *Physa fontinalis*, *Valvata cristata* and *V. piscinalis*, and the bivalves *Pisidium nitidum* and *Sphaerium corneum*. All of these are common species of open fresh waters in East Anglia today.

On the higher south-east side of the whole site the topsoil was scraped off the limestone ridge to provide an open limestone surface for plant colonisation. The limestone rock is relatively soft and contains innumerable small sea-urchin fossils (*Cardioceras cordatum*). At several other locations excavated limestone spoil from the main quarry was spread on the surface; near the lake and on its islands limestone spoil was added to make suitable nest sites for the Little Ringed Plover. Towards the south-east of the site, on higher ground, two ponds were cut into the limestone with a 4-m cliff on their south (north-facing) sides. Both immediately held water. These ponds were cut principally for Sand Martins, for which nest-holes were drilled.

Between the higher ground in the south-east and the excavated lake in the north-west are two areas designed for flood-meadows with managed cutting or grazing. These are on the slightly higher ground. Lower down in graded steps to the north are four areas assigned for reedbeds. All are embanked and have controlled sluices. There is one small area at O.D. designated for a litter-field. In the north-east is a potentially very wet excavated site for a further flood

meadow. The drainage control is managed by the use of plastic pipes at the sites indicated in Figure 3. These pipes are fitted with an adjustable right-angle section that may be tilted to control the level of overflow, to within a few millimetres, from a higher to a lower section. A feeder ditch runs along the O.D. contour line from south-west to north-east. This can be managed to send water coming from the higher land in the limestone-water feed ditch in either direction. Outflow sluices at two points on the northern perimeter ditch allow flood water to flow into the Padney Drain if necessary. There seems to be some seepage through both the old and the new banks; some water may be persistently entering the crouch ditch from the main Cam bank. Provided that there is sufficient rainfall, considerable potential for water control and flexibility of water management is built into this flood/drainage design.

Monitoring colonisation and introducing species

An initial aim of the whole project was the restoration of fenland ecosystems on an industrially farmed landscape. It is well known that such farmed land will revert to fenland once drainage is lost and land is abandoned to winter flood. For example, a succession of flood land to *Phragmites* reed-swamp is well described by Ennion (1942) in his *Adventurers Fen*, the story of a natural fen restoration at Burwell, between the two World Wars. Here it was achieved by the economic forces of an agricultural depression alone! One difficulty with such natural plant recolonisation and subsequent succession is that rather uniform and species-poor communities may initially predominate through faster dispersal or better establishment. As there has been much experimentation recently with reedbed creation, with proven success, and, as Bulrush or Reedmace *Typha latifolia* very often becomes established in competition with Common Reed *Phragmites australis*, it was decided to sow reed seed and to plant reed rhizomes and 'plugs' in some of the constructed wetland areas (Hawke & José, 1996). The progress of this assisted colonisation is being monitored.

There was frank discussion, with diverse opinions amongst those giving their advice on this project. On the one hand, there was a botanical interest in monitoring the establishment of the new plant communities from the seed-banks in the soil and peat and from natural imports of migrant seed. Here was a clear opportunity to discover what, of itself, would return. As will be seen below, there has been a fascinating reappearance of uncommon plants, though many of them are ruderals (arable weed species). On the other hand, there was a clear intention by the owners and originators of the project to achieve a diverse series of managed plant communities through the programme of construction already described. It was initially hoped to establish these communities quite quickly and thereby to achieve the stability that fenland communities are known to have, as at Wicken Fen, when they are under a relatively constant set of environmental management conditions. To a very large extent the outcome has been a compromise between these two positions, with a considerable degree of uncertainty thrown in as to why particular plant species have appeared at all. The higher and drier limestone areas that are found on this site, unrepresented in conservation areas elsewhere locally, may well have considerable botanical interest in the future. These limestone areas have not been directly seeded to date.

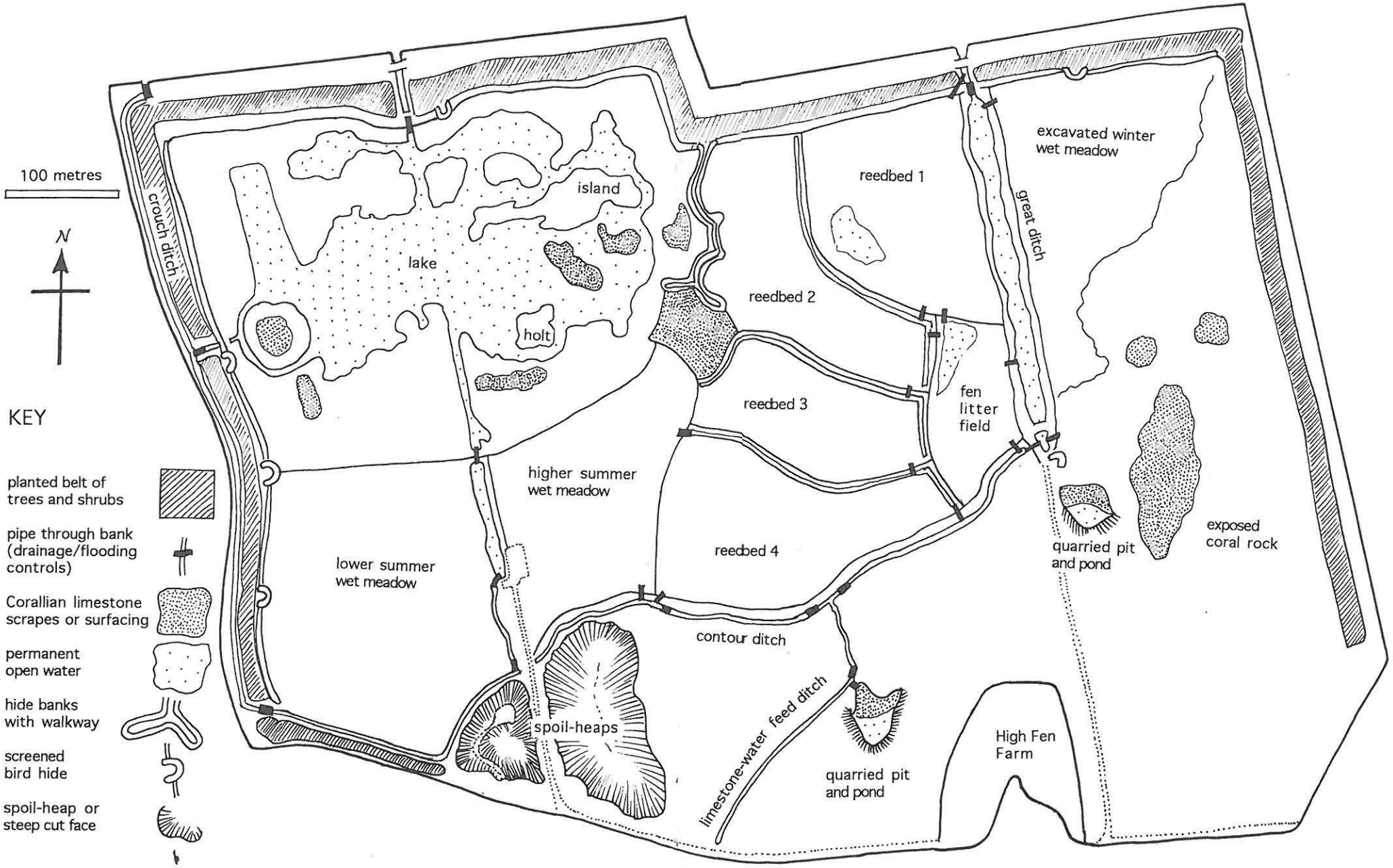


Figure 3: Map of the Kingfisher's Bridge Wetland after the 1995 excavations

Mike Crewe was engaged for the project by Roger Beecroft as botanical recorder, and he has produced annual reports on the species found and on the plant communities. He has employed methods used in the National Vegetation Classification as a basis for monitoring their development (e.g. Rodwell, 1992). Three different ways of botanical surveying have been used – NVC recording in random quadrats, monitoring of fixed-point quadrats, and a general search of the site to produce an overall list of species present. The last has been found most useful for picking up any species missed by the placement of quadrats and will help to provide a wider list of associates within the communities (Crewe, 1996). All plant nomenclature is based on *New Flora of the British Isles* (Stace, 1997). Mike Crewe has recorded species by tabulation of their occurrence within the different zones, noting their abundance by percentage ground cover and by frequency within a plant community by quadrats. A substantial data-base has thus been assembled.

Botanical report on the first growing season

The site was largely cleared of vegetation during the excavation phase in the autumn of 1995. The previous land-use for rotational cereal and root crops manifested itself in the occasional appearance of Sugar Beet *Beta vulgaris* subsp. *vulgaris* and Carrot *Daucus carota* subsp. *sativus*. Much of the area in the summer of 1996 developed stands of mixed Perennial Rye-grass *Lolium perenne* and Bread Wheat *Triticum aestivum* with a little barley *Hordeum* spp. which had been sown the previous year. There was a massive recruitment of ruderal (weed) communities typical of the Fens, most notably Flixweed *Descurainia sophia*, Black-bindweed *Fallopia convolvulus*, four goosefoots, *Chenopodium album*, *C. rubrum*, *C. ficifolium* and *C. polyspermum*, and Redshank *Persicaria maculosa* and the closely related *P. lapathifolia*.

Left to right: Yellow-juiced (or Babington's) Poppy, Fine-leaved Fumitory, Grey Field-speedwell, Dwarf Spurge, Venus's-looking-glass **Graham Easy**

Importantly, there were a number of arable weeds which are typical of the vice-county but are not particularly common on a national scale. These included Yellow-juiced (or Babington's) Poppy *Papaver dubium* subsp. *lecoqii*, Fine-leaved Fumitory *Fumaria parviflora*, Grey Field-speedwell *Veronica polita*, Dwarf Spurge *Euphorbia exigua*, Venus's-looking-glass *Legousia hybrida* and Large-flowered Hemp-nettle *Galeopsis speciosa*.

A feature which is more difficult to explain was the appearence on peat surfaces, amongst these ruderal plants, of abundant seedlings of Brookweed *Samolus valerandi*. This is a plant of marshy meadows and ditches, present in the Wicken area but not especially abundant. It has no obvious adaptations to rapid dispersal, but survival within a seed-bank in the peat seems unlikely, given both the age and the nature of the peats concerned. Perhaps it was spread by seasonal flooding from some local ditch where it was particularly abundant. The established drainage ditches across the site probably increased the rapidity of establishment of aquatics found in lesser quantity, notably Common Water-crowfoot *Ranunculus aquatilis*, Amphibious Bistort *Persicaria amphibia*, Pink Water-speedwell *Veronica catenata*, Narrow-fruited Water-cress *Rorippa microphylla*, Curled Pondweed *Potamogeton crispus* and Various-leaved Water-starwort *Callitriche platycarpa*.

The Venus's-looking-glass and Grey Field-speedwell were present in good quantity on the less nutrient-rich eastern limestone area. Lower and to the north, on the southern part of the projected flood meadow, there were vast stands of Wild Mignonette *Reseda lutea*, large plants of Musk Thistle *Carduus nutans* and innumerable Spear Thistles *Cirsium vulgare*. These provided huge numbers of seed-heads for small seed-eating birds at the end of the first summer. Where the topsoil had been completely removed from the even lower half of the northern winter wet meadow, Black-grass *Alopecurus myosuroides* predominated and Babington's Poppy was also found. The golden-flowered Flixweed, which covered much of the site in the first summer, was almost absent from this area.

The western area designated as summer wet meadow was much less disturbed, and here there were good quantities of Red Fescue *Festuca rubra* and Creeping Thistle *Cirsium arvense* in particular. In the reedbed Toad Rush *Juncus bufonius*, Blunt-flowered Rush *Juncus subnodulosus*, a typical fen species, and Soft Rush *Juncus effusus* were noticed in July of the first summer. Careful studies would be needed to discover whether these were from a pre-agricultural seed-bank. Greater Pond-sedge *Carex riparia* was only on the western boundary and river bank. Reed Sweet-grass *Glyceria maxima* and Reed Canary-grass *Phalaris arundinacea* were both confined to bordering ditches in this first summer. Common Reed was only patchily distributed along the western boundary and the ditch near the concrete pad. Bulrush or Reedmace appeared as innumerable seedlings across all the wetter areas of the site by the middle of summer 1996. This is well known to seed in rapidly by wind dispersal.

The initial reedbed seeding

Four individually embanked areas, one sixth of the whole area, were designated as reedbeds with the intention of introducing Common Reed. Reedbed creation is high on the agenda for many bird conservation

organisations such as the RSPB, but, where planting of rhizomes or 'plugs' with plants in them has been tried, it has been found to be both expensive and labour-intensive. A decision was made to use seed from Strumpshaw Fen, currently used as a source by the RSPB. Several bird species, notably Bearded Tit (Reedling) and Bittern, depend on this habitat. Sylvia Haslam had expressed the hope that only Wicken seed be used, but unfortunately the National Trust was unable to supply seed locally. It should be noted that there are well-established local reed plants on the site and, if there is any local adaptation of significance, the local morph will also be present. Reed seed was treated to break its dormancy and sown in rectangular blocks within the proposed reedbed area in the spring of 1996. The block planting was protected from grazers. Despite low rainfall the reed seedlings soon became established. Many seeds floated away from their original plantings and certainly some of these took root elsewhere quite quickly. By the autumn the plants were well enough established to form a future reedbed. The intention is to flood these areas in winter to protect them from wildfowl grazing and to reduce competition from ruderal species. Accurate and adequate control of water levels seems to be a prerequisite here for success.

The initial litter-field seeding

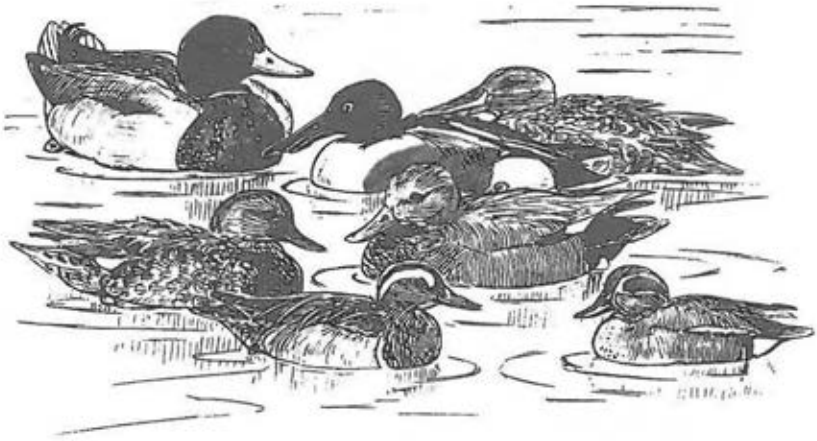
Approximately one hectare of the site (see Figure 3) was designated for development as a fenland litter-field. With part-funding from English Nature, an experiment in establishing appropriate species was agreed upon in the late summer of 1996. Two sites at Chippenham Fen NNR (compartments 10 and 11) were identified in July as suitable litter-field seed donors. Here the vegetation included Purple Moor-grass *Molinia caerulea* and Great Fen-sedge *Cladium mariscus*. There were also some 25 broad-leaved fenland species, including Common Marsh-bedstraw *Galium palustre*, Gipsywort *Lycopus europaeus*, Water Mint *Mentha aquatica*, Meadowsweet *Filipendula ulmaria*, Marsh Thistle *Cirsium palustre* and the rare Cambridge Milk-parsley *Selinum carvifolia*. In all, seed was collected from 35 species, none of which were present in the 1996 summer flush of seedlings on the Kingfisher's Bridge site. Half the seed collected was sown in pots in the autumn of 1996 and half retained for a spring sowing in 1997. By the end of 1996 seedlings of 17 species were established under polythene. However, the autumn germination of the rushes and grasses was particularly disappointing. Even more disappointing was the attempted import of seed from hay to be broadcast in the area. Bales of cut hay, collected one day after cutting so that the seed would not yet have dropped, were imported from Chippenham Fen to the 'Fenland' area of one hectare. Bales of recently cut hay from Wicken Fen were also spread on the northern area of winter wet meadow, but this held little seed. Before the imported material was spread, the sward of arable weeds was machine-flailed and the surface cultivated to produce an arable seed-bed. By 6 November 1996 ground cover was re-established. There was a carpeting of Small Nettle *Urtica urens* and Creeping Thistle *Cirsium arvense*, but not a single specimen of any of the imported species was to be found *in situ* that had not previously been recorded from the site in the summer. (It is hoped to publish more details of the 1997 and 1998 results of this attempt at community establishment in this journal in 1999.)

