LNHS

# THE LONDON NATURALIST

Journal of the
LONDON NATURAL HISTORY SOCIETY

No. 86 2007

# LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its recording area (the London Area) lies within a 20-mile (32-km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises Sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology, or rambling, there is a Section ready to help.

**Publications**

*The London Naturalist,* published annually, contains papers on the natural history and archaeology of the London Area and beyond, including records of plants and animals.

The *London Bird Report,* also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* and the *Ornithological Bulletin,* are sent to members throughout the year.

**Indoor meetings**

These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

**Field meetings**

Led by experts to visit interesting localities, both within and outside our Area. These excursions are very popular with beginners wishing to increase their knowledge, and enable members to get to know one another.

**Library**

A large selection of books and journals on most aspects of natural history is available for loan or consultation by members free of charge.

**Reading circles**

Many important natural history journals are circulated by the Sections at a fraction of the cost of subscribing direct.

## SUBSCRIPTIONS

| | |
|---|---|
| ORDINARY MEMBERS | £20.00 |
| STUDENT MEMBERS | £5.00 |
| SENIOR MEMBERS | £16.00 |
| FAMILY MEMBERS | £4.00 |
| CORPORATE SUBSCRIBERS | £20.00 |

Student membership is for persons under 18 or receiving full-time education, and senior membership is for persons over 65 who have been continuous members of the Society for ten complete years. All except family members receive one free copy of *The London Naturalist* and the *London Bird Report* each year. Cheques and postal orders, payable to the London Natural History Society, should be addressed to:

The Assistant Treasurer, LNHS,
Robin Blades,
32 Ashfield Road, London N14 7JY

## THE LONDON NATURALIST

Further copies of this issue of *The London Naturalist* may be obtained (price £8 plus £1 postage and packing in the UK and the Republic of Ireland) from Catherine Schmitt, 4 Falkland Avenue, London N3 1QR. Back numbers of most recent issues of both *The London Naturalist* and *London Bird Report* are also available from the same address. Cheques should be made payable to the London Natural History Society.

**Top:** A juvenile Leisler's bat and a juvenile noctule, caught at the London Wetland Centre. The noctule appears to be showing a significant decline in Greater London whereas the nationally rare Leisler's bat may be increasing in the region.

**Bottom:** Trapping surveys have revealed that the London Wetland Centre may be one of the most important sites in the UK in terms of numbers of foraging soprano pipistrelle. This individual was fitted with a small radio transmitter in order to track it back to its roost.

*Photos: Frank Greenaway*

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## No. 86

### for the year 2006

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# LONDON NATURAL HISTORY SOCIETY

**Founded 1858**

## President

JOHN SWINDELLS
10 Vivian Road, London E3 5RF

## Honorary Vice-Presidents

A. J. Barrett, R. M. Burton, MA, FLS, P. C. Holland, K. H. Hyatt, FLS, R. M. Payne, FRES, FLS, R. A. Softly.

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**Assistant Treasurer and Database Manager:** R. A. Blades, 32 Ashfield Road, London N14 7JY.

**Librarian:** Mrs L. Hewitt, 106 Hatherley Court, London W2 5RF.

**Editor,** *The London Naturalist:* K. H. Hyatt, 1 Tremcelynog, Rhandirmwyn, Llandovery, Carmarthenshire SA20 0NU.

**Editor,** *London Bird Report:* A. Self, 16 Harp Island Close, London NW10 0DF.

**Editor,** *Newsletter:* Ms E. Hinton, 33 Walker House, 11 Odessa Street, London SE16 7HD.

**Editor,** *Ornithological Bulletin:* N. Tanner, 11 Collins House, Newby Place, London E14 0AX.

**Elected Members of Council:** D. Bevan, M. Burgess, R. M. Burton, D. Darrell-Lambert, J. F. Hewlett, K. H. Hyatt, P. A. Hyde, M. Massie, P. J. Sellar, (one vacancy).

**Representative Members of Council:** BOOKHAM COMMON SURVEY — I. Swinney; BOTANY — Dr M. Spencer; ECOLOGY AND ENTOMOLOGY — Mrs C. M. Schmitt; HAMPSTEAD HEATH SURVEY — Keith Cavanagh; ORNITHOLOGY — Miss N. A. Duckworth.

# The Society's Recorders

## Botany

**Flowering plants and vascular cryptogams:** Dr M. Spencer, 72 Michael Cliffe House, Skinner Street, London EC1R 0WX (020-7837 1471).

**Lichens:** Ms A. J. H. Waterfield, B.SC., 29 Gloucester Crescent, London NW1 7DL (020-7267 8060).

**Fungi:** Prof. E. G. D. Tuddenham, 17 Bedford Road, London N22 7AU (020-8374 5167).

**Bryophytes**: M. C. Sheahan, PH.D., 61 Westmoreland Road, London SW13 9RZ (020-8748 4365).

## Ecology and Entomology

**Mammals:** C. Herbert, 67a Ridgeway Avenue, East Barnet, Hertfordshire EN4 8TL (email: armconservation@hotmail.com).

**Reptiles and amphibians:** T. E. S. Langton, B.SC., 12 Millfield Lane, London N6 6RA (email: t.langt@virgin.net).

**Fishes:** Dr Ruth Kirk, School of Life Sciences, Faculty of Science, Kingston University, Penrhyn Road, Kingston upon Thames, Surrey KT1 2EE (email: r.kirk@ kingston.ac.uk).

**Arachnida:** J. E. D. Milner, B.SC., 80 Weston Park, London N8 9TB (email: spiders@acaciaproductions.co.uk).

**Coleoptera (Carabidae and Coccinellidae):** P. R. Mabbott, B.SC., 49 Endowood Road, Sheffield S7 2LY (email: paulmabbott@blueyonder.co.uk).

**Coleoptera (Lucanidae and Buprestidae):** Dr D. S. Hackett, FRES, 3 Bryanstone Road, London N8 8TN (email: danielhackett@blueyonder.co.uk).

**Coleoptera (families not otherwise listed):** M. V. L. Barclay, 47 Tynemouth Street, London SW6 2QS (email: m.barclay@nhm.ac.uk).

**Lepidoptera (butterflies):** L. R. Williams, 34 Christchurch Avenue, Kenton, Harrow, Middlesex HA3 8NJ (email: leslie.williams1597@btinternet.com).

**Lepidoptera (moths), Syrphidae, and invertebrates not otherwise listed:** C. W. Plant, B.SC., FRES, 14 West Road, Bishops Stortford, Hertfordshire CM23 3QP (email: cpauk1@ntlworld.com).

**Orthoptera:** Vacant.

**Hymenoptera Aculeata:** R. W. J. Uffen, 4 Mardley Avenue, Welwyn, Hertfordshire AL6 0UD (01438 714968).

**Heteroptera:** Vacant.

**Odonata:** Neil Anderson, B.SC., 52 Beechwood Avenue, Greenford, Middlesex UB6 9UB (email: neil@anders42.freeserve.co.uk).

**Plant galls, Isopoda and Myriapoda:** K. Hill, BA, FLS, 93 Elmhurst Drive, Hornchurch, Essex RM11 1NZ.

**Mollusca:** Vacant.

Records may be sent to the appropriate recorder (where shown) or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

## Geology

Vacant.

## Ornithology

**Inner London:** D. McKenzie, 28 Braithwaite Tower, Hall Place, London W2 1LP.

**Hertfordshire:** A. D. D. Wilson, 7 Douglas House, Davison Drive, Cheshunt, Hertfordshire EN8 0SZ.

**Buckinghamshire:** A. V. Moon, 46 Highfield Way, Rickmansworth, Hertfordshire WD3 2PR.

**Kent and Lower Thames (London Bridge to Tilbury):** J. Horton, 65 Castle Lane, Chalk, Gravesend, Kent DA12 4TG.

**Surrey and Upper Thames (London Bridge to Staines):** S. Spooner, 32 Berkeley Drive, West Molesey, Surrey KT8 1RA.

**Middlesex:** R. E. Innes, 27 Dominion Close, Hounslow, Middlesex TW3 1PJ.

**Essex:** C. Langsdon, School House, Gillespie Road, London N4 1LH.

Requests for information should be made to the appropriate recorder.

# Contents

# Report of the Society for the year ending 30 June 2006

**Approved at the Annual General Meeting on 12 December 2006**

Following the report to Council of a Working Group considering revisions to the Society's Rules, and with the consent of the Charity Commission having been received, members voted at the Annual General Meeting on 6 December 2005 to adopt the new Rules which came into force immediately.

Council now comprises eighteen trustees of whom five represent the Society's Sections and thirteen are elected at the AGM. Honorary vice-presidents are no longer trustees *ex officio*. No trustee other than secretary and treasurer may hold office for more than five consecutive years. Other changes include giving trustees authority to determine the annual subscription, invest the Society's assets as they think fit, and delegate all but certain reserved powers to committees of Council. Four such committees — Administration and Finance, Library, Programme, and *The London Naturalist* — were appointed at the first meeting of Council.

The objectives of the Society now refer explicitly to recording so it is appropriate that, following extensive consultation with its recorders, Council approved a Data Exchange Agreement with the local environmental records organization, Greenspace Information for Greater London, governing the supply and use of species and habitat records. This means that members' records, other than any provided under conditions of confidentiality, will be publicly and (except for commercial purposes) freely available. It was felt appropriate in conjunction with this Agreement to carry out a review of the Society's Records Policy, in order to update and clarify recorders' duties and responsibilities.

The promotion of scientific investigations, another of our objects, is heavily dependent on access to the Society's extensive and comprehensive library. This is currently housed at Imperial College, which in January issued the Society with twelve months' notice to quit under the terms of a lease entered into in 1972. Council, working through the Library and Administration and Finance Committees, has been seeking alternative arrangements as a matter of urgency; the latest situation is outlined below.

'London's Heathland Heritage' is a project proposed by several London boroughs and conservation organizations including the LNHS, and funded by the Heritage Lottery Fund. The Society's involvement has included several field meetings devoted to the flora and fauna of heathland, and events in which some of our members have passed on their knowledge to the public. Standing in stark contrast to this declining habitat, London's burgeoning weed flora was the theme of John Swindells' Presidential Address which appeared in *The London Naturalist* **85**.

The president and secretary met the incoming chief executive of London Wildlife Trust, Carlo Lorenzi, to discuss how our organizations could work together. On the national level, the Society, together with many other bodies and individuals, wrote to the Natural Environment Research Council expressing disquiet at proposals to close sites and cut staff at the Centre for Ecology and Hydrology. Though the closures will go ahead, the campaign was not entirely unsuccessful and there is hope that activities of great importance to the Society, such as the Biological Records Centre, will continue to be supported.

## Membership and communication

Membership of 1,020 at 30 June 2006, including 91 who had not yet paid, was slightly down on the previous year: 76 new members joined in the

preceding eight months. We regret to record the deaths of Ms Cynthia Booth, Richard Green (a generous donor to the Society), Miss Jose Horwood, Royden Morgan, Mrs Lee Pledger, Roy Sherlock and Mrs Joan Walker. The death of Richard Fitter was recorded last year while Council was sorry to hear of the death, just after the year covered by this report, of the Essex ornithologist Mike Dennis. An obituary to Mike appears in this issue.

Under Graeme Lyall the two-monthly *Newsletter* has become essential and colourful reading. Other commitments including a growing family mean that Graeme will shortly vacate the editor's chair — he will be hard to replace. The Society has, however, been fortunate in persuading Marc Carlton to take over the website from the two Davids, Bevan and Corcoran, who have managed it since its inception. A new initiative during the year was an internet message board for members, suggested and brought to fruition by Mick Massie. Any member with internet access is welcome to join, at http://tech.groups.yahoo.com/group/LNHS-members.

The Society's new display stands were seen at several events during the year, including the Natural History Museum's Open Days, the Lee Valley and Rainham Marshes Bird Fairs, and the BBC's wildlife fair hosted by the Mayor of London at the GLA building. We thank Catherine Schmitt, Angela Linnell, Mike Trier and many others who represented the Society.

Paul Mabbott delivered the annual Brad Ashby memorial lecture at the Royal Entomological Society. We are grateful to the executors of Brad's estate who have offered his collection of entomological slides on permanent loan in furtherance of the Society's educational and scientific work; the collection is at present held by Mike Trier on the Society's behalf. An agreement has been reached with the London and Middlesex Archaeological Society to hold an annual lecture on a subject of common interest. Starting in 2006, the lectures will be given at the Museum of London.

## Publications and journals

*London Bird Report* **66** (2001) was published in early 2006, some eighteen months after the previous year's. The lengthening interval has been of great concern to Council, leading to the decision to award a contract to Peter Naylor to write the species accounts for 2002 and 2003. These will be published later in 2006 as a single issue covering both years. Council would be reluctant to commit further resources to the preparation of copy for future issues and has engaged with the editorial team to plan an annual production cycle within the capacity of the volunteer effort available.

*The London Naturalist* **84**, for 2004, published in December 2005, covered a remarkable range of topics — for example, a review of London's slime moulds, including several new to Britain, is separated from a report of attempts to conserve the adder in our area by a short but eloquent account of the lichen-encrusted headstone of a Society luminary, Cyril Castell. A palaeozoologist himself, Cyril would have approved the variety.

Sales to non-members amounted to 51 copies of *London Bird Report* and 93 of *The London Naturalist*, including back numbers: 103 copies of the Society's occasional publications were also sold. Catherine Schmitt is responsible for these sales which provide a useful service to the public as well as income to the Society.

## Research stations

Both the Bookham Common and Hampstead Heath Surveys had productive years. Publication of an annotated checklist of *The beetles of Bookham Common*, comprising more than one third of the British list, is expected soon, while Council has agreed in principle to collaborate with the Corporation of the City of London in preparing a new *Flora of Hampstead Heath*, intended for a general audience as well as more expert botanists.

## Sections

Field meetings — 19 botanical, 53 ornithological and 23 of entomological and ecological interest — were, with some disappointing exceptions, well attended. Sections will need to reflect whether their target audience is the interested amateur or the more sophisticated natural historian. A clue may be found in the very successful series of indoor meetings organized by the ornithologists, offering identification tips for the beginner, followed by field meetings where these were put into practice. Appreciation of the natural environment being one of the Society's objects, both experts and beginners (who will be tomorrow's experts) should be catered for.

Accounts of Sectional activities will be published in *The London Naturalist.*

## Library

The Society's library comprises some 8,000 volumes of which about half are journals. The lease at Imperial College having been terminated, its future is, at the time of writing, unclear. Council would prefer to retain it as an open-access collection in central London, and has made extensive enquiries accordingly. Unfortunately the major institutional and public libraries are themselves pressed for space and cannot help. Overtures to the Natural History Museum may yet bear fruit but if this and other possibilities fail to materialize Council has the choice of putting the Library into storage while seeking an alternative home, or disposal of the collection. Bearing in mind that many, though not all, members expect the Society to provide access to reference material in furtherance of its scientific and educational objects, neither alternative is palatable. Council commissioned a valuation of the collection, primarily for insurance purposes but also as a guide to its market value.

The Society was also required to vacate its stock room at Imperial College, which served as an office for our librarian, Linda Hewitt, and a useful committee meeting room. Back numbers of books and periodicals have been removed to the City Corporation's hut where the Hampstead Heath Survey group meets, while the Society's archives have been deposited with the London Metropolitan Archives at Clerkenwell. Finally, a large number of card index files, comprising ornithological records dating back to the 1930s, have been stored temporarily at London Wildlife Trust's offices awaiting digitization. As yet, there are no plans for carrying this out and the future of these records is unclear.

## Postscript

After this Report was written, a satisfactory resolution of the library question was achieved. The Natural History Museum has agreed to store the Society's collection, pending completion of Darwin Centre Phase II which will house a centre for public interpretation and study of Britain's natural history, with the Society's library as a major resource complementing the Museum's own collections. Once details of this arrangement have been negotiated, the library will again be available for use, by members and, subject to certain restrictions and safeguards, by the general public.

# Treasurer's report for 2005/2006

At the end of the financial year on 30 June 2006, the total net assets of the Society were £347,016 compared with £342,529 the previous year.

Income for the year totalled £36,465, compared with £37,212 in 2004/2005. Subscription income (including Gift Aid tax recovered) increased slightly from £19,287 in the previous year to £20,152 in 2005/2006. Sales of the Society's various publications generated £1,253, compared with £1,748 in the previous year.

Overall expenditure during the year was £31,978, compared with £37,041 in the previous year, when increased publication costs were incurred.

## Reserves policy

The Society's unrestricted general funds can be regarded as expendable endowment since they are invested to provide a regular source of income as well as capital growth, over time.

## Statement of trustees' responsibilities

Law applicable to charities in England and Wales requires the trustees to prepare financial statements for each financial year which give a true and fair view of the charity's financial activities during the year and of its financial position at the end of the year. In preparing those financial statements the trustees are required:

- to select suitable accounting policies and then apply them consistently
- to make judgements and estimates that are reasonable and prudent
- to state whether applicable accounting standards and statements of recommended practice have been followed subject to any departures disclosed and explained in the financial statements; and
- to prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue to operate.

The trustees are responsible for keeping accounting records which disclose with reasonable accuracy at any time the financial position of the charity and enable them to ensure that the financial statements comply with the Charities Act 1993. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud or other irregularities.

**Accounts follow:**

# Summarized accounts for the year ended 30 June 2006

These summarized accounts have been extracted from the Society's annual accounts for 2005/2006. They may not contain sufficient information to provide a full understanding of the financial affairs of the Society. For further information the full accounts, the Independent Examination report on these accounts and the trustees' annual report should be consulted. Copies can be obtained from the Hon. Treasurer, M. J. West, 52 Trinity Road, Ware, Hertfordshire SG12 7DD.

The annual accounts were approved by the trustees on 12 October 2006.

# Summarized statement of financial activities for the year ended 30 June 2006

| | Unrestricted general funds | |
|---|---|---|
| | 2006 | 2005 |
| | £ | £ |
| **Incoming resources** | | |
| **Activities in furtherance of the charity's objects:** | | |
| Subscriptions received from members | 20,152 | 19,287 |
| Publications/journals income | 1,253 | 1,748 |
| Interest receivable | 14,210 | 14,833 |
| Donations and other income | 850 | 1,344 |
| **Total incoming resources** | **36,465** | **37,212** |
| **Costs in furtherance of the charity's objects:** | | |
| Publications and other costs | 27,546 | 32,279 |
| Grants payable | — | 200 |
| Management and administrative expenses | 4,432 | 4,562 |
| **Total resources expended** | 31,978 | 37,041 |
| **Net movement in funds** | 4,487 | 171 |
| Fund balance brought forward at 1 July | 342,529 | 342,358 |
| **Fund balance carried forward at 30 June** | £347,016 | £342,529 |

# Balance sheet as at 30 June 2006

| | 2006 | 2005 |
|---|---|---|
| | £ | £ |
| **Fixed assets** | | |
| Tangible fixed assets for use by charity | 3,133 | 2,724 |
| **Net current assets (including cash deposits)** | 343,883 | 339,805 |
| **Total net assets** | £347,016 | £342,529 |
| **Represented by:** | | |
| Unrestricted funds | £347,016 | £342,529 |

# Official and sectional reports for 2006

## CONSERVATION

The tenth anniversary of the London Biodiversity Partnership, of which the LNHS has been an active partner since its inception, was marked in 2006. The event was celebrated at City Hall in November with addresses from Charles Secrett, Nicky Gavron, and LNHS member Professor David Goode. The Partnership grows apace, with four contrasting new partner organizations joining during the year: Transport for London, Buglife, Thames Landscape Strategy, and the City of Westminster.

