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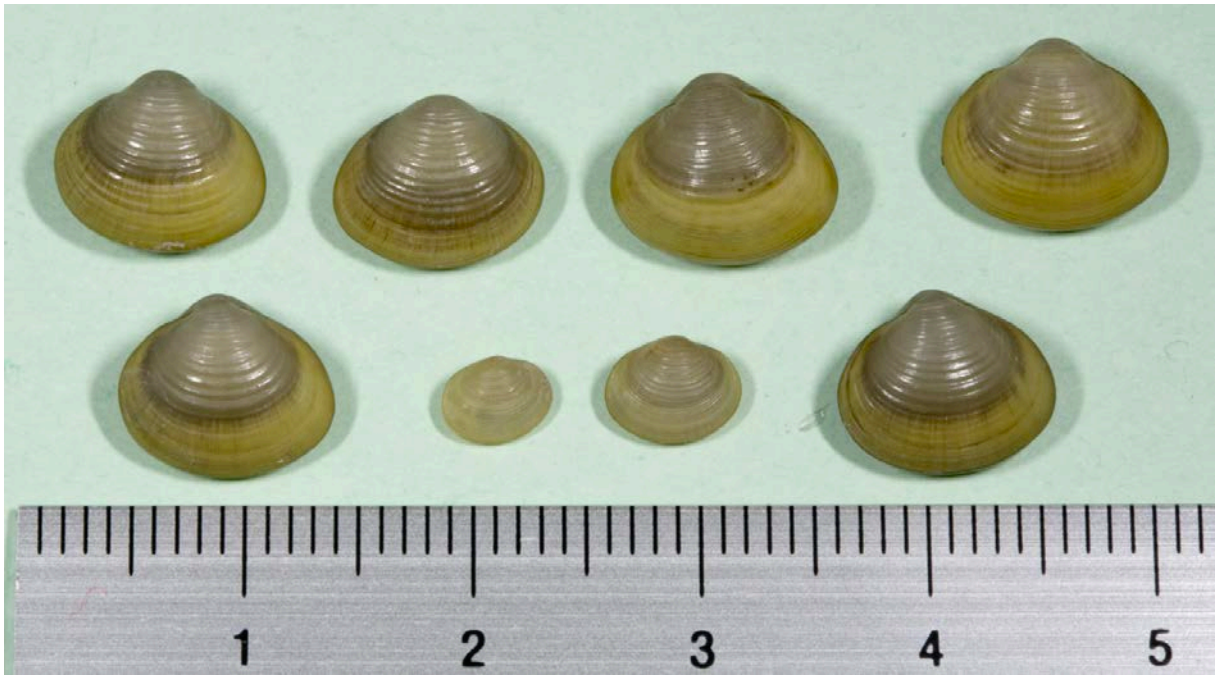


Plate 1 *Sphaerium solidum* from site 9, the New Bedford River near Mepal. (Note the difference in colour between the older grey and younger olive-yellow parts of the shell.) (scale: cm)


Plate 2 *Corbicula fluminea* from site 9, the New Bedford River near Mepal. (scale: cm)

(See article by Martin Willing, page 39)

## CONTENTS



Cover Illustration. Green-winged Orchid (*Orchis morio*) by Peter Stroh

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## EDITORIAL

There was a gratifyingly generous response to my mention last year of the journal's finances. We received numerous donations, and deserving special mention are Jane Bulleid, Arthur Chater, Gigi Crompton, Peter Grubb, Alan Leslie, Elizabeth Platts and Lorna Walters. Cambridge Natural History Society also continue to support us. Thank you to everyone who has helped us.

This year's botanical articles include a review of the status of the Green-winged Orchid, a description of the effects of management changes on Cambridge Milk-parsley and Part II of Hilary Belcher and Erica Swale's new Algal Flora of Cambridgeshire.

Amongst the articles on invertebrates we have two by Matirn Willing on aquatic species; the first concerning two uncommon molluscs, and the second describing the discovery of a marine prawn in the county.

Vertebrates are represented by a paper by Graham Easy concerning sea bird flights over Cambridgeshire originating in the Wash and one by John Flowerdew on vole and mouse populations in Hayley Wood.

Donald Pigott describes the history of the purchase of Hayley Wood by what is now The Wildlife Trust.

We also have obituaries and book reviews, and the regular sections on vascular plant and bryophyte record are joined by one for invertebrate records. If there is anyone who would like to contribute an additional records section, please contact me or any member of the editorial board.

John Clarke contributes the weather records from Swaffham Prior, something he has done since 1960. Sadly this is the last year for which he will be able to do this for us. We are immensely grateful for all the time he has taken to do this, and for the meticulous care with which he compiles his records. We are fortunate that John Kapor has agreed to supply us with weather records from the University Botanic Garden, and this year we include both sets of records. We intend to include a paper comparing John Clarke's records with the Botanic Garden records in a future issue.

A further change is that after eleven years as Membership Secretary Jane Bulleid has handed this task to Vicki Harley. We are extremely grateful to Jane – she has worked tirelessly to promote Nature in Cambridgeshire, and many people must have been made aware of the journal through her efforts. Jane has agreed to remain a member of the editorial board. We welcome Vicki, but warn her that she has a hard act to follow!

# The current distribution of Green-winged Orchid *Orchis morio* L. in Huntingdonshire (vc31), the Soke of Peterborough (vc32) and old Cambridgeshire (vc29)

Peter Stroh

The Green-winged Orchid (*Orchis morio*) is a species of unimproved neutral grassland listed in the Vascular Plant Red Data List for Great Britain (Cheffings & Farrell, 2005) as Near Threatened, meaning that there has been ≥20% decline in the species over the last ten years or three generations, whichever is the longer (Cheffings & Farrell, 2005). The decline of this formerly widespread lowland species has been well documented in Huntingdonshire, the Soke of Peterborough and old Cambridgeshire, with inappropriate management and loss of habitat through development and intensive agriculture being attributed as the main causes for the loss of historical sites (Payne 1991, Wells 1998). However, there is very little information on how these populations have fared since 1990 in this geographical area. The purpose of this paper is to assess the current status and condition of populations within Watsonian vice-counties vc29 (old Cambridgeshire), vc31 (Huntingdonshire) and the Soke of Peterborough (part of vc32).

Following recent DNA analysis undertaken by RBG Kew and Edinburgh, a number of nomenclatural changes have recently taken place within the *Orchidaceai*, including the transfer of some species of *Orchis* to *Anacamptis*. However, for the purposes of this discussion, nomenclature for vascular plants will follow Stace (1997).

## Sources of information

Records for Green-winged Orchid were compiled from a variety of sources. Gigi Crompton's 'Catalogue of Cambridgeshire Flora Records since 1538' (http://www.cambridgeshireflora.com) was an invaluable source of information for vc29, with additional information provided by Nick Millar (vc29 BSBI co-recorder). Terry Wells (vc31 BSBI recorder) provided a wealth of information on the distribution of the species in Huntingdonshire and the Soke, including previous publications, two new locations and valuable personal observations. Kevin Walker (CEH Monks Wood) produced the DMAP figure of the current distribution of Green-winged Orchid, as well as offering informed advice on the draft paper. In addition to these primary sources of information, contact with landowners and other interested parties led to the discovery of two further populations in vc29 and vc31.

## Methodology

A total of thirty-three sites was surveyed for Green-winged Orchid between 10-25$^{th}$ May 2006. Where the species was located, numbers of flowering spikes were counted during a structured walk of the site, and associated vegetation and site management were also recorded. At sites where there was a large population present, a minimum of three people was at hand to accurately record numbers.

Sites that were examined in Huntingdonshire and the Soke in 1990 were re-visited, including those sites where no flowering spikes of Green-winged Orchid were recorded in 1990. An annual count has been undertaken at Upwood Meadows since 1976, and Terry Wells kindly provided records from the 2006 count. All old Cambridgeshire sites where there were records for the species since 1949 were visited, excluding sites where planning development was known to have destroyed the site.

**Results**

Of the thirty-three sites visited, Green-winged Orchid was still present in sixteen; nine out of fourteen locations within Huntingdonshire and the Soke, and seven out of nineteen locations within old Cambridgeshire.

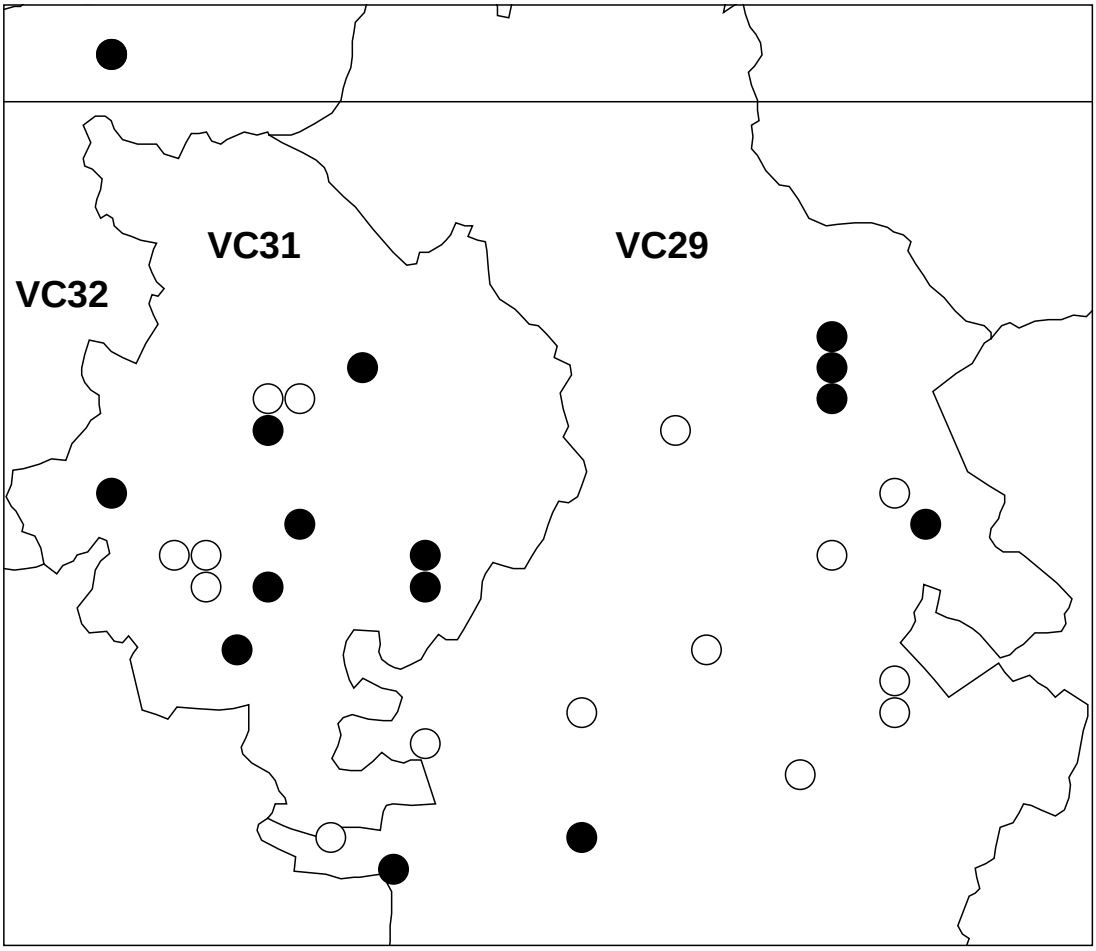


**Figure 1.** Distribution of *Orchis morio* in Huntingdonshire (vc32), Cambridgeshire (vc29) and the Soke of Peterborough (part vc32). Dots are sites where *O. morio* was confirmed as still being present in 2006; circles represent former sites. Distribution displayed at the tetrad (2 × 2km) scale.

Five new locations for the species post-1990 were recorded within the survey area. Seven sites had populations exceeding 100 flowering spikes, and could be classified as key locations for the species. Of the sixteen sites where Green-winged Orchid was recorded, four sites are cut with arisings not removed, four

sites are cut and baled, five sites are cut and baled with aftermath grazing, and three sites are managed solely by grazing. Management at the seven key locations involved three sites being cut and baled, two sites cut and baled with aftermath grazing, and one site managed solely by grazing. At the remaining key location, it was discovered that 'green hay' has been consistently applied over a three decade period, and the sward annually cut.

**Huntingdonshire and the Soke**

Green-winged Orchid was recorded from five Huntingdonshire and Soke sites in 1990. Three new locations in vc31 were found in the 2006 survey, and Green-winged Orchid made a re-appearance after a period of at least sixteen years at one historical site (Southorpe Meadow SSSI). This may be due to the re-instatement of a regular management regime of cutting, baling and aftermath grazing four years ago. Huntingdonshire holds two of the three largest populations of the plant in the survey area, Upwood Meadows NNR and Brampton Racecourse SSSI.

The most spectacular find was at Little Catworth meadow. This site was scheduled as a SSSI in 1984 for its unimproved mesotrophic ridge and furrow grassland, and included a small (<10) population of Green-winged Orchid. In 1990, no plants were recorded and it was concluded that the site had been fertilised at some point in the recent past, and that the population had probably been lost from the meadow. The site was re-visited in 2006 in a fairly pessimistic frame of mind, so the discovery of 171 flowering spikes came as some surprise. Whilst recording the associated vegetation, it was apparent that many of the indicator species associated with unimproved MG5 grassland (Robertson & Jefferson 2000) were present in large 'clumps', and surrounded by a very grassy sward. This seemed to indicate that these species were recovering and spreading outwards after an application of fertiliser in the past. By far the largest numbers of spikes (57%) were located along the western-most ridge abutting the boundary hedge, but flowering spikes were also found at scattered locations on a further ten of the fourteen ridges across the field.

Of the three new sites recorded in the survey, two flowering spikes were found by Tim Sparks and confirmed by Kevin Walker on the experimental field plots at CEH Monks Wood. These fields were taken out of arable production in 1963, and then put down to grass with an annual regime of cutting with no input of fertilisers. In the past two years, the fields have been cattle grazed in the winter months. The second new site was found on the edge of an embankment by the A1M link between Brampton and Buckden, following information received by Terry Wells. The embankment was created in the late 1970s, with topsoil being stripped whilst the embankment was created, then put back at a depth of six inches and seeded with a rye grass mix at 20g per m² (Keith Sullivan pers. comm.). The habitat has since been colonised by a wide variety of species, including Adders-tongue Fern (*Ophioglossum vulgatum*) and Green-winged Orchid. The grassland strip where the plants occur has had no input of fertilisers and is cut up to four times a year as a 'visibility strip' by contractors for the Highways Agency. It may be that at both these sites, due in part to

regular cutting and no input of fertilisers, suitable conditions have been created over time which has led to colonisation taking place via wind blown seed from Brampton Racecourse, which holds significant populations of the species and is located four kilometres to the north east. The third 'new' site discovered since 1990 was at Midloe Grange Farm in the early nineties after the landowner informed local ecologists that he had located Green-winged Orchid in one of his fields. This was confirmed by John Comont (Bedfordshire County Council ecologist) in 1991, and also independently by Nick Millar in 1993 whilst undertaking a county-wide Phase I survey (Nick Millar pers.comm.). The field where Green-winged Orchid occurs mainly comprises heavily grazed grassland that has received massive doses of fertiliser in the past. However, small areas would appear to have escaped inputs, and demonstrate species characteristic of unimproved neutral grassland (Terry Wells pers.comm.) including the near threatened/nationally scarce Sulphur Clover (*Trifolium ochroleucon*).

The species has also been recorded as having colonised cattle-grazed grassland at Upwood Meadows SSSI. The site consists of three meadows, one of which (Bentley Meadow) is unimproved species-rich grassland containing approximately 4000 Green-winged Orchid spikes in 2006. The other two meadows (Little Bentley Meadow and Helen's Close) have been improved in the past, with Helen's Close last sprayed with herbicide in 1971. Twenty-eight years later, in 1999, Terry Wells found the first Green-winged Orchid plant to colonise Helens Close since inputs ceased, and a second plant was found in the same field in 2003.

**Table 1**: The status of populations of *Orchis morio* in Huntingdonshire, the Soke of Peterborough and Cambridgeshire

| **Site Name** | **VC** | **Grid Ref.** | **Population size** | | **Conservation status** | | **Recorder 2006** |
|---|---|---|---|---|---|---|---|
| | | | **Last Published Record** | **2006** | **1990** | **2006** | |
| Arthur's Field (Hemingford Grey Meadow SSSI) | vc31 | TL292692 | 52 | 29 | SSSI | SSSI | Stroh, P.A. |
| Beacon Course, Newmarket | vc29 | TL588613 | 1 | 0 | SSSI | SSSI | Stroh, P.A. |
| Beacon Course, Newmarket | vc29 | TL599626 | 1 | 0 | SSSI | SSSI | Stroh, P.A. |
| Brampton/Buckden Embankment* | vc31 | TL19606893 | - | 26 | None | None | Stroh, P.A. |
| Brampton Racecourse | vc31 | TL204723 | 5,000+ | 20,532 | SSSI | SSSI | Hagen, C., Stroh, P.A., Tilley, J. |
| Caxton Moats | vc29 | TL295586 | 1 | 0 | CWS | CWS | Stroh, P.A. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Chettisham Meadow | vc29 | TL541832 | 4,500 | 6,765 | SSSI | SSSI | Stroh, P.A. |
| Chettisham New Meadow | vc29 | TL544840 | - | 1,294 | CWS | CWS | Stroh, P.A. |
| Chettisham, Graham's Meadow* | vc29 | TL54368396 | - | 33 | CWS | CWS | Graham, J.J. |
| Easton | vc31 | TL142717 | 0 | 0 | None | None | Stroh, P.A. |
| Easton | vc31 | TL136719 | 0 | 0 | None | None | Stroh, P.A. |
| Ely Common | vc29 | TL552808 | 3 | 0 | None | None | Stroh, P.A. |
| Far Close, Houghton (Houghton Meadows SSSI) | vc31 | TL293717 | 202 | 236 | SSSI | SSSI | Stroh, P.A. |
| Gamlingay Cinques | vc29 | TL225522 | 3 | 0 | CWS | CWS | Stroh, P.A. |
| Grafham | vc31 | TL158694 | 0 | 0 | None | Destroyed | Stroh, P.A. |
| Great Wilbraham Common | vc29 | TL533576 | 1 | 0 | SSSI | SSSI | Stroh, P.A. |
| Harlton Lord's Bridge Observatory | vc29 | TL393538 | 2 | 0 | CWS | CWS | Stroh, P.A. |
| Harlton Lord's Bridge Observatory* | vc29 | TL3982553756 | - | 4 | CWS | CWS | Brown, T., Stroh, P.A., |
| Hatley St George Park Meadow | vc29 | TL275508 | 180 | 653 | CWS | CWS | Astor, M. (pers comm) |
| Landbeach | vc29 | | 0 | 0 | None | Destroyed | Stroh, P.A. |
| Little Catworth Meadow | vc31 | TL082749 | 0 | 171 | None | SSSI | Stroh, P.A. |
| Madingley Hall | vc29 | | - | 0 | None | None | Stroh, P.A. |
| Midloe Grange Farm* | vc31 | TL162648 | - | c.12 | None | CWS | Stroh, P.A. |
| Monks Wood Experimental Field* | vc31 | TL19847929 | - | 2 | None | None | Sparks, T., Walker, K.J. |
| Monks Wood, West Field | vc31 | TL196803 | 0 | 0 | NNR | NNR | Stroh, P.A. |
| Soham North Horse Fen | vc29 | TL587759 | 3/4 | 3 | None | None | Stroh, P.A. |
| Soham Staples Meadow | vc29 | TL614730 | 1 | 0 | SSSI | SSSI | Stroh, P.A. |
| Soham Triangular Meadow | vc29 | TL611728 | "many hundreds" | 53 | SSSI | SSSI | Stroh, P.A. |
| Southorpe, Soke (Southorpe Meadow SSSI) | vc32 | TF084031 | 15 | 1 | SSSI | SSSI | Evans, Paul (pers.comm.) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sutton, 16 Acre Meadow | vc29 | TL4479 | 1 | 0 | None | Destroyed | Stroh, P.A. |
| Upwood Meadows SSSI | vc31 | TL252827 | 1,311 | 4,324 | SSSI | SSSI | Robbins, A., Stroh, P.A., Wells, T.C.E., Wells, S. |
| Wicken Fen | vc29 | | 2 | 0 | NNR | NNR | Stroh, P.A. |
| Woodwalton Marsh | vc31 | TL211810 | 0 | 0 | SSSI | SSSI | Stroh, P.A. |

***** New Sites post-1990 for Huntingdonshire and old Cambridgeshire

**Old Cambridgeshire**

By 1990 old Cambridgeshire supported just seven known locations for Green-winged Orchid, with four of these sites having just one or occasionally two plants (Payne 1991). The main populations recorded in vc29 circa 1990, Chettisham Meadows SSSI and Soham Wet Horse Fen SSSI, are still intact and are under appropriate management. At Chettisham Meadows, the population has risen from c.1,000 flowering spikes in 1994 to c.7,000 spikes in 2006 and it now holds the second largest population in the survey area, and by some margin the largest per hectare. However, the fate of the smaller populations cited by Payne in 1990 is not so promising, with no sign of Green-winged Orchid recorded at three of the four sites in 2006. This news is tempered by the discovery of a number of new sites since 1991, including two that could be considered key locations for the species.

Chettisham 'New' Meadow, one kilometre to the north of Chettisham Meadow SSSI, is situated next to an active railway line and was found by F&D Hayward in 1994 whilst undertaking a county-wide Phase I survey in conjunction with the Wildlife Trust. The site appeared to represent unimproved mesotrophic grassland, but as the survey focused on habitat, no estimate of Green-winged Orchid population size was recorded at the time. The final count in 2006 numbered almost 1,300 flowering spikes within 0.3ha, the fourth largest population recorded in the survey area. It seemed that a new key location, mysteriously absent from historical records for the species, had been discovered. However, the associated vegetation was inconsistent with all other key locations, specifically the prevalence of coarse grass species, the paucity of key indicator species such as Pepper-saxifrage (*Silaum silaus*), Hairy Oat-Grass (*Helictotrichon pubescens*) and Rough Hawkbit (*Leontodon hispidus*) and the dominance of Common Knapweed (*Centaurea nigra*). Further investigation led to the discovery that the farmer, Mr Murfitt, who has managed Chettisham Meadows SSSI so successfully by hay cutting had been spreading a proportion of 'green hay' onto the site of Chettisham 'New' Meadow since the late 1970s. There was no financial incentive for this extra work, simply the personal interest of witnessing which plants came up, and to observe whether Green-winged Orchid could be translocated by spreading green hay containing a seed source. The management has clearly been successful with regard to Green-winged

Orchid, and Mr Murfitt is to be congratulated for his unique experiment. His success may be attributed to a number of factors, including the geographical location of the new site in relation to Chettisham Meadows SSSI, the number of years that 'green hay' has been spread, and perhaps most significantly the population size and density within the donor site. A new location for the species was also recorded by Jonathan Graham en route to the 'New' Meadow in a corner of a field which otherwise comprised a seeded grassland ley. It is unclear at present whether this is a natural population, another experimental plot, or natural colonisation from the nearby seed source.

The second key location was first recorded at Hatley St George in the private grounds of Hatley Park in 1997. The population was found by Iain Webb of the local Wildlife Trust and confirmed by Derek Wells, and consistent management of cutting and baling by the Estate staff has led to an increase in numbers of Green-winged Orchid over the past nine years. Present numbers were kindly passed on to me by Michael Astor, who put the population at over six hundred flowering plants. Associated species were recorded by Derek Wells in 1997, and several species consistent with old unimproved grassland were recorded, including Spring Sedge (*Carex caryophyllea*), Fairy Flax (*Linum catharticum*) and Field Woodrush (*Luzula campestris*). It is highly unlikely that such species would have been artificially introduced.

Several historical sites (post-1949) with records for small numbers of the species (<10) were visited, but plants were recorded at just one of the thirteen locations. However, this location has no protection, and is under continued threat from the frequent use of fertilisers and an intensive grazing regime. Indeed, it is somewhat surprising the population still exists, as the area has clearly been in an intensive regime for some years and the location for the plant is neither in a field corner nor in a field margin. Associated species that have survived in the small area where Green-winged Orchid is located include Quaking Grass (*Briza media*), Sweet Vernal-Grass (*Anthoxanthum odoratum*), Field Woodrush and Bulbous Buttercup (*Ranunculus bulbosus*). Of the 12 sites where no Green-winged Orchid plants were recorded, suitable habitat still remains at Caxton Moats, Great Wilbraham Common, Newmarket Heath and Ely Common. A new small population was discovered at Harlton Lord's Bridge Observatory following information obtained from Dr Tony Brown. Although no plants were found at the Observatory's historical location, a search in rough grassland less than one kilometre east revealed four flowering spikes. It is not known whether this is an overlooked population or one that has benefited from a nearby wind-blown seed source.

## Conclusions

Comparison of 2006 data with surveys undertaken in the early 1990s leads to a tentatively positive picture developing with regard to the current status of Green-winged Orchid in vc29, vc31 and vc32 (part of). Three new key locations (>100 flowering spikes) have been discovered, and all of the main sites (>10 flowering spikes) that were present in 1990 are still intact today. Protection of sites is an important factor with thirteen of the sixteen extant populations

recorded in 2007 being within either SSSI or County Wildlife Sites (CWS). At sites where population numbers were small (<10 flowering spikes), the nature of recording coupled with variable weather conditions over time and indiscriminate grazing by rabbits and deer may have led to populations being overlooked, especially at sites where suitable habitat still occurs. Chatters (1994) notes that plants can persist in a vegetative state for many years if the inflorescences are removed by mowing or grazing, eventually flowering and fruiting when the pressure is released. The discovery of Green-winged Orchid on a number of coarse, nutrient-poor neutral grassland sites that are in a long term (>30 years) management regime that consists of regular cutting coupled with no input of fertilisers is encouraging. These sites all had a seed source for the plant within six kilometres or less, and findings at Upwood Meadows, Brampton/Buckden Embankment and Chettisham New Meadow seem to indicate that the plant has the potential to disperse and successfully colonise new suitable sites through either a wind-blown seed source or through the regular spreading of 'green hay' which contains a high proportion of Green-winged Orchid seed. The example of Little Catworth Meadow may also mean that Green-winged Orchid is able to survive as long-lived underground tubers in a sward that is fertilised on one occasion before re-colonising if the fertility of the meadow decreases sufficiently, although this hypothesis requires more comprehensive study and analysis. On a cautionary note, it should be recognised that at Upwood Meadows (Helen's Close) it has taken a considerable amount of time (28 years) for Green-winged Orchid to begin to naturally colonise previously improved land. This land also has the advantage of an abundant seed source available in the adjacent fields. In the intervening years since inputs ceased, it is also important to remember that this land was put into a conservation grazing regime designed to restore the meadow to a more species-rich sward.

Throughout this carefully optimistic tone, the combined threats of increased planning development, new road schemes, adverse agricultural activities and inadequate site management should not be forgotten. After all, at a conservative estimate at least half of the extant sites recorded post-1949 have been lost from the survey area. Although the populations now appear to be fairly stable in the survey area the fate of the Green-winged Orchid is, more than ever, intrinsically linked to our understanding of the ecology of species-rich meadows, the biological diversity that they support, and the management practices required to maintain this diversity. Continued vigilance and education is still essential to ensure the survival of this beautiful plant and its associated habitat.

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# The impact of a lack of grazing and lowered water-table on Cambridge Milk-parsley (*Selinum carvifolia*) and other plants at Sawston Hall Fen, Cambridgeshire

C. James Cadbury and J. Owen Mountford

## Abstract

Cambridge Milk-parsley (*Selinum carvifolia*) is considered Vulnerable, with only three extant sites in Britain, all in Cambridgeshire. The Sawston population is currently the smallest of the three populations and has undergone a considerable decline as a result of a lowering water-table and the cessation of grazing leading to the development of rank, tussocky vegetation and scrub encroachment. A count of 167 flowering plants of Cambridge Milk-parsley in 2005 was similar to that in 2004 but was 81% below the 895 recorded in 1998. The flowering plants of Saw-wort (*Serratula tinctoria*) were also counted; numbers were likewise similar to those in 2004, but it too has probably declined since 1989. Both species are associated with a fen community dominated by Purple Moor-grass (*Molinia caerulea*) (NVC **M24**). Of 136 vascular plant species recorded at Sawston Hall Fen between 1970 and 2005, 38 were not recorded in the 2002–2005 surveys and may have become extinct: 15 of these are wetland species and one other wetland species may have disappeared subsequently. Under the present ownership of the site active steps are being taken to restore the botanical interest of the fen, with a resumption of grazing.

## Introduction

Cambridge Milk-parsley is considered Vulnerable in the recent Vascular Plant Red Data List for Great Britain (Cheffings & Farrell, 2005). Sawston Hall Fen in South Cambridgeshire is a calcareous fen that supports one of only three extant populations of the species in Britain, the other two being Chippenham Fen and Snailwell Meadows, also in Cambridgeshire. Cambridge Milk-parsley has become extinct at three sites – Teversall, Nottinghamshire, Broughton, Lincolnshire, and Fordham, Cambridgeshire (Walters, 1956). Whereas in 1966 there were more than 17,000 flowering plants at Chippenham and just over 600 at Snailwell (Wright, 1999), the Sawston population has suffered a decline and is now small. This can be attributed both to a lack of grazing over the past 23 years (since 1982) and to a lowering of the water-table due to water abstraction. With a development of much coarse, tussocky vegetation and scrub encroachment, the SSSI on the site is now in unfavourable conservation status.

Since the discovery of Cambridge Milk-parsley at Sawston Hall Fen (usually referred to as Sawston Hall Meadows) in 1949 (Walters, 1956), subjective assessments of its status were made almost annually in 1969–1986 and more sporadically since, when systematic counts of flowering plants were undertaken (O'Leary, 1989; Meade, 1989; D. Radley, 1998 *in lit.*; Cadbury, 2002, 2003, 2004). The fen has also supported several locally scarce species, notably Grass-of-Parnassus (*Parnassia palustris*), Bog Pimpernel (*Anagallis tenella*), Lesser Water-plantain (*Baldellia ranunculoides*), Saw-wort and Great Fen-sedge (*Cladium mariscus*). These have also been recorded on frequent occasions (Meade, 1989; D. Radley, 1998 *in lit.*), but only Saw-wort and Great Fen-sedge have survived until the present. More intensive surveys of the vegetation were carried out by Smyth & Soden (1989) and Cadbury (2002, 2003, 2004). A survey undertaken by the authors of this paper in August 2005 was specifically to count the number of flowering plants of Cambridge Milk-parsley, Pepper-saxifrage (*Silaum silaus*) and Saw-wort and determine associated flora before the resumption of grazing by cattle after 23 years' absence.

## Methods used in the 2005 survey

The following records were taken:

a A comprehensive count was made of the flowering plants of Cambridge Milk-parsley, Pepper-saxifrage and Saw-wort. All areas where Cambridge Milk-parsley and Saw-wort had been recorded in the 2002–2004 surveys were visited.

b Associated plant species and their Domin cover frequency were recorded around plants of Cambridge Milk-parsley in nine 2 × 2 m quadrats with at least one quadrat in each of the areas where the species occurred in the fen. A further three quadrats were surveyed around Pepper-saxifrage plants. Four sward height readings were taken in each quadrat.

c An eight-figure grid reference was taken with a GPS at each of the quadrats.

**Results of the 2005 survey of *Selinum*, *Silaum* and *Serratula***

On 13 August 2005 a total of 167 flowering plants of Cambridge Milk-parsley was recorded, with 40 in the central area, 107 in the southern area, 15 in the south-west and five in the south-east (Table 1, Figure 1). Only a handful of non-flowering plants were observed in Sawston Hall Fen.

One hundred and twenty-two plants (73%) at Sawston in 2005 were associated within NVC community **M24** *Molinia caerulea–Cirsium dissectum* fen meadow (though *C. dissectum* no longer occurs in the fen). Another 40 (24%) were associated with **MG1** *Arrhenatherum elatius* coarse grassland/**M24** intergrade, and only 3% with **CG4** *Brachypodium pinnatum* grassland, which occurred in somewhat drier and perhaps more base-rich parts of the fen than those in which Purple Moor-grass was dominant (Rodwell, 1991, 1992). This distribution was in contrast to Pepper-saxifrage, with 71 of 134 plants (53%) growing in the *Brachypodium*-dominated community, while 270 of the 280 flowering Saw-wort plants (96.4%) were growing in the **M24** *Molinia* community. There are indications that both Cambridge Milk-parsley and Saw-wort grow in somewhat wetter conditions in the fen than Pepper-saxifrage.

Thirty-eight species of vascular plants were recorded in the nine 2 × 2 quadrats sampled around Cambridge Milk-parsley plants. Of the ten most common in both the number of quadrats in which they occurred and in Domin cover, four were tussock-forming grasses – Purple Moor-grass, False-oat (*Arrhenatherum elatius*), Tall Fescue (*Festuca arundinacea*) and Tufted Hair-grass (*Deschampsia cespitosa*). The mean sward height in the quadrats was 61.7 ± 20.3 cm.

**Comparison with previous surveys of *Selinum*, *Silaum* and *Serratula* at Sawston**

From 1969 to 1986 Cambridge Milk-parsley was recorded as being plentiful in Sawston Hall Fen, and it was noted as being abundant in 1973 and 1974, 1977, 1983 and 1986. Indeed it was extending its range on the fen between 1978 and 1985 (Meade, 1989). In 1988, Sawston, with up to 1,000 flowering plants, had more than either Chippenham Fen (600–800) or Snailwell Meadows (650) (O'Leary, 1989). At Chippenham only 17% and 3% of the total Cambridge Milk-parsley plants were flowering in 1987 and 1988 respectively. This is in contrast to the situation at Sawston in 2005, when the proportion was about 95%. Donna Radley and Malcolm Wright counted 580 flowering plants in 1997, with 515 in the southern fen and 65 in the central fen. On 23 September 1998 the count of flowering plants rose to 895, with 774 in the southern fen, 107 in the central fen and 14 elsewhere (D. Radley, 1998 *in lit.*). If the 1998 and 2005 counts are compared, there has been a 81.1% decline in flowering plants. Martin O'Leary did not count the number of plants when he visited Sawston Hall Fen in October 1997. His map, however, showed the plant to be considerably more widespread in the central fen and the wetter south-westerly part of the southern fen than it was in 2005 (O'Leary, 1997). In 1984 it was even more widely distributed in the latter area (Sue Everett, pers. comm.). In 2005 in the central

fen Cambridge Milk-parsley was restricted to three small isolated patches and in the south-west sector of the southern fen there were only 15 plants (Figure 1).

In 1988 Purple Moor-grass was the dominant plant associated with Cambridge Milk-parsley at both Sawston and Chippenham Fen, but Blunt-flowered Rush (*Juncus subnodulosus*) was another frequent associate at both sites. At Snailwell Cambridge Milk-parsley occurred in a different community, in which Meadowsweet (*Filipendula ulmaria*) and Red Fescue (*Festuca rubra*) were prominent (O'Leary, 1989). The indications are that at Sawston and Chippenham Cambridge Milk-parsley was associated with NVC communities **M22** *Juncus subnodulosus–Cirsium palustre* and **M24** *Molinia caerulea–Cirsium dissectum* fen meadow, whereas at Snailwell the community had associations with **M27** *Filipendula ulmaria–Angelica sylvestris* mire (Rodwell, 1991).

Saw-wort was in full flower in mid August, when similar counts of flowering plants were made in 2004 (291) and 2005 (280). However, of the 402 plants counted at the end of June 2004 more than a quarter did not flower later that year (Table 1). In 2002 and 2003 there were 200–300 flowering Saw-wort plants in Sawston Fen. Since at least 2002 Saw-wort has been in the central part of the southern fen but extended across a ditch into the south-eastern part.

## Vascular flora of Sawston Hall Fen

Between 1970 and 2005 136 vascular plant species were recorded from the site. There have been 38 or possibly 39 extinctions (Table 2), but 27 species have been added since 2002. These additions include eight wetland plants, five woodland species, three of scrub, five ruderals and two shrubs that were planted or naturalised (Table 3). It is likely that most of these had been overlooked previously and were not recent colonisers.

## Apparent extinctions

The 38 species that have not been observed since 1989 comprise 15 wetland species, 16 dry grassland species and seven widespread common species (Table 2). Another wetland species, Marsh Pennywort (*Hydrocotyle vulgaris*), has not been seen since 2002. In most instances the precise date of extinction is unknown.

Grass-of-Parnassus existed precariously at the edge of a wet ditch from before 1959 (T. F. Teversham in Meade, 1989) until 1975, when there was a single weak plant (Meade, 1989). Reed (*Phragmites australis*) encroached on the site. Bog Pimpernel was decreasing by 1971 and was last recorded in 1977. Lesser Water-plantain was recorded in 1977 but apparently not seen after 1983. Early Marsh-orchid (*Dactylorhiza incarnata*) and Common Spotted-orchid (*D. fuchsii*) were both plentiful in 1972 (Meade, 1989), but neither was recorded in the 1989 survey (Smyth & Soden, 1989); Southern Marsh-orchid (*D. praetermissa*) was, however, included among the species they listed. Meade mentions Marsh Arrowgrass (*Triglochin palustre*) in 1977, but it has apparently not been recorded subsequently. A small patch of Meadow Thistle (*Cirsium dissectum*) was discovered in Sawston Hall Fen in 1983; it had last been

recorded there in 1850 and 1898. This species, characteristic with Purple Moor-grass of **M24** fen meadow, persisted until 1989 (when it was recorded as rare), but has not been seen subsequently. Marsh Pennywort was recorded as being frequent in the **M24** *Molinia* fen meadow in 1989 (Smyth & Soden, 1989), was still present in 2002 (Cadbury, 2002), but has not been seen since. Though it could have been overlooked, the vegetation where it grew has become rank. Brookweed (*Samolus valerandi*) was recorded in 1983 (Meade, 1989) but not subsequently in the fen. It was, however, abundant in the dry moat of Sawston Hall in the late 1980s (CJC).

**Wetland species**

Excluding three willows (*Salix* species), 33 wetland plants survive in Sawston Hall Fen. They include:

- Common Meadow-rue (*Thalictrum flavum*) in the eastern part of the fen.
- Fen Bedstraw (*Galium uliginosum*), which is widespread.
- Marsh Valerian (*Valeriana dioica*) in species-rich **M24** fen-meadow in two areas, one in the southern sector and the other in the south-east.
- Hemp-agrimony (*Eupatorium cannabinum*), which is spreading and now forms extensive patches.
- Blunt-flowered Rush (*Juncus subnodulosus*), which forms dense stands, particularly in the south-west part of the fen.
- Great Fen-sedge (*Cladium mariscus*), which is one the fen's specialities and has been known from the site since at least 1969, when it was seen by Gigi Crompton and Margaret Meade (Meade, 1989). In 2003 there was a large patch extending 20 m along the northern of the two south-west/north-east ditches, two more stands in the southern of these and an isolated clump in the south-west of the fen.
- Twelve wetland sedges (*Carex* species): these include Tawny Sedge (*C. hostiana*), which was misidentified as Distant Sedge (*C. distans*) in the 1989–2003 surveys and is associated with **M24** community in the southern sector, Yellow-sedge (*C. viridula* subsp. *brachyrrhyncha*), Common Sedge (*C. nigra*), which was rediscovered in 2004, Slender Tufted-sedge (*C. acuta*) in and around the central ditches, Tufted-sedge (*C. elata*), identified in 2005 in the south-west area, and Flea Sedge (*C. pulicaris*), discovered in the southern sector (TL49114900) in 2003. The only other extant site for Flea Sedge in Cambridgeshire is Chippenham Fen (Leslie, 2005).

