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Hayley Lane: the cottage (see pp. 4–5) and newly laid hedge (see pp. 32–34) early in 1980

Keith Jordan

The large brickpit at Wicken Fen (see pp. 14 and 21–29)

William Palmer

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Cover drawing:
Gadwalls breeding on the Ouse Washes (see pp. 19–20) *Graham Easy*

EDITORIAL

1981 has been called "the year when nature conservation came of age". Though opinions differ about the likely effectiveness of the long-debated Wildlife and Countryside Act, there is no doubt that conservation is now recognised as a force to be reckoned with in the countryside. But the Trust is seeking to achieve its aims in the county by co-operation rather than conflict.

The year was eventful in other ways too. The Trust marked the success of its Wildlife Appeal at the end of the winter and its first quarter-century in June, and the University Botanic Garden celebrated its 150th Anniversary later in the summer. Our President is to be congratulated on the publication by Cambridge University Press of his scholarly but most readable Anniversary Book, *The Shaping of Cambridge Botany*, and on the Garden's own issue of a facsimile edition of J. S. Henslow's paper, published in 1831 in the Transactions of the Cambridge Philosophical Society, *On the Examination of a Hybrid Digitalis*. It is especially appropriate that this remarkable Cambridge Professor, who inspired so many young people of his day with his enthusiasm, teaching skill and integrity, should be honoured at this time, for among those he taught to observe and to reason was Charles Darwin, whose centenary is now being celebrated.

Philip Oswald
May 1982

CAMBIENT

TWENTY-FIFTH ANNUAL REPORT (1981)

1981 was a busy, successful and memorable year for CAMBIENT. Our Cambridgeshire Wildlife Appeal exceeded its target and totalled £108,000 in February, the Trust celebrated its 25th birthday in June, and we had completed all planned reserve purchases and the Hayley cottage renovation by August. Indeed a notable year!

We were delighted to finalise the lengthy negotiations for Overhall Grove and Soham Meadow; it is heartening to know that these two beautiful sites are now under our protection, particularly as they are so much appreciated by our membership. We were also fortunate to be able to purchase an additional 23 acres of Ouse Washes right in the centre of our reserve area, even if this did rather stretch the Trust's finances. This acquisition illustrated the value of continued contact with owners, since we were offered first refusal when the land came on the market. The purchase was grant-aided by the World Wildlife Fund, the Nature Conservancy Council and, for the first time, the National Heritage Memorial Fund. This level of support indicated the degree of importance that is attached to the site nationally.

The Winifred Parsons Memorial Fund, which featured strongly in our appeal, reached the magnificent sum of £1,548 and money is still being received. This fund is to be used to improve the educational service of the Trust for schools and the public, in line with one of Mrs Parsons' greatest interests.

The end of the appeal was marked by a celebration meeting of the patrons and full Appeal Committee at Emmanuel College and by a thanksgiving service at Great St Mary's Church. The Trust presented Mr Desmond January with an

engraved crystal goblet in recognition of all the hard work he put in as Appeal Chairman.

Our final appeal project, the renovation of the Hayley cottage, was successfully completed under the expert guidance of Mr Alan Bird, and members attending the Annual General Meeting were able to enjoy a conducted tour of the excellent accommodation. A short-term tenancy was then negotiated to ensure suitable occupation until employment of a woodland warden becomes feasible, and Cambridgeshire's Rural Information Officer moved in in August. During the year negotiations proceeded to purchase a small additional area of garden from the Longstowe estate.

Another important development at our Annual General Meeting was approval of the Trust's revised constitution and conditions of service for officers and members of Council. Numerous changes were made, and one of the effects will be the opportunity to recruit more new blood to the Trust's Council in future years.

The appeal was certainly a great success, but in 1981 general income decreased. We suffered along with everyone else from the effects of the recession, and this was noted in particular in loss of sales revenue. The level of grant-aid other than for purchase decreased, but we did obtain support from the County Council and from South Cambridgeshire District Council to help with specific projects on reserves. Ever-increasing commitments led to the inevitable increase in subscriptions which was approved by the Annual General Meeting in May and, towards the end of the year, to the formation of an informal working party to consider ways of increasing the Trust's annual income.

Our membership totalled 2,381 at the end of the year and our junior Watch membership rose to 157. We were pleased with the reception given to the new magazine for all Nature Conservation Trusts, *Natural World*. This was launched in February to coincide with the renaming of our parent body, SPNC, as the Royal Society for Nature Conservation (RSNC), under the patronage of HRH The Prince of Wales. The editions received three times a year are of a high standard and have done much to help recruit new members and increase the interest of existing supporters. Another milestone was reached this year by a body which gives us a great deal of assistance, the World Wildlife Fund, which celebrated its 25th birthday in July when HRH The Duke of Edinburgh took over its presidency.

The most notable national issue during the year was the passage of the Wildlife and Countryside Bill through Parliament. Its consideration attracted an enormous amount of public interest and a great deal of very informed discussion, as well as extreme controversy. Although many hard words were exchanged between landowners and conservationists, and it remains to be seen how effective the protection given to Sites of Special Scientific Interest by the final Act, passed in October, will prove in practice, the problems are now far more widely understood and the frank discussions will no doubt continue long into the future.

Apart from lobbying Members of Parliament during the progress of the Bill, CAMBIENT worked for better conservation understanding in the county and called a series of informal meetings between its farming members and interested individuals to consider the main issues involved and to identify positive action that it could take. On a wider front, the recently formed Cambridgeshire Farming and Wildlife Advisory Group offered practical advice to landowners requesting conservation management plans for their farms.

On our own reserves, management work has been continued enthusiastically by working parties at Hayley, Elsworth, Fordham and Fulbourn; the Cambridge Conservation Corps, Cambridge Members' Group and Cambridge Bird Club have helped on many sites. Fencing and coppicing tasks have been the order of the day, apart from the perennial problem of rabbit control. The highlight of the year for member involvement was the deer count, when a record number of over 70 people turned out to help on a beautiful Sunday morning. On the administrative side, insurance for work parties was arranged through the British Trust for Conservation Volunteers, and the management agreement over Soham Green Hills was renewed with the owner.

Again concerning sites, our three-year ecological survey carried out by Peter Seccombe and Sarah Douglas, with grant-aid from the NCC, neared completion. As a result a vast amount of information on sites of wildlife interest in the county has been amassed and a total of 439 sites recorded. Of these, 49 were identified as of very high natural history interest, and efforts will be made to try to ensure the conservation of at least some of these areas. Pete and Sarah ended their employment with us in November, but fortunately both found new posts in conservation. We wish them luck for the future; their cheerfulness and enthusiasm for the Trust's work are already sadly missed.

Apart from doing survey work, our two recorders were active in helping with excursions and members' meetings. These were numerous during the year, with our Sutton and Cottenham Area Groups arranging many events, and new Cambridge and South Cambs Groups beginning activities with summer rambles and later holding evening meetings. Such expansion of member involvement is very encouraging and we hope our groups will go from strength to strength. The support for junior activities has also been rewarding and our Field Officer has put in excellent work arranging excursions and producing newsletters for our 8–18-year-olds.

While doing all they can to support members' activities, the staff have also been heavily involved with local planning issues, preparations for the airport inquiry, representation on countryside committees, and attendance at conferences to keep in touch with national developments in the conservation world. The office staffing has remained the same, with three paid members of staff and the indispensable help of Ken Hudson and a faithful and fairly unchanging band of volunteers. Practical assistance on reserves has increased, as mentioned, and this and the development of more members' groups are good omens for the future. With more members becoming actively involved and able to speak out for conservation in the county, we should be able to make great strides, provided that we can resolve the very worrying problem of shortage of funds.

The celebration of CAMBIENT's 25th birthday this year, at a special garden party held in the grounds of our President's home, was an excellent occasion to remember 1981 by. It was one at which Trust members managed to rise above the rather unsettled climatic conditions of the day, and we trust that this bodes well for the future and that we shall be equally successful in going forward against the tide of ever-increasing demands on land and escalating costs of management. The enthusiasm and loyalty of our membership give us confidence to do this.

Joy Greenall
Secretary/Conservation Officer

EXECUTIVE COMMITTEE

1981 was a full and taxing time for the Executive Committee. After two years in which its efforts were directed mainly at the immediate objects of the highly successful appeal, the Committee tried to look at the Trust as a whole and face some fundamental problems.

Everyone has been delighted with the success of the appeal, but almost all the money so obtained was, of course, committed to particular projects. Many other important sites are known, some of which are under threat. Our highly trained and hardworking staff must be adequately paid. Extra funds are needed, not just for particular projects but for regular commitments as well. A working party has, therefore, been set up to investigate both new sources of income and the most appropriate form of investment.

Over the last few years the activities of the Trust have become much more diverse and its administration correspondingly more complex. Demands on staff increase inexorably. Since no resources are available for extra labour, the Committee has appraised the workload of each member of staff and attempted to set priorities, though the nature of the organisation makes this difficult. A list has been circulated of relatively self-contained tasks suitable for volunteers (and in many cases formerly performed by them). There has been a slow but steady response to this. The largest opportunities are in education, especially the running of the Watch Club in the county (see pp. 9–10).

The Committee also discussed at length CAMBIENT's links with the Cambridge Conservation Corps and the Cambridge Natural History Society, two bodies with which it has been linked from very early days. These relationships have been examined in the light of changed circumstances and placed on a firmer footing.

The full round of nature reserves business was dealt with as usual. We hope that local management committees do not feel that their interests have been neglected under pressure of other business. The Executive has not lost sight of the fact that the reserves remain the Trust's most important concern.

Finally, the Committee continued to work on the revisions to the Trust's constitution (see p. 5). Much of this work was done by Mr Peter Conder, who, to demonstrate his faith in the new provisions, thereupon resigned after 17 years on the Council and the Executive Committee. The gesture is respected, but his wisdom and directness are greatly missed! At the same time the present writer retired from the chairmanship of the Committee. He wishes to thank all the Committee, Council and staff for their friendly support and knows that it will be extended equally to his successor, Dr Roger Connan.

M. E. Smith

SCIENTIFIC ADVISORY COMMITTEE

The Committee met three times during 1981.

The identification of potential sites of natural history interest (NHI) was continued during the year by Peter Seccombe and Sarah Douglas, who presented an interim report on the field seasons of 1979 and 1980. It was agreed that the sites graded as "excellent" would be added to the list of NHIs. Members of the Committee agreed to add their own assessment of these sites, and a number of such

reports was received. Suggestions were made on the format of the final report to be prepared by the recording team.

A number of sites of wildlife interest were identified during research into the preparation of comments for the Newnham and West Cambridge draft District Plan, and these were added to the NHI list (see *N. in C.*, **24** (1981): 26–29).

Consideration was given to sites which may merit designation as Sites of Special Scientific Interest, and a list of these was made available for the revision of the Cambridgeshire SSSI schedule by the Nature Conservancy Council.

Possible management agreements were discussed for a number of sites. The Trust was approached by Cambridge University over a small piece of land in the control of the Department of Astronomy, and Isleham Parish Council asked the Trust to take an interest in the management of land under its control. It was agreed to pursue the latter opportunity. The Committee did not recommend the purchase of Eltisley Wood, but it was agreed that a management agreement should be suggested to the new owner and that the Forestry Commission should be asked to inform the Trust of any future sales.

Members of the Committee gave advice on the management of land on the University Farm. They also considered the resiting of species-rich turf from a roadside verge nature reserve partly threatened with destruction and reviewed the management plan for Coe Fen and Paradise.

A new system for the issue of scientific permits was approved. It was agreed that every encouragement should be given to research on Trust nature reserves and the new system was designed not to restrict such work but to ensure that the Trust is able to control and to benefit from this research. Where collecting is involved, a strict code of conduct is imposed, and permission will not be given for the collection of certain groups of organisms.

At a time of financial difficulty, the Committee was asked to discuss the potential for increasing the revenue from nature reserves. It agreed that, provided any activity fell within the approved management plan drawn up within the principles of nature conservation, such activity could be carried out to the profit of the Trust, for example by the sale of the produce from coppicing or dead elms for firewood.

RSNC had suggested that the Trust might become actively involved in the growing and sale of seeds from wild flowers. It was agreed to recommend to the Executive that the Trust should not become involved in this venture. RSNC also advised on the correct approach to British Rail if there were any railway verges on active lines, non-functional lines or other BR property that were of wildlife value.

A draft check-list prepared by MAFF to enable ADAS officers to assess the possible conservation value of any site liable to be altered by agricultural improvement was considered and amended by the Committee.

The Conservation Committee of the Geological Society of London urged the Trust to become involved in geological conservation, suggesting that one person be designated to deal with this. It was agreed to nominate Mr D. French for this role.

Mrs Lesley Gray was welcomed as the County Council Planning Department representative on the retirement of Mr French, who continues to serve on the Committee in his own right. Mr Jon Megginson also joined the Committee, and Mr Duncan Donald resigned on leaving Cambridge for a job based at Wisley.

J. K. McNaught
Secretary

EDUCATION COMMITTEE

The Trust's educational work often seems indefinable and the results elusive, but we are confident that the interest in and need for conservation education is growing.

Courses and lectures for teachers have been one activity this year that has gained impetus. Several schools have begun to develop part of their grounds as small nature reserves. Now that old meadowland is so uncommon and unfamiliar to children, the idle corners of playing fields and playgrounds assume a new importance.

In July, the memorial concert for Winifred Parsons fittingly added to the success of the appeal in her memory. Her granddaughter, Elizabeth Buffery, was the flautist amongst a musical trio whose rendering of works by Poulenc, Debussy and Fauré was indeed a tribute. £1,548 from the appeal has been donated to the Trust for its educational work. Currently we feel a great need for tape-slide presentations of the work of the Trust both for adults and for children at various levels. These vehicles of education can now be developed with a small part of the fund. The new Reserves Handbook, projected for 1983, will serve also as a memorial volume. The recouped income from sales of this publication will be used for the development of educational displays for children, probably housed on one of the reserves.

The Trust's branch of Watch (see below) has grown steadily under the aegis of the Field Officer, Keith McNaught. We should dearly love to be able to afford a full-time education worker for the Trust and are at present seeking aid for one through the Manpower Services Commission. With a full-time person great work could be done.

During the year Mrs Patricia Aarseth, Mrs Helen Moore and Councillor A. Ashton have joined the Committee.

S. P. Tompkins
Hon. Secretary

CAMBIENT WATCH CLUB

Membership of CAMBIENT Watch – the junior branch of the Trust – has continued to grow during the year and is now nearing 160 members. The time has come to realise the goodwill and enthusiasm of these members and encourage the growth of the Club, but this can only be done with more voluntary help. A "Watch Day" was held, in conjunction with the Beds & Hunts and Northants Naturalists' Trusts, at Ramsey Heights Visitor Centre, when Cambridgeshire teachers were told about Watch and the involvement of the Trusts, but, despite this, no help was found for CAMBIENT Watch. We must therefore look for help elsewhere than in the overstretched teaching profession.

The three CAMBIENT Watch newsletters have carried information about the work of the Trust and the Cambridgeshire countryside. Winter wildfowl, evergreens in churchyards, nuts and mammals, garden wildlife, frogs and toads, bats and butterflies have been suggested as subjects for outdoor projects.

The Watch Annual General Meeting launched an imaginative national butterfly survey, "Butterfly Countdown", with the help of the Post Office, which subsidised a six-page centre for *Watchword*. Some of our members took part, and the data gathered will provide information to help butterfly conservation.

The monthly programme of "Watchwalks" has been well attended. Activities have included visits to the Botanic Garden in Cambridge, Overhall Grove, Wandlebury and Cherry Hinton Chalk-pit, birdwatching at the Ouse Washes and pulling ragwort at Fulbourn Educational Nature Reserve. A joint fungus foray was held in Waresley Wood by invitation from the Beds and Hunts Naturalists' Trust Watch Group, and the annual family boat trip to Upware Field Studies Centre was enjoyed by young and old alike (see p. 11). The Shepreth L-Moor visit concluded with tea at the home of Roger and Jean Connan. Such social events were designed to allow time for our junior members to get to know each other and to encourage parents to take an active part in the Club.

The Hallowe'en barbecue in Hayley Wood – including a torch-lit walk through the wood – was the highlight of the year, and the Christmas party, with games and refreshments and a walk in the snow-covered Botanic Garden, could not have rounded the year off better.

The Watch Board proposed changes in membership which increase the age range for the Club to 8–18 and also allow adults to join. Affiliation to the Club by schools and youth groups will not be supported by this Trust for the time being.

A detailed or specialised knowledge of natural history is not essential for those who wish to help the Club; more important is the ability to get on well with children and to motivate them. Further details can be obtained from me at the Trust office.

Keith McNaught
County Watch Organiser

FIELD MEETINGS IN 1981

Saturday, 7 March: Ouse Washes

Mother Nature seemed determined to upset 25 keen bird-watchers with her antics. Undeterred by the strong winds and occasional showers, we arrived at Welches Dam and were warned to expect the worst by the Warden, Cliff Carson. The Washes had been completely flooded in response to the previous week's rainfall and many of the birds were seeking refuge and food in the surrounding fields.

The party split into two groups, ably led by the Warden and his assistant, and we squelched our way to the hides. From the newly completed Rickwood Hide we were presented with a vast choppy lake which few birds were prepared to negotiate. Wigeon seemed quite numerous in the air and on the far side of the Washes, and the more experienced members of the party also picked out pochard and, on one occasion, teal. A handful of swans appeared along the far bank but remained unidentified. The day's tally was completed by sightings of gulls (which were everywhere), coots, meadow pipits and lapwings. At the Common Wash Hide the wigeon were far more polite and a few pairs came quite close. For the novice bird-watchers of the party (like me) this was most rewarding, and we came away knowing how to identify at least one species of duck other than mallard on the village pond.

For regular Ouse Washes visitors, the show of birds was understandably disappointing, but I think most people felt that they had spent an enjoyable afternoon and that we were simply unlucky with the weather. The impression made by the Washes on the few first-time visitors in the party was nevertheless strong, and there is little doubt that they, as well as the regular visitors, will return frequently to enjoy the peace and beauty of this nature reserve.

Len Packman

Saturday, 9 May: Potash Lane Hedge, Polstead, and Groton Wood, Suffolk

This excursion to two nature reserves of the Suffolk Trust for Nature Conservation was of particular interest to the CAMBIENT members who took part because of the comparison that was possible between these sites and Hayley Lane Hedge and Hayley Wood. Potash Lane Hedge is about 300 metres long and is estimated to be about a thousand years old. It is managed by the Suffolk Trust. Twelve species of woody plant were recognised, including old ash stools, holly, wild cherry and various willows, with a range of woodland plants on the verge including dog's mercury, bluebell and wood spurge as well as the more usual roadside plants.

After a picnic lunch the Honorary Warden, Jeff Morse, conducted the party round Groton Wood, which consists partly of oak and partly of small-leaved lime. In the past this 50-acre wood has been managed rather differently from Hayley Wood in that it was apparently clear-felled at regular intervals, whereas at Hayley it was the coppice that was cleared in rotation and the standards were taken only irregularly. Groton Wood was last clear-felled in about 1920. The Suffolk Trust bought the wood in 1974 and has, with the help of the Suffolk Conservation Corps and its own members, coppiced two acres a year. The cut wood is sold. Interesting plants recorded were woodruff *Galium odoratum*, three-nerved sandwort *Moehringia trinervia*, wood speedwell *Veronica montana*, false oxlip (the hybrid between primrose and cowslip), goldilocks buttercup *Ranunculus auricomus*, yellow pimpernel *Lysimachia nemorum* and several dense patches of herb-Paris *Paris quadrifolia*. For birds the newly-coppiced sections proved most attractive, with nightingale, garden and willow warblers, blackcap and chiffchaff. All enjoyed their visit and were impressed by the management activities of the Suffolk Trust.

M. W. Stanier

Sunday, 14 June: Upware Field Studies Centre, by boat

Once again, on what has become an annual family outing, Watch members, their parents and friends set sail for Upware on board *The Duchess*. The enthusiastic wildlife watchers were able to gain a good impression of life on the river, both animal and human, as the boat sailed to Upware. As in previous years, much of the enjoyment of the river trip came from the observations of our captain, Mr Kelly, on wildlife and the history of the Cam and the surrounding areas.