The LNHS continued to play an important role in supporting the LBP by providing biological records to GIGL (Greenspace Information for Greater London — www.gigl.org.uk), which was launched as a fully fledged open space and biodiversity records centre in April 2006. These records provide a vital component in LBP's ability to assess progress in the London Biodiversity Action Plan.

In the early part of the year the Society was greatly concerned to learn of proposals from the Natural Environment Research Council to restructure the Centre for Ecology and Hydrology. These proposals included the closure of five nationally important CEH sites (including Monk's Wood, Winfrith, and Banchory) with the loss of about one third of the staff. Despite a massive campaign of objection from a wide range of individuals and environmental organizations, including the LNHS, we were disappointed to learn later in the year that most of the restructuring was going ahead (including the closure of the above mentioned sites), but with a small reduction in the proposed loss of staff.

With the ever-increasing demand for housing in the London area, ecologically important sites continue to come under threat. Private gardens are now officially classed as brownfield land, and many green 'backlands' in London are thus at risk of disappearing under bricks and mortar. In November the Society became aware of development proposals for part of West Thurrock Marshes — an important SSSI situated in the increasingly vulnerable Thames Gateway. Despite joining forces with Buglife and Thurrock Council to oppose this development, we were again disappointed to learn that Thurrock Thames Gateway Development Corporation (an unelected quango) had overridden the views of local people, and allowed the development to proceed.

Following a successful bid to the Heritage Lottery Fund in 2005, the Capital Woodlands Project finally got under way in 2006. This has resulted in a range of woodland management activity and training events in various London woods. In Coldfall Wood in Haringey, for example, an ambitious coppicing programme was carried out at the end of the year, and the resulting changes to the flora of the Wood are being carefully monitored.

DAVID BEVAN, *Conservation Officer*, FREDA TURTLE, *Secretary, Nature Conservation Working Group*

## BOTANY

The Botany Section has had another active year. At the AGM in November 2006, Ted Tuddenham, our recorder for fungi since 2003, gave a fascinating account of the fungi to be found in London. Although historically much under-recorded, Ted reported a significant increase both in the number of records received, and in the number of species reported during the last three years. Several of these were new to the London area, including the spectacular red native of Australia, *Clathrus archeri*, which appeared at Kew flourishing amongst rich leaf litter. There were no formal indoor meetings in the first half of 2006, but one traditional indoor informal gathering in the winter gave members an opportunity to show their best botanical photographs for 2005.

We had a very full programme of field trips this year thanks to the hard work of our indomitable field meetings secretary, George Hounsome. In the winter/spring 2005/2006 there were visits to Swyncombe and nearby sites, Trent Park (for mosses and liverworts), Hampstead Heath (for lichens), and St Pancras and Islington Cemetery (for fungi). At the beginning of June we joined the Ornithology Section for a visit to Rye Harbour, and there was a weekend visit to the Brecklands. Further outings included trips to Markfield Recreation Ground, Wakering (near Shoeburyness), Greenwich Ecology Park, Dancers End National Nature Reserve, Pippenhall Meadows, Pevensey Road Nature Reserve, Bricket Wood Common (for heathland flora), and Riddlesdown Chalk Pit. There were also visits to the East End and to Holland Park, and two recording visits: to Old Park Wood and Stockers Lake for the Hertfordshire & Middlesex Wildlife Trust; and to Hayes and Keston Commons for the London Heathland Habitat Action Plan. Autumn visits included Tottenham Marsh, Lambeth Marsh area (for aliens), Gernon Bushes (for ferns) and the annual Haringey fungus foray. One indoor meeting was held: Ted Tuddenham led a workshop on the identification of fungi.

Mark Spencer has been appointed as the Society's new recorder of flowering plants and vascular cryptogams, following the resignation of Rodney Burton. Rodney took over this onerous role following the death of J. E. Lousley in 1976 and has carried it forward with great distinction over this long period. The Society has benefited hugely from his encyclopaedic knowledge of the London flora, and from the immense amount of hard work he has devoted to its study. Rodney continued to receive records for 2006 and will write them up for *The London Naturalist*. All botanical records for 2007 should be sent to Mark Spencer. In 1995 Rodney started entering new records into a bespoke computer database, of which a copy (as at 2 October 2006) has been supplied to GIGL, the London Biodiversity Partnership's records centre. The layout of his database hinders the transfer of records to systems using programs designed for data interchange, and Rodney has been busy altering this layout and adding older handwritten records to the database in order to make things easier for his successor.

Rodney has also resigned as the Section's indoor meetings secretary, though he has kindly agreed to arrange our meetings for 2007. We are most grateful for all his hard work in this role, and for the outstanding range of speakers that he has managed to recruit for us over recent years.

Mary Clare Sheahan has been involved in bryophyte-recording visits to Coldfall Wood, Trent Park (where a number of first records including *Bryum subapiculatum* were found) and Hampstead Heath. She notes an encouraging increase in some species, notably *Cryphaea heteromalla, Microlejeunea ulicina* and *Orthotrichum lyellii*. All new records are being entered in MapMate, but there is still a considerable backlog awaiting entry.

Ted Tuddenham reports that throughout the year interesting finds were reported to the londonfungi webgroup that is moderated jointly by Keir Mottram and the recorder. The summer was extremely dry and hot, such that there were few fungi about in the south of the UK until the much delayed autumn rains appeared in mid October. After the rain, reasonable numbers of Basidiomycetes began to appear with especially good fruiting of boletes. Ted visited Mandy Rudd at GIGL in early November and transferred all his records (on MycoRec) for entry onto their Recorder-based system. Thus 1,070 records will be added, doubling the existing number of fungal records held by GIGL. GIGL staff have also offered to scan and transfer all the paper records that the recorder holds going back to 1985.

DAVID BEVAN, *Chairman*, SARAH GRAHAM-BROWN, *Secretary*

## ECOLOGY AND ENTOMOLOGY

The Section organized several interesting indoor meetings. At February's informal meeting two members showed slides on various aspects of the natural world and one member gave a talk on saving a potential local wildlife site. In March, Helen Roy of the UK Ladybird Survey told us about the so-called harlequin ladybird, *Harmonia axyridis*, 'the most invasive ladybird on earth'. For our annual joint meeting with the British Entomological and Natural History Society in September, Tony Davis of Butterfly Conservation, gave the Brad Ashby Memorial Lecture on 'Action for threatened moths'. Our AGM in October 2006 followed the successful formula of recent years with reports from recorders; Mick Massie gave the main talk on 'Evolution of spiders'.

Twenty-six field trips were organized during the year, some were well attended, others attracted only one or two members. A number of trips were joint with other organizations such as Butterfly Conservation, The Selborne Society and the British Entomological and Natural History Society. Several field trips also contributed to the initiative, 'London's Heathland Heritage'. The portable moth trap bought by the Society has been in use during some summer field trips. Thanks to all field trip leaders and those who helped arrange the trips.

The london-nhs-invertebrates e-group, with Paul Mabbott as moderator, is working well. The Section's home page on the Society's website has been posted. Once again the Section represented the Society at the Amateur Entomologists' Society exhibition, selling books and journals as well as making the work of the Society known to a wider public.

Gay Carr, David Howdon, Keir Mottram and Claudia Watts have joined the committee during the past year but we would welcome other members willing to join us to carry on the work of the Section and the Society.

COLIN BOWLT, *Chairman,* CATHERINE SCHMITT, *Secretary*

## ORNITHOLOGY

The Ornithology Section enjoyed a successful year with well-attended indoor meetings on bird identification, field trips to amazing birding sites close to London almost every weekend (showing just how fortunate we are to have so many sites so close at hand) and coach trips to well-known birding areas.

Our coach trip organizer, Neil Anderson, reports that the coach trips, which had shown a decline in popularity, now sometimes have waiting lists for places. In February 2006, we visited Holkham where we observed six shore larks and about a hundred snow buntings and saw many geese, including black brant. The Nag's Head in the Forest of Dean yielded western woodland species such as pied flycatcher, wood warbler and redstart as well as close views of hawfinch from the hide.

In June we went to Rye Harbour where we saw good numbers of breeding terns and gulls, including Mediterranean gulls and also breeding waders and wheatears. At the end of September we visited Holme in Norfolk, where the sea provided most of the action with gannets, scoters, red-throated divers, auks, arctic skua and the first returning skeins of pink-footed geese.

A well-supported trip to Slimbridge in WWT's sixtieth anniversary year was productive. A tundra bean goose was eventually located amongst the wintering whitefronts, the latter species now less abundant than in the past as many remain on the Continent. As usual, raptors were well represented and there were sightings of buzzard and peregrine. The highlight was the wildfowl arriving for feeding time at Rushy Pen, particularly the recently arrived Bewick's swans, while, simultaneously, starlings arrived to roost.

Attendance has been average, with most tours breaking even and some making a small loss but bookings were much improved at the end of 2006.

Since the beginning of 2006 we have employed ABC Travel as a replacement for Leaside Travel and have been happy with their competitive service. To ensure funds stay healthy, the next programme will see a seat price rise of £1 to £14: compared with public transport or individual car fuel costs this is still excellent value for money. Demand for gift vouchers did not materialize, so they will be discontinued. Our thanks are due to Mike Trier for his assistance with administration and to all who make the trips viable — please encourage friends and relatives to join the group for a good day out in the country. We concentrate on birds but all wildlife is of interest and a good sociable time is had as well.

Jennifer Hayden, our field meetings secretary who organizes the local trips, had a busy and successful year. The programme brings together a glimpse of what can be seen and enjoyed within a twenty-mile radius of London and further afield. The walks are all accessible by public transport and are led by very knowledgeable birdwatchers. Please turn up whatever the weather, as you can be confident that the leader will always arrive.

The year began with a cold spell in February but sharp winds gave way to warm sunshine and the water levels for the South-East meant that winter ducks were displaced. On 25 March the walk to Weald Country Park, a lovely area to visit just outside Brentwood and a new site for the programme, was very enjoyable with great views of bullfinches. The rolling countryside has large areas of oak, hornbeam and beech mixed with scrubland. As the sun shone along Chestnut Walk, we caught sight of our first brimstones, commas and red admirals. Down by the lake, we had goosander and a total of fourteen were seen here in the winter.

Members enjoyed another new walk at Alexandra Park, where they watched as grey wagtails collected nest-building materials. The day was a contrast of sharp showers and sunshine with glorious rainbows. Nightingales were staying low with only sharp bursts of song on the walk around Sewardstone. Overhead the sky was busy with a large migration of house martins and swallows heading north. Some were also swooping along the midge-laden meadows and hedgerows. It was at Chingford Plain that the nightingales stunned us into silence as there were at least three singing in the very thick undergrowth.

Cetti's warbler, that bird more often heard than seen, did just that at Rye Meads. Over the years this area of the Lee Valley has become a good area for them. Foots Cray Meadows is always well worth a visit to see kingfisher and grey wagtail and if you are very lucky, you will see a water rail. Of course this is one site that has a large flock of breeding parakeets and it will be interesting to see how local populations of other species suffer if they continue to do so well.

Stoke Newington Reservoir was also new to the programme and, in late September, on a warm sunny day, it was wonderful to visit a calm oasis. Sparrowhawks kept flying overhead and a pair of ruddy ducks and a good few pairs of red-crested pochards gave great views. This will be an excellent site for warblers in the spring programme.

Another central site at Wandsworth Common is excellent for sparrowhawks and we had wonderful views of chicks very close to. The three small balls of fluffy white chicks peeping out of their nest were a delight to see.

Some walks attract large numbers of members and Beddington Sewage Farm is a place where any good bird could drop into at any time, so the walks here are well attended. In late October, Beddington had taken on a tired look after the summer heat but linnets, tree sparrows, late wheatears and meadow pipits could be seen foraging among the grass seeds. A small flock of avocets made a quick visit to the site, which was an extra bonus to those who turned up. A spring trip to Rainham Marshes was very productive with marsh harrier, three hobbies, one pair of avocets and little ringed plovers, two whimbrels and two wheatears. An autumn trip to Tilbury Power Station, in conjunction with

an indoor meeting on tern identification, allowed participants side-by-side comparisons between sandwich, common and black terns.

The 'migration watch' open day at Brent Reservoir was included for the first time in the programme. A small crowd turned up to this site, which is not generally open to the public. There was no structured walk but it was an ideal chance to do a count of migrating birds. There was also a marvellous opportunity at Tilbury to put into practice the knowledge gained at our indoor meeting class on identifying terns when David Darrell-Lambert, our chairman, followed up his talk with the walk at Tilbury. New to the programme was Bedfords Park but this did not entice anyone to go although it was a great day for raptors — hobby, peregrine, buzzards, sparrowhawk, not to mention the spotted flycatchers — and warblers. Colin Jupp is an excellent leader and both sites he covers are well worth a visit.

Back to central London to a calm oasis at Stoke Newington reservoir. Gary James had a good turn out of twenty people. On a beautiful warm September day, grey wagtails were very busy feeding around the boating lake while out on a glass-calm reservoir, ruddy duck and red crested pochard showed well. This site did very well this year with a visit from a golden oriole early in May. As the site is not open to public, it was with great pleasure that Gary showed us around. Rye Meads RSPB reserve was quiet when Roy Woodward led a group but everyone enjoyed the day as it gave them more time to practise identification skills and Roy is very knowledgeable about insects as well as birds. John Reid led a visit to Oxleas Wood: this was a first visit to this ancient woodland and nuthatches and treecreepers love it here, while flocks of tits and finches enjoy the diversity and the site is interesting at any time of year.

Jennifer says: 'The programme is varied, some sites have a dedicated band of followers and new leaders and new sites are being introduced when I have made contact with people who visit sites regularly. Some new walks do not attract many people which is a shame as they have been a welcome addition to the programme. I would encourage people to make the effort to come along and enjoy getting to know a new area and discover all that London has to offer the local birdwatcher. I do hope members will make the effort to go on at least one trip a month. The walks are designed for you and I do hope you enjoy them. Happy birding.'

The Ornithology indoor meetings enjoyed a very successful year, often with over thirty people attending. In response to members' requests, the meetings have concentrated on improving bird-identification skills. This is something that other societies rarely cover. We had two guest speakers: Jeff Baker who tried to clarify those 'little brown jobs' in 'Warblers for beginners' and Ian Rumley-Dawson who spoke on 'Waders for beginners'. We are particularly grateful to our chairman, David Darrell-Lambert, who volunteered to give identification talks on ducks, buntings and the particular difficulties presented by the larger gulls. These meetings proved popular and were continued in September when David spoke on identifying terns. This was followed by a field trip down the Thames to put our new expertise into practice. Then in October, Dusty Gedge talked about the arrival of peregrines and black redstarts in London. In December, Helen Baker shared her research into house sparrows in London. In addition to the above, members expressed an interest in meetings about the major bird sites in London. So in March, David James talked about the new RSPB reserve at Rainham Marshes. Most meetings have been followed by a short informal quiz with prizes for the winners. There were further planned sessions on the identification of raptors and owls, thrushes and chats and pipits, wagtails and larks.

All meetings take place at King's Cross Methodist Church, Crestfield Street, a mere minute from King's Cross mainline station and the Tube, at 6.30 p.m. Please give it a try. Plenty of time is allowed to exchange the latest information

before and during the interval and many thanks are due to Jennifer Hayden who has provided the most generous refreshments, including truly outstanding cakes. We hope to see as many of you as possible at the indoor meetings and please bring your friends.

The chairman of the Records Committee, Andrew Self, reports that it had been a very hectic year in 2006 with the publication of the *London Bird Report* for 2001 and the effort to secure funding for the 2002 and 2003 issues. This would result in a double issue for these two years. Progress on the 2004 report had been delayed by the late receipt of records from a neighbouring county but it was hoped to complete it by spring 2007. A meeting to discuss future progress of the *London Bird Report* proposed that those submitting data should be encouraged to do it electronically. Volunteers were still needed to enter two-monthly reports of bird sightings and specified reports from the London Bird Website into spreadsheets. If you can help, please contact Andrew Self (020 8208 2139).

Some members continued to keep up to date with the literature on birds by using the Ornithology Reading Circle. There were fourteen subscribers, compared with fifteen the previous year and there was a balance of £74.97 compared with £45.40 the previous year. A flyer is sent out with the December LNHS *Newsletter* giving all the details. There are two Dutch periodicals, *Ardea*, a scientific journal and *Dutch Birding* (of more general interest), two UK periodicals: *Ibis*, a scientific journal and *British Birds* (of more general interest), and two periodicals for the rest of the British Isles: *Irish Birds* and *Scottish Birds*. Please contact Angela Linnell (020 8508 2932) if you are interested in subscribing to the Circle.

We would like to encourage all members to try the field trips and bring their friends, to show them just what is available on London's doorstep and also to enjoy the indoor meetings in the winter. If you have any suggestions for field trips, indoor meetings or any ways to improve the service or attract more members, please contact us.

DAVID DARRELL-LAMBERT, *Chairman*, ANGELA LINNELL, *Committee Secretary*

# London-rocket *Sisymbrium irio* L. in Britain and Ireland during three and a half centuries, with particular reference to the London Area

JOHN SWINDELLS

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**Presidential address delivered at the Annual General Meeting on 12 December 2006**

## Introduction

Last year for my Presidential Address I spoke about weeds. This year I want to focus on one particular plant species with a London connection. It is one of those species that Richard Mabey calls 'street flowers' (Mabey 1976); it is the plant that Peter Marren called 'the original urban wild flower' (Marren 1999) and, as I mentioned last year, it was runner-up after rosebay willowherb as Plantlife's county wild flower for London (Plantlife 2004). It belongs to the family formerly known as Cruciferae, now known as Brassicaceae or the cabbage family, of which Tim Rich writing in the Botanical Society's Handbook, *Crucifers of Great Britain and Ireland*, says, 'If there is one ecological generalisation about crucifers, it is that most are weeds' (Rich 1991).

Tonight's weed is *Sisymbrium irio* or London-rocket (Figures 1 and 2) which I have been studying for much of the last ten years, at first informally then more recently in order to write an MSc dissertation (Swindells 2006). Some of you may have heard me talking about it on BBC Radio 4 in a five-part series 'Street Life' (2005) about the wildlife with which we Londoners share our city. I was also persuaded in May 2006 to talk about it for a BBC London television news report. On the day scheduled for its transmission it was postponed in favour of some more topical item and I never saw how nearly three hours of filming while traipsing around the streets of Clerkenwell translated into just two minutes of television time.

London-rocket is one of the few plants with 'London' in its vernacular name. It gained that epithet after it appeared in great profusion in the ruins of London after the Great Fire of 1666. Robert Morison, the first Professor of Botany at Oxford, writing in 1669, noted, 'The spring after the conflagration at London all the ruins were overgrown with an herb or two, but especially one with a yellow flower: and on the south side of St. Paul's Church [i.e. the Cathedral] it grew as thick as could be; nay on the very top of the tower' (Morison 1669 translated from the Latin and quoted in Kent 1975).

Though not in such quantity, London-rocket came to prominence again in London after the Blitz of the Second World War. Whether or not it disappeared between times is a matter of some dispute warranting further historical research some of which I have attempted to pursue. What is not in dispute is that it has been found regularly on the remnant Roman City wall close to Tower Hill Underground Station since the late 1940s (Swindells 2004).