The first year's bird report (winter 1995/96 to September 1996)

Birds were given considerable recording attention from the start, 123 species being seen within a year of the first excavations beginning (September 1995 to September 1996). An intensive survey was conducted by James Cadbury and the results are included here. The newly created open water was an astonishing magnet for all manner of waterfowl, seemingly very much aware of this new opportunity of a refuge and potential food source. The bird notes below are in systematic order.

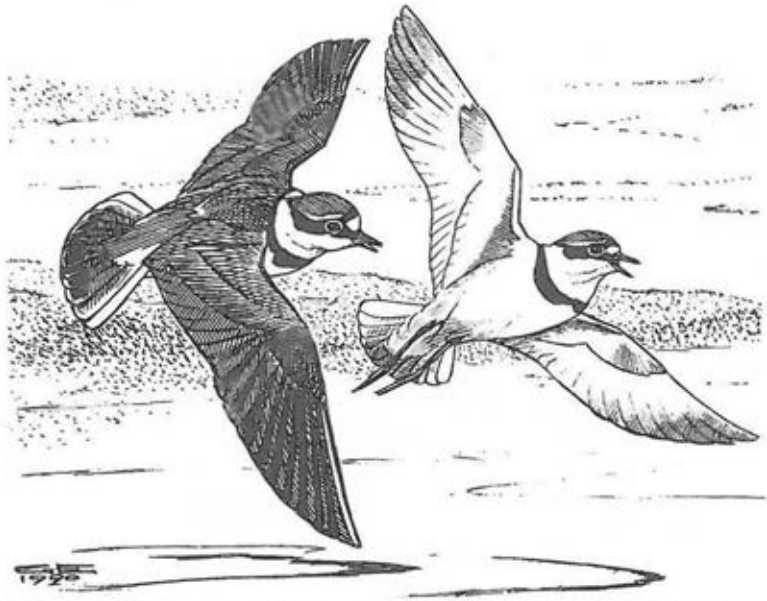
Great Crested Grebes were early territory-holders on the lake and a pair were present intermittently throughout the year. Mute Swans also became established and a pair bred successfully. Greylag and Canada Geese were present in large numbers in the spring, with the greatest count of the latter being 154 in September. Single Barnacle and Brent Geese were recorded. Even a vagrant Gannet appeared in September. The arrival of a diversity of duck species was truly phenomenal: there were 14 species in all, for which maximum recorded numbers are given in brackets. There were Shelduck (12), Wigeon (286), Gadwall (16), Teal (302), Mallard (74), Pintail (3), Garganey (2), Shoveler (14), Red-crested Pochard (1), Pochard (1), Tufted Duck (48), Goldeneye (3) and Goosander (20). Sparrowhawk and Kestrel were resident raptors, with spring sightings of Hen Harrier and summer sightings of a pair of Marsh Harriers and a Hobby. Red-legged and Grey Partridge and Pheasant were all resident breeders, the last having a most successful summer with the abundance of cover and small insect food. Coot and Moorhen were both uncommon, reflecting perhaps the initial lack of cover at the water margins.

The waders were again a huge excitement and 22 species were recorded. Little Ringed Plovers arrived in April and four pairs raised their broods on the exposed limestone surfaces. There were occasional sightings on passage of Avocet, Grey Plover, Sanderling, Little Stint, Dunlin, Ruff, Jack Snipe,



Summer dabbling ducks (top to bottom): Mallard, Shovelers, Gadwalls, Garganey, Teal
Graham Easy

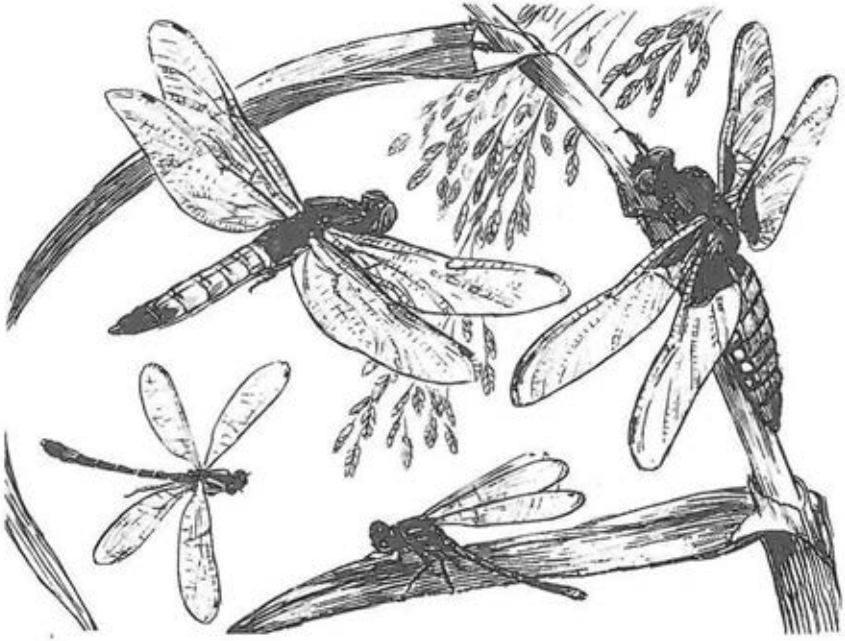
Black and Bar-tailed Godwits, Whimbrel, Curlew, Spotted Redshank, Greenshank and Common Sandpiper. Golden Plover and Lapwing were present in large numbers throughout the winter. Snipe were resident, and there were at least two territories with drumming birds in June. Five gull species were recorded and a Common Tern attempted to nest without success, but more than one Common Tern family party with juveniles arrived in July. Barn Owl, Little Owl and Short-eared Owl were all present occasionally. There was a resident Kingfisher. Skylarks were present in summer, with six singing males. Over a hundred Sand Martins appeared in the spring on the lake and displayed great interest in the nest-holes bored in the banks. Some courtship behaviour was seen there, but no birds stayed. Yellow and Pied Wagtails were recorded, the former breeding. There were scanty records of warblers, as one would expect, with perhaps only the Sedge Warbler breeding in this first year on the new reserve itself. Greenfinches, Goldfinches and Linnets benefited from the abundant crop of small weed seeds. There were extraordinary numbers of buntings in the spring – Yellowhammer (maximum 129 in April), Reed Bunting (129 in April) and Corn Bunting (130 in February).



Little Ringed Plovers, for which the exposed limestone has provided ideal nesting conditions **Graham Easy**

Dragonflies and damselflies

Early in the summer of 1996 there were abundant Common Blue Damselflies *Enallagma cyathigerum* and Black-tailed Skimmers *Orthetrum cancellatum* found throughout the ponds and ditches of the reserve.



Left to right: Black-tailed Skimmer, Blue-tailed Damselfly, Azure Damselfly, Broad-bodied Chaser **Graham Easy**

Both of these are species characteristic of newly created water bodies. In June Norman Moore also recorded Blue-tailed Damselfly *Ischnura elegans*, Azure Damselfly *Coenagrion puella*, Red-eyed Damselfly *Erythromma najas*, and Broad-bodied Chaser *Libellula depressa*. All were confined to a single 'mature' ditch with weed. The *Libellula* is at the edge of its range, but the others are all characteristic of fenland (Norman Moore, pers. comm.).

Conclusion

The Kingfisher's Bridge Wetland Creation Project has demonstrated in its first year a high level of success, in that its drawing-board design was converted into a reality on the ground and some immediate wildlife benefits are apparent. Clearly some of the projected plant communities will take some years, perhaps decades, to develop, but the initial steps in this reclamation attempt have been meticulously recorded. On the one hand, an impressive display of an astonishingly diverse range of plant species has appeared from seed dispersed to or dormant in the site. On the other, the difficulty of re-establishing endangered sub-climax fen communities has also been shown. Monitoring of some key groups of organisms is taking place, and clearly much will be learned from this pioneering restoration project.

Acknowledgements

I should like to acknowledge considerable help from Roger Beecroft and Andrew Green in putting this article together and to thank Mike Crewe for much direct quotation from his plant reports. The bird report is largely from James Cadbury. Norman Moore and Richard Preece provided dragonfly and molluscan records. Charles Turner has made a significant contribution to the peat analysis and also made needed corrections and additions to an early draft. I am also grateful to Graham Easy for his excellent illustrations and thank the County Record Office, Shire Hall, Cambridge, for the plate of the map of the Besborough Estate in 1770 (see back cover). Finally, the contributions and help of the Editor, Philip Oswald, have been invaluable.

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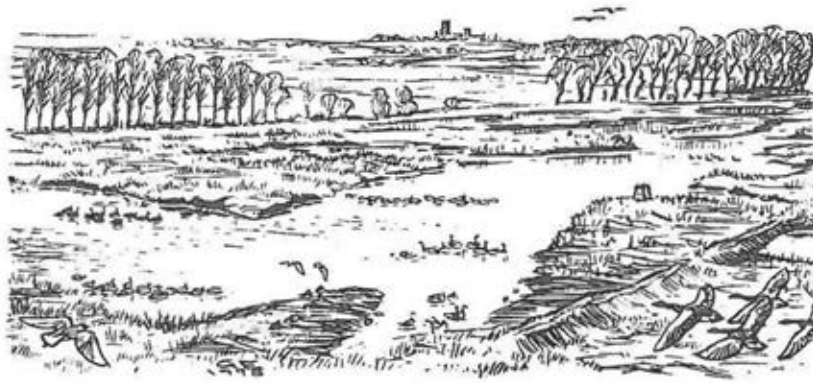

The Kingfisher's Bridge Wetland in the autumn of 1996, looking towards Ely Cathedral
Graham Easy

Cambridgeshire myxomycetes revisited

Bruce Ing

It is now over thirty years since the last account of myxomycetes in Cambridgeshire (vice-county 29) was published (Ing, 1962, 1964). During the intervening years local material has come to light in the cryptogamic herbarium of the Natural History Museum, London (**BM**); the British Mycological Society has held two residential forays in Cambridge, in 1963 and 1974 (Montgomery, 1964; Greenhalgh, 1975); and the present writer has made a number of visits to the ancient woodlands of the county, notably Hayley Wood (Ing, 1975) and Madingley Wood. In recent years valuable records have been made by John Holden of Shepreth. A short visit in October 1997 added 14 species to the vice-county list.

The number of species of slime moulds recognised in v.c. 29 is now 114. This compares well with the 60 species claimed in 1964. The main reason for this increase is the intensive use of the moist chamber culture of bark taken from living trees. This technique enables the minute corticolous species to be investigated, notably species of *Echinostelium*, *Licea* and *Paradiacheopsis*, which are now well represented in Cambridgeshire. These bark myxomycetes are useful indicators of good woodland conditions, including high humidity and low pollution levels. In spite of the dryness of the region in which our woods are situated, the richness of this epiflora suggests a steady improvement in air quality. It also reflects the efforts being made to conserve ancient woodland and thus to preserve the continuity of woodland cover (Ing, 1994).

In the 1962 account a comparison was made with neighbouring vice-counties and it may be interesting to have this table updated.

Vice-county	Number of species		%age increase
	1962	1997	
25 East Suffolk	103	124	20.4
26 West Suffolk	37	82	121.6
27 East Norfolk	146	183	25.3
28 West Norfolk	45	116	157.8
29 Cambridgeshire	49	114	132.6
30 Bedfordshire	124	152	22.6
31 Huntingdonshire	24	100	316.2

These figures give an indication of the relative richness of these areas and the attention they have been given in recent years.

In the following list the habitat is given, followed by the date and the name of the collector. Where there is no name the collector is the present writer, and "(!)" indicates that the specimen was determined or confirmed by him. "BMSF" indicates records made during a foray of the British Mycological Society when the name of the collector was not recorded. Nomenclature follows the most recent British checklist (Ing, 1980), with synonyms to enable comparison with the earlier Cambridgeshire lists. Where there are several records, only the 10-km grid squares are listed, all of them in TL.

MYXOMYCOTA

DICTYOSTELIOMYCETES

DICTYOSTELIALES

Dictyosteliaceae

Dictyostelium brefeldianum Hagiwara (*D. mucoroides* auctt., non Brefeld)
Isolated from soil: Cambridge, 1952, B.J.T. Baldwin (**IMI**). 45.

The dictyostelids are currently being studied by Helen Hodgson, a Cambridge researcher, and further species and sites will be published in due course.

ACRASIOMYCETES

ACRASIDALES

Acrasidaceae

Pocheina rosea (Cienk.) Loeblich & Tappin
On trunks of living trees with naturally acid bark or those affected by acid deposition: common. 25, 35, 45.

PROTOSTELIOMYCETES

PROTOSTELIALES

Protosteliaceae

Protosteliopsis fimicola (Olive) Olive & Stoianovitch
On bark of living trees: Hayley Wood, 1983. 25.

CERATIOMYXOMYCETES

CERATIOMYXALES

Ceratiomyxaceae

Ceratiomyxa fruticulosa (Müll.) Macbr.
On rotten trunks on the forest floor: common. 25, 35, 45, 56, 66.

MYXOMYCETES

ECHINOSTELIALES

Echinosteliaceae

Echinostelium colliculosum Whitney & Keller
On bark of living willow trees: Hauxton, 1997. 45.
E. corynophorum Whitney
On bark of living willow: Cambridge, 1997. 45.
E. fragile Nann.-Brem.
On bark of living willow: Cambridge, 1997. 45.
E. minutum de Bary
On bark of living trees, rarely on other substrates: common. 25, 45, 57.

LICEALES

Liceaceae

Licea biforis Morgan
On bark of living willow and apple: Hauxton and Cambridge, 1997. 45.
L. castanea G. List.
On bark of living apple: Cambridge, 1997. 45.
L. denudescens Keller & Brooks
On bark of living willow and apple: Hauxton and Cambridge, 1997. 45.

L. kleistobolus Martin
On bark of living willow: Hauxton, 1997. 45.
L. marginata Nann.-Brem.
On bark of living trees: Hayley Wood, 1983; Cambridge, 1997. 25, 45.
L. minima Fr.
On bark of living oaks: Madingley Wood, 1981, 1997. 45.
L. operculata (Wing.) Martin
On bark of living willow: Hauxton, 1997. 45.
L. parasitica (Hew.) Martin
On bark of living trees: common. 25, 45.
L. pusilla Schrad.
On bark of living oak: Madingley Wood, 1997. 45.
L. variabilis Schrad.
On fallen, decorticated conifer sticks: Gamlingay, 1970. 25.