Ditches, dykes and lodes of Roman origin converge to meet the canalised River Cam and its washland at Upware Lock and Pumping Station. It was here that we met our guide to this fascinating area, Alan Revill, who is Teacher/Warden of the Upware Field Studies Centre. The centre caters for non-residential visits from schools and, housed in the Old School, consists of two large classrooms with working facilities and displays, including fenland tools and bygones. Some of our group explored Upware itself – the old steam pump house, the lock and the site of the Lord Nelson Inn or "No Hurry", once a favourite place of boatmen, farmers and University students, now replaced by the new marina complex. For most of the group, however, it was a trip to the Commissioners' Pit, a nature reserve a short walk from the centre.

Upware is located on a ridge of Corallian Limestone, and an exposure of this fossil-rich limestone in the pit provided one of the activities for the afternoon – fossil-hunting. Bird-watching, pond-dipping and tree and plant studies were also carried out. We all learnt something new about the wildlife of the area and we were grateful for the time Alan Revill had spent with us and impressed by the work he carries out at the centre.

Keith McNaught

Sunday, 21 June: Soham Meadows

About a score of budding botanists assembled at the rendezvous at Soham, to be conducted on a search for grasses under the leadership of Derek Wells. We were fortunate in having fine dry conditions, both above us and also on the ground for walking through the tall meadow grasses. Beginners and old hands alike had a most rewarding day, starting with an excellent exposition from Mr Wells on the structure of grasses and the first principles of their identification, then continuing with the actual identification of a wide variety of species – appreciated and understood by even the rawest beginners. Meanwhile others in the party were keen to increase their knowledge and pick up hints on knotty problems, such as how to distinguish between the two meadow-grasses *Poa pratensis* and *Poa trivialis* in the field. Soham Meadows were ideal for us, containing as they do grass species in a variety and profusion not normally seen nowadays outside nature reserves. We only managed to cross three-quarters of the first field by lunch-time, there was so much to see.

After a picnic lunch on the sward, we passed through an area of damp scrubland, with more species of grasses (also several sedges), and into a second field. This, unlike the first, had not been grazed recently and offered a scene of great beauty, with flowering heads of decorative species such as quaking-grass *Briza media* in sheets, instead of the odd individuals usually encountered. Species other than grasses were also noted, including pepper-saxifrage *Silaum silaus*, fairy flax *Linum catharticum* and bee orchid *Ophrys apifera*, as well as other more colourful though commoner species which added to the attractiveness of the scene.

The ornithologists did quite well during the day too, recording wetland species such as snipe and redshank and scrub species such as spotted flycatcher and long-tailed tit, reflecting again the diversity of habitat.

We eventually emerged from the tall grass meadow beside Soham Lode, which we followed to the bridge carrying the half-constructed bypass. There we admired a fine show of poppies and crossed the lode to see the work in progress on excavating the new lake and to inspect the new part of the reserve. A notable find here was the frog orchid *Coeloglossum viride*. We were again impressed by the diversity of interesting and beautiful plants. It was useful to have the chance of appreciating what a good thing it is that we have this area under our care as a nature reserve. Long may it remain!

Margaret Howe

Saturday, 4 July: Hayley Wood at night

A small but enthusiastic party of members met Ray Symonds and John Selby on the evening of 4 July for a look at Hayley Wood's nightlife. Ray and John had agreed to talk about the mammals and moths of Hayley respectively, demonstrated by live specimens caught in traps or attracted by an ultraviolet light during the evening. At 8 p.m. the evening began optimistically: whilst setting 40 Longworth traps baited with porridge oats, Ray had found a badger track, smelt a fox and heard a willow warbler, so there was some wildlife about.

Although by 9 p.m. we had seen no mammals, a little detective work on droppings and tracks had shown that fallow deer had been in the wood, and muntjac too. Comparison between the size of tracks was made and it was surprising to learn that it is a mystery why fallow bucks' tracks are not found; it is uncertain what happens to the bucks between each rutting season. Hayley Wood is the "headquarters" for a herd of fallow deer that range over 2,000 to 3,000 acres. The large deer exclosure is designed to keep fallow deer out of the coppice plots to allow the ground flora and coppice regrowth to flourish without being damaged by deer. Evidence of muntjac was found within the exclosure during the evening, and it was difficult to believe that these animals could get through such small gaps between the wires of the fence.

By 9.10 a number of the small mammal traps had been examined, but nothing had been caught. It is usual practice to put traps out three or four days in advance so that the small mammals get used to their presence. This evening we would see what happened when the

traps are down only for a short time. The ultraviolet light and white sheets had been set up in the Roundabout by John Selby. Although he had seen a common swift moth and a fox had been attracted to the activity at the Roundabout, no moths had been attracted to the light. The evening was still too light for the moth trap to work successfully, and, returning at 9.30 after looking at the oak regeneration experiment in the Great Glade, we found it was still too light. Our party agreed to walk round the wood until it got dark and we were rewarded with a view of two fallow does, their heads above the crop in an adjacent field. At 10.10, when we had retraced our steps to the Roundabout, it was still too light, but a bat (species unknown) put in a brief appearance.

By now our party was reduced in number. Despite the empty mammal traps at 10.20 and still too much light for moth-trapping at 10.30, we sat and talked and waited optimistically. At 10.40 we were told that we *should* be seeing moths by now, but at 11 p.m. only a single specimen of one of the small tortrix moths, possibly *Agapeta hamana*, had been attracted to the light and only one slug (species unknown) caught in the mammal traps, so we decided to go home.

Keith McNaught

Saturday, 18 July: Coldham's Common

About 18 people gathered to explore the natural history of Coldham's Common under the leadership of Dr Mike Smith and Dr James Cadbury. After a brief shower at the outset the afternoon proved to be fine and warm.

Yellow iris or flag Iris pseudacorus, *one of the wetland species of Coldham's Common*
William Palmer

Coldham's Common is the largest of the Cambridge commons, and also the largest common in the county (see *N. in C.*, **23** (1980): 44). Over many years it has had much disturbance, including a University golf course, very rich coprolite diggings and a Corporation rubbish tip. A large part of the common is now given over to local sports activities, but much is still grazed by horses and cows.

The party explored the north-west half of the common, which contains several types of habitats ranging from dry grassland, with large patches of thistles and nettles, to various wet areas supporting some rarer plant species. The edges of the water-filled brickpit are accessible for cattle to browse and drink and thus show a graded area of grazed water plants. The silted-up areas at the south end of the pit have stands of bulrush or great reedmace *Typha latifolia*, backed by heavy scrub which provides excellent areas for nesting birds. A deep and fast-flowing stream (dug at the beginning of the Second World War as a tank-trap) brings a diverted River Stour into the brickpit but has less plants than the old course of the river along the north-east boundary of the common. Here a wide variety of aquatic plants is in evidence in a sluggish rather silted stream. This is increased in interest by the vegetation on the banks around the allotment gardens and the marshy area behind the Abbey Pool. Among the rarer wetland plants recorded were opposite-leaved pondweed *Groenlandia densa*, whorl-grass *Catabrosa aquatica*, common meadow-rue *Thalictrum flavum* and flowering-rush *Butomus umbellatus*.

Insect life was not very obvious during this visit, but meadow brown and small skipper butterflies were seen as well as several dragonflies and whirligig beetles along the stream. Not many birds were observed. A lesser spotted woodpecker was reported heard but not seen. A reed warbler was heard along the stream, and we were treated to a superb aerial display by a meadow pipit as we returned across the railway foot-bridge.

Derek A. Stubbings

Sunday, 9 August: River Cruise to Wicken Fen

As the captain, Mr Kelly, steered *The Duchess* towards Wicken, dead fish floated by, victims of effluent overflow from the sewage works after recent rainstorms. Further on, the sight of a kingfisher, herons and Indian balsam *Impatiens glandulifera* cheered us.

Tim Bennett, the National Trust's Warden, showed us round the Fen, explaining the problems of managing the 560-acre reserve with just four full-time workers; the peat is too soft to support machinery for seven months each year because so much water has to be pumped into the Fen (which is nine or ten feet above the shrunken peat of the surrounding drained farmland) to maintain the fen vegetation. Imposing an entrance charge has reduced the number of visitors to 300 on a sunny Sunday, thus limiting damage to the Fen and providing a useful income, but one drove was closed to allow recovery from wear.

We were shown examples of the various habitats, some maintained by cutting, as was done for the traditional peat, reed, sedge and grass (litter) crops, and admired the associated rich diversity of species. Amongst those we saw were the yellow-flowered greater bladderwort *Utricularia vulgaris* in the old brickpits (which indicated that the water was unpolluted – and we found a submerged bladder that had trapped an insect), greater spearwort *Ranunculus lingua*, marsh-orchid spikes setting seed, alder buckthorn *Frangula alnus* in old fen carr (scrub), dying back from a fungal disease, marsh pea *Lathyrus palustris*, the non-stinging variety of stinging nettle *Urtica dioica*, a fragrant patch of bog myrtle *Myrica gale*, and roach and perch in a dyke. Other features of interest were the renovated windpump, the demonstration beds of named Wicken plants, a new sluice-gate and half a mile of re-excavated dyke. Our tour ended at the thatched Tower Hide overlooking the Mere. The dull, wet day had not been good for bird-watching, but a grasshopper warbler was heard and a party of long-tailed tits was seen in flight, whilst on the journey back we passed a kestrel and a pair of mute swans with their four cygnets.

Vanessa Pritchard

Greater spearwort Ranunculus lingua *at Wicken Fen*

William Palmer

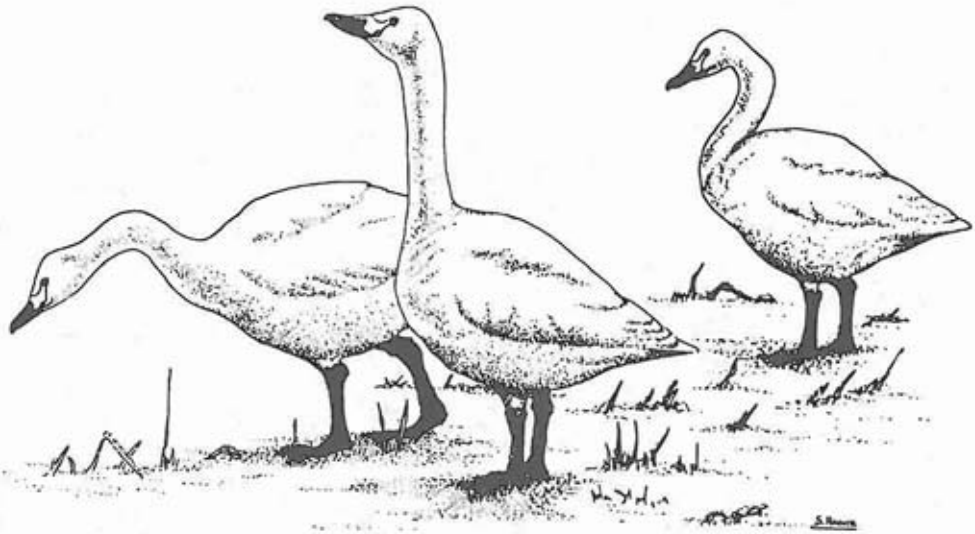
Saturday, 3 October: Fungus foray at Buff Wood, East Hatley

In this very good autumn for fungi 24 members visited Buff Wood, a nature reserve belonging to the University Botanic Garden. Despite pouring rain and semi-darkness, we recorded 72 species, 52 being new to the wood. These included *Lactarius pyrogalus* with its unforgettable taste, the very abundant lilac form of *Inocybe geophylla*, and *Russula mairei*, characteristic of the hornbeam which grows here. Among rare curiosities we found the beautiful shell-shaped *Lentinellus cochleatus*, the ground-living gill-bearing brackets of *Hohenbuehlia petaloides*, and the ground-incrusting polypore *Fibuloporia wynnei*.

Buff Wood is two miles from Hayley Wood, one-third its size, and on similar boulder-clay soils. It has a more complex history and a richer flowering plant flora than Hayley. Its fungi are less well known; 149 species have so far been found, a third of the number recorded from Hayley. But they are not just the commonest third of the Hayley Wood fungi; more than a quarter of the Buff Wood fungi have not been seen in Hayley Wood at all. Buff Wood has some of the characteristics of Hayley, for example many species of *Mycena*, few mycorrhizal agarics and no *Boletus* species, but there are remarkable differences. *Coprinus* is well represented at Buff, but *Lactarius* and *Crepidotus* poorly compared to Hayley. Each wood has its own unique fungus flora. Buff Wood resembles even less the more distant ancient woods such as Monks Wood near Huntingdon and the Bradfield Woods in Suffolk.

Oliver Rackham

Other excursions included a conducted tour of the Hayley cottage on Saturday, 16 May (see pp. 4-5); a walk around Shepreth L-Moor and a visit to Keys Cottage, Meldreth, at the invitation of Miss Margaret Hunter, on Saturday, 30 May; an evening ramble around Fordham Wood led by the Secretary of the Reserve Management Committee, Graham Loasby, on Thursday, 18 June; and an all-day trip to Norfolk Naturalists' Trust reserves in the Broads on Sunday, 23 August.



Bewick's swans on the Ouse Washes *Steve Rooke*

"NOW YOU SEE IT – NOW YOU DON'T"

An address given by the Rev Canon Michael Mayne in Great St Mary's Church, Cambridge, on Sunday, 29 March 1981, at a service of thanksgiving for the success of the Cambridgeshire Wildlife Appeal

A day or two before Max Walters invited me to hold a service for CAMBIENT members I had spent my weekly day off at Welches Dam. Some of you will know it – a reserve which forms part of the Ouse Washes and is jointly run by the Naturalists' Trust and the RSPB. You park your car and then propel yourself across the river on a small punt, and from there you walk along the far bank visiting a series of hides looking out on the flooded meadows. We saw no one else all day. There were teal and wigeon, coot and redshank, snipe exploring the thick mud with their knife-long bills, and fieldfare feeding on the path below the hide. There was even a short-eared owl. It was one of those rare days, sunny and still, and in one direction the black fen fields under the huge East Anglian sky were full of lapwing. In the far distance a flock of Bewick's swans were devastating a crop of what looked like early wheat. It was a day when you come home totally refreshed and at peace with yourself; so that when the request came the next day, how could I say anything but "yes"?

After all, Welches Dam is one of the places which could benefit from the recent appeal. In October 1979 an appeal for £100,000 was launched by CAMBIENT to buy or extend local nature reserves, not only in the Ouse Washes, but in that lovely historic wood in Knapwell, which is the home of badgers and which in a week or two's time will be thick with oxlips; and also to buy some ancient pastureland near Soham, a place where rare orchids grow, including the frog orchid; and to renovate an old railway cottage at Hayley Wood near Longstowe, another pure oxlip wood which I visited last Thursday – an existing reserve with a recorded history going back 700 years. By Christmas 1980 all the money had been found, a great deal of it from the pockets of local members, and the total to date is £108,000. So members of CAMBIENT have good reason to be well pleased, and the rest of us good reason to be grateful.

In the twelfth century Peter Lombard, one of the great mediaeval theologians, wrote this:

> Just as man is made for the sake of God – that is, that he may serve Him – so the world is made for the sake of man – that is, that it may serve *him*; therefore is man placed at the middle point of the universe, that he may both serve and be served.

One of the encouraging things in recent years has been the widespread renewal of concern about ecology and the environment. The rapid growth of science and technology, the greedy using-up of natural resources, the stresses of urban life, the poisoning of the countryside – all this has led people not only to join conservation movements, but to ask some basic – and actually very Biblical – questions about what it means to be stewards of God's creation, using it responsibly and guarding it for posterity. And one of the first things such stewardship requires is actually taking time to *see* the natural world and letting the creation speak to you of its Creator.

For there lies all about us, if only we have eyes to see, a creation of such spectacular profusion, such spendthrift and extravagant richness, such intricate and absurd detail, as to make us drunk with astonished wonder. I am not just talking of the awe we may momentarily feel at the sight of mountains with the snow on their peaks, or some exotic nature series such as *Life on Earth*. I'm talking of the awe it is possible to feel, once (as William Blake said) "the doors of perception are cleansed", at the markings on a single snowdrop, green on white; at the sound of a pair of Bewick's swans flying in at dusk to the Washes at Welney; at the colouring on a red admiral butterfly or a goldfinch's wing; at the power of a mature elm-tree which in the course of a single season can make six million intricate, perfect leaves; at the way a chestnut bursts into flower; at the fact that there are 228 separate and distinct muscles in the head of an ordinary caterpillar; at the fact that a bumblebee, according to all the laws of aerodynamics, shouldn't be able to fly; at the scent of a primrose; at the intricate chemical pattern of every last single cell.

When I was thinking of a title for this address I decided on "Now you see it – now you don't" for two reasons. First, because it seems to me that the primary requirement of anyone who cares about plants or birds or animals or insects or butterflies is training yourself how to see – a combination of patience and observation. You have to learn how to look and what to look for; and you have to know how to be still if you are to see fallow deer in Hayley Wood or kingfishers at Welches Dam.

But there is a second and more subtle meaning in the words "Now you see it –

now you don't", for what so many of the great nature writers and artists and poets have been able to do is to see the natural world with that absolute clarity of vision perhaps all of us have as young children, when we are seeing objects of wonder for the first time. For example, the naturalist Richard Jefferies, writing 100 years ago, said:

> If we had never before looked upon the earth, but suddenly came to it man or woman grown, set down in the midst of a summer mead, would it not seem to us a radiant vision? The hues, the shapes, the song and life of birds, above all the sunlight, the breath of heaven, resting on it; the mind would be filled with its glory, unable to grasp it, hardly believing that such things could be mere matter and no more. . . . So it seemed to me as a boy, sweet and new like this each morning; and even now, after the years that have passed, and the lines they have worn in the forehead, the summer mead shines as bright and fresh as when my foot first touched the grass.

The other day I read of a 22-year-old girl blind from birth who was one of the first to have a cataract operation. She was so dazzled by the world's brightness that she kept her eyes shut for two weeks. When eventually she dared look at the world, she was astonished and could only exclaim, again and again: "Oh God! How beautiful!"

"Your enjoyment of the world is never right," wrote the Welsh poet Thomas Trahearne 300 years ago, "until every morning you awake in heaven – and look upon the skies, the earth and the air as celestial joys." I take it he is saying what Elizabeth Barratt Browning was saying when she wrote: "Earth is crammed with heaven and every bush is fired with God"; or what Gerard Manley Hopkins was saying in that sonnet which begins:

> The world is charged with the grandeur of God.
> It will flame out like shining from shook foil;

or Robert Browning when he wrote:

> I but open my eyes, and God is seen God,
> In the star, in the stone, in the flesh, in the soul and the clod.

Now I'm not a pantheist. I believe God to be supremely revealed in *human* terms, and most perfectly in what we call the Incarnation, in Jesus Christ; and yet I believe He is a God who is incarnate too at every point of His Creation, "if we have eyes to see". It isn't God's will that we should love Him (as it were) *against* the creation, as though His world is in opposition to Him, but rather that we should glorify Him *through* the creation and with the creation as our starting point because every living thing is holy.

In the children's classic by St Exupéry, *The Little Prince* – which like all classics is really a book for all ages – there is this conversation with the little prince:

> In your world, said the little prince, men cultivate 5000 roses in one garden . . . and still they do not find what they seek.
> That is true, I said.
> And yet what they are looking for may be found in a single rose or a drop of water.
> So it can, I answered.
> And the little prince went on: But the eyes are blind: one must look with the heart.

THE GADWALL – A SUCCESS STORY

Graham Easy

Introduction

This article is the first of a planned series on species that have shown significant increases in distribution in Cambridgeshire (v.c. 29) in recent times. We are bombarded from all sides by such tales of woe concerning the loss of habitat and the decline of many species of our fauna and flora that we tend to forget that most birds are opportunists, quick to exploit any favourable situation. Many of the passerines have suffered with the increasingly hostile environment and loss of preferred habitat, yet the actual decline in numbers is generally less than one might expect. In contrast some wetland birds have increased quite substantially within v.c. 29 despite there being but small additions in suitable habitat: the gadwall *Anas strepera* is one such species.