The first printed record for *Sisymbrium irio* in the British Isles was in 1666 from the City of London in Christopher Merrett's *Pinax rerum naturalium Britannicarum* . . . , (Merrett 1666, quoted in Clarke 1900). Most of the stock of the first edition of his book was destroyed in the Great Fire in September 1666 and an unauthorized reprint was produced in 1667 (Kent 1975).

London-rocket had, in fact, been observed at least ten years earlier. William How's *Phytologia Britannica* was published in 1650. In his personal copy of that book is a manuscript note in How's own handwriting, attributing the discovery of London-rocket to John Goodyer 'near White Chappel east from Aldgate,

FIGURE 1. London-rocket *Sisymbrium irio* in Camden Place, Dublin, 28 May 2006.
*Photo: John Swindells*

London', i.e. just east of the City. The MS note must have been written after 1650 when *Phytologia Britannica* was published and before 1656 when How died. (How 1650 and Günther 1922). When Goodyer *actually* saw *Sisymbrium irio* is another matter but clearly it was before 1656. Our Secretary, John Edgington, who has seen How's book with the manuscript note has suggested to me that Goodyer may have seen the plant in 1642 or earlier. Prior to 1643 he had been in London many times but the Civil War had kept him away until at least 1649. Tantalizingly, there is a specimen in the Natural History Museum, London with Goodyer's name on it but no date or location. That Goodyer was a competent botanist is attested to by Thomas Johnson who described Goodyer as 'a man second to none in his industrie and searching after plants nor in his judgement or knowledge of them' and Johnson, who had already produced a revision of Gerarde's *Herbal* (Desmond 1994) had planned to work with Goodyer to produce a complete descriptive flora of Britain (Gilmour, 1944). Johnson, however, at the age of about forty-six was killed in the Civil War (Desmond 1994), so that never happened.

What I want to do tonight is:

- to trace the history of the distribution of London-rocket in Britain and Ireland from its first discovery to date and to look briefly at its wider distribution elsewhere in the world
- to discuss its status — that is to say whether it is native or an introduction — and even whether it matters
- to reflect on whether it deserves conservation status
- to speculate on its future prospects; and, as we go along
- to look at the habitats in which it has been found in Britain and Ireland

FIGURE 2. London-rocket *Sisymbrium irio* near Bow Wharf, Bethnal Green, 21 March 2007.
*Photo: John Swindells*

First though, some more about this plant. How would you recognize it?

I've already mentioned that London-rocket is a crucifer, a member of the cabbage family or Brassicaceae as they are now called. With the other 3,500 species in the family it is easily distinguished by the four petals arranged in a cross (hence the former family name Cruciferae), six stamens (a short outer pair and two longer inner pairs), and distinctive, often pod-like, fruits (Rich 1991). Its flowers have relatively small obovate, yellow petals, its fruits are pods that are more or less round in section and the plant bears simple hairs on leaves and stems that are characteristic of the genus *Sisymbrium*. It may be distinguished from other European species of *Sisymbrium* by its condensed inflorescence in which the slender young torulose fruits overtop the flowers and buds (Rich 1991 and Tutin et al. 1993). What do I mean by torulose? Like a string of beads — you can see the shape of the individual seeds through the walls of the pods.

There are several other species of *Sisymbrium* that may be found in Britain and Ireland. Stace (1997) keys out and describes eight of them and mentions another three. Graham Easy has illustrated ten of these with splendid line drawings (Clement 1982). Fruits of the five species most frequently found in the London Area were also depicted by Graham Easy in Burton's *Flora of the London Area* published by this society in 1983.

## Since 1650 where has London-rocket been found?

The major published sources of information on the distribution of our flowering plants are the two atlases of the British and Irish floras (Perring and Walters 1962 and Preston et al. 2002). The map in Perring and Walters shows London-rocket in 51 × 10-km squares; that in Preston et al. shows it in 87 × 10-km squares. When it comes to distribution by vice-counties, Stace et al. (2003) record London-rocket from forty-nine vice-counties in Britain, and Reynolds (2002) records it from three in Ireland, making a total of fifty-two.

My own literature and herbarium searches produced records from 128 × 10-km squares in fifty-eight vice-counties, showing that this plant has occurred more widely than either of the atlases of the British and Irish floras indicates. Figure 3 displays all the 10-km squares in which London-rocket has been found between 1651 and 2000.

Records from these 10-km squares were analysed by fifty-year date classes from *c.*1651 to 2000 and the graph in Figure 4 shows the number of 10-km squares in which London-rocket was present during each fifty-year period.

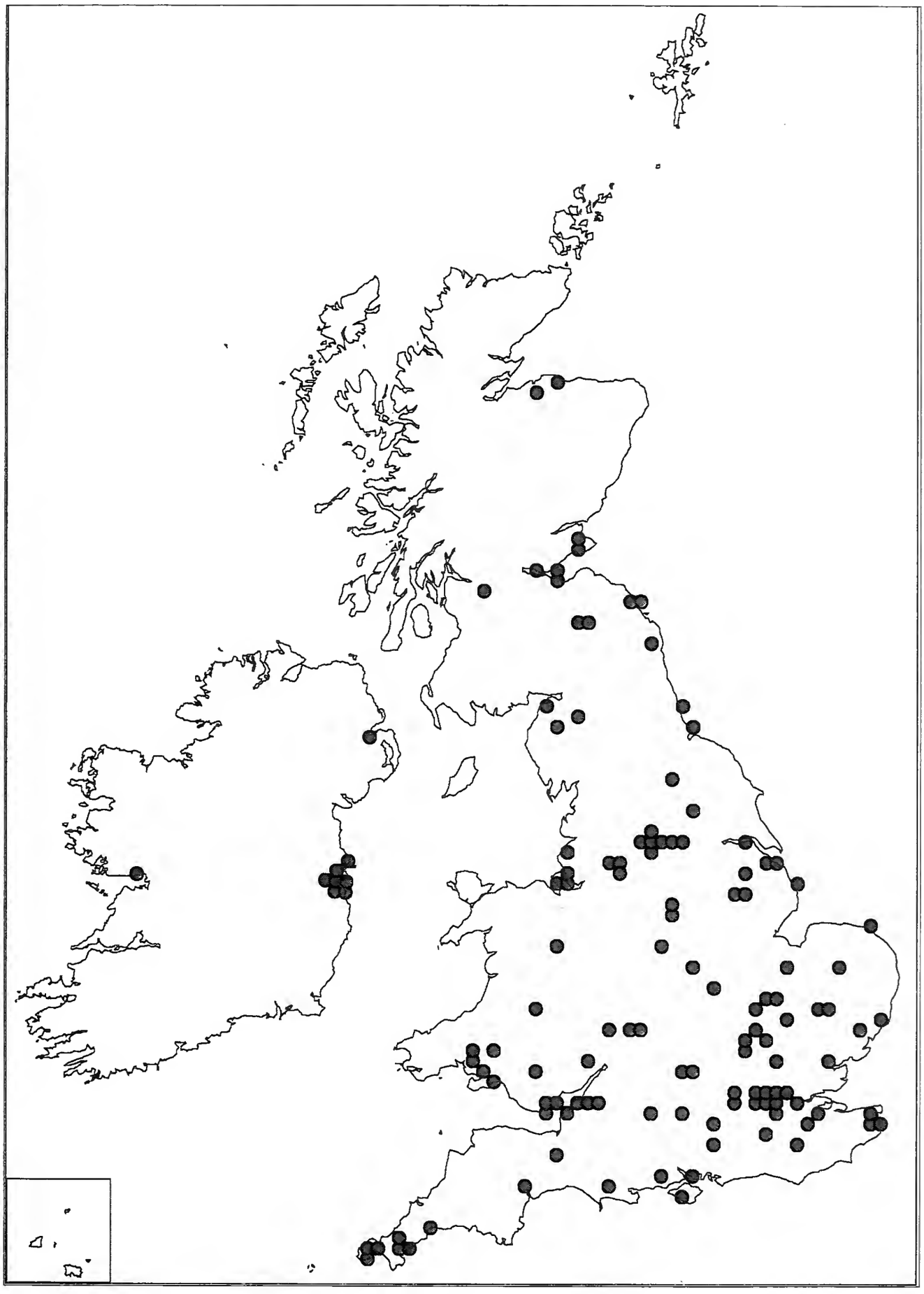

FIGURE 3. Distribution of London-rocket *Sisymbrium irio* in Britain and Ireland: all squares 1651–2000.

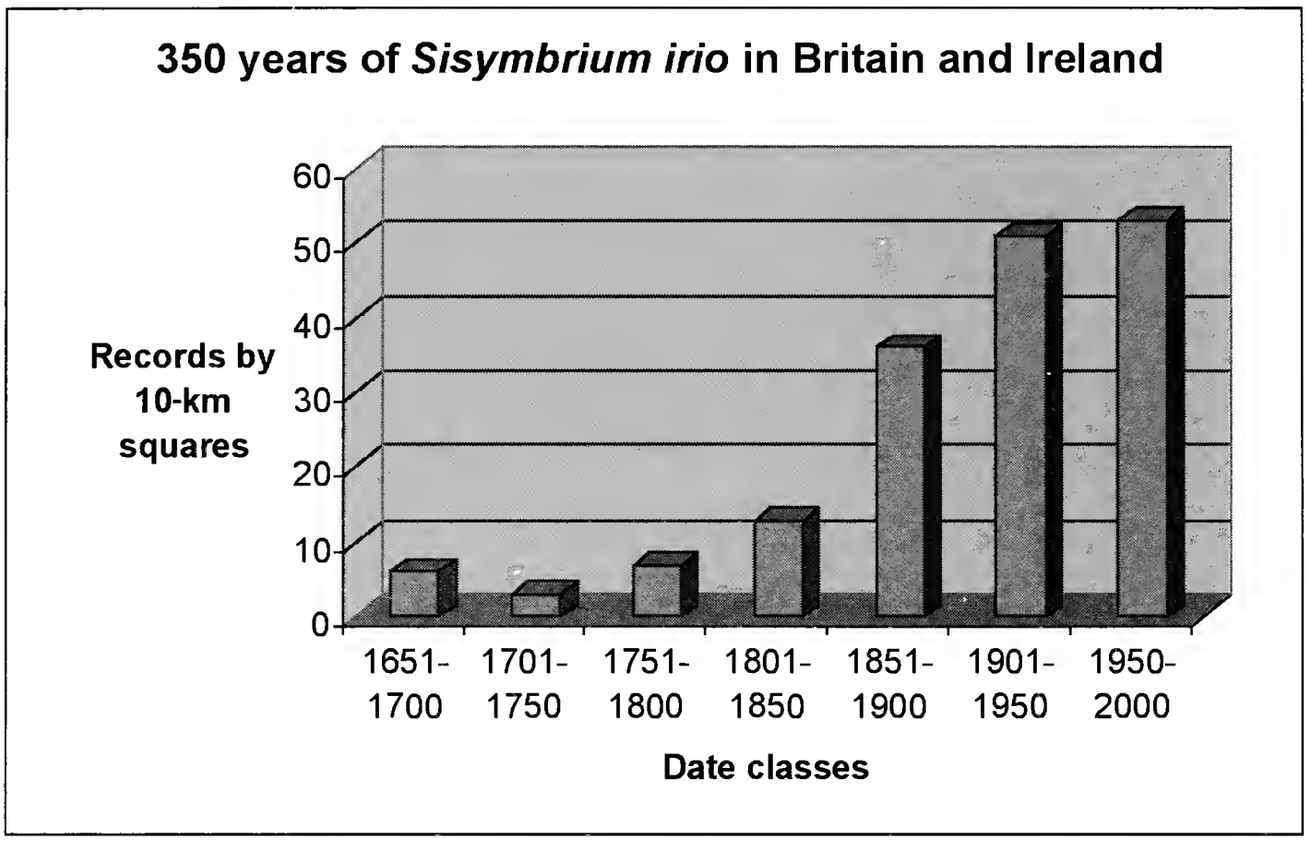


FIGURE 4. The presence of *Sisymbrium irio* by fifty-year date classes.

Distribution maps (Figures 5–11) together with commentary for each period follow.

**Records from 1651 to 1700**

Merrett (1666), Morison (1669) and Ray (1670) wrote of the abundance of London-rocket in 1667 and 1668 on the ruins of St Paul's Cathedral after the Great Fire in the City of London but it was also known from near King's Cross (Kent 1975), between the City and Kensington, and 'copiously about Chelsea' (Ray 1670 and Trimen and Dyer 1869, quoting Morison). Ray 'also observed it elsewhere, as about the House of my honoured Friend . . . at Faulkbourn in Essex [where Ray himself had lived from 1677 to 1679 (Bryan 2005)]; also on the walls of Berwick upon Tweed' (Ray 1690) where it was reported on and off for the next 230 years.

**Records from 1701 to 1750**

This is the thinnest period for records with the species only recorded as present in three 10-km squares, two in the London Area and one in Dublin. Near London it was reported from between Brick Lane (east of the City in Spitalfields) and Islington (to the north of the City). This was a period of much new building in Spitalfields with the arrival of Huguenot refugees from France (Rose 1951) which may be significant. The Dublin record is one from the pioneer Irish botanist Caleb Threlkeld in 1727. He recorded what several later botanists have accepted was London-rocket growing 'upon Walls as between *Dolphin's Barn* and *Cork Bridge*' (Colgan 1904). The species has certainly been found subsequently in the neighbourhood of Dolphin's Barn (Colgan 1904 and Dublin Naturalists' Field Club 1998).

The third edition of Ray's *Synopsis methodica Stirpium Britannicarum* . . . (Ray 1724) still included the records for Faulkbourn[e] Hall and Berwick-upon-Tweed (counted in the previous date class) but as these were not independently corroborated I excluded them from the data for 1701–1750. In the case of Berwick-upon-Tweed, however, the species was to be recorded again in three successive fifty-year periods from 1801.

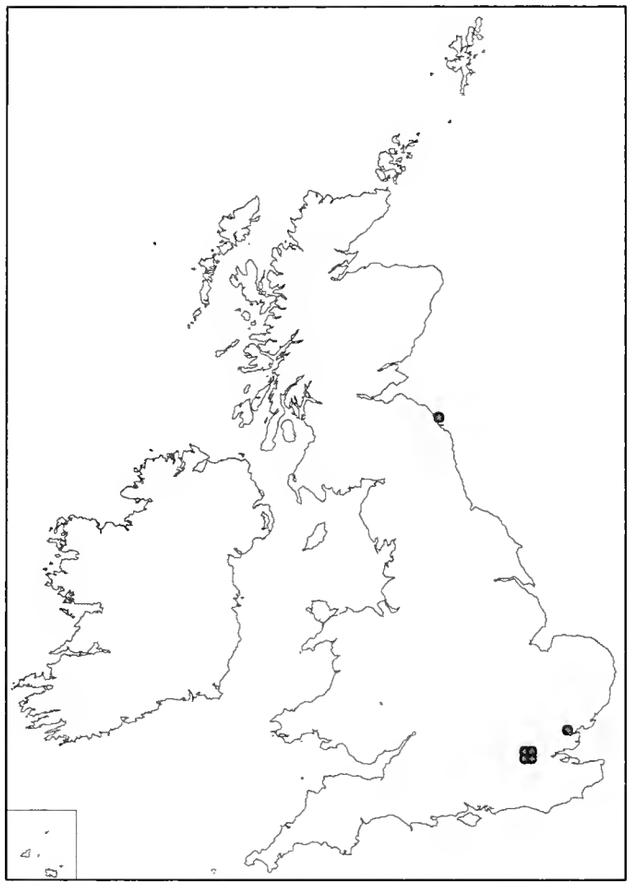

FIGURE 5. Distribution of *Sisymbrium irio*, 1651–1700.

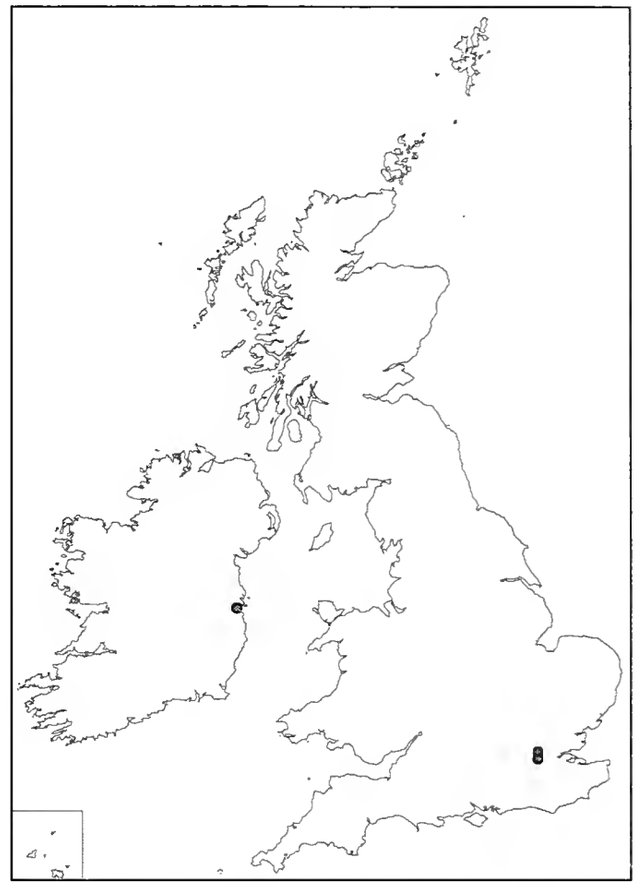

FIGURE 6. Distribution of *Sisymbrium irio*, 1701–1750.

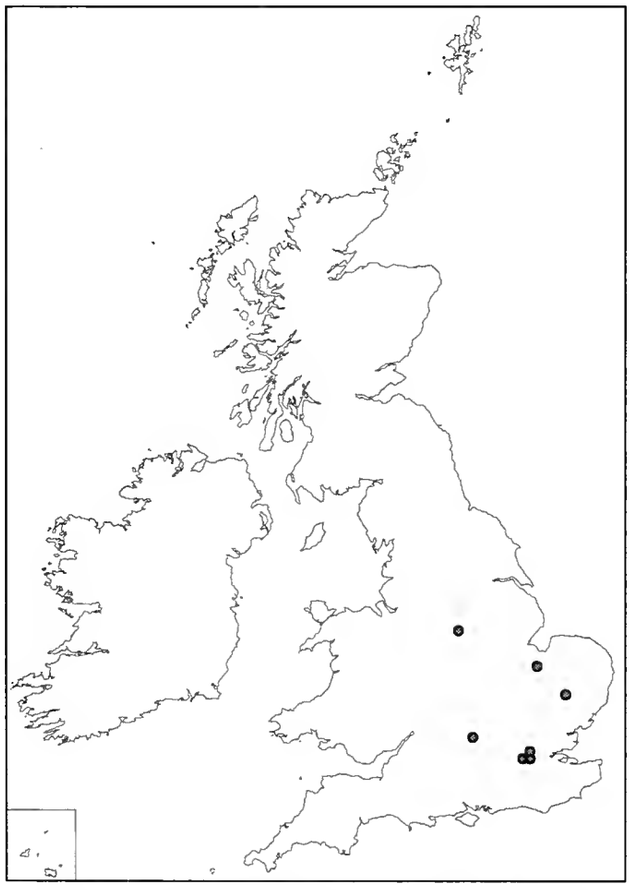

FIGURE 7. Distribution of *Sisymbrium irio*, 1751–1800.