**Grassland species**

In addition to Pepper-saxifrage and Saw-wort already mentioned, species associated with drier grasslands that still occur in Sawston Hall Fen include:

- Adder's-tongue (*Ophioglossum vulgatum*), which was recorded in 1972 (Meade, 1989) and again in 2005 (CJC & JOM).
- Zigzag Clover (*Trifolium medium*), first recorded in 1972 and still present 2005.
- Field Scabious (*Knautia arvensis*), recorded in 2002.

- Devil's-bit Scabious (*Succisa pratensis*), along with Quaking-grass (*Briza media*) in herb-rich **M24** fen-meadow, in two places.
- Tor-grass (*Brachypodium pinnatum*), which forms dense tussocks, was first observed in the fen in 1971 on old ditch-banks; it was already widespread by 1974 (Meade, 1989) and there are now extensive patches scattered over much of the site.
- Hoary Ragwort (*Senecio erucifolius*) is widespread in the drier northern and eastern parts of the fen.

**History of management**

*Drainage*

A large drain was dug through the fen in 1971 to connect with the new housing estate to the north. Meade (1989) records that the ditches were very dry or low in water in the summers of 1973, 1977 and 1980, but there was a high water-table in August and September 1974. Surveys in late summer in 2002–2005 showed the fen, including the ditches, to be dry. The wettest area was at the south-west end. NVC surveys in 2002 and 2003 indicated a spread of **MG1** *Arrhenatherum elatius* coarse grassland in the northern sector and invasion by Hawthorn (*Crataegus monogyna*) and Ash (*Fraxinus excelsior*) scrub, particularly at the eastern end. It was in this area that Traveller's-joy (*Clematis vitalba*) and Buckthorn (*Rhamnus cathartica*) were newly recorded for the fen. Tor-grass, a dry calcareous grassland species, is also spreading.

*Grazing*

By 1968 grazing of Sawston Hall Fen by cattle was becoming irregular and for short periods. What grazing there was occurred mostly in the spring. In 1972 cattle were noted grazing Tor-grass. In 1976 and 1980 there was no grazing after April, for only six weeks in 1979, and none at all in 1982 and 1985. A build-up of litter from enormous clumps of grass was noted in 1979 and the development of coarse vegetation was becoming apparent from the early 1980s. Alder (*Alnus glutinosa*) was spreading into the south-east corner by 1983 (Meade, 1989). There have been 23 years in which there has been no grazing by cattle. A small herd of Highland Cattle were introduced in the autumn of 2005. Muntjac (*Muntiacus reevesi*) have become established in the fen in recent years.

**Status and ecology of Cambridge Milk-parsley in Europe**

This species is found from southern Fennoscandia to Bulgaria, Italy and Portugal, but becomes much rarer in the Mediterranean zone. Although it is apparently local or even rare in a number of countries other than Britain (e.g. France and Finland), there is no indication of its threat status.

Cambridge Milk-parsley has been ranked in terms of its ecological indicator values for Britain (Hill *et al.*, 2004) with comparisons with those in central Europe. Characteristically it occurs:

a in well lit sites;

b in constantly damp but not waterlogged habitats, agreeing with observations at Chippenham Fen (O'Leary, 1989);

c in moderately acid soils in central Europe, whereas its British sites are at least weakly basic;
d on fairly infertile soils, though the Cambridgeshire sites may be marginally more fertile.

## Conclusion

The picture with regards to Cambridge Milk-parsley at Sawston Hall Fen seems to be a contraction in its distribution (since the mid 1980s) and a marked decline in the population (since at least 1998). There may have been a slight upturn in the population in the last two years (2004 and 2005) since it reached a low point in 2003. The flowering population of Saw-wort seems to have also suffered a reduction since at least 1998 but its distribution may always have been localised.

There seems little doubt that the causes of these declines and the apparent loss of a number of commoner wetland and calcareous grassland species are the lowering of the water-table and the development of rank, tussocky vegetation following a cessation of grazing in the early 1980s. Those species showing the most severe declines and extinctions are in the main either wetland indicators or low-growing species excluded from coarse swards (Hill *et al.*, 2004).

Under the new ownership of the site active steps are now being taken to rectify these problems in the hopes of restoring the botanical quality of the SSSI. The new owner is allowing the monitoring of the water-table and the flora, which is most welcome.

## Acknowledgments

We particularly applaud Adrian Critchlow, who since recently acquiring the Sawston Hall Estate is taking active steps with Natural England and the Cambridge Water Company to restore the conservation interest of the fen. We are most grateful to be allowed to survey the flora. Louise Knight was most helpful in assisting us with the survey. Much help and encouragement was given by Donna Radley, now at Natural England's Peterborough office, and by Peter Stroh of its Bedfordshire and Cambridgeshire Team. We are very grateful to Philip Oswald for his constructive editing of an earlier draft of this paper.

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| **Table 1** | **Botanical survey, Sawston Hall Meadows, Cambs, 13 August 2005** | | | | | |
|---|---|---|---|---|---|---|
| | | | **Flowering plants in vicinity of quadrats** | | | |
| | **2 × 2 m quadrat** | | ***Selinum carvifolia*** | ***Silaum silaus*** | ***Serratula tinctoria*** | **Vegetation community (NVC)** |
| Central | 1 | TL49024904 | 10 | – | – | *Arrhenatherum* (**MG1**) |
| | 2 | 49044904 | 22 | – | – | *Arrhenatherum, Deschampsia cespitosa* (**MG1**) |
| | 3 | 49064906 | 8 | 40 | – | *Arrhenatherum, Festuca rubra* (**MG1**) |
| | 4 | 49094904 | – | 20 | – | *Brachypodium pinnatum* (**CG4**) |
| Southern | 5 | 49114901 | 39 | 21 | 162 | *Molinia* (**M24**) |
| | 6 | 49094900 | 13 | 1 | 20 | *Molinia, Deschampsia* (**M24**) |
| | 7 | 49144901 | 41 | 1 | 36 | *Molinia* (**M24**) |
| | 8 | 49144900 | 14 | – | 52 | *Molinia* (**M24**) |
| South-west | 9 | 49044897 | 15 | – | – | *Molinia, Festuca arundinacea* (**M24**) |
| South-east | 10 | 49194901 | – | 29 | 10 | *Brachypodium* (**CG4**) |
| | 11 | 49184899 | 5 | – | – | *Brachypodium* (**CG4**) |
| | 12 | 49224905 | – | 22 | – | *Brachypodium* (**CG4**) |
| | | | | | | |
| | | | | | | |
| | | | **Total flowering plants** | | | **Source** |
| 2005 (13/8) | | | 167 | 134 | 280 | Mountford, Cadbury, Knight |
| 2004 (11/8) | | | 179 | 83 | 291 | Cadbury |
| | | | | | (402 plants on 28/6) | |
| 2003 (21 & 22/7) | | | 71 | n.c. | 205 | Cadbury |
| 2002 (29 & 30/8) | | | *c.* 100 | n.c. | < 300 | Cadbury |
| 1998 (23/9) | | | 895 | n.c. | n.c. | Radley & Wright |
| 1997 | | | 500 | n.c. | n.c. | Radley & Wright |
| 1989 (24/7) | | **M24** | Frequent | Frequent | Abundant | Smyth & Soden |
| | | **CG4** | Occasional | Rare | Occasional | |
| 1988 | | **M24** | Up to 1000 | n.c. | n.c. | O'Leary |

**Table 2**
**Apparent extinctions, Sawston Hall Fen,** with last recorded dates

| | | |
|---|---|---|
| **Wetland species (16):** | | |
| Water-cress | *Rorippa nasturtium-aquaticum* | (1989) |
| Bog Pimpernel | *Anagallis tenella* | (1977) |
| Brookweed | *Samolus valerandi* | (1983) |
| Grass-of-Parnassus | *Parnassia palustris* | (1975) |
| Greater Bird's-foot-trefoil | *Lotus pedunculatus* | (1989) |
| Marsh Pennywort | *Hydrocotyle vulgaris* | (2002) |
| Lesser Water-parsnip | *Berula erecta* | (1989) |
| Tubular Water-dropwort | *Oenanthe fistulosa* | (1989) |
| Brooklime | *Veronica beccabunga* | (1989) |
| Meadow Thistle | *Cirsium dissectum* | (1989) |
| Lesser Water-plantain | *Baldellia ranunculoides* | (1983) |
| Marsh Arrowgrass | *Triglochin palustris* | (1977) |
| Jointed Rush | *Juncus articulatus* | (1989) |
| Velvet Bent | *Agrostis canina* | (1989) |
| Early Marsh-orchid | *Dactylorhiza incarnata* | (1972) |
| Southern Marsh-orchid | *D. praetermissa* | (1989) |
| | | |
| **Dry grassland species (16):** | | |
| Meadow Buttercup | *Ranunculus acris* | (1989) |
| White Campion | *Silene latifolia* | (1989) |
| Cowslip | *Primula veris* | (1989) |
| Agrimony | *Agrimonia eupatoria* | (1989) |
| Bird's-foot-trefoil | *Lotus corniculatus* | (1989) |
| Red Clover | *Trifolium pratense* | (1989) (possibly confused with *T. medium*) |
| Fairy Flax | *Linum catharticum* | (1989) |
| Common Milkwort | *Polygala vulgaris* | (1982) |
| Cut-leaved Crane's-bill | *Geranium dissectum* | (1989) |
| Ribwort Plantain | *Plantago lanceolata* | (1989) |
| Oxeye Daisy | *Leucanthemum vulgare* | (1989) |
| Common Ragwort | *Senecio jacobaea* | (1989) |
| Meadow Oat-grass | *Helictotrichon pratense* | (1989) |
| Yellow Oat-grass | *Trisetum flavescens* | (1989) |
| Common Twayblade | *Listera ovata* | (1989) |
| Common Spotted-orchid | *Dactylorhiza fuchsii* | (1982) |
| | | |
| **Other species not recorded since 1989 (7):** | | |
| Common Mouse-ear | *Cerastium fontanum* | |
| Goat Willow | *Salix caprea* | |
| Herb-Robert | *Geranium robertianum* | |
| Cow Parsley | *Anthriscus sylvestris* | |
| Prickly Sow-thistle | *Sonchus asper* | |
| Mugwort | *Artemisia vulgaris* | |
| Rough Meadow-grass | *Poa trivialis* | |
| | | |

| | |
|---|---|
| Records | for 1972, 1975, 1977 and 1983 (Meade, 1989) |
| | for 1982 (SSSI citation, 1982) |
| | for 1989 (Smyth & Soden, 1989) |
| | for 2002 (Cadbury, 2002) |

**Table 3**
**Additions, Sawston Hall Fen 2002–2005** (27 species)

| | | |
|---|---|---|
| Traveller's-joy | *Clematis vitalba* | (2003) |
| Hazel | *Corylus avellana* | woodland |
| Water Chickweed | *Myosoton aquaticum* | (2002) wetland |
| Curled Dock | *Rumex crispus* | |
| Purple Willow | *Salix purpurea* | wetland |
| Sweet-briar | *Rosa rubiginosa* | |
| Enchanter's-nightshade | *Circaea lutetiana* | woodland |
| Red-osier Dogwood | *Cornus sericea* | (probably planted) |
| Buckthorn | *Rhamnus cathartica* | (2002) |
| Rough Chervil | *Chaerophyllum temulum* | |
| Bugle | *Ajuga reptans* | woodland |
| Germander Speedwell | *Veronica chamaedrys* | (2002) |
| Snowberry | *Symphoricarpos albus* | (naturalised) |
| Field Scabious | *Knautia arvensis* | (2002) |
| Bristly Oxtongue | *Picris echioides* | |
| Corn Sow-thistle | *Sonchus arvensis* | |
| Wood Sedge | *Carex sylvatica* | (2002) woodland |
| Yellow-sedge | *C. viridula* subsp. *brachyrrhyncha* | (2004) wetland |
| Slender Tufted-sedge | *C. acuta* | (2002) wetland |
| Tufted-sedge | *C. elata* | (2005) wetland |
| Flea Sedge | *C. pulicaris* | (2003) wetland |
| Meadow Fescue | *Festuca pratensis* | |
| Spreading Meadow-grass | *Poa humilis* | (2002) wetland |
| Common Bent | *Agrostis capillaries* | dry grassland |
| Creeping Bent | *A. stolonifera* | wetland |
| Wood False-brome | *Brachypodium sylvaticum* | woodland |
| Common Couch | *Elytrigia repens* | |
| | | |
| Tawny Sedge | *Carex hostiana* (misidentified as Distant Sedge *C. distans* in 1989, 2002 and 2003 surveys) | |

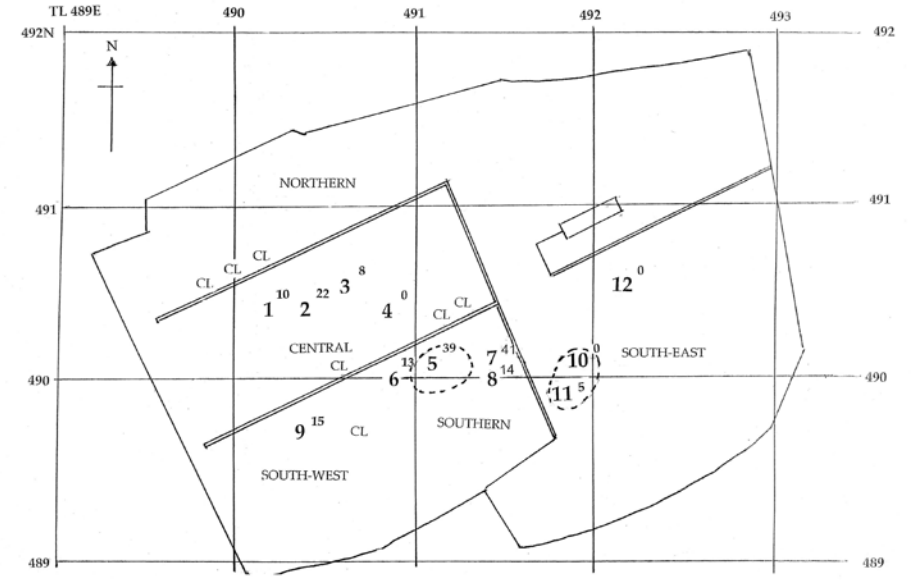


Fig. 1. Sawston Hall Meadows, showing positions of quadrats.

# Saving Water Germander (*Teucrium scordium*) in Cambridgeshire

Roger Beecroft, C. James Cadbury and J. Owen Mountford

## A special plant in Cambridgeshire

Water Germander (*Teucrium scordium*) is one of the county's special plants. It is classified as Endangered in the recently revised *Vascular Plant Red Data List* (Cheffings & Farrell, 2005). Currently it is restricted as an indigenous species to just three sites in Britain (Preston *et al.*, 2002) – two in dune-slacks in North Devon and the third in a flooded disused limestone pit near Wicken, Cambridgeshire. This is the last surviving population in the East Anglian Fens, where it has been known from a number of sites since before 1860. It vanished from Lakenheath, Suffolk, in 1976 (Simpson, 1982). A site was discovered at Bassenhally Pit near Whittlesey, Cambridgeshire, in 1967 but it apparently disappeared in the mid to late 1970s; it was last recorded there in 1975. Water Germander is still locally abundant on the calcareous shores of Loughs Derg and Ree (Co. Clare and Co. Galway) in western Ireland. In 2005 it inexplicably turned up at an artificial site on Anglesey (I. Bonner, pers. comm.).

## Precarious survival

The existing Cambridgeshire population of Water Germander is on private land at Kingfisher's Bridge, where it has long been known. Though the site, North Pit (or Upware Pit), is an SSSI, the plant is not doing well there. When monitoring began in 1997 there were 330 shoots. Cutting of the swamp vegetation resulted in an increase to 1200 shoots, but subsequently, with increased shading from scrub, the number of shoots fell to just 214 in 2004 (Beecroft, 1999).

## Readily propagated

Cuttings from growing shoots were taken by Roger Beecroft in 1997. These rooted easily and produced stock for further cuttings. Propagated plants, having been potted for a year, were planted out at 10 sites within the Kingfisher's Bridge Wetland Creation Project area. This project is the inspiration of Andrew Green, who seeks to restore a variety of semi-natural fenland habitats on land intensively farmed up to 1995. It lies close to the River Cam and is only 2.5 km from Wicken Fen (Tomkins, 1998). The created sites where the introductions took place were a shallow lake with seven islands, a reed-swamp and fen, seasonally flooded grassland and two water-filled ditches. The water is calcareous as a result of the underlying Corallian limestone and in summer the level, especially in the lake and reed-swamp, is subject to considerable draw-down, exposing a sparsely vegetated shoreline.

## Back from the brink

The initial introduction was in August 1998. Further introductions were made in 1999, 2000 and 2003, making a total of 1845 plants. Owing to the stoloniferous growth of this species, which makes it difficult to identify

individual plants, progress was checked by counting shoots in August and September. From 310 shoots on the plants introduced in 1998, the count rose to 5950 in 2001 and 20,578 in 2002; by 2004 it had soared to an estimated 181,000 (Beecroft *et al.*, 2007). The most explosive increases were on the seasonally flooded grassland and around the lake. In the reed-swamp/fen there was an increase up to 2000 but a subsequent marked decrease associated with development of tall dense Common Reed (*Phragmites australis*) (Beecroft, 1999).

After the disappearance of the indigenous Bassenhally population by 1970, there was an unsuccessful attempt in 1973 to re-establish Water Germander at the site, using Bassenhally stock, by S.M. Walters, R.M. Payne and J.O. Mountford. The failure was apparently due to shading by Hawthorn (*Crataegus monogyna*) scrub. A second introduction to a nearby herb-rich fen was made in 1999, using Kingfisher's Bridge stock. Here, from an initial 41 shoots, the count increased to 1683 in 2004 (Beecroft *et al.*, 2007).

**Ecology**

The main reproduction at Kingfisher's Bridge appears to be vegetative from horizontal, thickened stolons that are produced in late summer and autumn. In winter stolon segments get detached by grazing wildfowl, particularly Greylag Geese (*Anser anser*) and Canada Geese (*Branta canadensis*). Sheep may damage Water Germander by trampling but appear not to eat it, possibly because of its garlic-like odour. Stolon fragments are readily dispersed by water; hence the spread from one introduced site on the lake shore right round the margin and to all the islands. Though seed is set in abundance, there was little evidence of reproduction by this means.

The NVC community of the indigenous population at Kingfisher's Bridge is the Marsh Bedstraw (*Galium palustre*) sub-community of *Phragmites* swamp, **S4b** (Rodwell, 1995). Where Water Germander has thrived as an introduction in winter-flooded sites the NVC communities show relationships to various forms of regularly inundated grasslands, **MG11**, **MG13** and **OV28** (Rodwell, 1992 and 2000). It competes poorly with dense Water Mint (*Mentha aquatica*) and with tall dense Common Reed. Densities attained an average of over 560 shoots/$m^2$ in flooded grassland, but only 190/$m^2$ in dense reedbed. In the reedbed etiolated plants of Water Germander reached the height of 180 cm but had few flowers, unlike those in open habitats where flowering was prolific.

At Bassenhally Pit the vegetation community into which Water Germander was reintroduced in 1999 was one in which Creeping Bent (*Agrostis stolonifera*), Brown Sedge (*Carex disticha*), Slender Spike-rush (*Eleocharis uniglumis*) and Marsh Bedstraw were dominant. By 2004 Water Germander had spread into taller vegetation in which Slender Tufted-sedge (*Carex acuta*) was predominant. The presence of Saltmarsh Rush (*Juncus gerardii*) and Grey Club-rush (*Schoenoplectus tabernaemontani*) as well as Slender Spike-rush suggest a brackish influence.

## What has been learnt

a) The introduction of Water Germander in Cambridgeshire has tested and assessed certain aspects of the ecology of the species (Hill *et al.*, 1999).

b) It flourishes in calcareous substrates, both clay and peat.

c) It requires damp conditions and tolerates long periods of submergence, particularly in winter.

d) The main form of reproduction is vegetative by stolons. These are readily dispersed by water when detached, but low banks that inhibit water flow can act as barriers.

e) Flowering is suppressed by shading and, though shoots become etiolated, as a perennial it is eventually out-competed by Common Reed and other tall vegetation.

f) Optimal conditions for colonisation are sparsely vegetated areas exposed on the margins of water-bodies by summer draw-down.

## The future

What is the future for Water Germander in Britain? The Kingfisher's Bridge population is flourishing and spreading explosively in relatively recently created habitats suitable for 'pioneer' species that can exploit situations in early succession vegetation phases. Unless such habitat can be maintained, particularly the sparsely vegetated margins of water-bodies created by draw-down, Water Germander is likely to be out-competed and shaded out by taller vegetation. Suitable habitat may have to be created by scraping the margins of ponds and ditches. The dwindling indigenous population on Braunton Burrows, Devon, has shown encouraging signs of recovery after the scraping of dune-slacks to reduce competition and bring the surface near the water-table (James Diamond, pers. comm.). It is perhaps understandable why the species has been reduced to three indigenous sites, but it must be a candidate for further authorised and well-planned introductions at such sites as outworked calcareous quarries that have flooded.

## Acknowledgments

Andrew Green, the inspiration behind the Kingfisher's Bridge Wetland Creation Project, deserves particular acknowledgment. The project has received strong support from his family and the Kingfisher's Bridge Wetland Creation Trust. We are most grateful to Phil Grey of Whittlesey Wildfowlers (affiliated to BASC) for arranging access to Bassenhally Pit.

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## Garden alien plants

Graham Easy

These days botanists with interests in seeking out alien plants have mainly targeted urban walls, pavements and gutters for garden escapes growing at no great distance from their planted parents, or scrutinised areas where fruit-eating birds roost where seeds in their faeces have germinated to produce plants at a greater distance from their origins. There is, however, an overlooked major source for alien plants within the confines of almost every household in the county. A wide range of non-British species grows where birds are being fed in gardens, especially near bird tables. These are the results of impurities, crop weeds, in the mixed wild bird seed we buy. Since these aliens have not been deliberately introduced or planted they surely have some value as County Records: possibly there should be a separate category for such specimens.

Here is a list of plant species I have found growing in the vicinity of my garden bird table over the years: Mitre Cress (*Myagrum perfoliatum*) – the inspiration for this short note – is only rarely recorded in Britain; Sharp-flowered Signal-grass (*Urochloa panicoides*) (from Africa); Safflower (*Carthamus tinctorius*) (Asia); Cowherb (*Vaccaria pyramidata*) (Europe); Nodding Bristle-grass (*Setaria faberi*) (Asia); Gold of Pleasure (*Camelina sativa*) (Europe); Hoary Mustard (*Hirschfeldia incana*) (Europe); Cornflower (*Centaurea cyanus*) (Europe); Hairy Finger-grass (*Digitaria sanguinalis*) (Europe); Bastard Cabbage (*Rapistrum rugosum*) (Europe); Rye Brome (*Bromus secalinus*) (Europe); Californian Brome (*Bromus carinatus*) (America); Eastern Rocket (*Sisymbrium orientale*) (Europe); Narrow-leaved Pepperwort (*Lepidium ruderale*) (Europe); Bullwort (*Ammi majus*) (Europe); Ragweed (*Ambrosia artemisifolia*) (a major hayfever hazard in America); Thornapple (*Datura stramonium*); Hemp (*Cannabis sativa*) (Asia); Crimson Clover (*Trifolium incarnatum*) (Europe); Buckwheat (*Fagopyrum esculentum*) (Asia); and a wide range of common weed species. The list is roughly in order of frequency, rare to common.

There is, of course, a wide range of species actually cropped to make up the wild bird food mixture including all the cereal crops, various brassicas, Setaria species, Echinochloa species, Phalaris species, Panicum species, *Helianthus annuus*, *Guizotia*

*abyssinica* (Niger), *Linum usitatissimum* (Flax) and possibly also *Cannabis sativa*. Obviously these make up the bulk of the unwanted plants thus introduced into our gardens. We all normally eradicate these enthusiastically but it might be worthwhile looking carefully for these rare aliens, potential Cambridgeshire records.

## Contributions towards a new algal flora of Cambridgeshire (Vice-county 29). II. Phyla Prasinophyta and Chlorophyta, class Volvocales

Hilary Belcher, Eric George and Erica Swale

The origins of, and reasons for producing, a local flora of the important but much neglected freshwater algae (a heterogeneous group) are dealt with in Part I (Belcher et al 2006). This part deals with two other groups of motile green algae, the Phylum Prasinophyta and the superficially similar but only distantly related Class Volvocales of the Phylum Chlorophyta. Several of the following species appear to be new to Cambridgeshire, some to Britain; hardly surprising given that the freshwater algae as a whole are much neglected compared with other plant groups. This despite the publication of a comprehensive new British Algal Flora (John *et al.*, 2002). The species are illustrated as far as possible with our own drawings, nearly all from Cambridgeshire collections.

In the following list E.G.P. stands for E.G. Pringsheim, E.A.G. for Eric George, and B. & S. for Hilary (J.H.) Belcher and Erica Swale.

**Phylum Prasinophyta**

Plants of this phylum, though hitherto regarded as belonging to the class Volvocales of the phylum Chlorophyta, have been found to differ from them in several aspects of their fine structure. (See John *et al.*, 2002, p. 281).

*Mesostigma viride* Lauterbom 1894. E.G.P., 1943; E.A.G., 1949, 1971; B & S, 6 records. Ponds, ditches, rivers Cam and Great Ouse. Figure 1A (Belcher & Swale, 2000; John *et al.*, 2002, p. 184).

*Monomastix minuta* Skuja 1956. B. & S., in small container of rainwater, Girton, 2004. Figure 1B (Ettl, 1983, p. 106).

*Nephroselmis olivacea* F. Stein 1878. B. & S., 8 records, from rivers and ponds. Figure 1C, D (John *et al.*, 2002, p. 282). This species appears to be a complex, with a wide range of cell sizes of different clones, some flat like butter beans, others plump like haricots, all clones maintaining their shapes and individual size ranges in culture (J.H. Belcher, unpublished). There is also a strong possibility that Stein's original olive green flagellate belonged to another algal group, since cells of the species as now recognised always have chloroplasts of a bright grass green. (John *et al.*, 2002, p. 282).

*Pedinomonas minor* Korshikov 1923. B. & S., 5 records, from ponds at Girton and Dry Drayton. Figure 1E (John *et al.*, 2002, p. 281).

*Scourfieldia complanata* G.S. West 1912. B. & S., 9 records from ponds at Girton and Dry Drayton. Figure 1F (Belcher & Swale, 1996, John *et al.*, 2002, p. 281).

*Tetraselmis cordiformis* (H.J. Carter) F. Stein 1878. B. & S., 16 records, from rivers, pools and puddles. Figure 1G. (Belcher & Swale, 2000; John *et al.*, 2002, p. 284).

*Tetraselmis fontiana* (Margalef) Norris *et al.*, 1980. B. & S., 1 record, from a puddle at Coton, 1902. Figure 1H (Ettl, 1983, p. 147). A new British record.

**Phylum Chlorophyta, class Volvocales**

*Aulacomonas submarina* Skuja 1948. A colourless genus. B. & S., 12 records, from cattle troughs, ponds and rivers. Figure 2A (Belcher & Swale, 2000; Ettl, 1983. p. 184). Very variable in shape, which constantly changes.
*Basichlamys sacculifera* (Scherffel) Skuja 1956. B. & S., pond of the Cavendish Laboratory, Cambridge, 1977. Figure 2B. (John *et al.*, p. 304).
*Brachiomonas submarina* Bohlin 1897. B. & S., River Cam, Cambridge, 1976; Roswell Pits, Ely, 1995. Figure 2C (John *et al.*, p. 304).
*Carteria fornicata* Nygaard 1949. B. & S., pool, Cambridge, 1996. Figure 2D (Ettl, 1983, p. 592. Possibly new to British Isles).
*Carteria globulosa* Pascher 1927. Pool, Histon, 1995. (Belcher & Swale, 1999, as *C. globosa*; Ettl, 1983, p. 578. Possibly new to British Isles). Figure in Belcher & Swale, 1999. (Ettl, 1983, p. 578).
*Carteria incisa* E.G. Pringsheim. Cherry Hinton, 1941. (No references found to this species).
*Carteria klebsii* (P.A. Dangeard) Francé 1893 em. Troitzskaja 1921 B. & S., garden pond, Girton, 2001. Figure 2E. Cells of this population had stigmata in the usual forward place, but elliptical rather than elongated (Ettl, 1983, p. 583).
*Carteria pascheri* Skuja 1927. B. & S., pond, Girton, 1999. Possibly new to the British Isles. Figure 2F (Ettl, 1983, p. 579).
*Carteria radiosa* Korshikov 1927. B. & S., 5 records, from the Great Ouse river, a pond at Girton and a puddle at Histon. Figure 2G (Ettl, 1983, p. 593, John *et al.*, 2002, p. 306).
*Chlamydomonas angulosa* Dill 1895. B. & S., water barrel at Girton, 1991. Figure 2l (John *et al.*, 2002, p. 311).
*Chlamydomonas angustissima* Ettl 1958. B. & S., pond, Cambridge, 1995. Figure 2H (Ettl, 1983, p. 488, as *Chloromonas angustissima*).
*Chlamydomonas asymmetrica* Korshikov 1927. B. & S., puddle, Histon 2003. Figure 2J (Ettl, 1983, p. 366).
*Chlamydomonas bipapillata* Ettl 1976. B. & S., puddle, Histon, 2002. Figure 2K (Belcher & Swale, 2004; Ettl, 1983, p. 302. Possibly a new record for the British Isles).
*Chlamydomonas bourrellyi* Ettl 1965. B. & S., puddle, Histon, 2004. Figure 2L (Ettl, 1983, p. 265, John *et al.*, 2002, p. 311).
*Chlamydomonas capitata* Scherffel et Pascher 1927. B. & S., pond, Fowlmere, 1995. Figure 3A (Ettl, 1983, p. 240. Possibly a new record for the British Isles).
*Chlamydomonas insignis* Anachin 1931. B. & S., ponds, Girton, Barton and Impington. Figure 3C, surface view. Ettl, 1983 as *Chloromonas insignis* Gerlotf et Ettl 1970.
*Chlamydomonas leiostraca* (Strehlow) Ettl 1958. B. & S., puddle Histon, 2003. Figure 3D . (Ettl, 1983, p. 361. Possibly a new record for the British Isles).
*Chlamydomonas maculata* Playfair 1918. E.G.P., Great Shelford 1947. (Ettl, 1983, p.495, as *Chloromonas eumaculata* Silva).
*Chlamydomonas macrostellata* Lund, 1947. B. & S., dish of rainwater, Girton, 2004, and River Great Ouse, March 2003. Figure 3E (Ettl, 1983, p. 390, John *et al.*, 2002, p. 309).
*Chlamydomonas minutissima* Korshikov 1927. B. & S., puddle, Histon, 2004. Figure 3F (John *et al.*, 2002, Ett1 1983, p.353).
*Chlamydomonas monadina* F. Stein 1878. B. & S., 40 records from rivers, pools and puddles. Figure 3G This common species is easily recognisable by its pyrenoid, which may form a complete or partial ring or several small portions of varying size. A cell with a complete ring brought into culture gave rise to all these variants (Belcher, unpublished). (John *et al.*, 2002, p. 309, Ettl, 1983, p. 317).
*Chlamydomonas pertusa* Chodat 1896 and *C. pseudopertusa* Ett1 1965. B. & S., 5 records from rivers, ponds and puddles. Figure 3H. In Cambridgeshire the two species seem to grade into one another with respect to papilla size, the accepted distinguishing feature. (John *et al.*, 2002, p. 309, Ettl, 1983, p. 413, Belcher & Swale, 2004).
*Chlamydomonas proboscigera* Korshikov 1927. B. & S., puddle, Histon, 2002. Figure 3I (John *et al.*, 2002, p. 311, Ettl, 1983, p. 261, Belcher & Swale, 2004).
*Chlamydomonas reinhardtii* P. A. Dangeard 1888. B. & S., Trumpington, 1995, Girton 2004. Figure 3J (John *et al.*, 2002, p. 311, Ettl, 1983, p. 229).
*Chlorogonium elongatum* (P.A. Dangeard) P.A. Dangeard 1899. B. & S., four records from Rivers Great Ouse, Cam and Comberton Pond. Figure 4B (John *et al.*, 2002, p. 312).

*Chlorogonium gracile* Matvienko 1938. B. & S., puddle, Histon. Figure 3B (Ettl, 1983, p. 656). Possibly a new record for the British Isles.
*Chlorogonium tetragamum* Bohlin 1897. B. & S., River Cam 1997, River Great Ouse 1993, pond, Cambridge 1997. Figure 4A (John *et al.*, 2002, p. 314).
*Collodictyon triciliatum* H.J. Carter 1865. B. & S., ponds, Barton and Comberton, 2001. Figure 4C (Belcher & Swale, 2002).
*Diplostauron pentagonium* (Hazen) Pascher 1927. Pond, Fowlmere 1996, River Great Ouse, 2005. Figure 4D (Belcher & Swale, 2003, John *et al.*, 2002, p. 315)
*Eudorina elegans* Ehrenberg 1831. Common in rivers, ponds and puddles. E.A.G., Queens' Green backwater 1947, 1958; B. & S., 17 records. Figure 4E (John *et al.*, 2002, p. 317).
*Gonium pectorale* O.F. Müller 1773, G.S.W., ditches in Cambridge and Burwell, 3 records; E.G.P., ditches and backwaters of Cam, 1947, 1955; B. & S., 12 records. Figure 4F (John *et al.*, 2002, p. 318).
*Gonium sociale* (Dujardin) Warming 1876. Common in the same habitats as the above two species. E.G.P., Cherry Hinton 1941; E.A.G., backwater of R. Cam, 1957, 1963, Hayley Wood 1962; B. & S., 8 records. Figure 4G anterior view (John *et al.*, 2002, p. 318).
*Haematococcus droebakensis* Wollonweber 1908. B. & S., backwater of River Cam, Cambridge 1974. Figure 5A (John *et al.*, 2002, p. 318).
*Haematococcus pluvialis* Flotow em. Wille 1903. E.A.G., Cambridge, 1950. B. & S., 9 records from cattle troughs, puddles and containers of rainwater. Figure 5B (John *et al.*, 2002, p. 319).
*Hafniomonas reticulata* (Korshikov) Ettl et Moestrup 1980. B. & S., puddle, Coton 1979 and 2004. Figure 5C (John *et al.*, 2002, p. 319).
*Hyalobrachion omphalotus* Swindell 1938. A colourless species. B. & S., Girton, in containers of rainwater, 2001. Figure 5D (Belcher & Swale, 2002).
*Lobomonas gracilis* Christen 1958. B. & S., River Cam, Cambridge 1976. Figure 5E (Ettl, 1983, p. 359).
*Lobomonas rostrata* Hazen 1922. B. & S., 6 records, from puddles, pools and rivers. Figure 5F (John *et al.*, 2002, p. 320).
*Pandorina charkoviensis* Korshikov 1923. B. & S., puddle, Coton, May 2004. The elliptical coenobia approached those of *Eudorina elegans* in shape, but while the tier of four cells at one end (the anterior?) of the coenobia possessed large stigmata the next had several small ones, and in the remaining cells none was visible, thus resembling the condition in Korshikov's material. The digitate anterior edge of the chloroplasts illustrated by Korshikov was not seen. Possibly a new British record. Figure 5G (Ettl, 1983, p. 746).
*Pandorina morum* Bory 1824. G.S.W., 5 records from ditches and pools. E.A.G., ditch, Cambridge, 1947; Wicken Fen 1948; Madingley Brick Pits 1963; E.G.P. Balsham 1948; Trumpington 1940; B. & S., 44 records from puddles, pools, ditches and rivers near Cambridge, often abundant in flooded ruts. Figure 5H (John *et al.*, 2002, p. 320).
*Pascherina tetras* (Korshikov) P.C. Silva 1959. R. Starr, Jesus Ditch, Cambridge, 1951; B. & S., pools and River Cam backwater, Cambridge, 4 records. Figure 6A (John *et al.*, 2002, p. 320).
*Phacotus angustus* Pascher 1927. B. & S., puddle, Histon. The loricae were very rough externally, in the wider view elliptical to lemon-shaped, resembling the cells illustrated by Pascher 1927. Figure 6D (Ettl, 1983, p. 700). Possibly a new British record.
*Phacotus lendneri* Chodat 1902. B. & S., 4 records from ponds in Cambridge, 1995. Differs principally from *P. lenticularis* by its smoother lorica, with conspicuous regular oblique markings at the edges where the two loricae come together. Figures 6E (Ettl, 1983, p. 703).
*Phacotus lenticularis* (Ehrenberg) Stein 1878. E.A.G., Wicken Fen 1960; B. & S., 30 records from pools, puddles and rivers in and near Cambridge. Figure 6F (John *et al.*, 2002).
*Phyllocardium complanatum* Korshikov 1927. E.A.G., Great Shelford 1940, under ice. Confirmed by F.E. Fritsch. (John *et al.*, 2002 p. 322); Ettl, 1983, p. 172).
*Polytoma caudatum* Korshikov 1925. (*Polytomas* are colourless chemo-organotrophic species, often found in puddles enriched with animal faeces). B. & S., in plastic container of rainwater, Girton 2001. Figure 6C (Belcher & Swale, 2002, Ettl, 1983, p. 643).
*Polytoma uvella* Ehrenberg 1838. E.G.P., Cambridge 1941; B. & S., cart rut, Cambridge 1995, container with rainwater and dead leaves, 2002, also in several other sites near Cambridge. Figure 6B (Belcher & Swale, 2002, Ettl, 1983, p. 636).