A short history of the species in Cambridgeshire up to the 1960s

The gadwall was regarded as a rare winter visitor to Cambridgeshire during the 19th century, and it seems that less than a dozen were recorded in that period. It was still something of a rarity up to 1940, which is somewhat suprising considering the close proximity of the thriving Breckland population; but it was now appearing during the spring and summer months, which suggests that Breckland birds were exploring the east and centre of the county. Nesting occurred at Wicken in 1917 and on the flooded Burwell Fen in 1938 – especially encouraging signs of future colonisation – but no increases of these isolated breeding records followed. It seems likely that persecution of wildfowl, so rife at this time, prevented any build-up in numbers. A further factor that hindered the increase of wetland species which were showing marked improvements in distribution in surrounding counties was the restricted number of suitable areas of open water in Cambridgeshire.

During the 1940s gadwall were almost annually recorded, but surprisingly none was thought to have bred, even though the data available seem to indicate that nesting was attempted at Fulbourn Fen and was successful on the Ouse Washes in 1948. At this time the Cambridge sewage farm and the steadily expanding Milton gravel-pits were the centre for occurrences, but reports filtered in from Fulbourn Fen and the Ouse Washes and in 1949 the first of a series of interesting observations came from Peterborough sewage farm.

In the early 1950s Peterborough sewage farm and the Nene Washes featured prominently. Their distance from the other sites may imply that this colonisation was not associated with the Breckland penetration affecting areas to the east. While there was firm evidence of a regular winter arrival in East Anglia from the Continent (which showed well in ringing recoveries from 1950 onwards), the records throughout this period in the Nene Washes area were mainly of summering birds. Long-term projects by wildfowlers on the Nene Washes and at Sutton Bridge in Lincolnshire had been successful in introducing substantial numbers of surface-feeding ducks and geese, and it thus seems likely that the build-up of gadwall near Peterborough was the result of local introductions. The appearance of small groups during the early autumns of 1950, 1952 and 1953 suggested successful breeding in

these years, but again this was not followed by further colonisation; in fact records became few and far between from this area during the sixties. In contrast, the reports from the Ouse Washes were not particularly significant during the 1950s, but during the sixties the species managed to establish a firm foothold and by the end of the decade not only had these washlands become a major gadwall wintering area but substantial numbers remained into summer to breed.

The recent success

The major increase came in the years 1966 to 1968. Significantly, 1966 was an exceptional year for Breckland gadwall: 177 ducklings counted along the River Lark between Barton Mills and Lackford in Suffolk suggest the sort of breeding success that led to some of the largest gatherings of gadwall ever seen in the area, with 500 at Stanford Water in September.

The normal pattern of gadwall movements in Breckland is not well documented. The appearance of these large flocks from early autumn into winter at a few selected open waters is often so sudden as to suggest an arrival from distant, even foreign, breeding grounds. Actually, gadwalls disperse from open water sites early in the year to marshland and to main and even minor river systems. Often pairs isolate themselves from their kind until the end of the breeding season. After nesting, the adults do reflock and young birds often form substantial crèches in the breeding areas in July and August, but by late September or October there seems to be an urge to gather at specially favoured sites; in fact in some years the flocks may consist of the whole Breckland population. Could this coming together be a means of assessing the need for dispersal in the event of overpopulation? This may seem improbable – yet the rapid decline in the size of the major flock from 500 to 350 in the autumn of 1966 corresponded with the influx on the Ouse Washes! Up to 30 or 40 birds were present along these washes from mid-October 1966 to early in 1967; then numbers fell there until a further huge increase took place in December 1968, when a maximum of 123 was counted.

Since that time the Ouse Washes population has become more stable and it seems to have evolved a similar pattern to that of Breckland. Pairs disperse along the washes from early spring until early autumn, and winter gatherings, often associated with flocks of coots *Fulica atra*, are frequently quite impressive. The numbers reported in recent years have almost eclipsed those of Breckland: for example, in 1974 and 1978 over 50 pairs bred, and in March 1975 391 birds were counted.

Associated with this build-up on the Ouse Washes there has since been a marked increase in the numbers wintering at Grafham Water in the old county of Huntingdonshire. Grafham may have been an alternative feeding place to the Ouse Washes initially, but by the end of the 1970s the reservoir and Little Paxton gravel-pits had become a further discrete autumn and winter feeding area in their own right.

The gadwall can now be expected as a visitor at many wetland sites right across Cambridgeshire, with one or a few pairs nesting regularly at several places away from the Ouse Washes. On the Ouse Washes themselves the summering population is now of such strength that it would appear to be approaching that of shoveler *Anas clypeata*. Indeed gadwall may compete with that species for breeding territory in the near future.

THE ORIGINS OF THE WICKEN FEN BRICKPITS

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The brickpits at Wicken Fen (see Figure 1) have long been a point of interest for visitors to this nature reserve. They display a sharp zonation of vegetation owing to their steep sides and three metres' depth of water. The zonation consists of three main communities. There is a floating and submerged open-water vegetation of particular interest, including white water-lilies *Nymphaea alba*, whorled water-milfoil *Myriophyllum verticillatum* and greater bladderwort *Utricularia vulgaris*. Surrounding the edges of the ponds is a narrow band of swamp species such as common reed *Phragmites australis*, bulrush or great reedmace *Typha latifolia* and the uncommon lesser bulrush or lesser reedmace *Typha angustifolia*. Beyond this band is a herbaceous vegetation dominated by grasses and sedges, while many areas surrounding the pits are developing scrub and woodland. This zonation has in the past been used as an example of the aquatic phase of fenland succession[1], but because the pits are of artificial origin the zonation cannot be regarded as truly successional. The terrestrial vegetation is presumably a secondary succession initiated when the site was abandoned, while the aquatic plant and animal communities must be the result of the colonisation of bare clay or of a water-filled clay-pit – a primary succession. This aspect of the site would be of even greater interest if the date of initiation of colonisation were known.

Several scientific studies of the brickpits have been made and at least two authors have suggested dates for the abandonment of excavations. These coincide quite closely, being around 1900[2] and around 1910[3]. Now documents have come to light that illustrate the land-use history of the site and confirm the earlier date. Unfortunately it has not been possible to include in this outline the small pits sited near the modern windpump; their origins remain obscure.

The brickpits are situated on a three-acre triangle of land which is part of Little Breed Fen on the village side of Wicken Sedge Fen. A map dated 1666[4] shows this same triangle clearly, but, although the site is referred to as "fen" both here and elsewhere[5], there is no indication as to the actual land-use. By 1842 the area of the pits was woodland, though part of the triangle was arable as today[6]. The site was then in the possession and occupation of James Dennis, farmer[7]. He had given up possession by 1849 to R. M. Stephenson[8], probably the farmer at Pitt's Farm, Burwell[9]. The earliest suggestion of brickmaking on the site is in 1869. In that year Stephenson sold the triangle of land to John Owers of Soham[10], whose family was involved in the brickmaking and building trade[11,7]. The earliest record of a resident brickmaker in Wicken village is in the 1871 census returns[12]. The brickyard was in full operation by 1880[13], having a kiln and also a windpump to keep the pits dry. Brick production continued through the 1880s[14,15] until at least 1894, when the yard, apparently in a functioning state, was sold to James Johnson, builder and brickmaker of Soham[16,17]. Johnson's firm was in the hands of executors by 1896[18], and both yard and windpump were "disused" by 1901[19]. It is probable that brickmaking was discontinued between these last two dates, the undrained pits filling up with water and being colonised by plants and animals. It must not be assumed, however, that colonisation has been a gradual process. Winter and spring

flooding of the Fen undoubtedly introduced many species from nearby dykes and accelerated the succession.

The site was sold to the auctioneer and estate agent J. B. Westley in 1905 as "Wicken Brickyard"[20], but there is no evidence of a subsequent revival of manufacture. By the end of the 1920s the kiln was in ruins and the windpump had disappeared[21,22]. The ponds were bought by the National Trust in 1929 and have been protected as part of the Wicken Fen Nature Reserve ever since.

In summary, the date of the conversion of the brickpit site from woodland to extractive industry occurred after 1842, possibly soon after 1869. The pits were apparently abandoned at the end of the nineteenth century, and pondlife has developed over the last eighty to eighty-five years.

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NTA=National Trust Archives, Queen Anne's Gate, London
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CHEMISTRY OF THE WATERS OF WICKEN FEN

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It is well known that the nature of the peat in Wicken Fen and the characteristics of the present-day terrestrial and aquatic habitats depend in large measure on the presence of calcareous ground and surface waters, but only a few chemical analyses

have been published (Corbet *et al.*, 1980; Jenkin, 1982). This paper summarises data collected in the last few years in connection with the teaching of Environmental Biology at Cambridge University and draws some tentative conclusions. The area of the Fen considered here is that bounded by Wicken "island", Wicken Lode, Howe's Dyke and Spinney Bank, with a total area of about 130 hectares.

Gains and losses of dissolved materials

The Fen overlies impermeable Gault Clay, so accession of foreign water from springs need not be considered. Solutes are derived from the following sources:-

1. *Precipitation and accompanying dry deposition.*
2. Run-off, normally only during winter, from calcareous soils on Gault and drifts on Wicken "island". The effects are probably small and confined to the brickpits and adjacent drains.
3. Seepage from Wicken Lode in summer, when water-tables in the peat are low (Godwin, 1931); this is sometimes supplemented by artificial pumping. Wicken Lode (97)* is fed by the perennially-flowing Monk's Lode, an extension of the New River which rises from the Chalk near Exning.
4. Water occasionally pumped, at times of drainage stress, from agricultural land on the north of the Fen into Drainer's Dyke (92).
5. Net mineralisation of biotic debris and peat, and solution of intercalated marl, which is widespread in Wicken Fen.

The principal loss of dissolved materials is by seepage of ground-water into Wicken Lode or connected drains when water-tables are high. Precipitation probably exceeds evapotranspiration by some 160 mm per year on average (Gowing, 1977) so that the net loss of solutes over the 130 hectares of the Fen will correspond to those in about 208,000 m^3 of ground-water. There will also be minor losses of nutrients in the crops of reed, sedge and litter still sold off the Fen. The main solute paths are shown in Figure 2.

In open water bodies overall concentrations of course vary with the prevailing balance of precipitation and evaporation.

Surveys of water chemistry

Apart from a number of isolated analyses between 1975 and 1981, three main surveys have been made, as follows:-

1. Routine analyses around midday at two-monthly intervals from August 1976 to August 1978 to reveal any long-term fluctuations or trends. Waters included the surface water at the head of Wicken Lode (National Grid Reference TL 5630 7047), the surface water of the large brickpit (76a) (see pp. 21-22) and ground-water in the peat near Godwin's Triangle (TL 5545 7003) (R. M. S. Perrin and M. D. Fysh, partly reported in Corbet *et al.*, 1980).
2. Analyses of several surface waters in as quick succession as possible to make comparisons over a short time. Measurements were made between 1340 and 1540 on 19 August 1981 in Monk's Lode (TL 5604 7015), in Wicken Lode at the head and at Godwin's Triangle, in Drainer's Dyke and in the new channels along Gardiner's (91) and Thomson's Droves (95) (J. R. Plumridge and S. J. Matthews).

*Numbers in parentheses other than grid references denote water bodies in Figure 1.

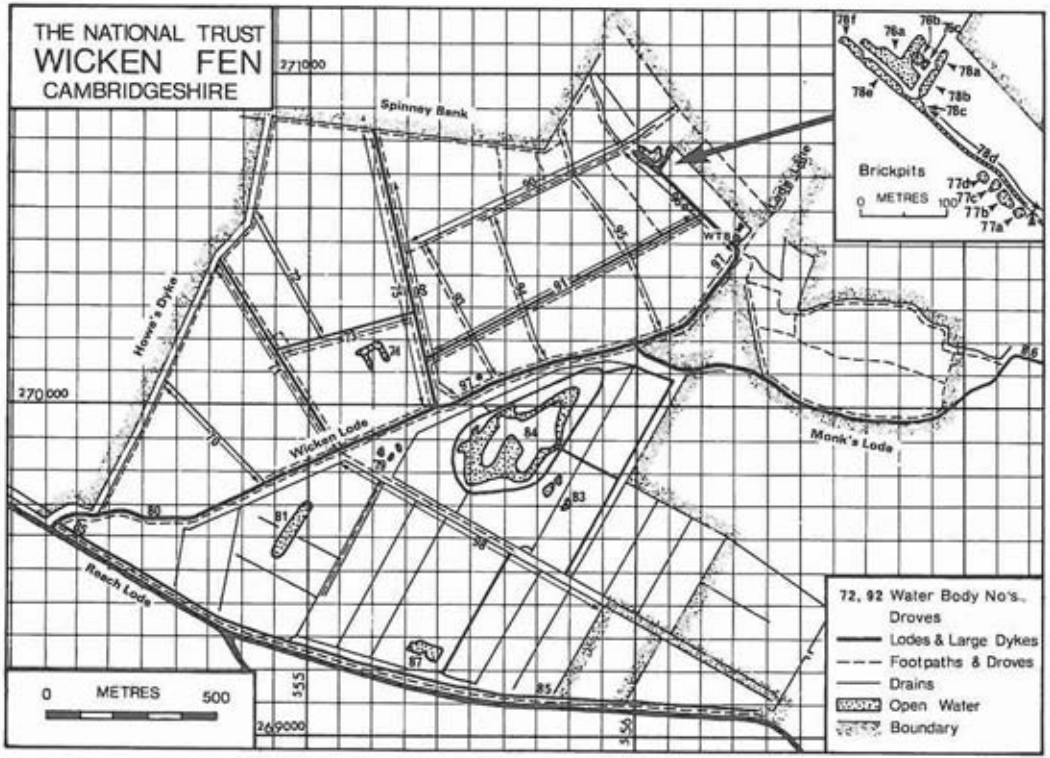

Figure 1: Water bodies in Wicken Fen

Copies of this map, prepared under the direction of Dr S. A. Corbet, may be obtained from the Warden at Wicken Fen by those wishing to make biological observations.

3. Measurements of nutrients and some other constituents at intervals of about one hour over a single 24-hour period in the brickpit (76a) on 1 and 2 August 1977 in order to quantify diel changes (Corbet *et al.*, 1980).

It must be stressed that these were independent studies and not parts of an integrated survey. No measurements were made to the west of Drainer's Dyke.

Chemistry of the waters

Precipitation

No chemical data are available for rainfall at Wicken. Partial analyses made between January and April 1981 in the Breckland are given in Table 1. Since the sites are some 40 km from Wicken, the results must be regarded with great caution, but they probably at least give the orders of magnitude of inputs from this source. Potassium, for example, from a rainfall of 520 mm might amount to about 5.2 kg per hectare per year – or 680 kg over the whole area of the Fen.

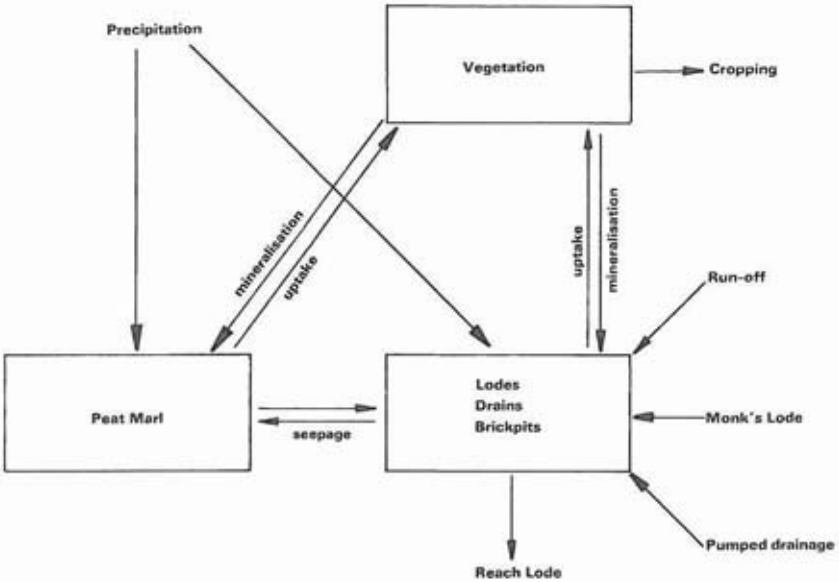

Figure 2: Main solute paths in Wicken Fen

Monk's Lode, Wicken Lode and Drainer's Dyke

The chemistry of Monk's Lode (Table 1) is typical of chalk-derived streams of south-east Fenland, being dominated by calcium bicarbonate and relatively high in nitrate and silica. The western end of Wicken Lode is a continuation of this stream and thus in August 1981 had a closely similar chemical composition (Table 1). At that time there would have been seepage into rather than from the peat.

The head of Wicken Lode, at the eastern end, however, is practically stagnant and more influenced by local inputs and outputs and by intensity of evaporation, while the seasonal growth and decay of the dense plant populations lead to large fluctuations in the nutrients nitrate, phosphate and silica and in dissolved oxygen (DO) and biochemical oxygen demand (BOD). At times there appears to have been some enrichment by seepage from piggeries at the end of Lode Lane.

Drainer's Dyke is also continuous with Wicken Lode and in general its chemistry is very similar (Table 1). When it receives pumped water from land north of the Fen, sulphate, bicarbonate and calcium are temporarily enriched.

Ground-waters in peat

The composition of ground-waters in the Fen reflects the balance of processes already mentioned. In 1976/78 these waters were always high or very high in sulphate, bicarbonate, total carbon dioxide and calcium, and sometimes relatively high in magnesium (which often accumulates in peats). As would be expected, pH, dissolved oxygen and oxidised nitrogen were low (Table 1). Potassium was also relatively low, presumably owing to uptake by vegetation.

Calcium is of course mainly associated with bicarbonate, from oxidation of organic materials and equilibration with exchangeable calcium and marl and with sulphate. Peats act as natural sinks for sulphate, which is partially reduced to sulphide (although in fen peats, in contrast to waterlogged mineral soils, little ferrous sulphide is formed owing to low iron levels) and re-oxidised when water-tables are lowered, the resulting sulphuric acid reacting with any calcium bicarbonate that is present. Waters from drained Fenland arable soils analysed in 1975/81 were always found to be high in sulphate and calcium.

If the drainage from the peat into the Lode is chemically similar to the ground-waters in Table 1, it is possible to make a rough estimate of net gains or losses by the Fen. Again using potassium as an example, the annual loss by seepage would be about 21-310 kg, implying a *net gain* of about 270-660 kg. Insufficient data are available to indicate whether such additions would be used up by net growth of carr; the removal of sedge and litter crops would have only a trivial effect.

By contrast there would be a *net loss* of about 44-64 tonnes of calcium. Although this appears a very large output, the top 1 m of peat at Wicken contains about 26,000 tonnes of exchangeable calcium apart from that in local concentrations of marl. Such losses could well be associated with local surface acidification of the peat (Gowing, 1977).

New channels along Gardiner's and Thompson's Droves

These channels were dug in 1980/81 in order to keep the Fen wetter in summer by pumping extra water from Wicken Lode via the drain (96) and the windpump at TL 5620 7059. They are not yet connected directly to the Lode or to Drainer's Dyke.

Measurements made in August 1981 at the two ends and in the middle of Gardiner's Drove and near the centre of Thompson's Drove are given in Table 2. Apart from the eastern end of Gardiner's Drove, all samples were very high in calcium, bicarbonate and electrical conductivity, with some enhancement of sulphate and magnesium, and were low in nitrate and ammonia. These features suggest that the waters were still at that time more influenced by drainage of the surrounding peat than by supply from the Lode. Presumably biological uptake of ammoniacal and oxidised nitrogen was dominant over derivation from mineralisation of peat.

As would be expected, the water from the eastern end of Gardiner's Drove, apart from low nitrate and silica, shows more affinity with the Lode.