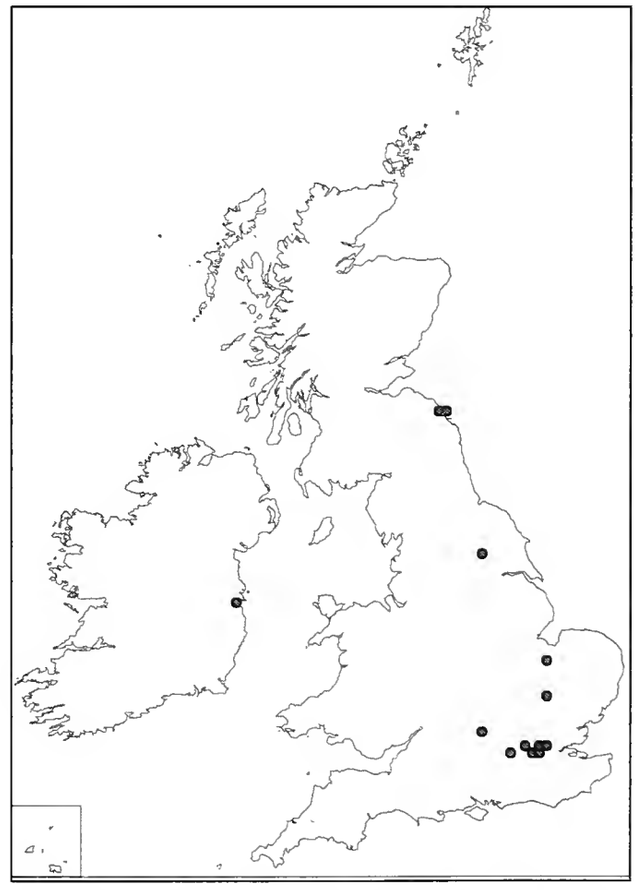

FIGURE 8. Distribution of *Sisymbrium irio*, 1801–1850.

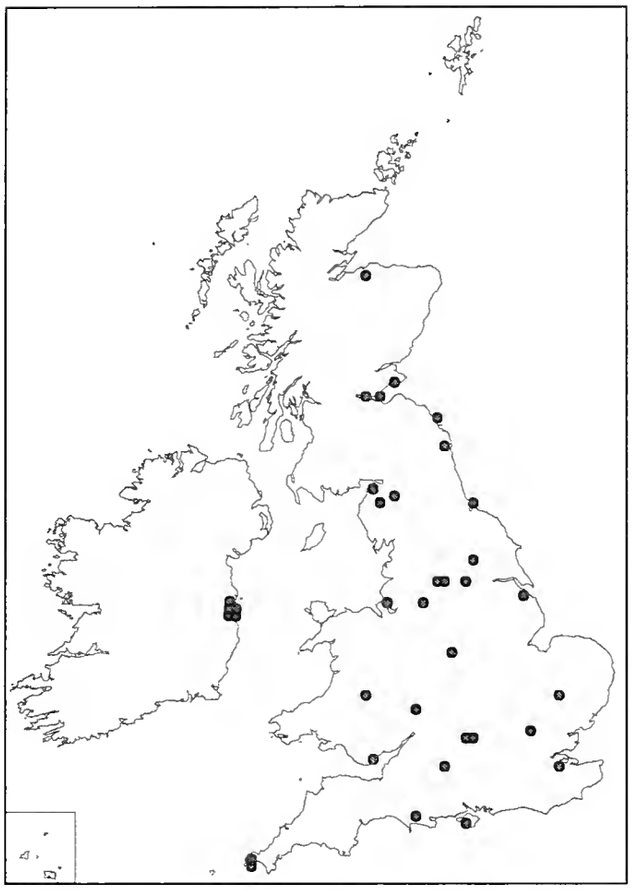

FIGURE 9. Distribution of *Sisymbrium irio*, 1851–1900.

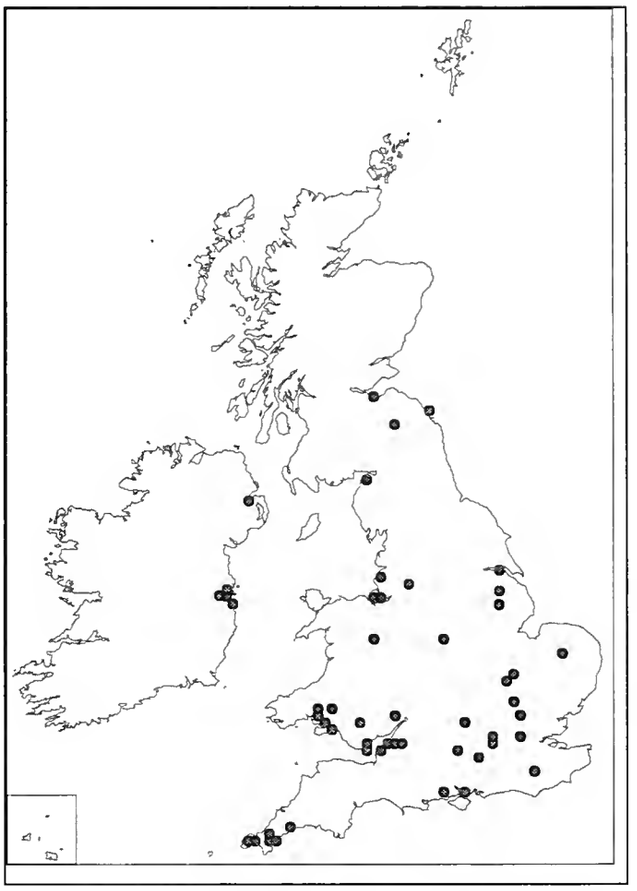

FIGURE 10. Distribution of *Sisymbrium irio*, 1901–1950.

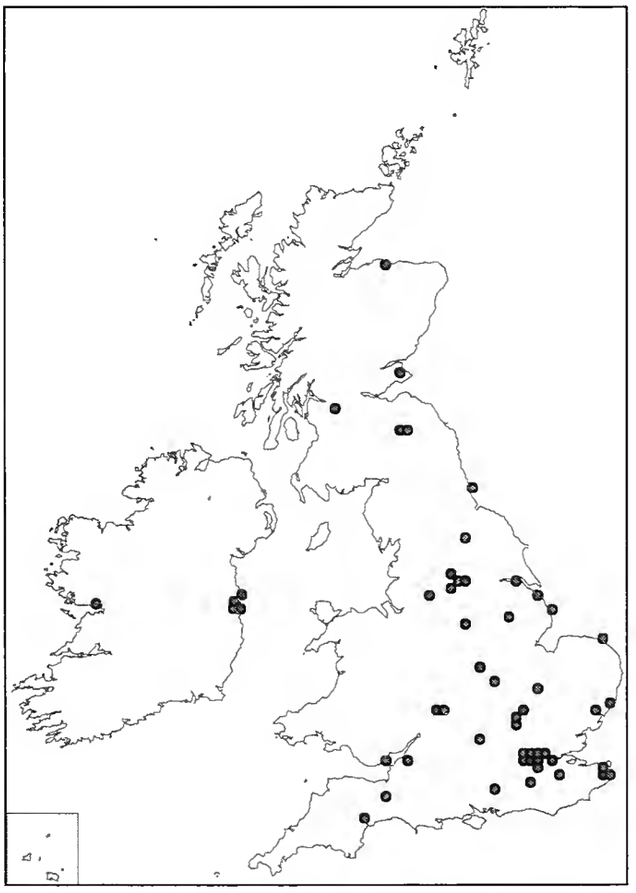

FIGURE 11. Distribution of *Sisymbrium irio*, 1951–2000.

**Records from 1751 to 1800**

In percentage terms there was a marked expansion of range, of 133.33 per cent, over the previous period but the net increase amounts to only four squares. *Sisymbrium irio* retained its presence in the London Area and was recorded 'in great abundance' between Little Chelsea and Hyde Park Corner in the last decade (Trimen and Dyer 1869). Of the new records, those from Wisbech, Bury St Edmunds and Wingfield Manor in Derbyshire may be regarded as casual occurrences, though *Sisymbrium irio* was recorded again at Wisbech in 1801–1850. The one from Oxford was the first of many stretching over the following 230 years (Swindells 2006).

**Records from 1801 to 1850**

There was a further expansion of range, by 85.71 per cent, over the previous period with a net gain of six squares, including Slough, Barnwell in Cambridge, Hanwell west of London and Barking east of London. It was found on the city walls of York and was recorded again on the town walls of Berwick-upon-Tweed (Swindells 2006). Here the northing separating the NT and NU squares of the National Grid runs through the town and its walls. In this period there is a specific reference to the appearance of *Sisymbrium irio* near to the new North British Railway station (Johnston 1853) in NT95; all other records giving detailed locations refer to places in NU05, so the non-specific records for Berwick-upon-Tweed have all been assigned to NU05 in my research. Preston et al. (2002) incorrectly omit NU05 and include only NT95 in their pre-1970 date class. *Sisymbrium irio* was recorded as common in Dublin (Dublin Naturalists' Field Club 1998) and continued to be present in Oxford; but in the London Area, though it started as 'a troublesome weed' in Chelsea at the beginning of the period it had apparently disappeared by the end (Trimen and Dyer 1869).

**Records from 1851 to 1900**

Expansion of range in 1851–1900 compared with the previous period was by 176.92 per cent, a net gain of twenty-three squares. This period saw the first Scottish, Welsh, Cornish, Cumbrian and Lancastrian records plus the first and only records from Dorset and the Isle of Wight. There was an expansion of range in Yorkshire and in County Dublin but no certain records from London (Swindells 2006).

**Records from 1901 to 1950**

Expansion of range in 1901–1950 compared with the previous period was by 41.66 per cent, a net gain of fifteen squares. It appeared in Hull but was not recorded anywhere else in Yorkshire during the period. In Ireland there was a slight contraction of range in Dublin with a change from five to four squares but there were new records in the Belfast area, one in Co. Antrim and one in Co. Down, though both were in the same 10-km square. There were a lot more records from Cornwall and south Wales, many in coastal towns, and the first definite record for about a hundred years in London when it was found in Trinity Square Gardens near the Tower of London in 1945, the record vouched for by a specimen in the Natural History Museum (Swindells 2006).

**Records from 1951 to 2000**

Comparison of this most recent date class with the previous one shows a net increase of two 10-km squares (+3.92 per cent). What is more significant, though, is that the losses (44) and the gains (46) were almost the same and compare with only seven squares unchanged. The losses were most marked in Cornwall and south Wales and the gains in Worcestershire, Yorkshire, East Kent

and the London Area. In Worcestershire, Yorkshire and East Kent the gains were associated with the use of wool shoddy as a fertilizer on fruit and vegetable crops (of which more later). Within the area of the present Greater London Authority *Sisymbrium irio* was being found on disturbed ground, on rubbish tips, or as a street weed in eight 10-km squares compared with only one in the previous fifty-year period (Swindells 2006).

## Further comments on records from Surrey and Middlesex

### Vice-county 17 Surrey

The note by Merrett (1666) that London-rocket was 'Almost everywhere in the suburbs of London on walls and next to ditches' may have included places in v-c. 17. In any event, it was near Dulwich in 1725 (Brewer 1863) and again in 1782 (Salmon 1931), and recorded from 'waste ground about Battersea' in about 1827 by Pamplin (Salmon 1931). Salmon also listed nineteenth-century records for Lambeth and Norwood and mentioned that it was a 'weed in Kew Gardens' without giving a date. In the last fifty years there have been records from near Earlswood in 1957 (Lousley 1976), from Roehampton in 1966 (Leslie 1987) and from Croydon in 1997 and 1999 (Rodney Burton, pers. comm. 2001).

### Vice-county 21 Middlesex

As already mentioned the first record of London-rocket in Britain was from Middlesex in the 1650s. There were many subsequent published records from a dozen locations in this Vice-county representing at least eighteen of the thirty-five decades between 1650 and 2000. However, Trimen and Dyer (1869) considered the species to be extinct having 'seen no specimens collected since 1832, nor ever met with it' themselves; 'though, no doubt, it was formerly very abundant,' with the localities they listed being 'confirmed by specimens in all the older herbaria collected near London'. De Crespigny (1877) said it was found in 'Waste places about London' but he may have been quoting earlier writers and, sadly for his reputation, a specimen collected by him from an 'old wall at Croydon' in 1875 and now in the herbarium of Manchester University Museum looks like tall rocket *Sisymbrium altissimum* to this writer.

Later records from Bloomsbury ('near the British Museum' in 1914 and 'the Strand' a few years before 1924) are regarded by Kent (1975) as incorrect. He thought the Bloomsbury plant was probably false London-rocket *Sisymbrium loeselii*; the Strand plant he stated was *S. altissimum*. However, Johnson (1924) who claimed the record of *S. irio* on the site of Australia House in the Strand stated, 'I have seen the London Rocket growing on the town walls of Berwick-on-Tweed where it appears to have lived for ages,' He was right about *Sisymbrium irio* growing on the town walls of Berwick-upon-Tweed whence it was recorded by John Ray (1690) and several subsequent writers until the early twentieth century, and attested to by herbarium specimens in the Natural History Museum, Manchester University Museum and the Hancock Museum in Newcastle upon Tyne, for example. If Johnson knew *S. irio* from Berwick-upon-Tweed perhaps he was right about the identity of the plant in Strand.

Twenty-one years later, Fitter (1945) noted how Sir Edward Salisbury failed to find *Sisymbrium irio* when he surveyed the London bomb sites in the early 1940s. Burton (1983) wrote of a century's absence. While it may not be possible to prove conclusively whether or not London-rocket did occur in Middlesex between 1840 and 1940 there is no doubt about its continuous presence since 1945. It was in 1945 that Mrs Kathleen E. Evetts found the species in or near Trinity Square Gardens near Tower Hill just east of the City of London and provided a specimen for the Natural History Museum's British

Herbarium. It was seen by Lousley in every year from 1947 to 1953 in six locations 'all within fifty yards of the Corporation boundary but only one within it' (Fitter and Lousley 1953). Lousley thought, 'The present occurrence is unlikely to be a survival from the earlier ones — it probably found its way to London afresh with some cargo which passed through the docks.'

On the western side of London it was abundant on a rubbish tip in Greenford (Lousley 1954). In the 1950s, 1960s and 1980s it was recorded in Regent's Park, and in the 1970s in Brentford (Swindells 2006). Burton (1983) noted that it was 'still an abundant weed' in gardens near the Tower and that it could 'fairly reliably' be found near the London Zoo in Regent's Park, but after 1986 he received no further records from near the Zoo (Burton 1993). In the 1980s it turned up in Mile End Park and Poplar (Swindells 2006). Game and Whitfield (1996) mention sightings in the early 1990s in at least ten places in the London Borough of Tower Hamlets. Swindells (2001) reported a record for Kensington and several in Tower Hamlets during 1995 to 2001. Since then, from my own observations and with information supplied by Jeremy Ison, Terry Lyle and Mark Spencer, I have seen London-rocket in Kensington, Clerkenwell, Stoke Newington, Hackney, near the Tower of London, Shadwell, Limehouse, Poplar, the Isle of Dogs, Mile End, Bethnal Green and Whitechapel, but could not relocate it in Spitalfields where it had been found in 1995 prior to redevelopment near the old Spitalfields Market.

## Changes in distribution pattern

What is clear from my studies is that in Britain and Ireland *Sisymbrium irio* is a plant of fluctuating fortunes in range and numbers. There was a marked increase in its distribution between 1801 and 1950 which levelled off in the second half of the twentieth century. From its earliest discovery in Britain it has been a plant of the streets though Horwood and Noel (1933) give it the rather grander epithet, 'viatical'. In the *Handbook of the Yemen flora* it is described as a plant of the villages and the fields but mostly of the villages (Wood 1997). Marren (1999) calls it 'the original urban wild flower' but it has also occurred in a variety of other habitats including waste places, old walls, mills and railway lines.

In the second half of the nineteenth century London-rocket was to be found in a number of ports on ballast hills but as the use of ballast declined and the hills became overgrown, were landscaped or built on that habitat was lost. In the early twentieth century the association of alien species with wool waste or shoddy became apparent (Hayward and Druce 1919). By 1960, 529 such species had been identified (Lousley 1961). *Sisymbrium irio* was one of these, associated with the use of wool shoddy as a fertilizer, particularly on market garden crops. Wool shoddy was still being used on the Yorkshire rhubarb crop as recently as 2004 (Herbert 2004) but according to Geoffrey Wilmore (pers. comm. 2006) London-rocket has not been seen in its v-c. 63 South-West Yorkshire sites since about 2000. At Blackmoor Fruit Farm (v-c. 12 North Hampshire) it was not seen after the 1970s (Gordon Hanson, pers. comm. 2006). In contrast, it was still found on Priestley's Farm, Flitwick (v-c. 30 Bedfordshire) in twenty-one of the years after 1982 when shoddy use ceased. Despite its continuing success at the last site it seems unlikely that the use of wool shoddy will account for more records of London-rocket in the near future.

Palmer (1983) speculated whether the appearance of *Sisymbrium irio* as a street weed in Hextable (v-c. 16 West Kent) in 1983 owed its origin to the use of shoddy on nearby fields during 1948–1950. Similarly, Bill Thompson (pers. comm. 2005) wondered whether its appearance in a car park in Evesham (v-c. 37 Worcestershire) in 2000 might have been connected with the use of shoddy in nearby market gardens in the 1950s. It is in car parks, streets and waste places where it appears currently to be most successful: in inner London, Taunton, Evesham, Oxford and still lingering in inner Dublin (Swindells 2006).

There appears to be no place in the British Isles where *Sisymbrium irio* has been found continuously since its first discovery until the present day, certainly the published records and herbarium data do not provide the information to claim this. On the other hand it has clearly survived for long periods in a few places: notably in London close to the City, in Oxford, in Berwick-upon-Tweed, and in Dublin. Table 1 lists the seven 10-km squares in which *Sisymbrium irio* has been recorded in three or more fifty-year date periods.