*Polytomella magna* Pringsheim 1955. E.G.P., Grantchester Meadows, 1947 (type locality), in exudate of elm sap. (Ettl, 1983, p. 174; John *et al.*, 2002 p. 305.) (No. 63/3 in Culture Collection, now at Oban).
*Polytomella parva* Pringsheim 1955. E.G.P., garden pool, Shelford, 1948 (type locality). (Ettl, 1983, p. 174; John *et al.*, 2002, p. 305.) (No. 63/1 in Culture Collection).
*Pteromonas angulosa* (H.J. Carter) Lemmermann 1900. E.A.G. Madingley 1944, Twenty Pence Pits 1968; B. & S., 21 records from the Cam and Great Ouse rivers, and pools and a puddle near Cambridge. Figure 6G (John *et al.*, 2002 p. 323). In March 1995 a completely colourless but very lively flagellate resembling this species was seen in a sample from a woodland pool at Haslingfield.
*Pyrobotrys stellata* (Korshikov) Korshikov 1938. E.G.P., Barton 1943, field by Madingley 1951. (John *et al.*, 2002 p. 323).
*Spermatozopsis exsultans* Korshikov 1913. M. Droop 1952, backwater of River Cam, Cambridge; B. & S., 9 records from ponds near Cambridge. Figure 6E (Belcher & Swale 1996, John *et al.*, 2002, p. 323).
*Sphaerellopsis fluviatilis* (F. Stein) Pascher 1927. B. & S., pond, Histon 1999. Figure 6F. (Belcher & Swale 1996; John *et al.*, 2002 p. 324).
*Stephanosphaera pluvialis* Cohn 1852. B. & S., in a rain-filled collapsed plastic rooflight, where starlings bathed, 1981. Figure 7A (Belcher & Swale 1984; John *et al.*, 2002, p. 326).
*Thoracomonas irregularis* Korshikov 1925. B. & S., pond at Comberton 1995, Lake, Madingley 1995, puddle, Histon 2002, ditch, Cambridge 1976. Figure 7B. (Belcher & Swale, 2004; Ettl, 1983, p. 677).
*Volvox aureus* Ehrenberg 1832. The commonest species of the large coenobial alga *Volvox*. E.A.G., backwater of River Cam, Cambridge 1947, 1948 and 1949, Coe Fen 1960, pond at Madingley 1963; B.M. Godward, Wicken Fen 1924; B. & S., 8 records from River Cam backwater and ponds at Cambridge, Comberton, Madingley and Impington. Figure 7C (John *et al.*, 2002, p. 326).
*Volvox globator* Linnaeus 1758. E.A.G., backwater of River Cam 1947, 1957, Coe Fen 1949. (John *et al.*, 2002, p. 327).
*Volvox tertius* Meyer 1896. E.A.G., backwater of River Cam 1947, 1948. (John *et al.*, 2002 p. 327).

It must be stressed that apart from the few older records the species above were observed by two people working part-time in a small area around Cambridge. In addition, the majority of samples we collected contained volvocalean cells, particularly of *Chlamydomonas* species, that, even when examined in detail, could not be matched with anything in comprehensive modern European algal floras such as those of Ettl (1983) and Huber-Pestalozzi (1961). There is obviously enormous scope for more study in this unfashionable field.

In our experience most bodies of fresh water, large or small, permanent or temporary, are worthy of investigation, and their phytoplankton may change from one month to the next. Nine sites in succession could be sampled without much of note being seen, while the tenth might be full of interest. In particular we have found the backwater of the Cam at Queens' Green to be very productive at times, as were ponds at colleges such as Churchill and New Hall. Persistent puddles at Histon and Coton yielded several rare species, while long-lasting accumulations of rain on flat roofs or in gutters are always worth examining.

Polythene containers set out to catch rain and dead leaves, like a natural puddle, are often productive. We found several unusual species, among them the prasinophycean *Monomastix minuta* and the colourless volvocalean

*Hyalobrachion omphalotus*, together with some species of *Chlamydomonas*. Wind must have brought spores of these and other species observed in the containers, while we suspect starlings of introducing spores of *Stephanosphaera* to the roof pool where we found it.

Where necessary, samples were concentrated either by use of a miniature centrifuge (described in John *et al.*, 2002) for small samples or by sedimenting larger ones and siphoning off the supernatant liquid, or by combining both methods. Some observations were carried out on cells swimming or at rest at the edge of a "hanging drop".

Since many of these species are poorly known, and in some cases probably new to the British Isles, we have attempted to illustrate all of our records with our own drawings. This will also show our own conception of each species. In a few cases, where our illustrations from inside the county have been thought inadequate the records are illustrated by our figures of species from outside the county. Some, accompanied by descriptions, have previously appeared in issues of *Nature in Cambridgeshire*, and are cited after the record in the above text, while figures no. 2B, C, 4A, B, E, F, 5A, B, H, 6A, G, H, 7A, C have been used in Belcher & Swale 1976 or 1979. There were no drawings accompanying Eric George's card index.

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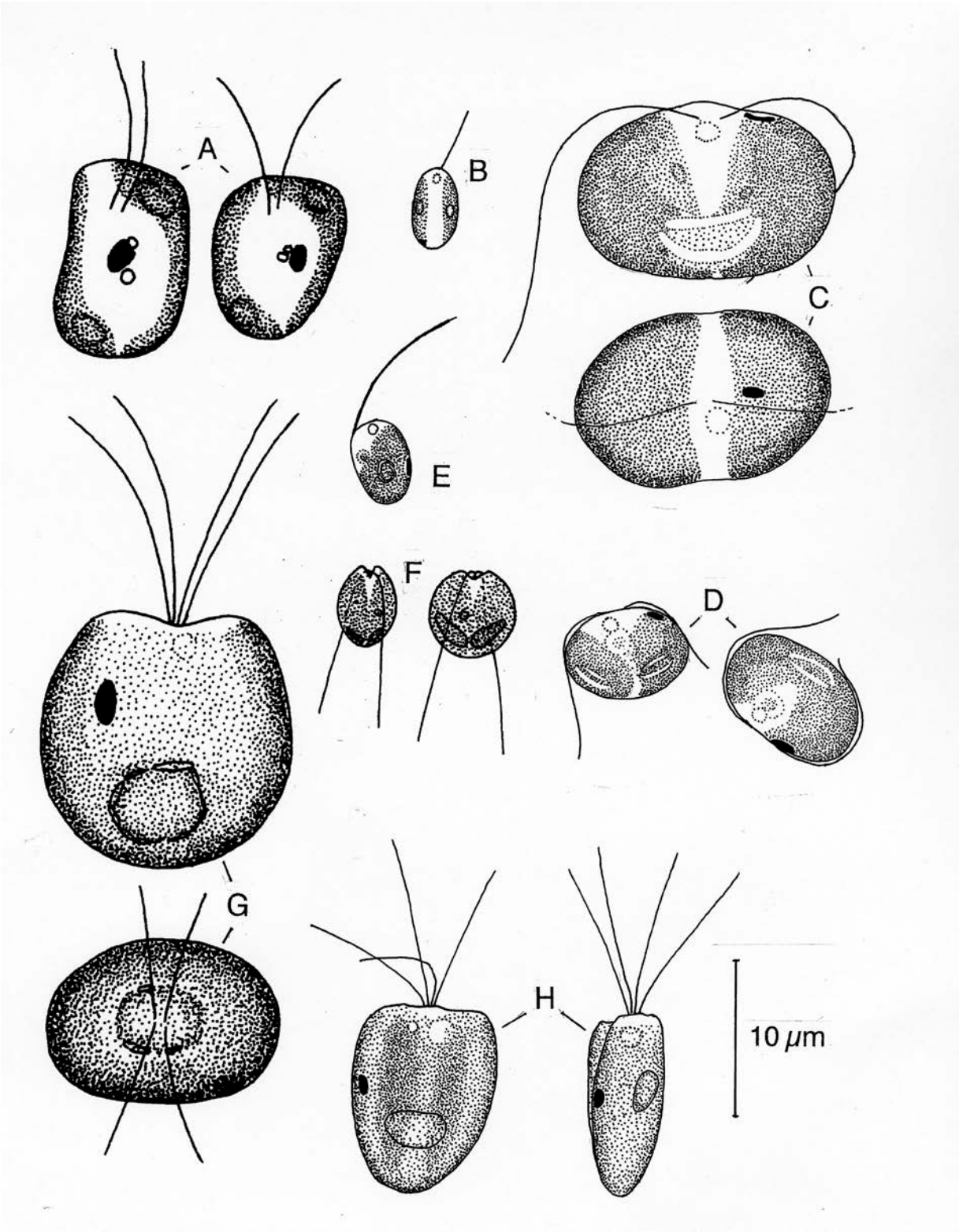


**Figure 1**
1A. *Mesostigma viride* Lauterborn 1894. Plankton, R. Great Ouse, Twentypence Marina, Nov. 1999. 1B, *Monomastix minuta* Skuja 1956. Girton, small container of rainwater, May 2004. 1C & D, *Nephroselmis olivacea* F. Stein 1878. 2 forms, Barton Pond, Aug. 2001. 1E, *Pedinomonas minor* Korshikov 1923. Kendal Canal, Cumbria 1960, owing to lack of good drawing from vc29. 1F, *Scourfieldia complanata* G.S. West 1912. Pond, Dry Drayton, Jan. 1996. 1G, *Tetraselmis cordiformis* (H.J. Carter) F. Stein 1878. Persistent puddle in roadworks, Girton, May, 1993. 1H, *Tetraselmis fontiana* (Margalef) Norris *et al.*, 1980. Puddle, Coton, June 2002.

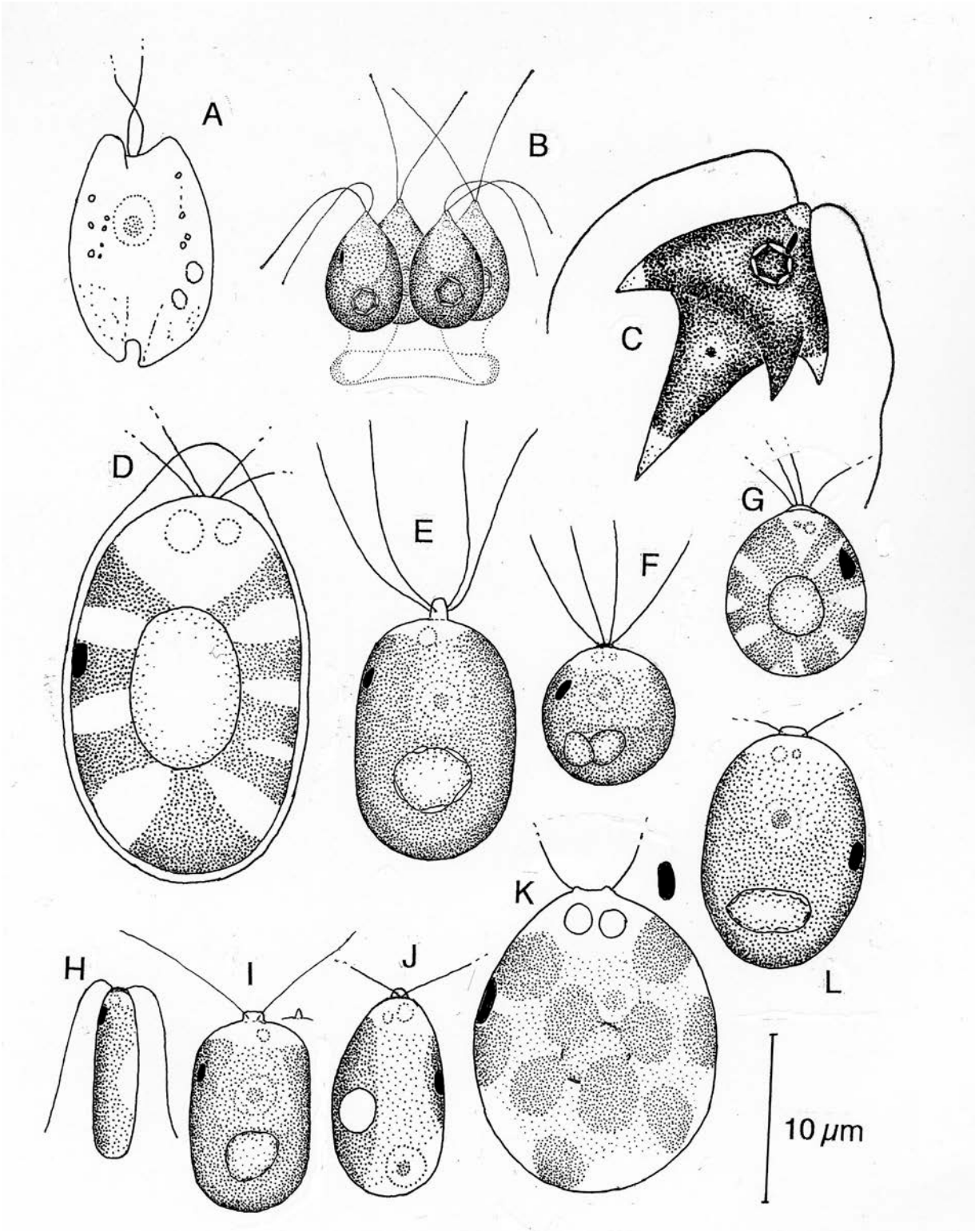


Figure 2. 2A, *Aulacomonas submarina* Skuja 1948. Pond, Shepreth, July 1999. 2B, *Basichlamys sacculifera* (Scherffel) Skuja 1956. Ditch, Cambridge, Jan. 1976. 2C, *Brachiomonas submarina* Bohlin 1897. R. Cam, Cambridge, June 1976. 2D, *Carteria fornicata* Nygaard 1949. Pool, Cambridge, July 1996. 2E, *Carteria klebsii* (P.A. Dangeard) Francé 1893. Rainwater in small container, Girton, May 2002. 2F, *Carteria pascheri* Skuja 1927. Girton, pond, March 1999. 2G, *Carteria radiosa* Korshikov 1927. Histon, puddle, May 2003. 2H, *Chlamydomonas angustissima* Ettl 1958. Pond, Cambridge, Sept. 1995. 2I, *Chlamydomonas angulosa* Dill, 1895, Girton, water barrel, Feb. 1991. 2J, *Chlamydomonas asymmetrica* Korshikov 1927. Puddle, June 2003. 2K, *Chlamydomonas bipapillata* Ettl, 1965. Puddle, Histon, June 2002. 2L, *Chlamydomonas bourrellyi* Ettl, 1965. Puddle, Histon, Feb. 2004.

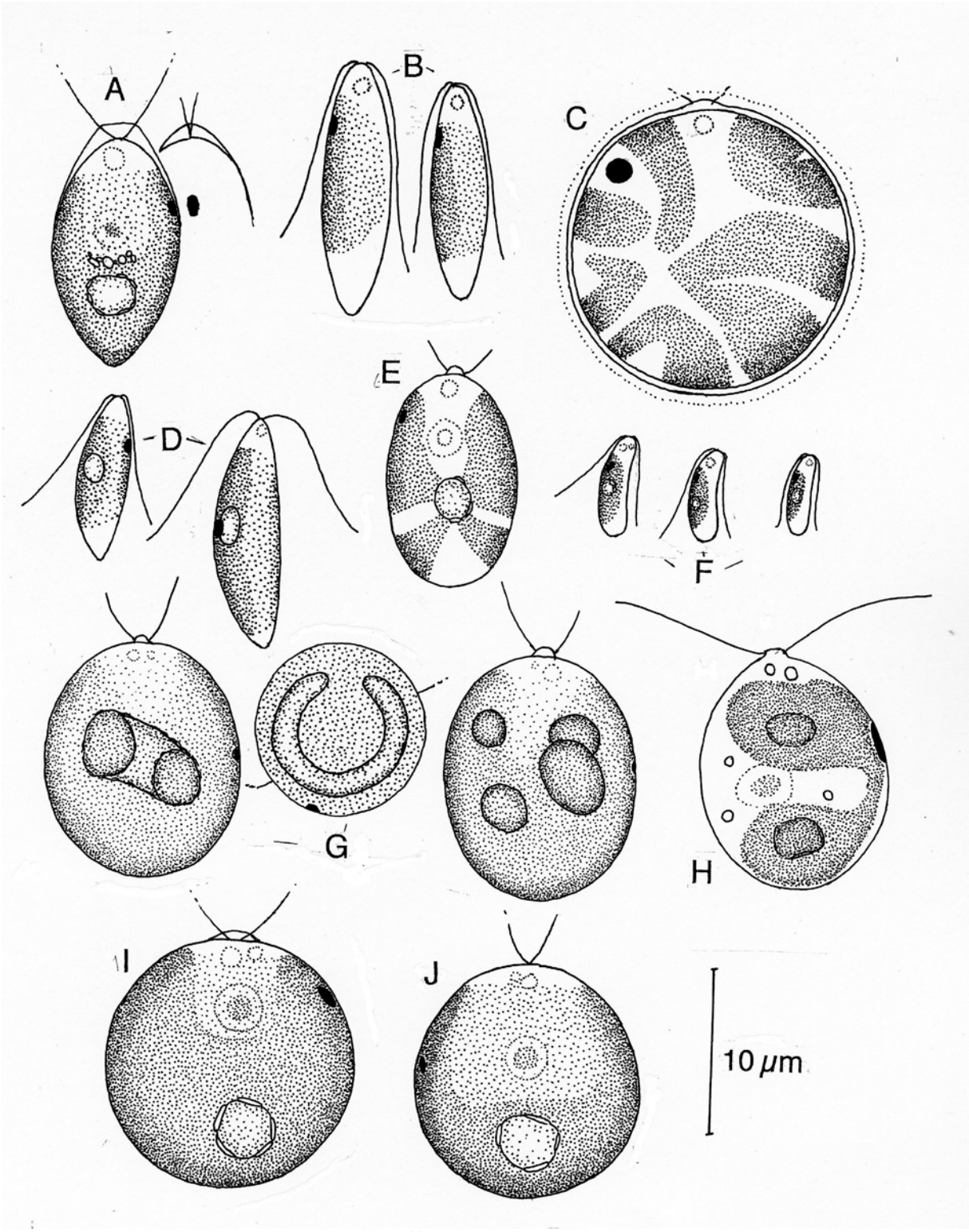


Figure 3. 3A, *Chlamydomonas capitata* Scherffel et Pascher 1927. Pond, Fowlmere, April 1995. With detail of stigma. 3B. *Chlorogonium gracile* Matvienko 1938. Histon, puddle, Nov. 2001. 3C. *Chlamydomonas insignis* Anachin 1931. Girton, pond, Jan. 2001. Surface view. 3D. *Chlamydomonas leiostraca* (Strehlow) Ettl 1958. Histon, puddle, June 2003. 3E. *Chlamydomonas macrostellata* Lund 1947. Girton, container of rainwater, Dec. 2004. 3F. *Chlamydomonas minutissima* Korshikov 1927. Puddle, Histon, Feb. 2004. 3G. *Chlamydomonas monadina* F. Stein 1878. 2 forms from Histon, puddle, Sept. 2001, and a cross-section showing pyrenoid as an incomplete ring, Barton Pond, Sept. 2001. 3H. *Chlamydomonas pertusa* Chodat 1896 or *C. pseudopertusa* Ettl 1965 (we find distinguishing between these two species difficult). Histon, puddle, June 2002. 3I. *Chlamydomonas proboscigera* Korshikov 1927. Histon, puddle, Dec. 2000. 3J. *Chlamydomonas reinhardtii* P.A. Dangeard 1888. Girton, puddle, May 2004.

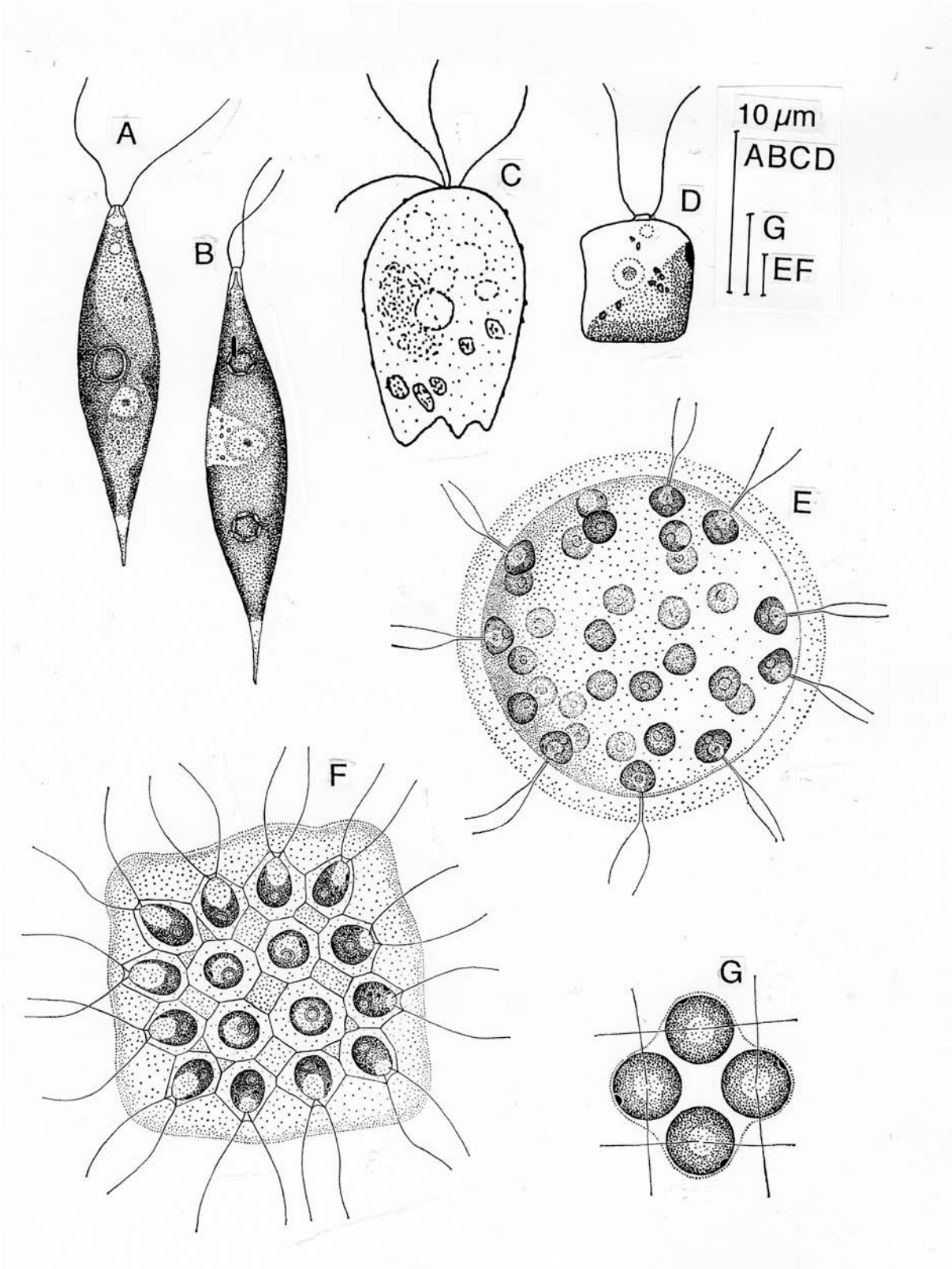


**Figure 4**
4A. *Chlorogonium tetragamum* Bohlin 1897. River Lee, Hertfordshire, 1959. 4B. *Chlorogonium elongatum* (P.A. Dangeard) P.A. Dangeard 1899. River Lee, Hertfordshire, 1959. 4C. *Collodictyon triciliatum* H.J. Carter 1865. Pond, Comberton, Sept. 2001. 4D. *Diplostauron pentagonium* (Hazen) Pascher 1927. Pond, Fowlmere, Mar. 1996. 4E. *Eudorina elegans* Ehrenberg 1831. Windermere, Cumbria, 1965. 4F. *Gonium pectorale* O.F. Müller 1773. R. Cam, Cambridge, 1965. 4G. *Gonium sociale* (Dujardin) Warming 1876. R. Cam backwater 1976.

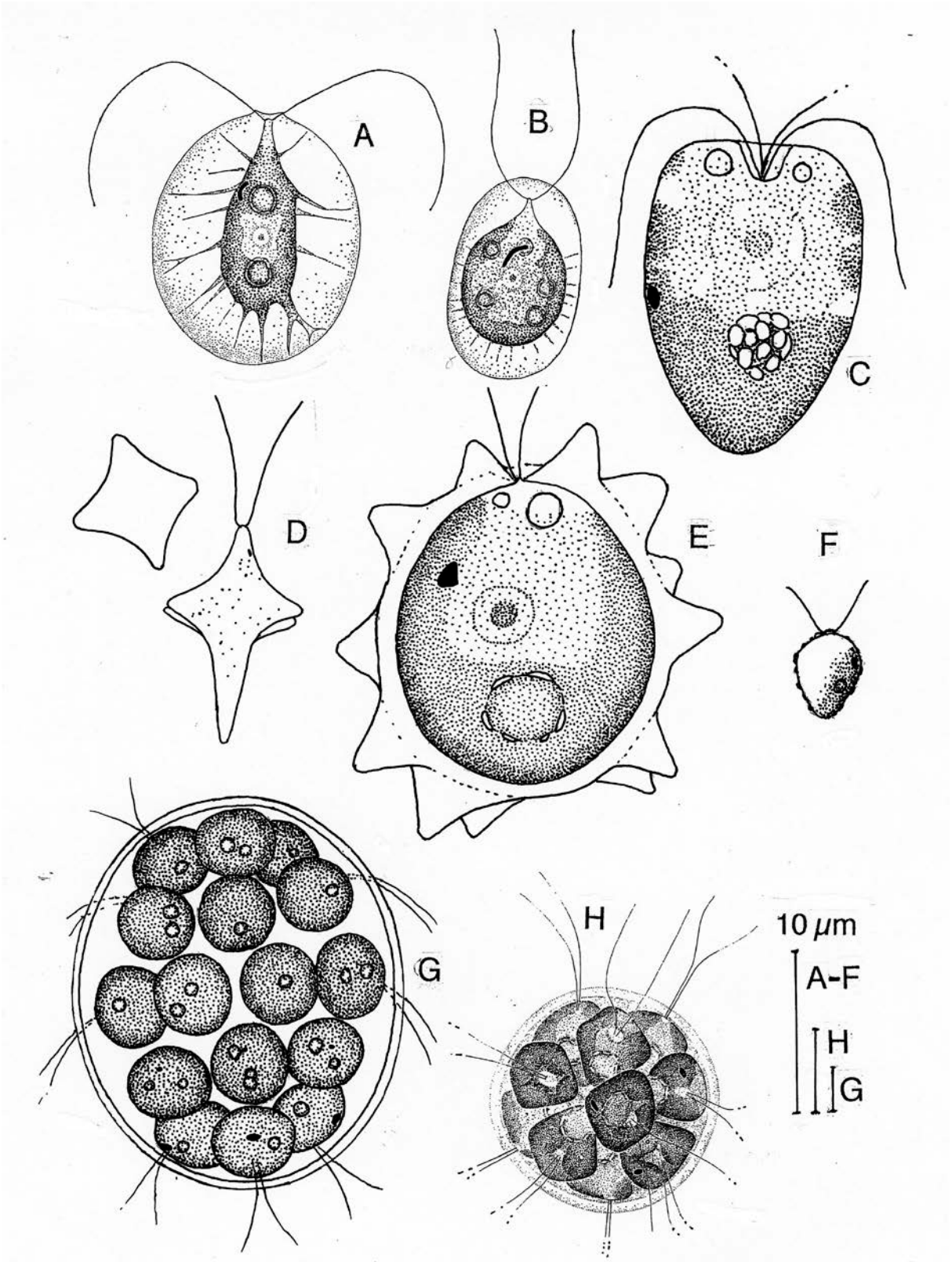


**Figure 5**
5A. *Haematococcus droebakensis* Wollenweber 1908. R. Cam backwater, Cambridge, Sept. 1976. 5B. *Haematococcus pluvialis* Flotow em. Wille. R. Cam backwater 1976. 5C. *Hafniomonas reticulata* (Korshikov) Ettl et Moestrup 1980. Puddle, Coton, July 2004. 5D. *Hyalobrachion omphalotus* Swindell 1938. Container of rainwater, October 2001. 5E. *Lobomonas gracilis* Christen 1958. R. Cam, Cambridge, Aug. 1976. 5F. *Lobomonas rostrata* Hazen 1922. Pond, Girton, Mar. 1999. 5G. *Pandorina charcoviensis* Korshikov 1923. Puddle, Coton, May 2004. 5H. *Pandorina morum* Bory 1824. R. Cam, Cambridge 1976.

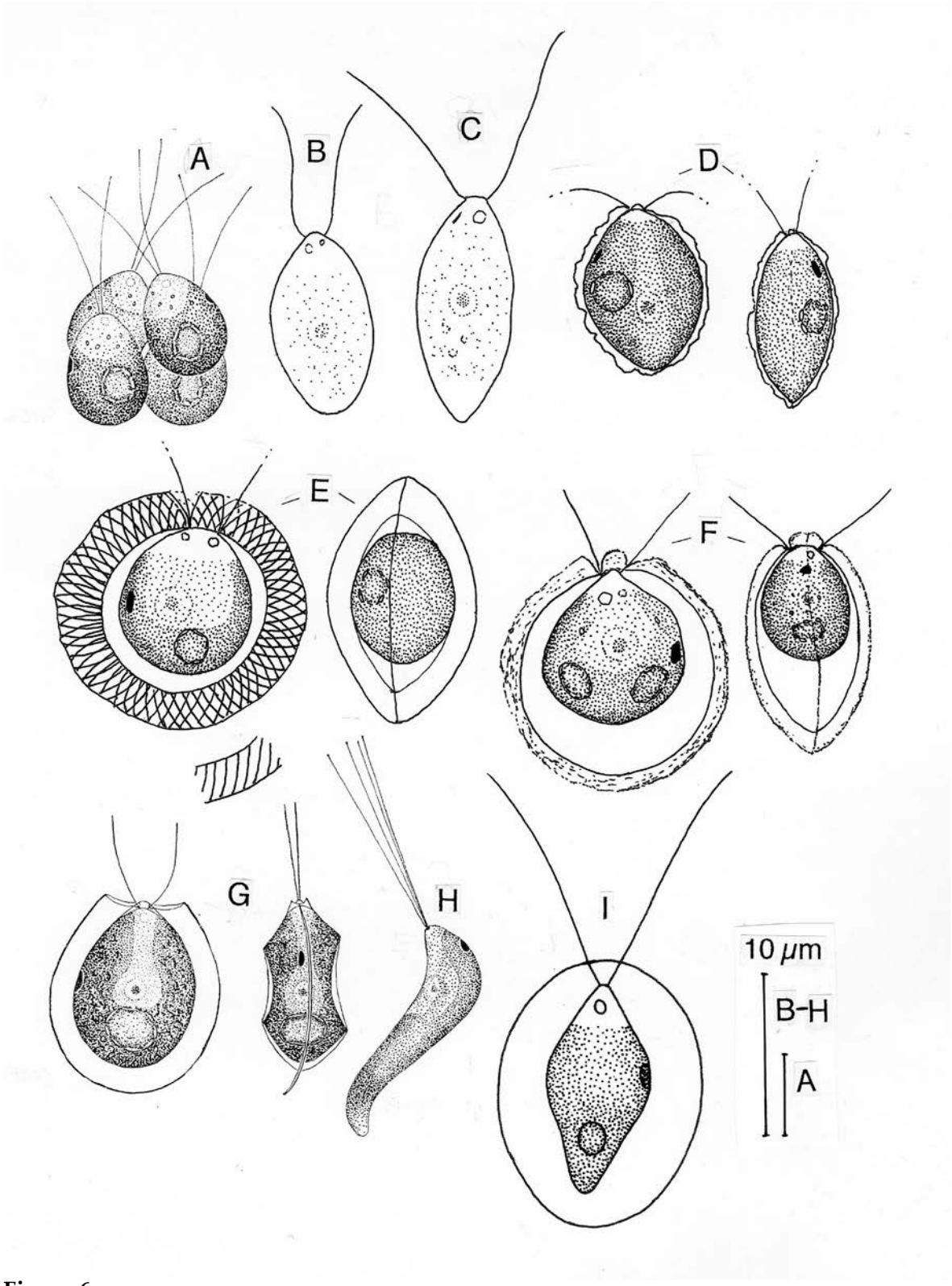


**Figure 6.**
6A. *Pascherina tetras* (Korshikov) Silva 1959. R. Great Ouse, Nov. 1975. 6B. *Polytoma uvella* Ehrenberg 1838. Container of rainwater, Girton, Nov. 2001. 6C. *Polytoma caudatum* Korshikov 1925. Container of rainwater, Girton, Nov. 2001. 6D. *Phacotus angustus* Pascher 1927. Puddle, Histon, Sept. 2000. 6E. *Phacotus lendneri* Chodat 2002. Pond, Cambridge, May 1995. 6F. *Phacotus lenticularis* (Ehrenberg) F. Stein 1878. Ditch, Coe Fen, Cambridge, July 1978. 6G. *Pteromonas angulosa* (H.J. Carter) Lemmermann 1900. Pond, Cambridge, Nov. 1957. 6H. *Spermatozopsis exsultans* Korshikov 1913. Probably R. Cam backwater 1976. 6I. *Sphaerellopsis fluviatilis* (F. Stein) Pascher 1927. Pond, Girton, April 1995.

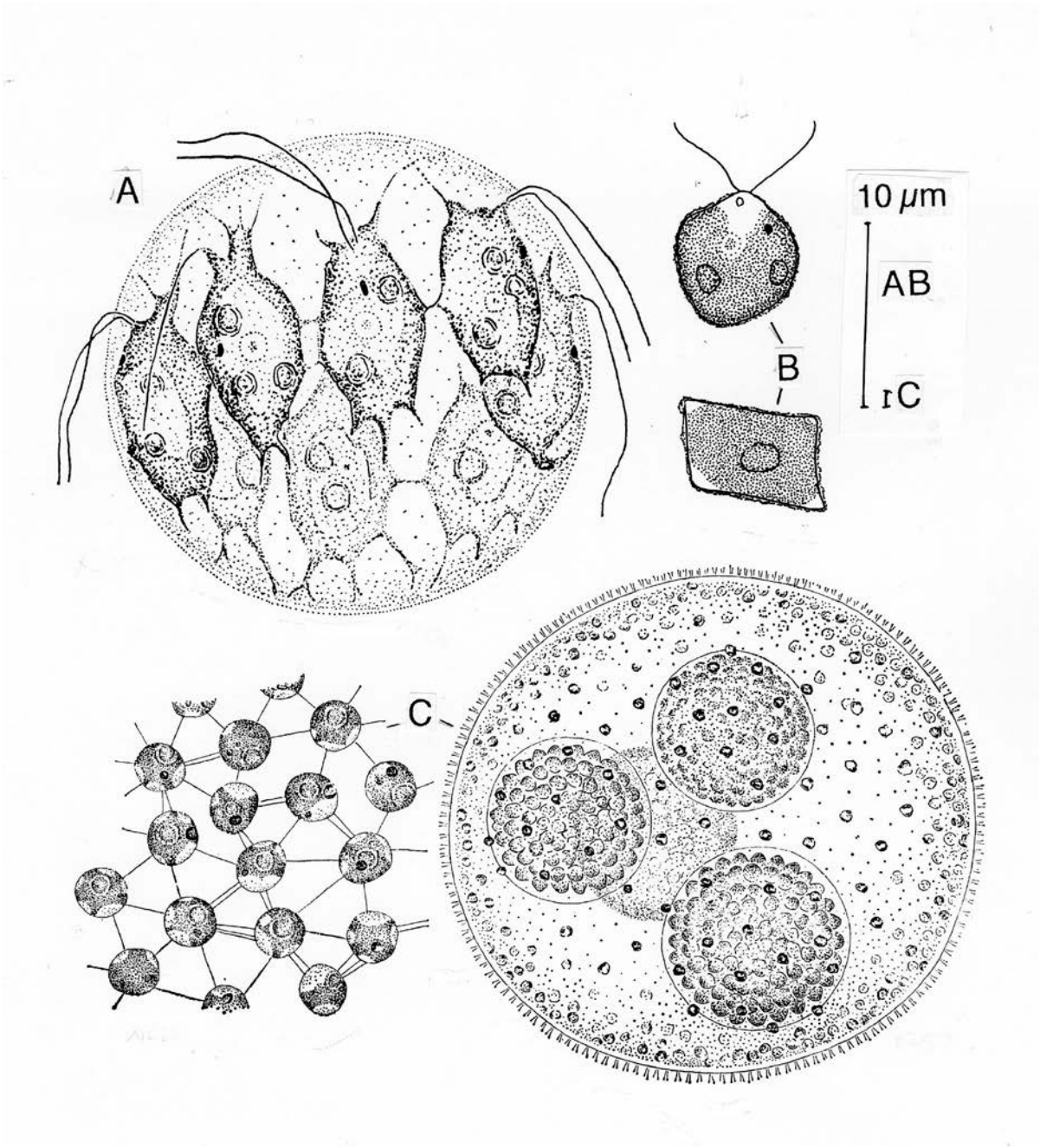


**Figure 7**
7A. *Stephanosphaera pluvialis* Cohn 1852. Rock hollow, Cartmel, Cumbria, April 1965. 7B. *Thorakomonas irregularis* Korshikov 1925. Puddle, Histon, May 2002. 7C. *Volvox aureus* Ehrenberg 1832, with detail of connexions between cells. Probably from R. Cam backwater, Cambridge 1976.

# The history of the purchase of Hayley Wood, Cambridgeshire, for a nature reserve

Donald Pigott

About two years ago I agreed with Max Walters that we should write down a brief history of the events of 1960 to 1962 which led to the acquisition of Hayley Wood for a nature reserve, but sadly we never did, so now it must be a solo.

I returned from Sheffield to Cambridge in September 1960 to a University Lectureship in the Botany School. I still had ongoing research in Derbyshire but I wanted to follow up work, and in particular that with Ken Taylor, on the rôle of phosphate and mineral nitrogen in the ecology of herbaceous plants in woodland. I discussed my ideas with Alex Watt in relation to the work he and his research student, B.A. Abeywickrama, had done in Buff and Hayley Woods and I decided to include the effects of poor aeration of the heavy boulder-clay soils. This was subsequently the project studied by Michael Martin, who joined me in 1961.

In the autumn of 1960 and the spring of 1961 I planned and set up experiments in Hayley Wood and went there regularly, often talking to Mr Alfred Cooper and his son Arthur at the railway cottage. I think that it was one of them who told me during the summer that the wood was to be sold and, after further enquiry, I learnt that it was to a timber merchant in Sandy who intended to clear residual timber (and possibly plant up the better drained areas).

I went to see Mr Henry Cox, the farmer at Gransden Lodge, and he confirmed that a sale was being considered. I expressed deep concern and he replied, “If you want to save it, then you buy it.” He had a low opinion of the wood, which he regarded as a source of pests, particularly Woodpigeons.

I discussed my concern with Max Walters and he proposed that I should raise the matter at the next meeting of the Naturalists’ Trust Council (of which I was, or then became, a member). This I did, and whether it was at the first meeting or at one in October I cannot recall, but my proposal was very fully discussed. Certainly by October I had a guide-price of £5,000, which now seems absurd but that is what is recorded in Oliver Rackham’s (1975) book. I have to say that the Council was lukewarm and not enthusiastic. It was argued that such a sum would be very difficult to raise and that to look after a large wood would be a constant drain on resources.