Dictydiaethaliaceae
Dictydiaethalium plumbeum (Schum.) Rost.
On fallen trunks, especially of beech: Madingley Wood, 1974, BMSF (!). 45.

Lycogalaceae
Enteridium lycoperdon (Bull.) Farr (*Reticularia lycoperdon* Bull.)
On fallen wood, dead standing trees, especially alder, and door and window frames in houses: common. 25, 34, 35, 45, 48.
E. splendens (Morg.) Macbr. var. **juranum** (Meylan) Härkönen (*Reticularia jurana* Meylan)
On fallen branches, especially of oak; usually a summer to autumn species, in contrast to *E. lycoperdon*, which is characteristically found in spring: Wandlebury, 1961; Madingley Wood, 1974, BMSF (!). 45.
Lycogala confusum Nann.-Brem.
On fallen trunks: Cambridge Botanic Garden, 1969, M. Holden (!). 45.
This has recently been segregated from *L. exiguum* Morgan; both are rare.
L. epidendrum sensu lato
Very common on fallen wood, throughout the year but most noticeable in spring; most records probably refer to the next species, but the true *L. epidendrum* (L.) Fr. is likely to be present. 25, 34, 35, 36, 44, 45, 56, 57, 65, 66.
L. terrestre Fr.
This is the more common taxon of the complex, but in the absence of specimens the older records cannot be placed accurately; material has been determined from Buff Wood, 1959; Hayley Wood, 1963. 25.
Tubifera ferruginosa (Batsch) Gmel.
On fallen wood of conifers and alder: common. 45, 55, 65.

Cribrariaceae
Cribraria argillacea (Pers.) Pers.
On fallen wood and stumps of conifers: Gamlingay, 1970; Madingley Wood, 1974, BMSF (!). 25, 45.
C. aurantiaca Schrad.
On fallen branches of conifers: Gamlingay, 1970; Madingley Wood, 1974, BMSF (!). 25, 45.
C. cancellata (Batsch) Nann.-Brem.
On fallen conifer branches: frequent. 35, 45.

C. persoonii Nann.-Brem.
On fallen wood of conifers: Madingley Wood, 1974, BMSF (!). 45.
C. rufa (Roth) Rost.
On fallen conifer wood: Trumpington, 1954, J. Lythgoe. 45.

TRICHIALES
Dianemataceae
Calomyxa metallica (Berk.) Niewland
On twiggy litter: Hayley Wood, 1963. 25.

Arcyriaceae
Arcyria cinerea (Bull.) Pers.
On fallen, often moss-covered wood and on bark of living trees: common. 25, 35, 44, 45, 56.
A. denudata (L.) Wettst.
On rotten trunks and stumps: common. 25, 34, 35, 36, 45, 46, 56, 66.
A. ferruginea Sauter
On rotten wood and stumps: Madingley Wood, 1974, BMSF (!). 45.
A. incarnata (Pers.) Pers.
On fallen branches, especially of oak: common. 25, 35, 45, 65, 66.
A. minuta Buchet (*A. gulielmae* Nann.-Brem.; *A. carnea* (List.) G. List.)
On fallen wood: Madingley Wood, 1974, BMSF (!). 45.
The 1960 record from Hardwick Wood has been reassigned to *A. incarnata*.
A. obvelata (Oeder) Onsberg (*A. nutans* (Bull.) Grev.)
On fallen wood, especially of beech: common. 25, 35, 45, 56.
A. oerstedtii Rost.
On stumps and fallen branches, especially of beech: Roman Road, 1955, J. Lythgoe; Wandlebury, 1961. 45, 55.
A. pomiformis (Leers) Rost.
On fallen oak sticks and bark of living trees: common. 25, 35, 45.
Metatrichia floriformis (Schw.) Nann.-Brem. (*Trichia floriformis* (Schw.) G. List.)
On fallen wood: common. 25, 35, 45, 66.
M. vesparium (Batsch) Nann.-Brem. (*Hemitrichia vesparium* (Batsch) Macbr.)
On fallen trunks, especially of beech and elm: frequent. 25, 45, 55, 65.
Perichaena chrysosperma (Currey) List.
On bark of living apple: Cambridge, 1997. 45.
P. corticalis (Batsch) Rost.
On bark of fallen trees, especially ash: common. 25, 35, 45.
P. depressa Libert
On bark of fallen trees, especially ash: common. 25, 35, 45.
P. vermicularis (Schw.) Rost.
In beech leaf litter: Wandlebury, 1963. 45.

Trichiaceae
Hemitrichia calyculata (Speg.) Farr (*H. clavata* in part)
On fallen wood, especially beech: frequent. 25, 45.
H. clavata (Pers.) Rost.
On fallen wood: Buff Wood, 1985, J. Holden. 25.
Trichia affinis de Bary
On very rotten, often mossy, trunks and stumps: common. 25, 35, 45, 66.

T. botrytis (Gmel.) Pers.
On fallen branches, especially of oak: common. 25, 35, 45, 66.
T. contorta (Ditm.) Rost.
On fallen bark and sticks: frequent. 25, 45.
T. decipiens (Pers.) Macbr.
On fallen wood: common. 25, 35, 45, 46, 57, 66.
T. munda (List.) Meylan (*T. botrytis* var. *munda* List.)
On fallen bark and living trunks: Hardwick Wood, 1960. 35.
T. persimilis Karst.
On fallen trunks, less rotten than those with *T. affinis*: common. 25, 35, 36, 45, 46.
T. scabra Rost.
On large fallen trunks: frequent. 25, 34, 45, 66.
T. varia (Pers.) Pers.
On rotten wood of all kinds, especially in damp sites: very common. 25, 34, 35, 36, 45, 46, 55, 57, 66.

PHYSARALES
Physaraceae
Badhamia affinis Rost.
On trunks and branches of living trees, common in western Britain but rare in the east: Anglesey Abbey, 1974, BMSF (!) (recorded as *B. capsulifera*). 56.
The record from Trumpington by J. Lythgoe in 1954, referred to in the 1962 account, has not been confirmed and, unless it was on bark from a living tree, must be regarded as doubtful.
B. foliicola List.
On grass in lawns: Cambridge, 1966, J.N. Hedger (!). 45.
B. macrocarpa (Ces.) Rost.
On dead wood and bark: Cambridge, 1893, E.R. Saunders (**BM**). 45.
B. panicea (Fr.) Rost.
On bark of fallen trunks, especially beech: frequent. 45.
B. utricularis (Bull.) Berk.
On stereoid fungi on fallen trunks: frequent. 25, 45.
Craterium aureum (Schum.) Rost.
In leaf litter, especially beech: Cambridge, 1893, E.R. Saunders (**BM**); Wandlebury, 1974, BMSF (!). 45.
C. leucocephalum (Pers.) Ditm.
In leaf litter: frequent. 45, 57.
C. minutum (Leers) Fr.
On leaf litter and herbaceous stems: common. 25, 35, 36, 45, 56.
Fuligo septica (L.) Wiggers var. **flava** (Pers.) R.E. Fr.
On fallen trunks and stumps: common. 25, 34, 35, 45.
Leocarpus fragilis (Dicks.) Rost.
On leaf litter and herbaceous or small woody stems: common. 25, 35, 45.
Physarum bitectum G. List.
On bramble stems: Madingley Wood, 1983. 45.
P. bivalve Pers.
On leaf litter: frequent. 25, 45.
P. cinereum (Batsch) Pers.
In leaf litter and on living grass: frequent. 36, 45.

P. compressum Alb. & Schw.
On herbaceous remains: Cambridge, 1968, P.C. Holland (!). 45.
P. didermoides (Pers.) Rost.
On straw bale: Anglesey Abbey, 1974, BMSF (!). 56.
One of a group of once common straw-heap species which has declined with the loss of habitat due to changing agricultural practices.
P. gyrosum Rost.
An introduced tropical species on plant remains in hothouses: Cambridge Botanic Garden, 1930, E.J.H. Corner (CMG). 45.
P. leucophaeum Fr.
On fallen wood: common. 25, 35, 45, 56.
P. nutans Pers.
On fallen wood: common. 25, 35, 45, 56.
P. oblatum Macbr.
On bark of living oak: Madingley Wood, 1997. 45.
P. pusillum (Berk. & Curt.) G. List.
On marsh litter: Hauxton, 1997, J. Holden (!). 45.
P. robustum (List.) Nann.-Brem.
On fallen wood: Madingley Wood, 1997. 45.
P. viride (Bull.) Pers.
On fallen branches, especially of oak or pine: frequent. 25, 45, 56.

Didymiaceae
Diachea leucopodia (Bull.) Rost.
On leaf litter and bramble stems: Madingley Wood, 1983. 45.
Diderma effusum (Schw.) Morgan
On leaf litter, especially beech: Cambridge, 1982, H.J. Hudson (!). 45.
D. floriforme (Bull.) Pers.
On fallen trunks in ancient woodland: Madingley Wood (Relhan, 1820). 45.
This distinctive species is never common but should have been found in recent times if it is still present in the vice-county.
D. hemisphaericum (Bull.) Hornem.
In leaf litter in damp vegetation: Cambridge, 1894, E.R. Saunders (**BM**). 45.
D. umbilicatum Pers. (*D. radiatum* (L.) Morg. var. *umbilicatum* (Pers.) G. List.)
On small fallen branches and dead bramble stems: the only Cambridgeshire record is the unlocalised Relhan specimen in **BM**; it is likely to have come from Madingley Wood.
Didymium anellus Morgan
In leaf litter: Madingley Wood, 1960. 45.
D. bahiense Gottsberger
In leaf litter and herbaceous remains: Gamlingay, 1970; Madingley Wood, 1974, BMSF (!). 25, 45.
D. clavus (Alb. & Schw.) Rabenh.
In leaf litter: Madingley Wood, 1974, BMSF (!). 45.
D. comatum (List.) Nann.-Brem. (*D. difforme* var. *comatum* List.)
On fallen dogwood leaves: Hayley Wood, 1963. 25.
D. difforme (Pers.) S.F. Gray
In leaf and general herbaceous litter: very common. 25, 34, 35, 44, 45, 56.
D. megalosporum Berk. & Curt.
In leaf litter: Cambridge, 1893, E.R. Saunders (**BM**) (!). 45.

D. melanospermum (Pers.) Macbr.
On *Prasiola* at base of tree: Madingley, 1954, J.L. Gilbert (!). 36.
D. nigripes (Link) Fr.
In leaf litter, especially of holly: frequent. 25, 35, 45.
D. squamulosum (Alb. & Schw.) Fr.
In leaf litter: very common. 25, 35, 45, 46, 56, 57.
D. tubulatum Jahn (*D. difforme* var. *repandum* List.)
On fallen dogwood leaves: Hayley Wood, 1963. 25.
D. vaccinum (Dur. & Mont.) Buchet
On straw bales: Bottisham, 1974, BMSF (!); Cambridge, 1974, M.C. Clark (!). 45, 56.
Another of the old straw-heap species which is, rather surprisingly, common on decaying cacti in arid regions.
Mucilago crustacea Wiggers (*M. spongiosa* (Leyss.) Morg.)
Encrusting living grass stems, especially in chalk grassland: common. 34, 36, 45, 56, 65.

STEMONITALES
Stemonitaceae
Amaurochaete atra (Alb. & Schw.) Rost.
Usually on newly fallen conifer logs, but recorded from a window frame: Shepreth, 1997, J. Holden (!). 34.
Brefeldia maxima (Fr.) Rost.
On stumps, often covering as much as a square metre and thus the largest species of myxomycete: Trumpington, 1954, J. Lythgoe. 45.
Collaria elegans (Racib.) Dhillon & Nann.-Brem. (*Comatricha elegans* (Racib.) G. List.)
On sticks, especially of conifers: Chippenham Fen, 1965. 66.
The 1960 records from Buff Wood and Kennet have been redetermined as *Comatricha nigra*.
Colloderma oculatum (Lipp.) G. List.
On lichens and mosses on bark of living trees: Hayley Wood, 1963. 25.
The 1960 record from Madingley Wood has been redetermined as a limeless form of *Physarum cinereum*.
Comatricha laxa Rost.
On sticks and fallen branches: Madingley Wood, 1974, BMSF (!); Shepreth, 1993, J. Holden. 34, 45.
C. nigra (Pers.) Schröt.
Very common on all kinds of fallen wood. 25, 34, 35, 45, 46, 56, 57, 65, 66, 76.
C. pulchella (C. Bab.) Rost.
On leaf litter, especially of holly and ferns: frequent. 25, 35, 45.
C. tenerrima (M.A. Curt.) G. List.
On dead stems of tall herbaceous perennials in damp sites: Cambridge, 1893, E.R. Saunders (BM); Madingley Wood, 1974, BMSF (!). 45.
Enerthenema papillatum (Pers.) Rost.
On fallen branches of oak and pine and on bark of living trees: common. 25, 35, 45.
Lamproderma arcyrioides (Sommerf.) Rost.
On leaf litter: near Cambridge (Berkeley & Broome, 1850). 45.
L. scintillans (Berk. & Br.) Morgan
On leaf litter, especially of holly: frequent. 25, 45.
Paradiacheopsis cribrata Nann.-Brem.
On bark of living lime: Cambridge, 1997. 45.

P. fimbriata (G. List. & Cran) Hertel (*Comatricha fimbriata* G. List. & Cran)
On bark of living trees, especially those which are naturally acidic or affected by acid deposition: common. 25, 35, 45.
P. solitaria (Nann.-Brem.) Nann.-Brem. (*Comatricha solitaria* Nann.-Brem.)
On bark of living trees: common. 25, 35, 45.
Since the first British record, from Hayley Wood in 1961, this species has been found commonly in all parts of the British Isles, especially in ancient woodland.
Stemonitis axifera (Bull.) Macbr.
On fallen branches and stumps: common. 25, 35, 45.
S. flavogenita Jahn
On fallen branches and stumps: frequent. 25, 35, 45.
S. fusca Roth
On fallen branches, trunks and stumps: common. 25, 35, 45, 56, 66.
S. herbatica Peck
On herbaceous remains: Cambridge Botanic Garden, 1929, E.J.H. Corner. 45.
Stemonitopsis typhina (Wiggers) Nann.-Brem. (*Comatricha typhoides* (Bull.) Rost.)
On wet, rotten wood: common. 25, 35, 45.
Symphytocarpus flaccidus (List.) Ing & Nann.-Brem. (*Comatricha flaccida* (List.) Morg.)
On trunks of dead standing trees, especially pine: Cambridge, 1903, J.J. Lister (**BM**). 45.

The absence from this list of such common species as *Macbrideola cornea*, *Diderma chondrioderma*, *Licea inconspicua* and *Physarum virescens* is entirely in keeping with the low oceanicity of Cambridgeshire. In Europe these species are either associated with Atlantic or Baltic regions or found in enclosed alpine valleys. Further collecting will undoubtedly reveal more species in the vice-county and it will be valuable to include roadside trees from the Isle of Ely in future studies, since, apart from a few records from Wicken Fen, the region is unrecorded for myxomycetes.