TABLE 1. 10-km squares with the longest occupancy by *Sisymbrium irio*.

| 10-km square | Locations | No. of 50-year date periods | The 50-year periods |
|---|---|---|---|
| TQ38 | The City & east London<br>(v-c. 21: Middlesex) | 6 | 1651–1700<br>1701–1750<br>1751–1800<br>1801–1850<br>1901–1950<br>1951–2000 |
| O13 | Dublin<br>(v-c. H21: Co. Dublin) | 5 | 1701–1750<br>1801–1850<br>1851–1900<br>1901–1950<br>1951–2000 |
| SP50 | Oxford<br>(v-c. 23: Oxfordshire) | 5 | 1751–1800<br>1801–1850<br>1851–1900<br>1901–1950<br>1951–2000 |
| TQ37 | Nr Blackheath<br>(v-c. 16: West Kent)<br>Dulwich & Lambeth<br>(v-c. 17: Surrey)<br>Isle of Dogs<br>(v-c. 21: Middlesex) | 5 | 1651–1700<br>1701–1750<br>1751–1800<br>1801–1850<br>1951–2000 |
| NU05 | Berwick-upon-Tweed<br>(v-c. 68: Cheviot) | 4 | 1651–1700<br>1751–1800<br>1801–1850<br>1901–1951 |
| TQ27 | Battersea<br>(v-c. 17: Surrey)<br>Kensington & Chelsea<br>(v-c. 21: Middlesex) | 4 | 1651–1700<br>1801–1850<br>1851–1900<br>1951–2000 |
| O14 | Swords<br>(v-c. H21: Co. Dublin) | 3 | 1851–1900<br>1901–1950<br>1951–2000 |

If the statement 'waste places about London' of De Crespigny (1877) could be relied upon then it would provide a record for the second half of the nineteenth century for TQ37 or TQ38 or both; then there might be one 10-km square in which *Sisymbrium irio* was found in all seven of the fifty-year periods. However, in the light of the 1869 comment of Trimen and Dyer that they had not seen a specimen collected during the previous thirty-seven years and the finding by this author of a doubtfully identified specimen from De Crespigny's herbarium mentioned already, it seems unwise to regard his statement as anything more than a generalization copied from earlier writers. There must be a similar question about the record in Ray (1724: 298), not about Ray's

competence as a botanist but arising from the fact that this was the third edition of his *Synopsis methodica Stirpium Britannicarum* . . . and published nineteen years after his death. The third edition was prepared by J. J. Dillenius and worked on assiduously by him according to Stearn (1973) but apart from the addition of page numbers to the references there is no difference in the entry for *Sisymbrium irio* from that of the 1690 edition. Was it *still* present at Berwick-upon-Tweed?

There are gaps in the records, so was *Sisymbrium irio* still present but unrecorded? In London it was first observed in Whitechapel before 1656 *and* it was present in Whitechapel in 2006 no more than a quarter of a mile from where it was first seen. One could imagine that botanists in the nineteenth century might shrink from investigating the streets and alleyways of London's East End which could have a bearing on the lack of records.

Is London-rocket a species which requires continuous reintroduction? Certainly Lousley (Fitter and Lousley 1953) thought that its presence just east of the City of London from 1945 was 'unlikely to be a survivor from the earlier ones — it probably found its way to London afresh with some cargo which passed through the docks'. Alternatively, were its seeds dormant awaiting the right conditions for germination? When conditions are right it can appear in profusion as a number of the historical records show but within two or three years its numbers can dwindle to single figures.

## Is London-rocket a native or an alien?

For many years there was some doubt about whether London-rocket was a native or an introduced (or alien) plant. You may ask, does it matter? Well, it does to government and agencies interested in nature conservation as they are almost exclusively concerned with native taxa. For modern botanists knowledge of the origin of a species provides a way of understanding more about its likely ecology.

A native plant is one that has been around for a long time, preferably with some fossil evidence; is found in a distinct habitat or group of habitats and is usually found in an identifiable plant community within the National Vegetation Classification. Alien or introduced plants are of two kinds: archaeophytes and neophytes, literally old and new plants — a bit like the sociological distinction between old and new money! An archaeophyte is one which has been around longer than anyone can remember, certainly since before 1500, but for which there is no fossil record; a neophyte is a more recent arrival (Preston et al. 2002). Pearman (2002) regards London-rocket as a neophyte and that is my conclusion. I've already mentioned its presence on ballast hills and its association with wool shoddy, both pointing to foreign origin, and Fitter and Lousley's (1953) comment about its rearrival via the docks.

## The worldwide distribution of *Sisymbrium irio*

If London-rocket is not a native in Britain or Ireland, where did it come from? Rich (1991) describes *Sisymbrium irio* as probably native from southern Europe and North Africa to India but introduced widely elsewhere. Dunn (1905) thought that 'its abundance in Afghanistan and parts of Northern India suggests that this region may be its home' though he noted that nowhere within its distributional range were 'its habitats given as obviously natural ones'. Tutin et al. (1993) state that it is native in southern Europe and widely naturalized elsewhere, northwards to Sweden and the Baltic States and eastwards to Ukraine and Russia. They include all the major Mediterranean islands from the Balearics to Cyprus in its distribution.

My research in national and regional floras (Swindells 2006) shows that in North Africa it is found from the Canaries to Egypt. It also occurs in

Ethiopia/Eritrea and maybe elsewhere in tropical Africa. In the Middle East and into Asia it occurs in Syria, Lebanon, Israel/Palestine, Jordan, the Arabian Peninsula, Iraq, Iran, the Caucasus, Pakistan, Afghanistan and Turkmenistan. South and east of this swathe of Asia it has been recorded from India, Nepal, Kashmir, Tajikistan and Uzbekistan, as well as Inner Mongolia, Xinjiang and Taiwan.

In the New World, London-rocket has been introduced to North and South America, and to Australasia; in 1963 it reached Hawai'i. It is often abundant in the south-western United States and Mexico but sporadic elsewhere in North America. In South America it has been found in all but one of the provinces of Argentina and also in Chile and Bolivia. In Australia it is in all the mainland states.

## Does London-rocket deserve a conservation status?

London-rocket was included in the first edition of the *Red Data Book* for vascular plants (Perring and Farrell 1977) because it was known then from fewer than fifteen 10-km squares but it was excluded from the third edition as a certain or almost certain introduction (Wigginton 1999).

In London, however, it has been identified as a plant of cultural interest and one of those species which 'provide a truly international dimension to the capital's flora and paint a vivid picture of the mixed cultural heritage of our city' (Bevan 2001). In Tower Hamlets it is the subject of a Species Action Plan (Swindells 2004) within the London Borough's Local Biodiversity Action Plan.

London-rocket may not be native but it is still a rare plant in Britain and Ireland and, to quote Peter Marren (1999) again, 'I would be as sad to lose *Sisymbrium irio* at the Tower of London as to lose an orchid in a meadow. It may not be a link with the Ice Age, but it is a souvenir of "1666 and all that", which has gathered to it a fair amount of history and folklore.'

## So what is the future for *Sisymbrium irio*?

Currently London-rocket is surviving best in urban locations, as a street weed and on walls, but urban locations are notoriously precarious for plants which have to find cracks in paving and walls and 'the dirt that collects in any odd corner' (Ingrouille 1995). 'They face physical disturbance, pollution and the difficulty of colonizing sites isolated by the desert of concrete, brick and tarmac' (Ingrouille 1995). Here, they also face hotter summers and milder winters.

Bevan (2001) wrote in *The London Biodiversity Action Plan* of the 'heat island effect' whereby built-up inner London experiences higher temperatures than outer London which 'brings the urban climate closer to the Mediterranean, allowing such plants as London Rocket . . . and many other warmth-demanding species to thrive'. Burton (1983) has suggested that its 'seed production is assisted by the city's summer heat' and this could account for its recent spread in inner London. Burton claimed that he did not know 'if it was in a period of warmer climate that it became established in a much smaller London' after the Great Fire. It probably was as the Booty Meteorological Information Source website (2006) reports hot summers in 1666, 1667 and 1669. The same website reports significantly warm summers in the years since 1990 which could account for the earlier flowering of *Sisymbrium irio* that I have observed in east London where its main flowering period is early April to mid June, rather than June to August as stated by Clapham, Tutin and Moore (1987).

Warmer climatic conditions seem to favour London-rocket but over-zealous tidying and the weedkilling of pavement edges are threats to it in some of its urban sites. It will be interesting to see whether it survives the makeovers of Trinity Square Gardens near the Tower, the churchyard of St John at Hackney and the Manchester Road frontage of George Green School on the Isle of Dogs.

## Conclusion

Throughout this address you may have recognized the names of several former presidents of the LNHS whose writings I have quoted or referred to (Ted Bangerter, David Bevan, Rodney Burton, Richard Fitter and Ted Lousley). One of them, Ted Bangerter, writing with Barbara Welch (Bangerter and Welch 1952) said that 'London Rocket is a plant that never fails to rouse the interest of London botanists'. You may pass your own judgement on that remark but I hope you will agree that it is a plant with an interesting story.

Near to the beginning of my address I quoted Robert Morison's reference to the abundance of London-rocket among the ruins of the burned out City of London in 1666. What I did *not* quote and will do now is the English translation, by another former president of this society, David McClintock, of Morison's Latin explanation of the plant's appearance in such quantity:

> 'In fact I believe that these hot bitter plants with four petals and pods were produced spontaneously without seed by the ashes of the fires mixed with salt and lime.' (McClintock 1966).

I would remind you that Robert Morison was the first Professor of Botany at Oxford. Botanical science has advanced a lot since then but there is still much to learn even about a straggly, unstriking plant like London-rocket *Sisymbrium irio.*

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# Book review

***The Isles of Scilly.*** Rosemary Parslow. New Naturalist No. 103, Collins, London. 2007. 450 pp. Softback, £25, ISBN 978 0 00 220151 3; hardback, £45, ISBN 978 0 00 220150 6.

We have had to wait a long while for a volume on the Isles of Scilly to appear in the New Naturalist series, and perhaps you may be asking why. I believe the answer is that until now there has been no one qualified enough to write it and maintain the high standard required by the series. There have been a number of eminent naturalists over the decades who have visited Scilly and who have published the results of their studies in scientific journals, for instance W. S. Bristowe on the spiders, or as a worthy book, like J. E. Lousley on the flora; and there have also been several bird books, and in recent decades, regular bird reports, the more recent incorporating wider natural history subjects.

However, now this volume is published, what can we say about it. Firstly, Rosemary Parslow's credentials are indisputable: she is a first-rate marine biologist and ornithologist, she is a former professional conservationist, and for the past twenty years she has been vice-county recorder for the Isles of Scilly for the Botanical Society of the British Isles. Whilst working in a marine section of the Zoology Department at the Natural History Museum early in her career she was an active member of the London Natural History Society.

The book itself — well, within a few weeks of it appearing in early August, I had been told by a number of acquaintances that they had bought a copy and that it was excellent, both in coverage and readability. There is no doubt that the author has done a first-class job in covering the wide range of topics in a masterly and readable way and has, above all, shown great feeling for the islands. The choice of over 200 photographs, almost all in colour and mainly by the author, excellently fits the text, and to those of us who know Scilly, they bring back such happy memories.

The Introduction sets the scene by briefly describing the islands, their history, their climate, and the uniqueness of the fauna and flora. Then we move on to the geology and early history, followed by the influence of people on the islands. This is followed by a chapter on naturalists and natural history. Then the islands themselves — St Mary's, the largest of the five inhabited islands, and the four inhabited off-islands, and next the uninhabited islands — that is, in most cases, those islands that normally carry vegetation above high-tide mark and have a natural history interest. The marine environment and the coast cover two chapters, then grassland and heathland, woodland and wetland, bulb-fields and arable plants and gardens. The fauna is covered in the following chapters — insects and other terrestrial invertebrates, mammals, reptiles and amphibians, and then birds. Lastly, the future, with the consequences of predicted sea-level rise (Hugh Town, St Mary's is particularly vulnerable and has been flooded in the past), tourism and changes in farming practice. But, however changes are brought about, every endeavour must be made to ensure the islands do not lose their wonderful natural wealth that makes Scilly so special.

Finally, an appendix on vegetation communities, a topic currently engaging much of the author's time.

To sum up: for the naturalist, whether already familiar with the islands, or planning a visit for the first time, or for the complete novice — buy this book; you won't be disappointed.

K. H. Hyatt

Too late for review in this issue, we have received New Naturalist No. 104 *A history of ornithology* by Peter Bircham. Ed.

# Hare's-foot clover in Kensington Gardens — a new central London site

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A vigorous patch of *Trifolium arvense* hare's-foot clover was noted in Kensington Gardens during August 2007. It was on barish sandy soil in a grassy area between The Temple and Serpentine bridge, beside a short-cut path. The plants formed a strip about three metres long and twenty-five centimetres wide — see overleaf. The strip seemed to follow a particularly favourable narrow substratum of this sandy soil (on bare ground here the orientation of strata is clear). The grid reference is TQ26760, 80156.

Although the elongated silky heads of this attractive plant are very distinctive, its pale pinkish flowers and small narrow leaflets make it inconspicuous and easily overlooked. Also, it is not immediately recognizable as a clover.

Owing to its restricted habitat requirements it is rarely found within Central London. In Kent (1975) a 1965 record for Brompton Cemetery is published but no subsequent find has been reported there. In 1992 David McClintock found it in Buckingham Palace garden 'Near south end of Lake' and it was still present during the 1995–8 natural history survey (McClintock and Wiltshire 1999: 35) — specifically a small colony in sward between the lake and the Mound in 1995 (Rodney Burton, pers. comm.).

## Acknowledgements

I am grateful to Nigel Reeve for providing the grid reference for the site, and to Rodney Burton for details from his archive.

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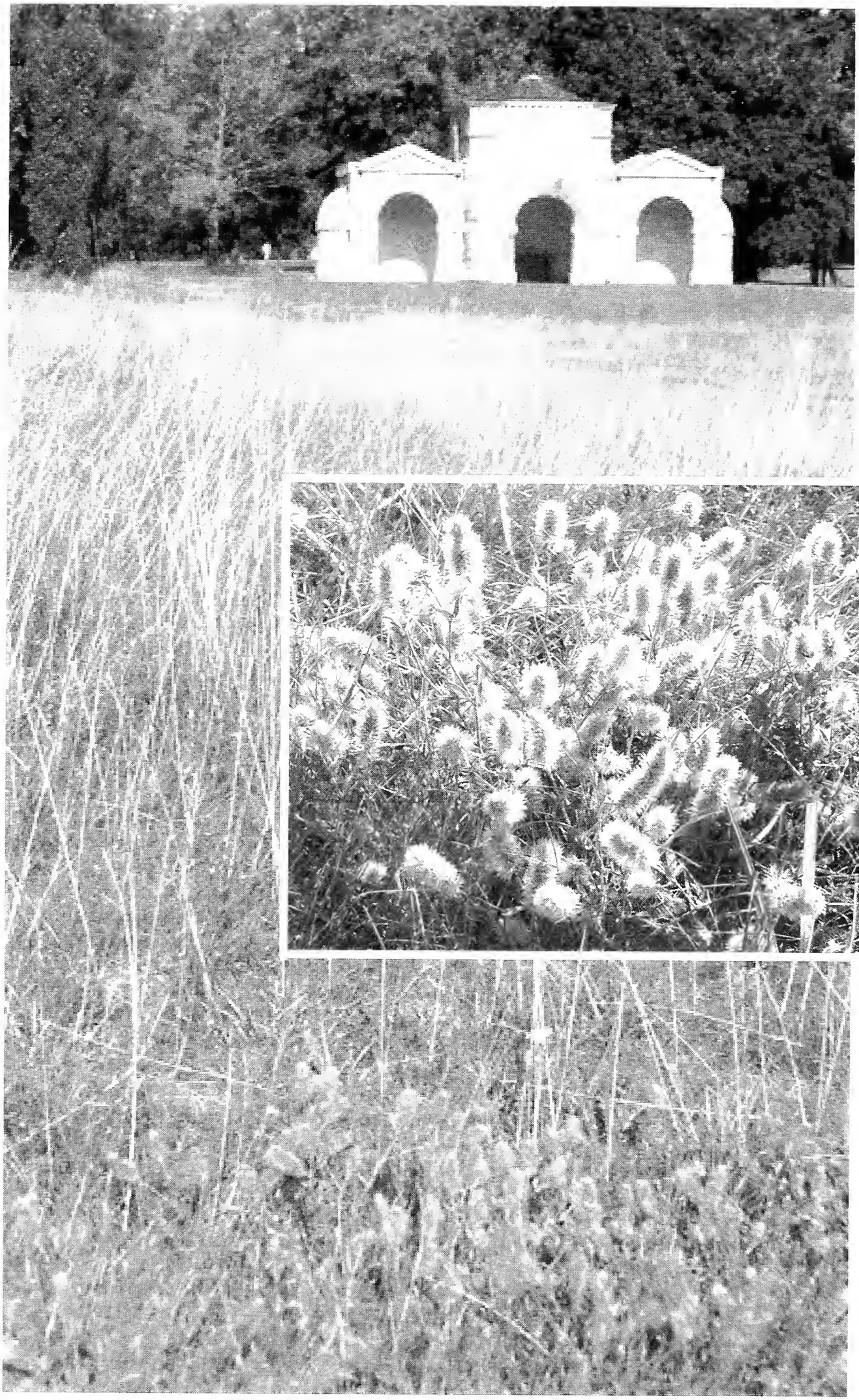

# Survey of mistletoe *Viscum album platyspermum* Kell. at Hampton Court Palace

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## Summary

This paper is based on a report by the Richmond upon Thames Mistletoe Species Action Plan Group. It is the result of surveys of mistlestoe *Viscum album platyspermum* growing on hybrid limes *Tilia* × *europaea* 'Koningslinde' in the East Front Garden of Hampton Court Palace in 2004 and 2006. From no mistletoe in 1994, the East Front Canal Avenue had almost half its limes bearing growths by 2006. It is shown that the mistletoe has appeared solely through the action of birds.

## Introduction

In 2004 and 2006, surveys were made of mistletoe *Viscum album platyspermum* Kell. growing on the East Front Canal Avenue of hybrid limes *Tilia* × *europaea* 'Koningslinde' in the East Front Garden of Hampton Court Palace.

The surveys have monitored the spread of mistletoe by natural causes to the avenue of 199 trees planted in 1987. The surveys form part of the Species Action Plan for mistletoe in the London Borough of Richmond upon Thames. The 2004 survey was undertaken by the author. Members of the Action Plan Group for mistletoe made the survey in 2006.

Mistletoe has populated many of the lime trees in the East Front Canal Avenue. The number of trees with mistletoe growths was 75 in 2004 and 94 in 2006, an increase of 25 per cent. Estimates of the number of trees with mistletoe in earlier years have been made from the apparent age of mistletoe growths in the survey years. These estimates indicate that the rate of increase in the number of trees with mistletoe has averaged just over eleven new host trees per year since 1998.

The number of growths of mistletoe on the host trees was 162 in 2004 and 249 in 2006, an increase of 54 per cent. The average number of growths per host tree increased from 2.16 in 2004 to 2.65 in 2006, an increase of 23 per cent. Taking 1994 as year zero, the average rate of increase in growths up to 2006 was nearly 21 new growths per year.

As the age of the oldest growth apparent on host trees increased, so did the number of growths. This was true of growths of from one to eight years old. Above that age records were too few to show a reliable trend.

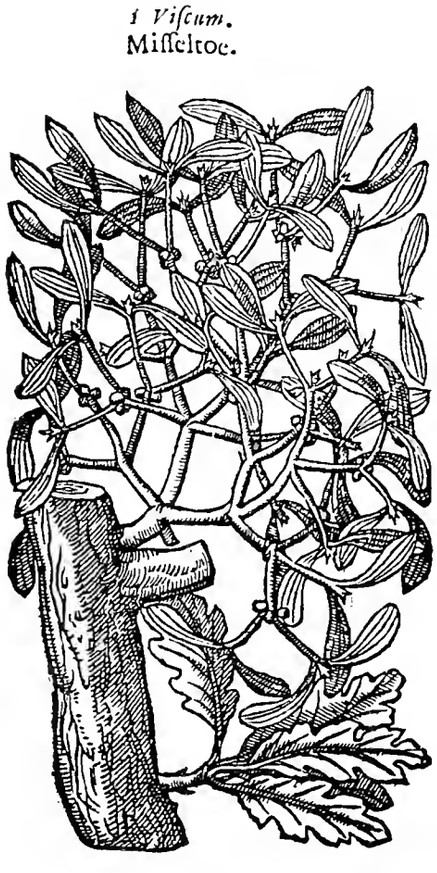
The mistletoe on the East Front Canal Avenue was seen to be abundant in 2004. Evidently, it is continuing to populate more trees and to produce more growths per tree. It will be interesting to monitor this in future years. If comparable survey results become available from other places it will be even more interesting. Meanwhile, these findings about mistletoe must stand on their own.