There was, however, a moment in the discussion that still echoes in my mind. I described the scientific value of the wood and the work of Watt and Abeywickrama, and then the great display of Oxlips and Bluebells in the spring and the green tunnels of the rides in summer. Suddenly a member of the Council, Mr Robert Payne, said, “You obviously love this wood and hold it in very high regard; I think we should back you.” Max Walters agreed and with that the opposition crumbled. The Council decided that we should negotiate an option to buy and launch an appeal.

By then Michael Martin was a research student, working in the wood, and he supported the project enthusiastically. I am grateful to him and to Oliver Rackham for filling in some gaps in my memory of the details. The appeal was launched in January 1962. We set up a Management Committee with Michael as Secretary. We advertised, and I led, a public excursion to the wood on 14 April 1962, to which about a hundred people came and many promised to contribute to the appeal. It was reported with a photograph in the local press.

The rest is well known. The appeal succeeded and Hayley Wood is now a flagship reserve. Had we failed, the wood might now be largely a sad plantation of Norway Spruce. This tree never grows well on heavy calcareous clay: much of Potton Wood, just across the county boundary in Bedfordshire, suffered the fate that Hayley Wood escaped and the last Norway Spruce there died from drought in 2005.

In 1964 I departed to Lancaster and Michael to Bristol. Oliver took over with energy and enthusiasm and I suspect it was his and my fascination with the history of the north-eastern corner of the wood, originally part of a field cut off by the railway and with its ridge-and-furrow so different from the rest, that set him on the road to becoming the leading authority on woodland history.

There is a lesson to be learnt from these events: it is to talk with local people, act quickly and not give up if initially there is doubt or opposition. Certainly our success at Hayley Wood encouraged me, after moving to Lancaster, to tackle and eventually succeed in a much more complicated, difficult and lengthy struggle to prevent the destruction of Gaitbarrows Wood in north Lancashire and to ensure its conservation. It too has become a flagship nature reserve.

**Reference**

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B.A. Abeywickrama later became Professor of Botany and Vice-Chancellor of the University of Colombo, Sri Lanka.

# *Sphaerium solidum* and *Corbicula fluminea:* two rare bivalve molluscs in the River Great Ouse System in Cambridgeshire

Martin J. Willing

**Abstract**

Following the discovery of the rare bivalve mollusc *Sphaerium solidum* living in the Great Ouse at Earith in 1999, further distributional surveys were undertaken between 2003 and 2005. These failed to find *S. solidum* upstream of Earith, but provided evidence for a patchy distribution along about 20 km of the Great Ouse/Old West River between Earith and Stretham. Large populations were also found in a central area of the New Bedford River between Gault Bridge and Pymore. Factors affecting the distribution of *S. solidum* are discussed and it is suggested that eutrophication is a major factor threatening its existence in the Great Ouse system. Whilst surveying for *S. solidum* on the New Bedford River in 2005 a population of the introduced invasive bivalve *Corbicula fluminea* was discovered, the first from Cambridgeshire. Study of the size and population structure suggests that this bivalve may have colonised this channel in 2002. The known distributions of *S. solidum* and *C. fluminea* in the lower Great Ouse system are described and the potential impact of *C. fluminea* is considered, particularly with respect to the populations of *S. solidum.*

## Introduction

*Sphaerium solidum* (Normand)

This bivalve mollusc, which is rare in Britain, was only discovered in the country in 1968. Although no postglacial fossils of *S. solidum* are known (Kerney, 1999) considers it to be native in Britain as it is unlikely to be a recent introduction. On the continent it is mainly present in central and south-eastern Europe with populations extending across the north German plain to the Low Countries. (Kerney, 1999). *S. solidum* is superficially similar to *Sphaerium corneum*, but can be distinguished from the latter species by prominent umbos, a more solid shell bearing regular, raised ribs, which are coarser on the young shell, often becoming finer towards the shell margins. Live and freshly dead shells collected in the Great Ouse system have a distinctive two-tone coloration, with a greyish younger shell that changes fairly abruptly to an olive-yellow colour towards the shell margins (Plate 1, inside front cover).

Living specimens of *S. solidum* were first recorded in Britain in 1968 from the River Witham in Lincolnshire and an associated fenland drain (Redshaw & Norris, 1974). As a consequence of its rarity *S. solidum* has been placed as category 1: endangered, in the British Red Data Book (Bratton, 1991). In November 2006 it was accepted as a proposed new UK BAP (Biodiversity Action Plan) priority species by the Invertebrate BAP Working Group.

In the early 1990s a Conchological Society field meeting confirmed good numbers of the bivalve in the fenland drain but ten years later the population appears to have severely declined (Aldridge, 2002), raising fears that the Lincolnshire population might be extinct. A further intensive survey in the following year only found two living specimens (Holyoak *et al.*, 2003)

confirming the precarious situation for the Witham populations. As a result of Environment Agency work, a new population of *S. solidum* was discovered in 1999 in the River Great Ouse at Earith (TL394747) in Cambridgeshire (Bass *et al*., 2003). As part of an English Nature project, *S. solidum* was re-confirmed living at Earith in 2003 and a further population was located about 10 km downstream (Holyoak *et al.*, 2004) on the River Great Ouse (Old West River). In 2004 and 2005 additional English Nature surveys were undertaken to study the distribution of *S. solidum* populations in the Great Ouse system in greater detail. In 2005 *S. solidum* were discovered in the New Bedford River and this paper reports on its occurrence here and elsewhere in the lower Great Ouse system, the distribution being displayed on Fig. 1.

*Corbicula fluminea* (Müller)

In August 2005 populations of the Asiatic Clam *C. fluminea* (Müller) were discovered in the New Bedford River, the first records of this bivalve from Cambridgeshire (Plate 2, inside front cover). *C. fluminea* is native to eastern Asia and a notorious invasive species. It was first noted in North America in 1924 (Counts, 1981) and is now widespread across the USA (McMahon, 1983) It arrived later in Europe (see discussion in Aldridge & Müller, 2001) being reported from Portugal in 1980, the Gironde in France in 1981 and Germany's River Weser in 1983, spreading to the Rhine system in which it was reported to be common by 1991. The species is now widespread in many other rivers in the Western Europe.

The first British discovery of *C. fluminea* was from the River Chet in the Norfolk Broads in 1998 (Baker *et al*., 1999, Howlett & Baker, 1999). It was estimated from the range of shell sizes that the population had been present for at least 4 years. By early 2000 it had been reported far more extensively in the river network of the Broads (Aldridge & Müller, 2001) and by 2002 it appears that *C. fluminea* had colonised all of the Broadland rivers (D. Aldridge, personal communication). The first records of *C. fluminea* reported from the River Thames were made in 2004 (Davison, 2006).

The rapid spread of *C. fluminea* in the United States, Western Europe and throughout much of the Norfolk Broads system in the U.K. illustrates that this species has excellent powers of dispersal. How *C. fluminea* was introduced into the UK is unknown, but Howlett & Baker (1999) list a number of possible mechanisms including introduction with ship's ballast or with pleasure craft crossing the North Sea from the Netherlands, from waterfowl or even ornamental koi carp. Aldridge & Müller (2001) consider that in East Anglia pleasure boats are likely to be important agents of dispersal, where anchors may have become contaminated when dropped into sediments supporting *Corbicula*. They also cite evidence that the clam could be dispersed by regurgitation from the gizzards of mollusc-eating ducks.

*Corbicula fluminea* is described by McMahon (1983) "as one of the most important molluscan pest species ever introduced into the United States". Aldridge & Müller (2001) provide an excellent summary of the possible economic and ecological impacts resulting from the spread of Asian clams.

Living and dead shells can block irrigation systems and water pipes by attaching themselves by means of byssus threads, impeding water flow. They can also contaminate dredged sand and gravel aggregate used for concrete manufacture.

Ecologically the clam can have a number of effects including:

1. the removal of much suspended particulate matter and the possible decline of phytoplankton as a result of the filter-feeding activities of the animals;
2. the possible increase in aquatic vegetation, fish and numbers of some mollusc eating ducks;
3. increasing the rate of sedimentation. Aldridge and Müller (2001) claim that the ability of *C. fluminea* to feed directly upon organic matter in sediments leads to the production of large quantities of pseudofaeces requiring more frequent dredging of water bodies.

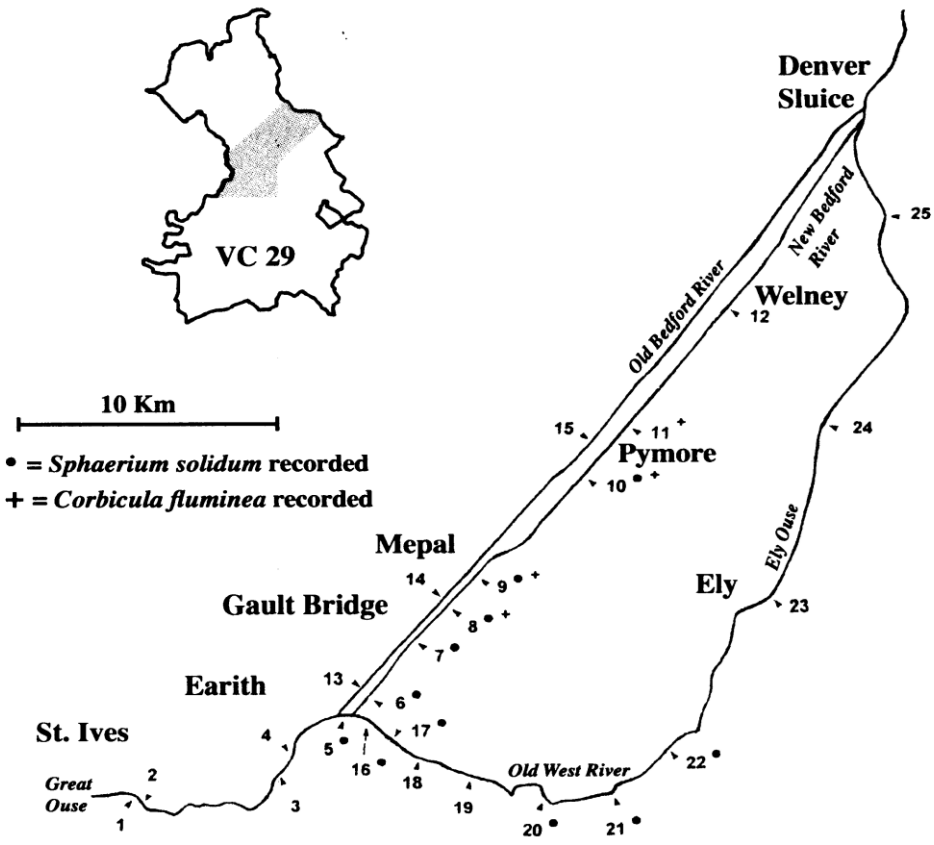


Figure 1: The River Great Ouse between St Ives and Denver Sluice showing sampling sites and occurrence of *Sphaerium solidum* and *Corbicula fluminea*

## Ouse Hydrology

An understanding of the distribution of *Sphaerium solidum* and *Corbicula fluminea* in the lower Great Ouse is assisted by an appreciation of the river's hydrology (Fig. 1). The river is tidal up to the weir at Brownshill Staunch (TL36907270), about 1 km upstream of Earith, where river waters divide. The main flow enters the tidal New Bedford River (or Hundred Foot Drain). A small amount of water, particularly during high winter flows, passes down the Old Bedford River. The remaining water enters the non-tidal old river channel, known as the Old West River, when boats pass through the locks at Earith. This channel is joined by waters from the River Cam east of Stretham after which it is known as the Ely Ouse. The waters from this river rejoin those of the New Bedford River at Denver Sluice, south west of Downham Market. Saline waters cannot pass up the Old West River but do penetrate the New Bedford River, which is essentially freshwater upstream of Welney except under severe drought conditions. The formal saline limit for low summer flows lies at Welney Bridge. Incursion of saline water up the tidal river is affected by tidal height and freshwater flows. During the severe drought of 1976 when freshwater flows fell close to zero, highly saline water was reported, on occasions, as far upstream as Earith (T. Clough, personal communication).

## Methods

Twenty-five sites were sampled on the River Great Ouse, Old Bedford River and New Bedford Rivers between 2003 and 2005 (Fig. 1). At each site a standard sampling procedure was adopted. Mollusca were sampled using a 0.5mm mesh square-framed net (FBA-pattern long-handled aquatic sampling net) attached to handles allowing sampling lengths from 1 > 4m. This technique was adopted to collect sediments and mollusca from river margins to about 4m into the channel. At points where the channel width prevented the the net from reaching mid-channel, additional samples were obtained with a 0.5mm mesh hand-held dredge, which was thrown from the bank to obtain surficial sediment samples to near centre-channel. Approximately 8 nets-full of sediment were processed from each site, allowing semi-quantitative comparisons to be made between sites.

The sediment recovered was washed through nested sieves of 2mm and 0.5mm mesh to separate the coarse material (with large mussels) from the finer sediments. The finer material was then air-dried and all remaining shells of *Sphaerium* and *Corbicula* removed. All shells of *Sphaerium* spp. were counted, scoring separate totals for living and dead specimens. For ease of comparison, total counts of separated dead *Sphaerium* valves were later halved to match counts of live (double valved) specimens. The posterior/ anterior length of all *Corbicula* recovered were measured with Vernier callipers to an accuracy of 0.1mm

## Results

*Sphaerium solidum*

On the New Bedford River *Sphaerium solidum* was found at five of the seven sites surveyed, extending from Earith downstream to a point close to Pymore, but not reaching Welney (Fig 1; Table 1). Only dead specimens were found at the two sites closest to Earith but 'good' numbers of live specimens were recorded between Gault Bridge and Pymore (Table 1). At all sites on the New Bedford River *S. solidum* was found in mud and clay substrates in a channel subject to daily tidal flows.

Ten sites were sampled along the non-tidal Old West River and its continuation, the Ely Ouse in 2003 and 2004. *S. solidum* was found intermittently between Earith and Stretham, a distance of about 20 km. Although *S. solidum* was found at five sites, living specimens were only present at two. Of 57 individuals collected (paired valves), only seven were live. No further specimens (living or dead) were collected at the three sites downstream of Stretham on the Ely Ouse. *S. solidum* was mostly found in muddy-clay sediments although small amounts of sand were present at site 22 (Stretham) and site 20 (near Wilburton). Upstream of Earith the species was not recorded, although the river was extensively sampled below and above both Brownshill Staunch and the weir in St Ives. Three sites were sampled (Fig. 1) on the sluggish waters of the Old Bedford River between Earith and Manea, but failed to produce the bivalve.

*Corbicula fluminea*

*C. fluminea* were found in the New Bedford River in August 2005 as a new vice-county record for Cambridgeshire. Specimens were found at four sites (Fig. 1; Table 1) between Gault Bridge running downstream to the railway crossing at Pymore, a distance of about 9 km. At this lowest site *C. fluminea* was the only mollusc species recovered. At all sites *C. fluminea* was found living in mud or clay.

| Sites (locations shown on Fig. 1) | *Sphaerium solidum* | | *Corbicula fluminea* | Other Notes |
|---|---|---|---|---|
| | dead | live | live (no dead shells found) | |
| 1. Great Ouse: St Ives (above weir) TL 3139 7050 | - | - | - | Not tidal; sand & gravel; no algal growth when surveyed; *S. corneum* present |
| 2. Great Ouse: St Ives (below weir) TL 3139 7050 | - | - | - | Not tidal; sand & gravel; no algal growth on channel floor when surveyed; *S. corneum* present |
| 3. Great Ouse: Brownshill Staunch (above weir) TL 36905 72633 | - | - | - | Not tidal; silty-clay; patches of filamentous algal growth on channel floor when surveyed; *Sphaerium. corneum* present |

| | | | | |
|---|---|---|---|---|
| 4. Great Ouse: Brownshill Staunch (below weir) TL 36963 72986 | - | - | - | Tidal; silty-clay; large patches of filamentous algal growth when surveyed; *Sphaerium corneum* present |
| 5. Great Ouse: Earith TL 3925 7467 | 37 | 3 | - | Tidal; muddy-clay; small areas of filamentous algal growth on channel floor when surveyed; *Sphaerium corneum* present |
| 6. New Bedford River: Earith TL 39452 74897 | 1 | - | - | Tidal; muddy clay; small areas of filamentous algal growth on channel floor when surveyed; *Sphaerium corneum* present |
| 7. New Bedford River: between Earith & Gault Bridge TL 41577 77719 | 48 | - | - | Tidal; muddy-clay; most of channel floor blanked with up to 15cm of filamentous algae and floating rafts of *Enteromorpha* on river margins (Plate 3), most freshwater molluscs recovered were dead; *Sphaerium corneum* present |
| 8. New Bedford River: Gault Bridge TL 42879 79424 | 55 | 34 | 14 | Tidal; muddy-clay; small areas of filamentous algae on channel floor; *Sphaerium corneum* present |
| 9. New Bedford River: Mepal TL 44093 81402 | 36 | 54 | 43 | Tidal; muddy-clay; no filamentous algae observed; *Sphaerium corneum* present |
| 10. New Bedford River: Pymore TL 47932 85508 | 10 | 1 | 30 | Tidal; muddy-clay; no filamentous algae present; *Sphaerium corneum* absent |
| 11. New Bedford River: Pymore TL 50214 88508 | - | - | 2 | Tidal; clay; no filamentous algae present; *Sphaerium corneum* absent |
| 12. New Bedford River: Welney TL 53485 92778 | - | - | - | Tidal; clay; no filamentous algae present; *Sphaerium corneum* absent |
| 13. Old Bedford River: Earith TL 39609 75840 | - | - | - | Not tidal; sand and gravel blanketed with ca. 5cm of filamentous algae; few live molluscs present; *Sphaerium corneum* present as dead shells |
| 14. Old Bedford River: Gault Bridge TL 42551 79792 | - | - | - | Not tidal; organic silty-mud; *Sphaerium corneum* present |

| | | | | |
|---|---|---|---|---|
| 15. Old Bedford River: Manea TL 47626 86565 | - | - | - | Not tidal; organic silty-mud; *Sphaerium corneum* present |
| 16. Old West River: Earith TL 39634 74402 | 13 | 5 | - | Not tidal; silty-mud with some peat; patches of filamentous algae on channel floor; *Sphaerium corneum* present |
| 17. Old West River: Bridge Farm TL 40518 73680 | 2 | - | - | Not tidal; silty-mud; patches of filamentous algae on channel floor; *Sphaerium corneum* present |
| 18. Old West River: Flat Bridge Farm TL 42040 72806 | - | - | - | Not tidal; centre channel silty-mud with some sandy-gravel at margins; patches of filamentous algae on channel floor; *Sphaerium corneum* present |
| 19. Old West River: nr Aldreth TL 44248 72161 | - | - | - | Not tidal; silty-mud with patches of peat with gravel at margins; areas of filamentous algae on channel floor; *Sphaerium corneum* present |
| 20. Old West River: nr Wilburton TL 47964 71082 | 39 (2003)<br>7 (2004) | 9 (2003)<br>- (2004) | - | Not tidal; centre channel silty-mud with some sandy-gravel at margins; large areas of filamentous algae on channel floor (when sampled in 2004 but not in 2003); *Sphaerium corneum* present |
| 21. Old West River: Stretham Ferry TL 50449 72188 | 2 | 2 | - | Not tidal; silty-mud with some peat with gravel at margins; patches of filamentous algae on channel floor; *Sphaerium corneum* present |
| 22. Old West River: Stretham TL 52294 73737 | 26 | - | - | Not tidal; centre channel silty-mud with some sandy gravel at margins; patches of filamentous algae on channel floor; *S. corneum* present |
| 23. Ely Ouse: Ely TL 5642 8096 | - | - | - | Not tidal; muddy-clay; *S. corneum* present |
| 24. Ely Ouse: Littleport TL 5765 8726 | - | - | - | Not tidal; silty-clay; *S. corneum* present |
| 25. Ely Ouse: Ten Mile Bank TL 6041 9706 | - | - | - | Not tidal; mud-clay; *S. corneum* present |

**Table 1** Occurrence of *Sphaerium solidum* and *Corbicula fluminea* at sites surveyed on the Great Ouse system between St Ives and Denver Sluice

## Discussion

*Sphaerium solidum*

In the River Witham and associated drains strong circumstantial evidence (in the form of filamentous algal blankets covering the floor of the channel) suggests that a marked decline in *Sphaerium solidum* populations was due to eutrophication (Aldridge, 2002, Holyoak *et al.*, 2003, Holyoak *et al.*, 2004, Killeen *et al.*, 2004).

Eutrophication also seems to adversely affect *Sphaerium solidum* in the Great Ouse system. When the Old West River was sampled near Wilburton in 2003, live specimens of the bivalve were fairly common, but the same site only produced dead valves in 2004. At this time the river channel both here and at other sites on the Old West River was blanketed with variable quantities filamentous algae.

When the New Bedford River was sampled in 2005 only dead shells (48) of *Sphaerium solidum* were recovered at site 7. At this point the channel floor was blanketed with a mat of filamentous algae and the river surface partly covered with 'rafts' of *Enteromorpha* (Plate 3, inside back cover). Most other Mollusca recovered at this site were also dead including numerous unionid mussels (*Unio pictorum* and *Anodonta anatina*). Downstream a gradual decline of algal mats was mirrored by an increase in the numbers of live *S. solidum*. Thus site 8 (Gault Bridge) produced 34 live and 55 dead, whilst site 9 (Mepal) with no noticeable algal growth produced 54 live specimens compared to only 34 dead *S. solidum*.

The disappearance of *S. solidum* (and all other freshwater molluscs except *C. fluminea*) between Pymore (site 10) and Welney is possibly due to occasional saline intrusions. According to The Environment Agency, the formal saline limit for low summer flows lies at Welney Bridge. During the extreme drought of 1976 highly saline waters were occasionally present as far upstream as Earith. It is not possible to say what effect such raised salinity might have had upon any *S. solidum* then living in the New Bedford River. If populations had suffered then conceivably they could have recolonised in the 29 years between 1976 and the 2005 survey. Wolff (1970) maintained that "there is not the slightest indication that *S. solidum* is able to withstand elevated salinities" although Gittenberger *et al* (1998) state that this mussel (as with many other freshwater species including *Sphaerium corneum*) can tolerate very slightly brackish 'oligohaline' conditions of approximately 0.5–3.3‰ salinity.

Low summer flows were also experienced in the New Bedford River in 2003 and 2005, but examination of Environment Agency water conductivity records showed no elevated salinity levels between Brownshill Staunch and Welney (all records with salinity levels <1 ‰). Results from the current surveys therefore provide no evidence to challenge Wolff's views.

*Corbicula fluminea*

A total of 89 live *C. fluminea* was collected from four sites on the New Bedford River, with the highest population density at Mepal (site 9). The populations in the New Bedford River in 2005 (see Fig. 2) were dominated by small individuals (3–10mm), which may represent a discrete population cohort. The relatively small number of larger clams (>20mm) and the absence of dead shells suggests that *C. fluminea* is a relatively new arrival in the New Bedford River and may have been introduced somewhere between Gault Bridge and Pymore. Aldridge & Müller (2001) suggest that populations of *C. fluminea* have a lifespan of about 3 years in Asia and North America. This suggests that the clam did not arrive in the New Bedford River until about 2002.

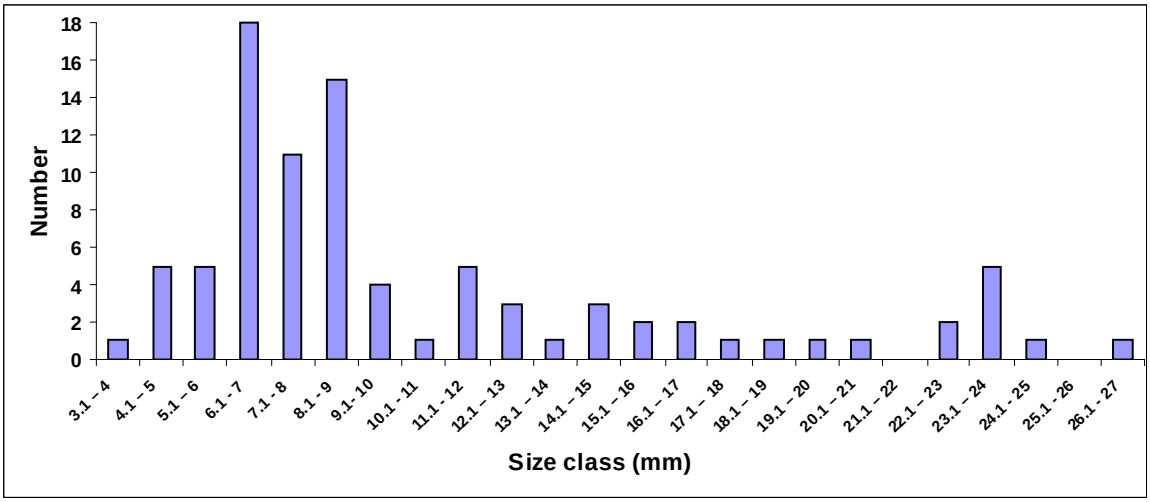


Figure 2: Size-frequency distribution of *Corbicula fluminea* from the New Bedford River (data are combined from sites 8–11) sampled in August 2005)

The presence of *C. fluminea* at site 11 (which lies about 5.5 km upstream of Welney Bridge) may indicate that the bivalve can tolerant occasional slightly brackish water (more than the other freshwater Mollusca in the New Bedford River). This opinion is reinforced by Gittenberger *et al* (1998) who indicate that in Holland this clam extends from freshwater to moderately brackish 'mesohaline' conditions of approximately 3.3-18.1 ‰ salinity. Environment Agency salinity records (taken at Brownshill Staunch, Earith, Mepal and Welney Bridge) do not indicate any elevated salinity readings. This testing regime might, however, have missed occasional saline intrusions. This is because samples were only taken at 1 – 2 monthly intervals testing marginal waters and not removing samples from lower levels of the channel where denser, more saline water would have penetrated.

Perhaps the greatest concern arising from the appearance of *C. fluminea* in the Great Ouse system is its effect as a possible competitor with native filter-feeding bivalves, especially the nationally important populations of *Sphaerium solidum* in the New Bedford River. *C. fluminea* can reach enormous densities, in excess of 130,000 clams $m^{-2}$ (Eng, 1977), which are likely to have a major impact upon other freshwater bivalves. Aldridge & Müller (2001) indicate that there is no evidence from N. America implicating the Asian clam in the decline of native unionid mussels. However, what effect the arrival of *C. fluminea* will have upon the very much smaller *S. solidum* is unknown. The 2005 distributional and population data from the New Bedford River provides a useful baseline against which to record the inevitable spread of *C. fluminea* in the Great Ouse system and to assess the potentially damaging effects of interspecific competition with *S. solidum.*

**Acknowledgments**

I am grateful to English Nature's Species Recovery Programme for part-funding this work and to Dr Roger Key for making the administrative arrangements, for giving support and for making valuable comments on a draft of this report. I also thank Terry Clough, Brenda Mace and Paul Wilkanowski of the Environment Agency (Brampton) for providing valuable information regarding the hydrology and water chemistry of the Great Ouse system. David and Gerry Holyoak are also thanked for assistance with fieldwork in 2003 and for valuable discussions whilst I am grateful to Mike Edwards for assistance with image processing. Finally I would like to thank Dr Richard Preece for making useful comments on a draft of this paper.

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# A note on new records of the prawn *Palaemon longirostris* H. Milne Edwards, 1837 (Crustacea, Decapoda) in Cambridgeshire

Martin J. Willing

## Summary

During the molluscan surveys undertaken on the Great Ouse in 2003 and 2005 (see previous paper), the prawn *Palaemon longirostris* was collected at several tidal sites lying between Earith and Pymore (on the New Bedford River). These finds mark new records for this species in Cambridgeshire and also record this predominantly brackish water species in freshwater conditions.

## Results

Large shoals of *P. longirostris* (identifications by T. Worsfold) were observed in shallow muddy water at the river margins at Earith in August 2003. (Plate 4, inside back cover.) Further finds were made on the New Bedford River in 2005 near Earith, Gault Bridge and Pymore (sites 7, 8 and 10 respectively; site numbering from previous paper in this publication).

At each site, *P. longirostris* were found in association with a freshwater molluscan community (Table 1).

## Discussion

The UK distribution of *P. longirostris* has not been comprehensively reviewed. Smaldon *et al* (1993) describe its distribution as occurring sporadically on the SE, S, and SW coasts as well as in the Norfolk Broads, with a world distribution ranging from NW Germany southwards to the Mediterranean (d'Udekem d'Acoz, 1999) and Morocco (González-Ortegón &

Cuesta, 2006). Its habitat is described as shallow water in the upper reaches of large estuaries, often occurring in dense shoals. Ashelby *et al* (2004) describe this as a brackish water species; González-Ortegón & Cuesta (2006) state that it can tolerate freshwater but shows a preference for brackish water.

| **Sites as described in "*Sphaerium solidum* and *Corbicula fluminea*: two rare bivalve molluscs in the River great Ouse system in Cambridgeshire" (see previous paper)** | **Site 5 Earith (TL 3925 7467)** | **Site 7 Between Earith & Gault Bridge (TL 41577 77719)** | **Site 8 Gault Bridge (TL 42879 79424)** | **Site 10 Pymore (TL 47932 85508)** |
|---|---|---|---|---|
| **Notes on *Palaemon longirostris*** | Thousands netted in shallow marginal water < 0.5m depth | About 18 collected in waters >1m depth near centre channel | 6 collected in waters >1m near centre channel | 8 collected in waters >1m near centre channel |
| Associated live Mollusca | | | | |
| *Viviparus viviparus* | ✓ | ✓ | ✓ | |
| *Theodoxus fluviatilis* | ✓ | ✓ | ✓ | |
| *Valvata piscinalis* | | ✓ | | |
| *Potamoypyrgus antipodarum* | ✓ | ✓ | ✓ | ✓ |
| *Bithynia tentaculata* | ✓ | ✓ | ✓ | |
| *Physa fontinalis* | ✓ | | | |
| *Physella acuta* | ✓ | | | |
| *Radix balthica (= Lymnaea peregra)* | ✓ | ✓ | ✓ | |
| *Radix (=Lymnaea) auricularia* | ✓ | | | |
| *Ancylus fluviatilis* | | | | |
| *Musculium lacustre* | | ✓ | | |
| *Sphaerium corneum* | ✓ | ✓ | ✓ | |
| *Sphaerium solidum* | ✓ | ✓ | ✓ | ✓ |
| *Pisidium casertanum* | | | | ✓ |
| *Pisidium amnicum* | ✓ | ✓ | ✓ | ✓ |
| *Pisidium henslowanum* | ✓ | | ✓ | ✓ |
| *Pisidium subtruncatum* | ✓ | | | ✓ |
| *Pisidium nitidum* | | ✓ | ✓ | |
| *Pisidium moitessierianum* | ✓ | | ✓ | |
| *Pisidium supinum* | | | ✓ | ✓ |
| *Unio pictorum* | | ✓ | ✓ | ✓ |
| *Unio tumidus* | ✓ | | ✓ | ✓ |
| *Anodonta anatina* | ✓ | ✓ | ✓ | |
| *Driessena polymorpha* | ✓ | ✓ | ✓ | |
| *Corbicula fluminea* | | | ✓ | ✓ |

Table 1. *Palaemon longirostris* sites on the Great Ouse with associated freshwater Mollusca; sites in sequence downstream

These finds in the Great Ouse system are of interest in that all were made in association with an entirely freshwater molluscan community (Table 1). All of the *P. longirostris* sites lie upstream of Welney Bridge, which is the formal saline limit for low summer flows (T. Clough, personal communication); indeed the Earith site lies 25km upstream of Welney, well beyond any saline influence. Examination of Environment Agency conductivity records taken between Earith and Welney for the survey period (2003 - 2005), show no elevated salinity levels

with all readings showing salinity levels < 1‰. On the basis of these limited observations, *P. longirostris* would appear to be a species that can range from brackish estuarine conditions well into freshwater, though it is not known whether they represent resident or migratory populations. These Cambridgeshire finds appear to be the furthest inland records of *P. longirostris* in the UK. No other freshwater Caridea occur in Britain (and very few Decapoda) but *Atyaephyra desmarestii* is widespread in mainland Europe (d'Udekem d'Acoz, 1999).

**Acknowledgments**

I am grateful to English Nature's Species Recovery Programme for part-funding this work and to Dr Roger Key for making the administrative arrangements and giving support. I also thank Terry Clough, Brenda Mace and Paul Wilkanowski of the Environment Agency (Brampton) for providing valuable information regarding the hydrology and water chemistry of the Great Ouse system. I would like to thank Tim Worsfold and Chris Ashelby of Unicomarine Ltd. for providing identifications of *Palaemon longirostris* and for making useful comments on a draft of this short note.

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## Reed beetles

Nick Millar

This small group of 21 species, forming part of the leaf beetle family, is rather unusual for that family because the larval and pupal stages are passed under water, the larvae feeding on various emergent or fully submerged aquatic plants. The adults spend most of their time on or near the aerial or floating parts of their foodplants. Their dependence on good quality aquatic habitats makes

them vulnerable to many of the changes that man is bringing about in the countryside; about half of the British species seem to have declined markedly when comparing pre-1970 and post-1970 records. This comparison is made in a very useful paper by Menzies & Cox (1996). The paper also provides some good background and ecology, vice-county distribution notes, identification keys and colour plates. Identification of many species is very straightforward and, with practice, much identification can be done in the field. Most species are bright and metallic gold/bronze and several species have iridescence or rainbow colours on parts of their bodies; some species, such as *Plateumaris sericea*, come in a variety of metallic colours that apparently change slowly with age or exposure to sun.

The common species in vc29, and in the rest of Cambridgeshire, are *Donacia vulgaris, D. simplex* and *D. semicuprea*; the adults may be spotted sitting on and nibbling tall emergent vegetation such as Reedmace (*Typha latifolia*), Branched Bur-reed (*Sparganium erectum*) or Reed Sweet-grass (*Glyceria maxima*) at the margins of rivers, gravel pits and other waterbodies. The beetles usually favour vegetation with its feet in water rather than that growing on the bank. Because of the lifestyle of the larval and pupal stages it seems likely that the periodic slubbing out of most fen drains serves to make this potential habitat of less value than it might be; I have yet to find any reed beetles in regularly cleared fen drains.

*Donacia clavipes*, a Notable B species, is one of the commoner reed beetles in the Great Ouse and Nene systems; even small clumps of Common Reed (*Phragmites australis*) often harbour a few individuals. Its characteristic feeding damage, a series of elongated holes transversely across the leaf, can often be spotted even though the adults are not visible; try looking in the upper rolled up leaves, the beetles like to tuck themselves in there.

Having read the literature one would be forgiven for expecting each species to be found only or largely on its foodplant. A visit to the Old Bedford River on the Ouse Washes at Mepal in 2004 revealed numerous reed beetles sitting on the lily pads. The literature led me to hope that the species might be *Donacia crassipes*, though it is apparently not recorded from vc29 post-1970, but instead I found *D. sparganii* (Na), *D. dentata* (Na) and *D. versicolorea*. All the correct foodplants were present but none had grown far enough to break the surface of the water so the adults were necessarily using the only floating leaves available. Menzies & Cox (1996) suggest that *D. versicolorea* has not been recorded from vc29 post-1970 but, given the availability of suitable habitat and that this is a common species nationally, this may be an error or oversight in the paper. I have recorded it at three sites in vc29 in recent years.

As one would expect, Wicken Fen is one of the best localities for reed beetles and the list in Friday & Harley (2000) is very enticing. In practice, rather fewer of these have been recorded here in recent times, though this is perhaps due to under-recording. *D. sparganii* and *D. dentata* are two of the scarcer species that can still be found here; Monk's Lode is ideal habitat for these species of floating aquatic plants. As usual, *D. clavipes* is easy to come by in the dense fringes of Common Reed along the lodes and smaller drains.

In the Nene system, a site I have dubbed Long Gravel Pit, lying between the Nene Washes and the re-routed Fen Causeway at Whittlesey (TL243892) has proved a profitable site for reed-beetles. In 2004 it yielded the common species *D. vulgaris*, *D. semicuprea* and *D. simplex* together with *D. cinerea* (Nb), distinctive with its ashy-grey coating of short patent hairs. In 2005 *D. clavipes*, was found to be common in the reedbeds around the western parts of this pit. Also in 2004 *D. versicolorea* was found in good quantity on the large floating patches of Broadleaved Pondweed (*Potamogeton natans*). This last species has a particular knack of disappearing just as the net is lowered over the floating leaves; it took several attempts before I realised that it was able to walk round to the underside of the leaf and hold on tight below the water, reappearing again only once danger had passed.

To catch species that frequent floating vegetation a long-handled net is highly desirable. A very serviceable net can be made by fixing a stainless kitchen sieve to an angler's landing net handle; these handles being extendable to some 2.5-3m. This eye-catching piece of equipment is also a useful talking point and affords the naturalist the entertainment of explaining to onlookers just what on earth he or she is up to.

A number of additional species occur in Huntingdonshire (vc31) or in the Ouse and Nene systems in neighbouring or nearby counties, including *D. thalassina* (Nb), *Plateumaris braccata* (Na), *P. affinis* and *P. sericea* and there seems to be no reason that they should not also occur in vc29. *P.braccata* is another Common Reed specialist that feeds in a similar way to *D. clavipes*, except that it leaves small round holes transversely across the leaf; it is recently recorded from Woodwalton Fen. *P. sericea* is recorded in twice as many vice-counties post-1970 than pre-1970, so it seems unlikely that is has been lost from vc29 and vc31, even though that is the situation shown in Menzies and Cox (1996). *D. impressa* (Na) seems to be quite widely found within the Ouse and Nene systems in vc31 and there seems to be no reason that it should not still be present in vc29. This species feeds on Bulrush (*Schoenoplectus* species) and sedge species and is often best found using a sweepnet, being rather hard to spot amongst the brown Bulrush/sedge flowers.

In summary then, whilst vc29 is a productive vice-county in which to look for reed beetles there are a good number of species either not recorded, or not recorded post-1970, which would be well worth looking for.

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## SELECTED RECORDS FROM 2004-05

**Nationally Notable categories.**
Taxa which do not fall within RDB categories but which are nonetheless uncommon in Great Britain and are thought to occur in 1) 30 or fewer 10km squares of the National Grid or, for less well-recorded groups, within seven or fewer vice-counties. **Notable A (Na)** or 2) between 31 and 100 10km squares of the National Grid or, for less well-recorded groups, between eight and twenty vice-counties. **Notable B (Nb)**

*Donacia sparganii* Na

Wicken Fen. TL56047015. 24/07/2004.
Lode with clear water and dense stands of Arrowhead (*Sagittaria sagittifolia*) and Unbranched Bur-reed (*Sparganium emersum*). Apparently entirely Arrowhead in the immediate vicinity of the flat bridge from which this specimen was taken. Beetle found, in company with many others, on floating, and sometimes the aerial, leaves of Arrowhead

Ouse Washes, Old Bedford River, Mepal. TL4355281137. 31/07/2004.
Broad drainage dyke with frequent waterlily leaves and occasional/frequent marginal emergents, inc. Branched Bur-reed and Reed Sweet-grass. Beetle caught on waterlily leaves.