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The identification and distribution of freshwater mussels in the River Cam catchment

David Aldridge

Introduction

During the past century, populations of freshwater mussels (Bivalvia: Unionidae) have declined worldwide. Much of this loss is attributable to pollution and human manipulations of natural watercourses. Larvae (glochidia) of all British freshwater mussels are obligate parasites on fish. Therefore, any efforts to conserve mussel populations must include sufficient protection of their hosts. Old records of mussel distributions are few because such organisms are inaccessible to all but the most enthusiastic naturalist. However, with the increase in mechanical management of water-bodies over the past few decades to control the growth of weed and build-up of silt, the shells of freshwater mussels have become a relatively common sight in the resulting riparian spoil. While such spoil-heaps illustrate the damaging effects of mechanical management on mussel populations, they can provide useful information on the distribution of mussels throughout British waterways.

The importance of freshwater mussels in the functioning of aquatic ecosystems is frequently overlooked. Mann (1965) found that mussels account for more than 90% of the energy content of the benthic fauna in the River Thames. The vast volume of water collectively filtered by them also greatly reduces particulate matter suspended within the water-body. Mussels perform a further function in the River Cam catchment because they serve as a host to the embryos of Bitterling *Rhodeus sericeus* Pallas. These fish were probably introduced into the Cam in the late 1970s and in some of the lodes are now outnumbered only by Roach *Rutilus rutilus* L. (Aldridge, 1997). During reproduction, the female Bitterling deposits her eggs with her extended ovipositor through the exhalant respiratory siphon of the mussel. The male then releases his sperm close to the inhalant siphon so that the sperm is drawn inside the host and fertilisation takes place across the gills of the mussel. The embryos develop in this safe environment for approximately four weeks and emerge only after their yolk sacs have been absorbed.

Freshwater mussels of Cambridgeshire

Five species of freshwater mussel occur in the water-bodies of Cambridgeshire (Figure 1), belonging to two subfamilies, which can easily be told apart. The Unioninae (*Unio pictorum* Philipsson and *U. tumidus* Philipsson) are relatively thick-shelled and have a swollen umbonal region (i.e. the origin of the shell's growth) which extends dorsally above the hinge ligament. Dead shells have anterior hinge teeth on their inner surface. The Anodontinae (*Anodonta anatina* L., *A. cygnea* L. and *Pseudanodonta complanata* Ross.) produce more fragile shells in which the umbo does not protrude above the hinge. They do not possess hinge teeth on their valves. There are no detailed descriptions of how to identify British freshwater mussels solely from external shell features, and internal characters can be difficult to interpret and require the mussel to be dead. Therefore, I include a simple guide

to the identification of mussel species, based on external features; Ellis (1978) provides supplementary details of internal shell characteristics.

Duck Mussel *Anodonta anatina*: The widest of the anodontines, with dorsal and ventral valve margins characteristically divergent towards the posterior. When compared with the other anodontines, the shell is notably more swollen in the ventral region just posterior to the umbo. Wavy umbonal rugae (ridged growth lines near the umbo) distinguish this species from other anodontines, but these may be eroded away in older specimens. This is the most widespread of the anodontines in the Cam catchment, where it attains a maximum length of 120 mm (Aldridge, in press).

Swan Mussel *Anodonta cygnea*: The dorsal and ventral valve margins are generally parallel and the shell less swollen than that of the Duck Mussel. (*A. cygnea* shares this feature with *P. complanata*.) Simple concentric rings of umbonal rugae can be a useful guide to identification in younger specimens. Size can be a tool only if the mussel is longer than 120 mm, when the shell will be that of a Swan Mussel, which can reach 150 mm in the Cam catchment (Aldridge, in press).

Depressed River Mussel *Pseudanodonta complanata*: The double row of short ridges forming the umbonal rugae is the most useful tool in identifying this species and is rarely eroded away. The hinge of the valves is markedly longer than in the other anodontines, making the shell look almost rectangular. When live specimens are collected, this species is characteristic in burying deeper into the river bed than any other mussel. When the valves of live individuals are closed, the mantle tissue remains exposed at two points along the ventral margin, one posterior and one anterior, and this species is very slow to retract its foot when removed from the river compared with other mussels. *P. complanata* is the shortest-lived and smallest of Cambridgeshire's mussels, attaining a maximum length of 85 mm (Aldridge, in press).

Painter's Mussel *Unio pictorum*: The shell is long and thin, with a less swollen umbonal region than in *U. tumidus*, but a relatively long hinge anterior to the umbo. The ventral valve margin is generally straight and runs parallel with the dorsal margin.

Swollen River Mussel *Unio tumidus*: The shell is short and squat compared with the other mussel species. The umbonal region is highly swollen, and the hinge length anterior to the umbo is shorter than in *U. pictorum*. Length for length, *U. tumidus* produces a thicker, heavier shell than *U. pictorum*. The ventral valve margin is convex.

Records of mussels within the Cambridgeshire study sites suggest that the distribution of some species has changed even during the last few decades. Brindley (1925) listed only *U. pictorum* and possibly *A. cygnea* for Wicken Fen. Paul (1967), some 42 years later, added *A. anatina* to the list. Bishop & Bishop (1971) recorded *U. tumidus* in Reach Lode together with *A. anatina*, *A. cygnea* and *U. pictorum*, while pointing out the apparent absence of

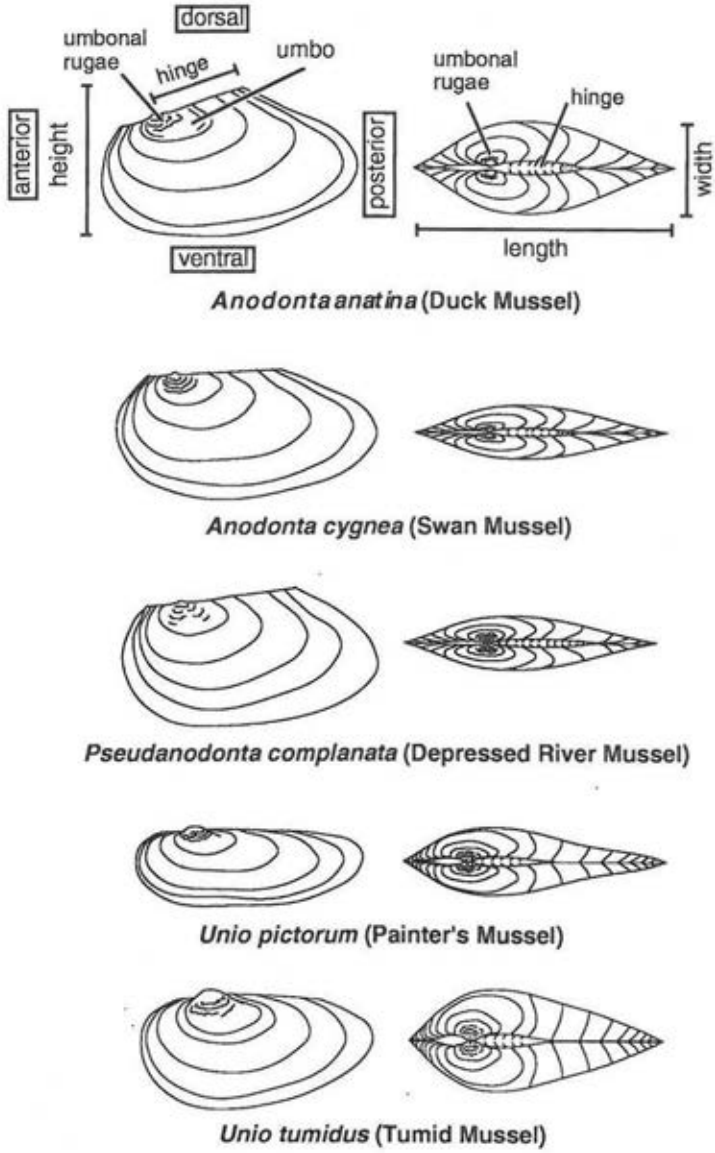

Figure 1: Diagnostic features of the shells of the five British species of unionid mussels

U. tumidus at Wicken Fen. It was not until 1974 that *U. tumidus* was discovered in Wicken Fen (Bishop, 1974). *Pseudanodonta complanata* was not recorded for Cambridgeshire until this study (Aldridge in Kerney, 1994), but its absence from previous records is probably a result of its misidentification as much as of its comparative rarity or its recent arrival. The apparently low species richness of unionids for Wicken Fen in 1925 may also be due to a lack of systematic collecting, which can cause rare species to be overlooked.

Little is known about the habitat preferences of the four commoner British mussel species (*A. anatina*, *A. cygnea*, *U. pictorum* and *U. tumidus*) (e.g. Ellis, 1962; Stone *et al.*, 1982) and the ecology of the fifth species, *P. complanata*, is very poorly understood (Willing, 1997). The need for information on Depressed River Mussels is all the more urgent since the recognition of this species' rarity by its inclusion in the Government's UK Biodiversity Steering Group's 'Short List' of species of special concern for conservation (Anon, 1995). This study investigates the habitat requirements of the five species by assessing their large-scale distribution in riparian spoil within the River Cam catchment. The sites studied ranged from large, flowing rivers to narrow, shallow channels with minimal flow.

Methods

Estimates were made of the relative prevalence of various species of mussels along the River Cam from Waterbeach to Ely and along a number of associated waterways. Mussel populations were interpreted primarily from riparian slubbings resulting from recent dredging works. Patches of slubbings were thoroughly searched visually, and the number of articulated shells of each mussel species was recorded. These distribution data were supplemented by hand-collected samples from some water-bodies, for which mussels were removed from the river bed to a water depth of 1 m.

Results

Collection from slubbings and hand-sampling indicates that the relative prevalence of species is highly variable between water-bodies but relatively consistent within long stretches of the same water-body (Figure 2). *A. anatina* and *U. pictorum* are the two most widespread species and, apart from *P. complanata*, were the only ones found in live samples taken from the large river systems downriver (north) from Reach Lode. Upriver (south) from Reach Lode, the mussel composition in the Cam becomes more variable, with all the four commonest species occurring in slubbings, but no mussels were found above Bottisham Lode in spite of intensive searching.

The species composition within Wicken Lode and its associated drains is remarkably consistent, with all the four commonest species occurring. However, Monk's Lode, the main tributary to Wicken Lode, produced only two dead shells of *U. pictorum* in a visual search of approximately 500 m of bankside. Furthermore, no live mussels of any species were produced by systematic dredging of this site in 1995 (Aldridge, 1997).

The lower sections of Reach, Bottisham and Burwell Lodes have very similar species compositions, being particularly rich in *Unio* spp. All three sites also show a change to an increasing prevalence of *Anodonta* spp. in their upper reaches and ultimately a reduction in numbers of mussels within the slubbed

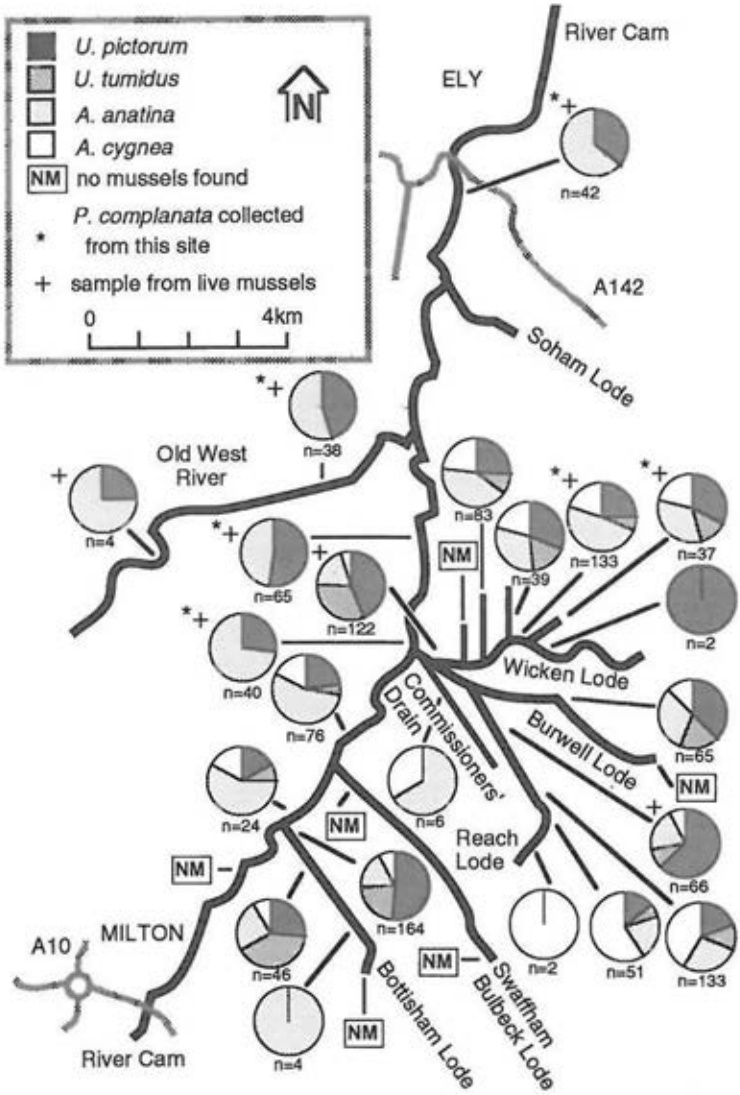

Figure 2: Relative abundance of unionid mussel species at sites throughout the River Cam catchment. All samples are from riparian spoil unless otherwise indicated. Sample sizes are shown below the pie charts.

mud: no mussels were found in the uppermost regions of Bottisham and Burwell Lodes. Commissioners' Drain, a shallow, slow-moving drain running parallel with and to the south of Reach Lode, contained a similar mussel population to the upper reaches of most of the lodes, with *Anodonta* spp. only and in small numbers.

Swaffham Bulbeck Lode, which is essentially similar in hydrology and macrophyte composition to the other lodes, did not reveal any mussels or fragments of shells despite extensive searching along its length. This lode is subject to very low water levels in some summers (L. Friday, pers. comm.).

Discussion

This study reveals notable variations in assemblages of mussel species between different sites. While sampling live mussels gives a good indication of the species present in a site, there are a number of potential problems associated with quantifying mussel populations from riparian spoil: first, one cannot be certain where the slubbings were taken from (for example, the records for all four commoner species in the two most southern sites of the Cam were taken very close to Bottisham and Swaffham Bulbeck Lodes, and it is quite possible that the mud was of lode, not river, origin); secondly, dead shells may not reflect the current live population characteristics; thirdly, differential decay of shells may bias estimates in favour of the thicker-shelled *Unio* spp.; fourthly, shorter-lived species have a faster 'turnover' of individuals and so have a higher representation in the slubbings; and, finally, dead shells may be washed downstream from other sites.

Rates of decay of mussel shells are fast; Bauer (1983) estimates a loss of 63.8 g in 10 years for the shells of the Freshwater Pearl Mussel *Margaritifera margaritifera* L. (Margaritiferidae), irrespective of the size of the shell or the river in which it is decaying. The shells of the unionids in this study are much thinner and lighter than those of *M. margaritifera*: a large 100-mm *U. tumidus* shell weighs 42 g, while a 130-mm *A. cygnea* shell weighs only 25 g (personal observation). Slubbed mussels are therefore likely to represent species present at the site within the last few years and population compositions are unlikely to have changed markedly over such a short time. Transport of shells from other sites can also be ruled out, as Bauer (1983) found only 2% of *M. margaritifera* to travel in this way even in fast-flowing upland streams. Additionally, such transport increases the rate of shell decay. For these reasons, slubbings can be used reliably to inform on the range of species present in a site, but less reliably on their relative abundances.