## Objectives

A Species Action Plan (SAP) has been prepared for mistletoe *Viscum album* L. as part of the Biodiversity Action Plan (BAP) for the London Borough of Richmond upon Thames.

Richmond's BAP was formally launched by Sir David Attenborough on 17 June 2005. The Plan describes the historical, biological and constitutional background of biodiversity and actions to enhance it (Williams 2005). The Plan presents five habitat plans and six species plans, including that for mistletoe.

Primary actions within Richmond's Plan for mistletoe are to identify sites where its growth can be readily and regularly monitored, survey such sites and publish the results. In doing so, the general aim is to promote awareness, appreciation and conservation of mistletoe within the Borough and more widely. The survey reported here meets part of the requirements of the Richmond Mistletoe Action Plan.




*Gerarde, John*
*The Herball*
*London, 1633*
*page 1350 Viscum Misseltoe*

FIGURE 1. An early illustration of mistletoe from Gerarde's *Herball*, 1633.

## Background

In Britain, mistletoe grows best in open landscapes such as gardens, orchards and parklands where Man has put his hand to Nature. Bushy Park, the gardens of Hampton Court Palace and its surrounding estate known as Home Park support many growths of mistletoe. They are some of the best to be seen anywhere in London. In other boroughs mistletoe is scarce. Because of this varied distribution, mistletoe is included in the Biodiversity Action Plans for Richmond and London (Briggs 2004).

The profuse growth of mistletoe in Richmond was first formally recorded for a survey instigated by Plantlife and the Botanical Society of the British Isles (Briggs 1999). Every tree in Bushy Park, Home Park and the gardens of Hampton Court Palace was surveyed for mistletoe growths. The results were plotted for individual trees. They showed that many of the hawthorn *Crataegus* spp. trees and hybrid lime *Tilia* × *europaea* trees in Bushy Park supported growths, as did the limes in the great avenues of Home Park and some of the non-native trees around the Palace (see also Appendix A). The lime avenues of Home Park provide one of the few remaining examples of large-scale Baroque plantings, having been commissioned by King William when he and Queen Mary lived at Hampton Court Palace from about 1690. When these *Tilia* × *europaea* 'Koningslinde' hybrid limes first supported mistletoe is not known. The earliest reference found so far is

in a pamphlet published in 1720 by Sir John Colbatch, on 'The Treatment of Epilepsy by Mistletoe', who procured his mistletoe from the lime trees at Hampton Court (Grieve 1984: 548). Cures based on mistletoe have been described for centuries past, for instance by the herbalist Culpeper (1652). The Roman Pliny, writing in AD 77, first described how the Druids collected, used and attributed magic powers to mistletoe (Opie and Tatum 1989: 253–256).

The stories about mistletoe, dating from these and other early descriptions (Figure 1), have led to folk law and superstitions based on its mysterious properties and romantic associations. These still catch the imagination of the public and can be the source of media comment on St Valentine's Day, on the first of December — 'Mistletoe Day' — and at Christmas time when the ancient Minster of York still decorates its high altar with mistletoe.

Because mistletoe is rarely found in most places but is occasionally abundant, it is a clear example of the need for active conservation. Public fascination with mistletoe offers a way to promote biodiversity in general.

## Mistletoe *Viscum album* L.

Worldwide, there are some 1,300 species of mistletoe. Amongst these is *Viscum album* L., now divided into three subspecies, of which *V. a. platyspermum* Kell. is our native form (Briggs 2003). It is to be found growing on deciduous trees throughout Europe: the further south, the more species it populates; the further north, the fewer the host species and the rarer it becomes. In Britain, *V. a. platyspermum* occurs in the south, frequently on the apple orchards of Gloucestershire and neighbouring counties, but becomes less frequent north of the Midlands and Norfolk. It is absent from Scotland, except where deliberately introduced and cared for.

Mistletoe is a hemiparasite, drawing only fluids from its host tree, while its evergreen leaves photosynthesize. Except where there are large growths on a small tree, typically a fruit tree, the biomass of the mistletoe and its need for fluids is unlikely to have much effect on the host. However, because the mistletoe growths on even the oldest and largest trees do appear to stop growing beyond a certain size, it might be that there is a natural maximum which cannot be exceeded because the mistletoe is taking all the available fluid from its host (Figure 2).

FIGURE 2. Exceptionally abundant growth of mistletoe on a lime tree (probably hybrid), Claremont Lake, near Esher, Surrey, March 2000.
*Photo: Tyrrell Marris*

Mistletoe is spread naturally by birds: the sole vectors. In particular, the mistle thrush *Turdus viscivorus* eats the berries and the defecated seed sticks to the branch where the bird has perched. Blackcaps *Sylvia atricapilla* also like the berries and, with their beaks, wipe off the seed with the remains of the sticky, 'Viscum' pulp onto the host tree. Other birds also spread the seeds in the same ways — if they can get at them — for mistle thrushes jealously guard their food supplies (Snow and Snow 1988: 36, 127).

Once deposited, by beak or by anus, the seed germinates and a small shoot bends over to penetrate the bark of the host tree. Having done so, a permanent bond is made and the mistletoe emerges as a tiny twig. Two leaves then grow, followed by two on two, and so on. The age of the mistletoe growth, since it first appeared, can therefore be calculated from the number of visible divisions.

Mistletoe plants are dioecious, that is of one sex, bearing either male or female flowers. They blossom in early spring, the clusters of tiny, vivid yellow female flowers producing two or three white 'album' berries in the crotch between each stem division during the autumn (Figure 3). Hence, berried mistletoe branches can be harvested as a crop to be sold at Christmas, supplementing income from apple or other orchards (Figure 4).

FIGURE 3. Female flowers and white berries of mistletoe, Claremont Lake, near Esher, Surrey, March 2000. *Photo: Tyrrell Marris*


FIGURE 4. Mistletoe is a cash crop. The customary mistletoe auction is held in early December at Tenbury Wells, Worcestershire. Bunches are sold by weight.

*Photo: Jonathan Briggs*

## The survey

### Choice of site — East Front Canal Avenue

From autumn 1986 to spring 1987 a new avenue of hybrid limes *Tilia* × *europaea* 'Koningslinde' was planted to replace the dilapidated avenue growing beside the canal in the East Front Gardens of Hampton Court Palace. The 199 new trees were then ten to twelve years old. Each tree was numbered with a tag about two metres above ground level. This is a single-rowed, two-sided avenue. The rows are set *c.*10 metres (30 feet) apart and the trees spaced at 8 metres (25 feet) intervals.

Chance observation in 1997 revealed that mistletoe was already growing on a few of the trees. It was seen to be on more trees in following years. The site was evidently well suited to making a formal survey of the spread of mistletoe by natural causes in a newly created habitat. There had been no deliberate attempt to seed the trees with mistletoe: it had come by the action of birds feeding from the substantial growths on the ancient avenues of trees radiating out from the Palace into Home Park. Growths on many of the limes and hawthorns in nearby Bushy Park could have been another source of berries.

Other reasons for the choice of this site were ease of access, accurate identification of the individually numbered trees of the avenue, security from vandalism, theft or accidental damage and well-informed co-operation from the Historic Royal Palaces, who are responsible for the site.

### Timing and method

Mistletoe is most easily surveyed early in the year, well before host trees are in leaf. The first formal survey in the East Front Gardens was made on the 31 March 2004. A second survey was conducted between 16 March and 6 April 2006.

For each of the 199 trees in the East Front Canal Avenue a record was made of whether or not mistletoe growths were visible. If visible the numbers of 'single' and 'multiple' growths were recorded: 'single' being defined as a growth emerging on a single stem and 'multiple' as growths emerging from a group of stems growing close together (within about 20 cm of each other) that could be assumed to originate from the same seed. In practice, the distinction between multiple and single was found to be increasingly difficult to distinguish as growths became larger with increasing age. That was especially true of growths found high on the host tree or near to each other. This report does not comment on the single/multiple data.

A record was also made of the estimated age in years of the oldest growth of mistletoe on the host tree, defined by counting the largest number of forks or divisions visible on any growth. This estimate makes no allowance for the time taken by the seed to germinate, penetrate the bark of its host and emerge as a visible growth — all of which might take about two years. The recorded age is therefore the apparent age, which is somewhat less than the actual number of years since the seed first inoculated the branch of the host. For more comments on the survey method see Appendix B.

### Accuracy

In general, the 2004 and 2006 survey results were mutually supportive. Where a tree was seen with mistletoe in the earlier survey the growth or growths were again seen in 2006, and two years older. Likewise, in 2004, mistletoe growths were correspondingly fewer in number on existing host trees, and not observed where growths of only one or two years old were apparent in 2006.

There were twelve particular exceptions to this general rule: six where the sole surveyor had missed young growths in 2004; two where the 2004 record was obviously wrong through inadvertent error; two where losses of mistletoe growths occurred between 2004 and 2006; and two for which the age of the oldest growth was miscalculated (Appendices C and D).

The few discrepancies between the survey findings, and the certainty of the revisions or corrections made retrospectively to the 2004 record, give confidence that the results as amended are robust.

## Mistletoe before 2004

Estimates have been made of the number of trees with mistletoe growths in the years before 2004. They are based on the age of the oldest growths apparent in 2006 and 2004. For example, where the apparent age of the oldest growth on a tree was ten years in 2006 and eight years in 2004, it can be assumed that mistletoe growths were to be seen on the tree in 2002 (aged six years); in 2000 (aged four years); in 1998 (aged two years) but not visible in 1996.

In fact, one mistletoe growth was recorded as old enough (nine years) in 2004 and confirmed by the record in 2006 to estimate that the host tree already bore mistletoe in 1996. None was older than this. Including this tree, three had mistletoe growths old enough to have been apparent in 1998, 20 trees had growths that would have been apparent in 2000, and 56 trees with growths in 2002.

Those estimates agree with casual observations in February 1997 when mistletoe was first discovered (by Elisabeth and Tyrrell Marris) on trees in the East Front Canal Avenue. From memory, about three trees were seen to have mistletoe growths then two or perhaps three years old. This gives informal confirmation of the one to three trees, estimated above, to have had growths in 1996 to 1998.

Both the casual observations of 1997 and the estimates made from the formal records of 2006 and 2004 suggest that no mistletoe would have been apparent in 1994, but that one or two trees might have borne growths in 1995. The year 1994 can certainly be taken as the starting year. (This assumes that no growths came in 1994 or earlier but did not survive. Appendix D supports this assumption, showing that the rate of loss between 2004 and 2006 was insignificant.)

It was the surprise discovery in 1997, just before a guided 'Mistletoe Walk', that revealed how mistletoe had first colonized the East Front Canal Avenue trees — unseen — within seven or eight years of planting when the limes were about nineteen or twenty years old. It was on guided walks in subsequent years that the obvious increase in growths showed how mistletoe was spreading. The formal surveys of 2004 and 2006 now quantify that rate of increase.

## Findings of the surveys

### Trees with mistletoe

Of the 199 trees in the East Front Canal Avenue, 75 had mistletoe growths in 2004 whilst 94 were seen to have growths in 2006, an increase of 25 per cent. Almost half the limes in the avenue were growing mistletoe by 2006 (Table 1).

TABLE 1. Percentage of trees with mistletoe growths (n=199).

| Year | Number of trees | Percentage |
|---|---|---|
| 1994 estimated | 0 | 0 |
| 1996 estimated | 1 | 0.5 |
| 1998 estimated | 3 | 1.5 |
| 2000 estimated | 20 | 10 |
| 2002 estimated | 56 | 28 |
| 2004 actual | 75 | 38 |
| 2006 actual | 94 | 47 |

Estimates for the years before 2004 are 56 trees with mistletoe in 2002, 20 in 2000, 3 in 1998 and 1 in 1996. It may be assumed that no growths were apparent in 1994 (Figure 5). From small, early beginnings in 1996 and 1998, the rate of increase in the number of trees with mistletoe has been fairly steady since 1998, at an average of just over eleven new host trees per year. There is, as yet, no sign that the rate is decreasing because the number of hosts is approaching the maximum of 199.

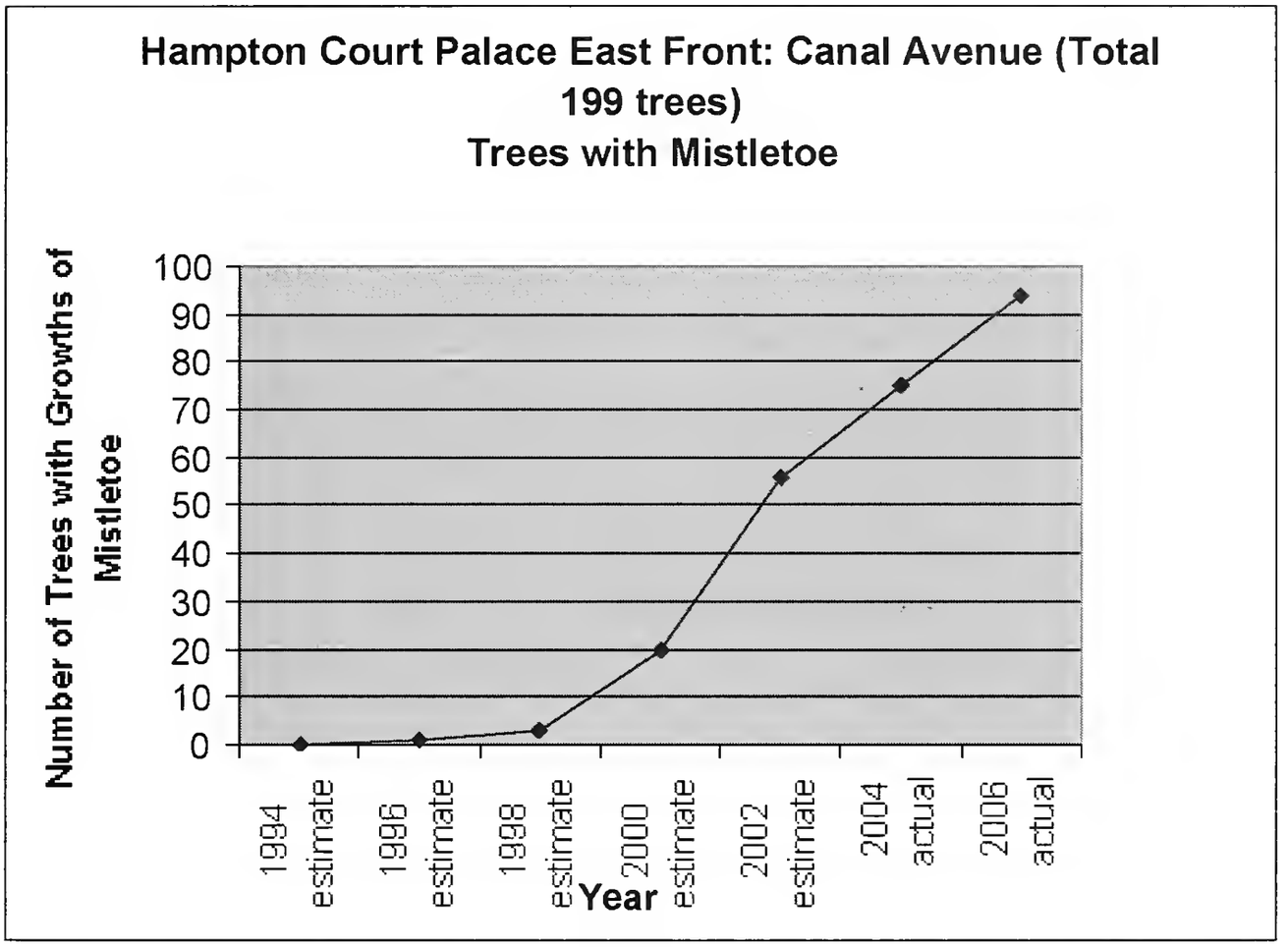



FIGURE 5. Colonization of 94 host trees by mistletoe between 1994 and 2006.

**Abundance of mistletoe growths**

Table 2 shows the number of trees observed in each survey with one growth of mistletoe, two growths, three growths etc, up to the most seen on any individual tree, which was thirteen growths. The resulting number of growths in each year is also tabled.

Most trees had just one or two growths and the number of such trees was almost exactly the same in 2004 as in 2006. But the number with three, four or five growths trebled between the two years from 7 to 21; and there was a near doubling of the number of trees with six to nine growths. Of the two exceptional trees with more than nine growths in 2004, one had a further growth in 2006 bringing its total to eleven; the other had thirteen growths in each year. Evidently, new growths were appearing on existing and new host trees.

The apparent age of the oldest growths on the trees that were new mistletoe hosts in 2006, compared with 2004, was naturally no more than two years. Most new hosts had just one growth, a few had two. It is these new hosts that were maintaining the number of one- or two-growth trees the same in each year. At the same time, many of the 2004 host trees had produced more growths. The notable increase in the number of trees with between three and nine growths accounts for the overall increase in the number of growths from 162 in 2004 to 249 in 2006, i.e. an increase of 54 per cent. Consequently, the

TABLE 2. Frequencies of trees recorded with 1–13 mistletoe growths in 2004 and 2006.

| Growths per tree | Number of trees | | Number of growths | |
|---|---|---|---|---|
| | 2004 | 2006 | 2004 | 2006 |
| 1 | 46 | 47 | 46 | 47 |
| 2 | 14 | 14 | 28 | 28 |
| 3 | 4 | 12 | 12 | 36 |
| 4 | 2 | 5 | 8 | 20 |
| 5 | 1 | 4 | 5 | 20 |
| 6 | 3 | 2 | 18 | 12 |
| 7 | 2 | 4 | 14 | 28 |
| 8 | 1 | 2 | 8 | 16 |
| 9 | 0 | 2 | 0 | 18 |
| 10 | 1 | 0 | 10 | 0 |
| 11 | 0 | 1 | 0 | 11 |
| 12 | 0 | 0 | 0 | 0 |
| 13 | 1 | 1 | 13 | 13 |
| **Total** | **75** | **94** | **162** | **249** |

average number of mistletoe growths per host tree went up from 2.16 in 2004 to 2.65 in 2006, i.e. an increase of 23 per cent in growths per tree.

The number of mistletoe growths was not recorded before 2004. Taking 1994 as the starting point, the average rate of increase in growths from then until 2006 is estimated at nearly 21 new growths per year.