*Donacia cinerea* Nb

Long Gravel Pit. TL243982. 13/06/2004.
Small disused gravel pit adjacent to Nene Washes. Beetle found in reasonable numbers in Reedmace stand on northern margin of the pit. Not seen in similar looking stands to east and west along this part of the margin.

*Donacia clavipes* Nb

Wicken Fen. TL5552670067. 15/06/2004.
Wicken Lode just below tower hide. Beetle found on Common Reed at margin of lode. Many beetles found head down in upper, rolled (ie. not completely emerged) leaves. This species also present just round the corner in reed fringe of Drainers' Dyke.

Fen Drayton Pits. TL3356869519. 04/06/2005.
Large disused gravel pit complex in the Great Ouse valley. Beetle found in small, narrow fringe of Common Reed on promontory on northern shore of Elney Lake.

Long Gravel Pit. TL2429198252. 18/06/2005.
Specimen taken in Common Reed on northern side of pit but feeding damage evident in most stands of reed around the pit.

*Donacia versicolorea*

Long Gravel Pit. TL2431998253. 29/07/2004.
Disused gravel pit with extensive development of marginal, emergent and floating/submerged vegetation. Large beds of Broadleaved Pondweed. Beetle present in good numbers.

Ouse Washes, Old Bedford River Mepal. TL4338980910. 31/07/2004.
Broad drainage dyke with frequent waterlily leaves and occasional/frequent marginal emergents (inc. Branched Bur-reed and Reed Sweet-grass). Shining Pondweed leaves seen in

the river in this stretch but no floating pondweed (Potamogeton) leaves of any type seen. Beetle caught on Fringed Waterlily (*Nymphoides peltata*) leaves.

Stow cum Quy Fen. TL5143362630. 01/08/2004.
Flooded coprolite pit with extensive reed bed. Unbranched Bur-reed (rare), Lesser Reedmace (*Typha angustifolia*) (very locally abundant). Many, moderate-sized patches of Broadleaved Pondweed along most of length of pit. *D. versicolorea* very localised in distribution. Specimen picked by hand from a Pondweed leaf.

*Donacia dentata* Na

Ouse Washes, Old Bedford River Mepal. TL4362481234. 17/07/2005.
Nick Millar with Florent Prunier. Large numbers of reed-beetles present on the waterlily leaves but all specimens examined were *D. dentata*, in contrast to 2004.

Ouse Washes, Old Bedford River Mepal. TL4355281137. 31/07/2004.
Broad drainage dyke with frequent waterlily leaves and occasional/frequent marginal emergents (inc. Branched Bur-reed and Reed Sweet-grass). Frequent submerged Arrowhead present at this point but no floating or aerial leaves seen here or elsewhere. Beetle caught on waterlily leaves.

# The spread of the harlequin ladybird in Cambridgeshire and Huntingdonshire

Peter Brown, Helen Roy and Michael Majerus

The arrival of the harlequin ladybird, *Harmonia axyridis* (Pallas) (Coleoptera; Coccinellidae), in the UK has been well documented (Roy et al 2005), with first sightings of this invasive alien species in Cambridgeshire (vc29) in 2004 (Brown et al 2006). The harlequin took hold in Huntingdonshire (vc31) in 2005 and has continued to spread in both vice counties in 2006, with 54 verified records being received (Figure 1). 70% of the 10km squares in the two vice counties now have records of the species, which are shown at 2km square resolution in Figure 2.

## Seasonality

93% of 2005 harlequin records came in the final quarter (Q4) of the year. While this is partly a result of increased recording effort late in that year, Q4 seems to be when the population is at its maximum and the ladybirds aggregate in large overwintering groups. However, the 2006 records were more spread out, with 6% in Q1, 26% in Q2, 37% in Q3 and just 31% in Q4.

## Larval records

Evidence of the harlequin ladybird breeding in the area was received in 2005, when ten confirmed records (from ten sites) of harlequin larvae were received, all but one in Q4. Perhaps surprisingly, larval records in 2006 were sparser, with

just five (from four sites) being received. Three of these were in Q3, with two in Q4.

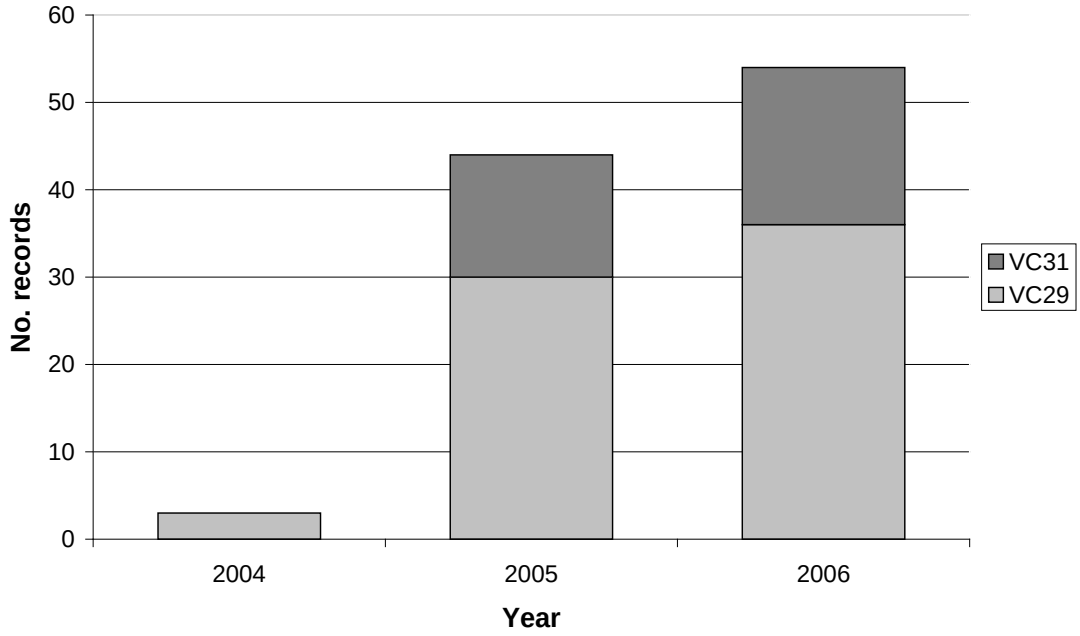


**Figure 1** – Verified harlequin ladybird records in vc29 and vc31.

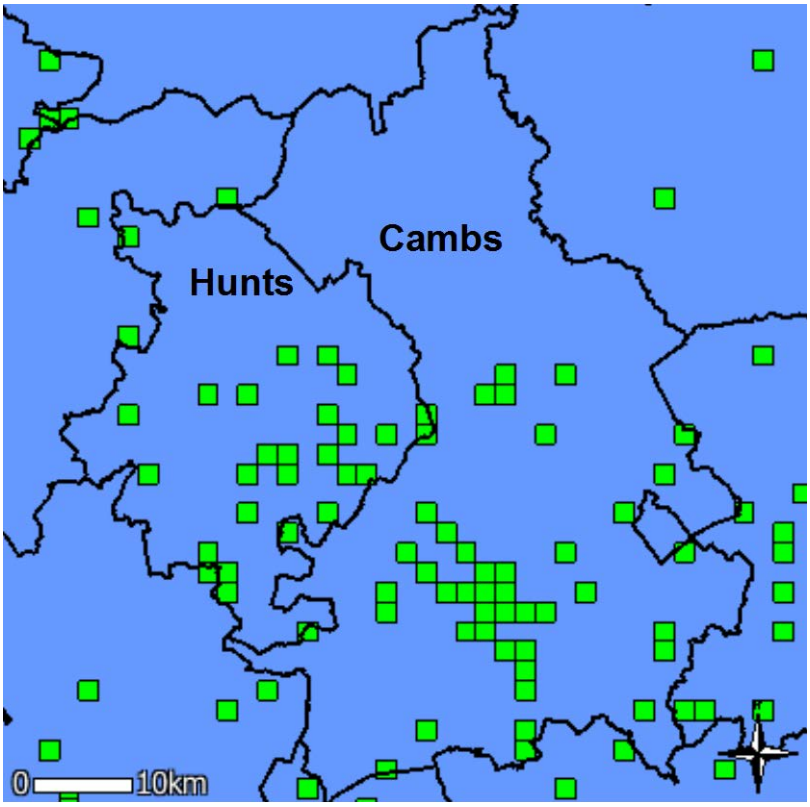


**Figure 2** – Verified harlequin ladybird records in 2km squares in Cambs & Hunts. Map reproduced with kind permission of National Biodiversity Network and Biological Records Centre.

## Numbers of harlequins

72% of the confirmed Cambs/Hunts records are for a single adult harlequin ladybird seen. The records with largest numbers seen together have all been in November, with 12 individuals found by Robert Frost in Godmanchester in November 2005, over 10 harlequins recorded at Royston and circa 36 seen in Sawston, both in November 2006. The low number of 'large' records is somewhat in contrast to some other areas of England, where very large swarms of hundreds (or in a few cases, thousands) of harlequins were seen in autumn 2006. These large records came particularly from the south coast, from Devon to Kent, with others from inland locations. The closest record of this type was from Audley End House in north Essex in late October 2006.

## Records from notable sites

Two National Nature Reserves, one from each of our vice counties, had first records of the harlequin in 2006. A single harlequin was found in a moth trap at Monks Wood NNR in July. At Chippenham Fen NNR one harlequin was found overwintering in a Scots pine tree in November.

## Atlas Project

The long-term project to compile a ladybird atlas for Cambridgeshire and Huntingdonshire continues. Records of any ladybird species would be appreciated and can be logged online at www.ladybird-survey.org or sent to the Biological Records Centre. So far, less than a quarter of the 900 or so 2km squares in the two vice counties have any ladybird records.

## Acknowledgments

We are very grateful to the 63 recorders who have provided the verified harlequin ladybird records in the two vice counties. We also thank Robert Frost, David Roy at the Biological Records Centre and Remy Ware and Ian Wright at University of Cambridge.

### Further information

*Contact details*

Email: harlequin-survey@ceh.ac.uk
Post: UK Ladybird Survey, Biological Records Centre, CEH Monks Wood, Abbots Ripton, Cambs, PE28 2LS.
Cambs/Hunts Ladybird Atlas Project Email: mail@fro5t.plus.com

*Websites* www.ladybird-survey.org www.harlequin-survey.org

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# Small rodent population dynamics in Madingley Wood, 1982-1993. Do warm winters and heavy tree fruiting promote more mice and voles?

John R. Flowerdew

## Introduction

Madingley Wood is a 16.8ha ancient woodland managed by the University of Cambridge and situated about 3 miles (4.5 km) west of Cambridge city. It has been extensively studied and mapped (Rackham & Coombe, 1996) and retains an area of medieval 'old wood' to the west which has been used for small mammal studies since the 1970s (Flowerdew, 1976; R. Hare, *pers. comm*., 1979).

In 1982 The Mammal Society started the 'National Woodland Small Rodent Survey', which, until 1995, collated six-monthly Bank Vole (*Clethrionomys glareolus*) and Wood Mouse (*Apodemus sylvaticus*) population data and woodland tree-fruiting data from up to 30 locations in the UK, including Madingley Wood (until 1993). These data have been extensively analysed and discussed, concentrating on their combined contribution to the understanding of rodent population biology and methodology (Mallorie & Flowerdew, 1994, Flowerdew, 2004, Flowerdew, Shore, Poulton & Sparks, 2004). The rationale and methods used here are described fully in these papers. Here is presented an 'in depth' description of the population dynamics of the two small mammal species in Madingley Wood over 12 years, giving an assessment of the relative impact on their numbers of annual variations in autumn tree fruit-fall and in temperature.

## Study area

The study was carried out from May 1982 to May 1993 on a live-trapping grid of 0.81ha square at 55m elevation. The grid reference TL402596 marks the SE corner of the grid that was located at the 'Large Clearing' (Rackham & Coombe, 1996), with the main axes lying W/NW and N/NE. The shrub vegetation was dominated by neglected Hazel (*Corylus avellana*) coppice. The canopy cover had approximately equally dominant Ash (*Fraxinus excelsior*) and standard Oaks (*Quercus robur)*, dating from the early 19$^{th}$ century, together making about 80%, with Field Maple (*Acer campestre*) adding most of the remaining 20%. The area covered parts of compartments A2 and B1 and was bounded on the southern side by compartment A3 (Rackham & Coombe, 1996). The ground vegetation in the area was described by Flowerdew (1976), being dominated by Dog's Mercury, Nettle and bramble. The westerly edge of the area was affected by Hazel coppicing for a distance of 30m from the southern boundary prior to November 1991, and in 1993-4 a large area was coppiced which prompted the end of the study in May 1993.

## Methods

Longworth live traps (Gurnell & Flowerdew, 2006) were placed in pairs at 49 points on a 15m grid covering the 90m x 90m study area. For the purpose of the National Survey all grids were recommended to be at least 100m from the woodland edge. However, in order to maintain common vegetational characteristics over the area, the northern perimeter varied between 40 and 60m from the woodland boundary. (There is a large area of Elm, *Ulmus minor* in A3 to the south (Rackham & Coombe, 1996), which prevented movement of the grid in this direction).

The trapping regime followed a system developed by Southern (1970, 1973) modified by Gurnell & Flowerdew (2006). During a period close to mid-May and late November each year traps were visited morning and evening for three days after placing them in position on the afternoon before the first day. Individuals were fur-clipped with the same mark, weighed and sexed, and reproductive condition noted. In May any juveniles (low weight and greyish fur) caught were noted separately, leaving the total numbers of 'over-wintered adults' for analysis. Evaluation of the numbers of 'trappable' individuals in the rodent populations was judged to be the number of 'new' (previously no fur-clip) individuals caught over three days. For this to be considered acceptable the proportion of new individuals caught on the last day should be small (Gurnell & Flowerdew, 2006), indicating that most of the trappable population on the study area has been caught over the three day period. This follows from Hayne's trap-out method (Hayne, 1949) where it would then be expected that there would be virtually no new captures on a putative fourth day of trapping. However, at times of high density in winter, with long nights when Wood Mice are active (as well as being generally less 'trap-shy' than Bank Voles (Gurnell, 1980)), competition for traps may have excluded Bank Voles from capture overnight. Although the Bank Voles would also have had the opportunity of being caught during daylight, the shortness of the winter days may have reduced the time available for capture before the nocturnal Wood Mice again occupied many of the traps (Wood Mice are usually restricted to night-time activity only, whereas Bank Voles are diurnal (Kikkawa, 1964, Flowerdew, 2000)). Thus in November 1990, for instance, 97 individual Wood Mice were caught, but only 17 Bank Voles, and although not all were caught at the same time, many mice would also be repeat captures and so the opportunity for Bank Voles to be caught was probably restricted. In this trapping session 9.3% of the Wood Mice were caught for the first time on the third morning, whereas 41% of the Bank Voles were caught at this time. Over the whole study, in winter, a mean of 16.92% of new Wood Mice and 24.08% of new Bank Voles were caught on the third day. Thus there was probably some under-estimation error associated with many of the winter Bank Vole trappings and this should be borne in mind in interpreting the results. In the May trappings the opposite occurred with overall 21.32% of adult Wood Mice and 13.48% of adult Bank Voles being caught on the third day. At this time the Wood Mice were at only half the average density found in winter and so would be less of

a possible hindrance to Bank Vole capture. In addition, the Bank Voles would have had a long day in which to be caught, and Wood Mice may well have been subjected to moon-lit nights which are linked to reduced activity (trappability) outside their burrows (Kikkawa, 1964). Therefore in summer there is likely to have been some underestimation of Wood Mice. However, given the large fluctuations in numbers and high peaks observed in both species it would seem that the major trends observed are likely to reflect real changes in relative numbers from one period to the next. Details of the numbers of Bank Voles and Wood Mice caught are provided in the appendix, Table 1.

The level of tree fruiting each autumn was assessed visually during each November/December trapping period by viewing the fruit crop on (or recently fallen from) the two co-dominant tree species. The crop from both trees was allocated to one of three categories (poor or none = 1, moderate = 2, good/heavy = 3). This was effectively an assessment of acorn (and to some extent ash) fruiting with the acorns making the largest contribution in terms of the mass of fruit available on the ground. This is because acorns have much higher mass per fruit (oak: circa 1.64 - 8.84g fresh weight, (Jones, 1959); ash: circa 25-40 mg (Greig-Smith & Wilson, 1985), and they are available on the ground almost immediately, whereas ash fruit may remain on the tree until the following spring, or later (Wardle, 1961, Newton, 1967, Gardner, 1977, Gurnell, 1993). Daily minimum temperatures were provided by permission of R. Baker from a private observatory on the Eastern edge of Royston (68m elevation), about 15 km S of Madingley Wood. Details of the fruiting assessments and the mean monthly temperatures are given in the appendix, Tables 2 and 3.

## Results

*Annual fluctuations*

The dynamics of both species in the UK usually follow simple winter peaks and late spring/summer troughs; however, the dynamics of Bank Voles may be more variable (Mallorie & Flowerdew, 1994). The Madingley Wood Mouse and Vole dynamics (Figure 1) often showed opposite extremes in numbers, especially during the winter. Wood Mice increased from summer to winter in 11/12 years and decreased from winter to summer in 11/11 years showing almost regular peaks and troughs; Bank Voles increased from summer to the winter in only 6/12 years and decreased from winter to summer in 7/11 years. Both species' patterns conformed almost exactly to the UK 'mean' dynamics from the Survey. Numbers of mice and voles in winter were not significantly correlated, possibly indicating different influences on dynamics at this time (or high errors in Bank Vole estimation, see methods), whereas numbers in May were highly correlated ($R^2 = 0.678$, $P<0.001$), possibly indicating similar influences on dynamics. At times, the numbers caught in the winter exceeded all the other study grids of the same area reporting to the Survey, for example Wood Mice (97) in November 1990.

*Influence of environmental variables on summer adult numbers*

The influence of annual variations in tree fruiting and monthly mean minimum temperature on population numbers, are studied individually, and in conjunction, by regression techniques applied separately for each species and season. It is possible that the November numbers may be affected by the November mean temperature, the immediate tree fruiting, or the previous winter's tree fruiting. The latter may occur if the crop is heavy enough to remain available on the ground (or under the ground in caches) or heavy enough to promote strong population growth from summer to autumn. May numbers may be affected by the previous winter's fruiting and the 'severity' of the winter, here assessed as the mean monthly minimum temperature for the four month period December-March.

In May the numbers of adult Wood Mice show a highly significant positive relationship with the previous winters' severity so that numbers are generally higher after warmer winters over the 12 years of study (Figure 2). It should be noted in particular that the cold winter of 1981-82 is associated with the lowest summer numbers of mice (3) caught in May 1982 at the start of the study, when, unfortunately no information was available on the previous winter's tree fruiting. In addition, over the 11 years available for study, the May numbers are also highly significantly related to the previous winters' tree fruiting scores (Figure 3). There is a lot of scatter in the points in the high fruiting category (3) and it is unclear whether the low numbers encountered in May 1982 would have improved the statistical relationship if fruiting data was available. To understand the influence of each factor separately a partial (multiple) regression was carried out. This shows that, over the 11 years, both the winter fruiting and winter severity have a strong relationship with May mouse numbers (fruiting: $p<0.003$, and severity: $P<0.007$) with a combined $R^2$ of 0.810 (indicating that 82.8% of the variation in May numbers is accounted for by these two environmental variables), with $F= 136.72$, $P<0.00001$.

Bank Vole numbers in May show a significant positive relationship with December-March mean minimum temperature over the 12 years (Figure 4). Tree fruiting over the 11 years of data (Figure 5) also shows a (less) significant positive relationship with May vole numbers, although there is much scatter in the plot. The partial regression of both winter severity and tree fruiting against May numbers over the 11 years again shows the same significant influences, with fruiting ($P<0.011$) and winter mean minimum temperature ($P<0.013$). The combined influence of fruiting and winter severity is very strong ($R^2 = 0.738$, indicating that 73.8% of the variation in May numbers is accounted for by these two environmental variables: $F = 90.6$, $P<0.00001$).

*Influence of environmental variables on winter numbers*

In winter it is possible that the current or previous tree fruiting may influence numbers and it also seems logical to assess the influence of the mean minimum temperature immediately before/during trapping in late November. For Wood Mice

the immediate tree fruiting showed a non-significant relationship with November numbers. However, one point (November 1990) had high numbers coinciding with a poor/nil fruiting (category 1). This is possibly the result of a very heavy fruiting in the previous winter that still had an influence 12 months later (as discussed above). Indeed, the regression of current fruiting against November numbers without the 1990 point (Figure 6) was significant, indicating that the 1990 fruiting measure may possibly not have indicated the true fruit availability on the ground (or its previous influence on numbers over the summer). It is apparent, however, that overall there is no strong delayed relationship between fruiting and later December numbers, as the regression of previous winter tree fruiting against current winter numbers was non-significant ($P<0.31$). November mean minimum temperature also showed a non-significant ($P<0.67$) relationship with winter mouse numbers.

For Bank Voles the immediate tree fruiting over the 11 years had a non-significant relationship with winter numbers ($P<0.92$); in addition, for the 10 year period 1983-92, the previous winters' tree-fruiting showed a weakly non-significant negative relationship with winter numbers (Figure 7). However, the November mean minimum temperature showed a moderately significant positive relationship with winter vole numbers over the 11 year period (Figure 8). The partial regression of previous fruiting and November mean minimum temperature over the reduced time period allowed the analysis of both variables' individual relationships with November Bank Vole numbers from 1983-1992. This showed similar positive and negative relationships as described above, but they were non-significant in both cases.

## Discussion

*Spring numbers*. The relationships of the various environmental factors with the dynamics of the two species were partly expected, in that some influence of tree fruiting is well documented for these, and many similar rodent species in the old and new world (Watts, 1969, Flowerdew, 1984, Mallorie & Flowerdew, 1994, Flowerdew, *et al*., 2004, Jensen, 1982, Pucek, Jedrzejewski, Jedrzejewska and Pucek, 1993, Boonstra & Krebs, 2006). Bank Vole and Wood Mouse populations in May appear to react to previous environmental conditions in similar ways. Both winter severity and the amount of tree fruiting have strong relationships with May numbers and therefore it is reasonable to presume they both have effects on the numbers present, probably through the balance of energy required and energy available for over-winter survival (Figures 1-4). The influences of previous tree fruitings on rodent dynamics in May were expected, but the relationships with over-winter temperature have not been rigorously described before for UK populations.

*Winter numbers*. The two rodent species show remarkable, and partially unexpected, differences in their relationships between winter numbers and the three measured environmental variables. The varied influences are discussed below:

**1) Current tree fruiting** shows no relationship with Bank Vole December numbers, whereas Wood Mice appear to be significantly influenced by this (Figure 6), once the confusion of poor fruiting mixed with a possible delayed effect of a previously heavy winter fruiting is removed from the analysis. This coincides well with previous studies where Wood Mice, but not Bank Voles, show a strong relationship between winter numbers and immediate food supply through both regression analyses and experimental manipulations (Flowerdew, 1976, Flowerdew, 1984, Mallorie & Flowerdew, 1994, Margaletic, Glaavas and Baumler, 2002). Indeed, a similar case may be shown by red-backed vole, *Clethrionomys spp*., in North America where spruce seed production is irrelevant to their population processes (Boonstra & Krebs, 2006). It has also been found that there are different reactions from different rodent species to different oak tree species' fruiting (Shimada & Saitoh, 2006); this is possibly a further example of possible competition (and therefore dominance in numbers) between the rodent species varying with the size and species of the tree fruiting (Halvorson, 1982, Schnurr, Ostfield & Canham, 2002). In addition, in Poland, (Pucek, Jendrzejewski, Jendrejewska & Pucek, 1993) where both *Apodemus flavicollis* and *Clethrionomys glareolus* populations respond similarly to synchronous peaks of masting by a range of tree species (oak, hornbeam and maple), it is suggested that the synchrony in dynamics may be the result of both rodents responding to different tree species which happen to fruit at the same time, but further work is needed on this.

**2) Previous winter tree fruiting** shows a non-significant relationship with winter numbers for both species; the relationship is weakly positive for Wood Mice and almost significantly negative in Bank Voles (Figure 7**).** Despite the apparent influence of the tree fruiting in 1989 on 1990 Wood Mouse numbers in December, it seems that the long-term influence of the tree fruiting at Madingley is not strong in these rodent populations, unlike Bank Vole populations in Danish beech woods where 'outbreaks' occur in the years following heavy masting (Jensen, 1982).

**3) November mean minimum temperature** has a strong relationship with Bank Vole numbers caught at the end of the month or early in December, whereas it is non-significant for Wood Mice. Bank Voles in Poland (Pucek *et al.*, 1993) also show a breeding response to warm temperatures in July, (in contrast to *Apodemus flavicollis* which show no temperature relationships at all).

Overall the winter Bank Vole and Wood Mouse dynamics at Madingley differ markedly from each other, mainly because of the positive impact of higher November temperatures on the vole population, but not on the mice, and the positive effect of immediate tree fruiting on the mouse population, but not on the voles. Following this diversion in their individual dynamics, their numbers are then influenced in the same way by the similar impacts of both previous winter tree fruiting and winter severity on numbers in spring/summer.

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**Appendix Table 1**. Numbers of bank voles and wood mice caught on the study area at Madingley Wood 1982-1993. Note that in May/June the juveniles (shown in brackets) were additional, and not used in the analyses of dynamics.

| | **Bank Voles** | | **Wood Mice** | |
|---|---|---|---|---|
| | **Numbers of individuals in May/June** | **Numbers of individuals in Nov/Dec** | **Numbers of individuals in May/June** | **Numbers of individuals in Nov/Dec** |
| **Year** | **Adults (Juveniles)** | **Total** | **Adults (Juveniles)** | **Total** |
| **1982** | 11 | 51 | 3 | 77 |
| **1983** | 29 | 25 | 40 | 31 |
| **1984** | 21 | 35 | 10 | 61 |
| **1985** | 10 | 20 | 11 | 49 |
| **1986** | 22 | 39 | 19 (1) | 48 |
| **1987** | 28 | 14 | 21 | 67 |
| **1988** | 52 (3) | 7 | 31 (1) | 81 |
| **1989** | 32 (16) | 14 | 28 (1) | 62 |
| **1990** | 65 | 17 | 48 (8) | 97 |
| **1991** | 4 | 20 | 5 | 44 |
| **1992** | 13 | 57 | 16 (1) | 39 |
| **1993** | 13 | n/a | 14 | n/a |

**Appendix Table 2**. Fruiting assessments of ash and oak on the Madingley Wood study area 1982-92 (see text for details of scoring).

| Year | Ash fruiting | Oak fruiting | Overall fruiting assessment |
|---|---|---|---|
| **1982** | 3 | 3 | 3 |
| **1983** | 1 | 1 | 1 |
| **1984** | 2 | 3 | 3 |
| **1985** | 3 | 2 | 2 |
| **1986** | 3 | 1 | 2 |
| **1987** | 1 | 3 | 3 |
| **1988** | 2 | 2 | 2 |
| **1989** | 1 | 3 | 3 |
| **1990** | 1 | 1 | 1 |
| **1991** | 2 | 1 | 1 |
| **1992** | 1 | 1 | 1 |

**Appendix Table 3**. Mean minimum temperatures at Royston 1981-92 in November and in the following December - March. (Data provided by R. Baker - see text).

| Year | Mean Minimum degrees Celsius in November | Mean Minimum degrees Celsius Dec - March |
|---|---|---|
| **1981** | n/a | 1.01 |
| **1982** | 6.00 | 2.50 |
| **1983** | 5.53 | 2.10 |
| **1984** | 6.47 | 0.62 |
| **1985** | 1.84 | 1.32 |
| **1986** | 5.42 | 1.23 |
| **1987** | 4.70 | 3.51 |
| **1988** | 2.72 | 4.62 |
| **1989** | 3.45 | 4.74 |
| **1990** | 4.89 | 2.18 |
| **1991** | 5.12 | 3.20 |
| **1992** | 5.70 | 2.97 |

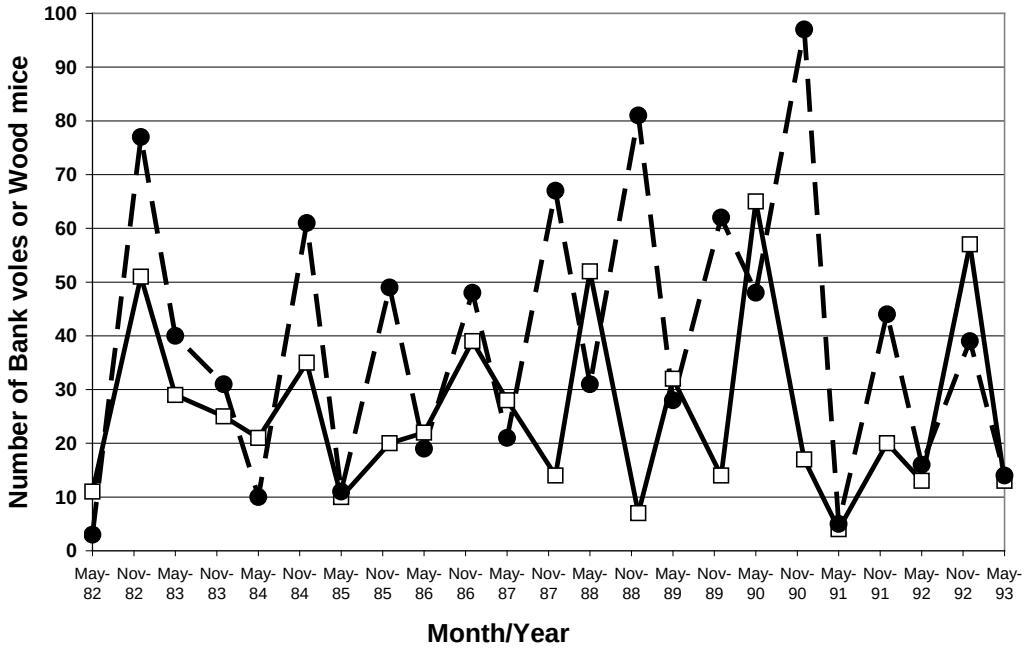


**Figure 1.** Population fluctuations (minimum number present, see text for details) of Bank Voles (solid line) and Wood Mice (dashed line) in May (adults only) and late November or early December (total) on a 0.49 ha live-trapping grid at Madingley Wood, Cambs., 1982-1993.

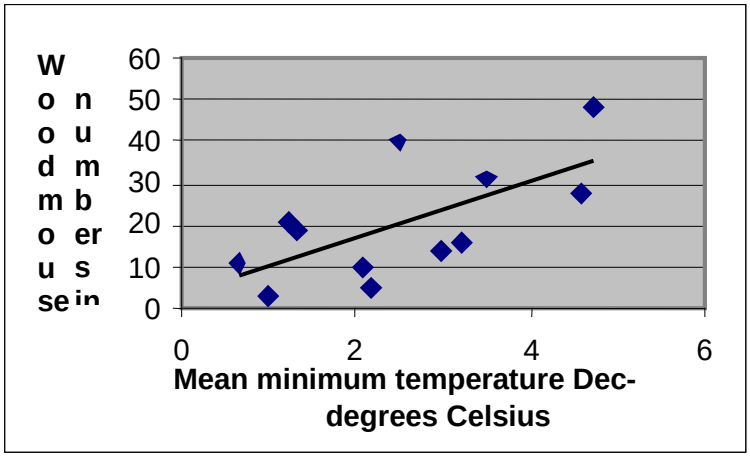


**Figure 2.** Relationship between wood mouse numbers in May (adults only) and the mean minimum temperature from the previous December to March inclusive (an index of 'winter severity'),1982-1992. Regression: y =6.72x +3.70, P<0.020; $r^2$ = 0.432

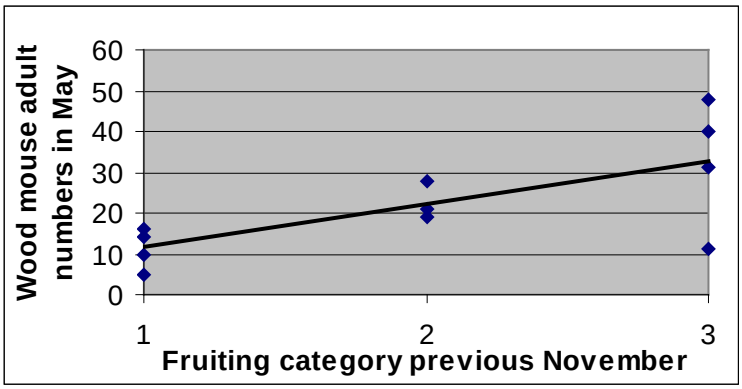


**Figure 3.** Relationship between wood mouse numbers in May (adults only) and the fruiting category assessed in the previous November, 1983-1992. Regression: y= 10.63x +0.84, P<0.014, $r^2$ = 0.507.

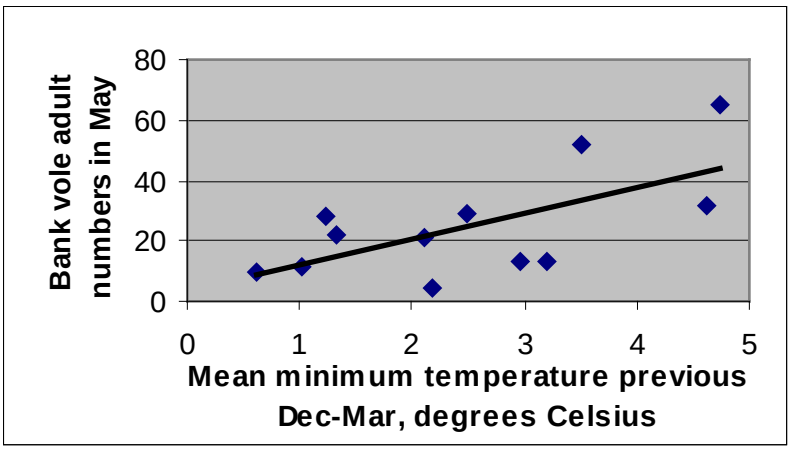


**Figure 4.** Relationship between bank vole numbers in May (adults only) and the mean minimum temperature from the previous December to March inclusive (an index of 'winter severity'), 1982-1992. Regression: y= 8.63x + 3.43, P<0.022; $r^2$= 0.422.

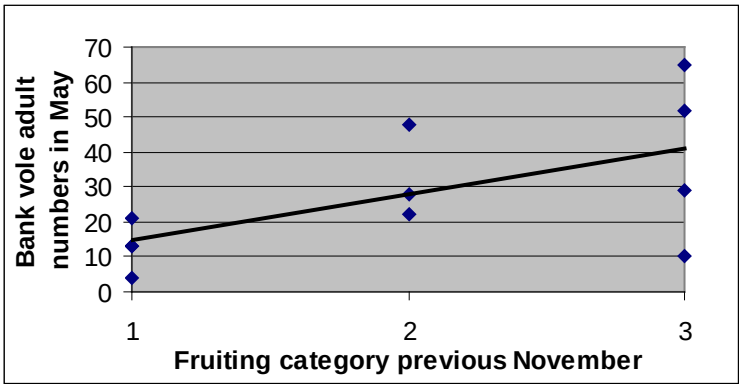


**Figure 5.** Relationship between bank vole numbers in May (adults only) and the fruiting category assessed in the previous November, 1983-1992. Note there are two points at x= 1, y=13. Regression: y= 13.13x +1.48, P<0.049; $r^2$= 0.365.

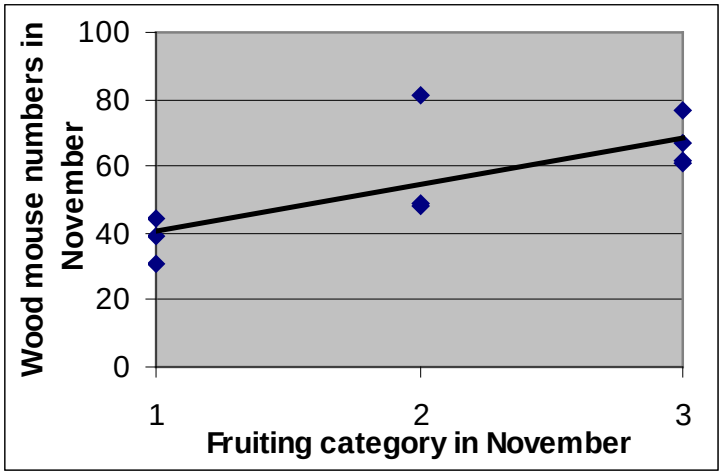


**Figure 6.** Relationship between wood mouse numbers in November and the fruiting category in November, 1982-1992, omitting the point at x=1, y =97, from 1990 (see text). Regression: y=14.07 + 26.35, p<0.012; $r^2$= 0.565.

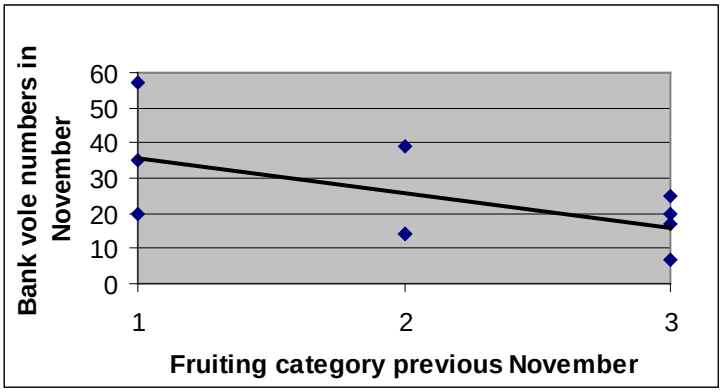


**Figure 7.** Relationship (negative and not significant) between bank vole numbers in November and the fruiting category assessed in the previous November, 1983 -1992. Note there are two points at x= 2, y=14. Regression: y= -9.83x + 45.44, P<0.081; $r^2$= 0.333.

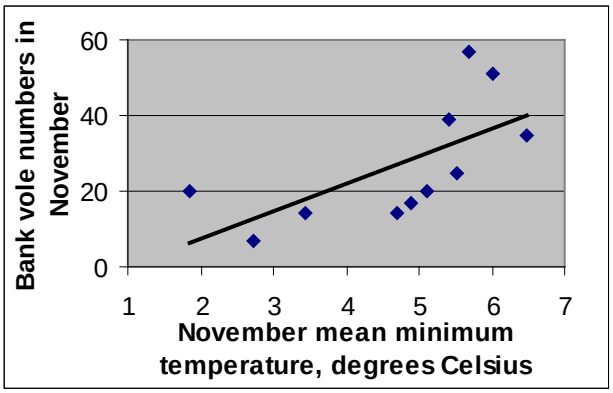


**Figure 8.** Relationship between bank vole numbers in November and the mean minimum temperature in November 1982 -1992. Regression: y= 7.32x - 7.33, P<0.028; $r^2$= 0.428.