The distribution of mussel species is unlikely to result from competitive interactions because occupiable sediment is available to excess in all sites; so distributions must reflect differences in specific ecology and morphology. In general, *Anodonta* spp. appear to tolerate the slower, upper reaches of channels where *Unio* spp. do not occur. *A. cygnea* and *U. tumidus* are not associated with larger rivers (the Cam and Old West), while *A. anatina* and *U. pictorum* are very common in these sites; *P. complanata* is also more abundant in the rivers than in the lodes.

The distribution of *A. anatina* and *A. cygnea* to some extent accords with the findings of Ellis (1962), who suggested that *A. anatina* "prefers flowing water", while *A. cygnea* is an inhabitant of "slow rivers, canals, lakes,

reservoirs . . . preferring a muddy, but not too oozy bottom". In the study area *A. anatina* is ubiquitous, being abundant in slow, and sometimes standing waters as well as in rivers. Ellis considered *U. tumidus* to be "essentially a river mussel", although this does not seem to be the case in this study. Ellis also reported that *U. tumidus* "needs fresher, cleaner water than *U. pictorum*", which may explain its restriction to the lodes, which are much less turbid and polluted than the Cam. Ghent *et al.* (1978) suggested that the ventral angle of a mussel (the maximum angle between the two halves of the shell from the line where they close) affects the ability of some species to bury into certain substrates. The very large ventral angle of *U. tumidus* may preclude it from burrowing successfully within the firm substratum of the river, particularly at its edges, while the softer, peaty sediments in the lodes are more accessible. The high, thin shell of *A. cygnea* and the large size it can reach often result in larger individuals lying on their sides on top of the sediment, rather than burrowing (Stone *et al.*, 1982; personal observation). This behaviour may preclude *A. cygnea* from the faster-flowing river sites, where there is a high risk of being disturbed or washed downriver.

The finding that only *A. cygnea*, sometimes accompanied by *A. anatina*, occurs in the upper reaches of the lode and drains may be explained by the relatively lightweight shells of these species. Such sites have characteristically little or no flow, and fine particulate matter is consequently able to settle, producing a very oozy substrate into which the heavier *Unio* spp. may sink. Such an argument was used by Ghent *et al.* (1978) for the confinement of *Elliptio complanata* Solander, a mussel with a heavy shell and a narrow ventral angle, to shallow lake sediments in Ontario, while *Anodonta grandis* Say has a lightweight shell and a wide ventral angle, which permit it to sit on deeper, soft, unconsolidated silt substrates. It is possible that *Anodonta* spp. are able to survive in upper reaches of channels because of a tolerance for low oxygen concentrations associated with the low mixing of water and high biological oxygen demand (BOD) of such waters. The differential oxygen requirements of mussels are currently under investigation.

Species distributions may also reflect differences in the early life histories of the mussels. The glochidia of *Unio* spp. have a very different method of locating host fish from the anodontines (Aldridge, 1997), and consequently different fish species may be the major hosts for the two groups of mussels. Fish show great variation in their own habitat preferences, and there is certainly a change in the composition of fish species between the River Cam and the lodes (Aldridge, 1997). The habitat preference of the fish to which a glochidium attaches itself may influence greatly the site where the metamorphosed glochidium eventually excysts from its host and falls to the bottom as a juvenile mussel. In addition, the differences in the reproductive periods of the mussel species (Aldridge, in press) will also affect the numbers and species of fish that the glochidia encounter and could be important in influencing future distributions. However, the fact that *A. anatina* and *U. pictorum* occur together as the predominant species in the River Cam and indeed the reeded zones of Wicken Lode (Aldridge, 1997), while their glochidia seem to utilise different host species of fish, suggests that their distributions are not primarily a result of differences in the ecology of the respective host species.

The life history of freshwater mussels is also likely to account for the absence of mussels in Swaffham Bulbeck Lode, despite its supporting a large fish population (Aldridge, 1997) and favourable sediment for colonisation by mussels. In a recent dry summer, the Lode dried up and mussel populations appear to have become extinct from the channel. Fish carrying glochidia are unable to repopulate the site with mussels by swimming up the Cam because a 1-m-high weir separates the higher lode from the river. Fish can therefore only leave the Lode and not enter it. Presumably the fish populations now present in Swaffham Bulbeck Lode were reintroduced, or else they originated from channels connected to the Lode or from pools within the Lode which did not dry out and in which mussels did not occur or in which the mussels died during the drought. Human manipulations of water channels clearly have profound effects on the distributions of mussel species. Similar limits to freshwater mussel distributions were found by Watters (1996), who observed that two North American species were limited to sites downriver of dams because their specific host fish's distribution was restricted by the presence of the dams.

Another factor which may affect the distribution of adult molluscs is the habitat requirements of juvenile individuals. However, the distribution of juvenile (< 10 mm) mussels remains something of a mystery, as they are rarely collected. Juvenile *M. margaritifera* are thought to bury deep into the sediment (Ziuganov *et al.*, 1994), and it is often suggested that this is what happens in the Unionidae, the family to which the Cam's mussels belong. I have collected a few such individuals in the matted roots of macrophytes within dense stands of Common Reed *Phragmites communis*. However, with no information available on the habitat requirements of juvenile mussels, their significance for the distribution of the adults cannot be evaluated at present.

Acknowledgements

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Isolepis setacea, a new plant for Wicken Fen?

Rosemary Parslow

While assisting Adrian Colston with a dragonfly training day at Wicken Fen in June 1998, I found a patch of Bristle Club-rush *Isolepis setacea* (L.) R. Br. growing on the track beside the Godwin plots. A few days later I went to show Owen Mountford the site and found substantial stands of this species also along the drove by Spinney Bank. It has subsequently been found on Verrall's Fen by Adrian Colston.

From the amount and distribution of the plant it has clearly been on the Fen for some time, but overlooked. The common associates at Wicken are Few-flowered Spike-rush *Eleocharis quinqueflora* (with which it might be confused) and Toad Rush *Juncus bufonius*. The plants are usually only 5–9 cm tall and, where trampled, form spreading patches of brighter green which stand out among the other vegetation.

Isolepis setacea has been recorded recently from only two other sites in v.c. 29, Chippenham Fen and Wood Ditton. It is a plant of open, wet ground on fens, marshes, heaths, etc., and it is interesting to speculate how long it has been at Wicken Fen. In his paper on *Eleocharis quinqueflora* at Wicken Fen (*N. in C.*, No. 39 (1997): 53–54), Max Walters mentions a record of "Scirpus cæspitosus" by C.C. Babington in his *Flora of Cambridgeshire* (1860) which may have been *E. quinqueflora*, though there is no herbarium material; certainly it was present by 1945. Perhaps *Isolepis setacea* has also been present at Wicken for some time and is now benefiting from the mowing and trampling that seem to have favoured *E. quinqueflora*, which is now very abundant on some of the main droves.

Desmids (Algae, Chlorophyceae) from a Cambridgeshire footbridge

Hilary Belcher & Erica Swale

At Coton, near Cambridge, a footpath leads from the Plough Inn eastward towards Cambridge, and after about 800 m it passes over the M11 motorway by a footbridge (TL 420587). On the bridge a series of puddles develops on each side of the path after rain, more on the southern side, and these sometimes become interconnnected. The puddles overlie a layer of mud a few millimetres thick, brought by wind, passing shoes, bicycle tyres and horses' hooves, fertilised by occasional horse droppings. The water has a pH of about 6.5, measured with test papers.

During June 1997, in a period of damp weather after several months of near drought, our attention was attracted by the growth of algae in some of the puddles. It was found that these small temporary water-bodies constituted an interesting microhabitat, with animals represented by *Philodina rosea* Ehrenb. and other rotifers, the tardigrades *Hypsibius novemcinctus* (Marcus) and *Echiniscus testudo* (Doyère), various ciliates, and shelled rhizopods, especially *Arcella* sp.

The algal flora was particularly noteworthy. In some samples the common green filamentous alga *Prasiola crispa* (Lightf.) Menegh. was dominant, while others showed a rich population of the interesting algae called desmids. After the sample had stood in indirect light for a couple of days and the mud in the sample tubes had settled, the desmids, which can move slowly by secreting mucilage, had arranged themselves into green flocculent masses up to a millimetre in diameter.

In November the desmids were still present in quantity, but in January 1998 the puddles had evaporated, leaving a few millimetres of damp mud, and only a few desmids could be found. Whether the rest had died off or had withdrawn into the mud is unknown, but it did not contain appreciable numbers of them.

Figures 1A–G are of the desmids, while some of the more conspicuous algae of other groups are illustrated in Figures 1H–N. All are drawn at x 1000 except the habit sketch N (x *c.* 100).

Figures 1A and B are of an apparently undescribed variety of the desmid *Cosmarium pericymatium* Nordst. Material has been passed to the desmid specialist Professor A.J. Brook of the University of Buckingham, and he intends to describe it shortly. The cells differ from the type variety in their considerably larger size, 50 to 64 µm long compared with 40 to 51 µm for the type variety (West & West, 1908) and in the presence of corrugations at the 'isthmus' or waist, seen in Figure 1B. (As with other desmids, the cell has identical halves or 'semicells', with the nucleus between them at the centre.) In this species, as in the three following ones, each semicell has a pyrenoid surrounded by a chloroplast which projects outwards in a variable number of radial plates. The end view is broadly elliptical. Figure 1A is of a cell at the upper end of the size range, while Figure 1B is of an empty semicell wall, viewed obliquely to show the corrugations. Brook & Williamson (1983)

found the very similar type variety of this species in the channel of a concrete sundial, where it survived drying up on many occasions, and West & West (1908) recorded the smaller variety *eboracense* among mosses on wet rocks, a situation also liable to desiccation at times.

Figure 1C is of *Actinotaenium cucurbita* (Bréb. ex Ralfs) Teiling. This species can also grow in habitats liable to dry up. It was found in the sundial channel just referred to and also from a roof in Ambleside, Cumbria. Ruzicka (1981) states that it may grow "subaerophytically".

Figures 1D and E are of side and end views respectively of *Actinotaenium habeebense* (Irénée-Marie) Brook & Williamson. This species has been found only rarely, usually in habitats liable to drying up, since it was first recorded in Canada (Brook & Williamson, 1990). We have found it in the gutter of a Cambridge roof, though we identified it erroneously as a species of *Staurastrum* (Belcher & Swale, 1984). Frequent in some of the bridge puddles, it was only occasional in others.

Figure 1F is of another species of *Actinotaenium*, *A. curtum* (Bréb.) Teiling var. *curtum*. This is shaped like a Rugby football, but has an internal structure similar to the above two species. According to West & West (1904) it "sometimes occurs in pure masses in temporary pools of rainwater on roadsides, cart-ruts etc." It has not previously been recorded with certainty from Cambridgeshire. The alga recorded under this name by us in 1984 may have been *A. cucurbita*.

Figure 1G is of the desmid *Cylindrocystis crassa* de Bary, which was common in some samples. There is no constriction at the isthmus, and the pyrenoid in each cell is surrounded by a chloroplast said to be substellate by West & West (1904), but this could not be seen clearly owing to the abundant reserve material present. The authors cited give no information on habitat for this species. It was very common in our puddles, but it has not previously been recorded from Cambridgeshire.

The remainder of the plate is devoted to some algae other than desmids which occurred in the samples. Figure 1H shows a cyst of the green flagellate *Haematococcus pluvialis* Flot. (Chlorophyta, Volvocales). These cysts, which were sometimes seen in the puddles, have a green chloroplast with a mass of red-coloured oil reserves surrounding a central pyrenoid. Both cysts and motile stages are seen commonly in gutters, bird-baths etc., which they may colour red. The early Dutch microscopist Leeuwenhoek saw this species, which he obtained from his gutter, in 1701 (Dobell, 1932).

Figure 1I is of a short piece of the filamentous *Prasiola crispa* (Lightf.) Menegh. (Chlorophyta, Prasiolales), with its thick wall and lobed chloroplast surrounding a central pyrenoid. This is a very common subaerial alga able to withstand much desiccation; it was common in some of our samples.

The remaining figures are of members of the blue-green algae or Cyanophyta, which are related to the bacteria and sometimes classed with them as Cyanobacteria.

Figures 1J and K are of two species of the coccoid genus *Chroococcus*, *C. turgidus* (Kütz.) Nägeli (1J) and a smaller species, possibly *C. minutus* (Kütz.) Nägeli. The mucilage envelope which holds the cells of this species together in groups is not shown in the drawing.

Figure 1L is of an unidentified species of *Oscillatoria*, of a bright blue-

green colour and with filaments about 4 μm in diameter. A few days after collection these had grown over and swamped everything else.

Figures 1M and N are of a species of *Microcoleus*, probably *M. vaginatus* (Vauch.) Gom. The filaments in this genus adhere together in a bundle or rope surrounded by a common mucilage sheath, as shown in the habit sketch (1N), at approximately x 100. A single filament, x 1000, is shown in Figure 1M.

A few diatoms occur in the samples. Living cells of the common soil- and moss-living species *Hantzschia amphioxys* (Ehr.) Grun., *Luticola mutica* (Kütz.) D.G. Mann and *Achnanthes coarctata* (Bréb.) Cleve were seen and confirmed from prepared slides. These species were illustrated from cells living among bryophytes by Belcher & Swale (1997).

Most species of desmids live in ponds, lakes and bogs and on wet rock surfaces and are more common in the north and west of Britain than in the south-east. When dried in the vegetative state they die, and they survive desiccation by resistant zygospores formed from the conjugation of two individuals. The five species dealt with in this note, together with a few others, are unusual in that they can survive drying in the vegetative state, quickly absorbing water when rain comes and resuming their normal lives. This enables them to survive in habitats liable to drying such as rainwater puddles on flat roofs, gutters, and puddles such as those on the footbridge. Why they can live in the latter in such masses as to be conspicuous to the naked eye, but not in puddles that form at the sides of roads and in ruts in tracks at ground level in this county is a mystery, for the non-desmid algae illustrated here can live in both places.

The desmids and other algae in the puddles, together with the various animals, must arrive in a dry but viable state, to revive and multiply under suitable conditions. In puddles there must be a wide diversity of chemical and physical conditions, making life possible for a wide range of organisms. The study of puddles would seem to offer much scope to the naturalist.

Acknowledgement

We wish to thank Professor A.J. Brook for helpful comments.