Brickpit (76a)

The two-monthly survey in 1976/78 reported in Corbet *et al.* (1980) showed that the pit was generally lower in dissolved oxygen than the Lode and, apart from having higher electrical conductivity, it was richer in sulphate, bicarbonate, the common cations and silica, but poorer in phosphorus and much lower in total oxidised nitrogen (Table 2). Also given are some results obtained in 1930/31 by J. T. Saunders and P. M. Jenkin (Jenkin, 1982), which are very similar except in magnesium and silica. But caution is needed in comparing nutrient concentrations, as Corbet *et al.* showed that their fluctuations during a single 24-hour interval may equal or even exceed those at a particular time of day over a period of months or years (Table 2).

There is often a clear oxycline in the brickpit in summer even when there is no appreciable thermocline, and oxygen is then undetectable (<0.2% saturation) below 1.5-2 m. Sulphide correspondingly rises rapidly with depth to about 1 milligramme per litre (1mg l^{-1} HS^-) near the bottom. The significance of these distributions to populations of *Chromatium* in the adjacent brickpit (78e) is discussed by McGarry in this issue (see pp. 30–32).

Conclusions

1. Although all the waters are dominated by calcium bicarbonate, there are some important differences between them, especially in sulphate, nutrients and dissolved oxygen. Compositions can reasonably be explained in terms of likely processes and water movements.
2. By assuming the chemical composition of rainfall and values for local precipitation and evaporation, it is possible to draw up rough solute balances for the Fen.
3. Present results are very tentative. A comprehensive survey with more sites and with more adequate replication of samples is now desirable, with particular attention being paid to quantification of solute movements.

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TABLE 1: GENERAL CHEMISTRY OF WICKEN FEN WATERS

(mg l^{-1} except where otherwise stated; surface samples for open waters)

	Precipitation[x] Breckland (mean) Jan./Apr. 1981	Monk's Lode Aug. 1981	Wicken Lode Head Aug. 1981	Wicken Lode Head (range) 1976/78	Wicken Lode Godwin's Triangle Aug.1981	Drainer's Dyke Aug. 1981	Ground-waters Godwin's Triangle (range) 1976/78
Cl	3.4	31	33	34–78	34	32	36–71
SO_4^{2-}		47	52	39–253	47	49	187–532
HCO_3^-		251	261	157–351	259	256	325–544
†NO_3^-	0.8	28	2.9	33–57	27	36	nd–5.3
*$H_2PO_4^-$		tr	tr	nd–0.3	tr	tr	nd–0.1
Na^+	4.4	14	15	7.8–34	16	13	19–30
Mg^{2+}	0.47	3.5	4.3	3.0–17	3.5	3.6	3.6–19
Ca^{2+}	1.6	113	100	102–202	111	111	210–310
K^+	1.0	4.5	4.6	3.3–9.9	4.5	4.1	0.1–1.5
NH_4^+	0.46	0.03	0.04		nd	nd	
$EC_{25°C}$, µS cm^{-1}		676	637	551–1190	693	704	1040–1580
pH		8.1	7.9	7.1–8.4	7.9	7.8	6.3–6.6
Alkalinity, meq l^{-1}		4.1	4.3	2.6–5.8	4.2	4.2	5.3–8.9
SiO_2		8.7	5.9	1.5–9.9	7.5	4.8	2.5–5.8
TON	0.20	6.3	0.66	0.75–13	6.1	8.1	nd–1.2
Total P	0.44	0.37	0.49		0.31	0.43	
DO, % saturation		160	77	87–139	130	112	nd–10
BOD		1.4	2.1	1.1–10.2	1.7	1.5	0.5–4.4

† total oxidised nitrogen (TON) expressed as NO_3^-

* molybdate – reactive phosphorus expressed as $H_2PO_4^-$

[x] analyses by D. Pearson, A. Clift-Hill, S. Guthrie and E. Wormington

tr = trace

nd = not detected

A blank space indicates no data available.

TABLE 2: GENERAL CHEMISTRY OF WICKEN FEN WATERS (CONTINUED)

(mg l^{-1} except where otherwise stated; surface samples for all cases)

	Gardiner's Drove West	Gardiner's Drove Middle Aug. 1981	Gardiner's Drove East	Thomson's Drove Aug. 1981	Brickpit 76a (range)* 1930/31	Brickpit 76a (range) 1976/78	Brickpit 76a (range) 1/2 Aug. 1977
Cl^-	56	54	37	47	36	30–58	
SO_4^{2-}	87	162	61	136		86–270	
HCO_3^-	551	549	261	539		276–333	
NO_3^-	1.1	0.66	nd	0.44		nd–5.9	
$H_2PO_4^-$	tr	tr	tr	tr	nd–0.12	nd–0.07	nd–0.43
Na^+	41	39	21	34		13–35	
Mg^{2+}	11	14	6.0	11		6.0–15	
Ca^{2+}	188	201	100	198	114–136	145–198	
K^+	3.6	2.6	6.0	3.7	18–41	6.7–8.5	
NH_4^+	nd	nd	nd	nd	nd–0.2		nd–0.18
$EC_{25°C}$, µS cm^{-1}	1230	1270	693	1150		880–1370	
pH	7.8	8.5	7.9	8.3	7.4–8.1	7.2–7.8	7.2–8.6
Alkalinity, meq l^{-1}	9.0	9.0	4.3	8.8	4.3–5.0	4.7–5.5	
SiO_2	2.4	4.7	1.2	5.1	0.33–6.1	2.0–14	5–12
TON	0.25	0.15	nd	0.1		nd–1.3	nd–1.1
Total P	0.64	0.49	0.37	0.28			
DO, % saturation	78	81	91	88	27–96	33–98	
BOD	1.2	2.3	2.1	1.4		1.2–7.2	

* Jenkin (1982)

CHROMATIUM IN A BRICKPIT AT WICKEN FEN

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During an Environmental Biology excursion to Wicken Fen on 25 July 1980, a red coloration was noticed below the surface of the water in the small brickpit at TL 5604 7074 (78e in Figure 1). The coloration had been observed by previous courses at the same time of year, but not in winter, and it was not known whether it was chemical or biological in nature.

A sample of water from a depth of 60-70 cm was studied under the microscope. The field of view was found to be crammed with red, uniflagellate micro-organisms, eventually identified as purple sulphur bacteria of the genus *Chromatium*. These are strict anaerobes, as are all purple sulphur bacteria, being poisoned by oxygen. They photosynthesise, using hydrogen sulphide as an electron donor to reduce carbon dioxide. The process, which is analogous to photosynthesis in green plants, can be summarised thus:-

$$CO_2 + 2H_2S \xrightarrow{\text{light}} (CH_20) + H_20 + 2S$$

This sulphur can be oxidised further to sulphuric acid, thus:-

$$3CO_2 + 2S + 5H_2O \xrightarrow{\text{light}} 3(CH_2O) + 2H_2SO_4$$

Further samples were taken on 4 August, using a polythene tube mounted on an aluminium pole. Water was drawn up through the tube from fairly precise depths into sample bottles by means of a small hand vacuum pump. A count was made of numbers of *Chromatium* in a small known volume from each depth, and a curve was plotted of the vertical distribution (Figure 3). The curve showed a marked stratification. In an effort to determine the cause of this stratification, profiles were made of oxygen saturation, pH, temperature and sulphide concentration.

Oxygen, pH and temperature were determined at the same time, using electrodes mounted on a probe. The pH measurements were made by means of a combination electrode consisting of calomel and glass electrodes. A potassium chloride/agar bridge, in the form of a sleeve, prevented leakage of water into the potassium chloride of the calomel electrode. The pH profile is also shown in Figure 3. The acidity was highest in the vicinity of the bloom. This would be expected, as sulphuric acid is a waste product of *Chromatium* metabolism.

Oxygen saturation was measured by using an E. I. L. Mackereth electrode, and temperature by means of an attached thermistor. The size of the electrode and the need to keep it moving make it difficult to relate oxygen saturation very precisely to depth, but a fairly clear profile was obtained (Figure 3). The numbers of *Chromatium* are related inversely to the oxygen concentrations. The oxygen distribution is probably the cause of the stratification of *Chromatium*, because the organism is strictly anaerobic. The temperature was 17.5°C throughout the depth of the pit, so there was no thermal stratification.

Samples for sulphide concentration determination were drawn from various depths directly into bottles, which were then sealed to exclude air and thus prevent equilibration with the gaseous phase. In the laboratory a sulphide anti-oxidant buffer was added to each sample to raise the pH to about 14, and measurements were made using a silver/silver sulphide electrode and a calomel electrode. The sul-

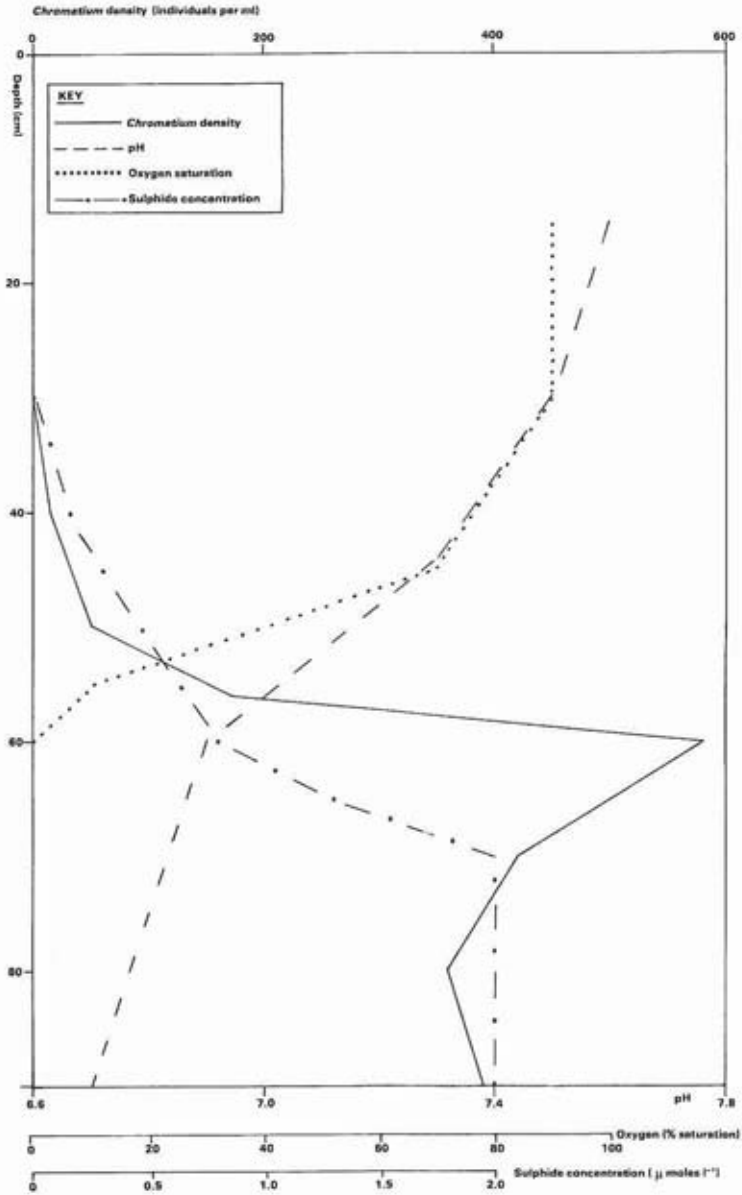


Figure 3: Vertical distribution of *Chromatium* density, pH, oxygen saturation and sulphide concentration in a brickpit at Wicken Fen

phide profile is compared with the vertical distribution of *Chromatium* in Figure 3. The clear relationship between them would be expected, as sulphide is essential to the metabolism of *Chromatium*.

The reason for the decrease in numbers below the peak at 60 cm is unknown. However, as *Chromatium* requires light for photosynthesis, it is possible that individuals in the water above limit the growth of those below by restricting the supply of light. Unfortunately it was not possible to make any radiation measurements.

The present work suggests that the apparent restriction of the bloom to summer conditions could be explained by oxygen and sulphur distributions. Although at the time of the measurements there was no thermal stratification, mixing of the water by wind would probably be slight in the summer owing to screening by the surrounding vegetation. In the autumn, cooling at the surface and exposure to wind would result in transfer of the upper, more oxygenated water to lower levels, inhibiting the growth of *Chromatium*. This would put an end to the bloom, with possibly only a few individuals surviving until the following summer when favourable conditions would return.

HEDGE-LAYING: CONSERVING A TRADITIONAL CRAFT

Stephen Lees

Introduction

The earliest documentary evidence of a "true" hedge, consisting of shrubs, dates back 2,000 years, when Julius Caesar in his *Gallic War* refers to a thorn hedge on the borders of France and Belgium (Pollard, Hooper and Moore, 1974). The reference also includes the information that the hedge had been laid. Despite these early origins hedge-laying, or hedging, only became a common craft in this country after the Inclosure Acts, many of which were passed in the late eighteenth and early nineteenth centuries.

Hedge-laying developed as a means of maintaining a permanent, stockproof barrier, and it is a skill which can always be improved upon. With the decrease in farm workers and the widespread introduction of mechanical trimming of hedges after the Second World War, the practice of laying hedges declined sharply. There has, however, been a recent, minor revival in the craft, often by volunteer workers such as local conservation corps. This interest has been stimulated by a desire to retain traditional skills in the community, but also in a few cases by a long-term deterioration observed in hedges as a result of mechanical trimming.

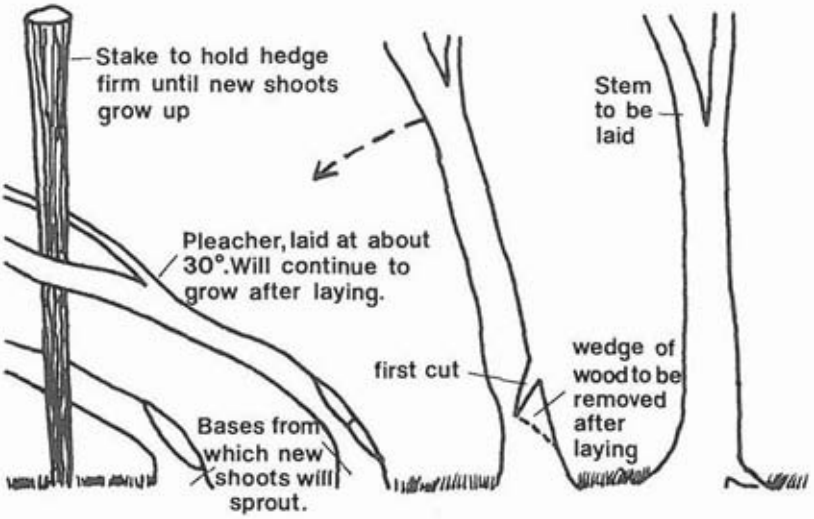
Hedge ecology

Research into the ecological effects of laying have been neglected, presumably because of the long time-scale such studies would involve. Newly laid hedges were found by Moore, Hooper and Davis (1967) to have relatively few nesting birds, but the longer-term effects were not monitored. Until ecological studies are undertaken it will be necessary to rely on informed, but unproven, opinion.

A believed advantage of managing a hedge by laying is the resulting diversity of structure. A hedge is usually kept trimmed between years of laying, which may be a period of 15 to 20 years, but it is allowed to grow up for about three years before being relaid. The different phases of a cycle represented in an area will support slightly different communities, thus increasing the diversity of species. A second advantage is that regular laying will maintain a hedge almost indefinitely, whereas mechanical trimming leads to the formation of scar tissue and usually thinning at the base and may eventually cause gaps, destroying the hedge's functional value. This is sometimes the first step towards hedge removal.

Laying techniques

Many regional styles have evolved over the years, partly as a result of the different types of stock to be fenced. The Midlands form is probably most widespread and is that practised by the Cambridge Conservation Corps. A simple diagram of this method is shown here. Detailed instructions for a variety of methods can be found in Brooks (1975). Brooks has calculated that hedge-laying need be no more expensive than post and wire fencing, if the compromise of mechanical trimming between the years of laying is accepted.



Basic steps involved in laying a hedge: pleachers are held in place by binding, usually with hazel wands woven across the tops of the stakes.

Present hedging activity

A sign of the recent increase of interest in hedge-laying was the formation in 1978 of the National Hedge Laying Society. This organises an annual national championship and co-ordinates local matches and activities.

The Cambridge Conservation Corps first started hedge-laying in 1972, at Hayley Lane. They have since tackled hedges at Soham Meadows, Haslingfield Pit, Elsworth, Gamlingay and Bourn Brook. With some tuition from experts, sound, functional laid hedges have been produced, even if lacking in some of the finer points. Students at Hills Road Sixth Form College have laid a hedge at Fulbourn, and one has been completed under the New Agricultural Landscapes Project, sponsored by Cambridgeshire County Council and the Countryside Commission.

Hedging will never be very common in Cambridgeshire, because it has no practical value in arable areas. Here a cheap method of management that may save many hedges would be to cut them down at regular intervals. This may sound drastic, but it is effectively a coppice rotation and would eliminate the need for annual trimming.

A somewhat unusual example of how laying saved a hedge arose from the Conservation Corps' visit to the Bourn Brook reserve. The Management Committee had reluctantly agreed to cut down a hedge, as the shade it cast was affecting neighbouring farmland. The hedge was, however, laid at the Corps' initiative and the ecological value has consequently been at least retained, while the lower structure has satisfied the farmer concerned.

Voluntary effort at present accounts for a high proportion of hedge-laying, particularly in this area. While this will enable the survival of the craft, it must be hoped that the recent revival of interest in hedging will continue. Its chances of surviving on a commercial basis, in some circumstances, are perhaps more hopeful now than for many years.

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INDICES FOR DYKE VEGETATION

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Introduction

Wetlands are perhaps the most threatened British habitat, and one part of this habitat is the dykes and drains of the Fenland and similar alluvial plains. Although

there are many reports of deterioration in fen dyke vegetation, there is a lack of firm evidence. Studies on hedgerows received a great impetus with the introduction of Dr Max Hooper's (1970) hedge age index, which was simple to apply and yielded fascinating information. Unfortunately dyke indices cannot provide evidence of Anglo-Saxon origin, but it is hoped that by their use Trust members will be able both to monitor changes (by recording the same dykes over a period of years) and to assess the botanical value of various parts of the Fens (by intensive surveys in single seasons).

The dykes and drains in the Fenland have been managed since their creation, as their drainage efficiency is maintained only by regular dredging to remove accumulating silt and by weed control measures to prevent vegetation hindering the easy movement of water through them. The traditional method of weed control was cutting, and this is still used, though to a lesser extent. The first chemical control was by copper sulphate, which is no longer permitted. Over the past few decades the use of aquatic herbicides has greatly increased, and so has the farming requirement for lowered water levels. High-quality plant communities are now rare outside nature reserves, and dykes with little or even no macrophyte (large-plant) vegetation are common.

It is simple to recognise and classify the extremes – first-class vegetation and empty channels. However, there is a need for a quantitative method of assessing vegetation, particularly in the intermediate stages of damage. "That dyke is not so good" is imprecise and can convey different ideas to different readers. A complete community analysis, though the best method of description, is too cumbersome – and too complicated for non-specialists – for the assessment of an area as being of, say, moderate quality. The convenient solution is the use of a vegetation index. This leads to each dyke community being given a number or letter and to all dykes with the same number or letter being considered as having vegetation of equivalent quality. This enables the vegetation to be classified, and comprehended, easily and quickly. The danger of using an index is that the observer may become obsessed by the number or letter and forget what this means in terms of plants, and so be too concerned when the classification alters by a small amount, without considering whether this small change is ecologically significant in terms of the total dyke environment.

Two attempts have been made to devise dyke indices, by de Lange and van Zon (in press, but earlier versions have been published in 1973 and 1977) and by Haslam and Wolseley (1981). Both assess the quality of the vegetation of man-made channels in alluvial plains such as the Fenland. They are constructed differently, and this paper compares their function and use.

The de Lange and van Zon index system – a conservation index

The de Lange and van Zon index system has two independent components, the Structural Evaluation Number or SEN (see Table 1) and the Geographical Rarity Number or GRN. The Dutch authors, from their long experience, have defined the "ideal" or "best" dyke community, consisting of plants of various growth habits (submerged, floating and emergent), giving a community structure that allows maximum biological development and a high species diversity, including many rare species. The SEN assesses the structure of the vegetation and is international in application. However, the line on the dyke edge that separates emergent aquatic

from terrestrial species varies with the observer and, as this affects the number of species recorded, it must be kept constant within each study; de Lange and van Zon use a demarcation line high up the bank, Haslam and Wolseley a lower one.