# The transformation of the riparian commons of Cambridge from undrained pastures to level recreation areas, 1833–1932

C. D. Preston and J. Sheail

## Introduction

The overwhelming victory of the Whigs in 1832, in the election that followed the passing of the Reform Act, ushered in a great spate of legislative reform. One of the first areas to attract the attention of the reformers was municipal government, and on 28 October 1833 "two of His Majesty's Commissioners for enquiring into the existing state of municipal corporations in England and Wales" began hearing evidence on the Corporation of Cambridge in the town's Guildhall (Anonymous, 1833). The existing Corporation was small and notoriously corrupt (Gray, 1925), and the Committee heard many accounts of malpractice[1]. One topic on which evidence was produced was the state of the Cambridge commons. Mr Chevell, Common-councilman and Deputy Town Clerk, said "he had heard complaints respecting the Commons, but not lately". The Pindar, William Grafton, who was responsible for impounding stray or strangers' stock on the commons, said that "Coe Fen and the Straits are in good order; but that they have been lately drained by subscription; and used to be very bad .... That New Bit (part of Coe Fen Leys), Parker's Piece and New Common are all uncommonly good. That Sheep's Green is pretty fair. That Queen's Green is muddy at the bottom, and that draining would do it good." However, Mr Beales, a long-standing opponent of the Corporation[2], gave evidence "that Midsummer and Butt Greens are in a very bad state; that the ditches are not cleaned. That they are situate immediately opposite the Mayor's house, and that it is in such a state, that if his worship were not of a very strong constitution he must have had the cholera long since[3] .... That Coe Fen was till lately so bad that the mire came up to the horse's knees .... That the medical men considered, that if it were not drained, it would be fatal to the health of the town .... That Jesus Green is by no means in a good state, but for the present dry season would be very bad. That applications relative to the drainage of the Commons had been repeatedly made to the Corporation for the last 30 years; but that they would never do any thing themselves, nor suffer others to do any thing .... That Sheep's Green is in a very bad state during the winter. That it wants draining .... That Queen's Green sadly wants draining .... That Stourbridge Fair Green is usually in a wretched condition .... That they may all be rendered very valuable if properly attended to and drained; and that the drainage might be effected at comparatively small cost."

It is clearly impossible for us to decide which of the two accounts of the commons presented to the Commissioners was more accurate, although the reformers were in the ascendant and historians usually cite and apparently accept without question their vividly expressed evidence. However, it is clear from the evidence given by both sides that (with the recent exception of Coe Fen) the

Commons were undrained. The purpose of this article is to describe how these commons were transformed in the following hundred years. The importance of the commons for recreational use increased during the late 19th and early 20th century. The traditional use of the commons as grazing land was to a large extent in conflict with this and was gradually restricted. The third and very pressing influence was the continual need of the Borough authorities to find land on which they could dump dredgings from the river and rubbish produced by the town, which increased rapidly in population from 10,800 in 1801 to 48,000 in 1901. As we will see, the undulating commons were used as rubbish dumps and thus some were turned into the level, green swards we see today. A second paper (Preston, in preparation) documents the history of the aquatic plants recorded from this area, to examine the extent to which they have been able to survive these management changes.

The Commons covered by the paper are shown on the modern O.S. city map as Coe Fen, Sheep's Green, Lammas Land, Queens' Green (given as Queen's Green in 19th and early 20th century references), Jesus Green, Midsummer Common, Butt Green and Stourbridge Common (formerly Sturbridge/Stourbridge Green/Fair Green). The commons further from the river (Coldham's Common, Christ's Pieces, Parker's Piece, Empty Common) are not covered, although they are sometimes mentioned in passing. Our account of the management of the commons is largely based on the minutes of the Borough of Cambridge Commons Committee, which survive from 1849 onwards[4] and are held in the Cambridgeshire Record Office; unattributed quotations are drawn from this source. The day-to-day management of the commons was in the hands of the Pindars. There were three Pindars in 1850, one for Coldham's Common, one for the northern complex (Stourbridge Common, Midsummer Common, Butt Green and Jesus Green, together with Christ's Pieces and Parker's Piece) and one for the southern complex including Queens' Green, Sheep's Green, Coe Fen and Empty Common. In later years the number of Pindars appears to have fallen to two and later one[5], but the Committee was responsible for other employees (e.g. 3 custodians and 6 labourers in 1913).

This paper develops the broader accounts of the River Cam and its riparian commons published by Preston *et al*. (2003) and Sheail & Preston (2001), papers which (unlike this one) concentrate on the management history of the River Cam.

## Threats to the commons, 1833–1849

Mr Beales' evidence to the Commissioners in 1833 clearly anticipated that a reformed corporation would improve the condition of the commons by drainage. Instead, in April 1841 the new council proposed to enclose the Commons, renting out the higher parts as building land or market gardens and the wetter areas as grazing land. Although the Commons Committee expected that the proposal would receive "a general approbation", a public meeting characterised by "great noise and tumult" voted against the proposal by a great majority and the plan was dropped (Cooper, 1852).

A further threat to the southern commons came from possible development as a railway station. There were numerous plans for railway development in Cambridge in the 1840s. Fellows (1948) identifies 17 proposed sites for stations, including Coe Fen, Sheep's Green and Jesus Green. The most serious threat was a proposal to build a branch line from the current station, opened in 1845, to the centre of the town. The plan[6] shows the line skirting Brooklands Farm then crossing Coe Fen and the River Cam to terminate on the south side of Newnham Mill Pit. This proposal was dropped, perhaps at the request of the University authorities who continued into the 1850s to oppose plans for a second station in the town (Fellows, 1948).

In the absence of such radical developments, the Commons changed gradually along the lines outlined in this paper.

## Transforming the landscape, 1849–1900

### *Drainage*

In 1833 the Commissioners were told by Mr Beales that Coe Fen "has recently been drained by subscription, at the expence of £150, to which the Corporation after two or three years delay *liberally* contributed £10. That the drainage has immensely improved it" (Anonymous, 1833). We have, perhaps surprisingly, been unable to trace any other reference to this operation; perhaps further details could be unearthed in local newspapers, college archives or other sources.

There are rather piecemeal references to drainage in the Commons Committee minutes. In September 1879 the Committee agreed "that a drain be made on Midsummer Common at the back of Mr Bullocks into the river to drain that part of the Common and that four inch tiles be used for the purpose", and in December 1881 "that a drain be put in with 6 inch pipes" to drain the portion of Midsummer Common next to Park Street. A detailed plan for the "the drainage and levelling of portions of Midsummer Common, Jesus Green and Butt Green" was prepared by the Borough Surveyor in 1893. He reported that "there are portions of each of the three Commons that are in a very wet and boggy condition" and his proposals to drain these areas were accepted and put into practice during the year. Meanwhile, in 1892, the Committee had "Agreed that 50 4" tiles be ordered for use of Pearce [the Pindar] on Coe Fen", suggesting small-scale drainage activity here.

### *Infilling the ditches*

Successive maps of Cambridge illustrate the loss of ditches associated with the riparian commons during the 19th century. The length of Jesus Ditch was gradually reduced as different parts became filled in or covered over. Ditches draining Jesus Green and Midsummer Common were shown on Baker's map of 1830 (Cambridgeshire Records Society, 1998), but by 1886 only one remnant survived, Middle Ditch on Jesus Green, which was no longer connected to the river and which had itself disappeared by 1903.

The minutes of the Commons Committee show that the members planned, not always successfully, to have the ditches removed. As early as 1850 it was "Resolved that the SubCommittee inspect the ditch on Midsummer Common and report what it will cost to complete the filling up and draining", and the next year they were discussing "the best means of remedying a nuisance occasioned by Queen's Ditch either by removing or draining the same". In 1853 the Inspector of Nuisances reported that "a ditch near Midsummer Common ought to be filled up". In 1881 Jesus College complained "that part of the ditch on Midsummer Common at the back of Mr Bullocks premises etc. had been filled up". Perhaps the final remnants of the ditches on Midsummer Common were removed with the implementation of the drainage plan in 1893.

The deterioration of a ditch on Coe Fen was reported to the Committee in 1870 by Prof. G.M. Humphry[7]. "The ditch on the Coe fen side of this estate (The Leys) and at the back of Belvoir Terrace derived formerly a good supply of water through a drain from the land springs in the 'New Bit' part of Coe Fen. Almost 12 years ago when gravel was dug from this part for town purposes the supply of water was cut off and to drain where the men were digging a pipe was laid into the adjacent Vicar's brook. Since then the Leys ditch has been in great part empty and in part filled only by stagnant water."

*Levelling the commons with the town's rubbish*

As early as 1849 the Commons Committee resolved "that Mr Rd. Rowe be requested and empowered to give persons carting rubbish on to Midsummer Common from time to time the value of a pint of beer to cart (and level) it into the hollow places as he thinks requisite". The 1851 bye-laws make it an offence to place "any stone, bricks, lime, mortar, timber, building materials, road materials, spare soil, or rubbish whatsoever" on the commons without lawful authorisation (Cooper, 1908), but it was clearly the strategy of the Committee to authorise rubbish dumping to level the commons. In 1853, it was resolved that "a notice be put up authorizing people to cart earth" onto Queens' Green and later, in 1858, "The Pindars are to direct all parties shooting rubbish to deposit same where the water is now standing on Queens Green near Erasmus's walk". Those dumping glass bottles were expected to make sure that they were "covered over" (1860) [8]. At this period people depositing rubbish were expected to level it without inducements, which they were sometimes reluctant to do. "Mr James Coulson[9] attended [7.4.1858] relative to a complaint made by Quincey the Pindar, that his men carried rubbish on the Common without depositing it on the lowest parts or hollows, refusing also to level it; and that on being requested to do so by the Pindar they abused him and threatened to horsewhip him. Mr Coulson was requested to give strict orders to his men on the subject".

In addition to inorganic rubbish, the Commons were convenient dumping places for "manure". In 1868 the Borough paid Edward Mayes "£3 for spreading the dung on Midsummer and Stirbitch Commons" and in 1873 William Marsh was

“appointed in the room of Edward Mayes deceased to spread manure on Midsummer and Sturbridge Commons”. Manure is not mentioned as such for some years afterwards. The term is presumably replaced by the even more euphemistic “road sweepings”, which, in an age of horse-drawn transport, must have included much dung as well as a multitude of other deposits. In typical entries, the Committee agreed to requests “to place road sweepings” or “road scrapings” on Coe Fen, Stourbridge Fair ground and Midsummer Common (December 1889). It was later “Agreed that the Borough Surveyor have authority to employ two men on Coe Fen for trenching the street sweepings etc deposited there” (April 1897). The sites of the dumps were closely controlled, and in 1897 the Omnibus Company, for example, was allowed to deposit its sweepings “at such place as may be directed by the Borough Surveyor or his servant”. In 1899 the Committee “Resolved that the Borough Surveyor have authority to continue the deposit of road sweepings on Queen’s Green, and that he separate from them as far as possible the paper and straw and either bury or burn the two latter”. Although references to road sweepings are less frequent thereafter, even as late as 1918 it was “Agreed that it be suggested to the Borough Surveyor that the uneven ground on Midsummer Common near the Fort St. George should be gradually levelled by the deposit of road sweepings”.

The manure was not all derived from horses. In 1901 the Committee heard that “soil from earth closets from houses in Stanley Road together with house refuse is still being carted on this [Stourbridge] Common. We recommend that this be stopped at once and suggest it be sent to the destructor[10]”.

Various other materials were dumped on the commons. In 1902 the Committee was told that “Star Brewery Cambridge Limited had offered the Town Clerk a large quantity of earth for deposit on Midsummer Common and that he had accepted the same and arranged with the Company to cast it on to the Common for the sum of £5”. The commons were also used to deposit snow cleared from the streets: in December 1890 the Committee discussed a letter from Professor Darwin[11] “complaining that the snow from the streets was carted on to Queen’s Green leaving masses of filthy slush for weeks opposite his house when it was Agreed that the Town Clerk reply to Mr. Darwin that the matter had been referred to the Surveyor with instructions to spread the snow and distribute the debris as much as possible”.

The Committee was constantly concerned that the commons should be leveled and, sometimes, rolled. In 1896 for example, the Committee responded to another complaint from Professor Darwin, about the state of the mud from the river deposited on Queens’ Green, and asked the Borough Surveyor to “see whether or not he cannot level some portions of the deposit”. The same areas required leveling repeatedly, as more material was deposited and, perhaps, as the deposited waste subsided. In 1890 the Committee agreed “that Pearce [the Pindar] have authority to hire three carts and employ three men and a boy for four days for the purpose of carting soil and levelling certain places on Midsummer Common”. Further work

was undertaken in connection with the drainage of the Common in 1893, yet in 1920 the Committee obtained support from the Unemployment Grants Committee (amounting to 60% of the wages bill, up to a maximum of £360) for leveling Midsummer Common and Jesus Green. Nevertheless, the Committee received a complaint in 1922 about "the large number of holes on Midsummer and Coldham's Commons" and pointed out rather testily that "the necessary leveling could be carried out if the road sweepings which are at present carted to the pit on Newmarket Road could be deposited on the above Commons".

*Disposal of dredgings from the river*

The riparian commons were also used as places to deposit river dredgings. In 1858 the Committee "Agreed that the Conservators of the Cam who are about to deepen the River between Kings College Bridge and Clare Hall Bridge have leave to deposit upon the lower end of Queens Green the soil taken from the river", demonstrating that dredgings, like rubbish, were used to raise the level of the commons. In 1868 the Committee resolved "that the mud and sewage matter taken out of the River at the mouth of the drain on Midsummer Common be conveyed by Mr Westrope by boats to Sturbridge Common and deposited there". In the same year the Cam Conservators acquired a steam dredger and the amount of material dredged out of the river increased (Preston *et al*., 2003). By 1889 the Committee was having difficulties finding somewhere to deposit the dredgings. They originally decided on 8 March 1889 to allow the Conservators to deposit some dredgings on Midsummer Common and some on Queens' Green, but following complaints to the Chairman it was agreed on 21 March that enough had been deposited on Midsummer Common and that the remainder should go to Laundress Green and Queens' Green. This in turn proved impractical and on 25 March "after some discussion" the Committee reverted to the original plan of depositing it on Midsummer Common, "upon the understanding that the soil taken out be properly levelled and sown with grass seed .... before the end of May". In the 20th century it became increasingly difficult to find land on which to deposit river dredgings, thus delaying dredging operations and increasing the cost (Preston *et al*., 2003; Sheail & Preston, 2001). However, the deposit of dredgings on Midsummer and Stourbridge Commons continued into the inter-war years.

*Exploiting minerals from the commons*

In general, the commons discussed in this paper were not used for gravel diggings or other mineral extraction. There are isolated references to some apparently small-scale gravel digging. In 1852, the Committee approved a payment "for the filling up the holes from whence the gravel was dug for the paths on Midsummer Common". In 1855, George Dobson undertook "to make a good road 12 feet wide from the Sturbitch Fair Road across the Common to the Ferry bridge at Chesterton and keep it in repair till November for the sum of Thirty five pounds if I am allowed to raise the gravel and stones of Sturbitch Fair Common". By

contrast, two of the commons not considered here in detail, Coldham's Common and Empty Common, were extensively excavated for coprolites between 1854 and 1872, and the details of the arrangements appear in the Committee minutes.

*Reseeding and tree planting*

After ground on the commons was levelled, vegetation was re-established by seeding the ground. A typical sequence is recorded for Queens' Green in 1897–8. On 6 August 1897 it was "recommended to the Council that it is desirable to carry out the work of levelling the earth on Queens Green" and on 29 October "Agreed that the Pindar have authority to seed Queen's Green as soon as the levelling is finished". On 1 April it was again "Agreed that the portion of Queens Green opposite Professor Darwin's premises to be drained ploughed and sown with grass seeds". Professor Darwin's occasional complaints to the Committee perhaps made them particularly conscious of the condition of Queens' Green. In March 1900 the Committee "visited Queens Green when it was Agreed that Pearce the Pindar have instructions to drag harrow the northern end of the Green and seed and roll the same. Special seed to be obtained for planting under the trees". There are various other references to reseeding the commons, including the purchase of 4 bushels of seed from Mr Willers[12] of Trumpington Road for sowing 3 acres of Midsummer Common and Coe Fen (1886), in 1888 of "hay seed for the various commons" and in 1890 of "a bushel of grass and 2 lbs of clover for seeding certain places on Midsummer Common". In 1891 the Pindar was "authorised to obtain two bushels of grass seed for use on the banks of the new roadway on Midsummer Common". In 1900, however, the Committee visited Midsummer Common and strongly recommended that the slope of the new embankment "be laid with turf instead of seeded. That ample turf can be acquired from that part of the Common which is now being raised and the turf covered up".

Tree planting on the commons is recorded occasionally in the Committee's minutes. In 1886 it was "Agreed that fresh trees be planted on the Commons in lieu of those that may have died". The following year the committee gave the Pindar instructions "to hire a horse and cart to remove soil to where the trees are being planted on Midsummer Common" and in 1890 they agreed to the planting of an avenue of [horse?] chestnuts on Midsummer Common. In 1900 the Committee sought "tenders for the planting of trees on the bank of the river between Midsummer and Sturbridge Commons".

## The increasing use of the commons for recreation, 1890–1930

*Conflict between recreation and grazing, 1890–1914*

The Commons Committee minutes give the impression that the commons were primarily used for grazing during the 19th century (Figs 1, 2). In 1861 the Committee reaffirmed that they had no desire to enclose the lands, in view of their use as "places of recreation and exercise .... and the great importance of preserving open spaces in the vicinity of this large and populous Borough", but they wanted

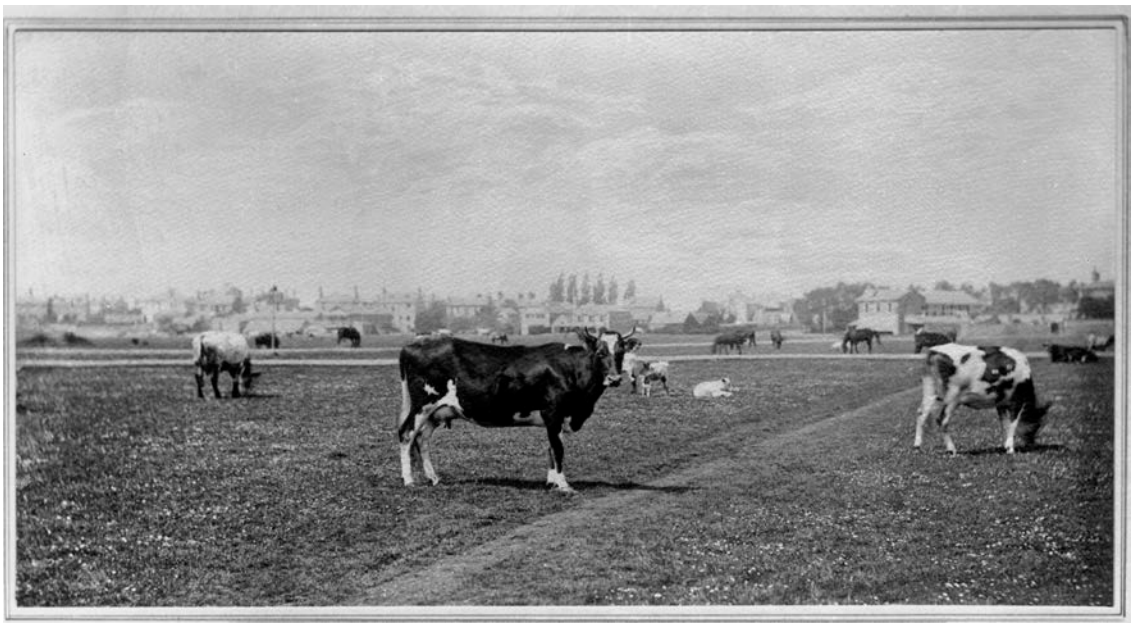

Fig. 1. Midsummer Common in the 1870s, before the construction of Victoria Avenue (Cambridgeshire collection J.Mid.J7).

Fig. 2. A rather romantic portrait of Sheep's Green and Coe Fen in the 1890s, by the photographer T.B. Hunt (Cambridgeshire collection J.Coe.J9). On 7 December 1900 the Commons Committee asked the Town Clerk "to look into the question as to what action can be taken to prevent Mr. Jones turning his fowls on Coe Fen" – could these be his hens in the picture?

the power to charge stockholders to defray the costs of "maintaining and improving" the commons and employing staff to superintend the stock. These powers they eventually obtained under the Commons Act 1876. In January 1881 stock owners were required to register the number of stock they intended to put on the commons during the year and were charged accordingly. It had been agreed in 1877 that Parkers Piece was to be "kept solely for recreation, no horses to be exercised, or cattle turned thereon".

In addition to the use of the commons for grazing, they were used for domestic activities in the 19th century (the restriction of carpet beating to specified sites was a recurring concern of the committee). The documentary evidence suggests there was a marked increase of recreational use after the 1880s. In December 1885 it was decided that, as commoners now paid for using the commons, it was no longer possible to flood Stourbridge Common for skating, although two years later it was agreed to flood it.

In the 1890s references to the recreational use of the commons become increasingly prominent, and this presumably reflects the fact that they had now been improved to a standard that allowed organised activities to take place there. A Ladies Bathing Place was established on Hell Meadow in 1895 (with a Ladies' Bathing Shed Committee[13] to look after the interest of the bathers); the initial proposal to put this on Laundress Green was changed after a protest from Professor Darwin and other residents[14]. By 1900 there were as many as 300 lady bathers on hot days and Miss Hardy, the custodian, "in consequence asked for an increase of Salary". In June 1899 the Committee visited the various commons to decide where seats were required, and in 1909 "receptacles .... for waste paper" were provided. In 1899, just 13 years after the Committee discussed the treatment of three men reported by the Pindar for bicycling on Midsummer Common[15], they asked the Borough Surveyor to prepare a plan for a quarter-mile running and cycling track there. In 1900 the Chairman's action in allowing a bonfire on Midsummer Common to celebrate the Relief of Mafeking was approved.

The conflict between the stock holders and the recreational use of the commons came to a head in 1901. In January the Committee recommended to the Council that the part of Midsummer Common west of Victoria Avenue [Jesus Green] be "preserved .... for purposes of Recreation" between 1 October and 12 May, and consequently that cattle should not be permitted between these dates. On 11 April they agreed to prepare a scheme to convert this area into a recreation ground. In November 1901 "a memorial was read from Cowkeepers and others" protesting against their plans, to which they replied rather brusquely that "the question has already been decided by the Town Council". However, the Town Clerk was informed by the Local Government Board that the Council had no power to make the byelaw required to exclude cattle from the Common. The Committee later met a deputation of stock owners and further legal advice was obtained, but Mr Danckwerts KC also thought that the Council lacked the necessary powers to set aside part of Midsummer Common as a recreation ground. It is, however, apparent

from a minute of April 1908 that there were cricket pitches on Midsummer Common, so clearly there was already considerable recreational use. The recreation ground proposal must have been resurrected in the following decade, as in May 1913 a "resolution passed at a meeting of Stockowners protesting against a portion of Midsummer Common being set apart as a Recreation Ground" was reported to the Committee. However, the commons were soon to be put to less peaceful uses.

*Wartime use of the commons, 1914–18*

A brief interlude in the history of commons was their use for military purposes in 1914–18. War was foreshadowed in 1911 when the Committee agreed to an " application from the War Office for permission for the use of Midsummer Common during the Autumn Manoeuvres for General French's Camp[16] from 14th. to 23rd. September". By 4 September 1914 the commons were obviously occupied by troops (Fig. 3), as it was "Agreed that the Military Authorities be asked to place


Fig. 3. Red cross waggons and horses of the Sixth Division on Coe Fen, 1914 (Cambridgeshire collection TG.K14). The Sixth Division was formed from units of the Regular Army on the outbreak of war (4 August 1914), and ordered to concentrate near Cambridge. It included three 'Field Ambulances' (units of 10 officers and 224 men). By early September it was fully equipped and trained and on 10 September it landed at St Nazaire, remaining on the Western Front for the duration of the war (www.1914-1918.net).

any latrines which it may be necessary to erect on the Commons for the accommodation of the troops encamped there at least one hundred yards from the dwelling houses". In June 1915 the Committee agreed that "Cambs Volunteer Training Corps be authorised to construct trenches on the Commons on sites selected by the Borough Surveyor" and there were clearly trenches on Coe Fen by July 1915, as the attention of the Military Authorities was drawn to the danger they posed to cattle. Later that year the 5th Essex Territorial Regiment were given permission to dig trenches on Coe Fen and the south-east corner of Stourbridge Common, and the Cambridgeshire Regiment on Coe Fen; the Royal West Kent Regiment were digging trenches on Empty Common. By February 1916 "Christ's Pieces, Alexandra Gardens, Sheep's Green and the Lammas Land are the only grounds that are not being put to some use for the training of soldiers".

*Recreation takes over, 1918–1932*

When in January 1920 the Commons Committee listed the matters they would like to see in any parliamentary Bill promoted by the Corporation, the first two items they included were "the abolition of rights of commoners on Lammas Lands" and "power to set apart a portion of various commons for cricket and other games, and to exclude cattle from such portions". In November 1923 they recommended to the Council that animals be excluded from Jesus Green and that the Superintendent "be asked to present a scheme to the Committee for converting it into a Sports Ground". This clearly went ahead, as by November 1925 "Jesus Green Sports Ground" is being referred to in the minutes. The approval of the Unemployed Grants Committee had been obtained in February 1924 for "the construction of a Promenade on the South Banks of the River Cam" along Stourbridge and Coldhams Commons. A scheme for converting Lammas Land into a recreation ground was deferred in January 1924, despite advice that there was no legal obstacle to proceeding with it, but appears from the minutes to have been underway by September 1926. A plan to lay out a portion of Stourbridge Common as a recreation ground was submitted to the Committee in May 1925. Later that year the Committee gave the Cambridge Banks Hockey Club permission to play on Coe Fen and Stourbridge Common. At a meeting of the Committee in November 1926 the suggestion that the Committee be renamed "Parks and Cemetery Committee" was proposed and seconded, which suggests that at least some members now regarded the riparian commons as public parks, but this proposal was voted down and instead the Committee recommended to the Council that it should be renamed the "Commons and Cemetery Committee".

In June 1927 the Committee decided not to exclude cattle from the remaining, eastern portion of Midsummer Common, but by September 1929 the Town Clerk submitted a report on the powers of the Corporation to prohibit cattle grazing on Midsummer Common and Coe Fen. There were legal difficulties in removing restrictions on the recreational use of Midsummer Common and Butt's Green, and at the end of the period under review, in May 1931, the Committee were told by the

Town Clerk of the inclusion in the proposed Corporation Bill of powers to allow the Corporation to prevent grazing in this area. Meanwhile, in November 1929, the Borough Surveyor "reported that the cost of constructing a miniature golf course on Coe Fen .... would be £1,300".

In the last decades of our period there are the first indications that the aesthetic or nature conservation interest of the commons was of interest to a minority of Cambridge residents. The *Cambridge Chronicle*, a newspaper that often sniped at the Council, commented[17] on 24 November 1915 that "Coe Fen .... has been altered out of recognition, and we doubt whether it is really in the interests of the town to use it as a deposit heap. The Fen originally had a charm of its own, and many old residents deplore the alteration going on". In 1924 there was a Public Inquiry by an Inspector of the Ministry of Transport into the proposal to construct Fen Causeway, a road across Sheep's Green and Coe Fen. Such a road had been discussed since 1904, but the impetus in 1924 came from the agreement of the MoT to contribute 50% of the cost as a contribution to the relief of unemployment in the area. The Public Inquiry lasted one day, and the *Cambridge Chronicle* (6 February 1924) reported Alderman Raynes'[18] opening remarks that "the views of the population as a whole, 60,000 people, were to be preferred to the views of a few who focussed their minds on one particular point, the natural beauty of the fen". However, the Borough Surveyor agreed not to attempt to drain the Fen, "a concession to people who took an interest in the growth of plants". A further attempt to protect part of the commons was made in September 1926 when the Commons Committee received letters from Dr Hugh Scott[19] and Professor J. Stanley Gardiner[20] suggesting that part of Lammas Land, which the Committee had agreed to turn into a recreation ground, "might be laid out as a Bird Sanctuary". However, "the Borough Surveyor reported that the ground had been levelled and sown".

**Implications of the management history**

Although we have known the riparian commons of Cambridge for decades, we never dreamt (until we undertook this research) that the level green swards of Midsummer Common, Jesus Green and Queens' Green concealed the dumped rubbish of Victorian Cambridge, nor did we imagine that the slightly more natural surfaces of Sheep's Green and Coe Fen had been so extensively modified. Although the rise of historical ecology as a discipline in recent years has emphasised the extent of the human modification of semi-natural habitats, the sheer extent of the operations to these sites at the edge of the city is remarkable. It brings into specific focus such generalisations as 'eutrophication' and 'recreational pressures'. The effect of the management of the commons on the visible landscape is, once known, easily appreciated. It is more difficult to assess the impact of the frequent reseeding of the commons. There must clearly have been considerable scope here for the introduction of both alien species and of alien genotypes of native species, a subject of much current debate which has been discussed in a Cambridgeshire context by Akeroyd (1992) and Sell (2006).

The account here is mainly presented from a single perspective, that of the Commons Committee. Inevitably it is an official view, and it must be at best a partial history. Items which required action by the Committee are obviously those that feature in the minutes, and there may well be significant events which are unrecorded because they were matters of routine. In particular there is a danger that we have underestimated the scale of the recreational use of the commons in the 19th century, although the treatment of the 1886 cyclists suggests that opportunities for informal recreation were rather limited. Doubtless other sources might contain extra material to enhance our understanding of the use of the commons, but the main outlines of the story, the deliberate use of rubbish and river dredgings to raise and level the commons, are very clear.

It is perhaps surprising that we had not become aware of the transformation of the riparian commons from the botanical literature. There are perhaps two reasons for this: authors tend not to write about things with which they know their readers will be very familiar, and both the habitats and the plants of the commons were probably too common in the county to have been of specific interest to botanists. There is one study, by I.H. Burkill (1893), on "plants distributed by the Cambridge dust-carts", which lists the species growing on the "dust of the Cambridge streets .... now dumped on Coe Fen with the purpose of raising the level". However, the most evocative description of the transformation of the vegetation of the commons we know is in Gwen Raverat's account of her Cambridge childhood, *Period Piece* (1952). Mrs Raverat, Professor Darwin's daughter, recalled that, when she first saw Queens' Green from her nursery window "the level of the Green was then lower than the road, and the horses grazed on the smooth ancient turf .... Then the Town Council decided that the level of the Green must be raised; and for a long time – two or three years – it was in a most repulsive mess, while cart after cart dumped refuse. The horses used to flounder about and often fell on the slippery mud .... At last the grass grew on the Green again; but the old, old turf[21] was gone and most of the daisies, too; and it has never been so beautiful since the level was raised".

**Notes**

1. Most shockingly, from one of the councillors, Richard Starmer, who considered that "the Corporation have a right to expend all their income on their friends or themselves, without laying out any part of their revenue for the benefit of the town". The publication of the report of the 1833 Commissioners was greeted by a thunderous denunciation of the old Corporation by *The Times* in a leading article cited by Taylor (1999).
2. S.P. Beales was a leading merchant who in 1826–29 had successfully challenged the Corporation's right to levy tolls on carts bearing merchandise as they entered and left the town (Gray, 1925).
3. The reference to cholera was highly topical: London had suffered its first outbreak in 1832. Mr Beales was clearly a believer in the 'miasma theory', which held that cholera spread in foul air such as that produced by rotting vegetation. It was not until 1854 that Dr John Snow demonstrated that it was actually transmitted in drinking water, thus proving the rival contagion theory (Hempel, 2006).
4. In 1861 a draft petition prepared by the Committee said that the commons "for above 25 years have been put under the special care and supervision of a Committee of the Council .... called the Commons Committee", suggesting that the Committee was set up soon after the establishment of the new Corporation under the Municipal Corporations Act of 1835. It was certainly in existence by 1841 (Cooper, 1852).
5. Three Pindars are named in *Mathieson's Cambridge Directory* (1867), two in *Spalding's Street and General Directory of Cambridge* for 1878, 1881, 1884 and 1887, and one in 1895 and 1913.

6. Cambridge University Library Maps.53(2).84.6 and MS.Plans.55(a). One still frequently hears the University authorities blamed for their opposition to railway development and the allegedly inconvenient position of Cambridge Station away from the centre of town, but such critics never consider the effect a closer station would have had on the character of the town centre.
7. George Murray Humphry, Professor of Anatomy (1866–1883) and later Professor of Surgery "began as a poor G.P. but became one of the most influential people in the University of Cambridge" (Matthew & Harrison, 2004).
8. A later minute (6.1.1888) dealing with the deposit of rubbish on Empty Common told the depositors that "they must place it at the lower end beyond the part levelled and that if they deposit of glass or tin they must take care to cover it up".
9. Joseph Coulson, "bricklayer and builder", "builder and beer retailer" or "builder" of East Road is listed in *Craven and Co.'s Commercial Directory* (1855) and Kelly's *Post Office Directory* (1847, 1864), but I cannot trace a James Coulson.
10. The destructor used street refuse as fuel instead of coal (see *Cambridge Chronicle* 24 November 1915, p. 3).
11. George Howard Darwin (1845–1912), Charles Darwin's son, was elected Plumian Professor of Astronomy and Experimental Philosophy in 1883. He lived at Newnham Grange and a portrait of the family is given by his daughter Gwen Raverat in her minor classic *Period Piece* (1952).
12. Geo.Willers, nurseyman of Trumpington Road, is listed in *Kelly's Directory* for 1883.
13. Cf Raverat's (1952) remarks in *Period Piece* on "another activity of the Cambridge Ladies: Committees: lovely Committees. How they did enjoy them!". One lady invited to serve on the Women's Bathing Place Committee (6 July 1900) was Mrs Marshall Ward of Cranmer Place, presumably the wife of the Professor of Botany, Harry Marshall Ward.
14. A detailed account of Darwin's campaign against the site of the Bathing Place is given by Keynes (1984).
15. They decided to take no further action against them in view of the fact that the three, S. Barnard of Emmanuel College and C.K.B. Cane and J.S. Barnes of Pembroke College, apologised to the Mayor for their trespass.
16. General Sir John French, later first Earl of Ypres, was then Inspector-general of the Forces; he commanded the British Expeditionary Force to France in 1914.
17. We initially found this quotation in Reeves (1977).
18. Alderman W.L. Raynes was the council's expert on finance; for a rather obsequious portrait see *Cambridge Independent Press* 8 August 1930, p. 4.
19. Dr Hugh Scott was, in 1926, Curator in Entomology, Museum of Zoology, University of Cambridge and later (1930–48) Assistant Keeper, Department of Entomology, British Museum (Natural History).
20. J Stanley Gardiner, Professor of Zoology 1909–1937, is perhaps best remembered by Cambridgeshire naturalists as the editor of *The natural history of Wicken Fen* (Gardiner & Tansley, 1923; Gardiner, 1925–32).
21. The references to the deposition of rubbish and dredgings on Queens' Green in the 1840s and 1850s cited earlier suggest that the turf was not really as ancient as she suggested.

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## Sea Bird departures from the Wash: the Cambridgeshire connection.

Graham Easy

For the past century Cambridge Bird Club watchers have provided the bulk of the published bird information on the South Wash. Throughout this history the Wash was recognised as the source of the majority of winter and autumn arrivals and movements across Cambridgeshire. Of special interest in recent times have been the passage routes taken inland by sea birds, especially skuas, Kittiwakes and terns. There are three main

departure points. Little information comes from one of these, the south-west corner at Welland Mouth; but there is little likelihood that birds going inland from this point would pass into Cambridgeshire. The other two staging posts do involve birds that mainly overfly the county.

**The South-east Corner, Terrington or Lynn Point**

This area was watched quite regularly during appropriately northerly weather conditions from the 1950s to the early 1990s. At first the River Ouse and its mouth were considered to be the guide line for seabird overland movements. Certainly large numbers of terns, some skuas and Kittiwakes were heading up this river system; however, a proportion of those going inland as the tide rose would return as it ebbed. Nonetheless significant numbers of skuas, terns and the odd Gannet, Fulmar or even Manx Shearwater did make off, usually quite low, in periods of northerly gales. One suspects some of these storm-driven individuals were the most likely to be observed later wandering about in Cambridgeshire. Generally birds setting off on this route appeared to lack any great commitment and skuas especially spiralled for long periods. One such incident was the spectacular spiral of skuas off Ouse Mouth during the gale of 7$^{th}$ October 1982, watched by Norfolk observers who failed to notice the impressive departures inland witnessed by our CBC contingent half a mile away up the river – which shows the difficulty of confirming an actual departure along this route.

In marked contrast a direct southerly heading of skuas especially, terns and the occasional Kittiwake group was first noticed in 1961. At Terrington the birds were coming in a little east of north, passing over the sea wall, almost following the pathway across the reclaim to head inland possibly a little west of south. Skuas taking this route usually headed in purposefully, the Arctic flocks often calling wildly as they departed. These were either at a moderate height or gained altitude steadily as they made off inland. This heading would have taken the birds into Cambridgeshire near Welney, on towards Cambridge and possibly to the South Coast around the Isle of Wight then on towards the Cherbourg Peninsula and the Bay of Biscay.

**Nene mouth – the other departure point**

This major staging post has only recently been documented fully. The original concept of this exodus being an entirely up-river, southerly movement of skuas, Kittiwakes and terns passing directly into Cambridgeshire at Wisbech, has been overturned. After ten years of more thorough observation a large south-westerly passage has become apparent with birds passing over generally at a very high altitude, possibly a movement that is too high to be visible at inland sites. Originally it proved difficult to assess the heading accurately with birds disappearing into clouds or cloud-bases as they made off. It was thought that these birds went over Lincolnshire and Northamptonshire, not touching Cambridgeshire; however, a chance observation of a group of Great Skuas migrating at a great height over Gore Point showed them to be heading towards the bund off Nene mouth. As this did not line up with the considered migratory heading a more serious attempt to pinpoint the overland flight path showed this to be a tad more to the south than

originally reported. This new projection indicates that the birds pass into the Soke of Peterborough, across the north-west corner of Huntingdonshire and on to the south bank of the River Severn thence into the Bristol Channel and the Atlantic. Thus all the birds from Nene mouth on this heading or flying up the river are heading towards Huntingdonshire or Cambridgeshire.