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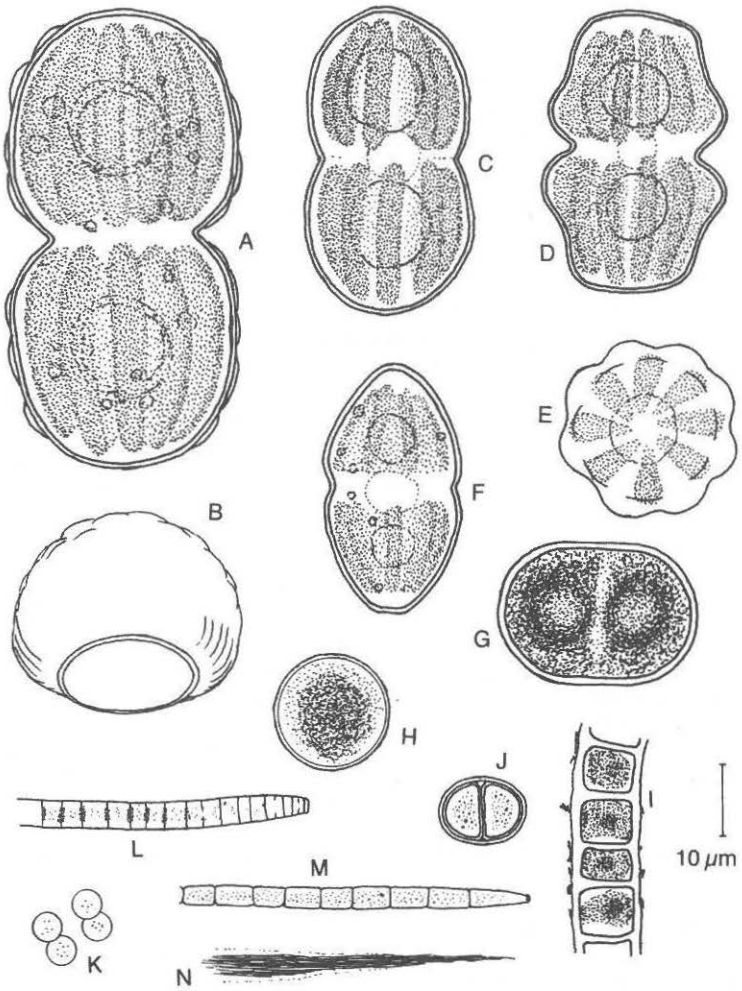

Figure 1: Algae from puddles on a footbridge at Coton **A**: *Cosmarium pericymatium* var., side view; **B**: empty semicell of this, viewed obliquely to show the corrugations around the isthmus; **C**: *Actinotaenium cucurbita*, end view; **D**: *Actinotaenium habeebense*, side view; **E**: end view of this, showing arrangement of chloroplasts; **F**: *Actinotaenium curtum* var. *curtum*, side view; **G**: *Cylindrocystis crassa*, side view; **H**: cyst of *Haematococcus pluvialis*, with a central mass of red food reserves surrounding a pyrenoid, hidden here by the reserves; **I**: short length of filament of *Prasiola crispa*; **J**: *Chroococcus turgidus*; **K**: *Chroococcus* sp.; **L**: *Oscillatoria* sp., end of filament; **M**: *Microcoleus* sp., end of single filament; **N**: habit sketch of colony of this, x 100.

Moss that grows on skulls: a curious old remedy run to earth in Cambridge

Hilary Belcher & Erica Swale

In Gerarde's (1597) *Herball* there is an account of a medicament under the name of "Muscus ex Cranio Humano, the Mosse growing on the skull of a man", accompanied by a woodcut from a worn block. This moss was apparently a "singular remedie" for whooping cough and epilepsy. It also had a great reputation for stopping bleeding, and Robert Boyle found it "most effectual" to staunch his own nose-bleeds. It was listed in the London Pharmacopoeia of 1651. Skulls bearing the moss were apparently brought to this country in the 17th century after various battles in Ireland and, according to a contemporary account, were to be seen in the druggists' shops in London. Such a skull, with a neat covering of moss, is to be seen, apparently as a *memento mori*, in a portrait of John Tradescant the Younger, dated 1652, in the National Portrait Gallery. The skull may have been borrowed from a local apothecary for the occasion.

Jacobus Theodorus, better known as Tabernaemontanus, in his *Neuw Kreuterbuch* (1588–1591) expressed scepticism about this cure and recommended that it be verified experimentally. He also described how skulls were laid out in a damp place to go mossy. His account was illustrated by a woodcut apparently from the same block used later by Gerarde, but in a much fresher state.

On the basis of the woodcut, but apparently without reading the text, G.M. Scott (1988) decided that the concept of therapeutic moss from skulls was fabricated by Tabernaemontanus' putting together previously published unrelated elements and concocting a fanciful tale around them. However, the use of skull moss was by no means new. The celebrated early chemist Paracelsus included "das mies auf dem toten köpfen" (the moss on the skull) as early as 1537, and he made no claim to originality.

We naturally wanted to find out what species of moss was or were involved. Attempts to grow moss on old beef bones failed, and no mossy old bones were seen on our wanderings, let alone skulls. Luckily in Cambridge there are three cabinets of old *materia medica*, mainly of the 17th century, which were described and their contents listed by Gunther (1937). His list of the contents of the Vigani Cabinet at Queens' College does not include skull moss, though "Emplast. Paracels." may have been the famous Weapon Salve of Paracelsus, which contained "Usn. Cran. Hum." and was applied to the weapon, not the wound.

We then paid a visit to the Addenbrooke Cabinet at St Catharine's College, by courtesy of the Curator, Dr David Kellaway. A specimen of the moss had once been in the collection, but now there is only the wrapping paper, a recycled bill for a physician's services to a Mr John Pyke.

Lastly the trail led to St John's College and the Heberden Collection. This was examined by courtesy of its guardian, Amanda Saville, the College Librarian. There were various fascinating items, including the paper in which the Philosopher's Stone had been wrapped, the stone itself having been lost or

stolen. Here at last was a tuft of "Usnea Cranii Humani", which we identified as the common *Homalothecium sericeum* (Hedw.) Br. Eur. The identification was confirmed by Dr Harold Whitehouse and a few stems were added to the Cambridge Moss Herbarium. This common golden green moss is often seen on stone walls and the bases of trees. It is unlikely to have been the only moss used. The moss in the woodcut from Tabernaemontanus' herbal could well be of that species, but that in John Tradescant's portrait looks more like a *Dicranum*, while species of *Splachnum*, which sometimes grow on old bones, have been suggested.

There is a reference to moss from human skulls in John Ray's Flora of Cambridgeshire (Ray, 1660, p. 101) under "Muscus ex cranio humano *The mosse on a dead man's skull*". Ray described it as "the basis of a bitter ointment which is useless". He may have been speaking from experience, as every winter when he was young he suffered from itching tumours on his feet "which in this country we call 'bloudy fals'" (Raven, 1942, p. 62) – presumably severe chilblains.

Acknowledgement

We wish to thank Dr Chris Preston for the reference to John Ray's Flora.

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Figure 1: Moss growing on a skull, from *Neuw Kreuterbuch* of Tabernaemontanus

Reviews

Plant Variation and Evolution (3rd edition)
D. Briggs and S.M. Walters. Cambridge University Press, Cambridge, 1997. 534 pp. Hardback £65.00. ISBN 0 521 45295 3. Paperback £22.95. ISBN 0 521 45918 4.

A new edition of this standard work is much to be welcomed, particularly as it has been largely rewritten and brought up-to-date. The study of plant variation and evolution is very much an advancing field and some 600 new publications are discussed. The reference list now runs to about 1,300 items. After reading the book, one is well qualified to comment on many topics of current controversial interest, such as conservation and the effects of global warming, of pollution and of the introduction of transgenic plants (that is plants containing genes from other organisms). The book is intended, as hitherto, to be an authoritative introductory university text, but it is also addressed to the general reader. The numerous diagrams and tables of data are a great help in understanding the often complex matters under discussion. The book is well-written and there is a glossary of technical terms, to which 'leptokurtic' (Chapter 9) and 'stochasticity' (Chapter 15) could usefully be added. The historical perspective that has always been such a valuable feature of the book is retained. The reader can see how modern research is built directly on the foundations laid by Ray, Linnaeus, Darwin, Mendel and many others.

The subject-matter of the book is often fascinating, and the authors' enthusiasm is evident. Is *Senecio cambrensis* derived from hybridisation of *S. vulgaris* and *S. squalidus*, or is it related to the Canary Island endemic *S. teneriffae* (Chapter 12)? What is the relationship of British *Spartina* x *townsendii* to the similar, but not identical, plant from south-west France? The excitement so often evident in the book comes about partly because such questions can now often be answered, through the advent of molecular techniques. Such methods, involving, for example, the analysis of base sequence in DNA or amino acid sequence in polypeptides, are beginning to solve the riddle of the course of evolution in the flowering plants. Nucleic acid studies with bryophytes (T.A. Hedderson, R.L. Chapman & W.L. Rootes, *Plant Systematics and Evolution*, **200** (1996): 213–224) have confirmed what has long been suspected, namely that there are not two but three primary divisions of the Bryophyta (mosses, liverworts, hornworts). In Chapter 14 the authors refer to work on nucleotide sequencing in the *rbc*L gene of the chloroplast, but they do not mention two major discoveries from this work by M.W. Chase *et al.* (*Annals of the Missouri Botanical Garden*, **80** (1993): 528–580). It seems that a primary division of the flowering plants can be based on whether the pollen-grain has a single pore, as in *Magnolia*, *Laurus* and *Nymphaea*, or three, as in the majority of Dicotyledons. A second finding with the chloroplast gene confirmed the pioneer discovery by Donald Boulter and associates (*Proceedings of the Royal Society*, **B181** (1972): 441–455), using the amino acid sequence of cytochrome c, that the Monocotyledons were an early offshoot from the Dicotyledons.

There is in Chapter 14 a useful account of cladistics – the method, much used

in recent years, of attempting to build phylogenetic trees by recognising primitive and advanced characters. This chapter includes a balanced survey, that is criticism of the cladistic method and also of the use of molecular methods alone in attempting to understand evolutionary relationships.

The book is produced to a very high standard. The only errors that I could find were the absence from the reference list of the last reference in the text (Tudge, 1991), the italicising in the reference list of the names of J.D. Watson and associates, and an error in the sequence of J.D. Watson's publications. It would be useful to the reader, when the book is next reprinted, to insert in Chapter 12 at the end of the discussion on *Polypodium* (bottom of p. 321) a cross-reference to further work on *Polypodium* given on p. 338.

The book can be recommended to anyone interested in plant evolution. The authors are to be congratulated on their masterly survey of the subject. The book should stimulate much interest in a rapidly advancing field of study.

Harold Whitehouse

British Plant Communities Volume 2: *Mires and heaths*
Edited by J.S. Rodwell. Cambridge University Press, Cambridge, 1998 (first published 1991). 638 pp. Paperback £29.95. ISBN 0 521 62720 6.

British Plant Communities Volume 3: *Grasslands and montane communities*
Edited by J.S. Rodwell. Cambridge University Press, Cambridge, 1998 (first published 1992). 550 pp. Paperback £29.95. ISBN 0 521 62719 2.

British Plant Communities Volume 4: *Aquatic communities, swamps and tall-herb fens*
Edited by J.S. Rodwell. Cambridge University Press, Cambridge, 1998 (first published 1995). 295 pp. Paperback £24.95. ISBN 0 521 62718 4.

Since Charles Turner reviewed Volume 1, *Woodlands and scrub*, in *Nature in Cambridgeshire*, No. 34 (1992, pp. 15–16), two further volumes of what will ultimately be a monumental five-part work have been published. Even more importantly, the first four volumes are now available in paperback, bringing them for the first time within the buying power of many of those for whom they were written "as a working tool, offering a reliable framework for a wide variety of teaching, research and management activities in ecology, conservation and land-use planning". (Volume 1 now costs £27.95.)

As Charles Turner commented, this work at last fills "one of the great gaps in the study of Britain's plant life, indeed in the scientific recording of our countryside as a whole", complementing our unique knowledge of the taxonomy and distribution of individual species of our wild plants with a scientifically based classification of vegetation types, accompanied by maps showing the distribution of the samples classified within each type. This classification is based strictly on the composition, 'frequency' and 'abundance' of plant species and not on any environmental factors such as habitat types or geographical regions: such information was "reserved, rather, to provide one valuable correlative check on the ecological meaning of the sample groups". "Here, 'frequency' refers to how often a plant is found on moving from one sample of vegetation to the next, irrespective of how much of that species is

present in each sample." "The term 'abundance', on the other hand, is used to describe how much of a plant is present in a sample, irrespective of how frequent or rare it is among the samples".

I shall not attempt here to give a detailed critique of these volumes, but rather shall mention some aspects of their origin and coverage particularly related to Cambridgeshire. The two major figures in the genesis of the project have strong Cambridge connections, though both their hearts are, I think, centred further north and west! In 1971 Dr Derek Ratcliffe, editor of the classic Nature Conservancy Council and NERC two-volume work, *A Nature Conservation Review* (CUP, 1977), and at the time Deputy Director (Scientific) of the previous Nature Conservancy, drew attention to "the need for a national and systematic phytosociological treatment of British vegetation". When the NCC was set up in 1973, Professor Donald Pigott proposed to it a research project to achieve this goal, based at the University of Lancaster, where he was then working. The NCC included this as a priority item within its commissioned research programme directed by Dr Ratcliffe. The latter still lives in Cambridge since his retirement in 1989 as Chief Scientist of the NCC, while Professor Pigott has retired to the Lake District after a period in Cambridge as Director of the Botanic Garden. While I myself was working for the NCC in Dr Ratcliffe's Directorate, I was intimately involved in the production of Volume 1 of *British Plant Communities*, and the name of another member of *Nature in Cambridgeshire*'s Editorial Board, Martin Walters, is mentioned next to mine in the Acknowledgements. Of course, the work is being published in Cambridge by the University Press (see its advertisement on our back cover): our Membership Secretary, Jane Bulleid, is acknowledged as "the copy-editor whose patience and cool nerve have been invaluable in bringing these huge manuscripts that much closer to publication and use".

There are some fine examples of several of the woodland communities described in Volume 1 in Cambridgeshire's boulder-clay woods, and the works of Oliver Rackham and George Peterken feature prominently in its bibliography. Volume 2 has, on the whole, a more northern and western emphasis, but, as the quotation below reminds us, we have important fen communities within the vice-county. In Volume 3 several of the calcicolous grassland communities can be seen on our remaining areas of unploughed chalk, while the first community described, *Arrhenatherum elatius* grassland, is "virtually ubiquitous throughout the lowlands of Britain": look at almost any roadside verge! Finally, the aquatic, swamp and tall-herb fen communities of Volume 4 are well represented in Cambridgeshire, especially in the Fens.

Although these are works of profound scholarship, John Rodwell's prose is most readable, as illustrated by this extract from his account of *Molinia caerulea–Cirsium dissectum* fen-meadow (Vol. 2, p. 256): "*Molinia* is almost always the dominant plant in the community and it can be very abundant, forming the basis of a rough sward or occurring as a more strongly-tussocky cover, a kind of structure well shown in the classic account of this vegetation from Wicken Fen in Cambridgeshire (Godwin & Tansley 1929). And there are stands in which the abundance of *Molinia* is so overwhelming that its dense herbage and thick litter reduce the associated flora to scattered individuals of a very few species."

Philip Oswald

Fifty-three years in the Cambridge University Herbarium

Peter Sell

Retirement speech made on 8 October 1997, with a few additions to make it clearer for those who do not know me or the herbarium

One of the things I am celebrating today is fifty years of avoiding all speech-making. However, there comes a time when you have to say thank you to a lot of people, and looking round me I doubt if I shall ever have a better occasion to do so.

The story starts in December 1943 in Bassingbourn Council School on my last day in class. My headmaster, Arthur Harcourt, who I am pleased to say is with us here today in his ninetieth year, was questioning the class on what they would do when they left school. He asked me a particular question: what work would I do if I did not have to worry about money? My reply was that I would study natural history. He said, "If I could get you such a job, would you take it?" I was an awkward cuss about being told what to do, but in the circumstances what could I say but "Yes"? He went first to Zoology, but there was no opening there. In Botany the technician in the herbarium, Arthur Gray, was due to retire and the position was open. I thus started work on 2 January 1944. It was still wartime and midwinter; I cycled to and from Bassingbourn to Royston with masked lights on my cycle, and the train from Royston to Cambridge had shuttered windows. The general opinion in the Department was that I would not keep this up very long. They did not know the nature of the beast, and here I am 53 years later.