Communities with good structure can be composed of common or of rare species, so the GRN is used to complement the SEN. The use of two numbers means that structure and rarity are separated and useful comparisons can be made, e.g. in zonation, in seasonal changes, and after herbicide treatments. There is, however, a difficulty in compiling the GRN in Britain. The Netherlands have been divided into 1,673 grid "squares" ($5 \times 4\frac{1}{6}$ km) and the distribution of each aquatic species within these squares has been mapped. Each species has been allocated a number, depending on the number of squares in which it is recorded, from 1 (extremely common, occurring in 1,210-1,673 squares) to 9 (extremely rare, recorded in 1-3 squares). To calculate the GRN, the numbers allocated to each species present in the site are averaged. Such detailed records of species frequency are not available for the Fenland, and it is suggested that readers wishing to use a GRN compile a 9-grade rarity order of species in the relevant area and use that. (This is what the writer has done in providing the GRN values in Table 5.)

The de Lange and van Zon index system can be termed a conservation index, as it assesses how near a community comes to an ideal biological system.

The Haslam and Wolseley index – a damage rating

The Haslam and Wolseley index is pragmatic rather than idealistic in concept. The standard or "undamaged" community has as high vegetation cover, as many infrequent species and as many species in all as are frequently found. Other communities are measured against this standard, and the degree of "damage" estimated. "Damage" here means anything that reduces vegetation, whether it is a temporary reduction caused by cutting – even cutting which may itself be a conservation measure – or a reduction due to long-term severe pollution.

Table 2 shows how the rating is calculated (with the aid of Table 3). The damage number in Table 2 is converted to a 6-point rating, using letters. The original 8-point rating from **a** (= all right) to **h** (= horrible) was designed for streams (Haslam and Wolseley, 1981). The dyke rating is currently cruder and uses only five letters (though the top grade **a** is divided into two, roughly separating good dykes with bad edge habitats from those with good edge habitats). It is hoped to refine the rating in future to include all eight letters, and so the same extremes of **a** and **h** are used as in the stream rating. Table 4 gives some guide to sources of damage.

This rating can be used internationally provided that species groups tolerant and semi-tolerant to damage can be identified. It does, however, require a low demarcation line between aquatic and terrestrial species, as mentioned above.

Index results

Nearly 150 sites in the Fenland, Somerset Levels and Trent alluvial plains were examined in 1980. For the de Lange and van Zon indices, 8–10 m lengths are recorded. For the Haslam and Wolseley rating, observations are made from point sites, which implies looking at 10–12 m in dykes (and more in the larger drains) in fair detail and adding large species seen further away. As dyke and drain vegetation is repetitive, in only about 4% of sites were more species seen with the latter method.

The results showed that, when each site was compared for SEN, GRN and damage rating, there was no correlation between SEN and GRN (the two estimating independent variables of the community), but that the damage rating (which includes aspects of both SEN and GRN) is closely related to SEN and less well so to GRN.

Sites which have an unduly high GRN value for their damage rating (i.e. good GRN but considerable damage) included several drains, where deeper-water species occur which are less common over the whole watercourse system but, like yellow water-lily *Nuphar lutea*, may be fairly tolerant to damage. Here the Haslam and Wolseley rating is assessing damage and the GRN showing that the drain habitat is not a frequent one. Other sites with unusual GRN/damage rating values had mainly been subject to recent management. Of the sites with unduly low SEN for their damage rating, most had a high cover of filamentous algae: the writer considers this is preferable to an empty channel, de Lange does not. The others either included several rare species (altering the damage rating but not the structural rating) or had unbalanced structures (e.g. much duckweed *Lemna minor/gibba*) and so a low SEN. Half of the sites with unduly high SEN for their damage rating had been recently managed: short-term damage from cutting etc. has a lesser effect on fundamental structure than on the quantity of vegetation. Most of the rest had unusually few rare species.

Table 5 compares regions, showing the number of sites in each that were awarded each score. All three sets of scores give similar assessments. The Somerset Levels come out the best, and the Central Fenland the worst. It is particularly interesting that GRN and SEN give similar results for a region when they show no correlation for individual sites. The conservation aspect of the de Lange and van Zon indices is emphasised by sites in nature reserves being more strongly concentrated in their upper grades than in those of the damage rating index.

In the Fenland as a whole there are more very low SEN and GRN values than very low damage ratings. This is a good reflection of the plants present. Most dykes contain some vegetation; they are therefore not totally damaged and so are not assessed at **h** on the rating. Their botanical quality, however, is negligible, and so their SEN and GRN values are very low.

All three of the GRN, SEN and damage ratings are, therefore, useful in the British alluvial plains.

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Table 1: Calculation of the Structural Evaluation Number
(after de Lange and van Zon)

Structural index				*Diversity index*		*Index of filamentous algae*	
% cover of flowering plants	*Scores*			*No. of species*	*Score*	*% cover of algae*	*Score*
	emergent	*floating*	*submerged*				
76 – 100	1	1	2	< 4	1	76 – 100	–4
*46(51) – 75	2	3	4	4 – 5	2	51 – 75	–3
26 – *45(50)	3	5	6	6 – 7	3	26 – 50	–2
*5(10) – 25	4	6	5	8 – 9	4	5 – 25	–1
1 – *4(9)	5	5	4	10 – 11	5	< 5	0
< 1	3	3	3	12 – 15	6		
nil	1	1	1	16 – 20	7		
				> 20	8		
	. +	. +	.				
		(.		+	.	+	.)÷2.5

= Structural Evaluation Number (SEN)
(rounded off to 1 decimal)

* dependent on the scale of estimation for % cover

Notes on the use of Table 1

Assume a dyke with: (a) 50% cover of emergent species;
(b) 10% cover of floating species;
(c) 40% cover of submerged flowering plants;
(d) 8 species present;
(e) 10% cover of filamentous algae.

If cover is measured to the nearest 10%, use the figures in brackets where these are given. If cover is measured to 5% or greater accuracy, the alternative cover figures (not in brackets) are used.

(a) Emergent species cover 50%, measured to nearest 10%; therefore figures in brackets apply and 50% scores 3.
(b) Floating species, again using the figure in brackets, score 6.
(c) Submerged flowering plants score 6.

Total for flowering plant cover: 3 + 6 + 6 = 15.

(d) 8 species score 4.
(e) 10% cover of filamentous algae scores –1.

Total score: 15 + 4 – 1 = 18.
To obtain SEN, divide by 2.5.
Therefore SEN = 7.2.

Table 2: Damage rating for dykes and drains

1. Score for species present:
   Tolerant species score 1 each.
   Frequent (semi-tolerant) species score 2 each.
   Other species score 3 each.
2. Species diversity allowance:
   0–3 species present score 0.
   4–6 species present score 1.
   7–9 species present score 3.
   10+ species present score 5.
3. Cover value for all species (not including tall edge plants):
   Cover up to 50% scores 0.
   Cover 50–70% scores 1.
   Cover 75–100% scores 2.

Add these numbers together and convert the total to a rating letter as follows:–

Rating number	*Rating letter*
0–1	**h**
2–5	**f**
6–10	**d**
11–19	**b**
20–26	$\mathbf{a_2}$
27+	$\mathbf{a_1}$

N.B. If the water is shallow or the dyke is covered with tall emergent plants, the rating cannot be used.

Table 3: Tolerant and semi-tolerant species
(modified from Haslam and Wolseley, 1981)

1. *Tolerant species*
   Agrostis stolonifera and other small grasses
   Callitriche species
   Enteromorpha species
   Filamentous algae

   If near coast:
   Potamogeton pectinatus
   Scirpus maritimus

2. *Frequent (semi-tolerant) species*

   Alisma plantago-aquatica/lanceolatum
   Apium nodiflorum
   Carex acutiformis/riparia
   Ceratophyllum demersum
   Elodea canadensis
   Glyceria maxima
   Lemna minor/gibba
   Nuphar lutea
   Phalaris arundinacea
   Phragmites australis (= communis)
   Potamogeton natans
   P. pectinatus
   P. perfoliatus
   Rorippa nasturtium-aquaticum/microphylla
   Sagittaria sagittifolia
   Sparganium erectum

Table 4: The effect of various types of damage on the components of the damage rating (from Haslam and Wolseley, 1981)

Type of damage	*Effect on damage rating*				*Comment*
	Diversity loss	*Cover loss*	*Tolerant spp. important*	*Infrequent spp. important*	
Dredging	(+)	+	–	+	—
Cutting	(+)	+	–	+	—
Herbicides	+	+	+	–	Discoloration.
Drying	+	?	–	–	Loss of water-supported species, particularly if slow-growing.
Flooding	+	(+)	–	–	Loss of shallow-water species.
Trampling, etc.	+	+	–	+	
Boats	+	+	(+)	–	Loss of water-supported species.

+ much affected (+) less affected

Table 5: Comparison of SEN, GRN and damage ratings from several alluvial plains: numbers of sites awarded various scores

	South Fenland	*Central Fenland*	*Somerset Levels*	*West Trent Plain*
SEN				
>7.0	3	3	5	2
6.1–7.0	4	5	7	1
5.1–6.0	8	4	6	1
4.1–5.0	1	4	5	—
3.1–4.0	11	9	7	1
2.1–3.0	6	8	4	3
0–2.0	12	22	1	—
Total sites	45	55	35	8
GRN				
>4.0	2	1	—	2
3.1–4.0	11	7	9	1
2.1–3.0	11	12	15	3
1.1–2.0	17	13	10	1
0–1.0	3	20	1	1
Total sites	44	53	35	8
Damage rating				
a_1	4	1	8	2
a_2	3	6	5	2
b	9	6	14	1
d	12	12	5	2
f	12	15	1	2
h	1	8	1	—
Total sites	41	48	34	9

THE HOVERFLIES (DIPTERA: SYRPHIDAE) OF HAYLEY WOOD

Francis Gilbert and Ivan Perry

The Syrphidae comprise a well-defined family of the Diptera, the two-winged flies. There are about 250 species recorded in Britain, with new additions to the list being made fairly frequently; one species not yet officially on the British list, *Cheilosia zetterstedti*, has been taken at Hayley. Adult hoverflies are strong fliers and are well known for their habit of hovering with their bodies almost motionless in the air; they are also some of the most characteristic visitors to flowers, from which they obtain food in the form of nectar or pollen. Most species can be satisfactorily identified using the key in Coe (1953).

The larvae of hoverflies are astonishingly diverse in their feeding habits: a great many species have larvae that feed on aphids, but there are also those that feed on plant tissue, fungi, compost, dung, solids suspended in water, sap and rotting wood. Two groups have larvae that live in the nests of ants or bees, eating waste material. The life histories of most species have yet to be discovered, and little is known about even the commonest species beyond a few basic facts.

Hayley Wood is an ancient deciduous wood, growing on boulder clay soil, and covers 122 acres: its recorded history stretches back over 700 years. A good deal is known of the history and botanical ecology of the wood (Rackham, 1975), but little is known of the insect fauna. Ancient woodland is probably the habitat in which hoverflies first evolved, and most British species are associated with woodland habitats of one sort or another (Speight, Chandler and Nash, 1975). In Cambridgeshire, much early collecting was done by Verrall and Collin in Woodditton Wood, which became noted for its rarities: Woodditton Wood has now been largely destroyed by the planting of conifers, leaving Hayley Wood as the largest surviving ancient wood in the county. *Platycheirus tarsalis*, a rare hoverfly, is recorded here for Hayley Wood. It has only previously been recorded in the county from Woodditton Wood, where it was taken by Collin from 1926 to 1936. *Cheilosia zetterstedti* (see above) has only been taken at Lode, Woodditton Wood and Hayley; *Criorhina berberina* has also been taken only once outside these two woods. These records emphasise the importance of Hayley Wood as a habitat for hoverflies, particularly now that Woodditton Wood has disappeared; indeed Hayley Wood is at present the most important site for these insects known in the county.

The data presented here are the results of a systematic survey of the hoverflies of the wood undertaken during 1980, supplemented by records from occasional visits of previous years. There are some interesting distributions within the wood: for instance, male *Syrphus ribesii* hover in groups under the trees of the Triangle (by far the youngest area of the wood, dating from the 1920s), but rarely elsewhere. The inclusion of flower records in this report, with pollen (P) and nectar (N) visits separately noted, demonstrates the overwhelming importance of certain plants as sources of food. These plants, particularly *Ranunculus* and *Rubus* species in the rides, seem to form the major part of the diet of many hoverflies; management practices which affect the flora of the rides should be undertaken with the knowledge of their likely effect on the diversity of flower-visiting insects.

In all, 61 species were recorded, and a further nine are expected to occur. This total compares favourably with the list of about 75 species which probably occurred

in Woodditton Wood. Other woods that have been surveyed in other counties often have higher totals recorded; for example, in Wharncliffe Wood near Sheffield 96 species have been captured (Brackenbury and Whiteley, 1981).

The nomenclature and order of species in the list follow Kloet and Hincks (1976).

Syrphus ribesii 27.v-26.ix. 153 records.
Flowers: *Ranunculus repens* (P), *Rosa arvensis* (P), *Rubus* sp. (P), *Filipendula ulmaria* (P), *Hypericum hirsutum* (P), *Taraxacum oblongatum* (P), *Cirsium palustre* (P), *Ulmus minor* (honeydew), *Heracleum sphondylium* (P,N), *Centaurea nigra* (P), *Senecio jacobaea* (P)

Syrphus vitripennis 15.vii-4.ix. 6 records.
Flowers: *Sonchus* sp.(P), *Rubus* sp.(P), *Rosa arvensis* (P)

Epistrophe eligans 13.vi; 25.v.

Metasyrphus corollae 30.vi-11.viii. 6 records.
Flowers: *Hypericum hirsutum* (P), *Filipendula ulmaria* (N)

Metasyrphus luniger 15.vii-4.ix. 3 records.
Flowers: *Rubus* sp.(P)

Dasysyrphus albostriatus 25.viii; 18.ix. 2 records.

Dasysyrphus lunulatus 4.vi; 12.vi. 2 records.
Flowers: *Ranunculus repens* (P)
The second Cambridgeshire record for this mainly northern species.

Dasysyrphus tricinctus 20.v. 1 record.

Dasysyrphus venustus 16.v-13.vi. 13 records.

Leucozona lucorum 8.v-22.vii. 26 records.
Flowers: *Taraxacum oblongatum* (P), *Rubus* sp.(P)

Melangyna labiatarum 25.viii. 2 records.

Melangyna umbellatarum 19.viii. 1 record.

Meliscaeva auricollis 25.viii. 1 record.

Meliscaeva cinctella 19.viii-4.ix. 13 records.

Episyrphus balteatus 12.vi-3.x. 419 records.
Flowers: *Ranunculus repens* (P), *Rosa arvensis* (P), *Rubus* sp.(P), *Lythrum salicaria* (P), *Hypericum hirsutum* (P), *Taraxacum oblongatum* (P), *Cirsium palustre* (P), *Lychnis flos-cuculi* (P), *Bryonia dioica* (P), *Sonchus* sp.(P), *Centaurea nigra* (P)

Sphaerophoria scripta 13.vi-4.ix. 4 records.
Flowers: *Rubus* sp.(N)

Chrysotoxum bicinctum 15.vii. 1 record.
Flowers: *Rosa arvensis* (P)

Chrysotoxum cautum 12.vi. 1 record.

Baccha elongata 3.vi; 1.viii. 5 records.

Baccha obscuripennis 25.v-26.ix. 50 records.
All fifty records were of females.

Melanostoma mellinum 22.vii-4.ix. 30 records.
Flowers: *Rubus* sp.(P), *Lotus corniculatus* (P)

Melanostoma scalare 27.v-3.x. 437 records.
Flowers: *Hypericum hirsutum* (P), *Ranunculus repens* (P), *Brachypodium sylvaticum* (P), *Arrhenatherum elatius* (P), *Rubus* sp.(P), *Cirsium palustre* (P), *Centaurium* sp.(P), *Geranium robertianum* (P), *Lapsana communis* (P)

Platycheirus albimanus 27.v-26.ix. 128 records.
Flowers: *Ranunculus repens* (P,N), *Rosa arvensis* (P), *Rubus* sp.(P,N), *Prunella vulgaris* (P), *Brachypodium sylvaticum* (P), *Centaurium* sp.(P), *Circaea lutetiana* (N)

Platycheirus clypeatus 25.v-19.viii. 7 records.

Platycheirus manicatus 4.v-26.ix. 286 records.
Flowers: *Stellaria holostea* (P,N), *Veronica chamaedrys* (P,N), *Ranunculus repens* (P,N), *Geranium robertianum* (N), *Rubus* sp.(P,N), *Rosa arvensis* (P), *Circaea lutetiana* (N)

Platycheirus peltatus 16.v-26.ix. 264 records.
Flowers: *Endymion non-scriptus* (P), *Ranunculus repens* (P,N), *Lychnis flos-cuculi* (P), *Rubus* sp.(P,N), *Lythrum salicaria* (P,N), Gramineae (P), *Sonchus* sp.(N), *Cirsium palustre* (P), *Taraxacum* sp.(N), *Centaurea nigra* (P)

Platycheirus scutatus 10.v-4.ix. 42 records.
Flowers: *Lychnis flos-cuculi* (P), *Ranunculus repens* (P), *Rubus* sp.(P), *Cirsium palustre* (N)

Platycheirus tarsalis 8.v-4.vi. 6 records.
Flowers: *Ranunculus ficaria*

Pyrophaena granditarsa 13.vi. 1 record.

Pipiza austriaca 28.v-22.vii. 40 records.
Flowers: *Ranunculus repens* (P,N)

Pipiza luteitarsis 25.v; 13.vi. 2 records.

Pipiza noctiluca 20.v. 1 record.

Pipizella virens 12.vi. 1 record.
Flowers: *Rubus* sp.(P)

Cheilosia albitarsis 27.v-13.vi. 7 records.
Flowers: *Ranunculus repens* (P)

Cheilosia grossa 18.iv. 1 record.

Cheilosia illustrata 18.vi. 1 record.

Cheilosia paganus 18.iv-4.ix. 29 records.
Flowers: *Ranunculus repens* (P,N), *Geum urbanum* (P)

Cheilosia proxima 22.vii. 2 records.
Flowers: *Ranunculus repens* (P)

Cheilosia variabilis 25.v-12.vi. 4 records.

Cheilosia vernalis 16.v-25.viii. 6 records.
Flowers: *Ranunculus repens* (P), *Leontodon autumnalis* (N)

Cheilosia zetterstedti 25.v; 13.vi. 3 records.
Flowers: *Heracleum sphondylium*
Not yet officially on the British list; found in Hayley Lane.

Rhingia campestris 24.v-3.vi; 11.viii-4.ix. 22 records.
Flowers: *Veronica chamaedrys* (N), *Endymion non-scriptus* (P,N), *Geranium robertianum* (N), *Prunella vulgaris* (N), *Lythrum salicaria* (N), *Centaurea nigra* (N)

Ferdinandea cuprea 25.v-30.vi; 19.viii-4.ix. 22 records.
Flowers: *Ranunculus repens* (P), *Rubus* sp.(P), *Cirsium palustre* (P)

Brachyopa scutellaris 18.vi. 1 record.
The species of this genus are difficult to recognise as hoverflies, looking more like muscids; the individual recorded from the wood was flying underneath the foliage of a small sapling in the main ride.

Neoascia podagrica 27.v; 25.viii-26.ix. 6 records.
Flowers: *Circaea lutetiana* (P), *Rubus* sp.(N)

Volucella bombylans 27.v-22.vii. 18 records.
Flowers: *Rubus* sp.(N), *Rosa arvensis* (N), *Filipendula ulmaria* (P,N)

Volucella pellucens 30.vi-22.vii. 4 records.
Flowers: *Rubus* sp.(N)

Xylota segnis 24.v-25.viii. 110 records.
Flowers: *Rubus* sp.(N?)