Totals of Kittiwakes and Skuas in Cambridgeshire and heading inland.

| | Kittiwake *Rissa tridactyla* | Great Skua *Catharacta skua* | Arctic Skua *Stercorarius parasiticus* | Pomarine Skua *S. pomarinus* | Long-tailed Skua *S. longicaudus* |
|---|---|---|---|---|---|
| Total of birds departing inland | | | | | |
| Ouse mouth 1965 – 1993 | c. 1,000 | 251 | 1,038 | 154 | 10 |
| Nene mouth 1993 - 2004 | 40,540 | 2,220 | 2,163 | 336 | 19 |
| Total of birds in Cambs (to 2003 | 1700+ | 19 | 118 | 11 | 2 |
| Total of birds in Hunts (to 2003) | c. 750 | 29 | 70 | 13 | 3 |

**Skuas and Kittiwakes over Cambridgeshire**

Having observed a total in the order of 1,100 Kittiwakes and 60 skuas over Cambridgeshire or vc29 in the 1960s-1990s the author was spurred on to assess the numbers passing over the county yearly. This has involved targeting as many of those weather conditions that promote inland movements from the South Wash; watching in uncomfortable and often bitter conditions, staring for hours to spot birds passing inland low or else way overhead, a mile or so high. Obviously one person cannot spot all that pass; for instance a large proportion of Kittiwakes even in flocks of hundreds look like wisps of grey-white smoke at these heights. The overall personal total of 6000 skuas and 40,000 Kittiwakes heading towards Cambridgeshire from the Wash over the last 40 years has provided the basis of the following calculations.

The Kittiwake departure is concentrated along the Nene mouth coastline, where the average of five of the most thoroughly covered years produced approximately 7,500 birds per annum. Since the coverage is never complete, and the movements were often in progress prior to my counts and further passage would have occurred at the unwatched Ouse mouth the overall total must be in the region of 10,000 birds each year, with the major movements in November to March – sometimes, surprisingly, into April.

Skuas: of eight years receiving more thorough coverage at Nene mouth the average was approximately 500 skuas annually. A six-year period at Ouse mouth produced a 200 yearly average. Admitting similar limitations to the accuracy of this tally as with Kittiwake, it would seem likely that up to 1,000 skuas are involved per annum, mainly August to December.

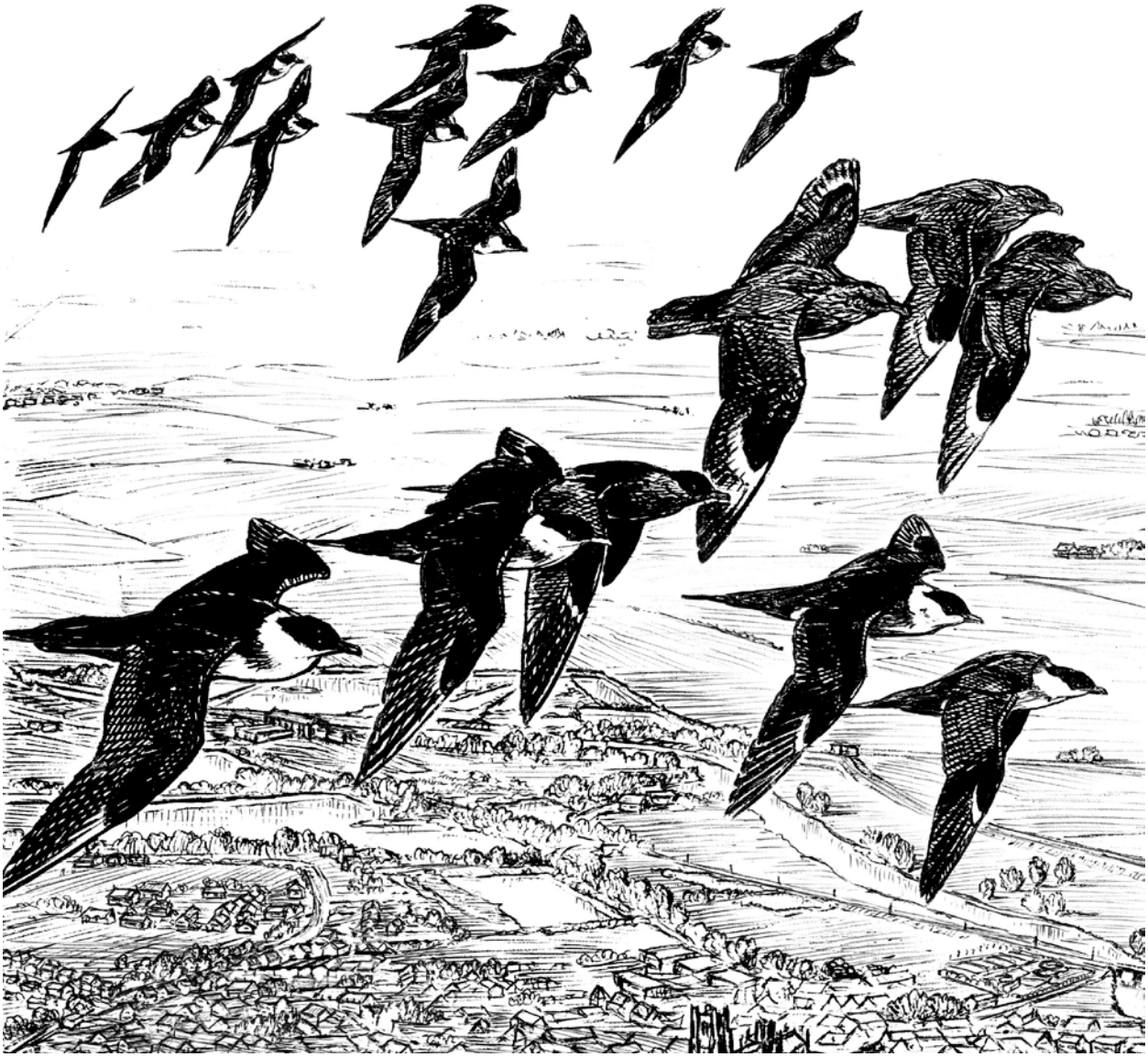
To the inland Cambridgeshire watcher this total of 1,000 skuas and 10,000 Kittiwake passing over yearly is tantalising.

One is most likely to encounter them in gale northerlies when the birds are not in complete control of their intended heading or wandering storm-driven, rather than migrating. Birds are more likely to be attracted to flooded Washland, pits or open expanses of water such as Grafham Water. Such birds, possibly exhausted as well as lost, can remain for long periods. Kittiwakes especially become quite attached to inland life and become regular feeders at rubbish tips, along with the congregations of gulls, as well as on larger areas of open water. More often they are only temporarily tempted to shelter or feed for a short time before continuing their journeys. Such an occasion was 22nd February 1999. Having watched over 4,000 Kittiwake fly up the River Nene from the coast, one low-flying flock of 650 birds was followed by car to the site of the old Wisbech Sewage Farm where the flock deviated from the river to rise high to head in the direction of the Ouse Washes. That afternoon on the Welney to Pymore Washes almost 900 were milling about with the gulls gathering to roost, indicating that a proportion of the passing flocks had been attracted down. Similarly flocks have also dropped down to Grafham Water in like conditions. During the sleety afternoon of 4th January 1981 four flocks totalling approximately 180 birds headed southwards over Milton farmland, no doubt attracted by the large number of gulls feeding at the nearby rubbish tip; on 13th April 1969 a flock of 200 flew south over Milton having been noted earlier over Waterbeach pits. Thus it is possible to encounter large flocks inland; however, it is more usual to see individuals or small parties. Sometimes they participate in quite abnormal activities: on 11th March 1966 an immature bird followed the plough with Blackheaded Gulls to feed on earthworms.

The quest for Cambridgeshire skuas can be frustrating. The flooded Ouse Washes have provided some of the best opportunities to spot migrating birds. Nevertheless it is surprising how many groups have been observed over major towns; possibly the conglomeration of roofs are mistaken for large areas of water at a distance as the birds approach. There was an abundance of reports from open farmland at Milton, but this was at a time when large gravel pits were to the north and south and of course Cambridge was also on the path of these birds. One must also point out that the observer was a farmer all day in the field, binoculars at the ready, with an especially keen eye during northerlies!

Grafham Water is the obvious place to see wandering or lost birds of course, but two points where major routes of high flying as well as storm-driven birds enter the county are at Welney on the Ouse Washes and Foul Anchor on the River Nene. Foul Anchor had been discounted in the late 1990s despite the regularity with which skuas passed over Wisbech Sewage Farm, next door, in the history of that site. Skuas had been spotted from this area but had been in the distance towards Sutton Bridge and veered to a more westerly heading before reaching the county boundary. More recent observers seem to be having more success there; even so, it is surprising how few have been claimed. From the coast flocks of up to 80 of these bulky Great Skuas have been watched until lost to sight with high powered telescopes and binoculars on a course for Cambridgeshire and surely within a mile of that goal. Time should prove the true worth of the watch point at Foul

Anchor. That is if the weather patterns of the last two years do not become permanent features. What appears to have been a change in the jet stream has caused low pressure areas to cross Great Britain from SW to ENE rather than from NW to ESE. During this survey most of the skuas and Kittiwakes entering the Wash were very likely to be on an overland migration. This new weather sequence does not produce suitable migratory conditions very frequently, thus the birds make a few frustrated attempts to make off then often fly back along the Lincolnshire coast rather than heading off inland.



Great and Arctic Skuas flying over Ely.(Drawn by the author)

## Vascular Plant Records

Alan Leslie

The list of records below must be one of the most diverse and exciting for many years. Not only was 2006 exceptional in the number and quality of the records made, but numerous earlier finds have now either just come to light or have recently been determined, not least of these the result of Peter Sell's painstaking examination of the hawkweeds at Royston where no less than twelve different species are now known to occur.

In a year remembered for its long, extremely hot and dry summer it is all the more remarkable that so many of the best native finds have been of plants associated with water or damp ground: *Oenanthe crocata*, new to the county, found on a Cambridge Flora Group outing to Swavesey, two new records for *Anagallis tenella*, plus *Eleogiton fluitans* and *Juncus bulbosus* refound at Whittlesey after many years. To have gained one new Water-dropwort might be considered fortunate but to have added two in one year is little short of remarkable, but with the addition of Jonathan Shanklin's find of *Oenanthe pimpinelloides* at Waterbeach this is exactly what happened and Cambridgeshire can now boast the 'full set' of seven British species.

Several new hybrids are reported for Cambridgeshire, one of these, a cross between *Conyza sumatrensis* and *Erigeron acer*, probably new to the British Isles. This time our roadside maritime flora was increased by the addition of just *Carduus tenuiflorus*, although there is an as yet unconfirmed record of *Elytrigia atherica* on the A14 somewhere near Bar Hill. As usual there is a rich crop of new alien discoveries, none more remarkable for being literally under the feet of so many people as the abundant *Portulaca oleracea* in the cobbles of the Great Court of Trinity College! No less intriguing is the confirmation of Ron Payne's reports of *Epilobium obscurum* on walls in several places in the northern part of the county, in an area and in a habitat from which this species has not previously been recorded. It is almost certainly being overlooked elsewhere.

As ever these records are perforce almost entirely restricted to first and second records for the botanical vice-county of Cambridgeshire, but a great deal of other recording goes on, contributing to our detailed knowledge of the flora. Jonathan Shanklin took up one of the challenges posed by Nick Millar and myself last year in *Nature in Cambridgeshire* and surveyed the parish of Waterbeach, with very satisfactory results, whilst David Barden has done a similar rewarding job with Teversham parish. The latter also continued his close study of the Science Park at Milton, revealing significant further populations there of *Vicia lathyroides*, and chased Cambridgeshire records for the Everlasting Peas (*Lathyrus latifolius* and *L. sylvestris*) and their varieties. I continued to extend our knowledge of *Berberis vulgaris* in the county and can now say that we must have over 50 bushes, some of which are probably well over 100 years old. There are many more challenges out there for anyone wanting to take up a species (or a whole genus) or some area or habitat: the rewards and satisfaction can almost be guaranteed!

On a rather different note Prof. John Richards has kindly reviewed all the material of Cambridgeshire dandelions in the herbarium of the School of Plant Sciences (**CGE**) and in the process has given us records for more than 15 new species, which I hope will feature in next years report: however in the process he also removed a few from the county list, so this was rather a case of both swings and roundabouts.

During the year I have endeavoured to establish contact with all the neighbouring vice-county recorders to make them aware of our plans for a new Flora of Cambridgeshire and to find out what they are doing in their own areas. This has already borne fruit in setting several of our new records listed below in a wider context and I have tried to draw attention to this in the individual records concerned.

*Achillea nobilis* One plant established on waste ground, layby along the Oakington Road, Cottenham, TL442668, A.C. Leslie, 6.1990, **CGE**. First v.c. record for this southern European species grown in gardens for its filigree foliage and heads of tiny flowers with white ray florets.

*Anagallis tenella* (a) several patches on bare soil thrown up from excavation of fishing lake, Middle Moor, Whittlesford, TL46334809, A.R. Arbon, R.D. James & M.A. Holland, 10.6.2006; last reported on Middle Moor in the 19$^{th}$ century (b) along 10m of ditch running across recently cattle-grazed fields, Fowlmere RSPB reserve, TL40674521, S. Lambert, 2005; not previously known at Fowlmere. A remarkable brace of records and a welcome return of Bog Pimpernel in an area of the county where it was once more frequent. Last reported at Sawston in 1977 and at Thriplow in 1979. Otherwise only recorded recently at Chippenham Fen.

*Anoda cristata* var. *brachyantha* Thriplow tip, TL445445, G.M.S. Easy, 10.10.1976, **Herb. G.M.S. Easy**, det. A.L. Grenfell. First v.c. record for a small-flowered variant of a North American Malvaceous perennial, often seen or treated as an annual over here. Previously published and illustrated from Cambs. material in *BSBI News* 47:36 (1987).

*Azara microphylla* One self-sown plant at base of street wall of Department of Earth Sciences, Downing Street, Cambridge, TL4558, A.C. Leslie, 17.8.2006. First v.c. record. Several huge old plants of this evergreen shrub with vanilla-scented flowers are planted within the Downing complex.

*Briza media* f. *albida* A few flowering stems, in triangular meadow on north side of Soham Lode, Soham, TL6172, J.L. Sharman, 2003. First v.c. record for a variant of Quaking Grass lacking anthocyanin in the inflorescence.

*Campanula carpatica* Several flowering plants, presumably self-sown, in crevice running round the top of a chest tomb, St Benet's churchyard, Cambridge, TL4458, A.A. Butcher, 9.2006. First v.c. record for a popular dwarf garden bellflower, accompanied here by *Asplenium ruta-muraria.*

*Carduus tenuiflorus* One large plant on south-west verge of A14, Bar Hill, TL37996419, A.C. Leslie, 18.6.2006, **CGE**. The Slender or Seaside Thistle was last recorded in the county on a verge at Cherry Hinton in 1955. There is a large population on a railway-side dump at

Conington (Hunts) and it is also reported to be spreading on new verges around St Neots (J.O. Mountford, *pers. comm.*).

*Carex acutiformis* x *C. riparia* (*C.* x *sooi*) Second field east of R. Cam, Cambridge Washes, Dimmock's Cote, TL539721-2, G. Crompton & P. Stebbings, 26.5.1992, **CGE.** This parentage was suggested by R.W. David and was confirmed by A.C. Jermy, M. Foley and M. Porter in 2002. First v.c. record of a very rare hybrid.

*Carex buchananii* One self-sown plant at base of brick wall, Back Lane, Ely, TL54528003, A.C. Leslie, 3.7.2005, **CGE** (vegetative material); revisited 13.8.2006 when flowering material (**CGE**) confirmed the identification. First v.c. record for one of the reddish brown New Zealand sedges, which recently have been much in vogue in gardens.

*Carex riparia* x *C. vesicaria* (*C.* x *csomadensis*) North bank of R. Ouse, near Aldreth, TL408735, A.O. Chater, 2.7.1955, det. A.O. Chater & A.C. Jermy, **BM.** First v.c. record for another very rare sedge hybrid and the challenge must now be for someone to refind it!

*Cedrus deodara* One self-sown tree (c.20ft tall in 2006), wedged between two graves, Mill Road cemetery, Cambridge, TL461582, A.C. Leslie, 10.2.2002, specimen collected 1.1.2006, **CGE**. First v.c record for a clearly self-sown Deodar Cedar.

*Ceratocapnos claviculata* Weed amongst bedding plants, Notcutts garden centre, Horningsea, TL493622, A.C. Leslie, 15.1.2006. First v.c record for Climbing Corydalis, a native annual usually found on free-draining, acidic soils, here clearly an accidental introduction.

*Ceterach officinarum* Sixteen plants on west side of boundary wall, on south side the junction of Church Green and High Street, Hinxton, TL496451, D.J. Barden, 4.6.2006; on visiting the site on 8.6.2006 ACL discovered thirty seven more plants on the house side of the wall and two more on the boundary wall of 2 Church Green. Fourth v.c record for Rustyback Fern and our largest colony.

*Cirsium arvense* x *C. palustre* (*C.* x *celakovskianum*) By the wind pump, Wicken Fen, TL562706, P.D. Sell, no.91/197, 8.8.1991, **CGE**. Second v.c. record; both parents were present in the area.

*Conyza floribunda* var. *floribunda* Weed on wasteground, Botanic Garden, Cambridge, TL455573, P.D. Sell, no.99/352, 1.10.1999, **CGE**. First v.c. record for this variant of the South American alien dubbed the Many-flowered Fleabane by Peter Sell. A close relative of the ubiquitous North American alien *Conyza canadensis*.

*Conyza floribunda* var. *linearifolia* Between pavement slabs, Free School Lane, Cambridge, TL4458, P.D. Sell, no.99/374, 30.9.1999, **CGE**. First v.c. record for this variant. Since reported from other sites in Cambridge, Histon and Wisbech and no doubt overlooked elsewhere.

*Conyza sumatrensis* x *Erigeron acer* (a) Sixteen plants, with both parents, on south-west facing, steep chalk bank on north side of Royston bypass, TL36374216, A.C. Leslie, 14.10.2006, **CGE** (b) one plant, with both parents, on steep south-east facing bank of water run-off pit on south-east side of A11, just south-west of the Fleam Dyke, TL54645393, A.C.

Leslie, 10.2006, **CGE.** First v.c. records for a hybrid not previously reported in the British Isles.

*Cupressus macrocarpa* One self-sown young plant at base of St Andrews churchyard wall, Coldham's Lane, Cherry Hinton, TL48955705, A.C. Leslie, 14.3.2002, det. K.W Page. First v.c. record for clearly self-sown Monterey Cypress.

*Dipsacus laciniatus* At least 50 flowering plants and more vegetative rosettes, waste ground on either side of the railway, just south-west of level crossing, Shepreth, TL38804768, A.C. Leslie, 30.7.2006, **CGE.** First v.c. record for the Cut-leaved Teasel. This is not amongst the plants deliberately introduced here along the railway line by Margaret Fuller (*pers. comm*., 2006). Recently recorded from fields beside the same railway line near Baldock (Herts.).

*Eleogiton fluitans* (a) Abundant in drain along north side of Benwick Road, Whittlesey, TL29119611 to 2995.9614, A.C. Leslie, 7.10.2006, **CGE.** Also extending along a connected drain on east side of track north of Benwick Road towards the railway and to north of railway to junction with New Road. Two weeks later N.P. Millar extended the distribution further east along Benwick Road to TL30129611 and for a short distance along the north side of New Road (b) two to three patches in drain along north side of Ives Drove, Whittlesey, TL25409451, N.P. Millar, 21.10.2006 (c) three clumps in drain running along north side of Beales Drove, Whittlesey, TL25409535, N.P. Millar, 21.10.2006. A welcome return for the Floating Spikerush last seen in the county near Thorney in 1975 and last reported at Whittlesey, along Blackbush Drove, in 1959. Nick Millar's sites are just to the west of Blackbush Drove.

*Epilobium obscurum* Short-fruited Willowherb was thought to be restricted in Cambridgeshire to a number of damp sites at Gamlingay, but in the course of his survey of buildings and walls in the Isle of Ely Ron Payne has revealed that is scattered over several such man made sites in the north of the county: disused railway platform, Wisbech (TL49, 2002), church wall, Christchurch (TF40, 2002), wall top, west of Tholomas Drove (TF30, 2002),wall, Thorney (TF20, 2004) and churchyard wall, Elm (TF40, 2004). He has also recorded it on a wall at Wilburton (TL47, 2003) so this inconspicuous species may well be overlooked elsewhere.

*Eragrostis minor* Dozens of small plants in amongst the cobbles bordering a path across the Great Court, Trinity College, Cambridge, TL44745863, A.C. Leslie, 20.8.2006, **CGE**, conf. E.J. Clement. First v.c. record for Small Love-grass, perhaps originating with bird seed in this case.

*Erophila majuscula* Disturbed gritty soil on edge of farmland, Nutsgrove Farm, east of Thorney, TF327058, D. Broughton, 12.4.2006, conf. T.T. Elkington. First v.c. record for the Hairy Whitlowgrass: more work needs to be done to determine the relative frequency in the county of the three species now distinguished within British *Erophila*. All three are recorded for v.c.29 and it is likely that *E. verna* is more frequent than either *E. majuscula* or *E. glabrescens.*

*Euphorbia maculata* Nursery weed, Westfield Nurseries, Whittlesey, TL27859601, A.C. Leslie, 1.10.2006. First v.c. record for a small, prostrate alien spurge that almost certainly arrived with container grown shrubs from southern Europe: likely to be found where these plants have been planted in gardens, where it can become a weed.

*Forsythia suspensa* (a) One plant established on old dumped soil, waste ground south-west of Royston station, TL34754110, A.C. Leslie, 23.10.2001 (b) side of wall, lane on east side of Broad Street, Whittlesey, TL2697, R.M. Payne, 4.2002, det. K. Beckett. First and second v.c. records.

*Glaux maritima* A group of several vegetative stems on a grassy ditchbank, south side of Moreton's Leam, south-west of Guyhirn, TF389023, C.D. Preston, 14.10.2006, **CGE**, conf. ACL. Other than one old record for it as an alien in Cambridge, Sea Milkwort has only been known in Cambs. from TF41 (Wisbech/Foul Anchor/Newton/Leverington) so this is a very interesting extension of its range. There is just a hint that it may have been in this general area before as square TF30 is listed for it in the 1964 Flora, but there seem to be no further details to substantiate this record.

*Hieracium aterrimum* Royston to Newmarket road, just out of Royston, TL3740, P.D. Sell, 30.9.1956, **CGE**, det. P.D. Sell, 1999. First v.c record for Patent-toothed Hawkweed.

*Hieracium cardiophyllum* Under trees by Royston to Newmarket Road, north side of cutting, just out of Royston, TL370409, P.D. Sell, no.99/188, 15.6.1999, **CGE.** First v.c. record for Heart-leaved Hawkweed.

*Hieracium exotericum* Railway bank by Devil's Ditch, Dullingham, TL6360, R.J. Pankhurst, 5.6.1968, **CGE**. Originally determined by P.D. Sell as *H. sublepistoides* but redetermined by PDS in 1999. First v.c. record for Jordan's Hawkweed.

*Hieracium firmiramum* Under trees by Royston to Newmarket Road, just out of Royston, TL370409, P.D. Sell, no.99/101, 15.6.1999, **CGE**. First v.c. record for Dense-branched Hawkweed and the only British record.

*Hieracium gentile* Bank of cutting of A505, just east of Royston, TL373409, P.D. Sell, 30.9.1956 (grown from here in the Botanic Garden and a specimen from cultivation (PDS no.67/485) collected 3.7.1967 (**CGE**) and det. PDS, 1999). First v.c. record for Foreign Hawkweed.

*Hieracium koehleri* (a) cutting just out of Royston on the Newmarket road, TL373409, P.D. Sell, no.53/71, 7.6.1953, **CGE,** det. PDS, 1999 (b) roadside where the Melbourn New Road joins the main Newmarket road, TL398924, P.D. Sell, no.53/57. 7.6.1953, **CGE**, det. PDS,1999. First and second v.c. records for Koehler's Hawkweed.

*Hieracium neosparsum* Royston to Newmarket road, just out of Royston, TL3740, P.D. Sell, 30.9.1956, **CGE**, det. PDS, 1999. First v.c. record for Bank Hawkweed.

*Hieracium onychodontum* Under trees by the Royston to Newmarket road, north side of cutting, just east of Royston, TL370409, P.D. Sell, no.99/187, 15.6.1999, **CGE**; also on the chalk cutting on the north-east side of the junction of the Royston to Newmarket road and the Royston bypass, TL373409, P.D. Sell, no.99/211, 18.6.1999, **CGE**. First v.c. record for Giant-toothed Hawkweed ( the two sites are regarded as part of one population).

*Hieracium quadridentatum* Chalk side of cutting on east side of junction of Royston to Newmarket road and the Royston bypass, TL373409, P.D. Sell, no.99/209, 18.6.1999, **CGE**. First v.c. record for Four-toothed Hawkweed.

*Hieracium seriflorum* Under trees by Royston to Newmarket road, north side of cutting, just out of Royston, TL370409, P.D. Sell, no.99/183, 15.6.1999, **CGE**. First v.c. record for Gigantic-toothed Hawkweed.

*Hieracium sylvularum* Under trees by Royston to Newmarket road, north side of cutting, just out of Royston, TL370409, P.D. Sell, no.99/184,185 &186, 15.6.1999. **CGE**. First v.c. record for Ample-toothed Hawkweed.

*Juncus bulbosus* (a) one or two floating patches, Blackbush Drain, Whittlesey, TL25789446, N.P. Millar, 14.10.2006 (b) scattered patches in branch of Blackbush Drain, east of Ives Farm, Whittlesey, TL95699446, N.P. Millar, 14 10 2006 (**CGE**, specimen collected 21.10.2006) (c) in two places in a drain with heavy iron-staining in the water, west of Blackbush Drove, Whittlesey, TL24189536 & 24289534, N.P. Millar, 21.10.2006. The first records of Bulbous Rush from Whittlesey since 1957. Last reported in its only other native locality in the county, at Gamlingay, in 1988.

*Limonium platyphyllum* At least 100 plants of all sizes, self-sown at the base of wire fence at edge of a pony paddock, Chippenham, TL66616993, A.C. Leslie, 28.10.2006, **CGE**. Second v.c. record for this alien sea lavender that is sometimes grown as a dried flower crop and is better known as *L. latifolium.*

*Lonicera xylosteum* One multi-stemmed shrub, bird-sown on the track of the old railway, by the Science Park, Milton, TL46586135, A.C. Leslie, 29.10.2006, **CGE.** Second v.c. record for Fly Honeysuckle.

*Lychnis chalcedonica* At foot of hedge in reverting farmland, northwest of Quy Water, Lode, TL528623, D. Jordan & J.O. Mountford, 2006. Second v.c. record for the Maltese-cross.

*Nemesia denticulata* Several plants in clinker at edge of old railway track, north-west of former station, Histon, TL43566313, A.C. Leslie, 9.9.2006, **CGE**. First v.c. record for a widely grown, purplish pink-flowered bedding and hanging basket plant; an earlier record for a white-flowered *Nemesia* on a wall in Bateman Street in Cambridge has yet to be specifically identified.

*Nolana paradoxa* One flowering plant on recently disturbed verge, north side of Brooklands Avenue, Cambridge, TL45545698, A.C. Leslie & A. Stevenson, 22.6.2006, **CGE**. First v.c. record. A Chilean annual grown in the Botanic Garden; a member of the *Nolanaceae*, with relatively huge blue and white flowers on short stems.

*Oenanthe crocata* One fruiting plant at water level, at base of R. Ouse embankment, Middle Fen, Swavesey, TL35987068, A.C. Leslie, N.P. Millar & J.D. Shanklin, 12.8 2006, **CGE**. First v.c. record for Hemlock Water-dropwort, a rare plant in East Anglia, but one which has recently been reported to be spreading in Essex, Northamptonshire and Huntingdonshire.

*Oenanthe pimpinelloides* A number of plants scattered in herbaceous vegetation around fishermen's platforms dug into the bank of lake, Waterbeach airfield, TL48996726, J.D. Shanklin, 9.6.2006, **CGE** (specimen collected by ACL & JDS 5.8.2006). First v.c. record for the Corky-fruited Water-dropwort. Although the source of introduction here is not clear this seems unlikely to be a relic native occurrence. This species is also rare in East Anglia as a

whole but it has recently been reported to be spreading in Essex from possible native localities, both through the deliberate strewing of green hay and inadvertently with mowing machinery.

*Portulaca oleracea* Abundant amongst the cobbles of the Great Court, Trinity College, Cambridge, TL447586, P.H. Oswald, 29.8.2004; abundant again 18.7.2006 despite attempts to eradicate it with weedkiller. Second v.c. record for the small, fleshy, prostrate annual, Common Purslane, previously reported as a weed in the Botanic Garden, where it still occurs.

*Pteris multifida* One good-sized plant under grating on the Trinity Street side of Michaelhouse church, Cambridge, TL44845853, P.H. Oswald, 13.7.2006, **CGE,** conf. F.J. Rumsey, 2007. First v.c. record for another alien fern, the third species of Ribbon Fern to be found naturalised in Cambridge city.

*Quercus cerris* x *Q. suber* One bird- or self-sown plant at the base of railings bordering the east side of King's College Fellows' Garden, Queen's Road, Cambridge, TL443583, A.C. Leslie, 6.7.2003, **CGE**, det. P.D. Sell (11.2006). First v.c. record for this more-or-less evergreen hybrid between the deciduous Turkey Oak and the evergreen Cork Oak: the probable parent is in the Fellows' Garden.

*Ranunculus sardous* Thousands of plants along a broad arable field headland, north-east side of A14, Hill Farm, Swavesey, TL37376466, A.C. Leslie, 21.6.2006, **CGE.** Never a common plant in the county and last reported from Saxon Street in Cambridge and from the Newmarket railway sidings, both in 1991.

*Senecio inaequidens* One large plant on margin of old runway, Waterbeach airfield, TL48636647, J.D. Shanklin, 9.6.2006, **CGE** (specimen collected by ACL & JDS 5.8.2006). First v.c. record for Narrow-leaved Ragwort, a South African alien spreading in south-east England; Graham Easy (*pers. comm*., 2006) has already reported it naturalised in fields at Lakenheath.

*Verbena tenuisecta* One self-sown flowering plant in paving crack, junction of Leys Road and Highworth Avenue, Cambridge, TL45586025, A.C. Leslie, 9.9.2006. First v.c. record for a pretty South American species with finely dissected foliage that is used in bedding schemes.

*Vicia tenuifolia* About 40 plants in grassland, just east of old sand pit, above Ley Rectory Farm, Little Abington, TL53985008, A.C. Leslie, 5.6.2006, **CGE.** First v.c. record for Fine-leaved Vetch, an alien vetch resembling a larger version of *V. cracca*.

*Viola odorata* var. *leucoium* (a) southern margin of churchyard, Dullingham, TL63155770, A.C. Leslie, c.2003, still there 2005 (b) scattered in mown turf, south-western end of churchyard, Chippenham, TL663698, A.C. Leslie, 2.4.2006. First and second v.c. records for a very scarce variant of Sweet Violet with white (or very pale blue) flowers with white spurs; all other white-flowered variants have a coloured spur.

## Bryophyte records

C. D. Preston and M. O. Hill

Last year we reported the surprising discovery of *Antitrichia curtipendula* in a Cambridgeshire orchard. It is fortunate that it was found when it was, as the tree on which it grew was felled in the autumn of 2007 when this block of orchard trees was replaced by younger stock. Robin Stevenson transferred a portion of the moss to an apple tree elsewhere in the orchard, but we do not yet know if the transplant was successful. We could not have imagined that we would have anything as surprising as the discovery of *Antitrichia* to report this year, but the discovery of *Hypnum cupressiforme* var. *heseleri*, also in an orchard near Wisbech, is equally remarkable. Another notable record is the rediscovery of *Sphaerocarpos michelii* in the county, the first record for 204 years. These and most of the other records reported below were made during fieldwork for the planned new Bryophyte Flora of the county. The current state of recording for the Flora project, which started in 2000, is shown in Figure 1. We have continued to look into some of the older records in preparation for this Flora, and some *Sphagnum* records resulting from this revision are published below.

During the winter we were saddened by the death of Bob Finch, a long-standing contributor to these records. During a long illness he retained his enthusiasm for bryophytes, and we include below a record he made last year in his garden. An obituary of Bob appears in this journal, and further obituaries will be published in the *Journal of Bryology* and in *Watsonia*.

### Mosses

*Aloina rigida* On disturbed chalk soil in at least two places, with *A. ambigua* and *Barbula unguiculata*, E. side of Barrington Cement Works, TL35V, C.D.P. & M.O.H., 9.12.2006. This nationally scarce species of recently disturbed chalk soil was last recorded at Cherry Hinton in 1989.

*Bryum imbricatum* Bare soil around planted tree in newly planted area on E. side of plantation W. of Balsham, TL563506, C.D.P., 23.9.2006. The fifth vice-county record of this weedy *Bryum* species.

*Climacium dendroides* Two small patches in low turf by small garden pond, with abundant *Calliergonella cuspidata*, 2 Cross Street, Whittlesey, TL265975, J.J. Graham, 3.4.2007. This is a rare species in the county, but it was probably introduced to this site with marsh plants which came from a known *Climacium* locality.

*Eucladium verticillatum* Dense patches, many square metres in area, on the sides of a cave in the chalk face, extending as thinly scattered shoots to the back wall 25 m from the S.-facing entrance, disused chalk quarry, Balsham, TL574511, C.D.P., 23.9.2006. This is a very uncommon species in the county and this is much the largest population we have encountered.

*Hedwigia ciliata* var. *ciliata* One small tuft on elder in scrub, with *Amblystegium serpens*, *Orthotrichum affine* and *O. diaphanum*, Swaffham Lock, TL522672, C.D.P., 28.9.2006,

BBSUK, det. G.P. Rothero. New to v.c. 29. *H. ciliata* is usually a plant of roof tiles, walls and natural rock outcrops and it is rather infrequent in Britain; it was recorded in 1995 on a large *Salix fragilis* tree in Chelmsford, N. Essex, but is not otherwise known from East Anglia. It is presumably a casual colonist at Swaffham Lock.

*Hennediella stanfordensis* Trampled chalky ground near cut beech stump by northernmost springhead, Nine Wells, Trumpington, TL462542, C.D.P., 14.12.2006. Two *Hennediella* species are known in the vice-county, both of them apparently introductions; *H. stanfordensis* is the rarer one and has only previously been recorded from Whittlesford.

*Hypnum cupressiforme* var. *heseleri* One patch measuring 18 × 12 cm, 60 cm above ground on upper trunk of a Lord Derby apple tree, W. Norman's orchard, Begdale Road, Elm, TF45990670, M.O.H., 4.3.2007, BBSUK. The first vice-county and only the second British record of this distinctive plant, which has little superficial resemblance to the common and variable *H. cupressiforme* but appears to be a genetic mutation of that species. It was first collected in the Netherlands in 1984 and is now known from at least 10 localities in Holland, Germany and France. It was not found in Britain until 2005, when Robin Stevenson discovered a patch, also measuring 18 × 12 cm, on a Cox's Orange Pippin tree in the Royal Orchards at Flitcham, W. Norfolk.

*Leptobarbula berica* Shaded, flat brickwork on ground at foot of N. wall of church, with *Rhynchostegium murale* and *Tortula muralis*, Histon church, TL436639, C.D.P., 17.4.2006. This is a very inconspicuous species but it appears to be genuinely uncommon in the vice-county.

*Leucodon sciuroides* Sloping ledge on old brick wall, High Street, Graveley, TL24716413, C.D.P., 16.3.2007. This is a very scarce species in the county, more frequently found on churchyard monuments than in other habitats.

*Orthotrichum striatum* On 100-year-old Bramley Apple tree in orchard, Popple Drove, Leverington, TF40890891, C.R. Stevenson, 28.3.2006, det. G.P. Rothero. This is the rarest of the epiphytic *Orthotrichum* species that have colonised the county in recent years; there is only one previous record, from a garden in Luard Road, Cambridge, in 1995.

*Pterygoneurum ovatum* Fruiting plants on dumped clay overburden, with *Aloina* sp., *Barbula unguiculata*, *Dicranella varia* and *Didymodon fallax*, and vegetative shoots on chalky spoil heap, Barrington Cement Works, TL35V, S. Damant, R.J. Fisk & A. Saunders, 9.12.2006, conf. R.J.F. & C.D.P. Open, shaded chalk soil at edge of scrub at top of Ruddery Pit, Guilden Morden, TL284400, S. Damant, 20.1.2007, det. C.D.P. Two further sites for a declining species that was found in a brick pit at Whittlesey in 2005, the first Cambridgeshire record since 1977.

*Sphagnum cuspidatum* This species should be deleted from the county list. The first report, Relhan's (1820) record from Gamlingay Bogs, has to be discounted as Relhan's concept of *S. cuspidatum* would have encompassed plants now regarded as other species, including *S. fallax*. The only other record is based on P.W. Richards' specimen from Gamlingay Heath Wood. This was initially reported as *S. fallax* (*Transactions of the British Bryological Society* 1: 117, 1948) and is indeed referable to this species (see below). It was erroneously attributed to *S. cuspidatum* in Proctor's Bryophyte Flora (1956) and by Whitehouse in the 1964 Flora.

*Sphagnum fallax* Bog, Heath Wood, Gamlingay, P.W. Richards, 10.1930, NMW, conf. M.O. Hill, 2006. Hitherto misreported as *S. cuspidatum* (see above), this is the earliest record from the county of a species only known elsewhere from Wicken Fen.

*Sphagnum palustre* var. *centrale* Fairly large mounds in rather open *Betula* scrub, with *Cladium mariscus*, *Phragmites australis*, *S. fimbriatum*, *S. squarrosum* and *S. subnitens*, Compartment 12, Wicken Sedge Fen, TL553704, C.D.P., 5.4.2003, BBSUK, det. M.O.H., 2006. *S. palustre* in Cambridgeshire has hitherto been assumed to be var. *palustre*, which is much commoner than var. *centrale* in Britain. Critical examination of specimens following the discovery of var. *centrale* in Bedfordshire in September 2006 shows that both varieties occur in the county.

*Sphagnum palustre* var. *palustre* Bog, Heath Wood, Gamlingay, P.W. Richards, 10.1930, BBSUK & NMW, det. M.O.H., 2006. Compartment 5, Wicken Fen, [probably TL55.70.], H.L.K. Whitehouse, 13.5.1989, CGE, det. M.O.H., 2006. The Wicken plant had a small number of cells of the *centrale* type, suggesting that the varieties may not be very distinct in Britain.

*Ulota crispa* One tuft on *Cotinus coggygria*, garden of 68 Holbrook Road, Cambridge, TL46.55., R.A. Finch, 2006. *U. crispa sens. lat.* is not uncommon in the county, having increased in frequency in an apparent response to falling levels of atmospheric pollution. However, most specimens are *U. bruchii* and this is only the second record of the closely related *U. crispa sens. str.* since 2000.