Arthur Gray stayed on for a year past his retirement age to teach me the job. He knew little about taxonomy but an enormous amount about the history of the herbarium. I was still only 15 when he finally retired and I found myself in charge of the herbarium, and nobody had told me what to do. At the time this did not surprise me at all, but over the years I have looked back on it with astonishment. Perhaps they thought I would burn it down!

On my first morning alone, dead on the stroke of nine o'clock, a bell rang summoning me to the then Professor, F.T. Brooks. There were in those days only one external telephone and four internal connections in the building. I knocked and entered his room. He stood by his desk with an open parcel of plants on his table. I walked over and looked down on it and said "*Asplenium adiantum-nigrum*". He said "Oh really?" and nothing else. So I went back to the herbarium. Professor Brooks was a stickler for time and very abrasive when addressing people. I think he did not want to know about the *Asplenium*, but merely to know if I was at work by nine o'clock. I owe him, however, one great debt: he paid out of his own pocket for me to have individual tuition in Latin. I spent the next three years finding out where everything was in the herbarium and where all the taxonomic works were in the library.

The only person I saw regularly in the herbarium was Humphrey Gilbert Carter, who was then Director of the Botanic Garden and who came in to answer any letters. Anyone who came across Humphrey never forgot his

eccentric manner and mode of address. While still at school I had learned the Latin names of many birds, but I did not know how to pronounce them, a matter which Humphrey was continually trying to put right. I also persuaded him to name plants with me and so learned how to do it from a master, with all sorts of information about the origin of words thrown in. After half an hour or so he would begin to fidget, and nothing would prevent him disappearing to 'the Bun Shop' for his daily pint.

During the summer vacation there was a six-week field course in which one day a week was spent visiting six different habitats – Royston Heath, Hardwick Wood, the Breckland, Wicken Fen, Holme saltmarsh and Dersingham Fen. The leader of these excursions was Dr Godwin, later Professor, then Sir Harry. I used to work the slide projector for his lectures and on the excursions he liked me to blaze the trail, especially in Wicken Fen and Fen Valley Wood at Tuddenham. The students followed in a crocodile and when it was muddy those who came last were sometimes up to their knees in mud. Being at the front, I heard clearly everything Dr Godwin said and, while waiting for the crocodile to catch up, he treated me to all sorts of extra titbits, not always about plants. To his astonishment I used to name all the birds for him by their calls, a fact he mentioned in his own retirement speech.

My two years of National Service taught me one important thing, self-discipline. I found that if you obeyed orders to the letter you never got into trouble. Anyone who can make a good job of painting coal white can force himself to do any job well, however menial.

On my return from the army three important things had happened in the Botany School. Max Walters had been made Curator of the herbarium, John Corner had become Lecturer in Tropical Botany, and the Department was full of young ladies. When I left for the army there was only one lady in the building.

For over twenty years I was able to receive the calm rational advice from Max Walters in a room on one side of the herbarium and the rapier-like criticism of John Corner in a room on the other. The happy association with Max still exists, and it gave me great pleasure to know that John Corner trusted me to put his last book through the press when he could no longer see to read the proofs.

I considered all the critical genera of British plants to see which I would like to study and decided on *Hieracium*. I had hardly started when in came Cyril West with the same idea. We joined forces and worked together on the genus for over thirty years until Cyril was well into his nineties (cf. Sell, 1987).

One other person in the Botany School contributed much towards my early training – Sandy Watt. I had no vehicle in those days and I used to go with him when he was doing his fieldwork in Breckland. We worked separately, but we always ate our lunch together, when I learned much from our conversations.

Outside Cambridge, my visits to the British Museum (Natural History) were very important. Here I came in touch with James Dandy, who was known for his immense knowledge of nomenclature. Like Corner, his criticism could be extremely cutting, but for some reason not known to me he spent a lot of time explaining the difficulties of nomenclature to me. That wise old bird of English botany, the late John Dony of Hitchin, told me it was a question of one-upmanship. Both Dandy and I were keen soccer players in our youth, and Dony said that I had broken one collar-bone playing but Dandy had broken two. This was true, but how Dony found out I have no idea. The other person of

note who from time to time added information on typification, Linnaeus or the date of books was William Stearn.

These men were not only famous botanists but very different from one another, and somehow I had to assimilate the information and come out with my own line of thought. Strangely, however, the most important item in my study of natural history, I consider, was my upbringing on a farm, which somehow seemed to have more to do with nature than everything else (cf. Sell, 1989). The 1950s were the formative years, the next twenty years ones of immense toil. I was intimately connected with *A Flora of Cambridgeshire*, *Atlas of the British Flora*, *Flora Europaea*, *Critical Atlas of the British Flora* and *A Flora of the Maltese Islands*, as well as numerous papers and a major contribution to the *Flora of Turkey*.

None of this would have run as smoothly as it did without the help of a long line of ladies, to whom I owe an enormous debt, not only for what they did for the herbarium but for how they helped to cheer the place up. At the end of the years of toil it was not surprising that I suffered a heart attack, after which I got very downhearted. Undaunted, Caroline McCrudden (whom you probably know better as Caroline Pannell) came over to Bassingbourn from Oxford, took me back with her, and we went walking under Gilbert White's beech hangers at Selbourne to give me inspiration. And in 1990, when I had a bypass operation, Gina Murrell constantly came to Bassingbourn to cheer me up and, when she thought it appropriate, ordered me back to work and said if I didn't go she would come and fetch me. As if the Botanic Garden, where I have always received much help, was not to be left out of it, when I had my second heart attack last year and afterwards put in my first appearance at the garden, to my great surprise and immense pleasure I got a great big hug from Bridget Stacey.

And who could forget dear old Dorothy Soden? She first came to work in the herbarium when she was sixty and did not pack up until she was nearly ninety. For many years I used to have a Christmas celebration in the herbarium and it was at one of these that I shall always remember her. She sat with her feet up on the table. Long red drawers down to her ankles. Sipping sherry. She told us how the previous Christmas morning a pipe burst in her house and she had a flood. Her plumber not only came out and mended it, but took her to church afterwards in his van. Her pose, her sipping sherry and the telling of the story in vivid prose silenced even Professor Corner.

When I look back on my life, most of the things which come to my mind are not really anything to do with botany. Dropping the big herbarium ladder which missed Ann Wright by an inch. Sitting with Max Walters on a rock on the top of a Yugoslavian mountain in a thunderstorm, watching the lightning darting from rock to rock all round us. Nobby Clarke getting fed up with having cracked cups for our tea-breaks, suddenly grabbing them one after the other and throwing them at the wall in a great shower of china and saying, "Now they will have to buy some more."

The most amusing botanical hunts I ever had were with Gina looking for *Limonium* species. We went to the Durdle Door in Dorset on one of the hottest days I have ever known in search of *Limonium dodartiforme*. Gina did not like heights, so I went down the Durdle Door on my own. David Coombe had given me a very precise grid reference, so I knew exactly where to go. As I turned into the bay where it grew I discovered it was full of topless sunbathers.

When I mentioned this to Arthur Chater, he remarked that it probably made me even hotter. I picked my way through the bathers. I took my camera from my rucksack and photographed the plant. I took out my notebook and wrote a description of the plant and I collected my specimens. I picked my way back through the sunbathers, and during the whole episode none of the bathers took any notice of me whatsoever.

When we went to the Essex coast in search of *Limonium saxonicum*, we went one step further. The only grid reference we had, as David Coombe remarked, was somewhere out on the Dogger Bank. Guessing where it might be, we found ourselves in the middle of a nudist colony. We sat down and had our lunch, while I thought out were the plant might be found, while curious nude figures bobbed up and down all round us.

And last year we went to Kent in search of *Limonium cantianum*. The first day, spent at Broadstairs, was bright and hot, and we found the plant in great quantity on the cliffs at the back of the promenade. The next day we wished to compare it with the plant which grew at St Margaret's Bay. That evening it clouded over and rained. As we sat at breakfast the next morning it was raining stair-rods and the news on the radio told us there was a gale on the coast and over four inches of rain had fallen over night. I remarked to Gina that most people would go back to Cambridge and forget about St Margaret's Bay. All she said was that she rather liked doing what other people would not do. If I ever had any doubts about asking Gina to help me write the *Flora of Great Britain and Ireland*, such doubts were dispelled, as doing what other people would not do was what I had been doing all my life. And so we went to St Margaret's Bay and in torrential rain and with mountainous seas breaking on the cliffs we got our plant. It was in fact a wonderful sight we were glad we had not missed.

There is one person I have not mentioned, who of all the people in the Botany School I consider was unique, and that was John Peck. His escapades are not tellable here, but I wish to tell you about the last time I saw him when he was nearly eighty. He was standing outside Woolworth's and, when I asked him what he was doing, he said "Studying form". There are only two sorts of form John Peck would have studied, and only one of them could be found outside Woolworth's; the other he would go to Newmarket for. I tell you this story because, if, as Gilbert Carter would have said, I am blessed and live to get anywhere near the age of eighty, like John Peck I would still like to be able to study form. Not entirely the form that John Peck was studying, but a little of that. But also the shape of clouds in a sky, the outline of trees and the waves on a seashore, things which have moved me all my life.

I most deeply thank all of you who have come here today to make it such a pleasant occasion and for the more than generous cheque to which you have contributed. One of the things I was going to buy on my retirement was a modern telescope to look at my beloved birds. This cheque should enable me to buy one of the best on the market.

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John C. Faulkner (1904–1997)

John Faulkner, who died on 1 August 1997 at the age of 93, had been a member of the Cambridge Natural History Society and the Wildlife Trust for over 40 years. He was born in Uttoxeter on 5 October 1904, but his parents were from Lincolnshire and he was brought up on the family farm at Somerby, three miles east of Grantham. He went to the village school at nearby Ingoldsby, from which, in 1917 at the age of 13, he gained a scholarship to King's School, Grantham, where Isaac Newton had preceded him. He did well, taking form prizes and the Latin prize: books on natural history and astronomy were amongst those he won. In 1922 he moved on to a Teacher Training College at Southampton, laying the foundation for a career in teaching which was wholly in Cambridgeshire – first at St Philip's in Cambridge, then as Headmaster at Milton and finally moving to Great Abington in 1939, where he was to remain as Headmaster until he retired 25 years later.

It was here at Abington that he first came into prominence in the natural history world when he discovered a population of Man Orchid *Aceras anthropophorum* in Little Abington parish. His black and white photograph of it was one of the plates used to illustrate *A Flora of Cambridgeshire* (1964).

Orchids were one of John's particular interests, and perhaps his most outstanding discovery was Violet Helleborine *Epipactis purpurata* in Hildersham Wood on the Essex border on 7 September 1962, a new vice-county record. He wrote about this find in detail in the only long paper that he contributed to *Nature in Cambridgeshire* – 'Hildersham Wood, a botanical survey' (*N. in C.*, No. 6 (1963): 26–31). Here he described it thus: "latest of the woodland orchids, though dull in colour, with pale yellowish-green flowers and a faint tinge of purple in the leaves, it is slender and graceful with a dense cylindrical spike of great charm." As all adjacent vice-counties had recorded the species already, he was surprised that it should have been missed until then. He also noticed a curious oak there in 1956, later identified as *Quercus petraea* x *robur*, only the second record for the vice-county.

However for me the most abiding orchid connection was that for several years in the 1960s John helped with the counts of Southern Marsh-orchids *Dactylorhiza praetermissa* made every June or July in Thriplow Meadows (see, for example, *N. in C.*, No. 8 (1965): 24). His experience as a schoolmaster was invaluable in controlling 20 or more talkative volunteers.

John was a gifted field naturalist, walking round his own patch and getting to know it in detail. After he retired from Abington School in 1964, he and his wife went to live in Brinkley and he immediately began to make more interesting finds – the third vice-county record for Common Bistort *Persicaria bistorta* since 1830, at Balsham in 1965, and the second record for the Oxlip x Cowslip hybrid, *Primula elatior* x *veris*, in Clamp's Lane, Carlton, in 1967 together with both parents, Oxlip being in its only non-woodland locality in v.c. 29 (see *N. in C.*, No. 30 (1988): 60). The second post-1949 vice-county record for Moschatel *Adoxa moschatellina* was made nearby, between Weston Colville and Brinkley. John photographed many of these plants and was much in demand around the county to give talks on them to local societies and Women's Institutes.

Very soon after the Cambridgeshire and Isle of Ely Naturalists' Trust was formed in 1956, John became involved in site surveys, and he was elected to Council in 1958, serving in that capacity for over 25 years. In 1960 he became Assistant Treasurer after the death of Alfred Burton and took over membership responsibilities. He immediately circulated all resident members of the Natural History Society, enabling the Trust to reach its minimum target of 200 members. In 1964 he was one of three members of Council to represent the Trust at the SPNR's Trusts Conference in York. In 1966 he became Acting Treasurer and he was, for one year, Treasurer, but he was forced to resign through the ill-health of his first wife, Marjorie, at the end of 1967. He himself had contracted tuberculosis in 1963 and had to spend some months at Papworth. However he was not idle during his recuperation, discovering the importance of Papworth Wood and preparing a report which set in train the process whereby this 18-acre ancient wood became one of the Trust's nature reserves.

In his retirement John continued to contribute to the work of the Trust, through membership of the Technical Committee and in site surveying. He also prepared site maps of Perennial Flax *Linum perenne* subsp. *anglicum* for the Nature Conservancy Council's survey of rare plants in eastern England and served on the Wandlebury Management Committee.

John's first wife died in 1972, but in 1975 he remarried and moved into Cambridge, where he devoted much of his last 20 years to serving St John's Church in Hills Road, where his considerable talent for wood-turning can be seen today in the many candlesticks and other church furnishings which he made. A rose garden in his memory in the churchyard was blessed in February 1998.

Despite an often difficult home life with an invalid first wife and the very sad early death of his daughter Anne in Australia, John was the epitome of the naturalist-cum-conservation-volunteer on whose shoulders the success of the Trust movement now stands. It was a joy for all his old friends from the field or on committees that he was present at the 40th anniversary celebrations of the Wildlife Trust on 15 November 1996, accompanied by his wife Vera with whom he had enjoyed such a peaceful and rewarding period during the last two decades of his life.

Franklyn Perring

Vascular plant records

G. Crompton & C.D. Preston

Cornus sericea Extensive colony, originally planted but now spreading, at edge of Hobson's Brook, Cambridge, TL 455567, G.M.S. Easy, 17.9.1987. Well established in hedge at point where footpath leaves railway for Morden Grange Plantation and in hedge along footpath to the plantation, TL 301388–302391, J.C.A. Rathmell, 21.7.1997. The first and second vice-county records for a North American species which is widely planted in Britain on roadsides and in parks. The Cambridge plant is the cultivar 'Flaviramea' with yellow twigs, whereas the Morden plant has blood-red stems and white berries.

Epilobium obscurum With *E. tetragonum* in Wildlife Trust's meadow, Gamlingay, TL 222510, J.C.A. Rathmell, 25.7.1996. The most frequent species in this meadow, which is now its only site in the vice-county. *E. obscurum* was first recorded at Gamlingay in 1859 and last recorded in this meadow by A.C. Leslie in 1977.