Xylota sylvarum 4.vi-1.viii. 33 records.
The two *Xylota* species are common in the wood. Almost invariably they are to be found systematically collecting food from the surface of leaves, rarely visiting flowers at all.

Syritta pipiens 18.iv-4.ix. 17 records.
Flowers: *Ranunculus repens* (N), *Rosa arvensis* (P), *Rubus* sp.(P,N), *Leontodon autumnalis* (N)

Criorhina berberina var. *oxyacanthae* 12.vi. 1 record.
Flowers: *Rubus* sp.(N)

Criorhina floccosa 22.v. 1 record.

Helophilus pendulus 27.v-26.ix. 31 records.
Flowers: *Rubus* sp.(P,N), *Sonchus* sp. (P), *Taraxacum oblongatum* (N), *Centaurea nigra* (N)

Parhelophilus versicolor 22.v. 1 record.

Eristalis arbustorum 27.v-4.ix. 26 records.
Flowers: *Crataegus monogyna* (N), *Rosa arvensis* (P), *Rubus* sp.(P,N), *Cirsium palustre* (P)

Eristalis intricarius 8.v; 22.vii. 2 records.
Flowers: *Rubus* sp.(P,N)

Eristalis nemorum 3.vi-22.vii. 14 records.
Flowers: *Ranunculus repens* (P), *Rubus* sp.(N)

Eristalis pertinax 8.v-26.ix. 40 records.
Flowers: *Heracleum sphondylium* (P,N), *Rubus* sp.(P,N), *Filipendula ulmaria*, *Cirsium palustre* (P)

Eristalis tenax 18.iv-4.ix. 14 records.
Flowers: *Rosa arvensis* (P,N), *Rubus* sp.(N), *Ranunculus repens* (P), *Cirsium palustre* (N), *Centaurea nigra* (N)

Eristalinus sepulchralis 18.vi. 1 record.

Myiatropa florea 27.v-25.viii. 29 records.
Flowers: *Crataegus monogyna* (N), *Rubus* sp.(P,N)

Species expected to occur in Hayley Wood
Epistrophe grossulariae, *Scaeva pyrastri*, *Parasyrphus punctulatus*, *Melangyna lasiophthalma*, *Sphegina clunipes*, *Cheilosia albipila*, *Orthonevra splendens*, *Eumerus strigatus*, *Merodon equestris*

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BLACK POPLARS IN CAMBRIDGESHIRE

Graham Easy

With the loss of the majority of our magnificent elms, especially *Ulmus glabra* Hudson and *U. procera* Salisb., poplars have taken on a more important role in the Cambridgeshire landscape. Elms have given botanists problems in identification in the past, and these poplars are likely to provide even more headaches in the future. A wide selection of hybrid poplars is offered by horticultural merchants and certainly a confusing range of these vigorous young trees is becoming conspicuous in plantations, in gardens and by roadsides. Most have a simple, erect habit that provides a helpful pointer for recognising them (see Figure 4: H). I have not attempted to record or separate this wide range of hybrids in my search for poplar trees in Cambridgeshire, nor have I taken into account the long-established white poplar *Populus alba* L., the aspen *P. tremula* L. and their hybrids, one of which, the grey poplar, *P. canescens* (Aiton) Sm., was considered a separate species until recently and is widely distributed across the county.

The recent national survey of the black poplar *Populus nigra* L. has also brought to light some unexpected problems in identification. A major feature suggested in *A Flora of Cambridgeshire* (Perring *et al.*, 1964) and elsewhere to separate the true black poplar from the hybrid *P.* × *canadensis* Moench (= *P.* × *euramericana* (Dode) Guinier) is the conspicuously bossed appearance of *P. nigra*. Generally the literature available is confused over the emphasis of features distinguishing *P. nigra* and its hybrids from the American species *P. deltoides* Marsh. Reference to material collected in herbaria usually helps clear up any such confusion between similar plant species, but in this case vital information on the age and appearance of the trees from which the preserved leaves and twigs came has often gone unrecorded.

I have not investigated the most numerous of the mature "black poplars" – the Lombardy poplar (the fastigiate cultivar of *P. nigra*, 'Italica': see Figure 4: D, E, e), which is especially common in South Cambridgeshire. Nevertheless, it seems worth mentioning that two similar forms of "Lombardy poplar" are to be found, one with glabrous and the other with pubescent leaf-stalks and young twigs; unravelling the distribution of these seems a worthwhile future project.

I have, however, examined about 600 other trees presumably planted around the turn of the century or earlier. The most widespread of these poplars has proved to be the hybrid, *P* × *canadensis*, which is a huge tree with great boughs that project at 45° from the main trunk. The bark on the trunk and main branches is cut in long, deep, vertical ridges and is usually without disfiguring elm-like bosses. The leaf clothing is thin and evenly distributed, and the general paleness of its green is often noteworthy. Despite considerable variation in overall shape and general appearance, due to the amount of competition for growing-space or to earlier pollarding or damage, close examination of the leaves suggests that the majority of the more impressive of these trees are of a common clone. The leaves are large and vaguely kidney-shaped, with deeply cut, markedly curved teeth evenly distributed around the edges. Their stalks are noticeably flattened, hairless and usually with one or two distorted, large glands near the junction with the leaf. This appears to be *P.* × *canadensis* 'Serotina' (see Figure 4: I, i).

Bossed trees are not necessarily *P. nigra*. A number of otherwise typical 'Serotina' have hideous protuberances on their trunks which were probably caused by disease or damage when the trees were considerably younger; a large specimen on the roadside between Histon and Wilburton shows this well.

Another hybrid poplar has a much more untidy appearance, with distorted grooves in the bark and frequent boss-like growths with twiggy offshoots on the trunk. Examples are to be found in quantity in the north of Cambridgeshire, at the Wisbech sewage farm (which falls within our vice-county, v.c. 29), in Swaffham Prior and Reach Fens, and at several coastal localities in adjoining counties. All those examined at flowering time so far have proved to be female. All these trees are at especially exposed sites, which suggests that they have this appearance as a result of difficult growing conditions. Nevertheless they seem referable to the form 'Regenerata' of *P.* × *canadensis*, commonly called the railway poplar (see Figure 4: G, g). Despite the frequent resemblance to the true black poplar in overall shape, the leaf structure – with distorted petiole glands — confirms that these are hybrids.

The main problem has been categorising the remaining trees which either are or closely resemble *P. nigra*. There are over one hundred such individuals in Cambridgeshire; I examined about 70 in 1981. Basically all agree in general appearance, being rather densely twiggy and untidy when young, but maturing into impressive trees, the more ancient of which have a majestic if somewhat forbidding aura about them!

Frequent pollarding suggests that these trees were of great importance in earlier times. Since they provided one of the few easily prepared woods that did not splinter when subjected to hard wear, their planks were used for cart floors and similar purposes (E. Milne-Redhead, pers. comm.). Pollarding has given many trees an untypical appearance; as the newer growth is more vigorous, it rarely matches the gnarled, often hollow, bossed base, as can be seen in examples at Bassingbourn, Shepreth by the railway, Burwell by the river (see Figure 4: B) and Great Wilbraham. At the last site an impressive trunk seems to support four separate trees! Pollarded or not, one similar feature shown by all these *P. nigra* types is a dense covering of leaves at the crown. The cultivar 'Serotina' can also produce this type of canopy, though usually only after pollarding (as in the Cambridge sewage farm specimens); generally its foliage is, by contrast, thin and evenly distributed, as described earlier in this account.

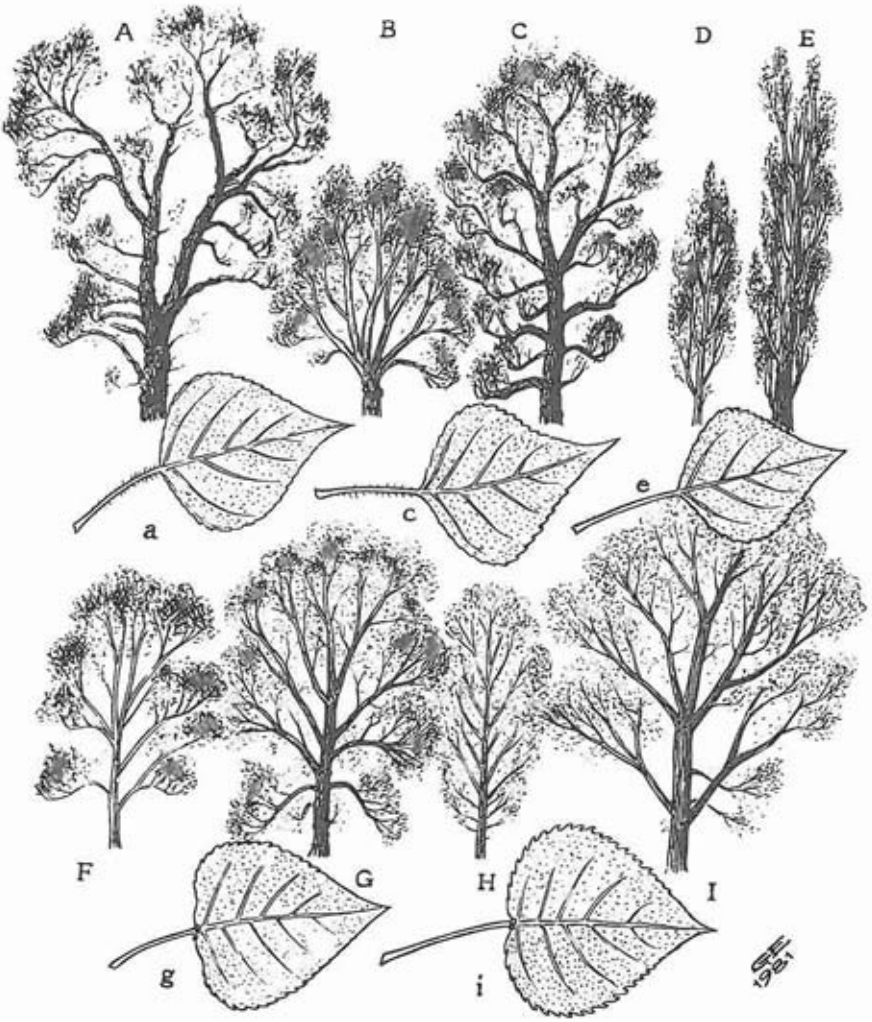


Figure 4: Cambridgeshire black poplars

A, a True black poplar – Fen Ditton, 1976
B Pollarded true black poplar – Burwell, 1981
C, c Bossless black poplar – Horningsea, 1981
D Lombardy poplar – Lode, 1900 (from a photograph)
E, e Lombardy poplar – Lode, 1960 (probably the same tree)
F Immature black poplar – Burwell, 1978 (perhaps grown from a cutting taken from one of the older trees growing nearby)
G, g Railway poplar *P.* x *canadensis* 'Regenerata' – Cambridge, 1981
H Hybrid poplar – Milton, 1981
I, i Black Italian poplar *P.* x *canadensis* 'Serotina' – Cambridge Sewage Farm, 1981

Approximately half the trees examined agreed with the accepted description of *P. nigra* var. *betulifolia* (the form supposedly native in Britain), having heavily bossed trunks, noticeably drooping lower and side main branches with upturned twigs, hairy petioles and young twigs, and more rhomboidal leaf shapes with less strongly toothed leaf-edges (see Figure 4: A, a). I have included here the much pollarded lines of field-edge trees at Bassingbourn. The severe cutting-back has produced oddly-shaped trees with many erect boughs, but the remarkably smoothly bossed, ancient trunks and the leaf detail and covering would seem to suggest that these are also *P. nigra* var. *betulifolia*.

The fallen tree at Shepreth Mill leaning towards the A10 has been identified as "*P. nigra var. genuina*". It agrees with *P.* × *canadensis* superficially, having similar bark grooves, appearance of boughs and leaf cover; but, while the leaf petioles are hairless, they lack that hybrid's glands; thus this female specimen remains a mystery. All trees in the county that have been definitely identified as *P. nigra* have proved to be male.

The remaining 30 or so trees include several that have caused identification problems in the past, being recorded as *P. nigra* on some occasions and *P.* × *canadensis* on others; examples occur at Fen Ditton, Little Wilbraham and Horningsea (see Figure 4: C, c). These closely resemble *P. nigra* var. *betulifolia*, as is best shown at Fen Ditton and near Factory Road, Burwell, where specimens grow side by side with typical *P. nigra*, identical in all basic features, size and age; yet the problem trees are immediately obvious because they lack any bosses! A high proportion of these "misfits" have more pronounced teeth along the middle portion of the leaf-edge (see Figure 4: c). It is possible that these trees are examples of a hitherto unrecognised hybrid; but, since the age of a number of them, such as the tree at Fen Ditton, would seem to antedate the documented history of the introduction of other hybrids into England and, furthermore, as the range of trees at Burwell produces a cline linking both extremes, these trees are being considered, for the time being, as a variety of *P. nigra*.

If any reader knows of a tree of *P. nigra*, bossed or unbossed as described, that seems to have been overlooked by this survey, it would be most helpful if details of the locality could be given to the County Botanical Recorder, Mrs G. Crompton, at the University Botanic Garden, 1 Brookside, Cambridge.

KEY TO CAMBRIDGESHIRE POPLARS

1 Leaves lobed or irregularly and boldly toothed: ASPEN, WHITE and GREY POPLARS
Leaves not lobed, with regular leaf-edges bearing small, even, incurved teeth: 2

2 Tree with erect trunk and main boughs: 3
Tree with spreading main boughs: 4

3 Tree with all boughs and twigs more or less erect; the tree columnar:
LOMBARDY POPLAR *P. nigra* 'Italica'
Tree with trunk and main boughs not diverging more than 15° from perpendicular, the less significant side boughs spreading evenly from them:
The wide range of hybrid poplars used in forestry and recently planted in hedgerows and gardens; some examples of RAILWAY POPLAR *P.* × *canadensis* 'Regenerata', *P.* × *canadensis* 'Robusta' (Coe Fen) and *P.* × *canadensis* 'Eugenei' (Botanic Garden)

4 Tree with boughs spreading stiffly at approx. 45° from the perpendicular; few, if any, branches drooping: BLACK ITALIAN POPLAR *P.* × *canadensis* 'Serotina'

Tree more erratically branched, with many boughs at 90° or at least dropping earthward significantly: **5**

Tree obviously pollarded; trunk ancient, yet boughs immature, often massed: **5**

5 Leaves with hairless stalks, with 1-2 pronounced glands at the junction with the leaf-blade; twigs hairless: *P.* × *canadensis*

Leaves with hairy stalks; no significant glands at junction, and usually glandless; twigs often very hairy: **6**

Leaf-stalks and twigs hairless, with no glands; tree with long, deep bark furrows and with no bosses throughout: ?BLACK POPLAR (Shepreth Mill)

6 Tree heavily bossed, with deeply grooved bark on main boughs and smoother, even, silver bark on upper branches; bosses on trunk, with chunks of wood protruding in a grossly distorted fashion: BLACK POPLAR *P. nigra* var. *betulifolia*

Tree heavily bossed, with bark not deeply grooved; bosses smooth and not distorted; boughs with smaller, less conspicuous, though often very frequent, bosses; upper branches more "weathered" and knobbly: BLACK POPLAR *P. nigra* ?variety

Tree not noticeably bossed, though branches often "weathered" and knobbly; boughs often with few, small bosses; if trunk has bosses, these smooth: ?BLACK POPLAR

N.B. Intermediates between the last three varieties occur.

Male black poplar trees in Cambridgeshire and Newmarket (Suffolk)

	Bassingbourn	Meldreth	Orwell	Shepreth	Cambridge	Girton	Madingley	Wilbrahams	Lode	Fen Ditton	Horningsea	Chesterton	Swaffhams	Burwell	Fordham	Snailwell	Exning	Kennett	Red Lodge	Badlingham	Chippenham	Chatteris	Wisbech St Mary	Newton	Christchurch
A							1							5	1†		11	7	1	1	1		1*		
B				1*	2			2		1			1	2		1			1						
C	8*	1						2(1*)	1				1	2(1*)			1	2(1*)		1*					1
D								2(1*)		1				1*			1	1						1	
E						2							1												
F	8*							1*	1*		1	1	1	6*											
G																		1*							
H			1									1	1	3								1*			2
J			1		2			1					4	1			1		2						

KEY

A	Heavily bossed	Girth 12–23 ft
B	Moderately bossed	
C	Bosses restricted to trunk	
D	No bosses	
E	Moderately bossed	Girth 10–12 ft
F	Bosses restricted to trunk	
G	No bosses	
H	Immature: grooved bark, occasionally bossed	Girth less than 10 ft
J	Immature: ungrooved bark	

* Pollarded

† This tree, discovered in 1982, must be the lone survivor of the trees noted by John Ray before 1660.

True black poplar Populus nigra *near the American Cemetery, Madingley, in March 1982*
William Palmer

A TALE OF BEE ORCHIDS

Nicholas Warner

Introduction

The bee orchid *Ophrys apifera* is a plant of alkaline habitats, often occurring among the several orchid species that frequent closed but not rank chalk or limestone grassland, but quite at home also in some more open habitats such as old quarries and chalk-pits or stabilised dunes. Though the mainly calcareous soils of Cambridgeshire are suitable for it, the county's prevailing arable land-use is not, so that its occurrence is scattered and, with the notable exception of the population here described, rarely in large numbers.

As with many British orchid species, the variability and unpredictability of the bee orchid's "appearances" have for long puzzled botanists. Instances have been recounted of the species suddenly and unaccountably flowering in great numbers where it had hitherto been absent or only occasional, but soon thereafter dwindling to a few individuals or vanishing altogether for several years or even permanently. There are few places where its regular annual appearance can be taken for granted.

As an extension of their own research on populations of various orchid species, Mr Terry Wells of the Institute of Terrestrial Ecology and Miss Lynne Farrell of the Nature Conservancy Council have invited botanists to participate in a project on the bee orchid to help elucidate the factors responsible for flower and seed production. In this programme, about a dozen groups or individuals, mainly amateurs, have undertaken to keep detailed records of bee orchid populations by measuring

the position of each plant within a chosen area and recording its performance (or absence thereof) from year to year.

Description of site

The site occupied by the Lord's Bridge Radio Astronomy Observatory was until the Second World War largely arable but was then taken over for defence purposes. This brought about great changes in its character; buildings and earthworks were erected, railway sidings laid from an adjacent line (involving quite large importations of soil and ballast), and a network of access roads provided. When defence use ended, the site was acquired by the University of Cambridge for its present purpose. Most of the war-time buildings (but not all their foundations) were removed, but many of the earth structures and the railway sidings remained. Large-scale apparatus was installed and some areas were levelled and re-seeded with grass both for operational use and for the sake of tidiness, but, so far as is known, no post-war importation of soil took place and much of the site was left open to natural processes of regeneration and succession, which still continue and constitute one of the chief features of interest at the site as a whole. The area is on gault clay with some patches of chalk marl, and during the various changes much of this material was brought to the surface. Gault clay is a heavy, slow-draining material, and so this site with a high water-table is liable to be waterlogged or in parts even under standing water in winter; but, in this region of low rainfall, drying-out quickly causes severe shrinking and so is liable to leave a harsh concrete-like surface in which fissures 20 or more centimetres wide can open up.

I have been very kindly allowed to investigate the natural history of the site as a whole, and, in particular, to use parts of it for the bee orchid research programme. Flowering of bee orchids has been noted on many parts of this site by members of the staff for many years but has not hitherto been systematically investigated. An area for the study was selected early in 1980, and so I can now give an account of the procedure followed and findings noted over two flowering seasons.

Notes on weather during the period of the survey

The behaviour of plants such as the bee orchid that have distinct seasonal phases may be strongly influenced by year-to-year variations in such factors as rainfall and temperature. Meteorological statistics are not available for the site itself, but records are kept at Shelford about 8 km distant. The weather between February and July was strikingly different in 1980 and 1981. In February 1980, 73 mm of rainfall were recorded and only three nights with air frost; in February 1981 there were only 8.5 mm of rain but 21 frosty nights. April and May combined saw only 32 mm of rain in 1980, but in 1981 the same two months produced 128 mm, exactly four times as much. After the 1980 spring drought, June and July yielded 136.5 mm, but in 1981 the rainfall for these two months was only 37.5 mm.