## Number of growths and apparent age of oldest growth

Table 3 combines the data from the two survey years, adding together records for the trees with mistletoe in 2004 (75) and 2006 (94). It shows the number of trees with different numbers of growths against the age of the

TABLE 3. 2004 and 2006 data combined.

| Age of oldest growth (years) | Number of host trees with this number of mistletoe growths (2004 and 2006 combined) | | | | | | | | | | | | | Total trees | Mean mistletoe growths per tree |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | | |
| 1 | 13 | 1 | | | | | | | | | | | | 14 | 1.1 |
| 2 | 19 | 3 | | 1 | 1 | | | | | | | | | 24 | 1.4 |
| 3 | 18 | 6 | 2 | | | | | | | | | | | 26 | 1.4 |
| 4 | 11 | 10 | 2 | 2 | 1 | | 1 | | | | | | | 27 | 2.1 |
| 5 | 16 | 3 | 3 | 2 | 2 | 1 | 2 | | | 1 | | | | 30 | 2.6 |
| 6 | 10 | 3 | 8 | | | 1 | 2 | 1 | 1 | | | | | 26 | 3.0 |
| 7 | 4 | | | 1 | | 1 | | 2 | | | 1 | | | 9 | 4.6 |
| 8 | 2 | 1 | 1 | 1 | 1 | 2 | | | 1 | | | | | 9 | 4.1 |
| 9 | | | | | | | | | | | | | 1 | 1 | 13.0 |
| 10 | | 1 | | | | | 1 | | | | | | | 2 | 4.5 |
| 11 | | | | | | | | | | | | | 1 | 1 | 13.0 |
| **Total** | **93** | **28** | **16** | **7** | **5** | **5** | **6** | **3** | **2** | **1** | **1** | **0** | **2** | **169** | |

apparently oldest growth in the tree. The final column indicates the mean number of growths per tree according to age group; that is the total number of growths on trees where the oldest growth was of that age divided by the number of trees supporting a growth of that maximum age.

Where the oldest growth was one or two years (38 records) most trees had only one growth (32 records). At three or four years old (53 records) little more than half the trees had one growth (29 records), almost a third had two growths (16 records) and the rest had up to seven growths (8 records). As the apparent age of the oldest growth increased, the number of growths increased fairly steadily from an average of 1.1 growths per tree where the oldest was one year, to 4.1 growths per tree where the oldest was eight years (Figure 6). At greater ages, numbers of records were few and the average counts became erratic.

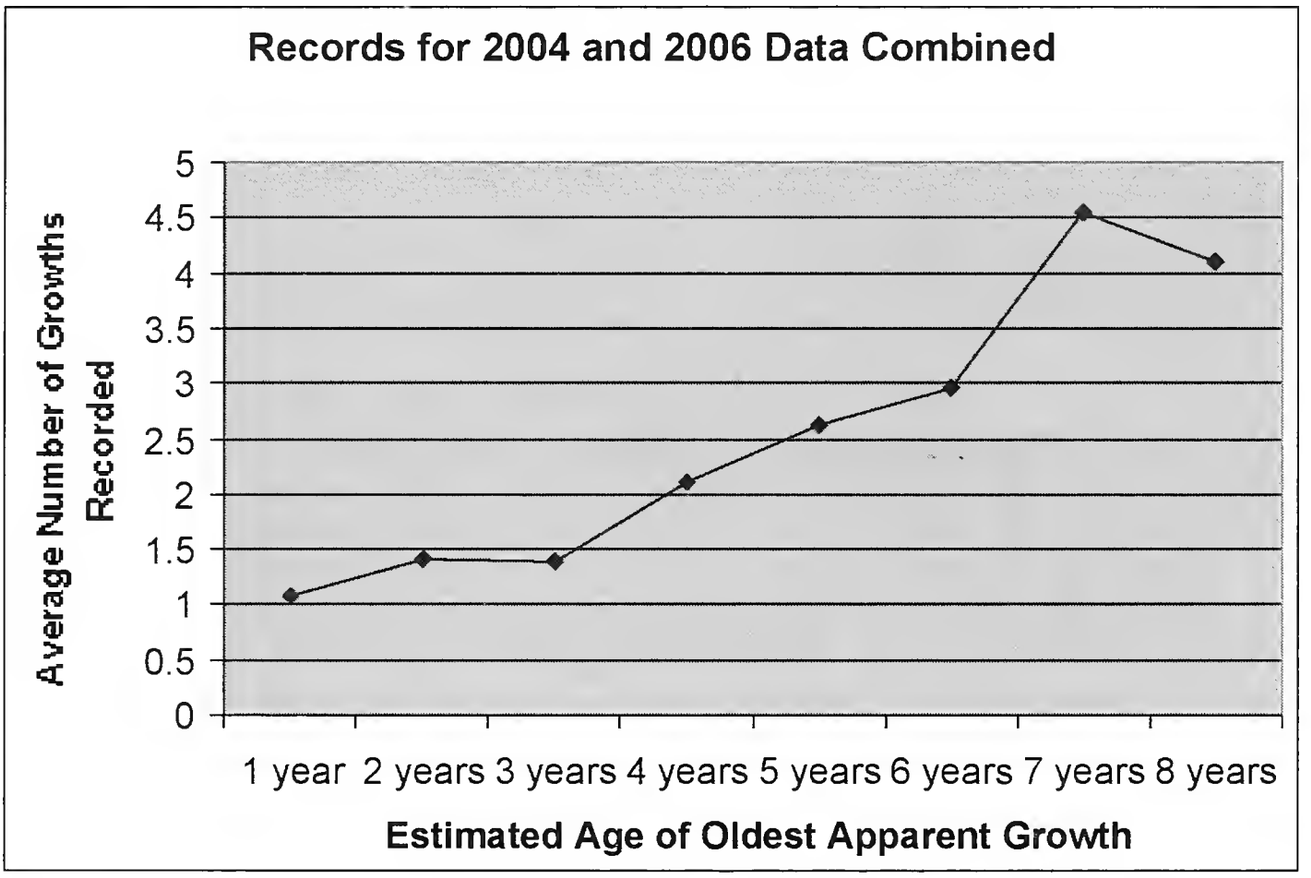



FIGURE 6. The relationship between numbers of mistletoe growths and apparent age of oldest growth on host trees.

## Conclusion

The surveys have demonstrated both the presence of mistletoe on the trees in the avenue, and the speed with which it has spread. From no mistletoe in 1994, the East Front Canal Avenue had almost half its limes bearing growths by 2006. Not only is the number of host trees increasing but also the number of growths per tree. Consequently an avenue planted in 1987, about twenty years ago, is already abundantly populated with mistletoe. There has been no man-made intervention: the mistletoe is there solely because birds have carried it there.

It will be interesting to monitor the spread of mistletoe in future years. If comparable survey results become available for other mistletoe sites it will be even more interesting. Meanwhile the findings from these surveys must stand on their own.

## Acknowledgements

The author is glad to thank Jonathan Briggs, who chairs the London Mistletoe Working Group, for sharing his exceptional knowledge of mistletoe. Charlotte Williams, former Ecology Officer with the London Borough of Richmond upon Thames, gave much

practical help and encouragement during the preparation of this report and the Mistletoe SAP for Richmond. Steve Whitbread, Richmond's Interim Ecology Officer, has also provided valuable help and scientific advice. The 2006 survey and the analysis of our findings depended entirely on the good fieldwork and advice of members of Richmond's Mistletoe SAP group, which I am privileged to chair, namely: Veronica Baker (Secretary), Ecology and Conservation Studies Society; Mark Bridger, The Royal Parks; Graham Dillamore, Historic Royal Palaces; David Ivison, Landscape Manager; and Elisabeth Marris, Ecology and Conservation Studies Society.

The Historic Royal Palaces, whose lime avenue beside the magnificence of the Palace provided our field site, deserve particular thanks for allowing us to make the survey. More generally, it is also right to acknowledge the enlightened approach of their staff to biodiversity and conservation at Hampton Court.

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## APPENDIX A

## Mistletoe on the other Avenues of Home Park

### The Kingston and Thames Ditton Avenues

These are the remains of two avenues of hybrid lime trees first planted in Home Park in the eighteenth century and now somewhat dilapidated. The northerly Kingston Avenue is aligned about north-east from Hampton Court Palace towards Kingston Parish Church. The southerly avenue is aligned south-east from the Palace towards Thames Ditton and runs through the Home Park golf course. Each is a double-rowed, two sided avenue about one kilometre long. Some of the old trees have large growths of mistletoe high up, obviously of great age. In 1995, six Kingston Avenue limes, and seven Ditton Avenue limes had mistletoe growing on them.

### The Long Water Avenue

There was formerly an avenue of trees, of similar age to the Kingston and Ditton avenues, planted two a side along the Long Water of Home Park and aligned eastwards from the Palace. It had become ragged with many gaps, stunted new trees wrongly located or of non-matching species of lime and very few of the original three-hundred-year-old trees were still standing. Between autumn 2003 and early 2004 the avenue was uprooted. In 2004 it was replaced with 544 nine-year-old 'Koningslinde' hybrid limes, planted as exactly as possible in the places where the original trees had been.

This newly planted avenue presents an opportunity to monitor the inoculation of young limes by mistletoe, and its subsequent spread. Like the limes of East Front Canal Avenue, these are easy to access, numbered and of known age. No mistletoe was observed on the trees in 2006.

**The Cross Avenue**

This avenue was planted with 1,276 'Koningslinde' limes between 1981 and 1982. It replaced an almost non-existent avenue, another part of the original majestic planting plan, running in a north/south direction across the ends of the Ditton, Long Water and Kingston Avenues. It is about two kilometres long.

In March 2004, one tree in the Cross Avenue was seen to have a single four year old growth. (This host tree is at the north end just where the Cross Avenue crosses the Kingston Avenue. It is in the inner of the two western lines of the Cross Avenue). The same growth was seen when the Cross Avenue was surveyed on 1 April 2006, by then six years old. It was nearly in flower, a multiple growth with about four shoots emerging within 20 cm of each other.

This growth would have been visible in 2002, only just emerging in 2000. So the tree had apparent mistletoe in 2002, some ten years after planting, when it was about eighteen years old. The age of the tree and the number of years after planting are similar to those for the first colonization by mistletoe of the East Front Canal Avenue. No mistletoe was visible elsewhere on the Cross Avenue in 2006, but a pair of mistle thrushes was seen that day. They were feeding under the Avenue, near the golf club. This was encouraging because mistle thrushes are our main vectors of mistletoe as they fly from tree to tree, eating and defecating the seeds.

## APPENDIX B

### Comments on the survey method

Year on year, the number of divisions on the mistletoe growths naturally increases as does the abundance of growths, both 'single' and 'multiple'. On growths up to about eight years in apparent age it is possible to see the number of divisions with precision. Above that age, especially if the growth is high on the tree or partly obscured by others, the apparent age is hard to calculate.

Now that the age of the oldest growth has been used effectively to estimate the number of host trees in years before 2004, the continued value of the oldest growth observation is doubtful. Survey effort might be better used, in future, to record the apparent age of the youngest growth. That would be both easier and of special interest when growths of only one or two years old are visible. They are the sure markers for the spread of mistletoe to new host trees. Likewise the distinction between single and multiple growths is becoming harder to make, of less value, and could be discontinued.

The sole surveyor in 2004 had made recording errors (two) and failed to see some young growths (six). Although the necessary amendments to the 2004 results are few, this shows the importance of having at least two surveyors working together so that the record is verified on site.

The last date of surveying, in 2006, was 6 April. Ten days later the limes in the avenue were already sufficiently in bud to have made surveying less easy. Obviously, surveying should be no later than early April at this site.

## APPENDIX C

### Accuracy of the surveys

The 2006 survey was made by two or three members of the SAP group working together, checking each other's observations on the site. The 2004 survey was made by a sole surveyor. The most likely error is to miss seeing small growths of mistletoe just starting to sprout. Therefore, when the 2006 surveyors saw one or two growths more than two years old of which the sole surveyor in 2004 had made no record, the 2004 data have been revised accordingly. Six such revisions have been made, increasing the number of trees and the number of growths by that amount.

There were two other trees where the 2006 surveyors saw three or more growths of which at least one was more than two years old, but not recorded in the previous survey. That indicated a recording error (rather than a visual error) in 2004 and the data were corrected.

Thus, eight revisions have been made retrospectively to the 2004 data, on the basis of the more reliable 2006 findings. As described in Appendix D, two mistletoe growths were lost between 2004 and 2006.

Another potential source of error relates to the estimated age of the oldest apparent mistletoe growth. Where growths are young or low down on the tree the apparent age is easy to calculate but where growths are high up, dense and large the estimate is not always precise. Two of the recorded 2004 ages were subsequently revised to agree with 2006 records, but by no more than one or two years.

With the twelve exceptions described above it was found that the 2006 and 2004 surveys agreed well with each other. Where growths were recorded in 2004 correspondingly older growths were seen in 2006. Likewise, where one or two year old growths were seen in 2006, the tree either had no growths in 2004 if it was a new host or fewer growths in 2004 if mistletoe was already on the tree by then. This gives confidence that the 2006 findings, and the 2004 findings as revised, do present an accurate set of data; and that the estimates for the occurrence of mistletoe on trees in earlier years are robust.

## APPENDIX D

### Lost mistletoe

There was evidence of loss of mistletoe growths from two trees between 2004 and 2006.

First, there was one tree on which a single mistletoe growth, apparently five years old in 2004, was not seen in 2006.

Second, a tree with three growths in 2004 of which the oldest was apparently three years old had lost that growth by 2006. Although the tree still had the same number of growths in 2006, the youngest was just one year old and therefore absent in 2004, while the oldest was only four years old rather than five. Evidently the three-year-old growth of 2004 had been lost.

From both these trees either the 2004 growth had been broken off or, perhaps, the whole branch on which it had sprouted. That is a loss of two growths out of the total of 162 growths in 2004, just over 1 per cent in two years; or a loss of one mistletoe-bearing tree out of a total of 199 trees, a proportion of 0.5 per cent in two years. The spread of mistletoe on other trees between the two years far exceeded those small losses.

# Ten years of bat monitoring at the WWT London Wetland Centre — a comparison with National Bat Monitoring Programme trends for Greater London

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## Abstract

Regular monthly bat surveys were carried out at the Wildfowl and Wetland Trust's London Wetland Centre between 1997 and 2006 using consistent methodology. The data have been analysed to produce trends in species activity levels, which can be taken as an index of changes in bat populations. The site trends have been compared with Greater London trends from the National Bat Monitoring Programme (NBMP), which has been run by the Bat Conservation Trust since 1997. The two datasets suggest that in Greater London: common pipistrelles *Pipistrellus pipistrellus* and soprano pipistrelles *Pipistrellus pygmaeus* appear to be increasing; Daubenton's bats *Myotis daubentonii* may be declining; and noctules *Nyctalus noctula* are significantly declining. Serotines *Eptesicus serotinus* may also be declining, but the trend is less clear. Two nationally rare species, Leisler's bat *Nyctalus leisleri* and Nathusius' pipistrelle *Pipistrellus nathusii*, have been recorded in London with increasing regularity in recent years. It is recommended that regular monitoring is carried out at important bat foraging sites, and that more NBMP surveys are undertaken to give a clearer picture of how London's bat species are faring.

## Introduction

The London Wetland Centre (LWC) (OS Grid Ref. TQ228770) is managed by the Wildfowl and Wetlands Trust (WWT) and is located in Barnes about seven kilometres west-south-west of Westminster. The reserve lies one kilometre south of Hammersmith Bridge with the tidal Thames and wooded towpath forming its eastern boundary. It is also situated at the northern end of an extensive corridor of city green space, which extends three kilometres south-west from the site through the Barn Elms Playing Fields, the Beverley Brook, Barnes Common, Roehampton golf course (and Rosslyn Park RFC) and finally to the north-eastern edge of Richmond Park. Compared to the adjacent

built-up suburbia, this green space is regarded by London's bat workers as a vital 'dark' corridor along which bats can commute and feed.

Historically, the environment in Barnes in south-west London has undergone some major changes over the past two centuries. During much of the nineteenth century, Barnes was rural in character with farming, osier beds and market gardening predominantly shaping the nature of the landscape (Brown 1985, Grimwade and Hailstone 1992). However, towards the end of the century the landscape changed dramatically as housing spread across what is now south-west London. Furthermore, a string of large reservoirs was constructed (the first built at Lonsdale Road in 1837), which encompassed the northern edge of Barnes alongside the tidal River Thames. These included the Barn Elms Reservoirs, which were the largest and last to be constructed in 1897, extending over an area of fifty-one hectares (Figure 1).

FIGURE 1. The Barn Elms Reservoirs viewed towards Putney Bridge. © Thames Water (*c.*1992).

The construction of the reservoirs probably had a dramatic effect on the local wildlife at that time. Nevertheless, by the turn of the century, it was clear that the Victorians had inadvertently created artificial wetlands that were to be of great benefit to London's wildlife. Records, made by ornithologists at the reservoirs during the first half of the twentieth century, showed that they had become of prime importance for London's birds. Similarly, despite any impact the initial phase of reservoir development would have had upon the local bat population, the longer-term prospect for Barnes' bats was to be extremely beneficial. Ian Beames (1968: 38) wrote about bats in London: 'Lakes and ponds, even reservoirs, attract large swarms of insects especially in late summer. Small, and occasionally, large bats occur in some number over and around many of these waters.'

With the development of bat detectors during the post-war period, London's bat workers discovered a wide-ranging distribution of bat feeding activity across the capital. Hooper's surveys during the period 1965–1980 demonstrated the widespread occurrence of bat activity both in Barnes (e.g. pipistrelle bats on Barnes Common) and south-west London (Hooper 1981). However, it was the London Bat Project of 1985–6 which helped identify a large number of bat feeding areas across Greater London, including important local sites such as Barn Elms Reservoirs (Mickleburgh 1987). Simon Mickleburgh, who headed the project, returned in 1990. His survey that year

helped identify four species of bat: noctule *Nyctalus noctula*, serotine *Eptesicus serotinus*, pipistrelle species *Pipistrellus* sp. and Daubenton's bat *Myotis daubentonii* (Mickleburgh 1990). This survey and subsequent surveys in 1992–3 by Jan Hewlett of WWT and Colin Catto of the Bat Conservation Trust (BCT) demonstrated that impressive numbers of bats foraged over the reservoirs. Catto (1994) wrote: 'In the London context, Barn Elms is an important site — within the top 5% for the Greater London area — both for its diversity of bat species and the number of bats using the site.'

However, as had happened almost one hundred years ago, the landscape of Barn Elms was once more transformed. This time, the redundant Thames Water reservoirs were developed into WWT's new LWC 42-hectare reserve. This transformation (initiated in November 1995) would see one artificial post-industrial wetland change into a newly created wetland habitat (Figure 2). The reserve contains a diverse range of wetlands (including open-water lagoons, reedbeds, marshes and wader scrapes), which were flooded and planted from 1997 to 1999. The range of habitat diversity at LWC has already proved to be beneficial for a diverse range of wildlife. Fortunately for bats, wetlands generate an abundance of insect food, and bat surveys undertaken on the new reserve by Bill Landells of London Bat Group (LBG) during the late 1990s showed that bats continued to forage over the area even during the most intensive phase of habitat creation in 1996.

FIGURE 2. The London Wetland Centre viewed towards Richmond Park. © Berkeley Homes (2002).

This period of the site's transformation coincided with new discoveries about the pipistrelle species resident in the UK, and this was reflected in bat surveys carried out during this time. It became clear from the surveys undertaken by Bill Landells in the mid 1990s that the pipistrelle species feeding over the site were echolocating at two different frequencies (Landells 1996). It is now known that the two phonic types of pipistrelle (then collectively known as *Pipistrellus pipistrellus*) are separate species (Jones and van Parijs 1993, Barratt *et al.* 1997): common pipistrelle *Pipistrellus pipistrellus* (45kHz) and soprano pipistrelle *Pipistrellus pygmaeus* (55 kHz). However, another pipistrelle species was reported on the reserve during late September 1999. Verification work subsequently undertaken by Pete Guest (LBG) using a time expansion detector confirmed the identification of the new bat as Nathusius' pipistrelle *Pipistrellus nathusii*. Until 1997, this species was only known as a vagrant or

migrant to Great Britain. However, a few breeding colonies have since been located in the UK, although none has been located in Greater London.