Filago minima Small patches on waste ground with parked agricultural machinery, by path to Wildlife Trust's meadow, Gamlingay, TL 220512, J.C.A. Rathmell, 22.7.1997; G. Crompton & D.A. Wells, 31.7.1997, **CGE**. *F. minima* was first recorded by Ray in 1660 "in the sandy grounds about Gamlingay", but the last record here was apparently made by C.E. Moss in 1912. It occurs elsewhere in the vice-county.

Geranium sanguineum Scattered along hedge by footpath on the edge of arable land adjacent to the south-west side of the Devil's Ditch, Dane Bottom, TL 648588, P.F. Yeo, 19.11.1997, **CGE**. There is a good colony of *G. sanguineum* on the Ditch here, but this is the first time that the species has been recorded on adjacent land.

Hieracium argutifolium Pugsley Shaded piles of cinders and ballast, Whittlesey railway station, TL 280962, J.O. Mountford, 17.8.1970, **CGE**, det. P.D. Sell, 1997. The first vice-county record of a species which has been treated as a synonym of *H. sabaudum* (*H. perpropinquum*) in recent years.

Rorippa x *anceps* (*R. amphibia* x *R. sylvestris*) With *R. palustris*, but commoner than that species, on bank of River Great Ouse above Brownshill Staunch, TL 371729, J.C.A. Rathmell, 19.7.1997, **CGE**, det. T.C.G. Rich. The prediction in *N. in C.*, No. 36 (1994): 93 "that a search of riversides in the vice-county might reveal the hybrid at further localities" has been gratifyingly realised.

Senecio squalidus Alington bank [Allington Hill, Bottisham, TL 579587], **herb. Mrs Casborne**, 1832, in **CGE**, det. P.D. Sell, 12.11.1997. Cambridge, TL 45, R.H. Lock, 8.1899, **CGE**, det. P.D. Sell, 12.1997. Mrs Casborne's specimen precedes by over 100 years the record hitherto regarded as the earliest in the vice-county, E.A. George's from Chesterton Ballast Pits and Coldham's Lane in 1939. It is labelled as *S. ?aquaticus* in Henslow's hand. "The plant was grown in the Cambridge Botanic Garden in the last century" (F.H. Perring *et al.* (1964), *A Flora of Cambridgeshire*, p. 198). Lock's specimen, which he labelled *S. erucifolius*, might represent an escape from this source.

Sonchus palustris About 20 plants near an upturned old tree near edge of brook, Field C, Wildlife Trust's meadow, Thriplow, TL 437469, J.C.A. Rathmell, 28.7.1997. The history of this species in Cambridgeshire is remarkable: eliminated by fenland drainage in the 19th century, it has reinvaded since 1950, probably from stock planted at Woodwalton Fen. This is only the second record since then from the south of the vice-county.

Bryophyte records

C.D. Preston & H.L.K. Whitehouse

We have previously reported bryophyte records from Cambridgeshire by calendar year; however, most bryophyte records are made in the winter months, so we have listed below those notable records made in the winter of 1997/98, together with one record held over from 1996.

Anomodon viticulosus In some quantity at base of two trees, a dead sycamore and a recently felled lime, near edge of Ash Wood, Chippenham Park, TL 661691, C.D.P., 14.3.1998. A welcome new site for a species which appears to be less frequent than formerly in the vice-county, although it may not survive on these particular tree bases for very long.

Bryum radiculosum Molehills, Thriplow Meadows Nature Reserve, TL 43-46-, M.O. Hill, 13.12.1997. Earthy paving stones, Docwra's Manor, Shepreth, TL 393479, M.O. Hill, 13.12.1997. Anthills, Shepreth L-moor, TL 38-47-, M.O. Hill, 13.12.1997. Chalky soil, with *Weissia longifolia* var. *angustifolia*, Fleam Dyke, TL 54-54-, H.L.K.W., 7.2.1998. With *B. klinggraeffii* in stubble field between road and railway on N. side of Shepreth L-moor, TL38-47-, R.A. Finch, 9.2.1998. This species is common on walls and also occurs in chalk grassland in Cambridgeshire (see *N. in C.*, No. 37 (1995): 51). The record from the Fleam Dyke provides a further example of the chalk grassland habitat, whereas the others suggest that the species might have a wider habitat range than we have appreciated.

Bryum violaceum Stubble field between road and railway on N. side of Shepreth L-moor, TL 38-47-, M.O. Hill, 13.12.1997. This is one of the rarer tuberous *Bryum* species in Cambridgeshire.

Dicranum tauricum Dry wood of trunk and branches of fallen and decorticated tree near S.E. corner of Eversden Wood, TL 34-53-, C.D.P., 21.2.1998. A further record of a species which was first recorded from the vice-county in 1977 and is spreading nationally.

Ditrichum crispatissimum With *Barbula hornschuchiana* and *Thuidium abietinum* subsp. *abietinum* in rabbit-grazed chalk turf, Devil's Dyke, TL 611622, R.D. Porley, 7.3.1998, conf. G. P. Rothero, **BBSUK**. The first record of this segregate of *D. flexicaule*, which is the commoner of the two plants nationally but has not previously been recorded in the vice-county. *D. flexicaule* also occurs on the Devil's Ditch (see *N. in C.*, No. 35 (1993): 85).

Ephemerum recurvifolium Trampled ground by footpath along Fleam Dyke, near the juniper bushes, TL 55-53-, C.D.P., 7.2.1998. Stubble field between road and railway on N. side of Shepreth L-moor, TL 38-47-, M.O. Hill *et al.*, 13.12.1997; R.A. Finch, 9.2.1998. This inconspicuous ephemeral perhaps benefited from the mild, moist winter of 1997/98.

Eucladium verticillatum With *Barbula tophacea* in dense band just above water level on root-plate of upturned tree in stream along side of Thriplow Meadows Nature Reserve, TL 43-46-, M.O. Hill, 13.12.1997. The fourth site in which this species of moist, calcareous habitats has been recorded in the vice-county since 1950.

Fissidens bryoides Crumbly soil on bank of stream in interior of Eversden Wood, TL 34-53-, H.L.K.W., 21.2.1998. A calcifuge which is much less common in our area than the related calcicole *F. viridulus*.

Leucodon sciuroides West-facing brick wall on east side of road near entrance to Wimpole Hall estate, TL 343510, R.A. Finch, 21.2.1998. The presence of *L. sciuroides* on the 'Wimpole Stone', a glacial erratic, was reported in *N. in C.*, No. 35 (1993): 85. The presence of a colony (with axillary propagules) on a nearby wall perhaps explains how this species colonised the stone.

Orthotrichum lyellii Large patch on trunk of willow, TL 48-62-, C.D.P., 23.11.1996. On old apple trees in derelict patch of orchard, Coldham, TL 43-02-, Cambridge Bryophyte Excursion, 8.2.1997. Further records of this epiphyte which has been recorded with increasing frequency in recent years.

Tetraphis pellucida Old, decorticated stump near S.E. corner of Eversden Wood, TL 34-52-, C.D.P., 21.2.1998. This colonist of dead wood is uncommon in Cambridgeshire.

Calypogeia fissa With *Atrichum undulatum*, *Dicranella heteromalla* and *Fissidens bryoides* on crumbly soil on bank of stream in interior of Eversden Wood, TL 34-53-, H.L.K.W., 21.2.1998. This liverwort avoids calcareous soils and so is uncommon in the vice-county.

Weather notes for Cambridgeshire 1997

J.W. Clarke

January: Cold and very dry. Severe frosty weather during the first week, with temperatures below freezing point all day on 1st and 2nd. Snow still lying from December 1996 fall. Changeable, but cold and dry thereafter. Mean daily minimum temperature 4°F and mean daily maximum 6°F below average. Rainfall on 7 days, one fifth of average (0.32 ins).
February: Changeable and very mild throughout. Both mean daily minimum and mean daily maximum temperatures 4°F above average. Rainfall about average. Thunder on 18th.
March: Changeable and very mild throughout. Daily maxima exceeded 50°F on every day but one (21st). No minima below 32°F recorded. Very dry, with rainfall 0.32 ins, on 9 days.
April: Warm, despite several night frosts. A sharp frost (27°F) on 21st severely damaged fruit blossom and other vegetation. Mean daily maximum temperature 3°F above average; mean minimum about average. Very dry, with rainfall 0.41 ins, on 6 days.
May: Warmer than average, with some very warm spells: 1st–3rd with 80°F on 2nd, 16th–20th with 77°F on 18th, 29th–30th with 76°F on 30th. Mean daily maximum 4°F above average; mean minimum slightly below average. Air frost on 7th (30°F) and 24th (32°F). Ground frost on 25th and 29th. Rainfall much below average, on 9 days.
June: Fine and warm to 11th. Thereafter unsettled and extremely wet with rainfall every day from 11th to 30th. Mean daily maximum 2°F and mean daily minimum 3°F above average. Total rainfall 5.82 ins, on 20 days, almost three times the average and well exceeding the total rainfall in the previous five months. Thunder on 3 days.
July: Changeable, dry and warmer than average. Mean daily maximum temperature 4°F above average. Rainfall 1 inch below average, on 10 days. Hardly any thunderstorms, despite many hot and humid days.
August: A remarkably hot, humid month. Daily mean maximum temperature (81.55°F) more than 10°F above average, with 18 consecutive days (5th–24th) exceeding 80°F; mean daily minimum 7°F above average. Rainfall almost 1 inch below average, on 11 days, and only 3 days with thunder.
September: Fine, settled and warm. Mean daily maximum temperature 3°F above average; minimum about average. Very dry, with rainfall (0.50 ins) one third of average.
October: Sunny and warm in the first week (74°F on 1st). Changeable until the middle of the month, when an anticyclone became established, giving warm

weather at first. After 22nd night frosts became frequent and sharp (23°F on 29th). Temperatures average. Rainfall a little below average, on 7 days.
November: First 3 days anticyclonic with night frosts; changeable and mild thereafter. Much warmer than average. Daily maximum and minimum temperatures 3°F above average. Rainfall below average, on 15 days.
December: Changeable and very mild, apart from a few days in the first week with slight night frosts and a covering of snow on 2nd. Daily maximum and minimum temperatures a little above average. Rainfall much above average, on 17 days. A south-westerly gale overnight on 24–25th brought down a number of trees in Cambridgeshire.

Weather records at Swaffham Prior 1997

Temperature °F

Month	*Mean max.*	*Mean min.*	*Highest*	*Lowest*	*Rainfall (ins)*	*(days)*	*Thunder (days)*
January	39.06	29.48	47 on 24th	15 on 3rd	0.32	7	–
February	49.75	37.71	56 on 23rd & 28th	28 on 3rd	1.26	13	1
March	55.58	40.22	63 on 17th	32 on 22nd	0.32	9	1
April	58.20	38.90	73 on 30th	27 on 21st	0.41	6	–
May	66.99	43.45	77 on 18th	30 on 7th	1.11	9	–
June	69.98	51.06	80 on 6th	45 on 1st	5.82	20	3
July	75.38	53.71	81 on 29th	48 on 2nd	1.28	10	1
August	81.55	59.36	91 on 8th	51 on 28th	1.43	11	3
September	68.87	49.04	74 on 18th & 29th	39 on 22nd	0.50	4	–
October	57.77	42.48	74 on 1st	23 on 29th & 30th	1.59	7	–
November	52.37	41.67	62 on 15th	24 on 1st	1.35	15	–
December	46.17	37.68	58 on 3rd	29 on 4th	2.48	17	–
Annual means	60.14	43.73		Totals	17.87	128	9

Number of days over 90°F	1
Number of days over 80°F	26
Number of days over 70°F	108
Number of days with a maximum under 32°F	4
Number of days with a minimum under 32°F	56
Last air frost of the spring	24th May
First air frost of the autumn	22nd October
Days with snow lying	4
Days with thunder	9
Days with fog persisting all day	None
Highest temperature	91°F (on 8th August)
Lowest temperature	15°F (on 3rd January)

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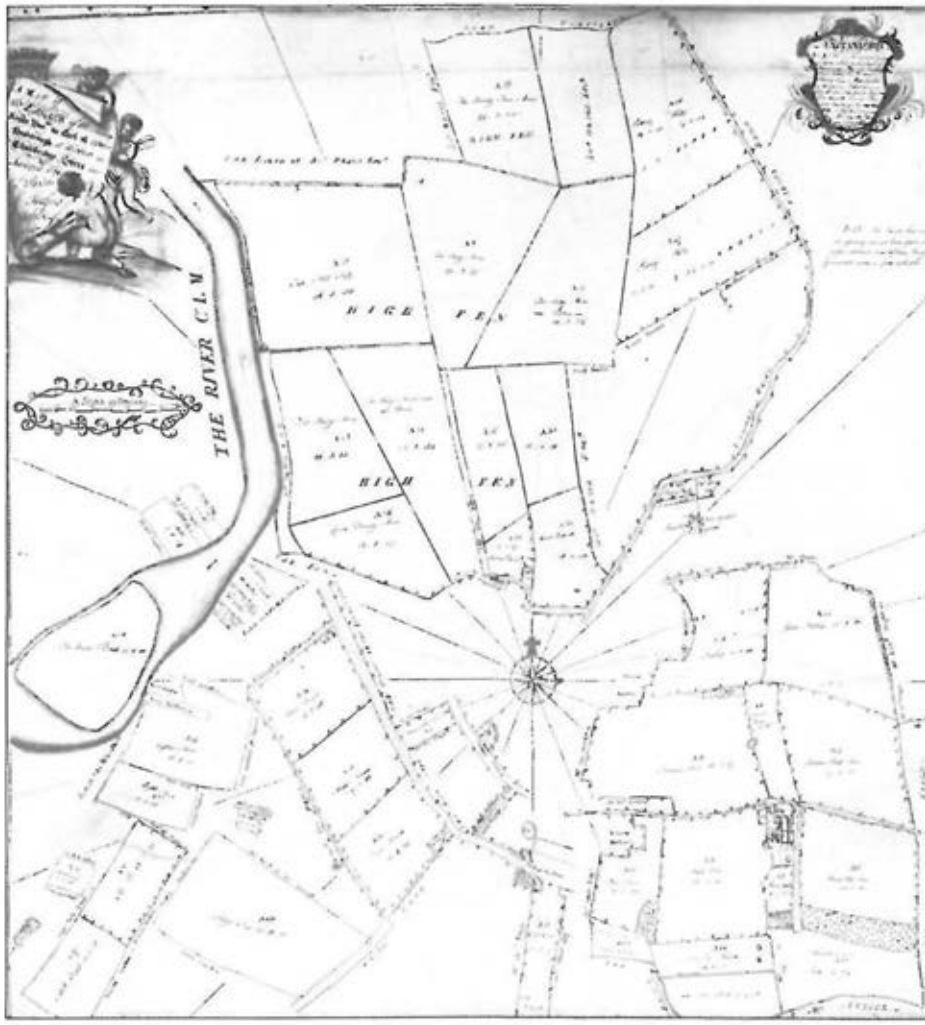

A map of the Estate of the Right Hon. the Earl of Besborough at Wicken, dated 1770, including the area of the new Kingfisher's Bridge Wetland (see pp. 37–52). The pattern of drainage ditches approximates to that existing in 1995 before the development of the wetland. The quarry pit dug in the Upware Rock, now the Upware North Pit SSSI, is not shown, although the cut channel is present. The pit appears on all the 19th-century maps in the County Record Office.

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