Procedure and findings

I selected a level rectangular area adjacent to a good access road, measuring 33 × 6 metres and divided for convenience of recording into five plots 6 × 6 m and one 3 × 6 m, where I knew that bee orchids had often been seen. Each of the long sides of the rectangle was marked out at 3 m intervals by sinking 20 cm lengths of plastic tubing into the ground, their tops level with the surface. When required, short

lengths of wood with cup-hooks at their tops were placed into the tubes and measurements taken with tapes from them to each located bee orchid plant. By measuring the distance of each plant from each of its two nearest posts, co-ordinates could be recorded.

The survey began in March 1980 with a general inspection of the selected area, which indicated the presence of a good (but not systematically counted) number of bee orchid basal rosettes. The bee orchid, like the lizard orchid *Himantoglossum hircinum* (see *N. in C.*, **22** (1979): 47) but unlike many other British orchid species, begins to show above-ground growth sometimes as early as the end of September; but more commonly, and particularly in the case of small immature plants, leaves become visible progressively but irregularly throughout the winter months, no doubt depending on the weather. (February and March 1980 had been mild.)

After the drought of April and May 1980, inspection of the area revealed no visible trace of bee orchid rosettes whatever, even in spots where before the drought they had been evident and numerous, and I formed the opinion, sadly but fortunately erroneously, that the plants had died. But the drought broke in June and, to my surprise, bee orchid flower spikes began to emerge, but all *without any but the most scanty leaf growth*. Systematic measurement and recording then began, and eventually 119 flower spikes were measured and plotted (see Figure 5: A); no non-flowering ("vegetative") plants were seen at all. The condition of the plants was poor, with average height only 15.5 cm and average number of individual blooms three, with a maximum of six. As the bee orchid differs from most British orchid species in being regularly self-pollinated, seed-set was good (about 85% of blooms), but it soon became apparent that seed-set does not necessarily lead to seed ripening and dispersal. Inspection of the survey plots in August 1980 could trace very few stems, out of the 119 that had flowered, still standing with seed capsules in a healthy-looking condition; all the rest had withered away. Perhaps one may speculate that the spring drought had, after all, had a harmful effect.

I resumed my observations in the same plots at about the time when bee orchid leaves might be expected to be showing above ground. For the sake of tidiness the plots had been mown, under contract with a local farmer, in September, but roughly and without removal of the cuttings, which now constituted a messy "thatch". Some of this was removed by raking, as experience suggested that bee orchids were unlikely to prosper under a tangle of matted "hay". It soon became apparent that the task of a winter-time bee orchid searcher is a demanding one, requiring hands-and-knees activity. But at that time of the year ground-cover is sparse, and the distinctive grey-green hue of even minute bee orchid leaves quickly catches the eye once the "jizz" of the species becomes familiar. The tally rose progressively – 15 plants on 11 December 1980, with leaf length not more that about 2 cm; by 7 January 1981 about 40; by 22 January 94; by 29 January 136, with the average leaf length now increased by about 1 cm. The position of each plant was marked by a cane as soon as it was found and later by a short plastic label (as used by gardeners), carrying a serial number.

In the middle of April, with some valued help, the co-ordinates of the plants were recorded (see Figure 5: B). The total number measured was 239, including many immature plants, some with only one small leaf, most unlikely to grow any bigger that year; general appearances, however, suggested that up to 45% of the plants might be of flowering size.

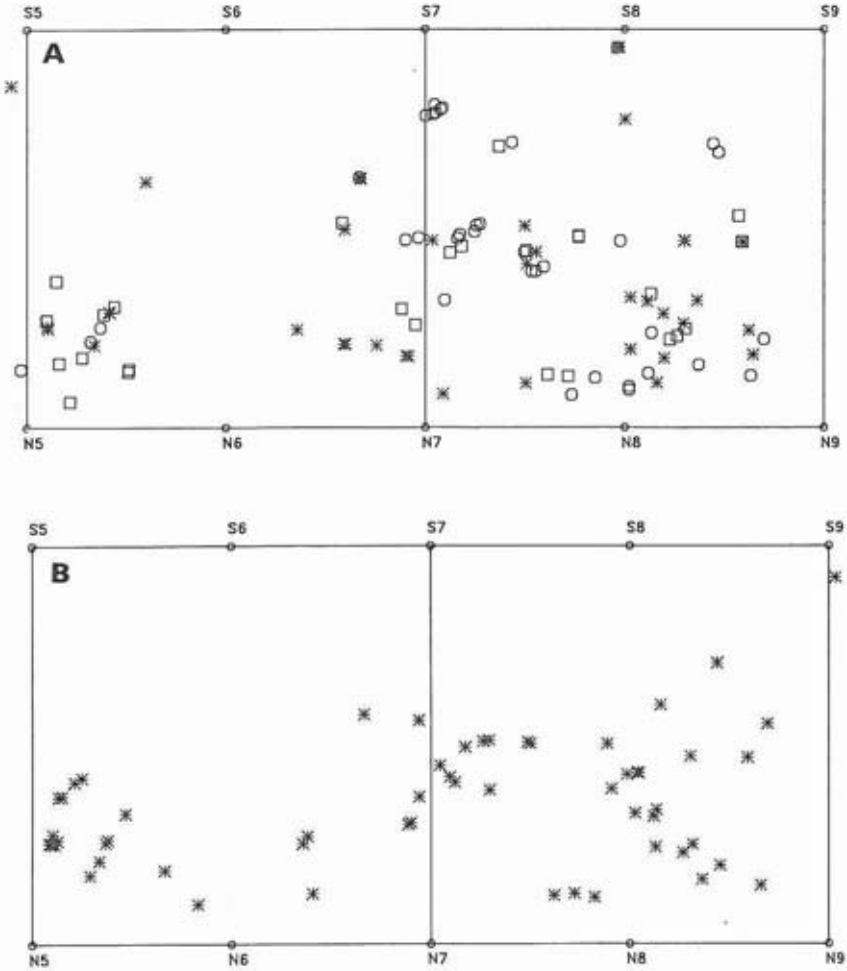


Figure 5: Computer print-outs of the location and performance of bee orchid plants in plots C and D of the main recording area in 1980 (A) and 1981 (B): note that only flowering plants were recorded in 1980.

(Program and print-outs by courtesy of SERC Interactive Computer Facility at Cambridge University Engineering Department and K. N. Warner)

✳ Plant that produced an inflorescence, though often damaged before flowers opened

□ Plant with summer leaves but no flowers

○ Plant with winter leaves only, showing no summer growth

By 5 June it had become clear which plants were producing flower spikes – but other things became apparent too. First, rabbits were finding the bee orchid buds a delicacy. Rabbit-grazing is generally regarded as beneficial to the production of the dwarf swards in which many orchids flower, but there is a price to pay in the shape of bitten-off flower stems. (Twayblade *Listera ovata* is particularly favoured.) Secondly, many of the plants which had been marked during the winter were now "going back". Many of these were small immature plants which perhaps had not accumulated enough strength from their earlier photosynthesis to make fresh growth that year. In June all plant-sites which had been located in the survey plots were classified as follows:–

With clearly visible flower buds	– 63 (26.3%)
Flower stem produced but bitten off	– 22 (9.2%)
With healthy looking basal leaves but no sign of flower stem ("vegetative")	– 74 (31.0%)
Clearly decreased or dwindled since first recorded	– 29 (12.1%)
No longer traceable above ground	– 51 (21.4%)

The decline continued, and particularly the rabbit damage; by 18 June just 20 plants were beginning to open flowers – about 8.4% of those originally found. But, oddly enough, three or four of those which did flower were at spots where no winter growth had been detected and no basal leaves were visible at flowering time – as had been the general case in 1980. What is quite clear is that "appearance", if that term is regarded as synonymous with flowering or at least visible presence at normal flowering time, provides no valid indication of the total size of a bee orchid population.

It must be remembered that, as only flower spikes were recorded in 1980, this survey does not yet allow a full comparison of year-to-year behaviour of the bee orchid plants present in the study plots. But the following comparisons can be made. Of the 119 plants which flowered in 1980, 61 (51%) could with reasonable assurance be said to have "reappeared" in 1981. But of these 61, only four actually flowered, to which may be added 16 which almost certainly would have flowered but for damage by rabbits or other accidental factors – a total of 20 (17%) in all. Of the remainder, 27 (23%) were classed as "vegetative" (with basal leaves at flowering time but no flower spikes) and 14 (12%) which were seen earlier in the winter or spring had "gone back" or disappeared by flowering time. No relationship was obvious between 58 (119 – 61) of the 1980 plants and 178 (239 – 61) of those observed in 1981.

Observations in other parts of the site

My winter-time searches had aroused the interest of other people regularly working on and around the site. Bee orchid plant-spotting became quite a popular spare-time pursuit there, and I got used to arriving at the plots to find that since my last visit they had sprouted a number of new markers (all accurately placed!). I had known for long that bee orchids occurred in other parts of this large site. When a member of the site staff told me he had seen some presumed bee orchids in areas which, both for working purposes and in the interests of tidiness, he kept regularly mown, I started, with his most helpful co-operation, a more careful search. Group

Bee orchids Ophrys apifera *growing in one of the "lawns" at Lord's Bridge in 1981*
Nicholas Warner

after group was discovered in places which are normally mown at least once a week during the grass-growing season. One such area, a strip precisely half a mile long by nine yards wide (laid out for technical purposes), contained over 300 plants. Four patches close to the house of the resident custodian (himself keenly interested in the natural history of the site) were found to hold jointly about 200 plants. And almost all these "lawn" plants were massive robust specimens, obviously capable of flowering if allowed to. As early as 10 February 1981 I measured one five-leaved example at 15 cm across. With official collaboration and thanks to the keen eyesight and adept steersmanship of the groundsman almost all these groups were left intact till after the plants had flowered and seeded.

Encouraged by this unexpected counterbalance to the disappointment at the survey plots, I made a more thorough search over the site as a whole. Bee orchid basal leaves were found in a surprising variety of places, either in groups or as scattered individuals. Some were in waterlogged places, at one time under two or three inches of standing water; some were in barren squelchy mud; one at least was growing sturdily at the edge of a made-up roadway which had been treated the previous autumn with a total three-year persistent herbicide (atrazine); one small group was in a particularly well-tended lawn adjacent to the site's headquarters building; and all these were easily visible strong plants, not searched for on hands and knees. Some orchid species, including green-winged orchid *Orchis morio* and autumn lady's-tresses *Spiranthes spiralis*, are known to take advantage of neglected lawns, but I had not heard of a comparable occurrence with bee orchids, for all their known quirkiness. Overall, a conservative estimate puts the total number of plants spotted in 1981 at well over 1,000.

It would obviously have been impracticable to extend the detailed survey to so large a population, but some steps were taken to add to the information obtained from the originally selected plots. First, a further small plot, measuring only 2 × 2 m, was marked out in a corner of one of the "lawns". It contained nine bee orchids, the co-ordinates of which were measured. In striking contrast to the main plots, seven of the plants flowered, with a total of 56 flowers, averaging eight per

plant. One spike was measured at 40.5 cm with three buds still unopened. (The largest plant measured on the site as a whole was a whopping 56 cm tall, with 12 flowers.) Not many "lawn" plants were seen with fewer than six flowers. As the bee orchid is regularly self-pollinated, seed-set over the site as a whole was high, estimated at about 75% of flowers overall, but in the "lawn" areas it must have been quite 90%, with the capsules measuring up to 3 cm long. One patch of about 8 m^2 in a normally mown working area contained 37 flower spikes.

Another unexpected opportunity for investigation arose when a local farmer sprayed an area from which he was to take a commercial hay crop with a selective herbicide, mainly to control ragwort. This area included a group of some 70 bee orchid plants. The first noticeable effect of the spray was (as often happens) to "shock" them into accelerated growth, flowering beginning earlier than elsewhere on the site; but the plants soon became distorted, and before long all above-ground growth had withered. However, investigation of the root system of two plants showed apparently healthy new tubers; indeed, one appeared to be starting into precocious growth. These tubers have been planted elsewhere for further observation and the whole area where the plants were growing has been marked off so that the longer-term effects of the spray can be studied; it is hoped that it will not be sprayed again. (Five of these plants have reappeared in 1982.)

It is interesting to speculate on the reasons for the massive flowering in the "lawns". These areas were created some 25 years ago, when the site was tidied up after war-time occupation, and, so far as is known, the local soil was merely spread, levelled and seeded with a commercial grass mixture. Until 1981 they were regularly mown throughout the growing season. So far as I can ascertain, no one had seen a bee orchid plant in flower there, except perhaps for an occasional individual at the edge of one of the areas. As it is generally established that all orchid species take several years to grow to flowering size, it must be assumed that the exceptionally large plants first noticed in 1981 had been growing there, flowerless and unnoticed, for some years. Should we therefore conclude that the best way to produce an impressive "appearance" of bee orchids is to mow off the flower spikes for about 20 years and then leave them for us to enjoy the spectacle in the 21st year? But what then of the next year? Perhaps we shall see!

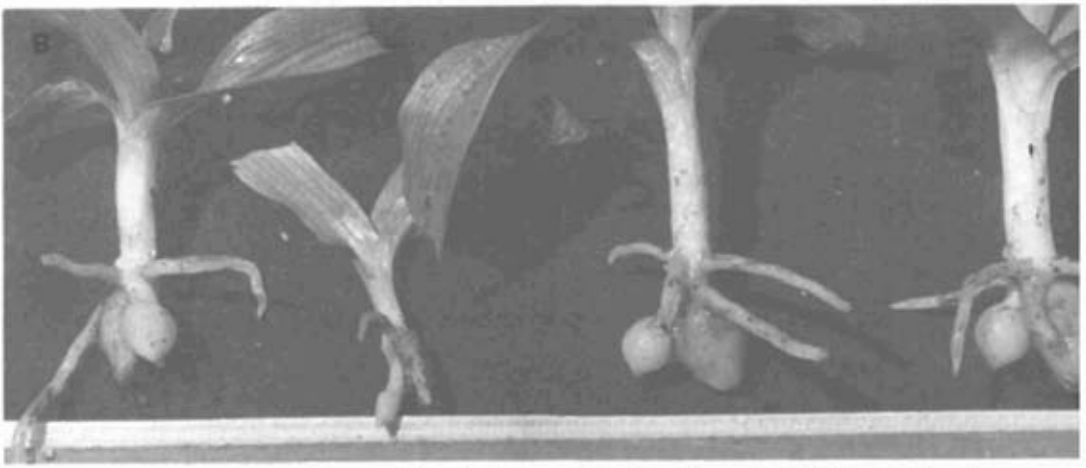
Some observations on bee orchid root systems

The bee orchid is usually described as having a "pair" of root tubers, but this has been found to be true only for part of the plant's annual cycle, most noticeably at the flowering stage. In order to investigate this, a small number of plants were (with the necessary permission) dug up for examination and photography; all were later replanted, when most of them flowered normally. (Many have reappeared in 1982.)

Photograph A shows plants in early winter, by which time they have normally produced new basal leaves which build up strength ready for the next flowering. There is then no trace left of an old used-up tuber and only a slight possible hint of the next tuber being formed among the roots at the base of the stem. (The illustration includes a very small juvenile tuber, with no roots, dug up by chance.)

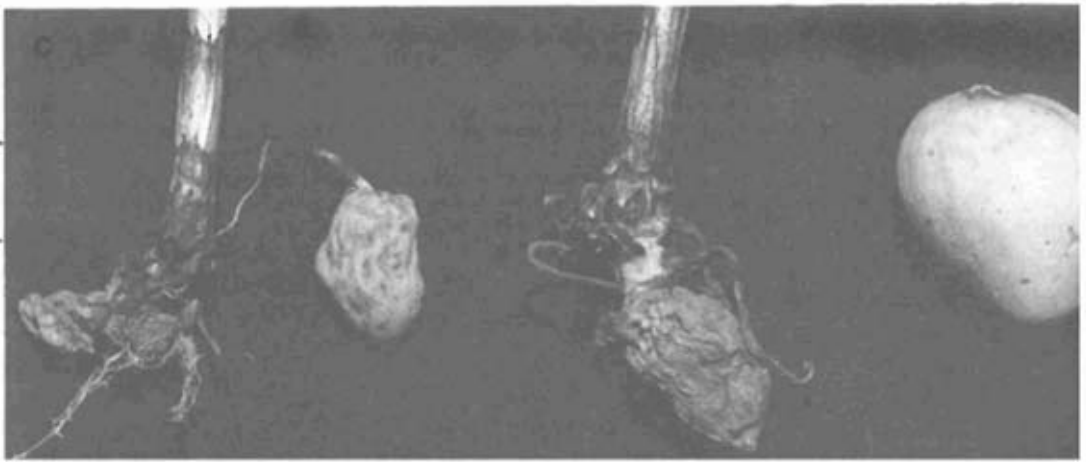
By April (B) the new tubers are easily identifiable; at this stage they are very soft and delicate, and liable to predation by slugs and possibly mice.

After the flowering season (C) that year's tubers are clearly shrivelling away, even though the particular plants shown had *not* flowered that year. New tubers are



Bee orchid plants dug up to show development of the tubers (December 1980, April 1981 and late August 1981)

Nicholas Warner



by then usually quite detached from the parent plant and can only be detected as small, firm, inert lumps, easily mistaken for small pebbles. I think it also possible that bee orchids sometimes multiply by producing more than one new tuber in this way: I saw several twin plants, a few triplets and one set of quins whose identically marked flowers suggested that they were a clone.

The "two-phase" annual cycle of the bee orchid

All the evidence collected in this investigation suggests that the bee orchid has a "two-phase" annual cycle – an autumn-winter phase of leaf production, during which the root system is nourished and developed by photosynthesis, and a spring-summer phase during which it expends its stored energy on flowering, seed-ripening and production of a new tuber (or perhaps tubers) for the following year.

Acknowledgements

The opportunity to study, without constraints, an unexpectedly large and varied population of bee orchids was a fascinating and valued experience. I should like to express my great indebtedness and gratitude to the owners, managers and staff at Lord's Bridge for their indulgence and assistance, and also to Nigel and Jeanette Luckhurst, whose help in taking winter measurements and in many other ways provided welcome relief to my septuagenarian limbs.

Postscript

The investigation described here is being continued in 1982. Of particular interest already is the very high proportion (over 90%) of the plants recorded in the survey plots in 1981 that had re-emerged before the 1981/82 winter.

ACCESS TO LORD'S BRIDGE RADIO ASTRONOMY OBSERVATORY

The authorities at the Observatory have kindly agreed to allow interested naturalists to visit *certain specified parts* of the site, including the bee orchid study areas, between 2.00 and 4.30 p.m. on Mondays to Fridays from May till the end of August 1982. It is regretted that unsupervised visiting cannot be allowed at times, such as week-ends, when the site's staff are not present.

Entry will be by the gateway signed "Lecture Room" at the former Lord's Bridge Railway Station (*not* by the main site gateway). Cars may be parked in the old station yard but must not be taken further into the site (except that cars carrying a disabled person may proceed, as described below, to the Conservation Hut and the main bee orchid area). A diagramatic map and copies of a leaflet guide can be found on the wall of the old goods shed.

On leaving the car park, visitors should follow the metalled roadway which diverges sharply to the right and leads in approximately one third of a mile to the Conservation Hut which the authorities have made available; here photographic and other material is displayed and further copies of the guide are available together with loan copies of a diagram of the area that may be visited.

The purpose of these facilities, which are provided on an experimental basis, is to enable naturalists to see what is being done at this site to conserve and study its wildlife. Visitors are asked to note particularly the limits of access and to be willing, if requested, to identify themselves (e.g. as members of a conservation or similar body). Organisers of groups wishing to visit should first consult the University Department of Physics at the Cavendish Laboratory, Madingley Road, Cambridge.