Liverworts

*Ricciocarpos natans* Dominant for 0.8-1 km of one field drain, with *Myriophyllum verticillatum* and very occasional *Lemna minor*, and in a 10 m cleared length of another drain, with occasional *Riccia fluitans* and *Lemna trisulca*, *Myriophyllum verticillatum* and *Potamogeton natans*, N. of Ramsey Mereside, TL280905, J.J. Graham & J.O. Mountford, 1.10.2006. This nationally scarce species has not been recorded since 1987 from any locality in v.c. 29 except for Wicken Fen and Kingfisher's Bridge; its discovery in such extraordinary abundance at this new site is therefore very welcome.

*Riccia sorocarpa* Occasional to frequent in wheat stubble fields on clay soil, pH 6.0, Ashley, TL699617, and on sandy loam soil, pH 6.0, N. of All Saints Church, Ashley, TL705603, Cambs Bryophyte Excursion, 29.10.2007. A very uncommon arable weed in the vice-county, growing in both these fields with the somewhat more frequent *R. glauca*.

*Sphaerocarpos michelii* Wheat stubble field on sandy loam soil, pH 6.4, N. of All Saints Church, Ashley, TL705603, C.D.P., 29.10.2006 and R.J.Fisk, 17.3.2007, BBSUK. When this population was first discovered only a few non-fruiting rosettes were seen (Plate 5, back cover), but by March 2007 R.J.F. was able to check the spores of c. 15 rosettes, some on collection and others after growing them on to maturity. All proved to be *S. michelii*, a plant last reported from the county at Barnwell by Relhan (1802). A further population of *Sphaerocarpos* was found on trampled, sandy soil on both sides of the drive near the entrance to the house at Anglesey Abbey, TL53026224, by M.O.H. on 17.3.2007, but no fruiting plants were found here so these plants cannot be identified to species. *S. michelii* is a nationally scarce plant which is normally found on cultivated land over sandy soils.

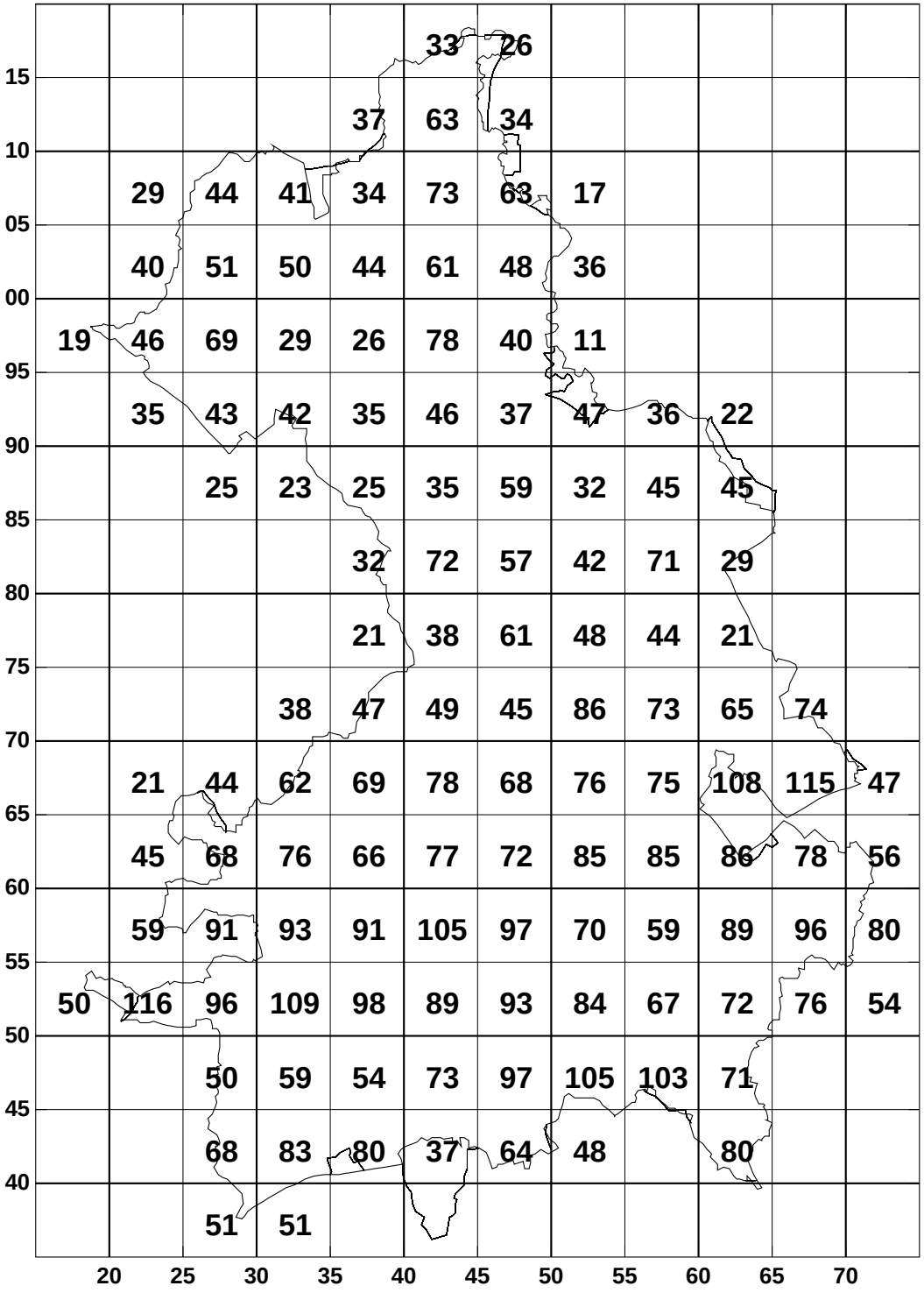



Figure 1. Number of bryophyte taxa recorded in each 5 x 5 square, 1 January 2000 – 20 April 2007.

# Invertebrate records

Louise Bacon

This is the first of what will hopefully become an annual feature, records of invertebrates that have never been recorded in vc29, rarely recorded, or showing unusual occurrence patterns from normal.

Contributions have come from various sources, mostly county recorders or other keen amateur naturalists, and have been compiled by Louise Bacon. Records of significant invertebrates can be sent to the data officer at Cambridgeshire Biological Records Centre, Manor House, Broad Street, Cambourne (email via data@cpbrc.org.uk) and will be passed to county or national scheme recorders.

Na and Nb are measurements of national scarcity based on 10km square distribution.

COLEOPTERA (Beetles)

**Carabidae (Ground Beetles)** These records have been contributed by Nick Millar.

*Ophonus punctatulus* (Na and national BAP priority species). Gog Magog Hills, TL488545, 29.4. 2006, Nick Millar. At the weedy margin of a chalky arable field. A welcome re-find of this seed-eating beetle in the general locality where it was last recorded by the Rev. C.E Tottenham in 1944.

*Ophonus ardosiacus* (Nb). Litlington Parish Pit, TL315416, 6.9.2006, Nick Millar. In arable buffer zone around disused pit. A reasonable sized colony of this seed-eating beetle that more usually turns up locally as singletons in disparate habitats in southwest Cambs.

*Zabrus tenebrioides* (Na). Devil's Ditch, Burwell, TL5864, 27.8.2006, Brian Eversham & Florent Prunier. Two individuals: one on the path from the Burwell Road carpark and another on the Ditch itself. Gog Magog Hills, TL484587, 3.9.2006, Nick Millar. A single specimen deep down in a crack in the soil at the margin of a wheatfield.

Two recent records for this very scarce beetle which feeds on wheat and other grain in arable fields. Benefiting from hot summers, we may see an increase in this species in coming years. It has been recorded before from both locations listed.

**Silphidae (Burying Beetles)**

*Necrodes littoralis* (Shore sexton beetle). Cobbs Wood, TL349513, 23.9.2006, Simon Damant, John Dawson, et al. One came to Mercury Vapour light. This scarce beetle was once thought to be confined to coastal areas, although there is now a scatter of inland records. The nearest records appear to be from Suffolk and Huntingdonshire (NBN Gateway).

**Bolboceratidae (Formerly Geotrupidae) (Dung Beetles)**

*Odontaeus armiger* (Na). Chippenham Park, TL6668, 5.9.2006, John Dawson et al. One came to Mercury Vapour light. This very distinctive beetle with a long "nose" on its forehead has classically been thought of as a breckland species. This has been confirmed by the national scheme recorder, Darren Mann (Oxford) with the comment that this species is becoming more

frequently recorded across southern England as the popularity of moth-trapping increases. It is the first record for VC29.

ORTHOPTERA (Grasshoppers & Crickets)

*Acheta domesticus* (House cricket) Compiled by Rob Partrige. An unusual number of records of this species from 29.9.2006 to 11.9.2006 from across the county. Recorded from 10 locations in VC29 – Toft, Haddenham, Aldreth, Waterbeach, Witcham, Chatteris, Mepal, Stretham, Grunty Fen, Dry Drayton. Whether these were a response to the very warm weather conditions or not is unknown. The paper in Nature in Cambridgeshire (Colston, 1998) cited this species as only having two records, both post 1980, but there have been one or two other individuals reported in the last 2-3 years, mostly by birdwatchers or moth-trappers. Whilst this species is apparently kept as food for reptiles and does escape, the records this year are probably more than just escapees. Whether this influx continues over the coming years with our warmer climate remains to be seen

DIPTERA (Flies)

Most of the observations here are of Hoverflies (**Syrphidae**).

*Volucella* species (*V. inanis, V. zonaria* and *V. pelluscens*) were in evidence in many unusual locations, such as gardens in Cambridge and elsewhere, through the second half of the season (late June – October) including late records of *V. zonaria* from Fowlmere RSPB reserve (17.9.2006, P Herkenrath) and the Botanic Gardens (29.10.2006, P Oswald). These species are distinctive and relatively easy to identify, and this range expansion is being linked to our warming climate. An article in British Wildlife (Vol 17 April 2006) deals with this genus in greater detail.

*Criorhina ranunculi*. An early-season hoverfly species. Hardwick Wood, TL3557, 12.5.2006, Simon Damant. First record for VC29. There are records of this woodland species, whose larvae live in dead wood, from the Peterborough area (vc32) in recent years.

*Xanthogramma citrofasciatum*. A scarce, southern species whose larvae live in ant's nests. Fowlmere NR, 1 male, 6.5.2006, Peter Herkenrath.

*Chrysotoxum verralli*. A local, southern species whose larvae live in ant's nests. Fowlmere NR, one female, 5.8.2006, John O'Sullivan, Peter Herkenrath.

LEPIDOPTERA (Butterflies and moths)

One of the best years of recent times for lepidoptera, especially migrants.

Butterflies.

As well as reasonable numbers of the more usual migrants species, Painted Lady (*Vanessa cardui*), Red Admiral (*Vanessa atalanta*) and Clouded Yellow (*Colias croceus*), this was an exceptional year for the following two species:

Camberwell Beauty (*Nymphalis antiopa*) – recorded from several localities in Cambridgeshire, one of the best years with at least six records.

Silver-washed Fritillary (*Argynnis paphia*). This species ceased to be a resident around 30 years ago, and occasional sightings have been linked to releases of captive bred stock either accidentally or from a specific small introduction programme in the late 1980s. However, this year reports from several woodlands and even gardens across the whole of modern

Cambridgeshire (including Huntingdonshire & Peterborough area) included Gamlingay Wood and Potton Wood, on the Bedfordshire - Cambridgeshire border. At the latter site it was reportedly seen during butterfly transect monitoring on multiple occasions. Presumably linked to climatic conditions, it remains to be seen whether viable populations get established at any sites

Moths

One of the best years in recent times for migrants and new species for the county.

One of the most surprising migrants which was recorded by many moth trappers in their gardens was Scarce Bordered Straw (*Helicoverpa armigera*) – until this season only four records ever (two in the 19th century and two in 2004) – many people recorded several individuals or more than one at a time. The Vestal (*Rhodometra sacraria*) and the Great Brocade (*Eurois occulta*), also migrants, each had only about six previous records. They were recorded in large numbers several times at locations across the county. Many other migrants were also frequently encountered, including The Delicate (*Mythimna vitellina*), Small Mottled Willow (*Spodoptera exigua*), Silver Y (*Autographa gamma*), Gem (*Orthonama obstipata*) and several migrant micro-moths (including *Udea ferruginalis* and *Plutella xylostella*). Migrants recorded for the first time in the county were the micro-moth *Palpita vitrealis* (formerly *P. unionalis*) (Witcham) and the Blair's Mocha (*Cyclophora puppillaria*) (Shelford, 10.10.2006).

Also in evidence amongst the migrants were probably the most prized of moths, the hawkmoths. Hummingbird Hawkmoths (*Macroglossum stellatarum*) have become almost commonplace in recent years,visiting flowers by day (especially Buddleia and Nicotiana) but the nocturnal family members gave an especially good showing this year.

John Dawson, VC29 moth recorder, started the migrant hawkmoth season in mid June with a Striped Hawkmoth (*Hyles livornica*), first for VC29, at Kingston Old Railway NR during an event for National Insect week. Later in the summer, Convolvulus Hawkmoths (*Agrius convolvuli*) were found by several moth trappers, either in light traps, at flowers at dusk, or on doorsteps during the day! These were found during September, across the county in several locations, and again, only a handful of previous records for the county was more than equalled in a single month. The other two species were Bedstraw Hawkmoth (*Hyles gallii*) – a singleton again in September, in Stretham, and a Death's Head Hawkmoth (*Acherontia atropos*) (Plate 6, back cover) in late October found in Shepreth, notified to Louise Bacon and John Dawson by Simon Damant, who also had reports of a second found around the same time at Bassingbourn.

# OBITUARIES

## Suzanne Smith (1942–2007)

Suzanne Smith, who died tragically as a result of a brain tumour on 19 February 2007, was for many years a prominent member of the Cambridge Bird Club, the U3AC Bird Club and the Cambridge Rambling Club. She decided that she wished to complement her wide experience of birds with some knowledge of wild plants, so she joined the U3A Botany Group in 1994 and soon became a proficient field botanist as well, later becoming a valued member of the Group's planning committee.

Suzanne was born in Urmston, Lancashire, moving as a small child with her family to Sherborne in Dorset and later to Berkhamsted in Hertfordshire and then to Girton. She attended the National School of Drama and Music at Berkhamsted and a finishing school in Switzerland. Being dissatisfied with the jobs she could secure in Cambridge, she emigrated to Canada to work as an *au pair* and in the hotel industry. Returning to Cambridge, she married a Cambridge academic, Anthony Edwards, had three sons, Mark, Simon and Jason, and joined the support staff of Girton College.

Always keen to extend the breadth of her knowledge, Suzanne studied music, ornithology, archaeology and astronomy. When out with the U3A Botany Group, she always kept her eyes and ears open for birds and was soon learning the British butterflies as well. But she seriously underrated her abilities: for example, when invited to stand for election to the Chair of the Cambridge Bird Club, she immediately declined without hesitation!

Nine years ago Suzanne met Claude Smith while birdwatching in Morocco; he too became an enthusiastic member of the U3A Botany Group. They went to live at Chestnut House, Great Gransden, in 1999. Suzanne loved village life, taking a prominent role in the Women's Institute and WEA classes in the Reading Room, joining the Gransden Society and the local gardening club and worshipping at the parish church; but she also had to find the time for her grandchildren and to travel widely with Claude, seeking out interesting birds and flowers. As the Vicar, the Revd Catharine Furlong, said at her funeral on 8 March, "She was keen to do it all and did! Everyone whose lives she touched will remember her." I am sure I am not alone in saying that I shall sorely miss Suzanne's keen perception, incisive comments and good company in the field.

Philip Oswald

## Robert Alan Finch (1939 – 2006)

Bob Finch, who sadly died of cancer on 18 December 2006, will be fondly remembered by all who knew him, especially by the Cambridgeshire botanists and bryologists who worked with him.

Bob's interest in natural history began when he was young, and this interest was encouraged at Hastings Grammar School. He published his first paper, on the plants of roadside clinker heaps, in the Hastings and East Sussex Naturalist in 1958, when he was 19. From school, Bob went to Pembroke College, Oxford, where he followed his degree with a D. Phil. on the cytology of the genus *Leontodon*. After a year as a lecturer at Newcastle, Bob moved to Cambridge, to work on the cytology and genetics of barley at the Plant Breeding Institute at Trumpington. He worked there, publishing over 30 papers on barley, until 1985, when, along with many of his colleagues, he was made redundant.

Bob continued to study *Leontodon* at Cambridge, and was also a very keen bryologist (he discovered two species new to Britain), attending many British Bryological Society local group field meetings in Cambridgeshire and East Anglia. Those who attended meetings with him knew that he would always be

smiling and always be helpful, especially to beginners who might otherwise be daunted by the problems of identifying bryophytes. Bob was old-fashioned and refused to enter the 'computer age'. Anything he undertook would be done with meticulous care.

I got to know Bob when he spent two years (1987 – 1989) at Monks Wood, working on the *Atlas of Bryophytes*. It was always a pleasure to talk to him; I never heard him say a bad word about anyone, and the only time he came anywhere near being cross was when he discovered some apparent error in work that he had done himself. I met him from time to time after this period, and always gained something from our conversations. He will be very much missed, by those who, like me, did not know him very well, as well as by those who knew him much better.

Henry R Arnold

## BOOK REVIEWS

*The Wisdom of God* [*Manifested*] *in the Works of the Creation*. John Ray. Facsimile edition of the 1826 edition. Ray Society, London, Vol. 167**,** 2005. ISBN 10 0-90387-342-6. ISBN 13 978-0-90387-432-8. *John Ray's 'Wisdom of God Manifested in the Works of the Creation'*. S. Max Walters. Ray Society Special Publication, 2005.

John Ray was, by any reasonable reckoning, one of the six greatest scientists that Cambridge has produced. The tercentenary of his death was officially ignored by the University. He will be known to readers of this journal by his 'Cambridge Catalogue', the earliest flora of any county, published in 1660. He had not Linnæus's gift for publicity: at the height of his international reputation the limit of his ambition was to retreat to his Essex birthplace, marry his sweetheart, and live happily ever after, writing prodigious and learned Latin books on animals and plants.

Ray was also a theologian, usually writing in English. This short (by his standards) book of popular philosophy, first published in 1691, had a vast readership for 140 years. Here he explores in curious detail a favourite subject of his: that the universe and all that is in it is, as he would put it, carefully organised and maintained by God for the benefit of living creatures and especially of mankind (and of intelligent beings, if any, on other planets). His object seems to be to counteract what would now be called the Deist position, which he attributes to Descartes, that the universe and its inhabitants are machines, originally built and set in motion by the Creator, and thereafter left to their own devices.

Present readers will recognise in Ray an early exposition of what they would call the Argument from Design. This has now fallen into disgrace, perhaps not wholly deserved - hijacked by Christian fundamentalists and scorned by their reductionist opponents, as though something as complex as the Universe had to

be entirely one thing or the other. In Ray's time it would have been difficult to maintain anything else for the biological world. I cannot find in this book any hint of evolution: the idea that even subspecies, let alone species and families, have a time dimension was not to emerge for another half-century. The accompanying essay is the last published work of Max Walters (obituary, *Nature in Cambridgeshire*, No 48 (2006): 2-11). It pursues several of Max's interests, especially how Ray fared at the hands of biographers such as Charles Raven. Another matter that fascinated Max, especially in relation to Ray's time, is the emergence of what I would call the anthropology of botanical nomenclature. Why do so many big European plant families have names ending in *-ae* rather than *-aceae*? Why are there many genera of grasses, each with a few species, whereas most sedges are in one giant genus, *Carex*? In a rationalist's world this would depend on the amount of variation among grasses and sedges. Max, however, argues that it results from the development of European ethnobotany as a science independent of zoology and more closely related to agriculture and pharmacology. For grasses, the idea of genera and the names for them had already emerged by medieval times. Sedges, in contrast, lacked interest as food or drug plants and were little studied until Ray's time: they have never been fully divided into genera as grasses have. The big European plant families are not older in their evolutionary history, but older in the history of the subject: they date from before the *-aceae* ending became obligatory.

Oliver Rackham

*Woodlands*. Oliver Rackham. New Naturalist Library No. 100. HarperCollins, London, 2006. Hardback: ISBN-13 978-0-00-720243-0, ISBN-10 0-00-720243-1, £45.00. Paperback: ISBN-13 978-0-00-720244-7, ISBN-10 0-00-720244-X, £25.00.

It is most fitting that the editors of the New Naturalist Library should choose as their hundredth volume this book on woodlands by Oliver Rackham, for he personifies the best traditions of British natural history. It is fitting too that he opens with a fine testimonial to Max Walters, one of the early contributors to the series, a later editor, and a mentor and inspiration to the author. The breadth of vision in this book was a special characteristic of the Botany School of those days when Max was a member of staff and Oliver a postgraduate.

*Woodlands* draws on a lifetime of study and observation of British woodlands, covering equally their history and ecology. Oliver started his ecological work in Hayley Wood and his interest in the history of woodlands was stimulated by his discovery of the *Ely Coucher Book* compiled on orders from the Bishop of Ely in 1251. (A lovely facsimile of the entry relating to Hayley appears on page 171.) So it is perhaps hardly surprising that many of his most detailed analyses are related to East Anglian sites. But, in addition to a thorough treatment of England and Wales, there are valuable discussions of woods in Scotland and Ireland and illuminating comparisons with the Mediterranean, of which he has also made a detailed study; these are

supplemented by observations from elsewhere in Europe, from North America and from Japan.

He sets out his stall from the very beginning, and very refreshing it is.

> "This is not a book about the Environment. … This is a book about Ecology. … I am not a forester. …"
>
> "I write as a now rather old-fashioned botanist, concerned with woodland as an ecosystem with a life of its own, in which human agency is one among many environmental factors. In this book trees are themselves wildlife, rather than merely a habitat for wildlife."
>
> "Unlike my previous books, it deals more in investigations than in results. For good or ill, I have no particular theory to promote."

The first two chapters lay the groundwork. They deal with the characteristics of trees (their lifespan – the greater their hardship the longer they live, their reproduction and their behaviour in relation to coppicing, pollarding, fires, wind-blow, uprooting, soil differences, mycorrhizal associations and many other features). Here also he draws the important distinctions between wildwood, woodland, wood-pasture or savanna (divided into wood-pasture commons, parks and Forests), plantations and non-woodland trees. Chapter 3 gives a brief outline of woodland history from the presumed wildwood to the present day.

Chapter 4 discusses early vegetational history (the age of evolution, the age of climatic change, the age of humanity) and the evidence provided – or not provided – by pollen analysis: on page 84 there is a map of the presumed woodland provinces of Britain in the Atlantic Period (Birch, Pine, Oak–Hazel, Hazel–Elm, Lime and areas beyond the limit of continuous woodland). There follows an interesting discussion of the points for and against two rival hypotheses about the nature of the wildwood – that of Tansley, continuous tree cover, and that of Vera, a sort of savanna maintained by large populations of grazing herbivores. The discussion is inconclusive – as no doubt it should be! There is detail about two interesting events of wide significance, the elm decline at the end of the Neolithic, perhaps due to Dutch elm disease, and the advent of oak mildew in 1908, which has altered, perhaps irrevocably, the regeneration behaviour of oak.

The next two chapters enlarge upon some of these questions – the extent to which woodland reflects earlier wildwood and the interrelations of woodland and wood-pasture. There follow chapters on how to study woodlands: archives and how to read them; evidence from archaeology and land-forms; pictures and photographs (surprisingly with no mention of the value of stereoscopic air photographs); and evidence in the field (soils, trees and vegetation). Chapter 11 is about the uses of wood and timber through the ages and the evidence these provide about the woods from which they came. Next is a chapter on ancient-woodland plants and other creatures – the indicators of ancient woods. There are chapters on the types of woodland in lowland Britain; on the Caledonian pinewoods; on environmental damage, pests and diseases; and on experiments and long-term observations. Two chapters are devoted to the rise and fall of modern forestry and its legacy: the Forestry Commission is now doing its best to

reverse the enormous damage it did between 1950 and the late 1970s (even later according to my observations). The book ends with some interesting and speculative comments about the future.

This book can be read at three levels, at least. First, to pursue and appreciate the great detail in some of the case studies: examples are the table of properties of trees (pp. 12–13), associations between mycorrhizal agarics and trees (pp. 39–42), the pollen cores from the meres of south Norfolk (p. 86), the lawsuit of the 1750s involving the rights in the Ballochbuie pine forest on the upper Dee (pp. 395–398) or the detailed history of the wooded forest of Blackmoor (Chapter 20). A second level is to follow the varied sequences of events affecting wildwood, wood pasture, woodland and plantation, and the interaction between these and the flora and fauna – the ways in which economic history has influenced these and how so many woodlands have persisted throughout. (There is a discussion, important for conservation, of what 'normal' may mean.) Yet a third is simply to enjoy the rhetorical questions scattered through the text, the exposure of fallacies and the author's penetrating and astringent comments on the passing scene. Here are some samples:

> "Popular affection for woods and trees flourishes as never before, albeit sometimes embarrassingly ill informed."
>
> "... commercial coppicing has continued to decline – partly because of the counterproductive efforts of conservationists in promoting the recycling of paper, … ."
>
> "… Britain is far too small: exhorting people to plant trees to sequester carbon dioxide is like telling them to drink more to hold down rising sea level."
>
> "Much ecological history is written by either:
> • historians who fail to understand the ecology, who write (for example) about people 'destroying' forests by cutting down trees, not realising that cutting down an ash-tree is a different action from cutting down a pine;
> or:
> • ecologists ... who assert that 'ancient authors say …' without stating which ancient authors, what exactly they say, what exactly the Greek or Latin words mean, and what are the grounds for believing them."
>
> "Conservationists may smile at the vicissitudes of fashion in forestry, but their own profession has them too. … Forestry and conservation fashions have something in common that differentiates them from other kinds of fashion. If I order a fashionable shirt I expect to wear it before it goes out of fashion. But activities that depend on the growth of trees and plants can never catch up with the fashion before it changes."
>
> "All too often, professional conservationists look for how a wood resembles other woods, rather than what makes it special. The former was made easy by the woodland volume of the *National Vegetation Classification*, … . Its coarse-grained but rigid categorisation, giving no room for further discovery of rare woodland types, was useful to anyone needing to pigeonhole a wood without doing much fieldwork."
> [An unfortunate and unintended consequence!]

Whatever approach one takes, this is a book to cherish and enjoy – perhaps rather to dip into than to read through from cover to cover. It leaves many questions in the air; there is often not the evidence to decide. Some matters

require more research, others are left for the reader to make up his own mind. It should encourage everyone to regard any woodland and any tree to be examined as itself, as something unique and with its own history, to look with new eyes, with heightened awareness and without preconceptions, and to avoid facile generalisations.

I have only two minor quibbles. The index, though copious, does not do justice to the richness of the subject matter: sometimes it is inaccurate and there is at least one place where its use of the alphabet is eccentric; for such an encyclopaedic work a copious index is vital. The second criticism is no doubt made necessary by the exigencies of present-day printing: the combination of small type and semi-glossy paper makes the book exhausting to read. But these are trivial matters indeed.

Let the last word be Oliver's. After referring to the fears of the 1970s, he says:

> "A third of a century on, the threats have diminished or disappeared. Programmes then started have achieved many of their objectives, and there is no longer such a need for haste. People now should stop and think and get the details right. This may involve waiting a year or two, or planting fewer but better-chosen trees; or doing nothing and letting natural succession do the job. The time for playing God is over."

Duncan Poore

*The Butterflies of Cambridgeshire*. R. Field, V. Perrin, L. Bacon & N. Greatorex-Davies. Butterfly Conservation, Cambridgeshire & Essex Branch. 2006. ISBN: 0-9554347-0-X. Paperback. £8.00. iii+122 pp.

This slim volume provides a succinct and comprehensive overview of the recent distribution and past history of the occurrence of butterflies in 'greater' Cambridgeshire (vice-counties 29 and 31, and the Soke of Peterborough area of vc32). The map on the front end-paper shows the area covered, indicating also major towns, roads and rivers and some of the more important sites for butterflies. Anyone with even a passing interest in their local butterflies should invest in a copy – it is up-to-date, informative, and illustrated with at least one colour photograph of every species of butterfly known to have occurred in the area.

At the core of this overview are the results of a survey conducted by a small band of volunteers between 1990 and 2005. For the 34 species found regularly in Cambridgeshire, these results include tetrad (2x2km square) distribution maps and comments on the history, status and distribution of the species. The overall geographical coverage of tetrads by recorders is good (83%), with gaps mainly in the fens, in the north and north-east of the area. Well presented additional information for each of the 34 species includes: Changes since 1990 (mostly the loss of populations and sites), Habitat (including land use types), Larval foodplants, Nectar sources, Habits, Where and when to look and Identification. The authors have provided a very readable account for each species, which will help readers to find species in the field. Many of these more detailed species

accounts include annual population indexes, using data from the Butterfly Monitoring Scheme from 1976 to 2005.

In addition, 23 species are now considered to be extinct in Cambridgeshire. These species accounts give less detail, with selected localities being listed in the text, but without distribution maps. It was a saddening experience to read these well-referenced accounts of losses, including several species that I had seen myself at sites in Cambridgeshire during the 1960s. A further short section covers seven species that are classed as Vagrants, Scarce Migrants and Accidentals.

The final section – Monitoring Butterfly Populations in Cambridgeshire – gives a brief account of the Butterfly Monitoring Scheme (BMS) and its methods. As the methodology was developed at Monks Wood and BMS has been operated from there since 1976, it is not surprising that many local sites have been monitored. This section also contains comments on population changes for many species, which complement the preceding species accounts.

No review should be all praise, and this book has a few faults – in particular some typographical errors and erratic use (or lack) of punctuation. Nevertheless, as a fact book on local butterflies, with good colour photographs and maps and clear text, it is essential reading – it is full of relevant information, with plenty of references to where to find out more.

Paul Harding

## Weather Notes from the Cambridge University Botanic Garden for 2006

John Kapor

The Botanic Garden has housed a weather station since at least 1903. The current station, located within the private experimental section of the Garden, is part of the network of Meteorological Office stations and records rainfall, various temperature readings along with daily observations. The following account is based on the observations and records from this station for 2006.

January and February continued the dry winter theme that started in December 2005. The total rainfall for January was 17.8mm with 26.6mm in February. This meant that the three winter months totalled 60.9mm, making it a very dry winter. There were no extremes of temperature noted. Despite a few flakes of snow early on 7th January, there was no measurable snow for the remainder of the year.

March and April both continued the dry theme with around 30mm being recorded for each month. Temperatures were generally on the low side, giving us a cool spring with the highest April temperature being only 17.1°C, recorded on the 27th. Interestingly, March's highest temperature was 0.4°C greater, a maximum of 17.5°C being recorded on the 30th. April saw the last of the season's air frosts with -1.4°C on the 5th. However a few slight ground frosts occurred later in the month. In total only 108.4mm of rain fell in the first third of 2006. The droughted garden received a welcome 66.2mm of rainfall in May, which at long last reversed the dry trend. Combined with average temperatures

this made for good growing conditions. A maximum of 27°C was reached on the 4th.

The dry conditions returned during June with only 19.2mm being recorded. The temperatures steadily increased during the summer, with July having twelve days when the temperature exceeded 30°C. A peak was reached on 19th July when a maximum 36.6°C was recorded. This would have contributed to the six days on which thunder was heard, usually during some short sharp but welcome showers. One of these produced 16.2mm on the 27th making this the wettest twenty-four hours of the year.

August was cooler but with above average rainfall, which totalled 66.4mm. This made August the wettest month of the year, just beating May's total rainfall by 0.4mm. Mowers and edging shears were again being used to their full potential. September will be noted for having only two days when the maximum temperature failed to reach over 20°C. The maximum temperature of 28.9°C was reached on the 11th, which was one degree warmer than the August maximum of 27.9°C. Rainfall figures were around average. October had three days over 20°C, this is five days less than October 2005. We managed to get to the end of the month without having a ground frost. However, by 2nd November the first frosts arrived. The sharpest of these was recorded on the 3rd with a temperature of -1.8°C. The month was also wetter than average.

| **2006** | **Monthly mean temperature °C** | | | |
|---|---|---|---|---|
| | **Maximum** | **Minimum** | **Rainfall per month (mm)** | **No. of rain days (0.2mm or more)** |
| January | 7.11 (11.6) | 2.02 (-5.5) | 17.8 | 11 |
| February | 6.95 (11.9) | 1.85 (-2.3) | 26.6 | 9 |
| March | 10.98 (17.5) | 1.83 (-5.9) | 34.8 | 12 |
| April | 14.01 (17.1) | 4.84 (-1.4) | 29.2 | 14 |
| May | 17.81 (27.0) | 8.95 (1.8) | 66.2 | 16 |
| June | 22.87 (29.9) | 11.22 (2.7) | 19.2 | 8 |
| July | 28.33 (35.6) | 14.48 (9.0) | 44.6 | 10 |
| August | 21.65 (27.9) | 12.35 (7.3) | 66.4 | 21 |
| September | 22.67 (28.9) | 13.49 (6.4) | 53.3 | 10 |
| October | 17.67 (20.5) | 10.35 (5.0) | 48.4 | 15 |
| November | 12.67 (16.4) | 4.48 (-1.8) | 61.4 | 12 |
| December | 9.64 (15.1) | 3.89 (-3.9) | 42.4 | 13 |

Figures in parenthesis are individual highest and lowest temperatures.

December was considerably wetter than last year with 42.4mm of rain. The month was divided into three parts, with mild and unsettled conditions at the start and end of the month with an anticyclonic middle giving us six consecutive days of air frost between the 18th and 23rd. During this spell there was widespread freezing fog and on the 19th the air temperature failed to rise above -0.3°C. The last time the temperature remained below freezing all day was in December 2000. This meant the fog was constantly depositing ice onto all the trees and when the freezing fog did finally clear and the sun shone with clear blue sky we were all treated to a stunning winter scene.

## Weather Notes for Cambridgeshire 2006

John Clarke

**JANUARY** Unsettled to 20th. Anticyclonic thereafter with a little frost at night and fine sunny days. Rainfall a third of average. Mean minimum temperature slightly below average. Mean maximum 1°F below average.
**FEBRUARY** Fine anticyclonic with only one or two slight frosts to 12th. Changeable, mild and sometimes wet to 20th. Anticyclonic thereafter. Rainfall a third below average. Mean minimum temperature average. Mean maximum 2°F below average.
**MARCH** Mainly anticyclonic fine and cold with sharp frost almost every night to 24th. Changeable and mild thereafter. Rainfall slightly below average. Mean minimum temperature 1°F below average. Mean maximum 2°F below average.
**APRIL** Changeable and mild to 24th. Fine and anticyclonic thereafter. Rainfall 0.30 inches below average. Mean minimum temperature 2°F above average. Mean maximum slightly above average.
**MAY** Fine and very warm in the first week. Unsettled and very wet thereafter. Rainfall more than 1.5 inches above average on 17 rain days. Mean minimum temperature 2°F above average. Mean maximum about average.
**JUNE** Anticyclonic almost throughout, and very warm and dry. Rainfall one third of average. Mean minimum temperature 3°F above average. Mean maximum 4°F above average.
**JULY** Fine, sunny and hot first three days, unsettled, close and thundery 4th to 9th. Anticyclonic thereafter, sunny and hot (95° F on 19th). Rainfall 0.50 inches below average. Mean minimum temperature 4°F above average. Mean maximum 10°F above average.
**AUGUST** Mainly unsettled and very wet. Anticyclonic fine and warm 5th – 10th, changeable thereafter. Rainfall more than 1.5 inches above average. Mean minimum temperature 1°F above average. Mean maximum 1.5°F below average.

**SEPTEMBER** Changeable and wet, but also very warm at times (82°F on 11th) Rainfall 1.5 inches above average. Mean minimum temperature 7°F above average. Mean maximum 3°F above average.
**OCTOBER** Changeable and warm. Rainfall 0.5 inches below average. Mean minimum temperature 6°F above average. Mean maximum 3°F above average.
**NOVEMBER** Anticyclonic, fine and mild to 12th. Changeable and mild thereafter. Rainfall 0.5 inches above average. Mean minimum temperature 4°F above average. Mean maximum 3°F abve average.
**DECEMBER** Changeable to 17th. Anticyclonic to 27th with frost and fog 18th to 21st. Fog persisting all day on 19th and 22nd . Changeable and mild in the last week. Rainfall 0.5 inches above average. Mean minimum temperature 2°F above average. Mean maximum 3°F above average.

Weather records at Swaffham Prior 2006

| | Mean Max | Mean Min | Highest | Lowest | Rain (Inches) | Rain days | Thunder days |
|---|---|---|---|---|---|---|---|
| January | 43.58 | 33.55 | 52 on 19th | 22 on 24th | 0.49 | 9 | - |
| February | 43.51 | 33.09 | 52 on 15th | 27 on 3rd | 0.88 | 9 | - |
| March | 47.67 | 33.13 | 62 on 30th | 19 on 3rd | 1.33 | 12 | - |
| April | 55.83 | 39.99 | 62 on 25th | 30 on 10th | 1.02 | 12 | - |
| May | 63.22 | 46.77 | 80 on 4th | 38 on 2nd | 3.28 | 17 | 1 |
| June | 72.50 | 51.43 | 84 on 12th | 38 on 1st | 0.75 | 4 | - |
| July | 81.55 | 56.90 | 95 on 19th | 50 on 16th | 1.78 | 7 | 4 |
| August | 69.60 | 53.76 | 80 on 6th | 48 on 8th | 3.97 | 14 | 2 |
| September | 71.30 | 55.23 | 82 on 11th | 45 on 8th | 3.10 | 12 | 1 |
| October | 61.93 | 49.86 | 68 on 10th | 42 on 14th | 1.62 | 14 | 1 |
| November | 52.80 | 41.26 | 59 on 15th | 31 on 2nd | 2.43 | 14 | - |
| December | 43.09 | 39.00 | 58 on 4th | 25 on 19th | 1.81 | 12 | - |
| Annual Means | 59.30 | 44.74 | Totals | | 21.46 | 136 | 9 |

| | |
|---|---|
| Number of days over 90º F | 7 |
| Number of days over 80º F | 27 |
| Number of days over 70º F | 93 |
| Number of days with a maximum under 32º F | 2 |
| Number of days with a minimum under 32º F | 43 |
| Last air frost of the spring | 10th April |
| First air frost of the autumn | 2nd November |
| Days with snow lying | none |
| Days with fog persisting all day | 2 |
| Warmest day | (95° F) 19th July |
| Coldest night | (19° F) 3rd March |

Plate 3: The New Bedford River near Earith (Site 7) showing floating mats of *Enteromorpha*, August 2005. (see article by Martin Willing, page 39)

Plate 4. The prawn *Palaemon longirostris* from the River Ouse. (Scale bar = 1cm.)
(See article by Martin Willing, page 49)

Plate 5. *Sphaerocarpos michelii* in a stubble field at Ashley, October 2006, the first Cambridgeshire record since 1802. Photograph: C.R. Stevenson.
(see Bryophyte Records, page 96)

Plate 6. Death's Head Hawkmoth (*Acherontia atropos*)
(See Invertebrate Records, page 100)