CRASSULA HELMSII, THE SWAMP STONECROP, NEAR CAMBRIDGE

Erica Swale and Hilary Belcher

In October 1981 a small aquatic flowering plant unknown to us was found growing profusely in a pond to the north-west of Cambridge at the junction of the A604 and the road to Oakington (National Grid Reference TL 396 631). The plant formed a dense turf of matted stems a few inches high, rooted into the clay soil and occupying a band, 1-2 feet wide, around roughly three-quarters of the pond's edge. The plants of the outer margin were fully exposed to the air, only their roots being damp, while the inner ones were in water to about three inches depth. These would probably have spread further into deeper water, but here they adjoined a sward of *Elodea canadensis* with which apparently they could not compete. Some patches of the emergent stems bore small white flowers, and there were many old flowers and young fruits on the submerged stems.

With the help of Mr Clive King of the University Botanic Garden, the plant was identified as *Crassula helmsii* (T. Kirk) Cockayne. Enquiry at the Biological Records Centre at Monks Wood showed that this alien, a native of Australia and New Zealand which has been recorded with increasing frequency in recent years from widespread sites in Britain, had not yet been found in a natural habitat in Cambridgeshire. It was, however, noticed last year by Dr S. M. Walters in an ornamental pond belonging to a block of flats, "Highsett", Hills Road, Cambridge.

The pond by the A604, like its twin on the opposite side of the road, was made by the Eastern Road Construction Unit of Bedford during the extensive roadworks of the late 1970s, to collect surplus run-off water. Two years ago various aquatic plants, including white water-lilies, were introduced by Mr R. W. Hacker, using material from ornamental ponds in the grounds of the nearby Hacker's Fruit Farm. The *Crassula* was not planted deliberately, but a small patch of it was found recently in one of these ponds, the obvious source of the population of the roadside pond. The origin of *C. helmsii* at the farm is not now known, but it has been there for at least ten years.

The source of some of the *C. helmsii* colonies in this country – possibly all of them according to Laundon (1961) – was Perry's Hardy Plant Farm, Enfield, Middlesex, now Jackamoor's. Mrs M. Pledger of this nursery kindly sent us a sample of the plant, which at first sight appeared to differ in several details from that in the A604 pond and closely matched the "Highsett" material. Further collections from the former pond, however, indicated that plants from different parts of the colony showed variation in habit and leaf shape, as recorded by Laundon, and also in floral morphology. Similar variations can be noticed by comparing the two sets of illustrations reproduced in *BSBI News* (Vaughan, 1978; Richards, 1979).

Differences in the material we have examined may be summarised as follows:-

Jackamoor's plants, those from "Highsett" and some of the A604 ones have fleshy, rather broadly lanceolate leaves on strong pinkish stems (Figure 6: D, F). The sepals are pink, and sometimes the corolla as well. The petals on these flowers appear not to open fully so as to become reflexed or recurved, but remain bent over the carpels as shown in Figure 6: E until the pollen is shed, when they wither in the same position. This appears to be the form drawn by Lysbeth Richards from a gravel pit at Lossiemouth (Richards, 1979; Clement, 1979).

The first plants collected from the A604 pond were more slender, with narrower, longer, less fleshy leaves (Figure 6: A, C). The stems were always green, and the flowers, which had proportionately smaller stamens, bore white, neatly reflexed petals, as described by Clapham, Tutin and Warburg (1981) and illustrated from Australian material by Helen I. Aston in Vaughan (1978). Figure 6: B shows one of these flowers.

The variations described may seem small, but they give rise to a marked difference in overall appearance. Reflexed petals, in addition to the long pedicels, are given by Clapham, Tutin and Warburg (1981) as a definitive feature of *Crassula helmsii*, to distinguish this species from the rare and possibly native *C. aquatica*, whose petals are always upright.

Laundon (1961) established that *C. helmsii* had been sold by Perry's since 1927, under its synonym of *Tillaea recurva* Hook. f. At this nursery (now Jackamoor's) it is still grown and is said to be very vigorous and "a weed". It is not listed separately in the current catalogue, but is sold in collections of mixed oxygenators. Two other nurseries that we enquired of sometimes offer it anonymously in a similar way. One of these nurseries obtained its plants initially from Perry's and the other assumes this to have been the source.

Mr R. H. Perry, one of the previous owners of Perry's, wrote to us that he believed his father had obtained a plant from Australia before the 1914-18 war and that, during the war and the consequent neglect of the nursery tanks containing *Nymphaea* species, the *Tillaea* (i.e. *Crassula*) had taken charge and literally choked out many of the other plants. Mr Perry was unable to find a written record of either the source or the exact date of arrival of the *Tillaea*, although he searched in his father's diaries.

The spread of *C. helmsii* in Britain, from the first observation at Greensted, Essex, in 1956, can be followed by reference to notes published in *London Naturalist* and in *BSBI News* (Lousley, 1957, 1961; Kent and Lousley, 1957; Bowman, 1977; Hall, 1978; Vaughan, 1978; Clement, 1979; Cockerill, 1979). Most of the later ones refer to the comprehensive paper by Laundon (1961), who discussed both the confusing nomenclature of the plant and its introduction into this country. A high proportion of the records appears to refer to introductions by human beings, either deliberate or accidental. It will be interesting to see whether it can be carried from site to site by natural agencies. One purpose of this note is to draw the attention of local naturalists to the plant so that further observations on its spread may be made.

Many artificial water-bodies are at present being made both for amenity and to encourage wildlife. The edges of such pools may remain bare and unattractive for some time, especially where polythene has been used in the construction. Here is an excellent ecological niche for *Crassula helmsii*, which grows rapidly to form an attractive and seemingly desirable addition to our flora.

Acknowledgements

We should like to thank the following people who have helped generously in a variety of ways:- Clive King, Chris Preston, C. J. and R. W. Hacker, G. Crompton, R. H. Perry, Mary Pledger and C. R. Frost.

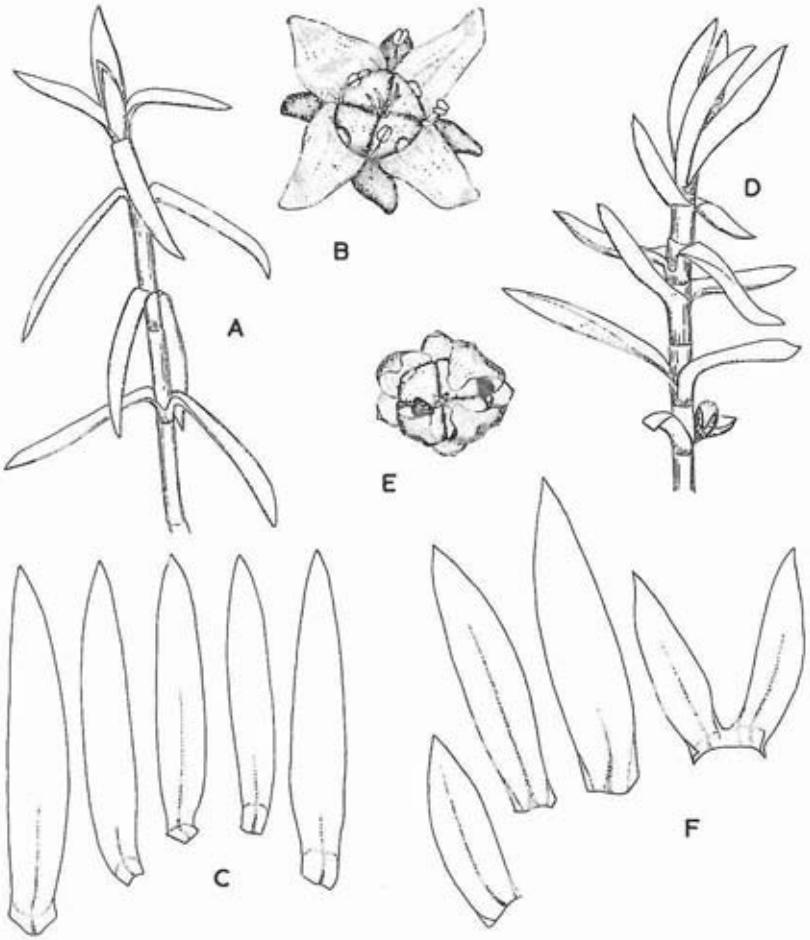


Figure 6: ***Crassula helmsii*** **(T. Kirk) Cockayne**
A: part of plant from "Highsett" x 2.5
B: a flower x 12
C: leaves x 5
D: part of plant from the A604 pond x 2.5
E: a flower x 12
F: leaves x 5

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VASCULAR PLANT RECORDS

G. Crompton

1981 was a disappointing year for plant records. Though many useful records were sent in, this has been the first year since 1976 when it has been difficult to find records which should be published or are sufficiently unusual to include here. The very useful records include the addition of 29 species to the list for the Devil's Dyke by Alan Leslie, Graham Easy's penetrating survey of black poplars (see pp. 45–50) and Robert Payne's six lists of new records for the more unusual plants in the county.

Since the publication of *A Flora of Cambridgeshire* in 1964 few recorders have attempted to determine their finds beyond the species level, but seven records at subspecific or varietal level are included in the following list.

The boundary of vice-county 29 has been most ably checked and amended by Jim Bevan, inch by inch, and the resulting map can be consulted in the Trust Office.

The Biological Records Centre is now working to complete the maps for the first volume of the new Flora of Great Britain and Ireland. All new or post-1950 records for 10 km squares are abstracted on to the Flora card index and are then sent to the BRC annually; so do send me your records promptly!

Fumaria parviflora var. *acuminata* Jordan Arable field near Chippenham Fen, 52/65–69–, D. E. Coombe and P. D. Sell (in **CGE**), 12.7.1967, NCR.

Rubus elegantispinosus (Schumach.) Weber Waste ground by a small copse, Chippenham, 52/674690, A. C. Leslie (in herb. A.C.L.), 27.7.1974, det. A. Newton 1980, NCR. According to Newton (*Watsonia*, **11**: 380–381), it is probably an alien species, akin to *R. procerus*.

Rosa sherardii var. *typica* Wolley-Dod (*R. subglobulosa* Sm.) Three bushes on the Devil's Dyke near Reach, 52/573656, A. C. Leslie, 10.10.1981, det. Mrs I. Vaughan (in herb. I.V.), 3rd CR for the species.

Crassula helmsii (T. Kirk) Cockayne In fruit in a pond at Highsett, Cambridge, S. M. Walters (in cult., Cambridge University Botanic Garden), 6.12.1980, NCR of an Australian aquatic used as an oxygenator in aquaria. Pond near A604, 52/396631, E. Swale and H. Belcher, 19.10.1981, 2nd CR (see pp. 59–62).

Epilobium parviflorum Schreber x *E. tetragonum* L. subsp. *tetragonum* (*E. adnatum* Griseb.) Waste ground, Cambridge, 52/462575. G. M. S. Easy (in herb. G.M.S.E.), 21.7.1972, conf. A. C. Leslie 1980, NCR.

Rumex crispus var. *uliginosus* Le Gall Delete NCR in *N. in C.*, **21**: 28 recorded by P. Adam and J. R. Akeroyd; J. R. A. has found that the character is not maintained in cultivation.

Salix x *calodendron* Wimmer Several large bushes north-west of the old moat, Snailwell, 52/640678, A. C. Leslie (in herb. A.C.L.), 25.10.1980, conf. R. D. Meikle 1981, 3rd CR. The dominant willow in Gray's Moor Pits Reserve, 53/41–00–, tetrad recorders' excursion, det. D. R. Donald. One bush in willow holt at Elford Closes, 52/501719, A. C. Leslie (in herb. A.C.L.), 10.10.1981, conf. R. D. Meikle. Perhaps this long-leaved willow has been planted more frequently than was recorded in *A Flora of Cambridgeshire*.

Orobanche minor var. *compositarum* Pugsley Near Hildersham Furze Hills, c. 52/550487, M. W. Rand & M. E. Smith, 1969, 2nd CR. Cheveley, on *Senecio* 'Sunshine', 52/683612, A. C. Leslie, 1979, 3rd CR. Widespread in a stony field of failed sainfoin, West Wickham, 52/591497, Mrs J. Rumens (in **CGE**), 8.7.1981; the plants were frequent on *Carduus nutans* and occasional on *Tripleurospermum maritimum* and *Sonchus asper*, a very remarkable sight!

Orobanche hederae Duby University Botanic Garden, on *Hedera colchica* 'Paddy's Pride', one large plant in July and three smaller ones in Sept. – Oct., Richard Ward, 1981; also several plants on an ornamental ivy in the new Winter Garden, P. H. Oswald, 20.9.81. This species can be found in most, if not all, years in the Botanic Garden, but since 1939 only one other stand of it has been formally recorded; this is most interestingly not on ivy but on another member of the Araliaceae, the shrub *Acanthopanax wardii*; unfortunately the host plants may not survive much longer. Always an introduced plant in our county, the last record elsewhere was from the Main Court, Girton College, in 1940.

Hieracium oblongum Jordan In long grass at Newnham College, 52/44–57–, N. Stewart, 30.5.1979, det. P. D. Sell, NCR and only the 4th locality in Britain.

Ophrys apifera var. *trollii* (Hegetschw.) Nelson Camps End, 52/612422, Mr & Mrs MacMillan (in **CGE**), 3.7.1981, conf. L. Farrell, NCR; this wasp orchid, with its long, narrow labellum, occurred with bee orchids and four other species of orchids and hybrids between them in rough chalk grassland and scrub!

Carex ovalis Gooden. One large clump in an open ride, Pickmore Wood, 52/654582, A. C. Leslie, 27.6.1981, a new locality for a sedge rare in Cambs; since 1957 it has only been known from Gamlingay, where A.C.L. confirmed two old stations in 1976 and 1977.

Catapodium rigidum subsp. *majus* (C. Presl) F. H. Perring & P. D. Sell Cherry Hinton Chalk-pit, at the highest point, on the edge of the track, 52/482556, P. J. O. Trist (in herb. P.J.O.T.), 18.6.1980, NCR. On imported gravel at the base of a wall, Wandlebury, 52/492533, P. J. O. Trist, 18.6.1980. Although this is a coastal subspecies, Trist and Sell regard it as native at Cherry Hinton.

WEATHER NOTES FOR CAMBRIDGESHIRE 1981

J. W. Clarke

The year began with mild, open weather throughout January and continuing into February, and, although February was colder than January, no spells of severe winter weather developed. Rainfall was below average during these first two months of the year, but in March very wet changeable weather set in to give the second wettest March since records began in 1727. (Only 1947 was wetter.) It was also the dullest March since 1947, and very mild and frost-free. April was colder than

March and, although rainfall was still above normal, not excessively wet. May, however, was much wetter than usual and particularly sunless and cool, having the least sunshine since 1932. The lack of sunshine and the coolness continued in June, but rainfall was less than normal. In no year since sunshine records began in 1929 have May and June had so little. The dull and cool tendency persisted in July, but with a few very warm days. On 24th the maximum temperature only reached 53°F. Rainfall was above average and the month was the wettest of the year. (July is usually our wettest month in Cambridgeshire.)

August was a much sunnier and drier month and the only month of the summer when temperatures reached normal values. Almost the whole of the rainfall for the month fell during a series of violent thunderstorms on 6th. Dry and warm weather continued until 10th September. Changeable wet weather then set in and continued throughout October, but, although it was warm and wet in September, in October it was cold; in fact it was one of the coldest Octobers on record. November was much drier with near-normal temperatures. The first week of December was open, with normal temperatures. Heavy overnight snow on 8th brought snow cover, which persisted until the end of the month, and plunging temperatures. Frost was virtually continuous until 28th. On 13th December more snow with a strong to gale force south-east wind brought blizzard conditions and severe drifting of snow. By the early hours of 14th many roads in Cambridgeshire were blocked by snow drifts up to six feet deep. The temperature rose above freezing point in the last three days of the year and brought a slow thaw.

Weather records at Swaffham Prior 1981
Temperature °F

Month	*Mean max.*	*Mean min.*	*Highest*	*Lowest*	*Rainfall (ins)*
January	44°	34°	53 on 2nd	25 on 13th	1.28
February	40°	32°	55 on 6th	20 on 14th	0.57
March	50°	43°	63 on 28th	30 on 18th	3.21
April	48°	39°	67 on 10th	29 on 23rd	2.02
May	61°	47°	69 on 12th	31 on 3rd	2.20
June	65°	55°	78 on 14th	43 on 18th	0.77
July	69°	56°	81 on 18th	49 on 31st	3.38
August	70°	57°	82 on 5th	46 on 2nd	1.19
September	67°	55°	78 on 10th	48 on 29th	2.27
October	52°	42°	65 on 1st	31 on 17th	2.75
November	49°	39°	59 on 2nd	31 on 9th	1.10
December	33°	27°	49 on 4th	15 on 18th	1.67
Annual means	54.0°	43.8°		Total	22.41

Number of days over 80°F	2
Number of days over 70°F	44
Number of days with a maximum under 32°F	18
Number of days with a minimum under 32°F	70
Last air frost of the spring	5th May
First air frost of the autumn	17th October
Days with snow lying	22

CAMBRIDGE NATURAL HISTORY SOCIETY

Presidents:

Lent Term: Dr D. W. T. Crompton

Michaelmas Term: Mr J. A. Hammond

At the General Meetings held in 1981 the following lectures were given:

23 January	Mr Trevor Gunton (Royal Society for the Protection of Birds)	European birdwatching spectacular
6 February	Dr H. J. B. Birks (Botany School, Cambridge)	Scotland's forests: past and present
27 February	Dr R. S. K. Barnes (Dept of Zoology, Cambridge)	Scolt Head Island, Norfolk
30 October	Dr J. P. Dempster (Monks Wood Experimental Station)	The swallowtail butterfly on Wicken Fen
13 November	Dr R. E. Stebbings (Monks Wood Experimental Station)	Natural history of bats and their conservation
	Film: Okavango	Threatened marshland in Botswana
27 November	Dr S. M. Walters (Cambridge University Botanic Garden)	Recent developments in the Botanic Garden

The several sections of the Society held their usual meetings, and the annual conversazione met with more than its usual success.

Members of the Trust are reminded that they are entitled to attend all General Meetings of the Society and sectional meetings by arrangement.

Subscriptions (1982/83): Life Membership, £15; 1 year, £2; 2 years, £3.50; 3 years, £5.

Applications to: Mr E. J. Wiseman, The White House, Barley, Royston, Herts, SG8 8HT. (City Secretary)

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WILDLIFE WITH A WILL

There was a time when meadow, grove and stream,
The earth, and every common sight,
To me did seem
Apparelled in celestial light,
The glory and the freshness of a dream.

It is not now as it hath been of yore;–
Turn wheresoe'er I may,
By night or day,
The things which I have seen I now can see no more.

William Wordsworth

The fauna and flora that now give so much enjoyment to so many people need to be conserved for future generations, but this costs money. The Trust is doing its best with limited funds and needs your help. Will you please remember us when planning bequests in your will? The Trust is dependent on the generosity of its members and a legacy could be a very real help.

Just a few strokes of a pen could mean so much!

Unlike many other County Trusts, CAMBIENT has not, with one or two exceptions, benefited from major bequests of money, property or land from members. It is now possible to gain exemption from Capital Transfer Tax by making gifts and legacies to the Cambridgeshire and Isle of Ely Naturalists' Trust in its capacity as a registered charity (No. 202123). Exemptions can be obtained in the following ways:–

1. *Donations to CAMBIENT*
   Lifetime gifts made more than one year before death are totally exempt of CTT. If the gift is made on death or within one year of death, the exempt limit is now £250,000.
2. *Surviving spouse*
   A benefactor can now leave his/her estate to his/her wife/husband for life and thereafter to the Trust without any CTT payable on either death.
3. *Capital Gains Tax*
   Gifts of any kind made direct to the Trust are free of this tax both to the donor and to the Trust.

These are complex matters and have been dealt with only superficially in the preceding paragraphs. Whilst the Trust is always pleased to discuss matters with prospective benefactors, it would *strongly recommend* members to consult their professional adviser before making any formal gift or bequest.

Thank you for reading this far and for the interest you have shown in the Trust. Any bequest large or small will help our vital work to continue.

The sad thing about most legacies is that people who make them never know how greatly they are valued. If you ask your solicitor to tell us as soon as the Trust has been included in your will, we shall see that you receive a personal letter of thanks to tell you how much we appreciate your generosity.

Ken Hudson
Membership Secretary