The object of this paper is to demonstrate the use of a long-term monitoring bat survey at a single site with the aim of gaining knowledge about both its species diversity and trends in bat activity, and also to provide inspiration to land managers and bat workers alike to adopt bat monitoring transects on their site or local 'patch'. The site trends are compared with London-wide trends derived from data collected at randomly selected sites which have been monitored as part of BCT's National Bat Monitoring Programme (NBMP).

## Survey methods

Bat species were identified in the field through visual clues including size and foraging habits, and hearing their echolocation calls on heterodyne (tuneable) bat detectors (Stebbings 1986, Watson 1990, Yalden 1985). BatBox III detectors (BatBox Ltd) were used on all surveys throughout the study period (1997–2006). In recent years additional models were used: BatBox Duet (BatBox Ltd), Pettersson D100 (Pettersson Elektronik AB), and Mini-3 (Ultra Sound Advice). Bat detectors translate the ultrasonic echolocation calls of bats into audible frequencies, with different species having recognizable peak frequencies at which the call is loudest (Stebbings et al. 2005). When a bat was heard, the detector was tuned through a range of frequencies in order to ascertain the peak frequency of the calls (Table 1) and to determine call characteristics including tone, rhythm and repetition rate, which aid species identification (Russ 1999).

TABLE 1. Some of the call characteristics registered on bat detectors used by bat workers to determine bat species at the London Wetland Centre.

| Bat species | Bat detector peak frequency | Repetition rate (noise) |
|---|---|---|
| Noctule *Nyctalus noctula* | 19-25 kHz | Very slow (very loud) |
| Leisler's bat *Nyctalus leisleri* | 23-27 kHz | Moderately slow (loud) |
| Serotine *Eptesicus serotinus* | 28 kHz | Slow (loud) |
| Common pipistrelle *Pipistrellus pipistrellus* | 45 kHz | Fast (readily audible) |
| Soprano pipistrelle *Pipistrellus pygmaeus* | 55 kHz | Fast (readily audible) |
| Nathusius' pipistrelle *Pipistrellus nathusii* | 38 kHz | Less fast (readily audible) |
| Daubenton's bat *Myotis daubentonii* | 40 kHz | Very fast (quite quiet) |

Since 2005, time expansion detectors have been regularly used at LWC to make recordings of bat calls. A Tranquility Transect (Courtpan Design Ltd) and latterly a Pettersson D980 (Pettersson Elektronik AB) were linked to a minidisk recorder (Sony MZ-R900). Ambiguous calls were then analysed by measuring the call parameters using the BatSound program. This has enabled a more precise identification of the three 'big bat' species (defined as noctule, serotine and Leisler's bat), confirming the presence of the Leisler's bat. A few common pipistrelle passes have also been detected, which would have otherwise been 'drowned out' by the larger numbers of soprano pipistrelle passes. The time expansion system has also provided hard evidence of the presence of Nathusius' pipistrelle, although with practice this species is also reasonably easy to identify using heterodyne detectors. Furthermore, the use of a time expansion detector has occasionally revealed *Myotis* bat calls that have characteristics typical of whiskered/Brandt's bat *Myotis mystacinus/Myotis brandtii*, a species occasionally suspected but not confirmed at the site.

However, *Myotis* bats may produce virtually identical call types when flying insimilar environments (Russ 1999) and it is more likely that these calls came from Daubenton's bats commuting to their feeding areas. Another advantage of time expansion is that it is a broadband system, which can pick up all bat calls without the detector needing to be tuned within any particular frequency range. However, the LWC survey method of having one heterodyne detector tuned to 25 kHz and another tuned to 50 kHz is arguably just as effective in detecting all bat species likely to be recorded in the area.

It is very difficult to quantify the numbers of bats encountered in the field (Richardson and Sargent 1994). The merits of using visual or audible recording of bat numbers or bat activity levels have been widely discussed (Hutson 1993, Sutherland 1996, Thomas and La Val 1988). Measurements of bat activity levels (numbers of passes) are thought to be more reliable, and these can be taken as an index of number of bats: if the number of passes halves in five years then we assume that the number of individual bats has halved (Walsh et al. 2001). However, various factors influence numbers of bat passes recorded and need to be taken into account when interpreting trends. Key factors include bat detector model, temperature (Bat Conservation Trust 2006) and wind speed (Boonman 1996). Another possible variable is surveyor expertise. On LWC surveys, new volunteers are always accompanied by experienced surveyors so that consistency is maintained.

Volunteer conservation groups (WWT, LBG, BCT and Barn Elms Natural History Group) assisted in the recording of bats on the reserve. Two bat transects were established at LWC in 1997. The transect methodology was based on techniques now used by BCT's NBMP Field Survey run from 1998 to date (Walsh et al. 2001), and has attempted to record (where possible) all bat species encountered. At present, there are a restricted number of long-running bat transects in London — the majority being NBMP surveys.

## London Wetland Centre field surveys

Two survey routes were walked simultaneously: transects A and B (Figure 3). Each route comprised six 'sections' of roughly equal length, each terminated by a 'station' (located near water — the preferred foraging habitat for Daubenton's bat). The weather conditions were noted prior to the start of each survey. Surveys began *c.*20 minutes after sunset, comprising walks of seven minutes' duration along sections and stops of three minutes' duration at stations.

Where two surveyors walked a route, one bat detector was tuned to 25 kHz to record 'big bat' species and another detector was tuned to 50 kHz for the other smaller species (Table 1). If only one surveyor walked a route, the detector was tuned between these frequencies to determine species from both groups.

On reaching each station, bat species detected along the preceding section were recorded, along with the minimum number of bats seen feeding at any one time in conjunction with the number of bat passes heard on detectors, thereby measuring bat activity along the section. This exercise of counting bat passes and bats seen was repeated while standing at the station for three minutes and the results were noted on recording sheets before walking the next section.

Routes A and B have been surveyed regularly since 1997, normally once a month from March to October inclusive, although one or two months have been omitted in some years. Only June to September survey data have been included in analysis, as surveys were undertaken in these months in all years. Variations in bat activity throughout the year could distort the annual trend if counts from a particular month are included in the averages for some years but not others.


FIGURE 3. Transect routes A (west side of reserve) and Transect B (south side).

According to Stebbings et al. (2005), regular transect surveys with a bat detector can:

- provide an index of relative foraging activity
- estimate minimum species diversity in an area
- identify key habitats for commuting and foraging
- sometimes indicate where roosts are located

This study marks ten years of consistent bat monitoring at LWC which should provide a long enough data run to demonstrate effectively how the local bat populations are faring.

## Greater London data from the National Bat Monitoring Programme

BCT supplied data collected for the NBMP at various sites within the London Natural History Society area (Figure 4). This dataset includes records from the Field Survey and the Waterway Survey. The Field Survey protocol is similar to that used on LWC surveys in that a route is mapped out within a one-kilometre square and twelve spots are marked out at regular intervals along the route. The difference is that rather than identifying and counting all bats along the route, only common and soprano pipistrelle passes are counted while standing for two minutes at each station, whereas only noctule and serotine passes are counted while walking the sections in between. The Waterway Survey involves walking along a one-kilometre stretch of waterway and counting Daubenton's bat passes while standing for four minutes at each of ten stations marked out at regular intervals along the route. These data were analysed using the same statistical methods as described in the Results section below. The Greater London (NBMP) trends are presented alongside the LWC trends for each species.

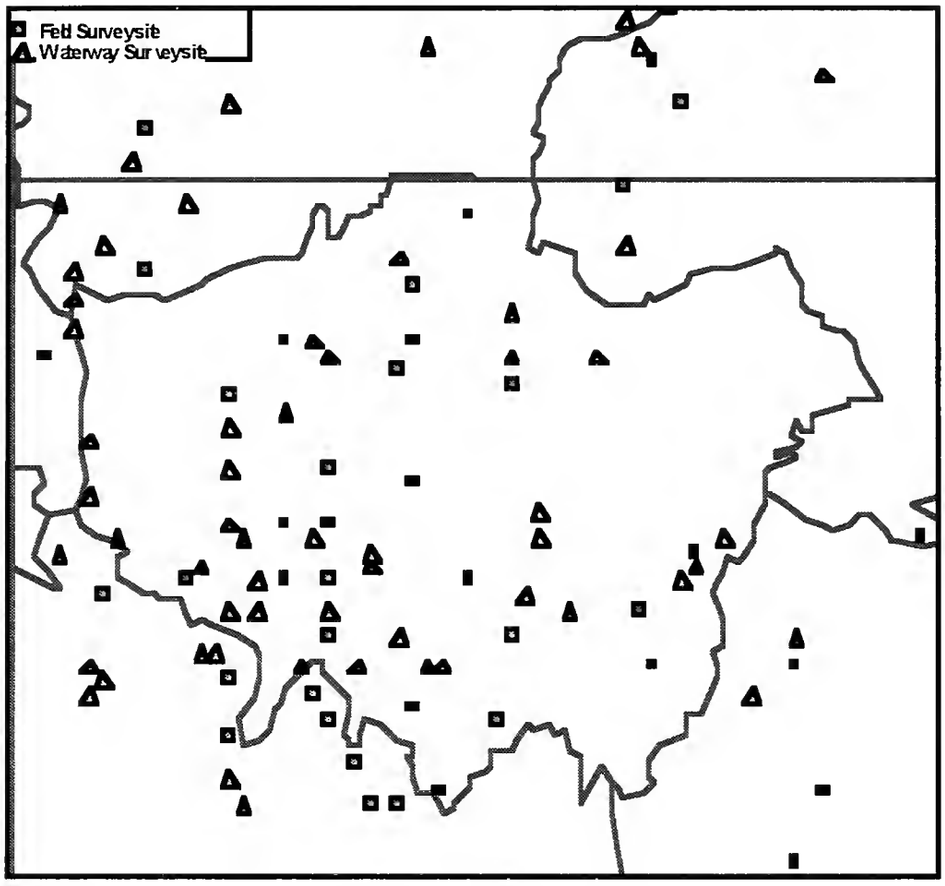



FIGURE 4. Distribution of NBMP sites in the LNHS area (the Field Survey covers noctule, serotine, common pipistrelle and soprano pipistrelle, and the Waterway Survey covers Daubenton's bat).

## Results

Seven species of bat have been regularly recorded during the past ten years (Table 1). The number of species found each year has increased from three species in 1997–8 to seven species in 2005–6. Relative abundance of each species, based on average activity levels across all surveys, is shown in Figure 5. Two other bat species (whiskered/Brandt's bat and brown long-eared bat *Plecotus auritus*) have been reported at LWC and Barn Elms, but have not been recorded on bat transects.

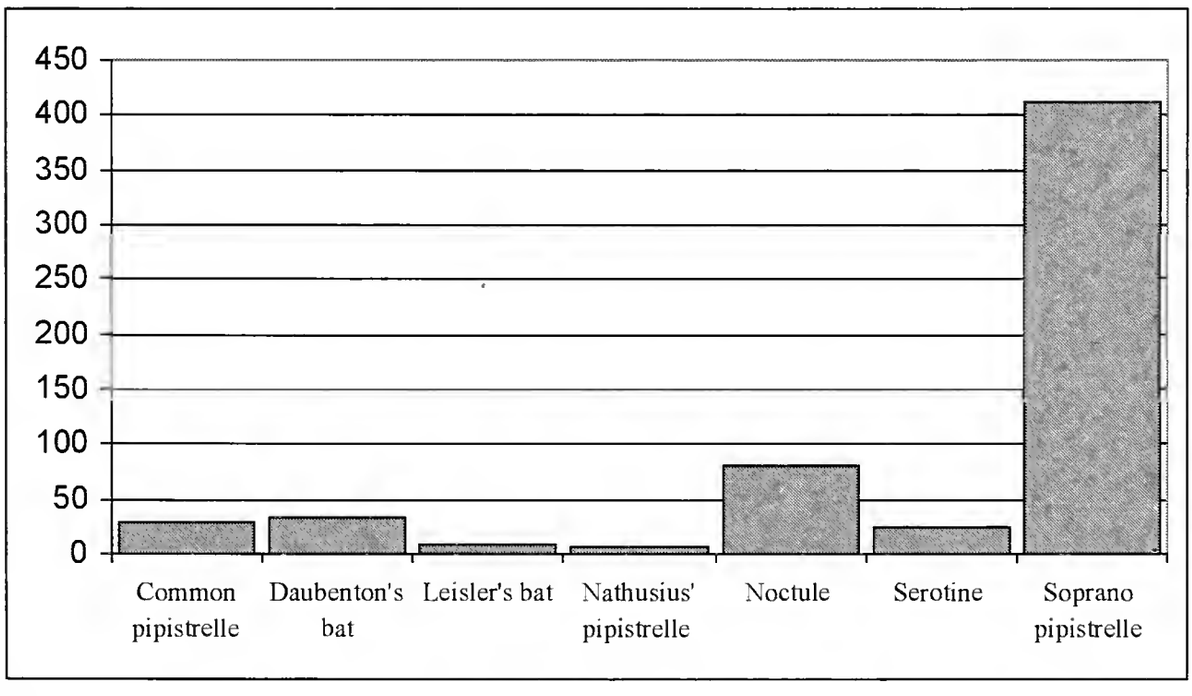
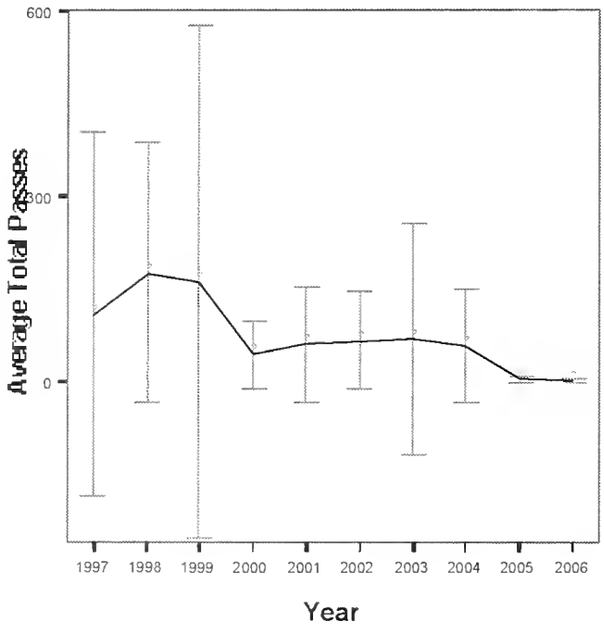


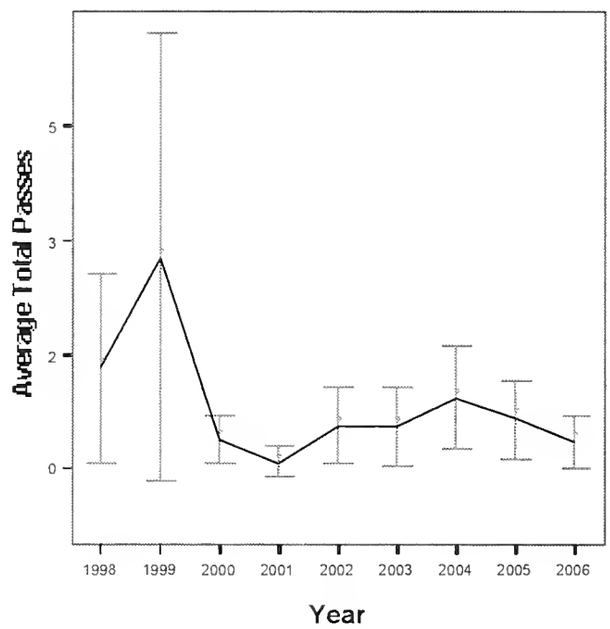

FIGURE 5. Average activity levels (numbers of passes) per species across all surveys.

Summaries of the annual levels of bat activity for the seven species regularly occurring at LWC are shown in Figures 6–12, with a combined summary of the larger-sized 'big bats' shown in Figure 13. The mean level of activity for a species provides a comparative index of abundance of that species on transects walked at LWC, and the index could be compared with those indices from the same transects walked in other years.

Mean levels of bat activity have been analysed using SPSS version 15.0. The significance of the trends was analysed using the General Linear Model Univariate Analysis of Variance. This analysis method was used to test for clear increasing or decreasing linear trends in the data. The results are summarized on a species by species basis. The graphs show annual means with 95 per cent confidence intervals.

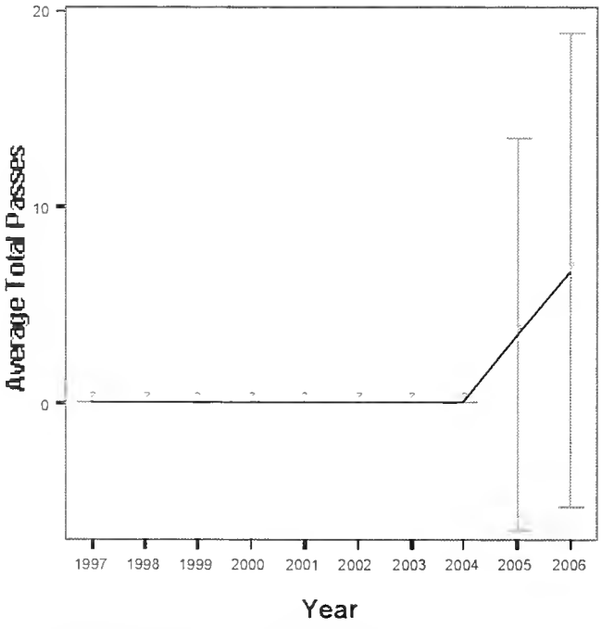



**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = 2.058$, p = .068.
This result is almost statistically significant.




**Greater London trend (NBMP Field Survey)**
Between 16 and 27 sites surveyed per year (only 11 in 2001 due to foot-and-mouth disease).
$F_{1,8} = 2.026$, p = .046.
This result is statistically significant ($p<0.05$).

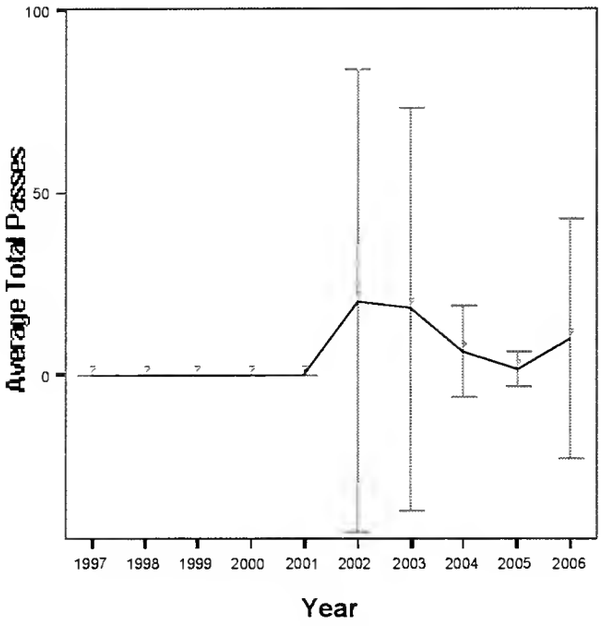
FIGURE 6. Noctule: bat pass activity and trend analysis.



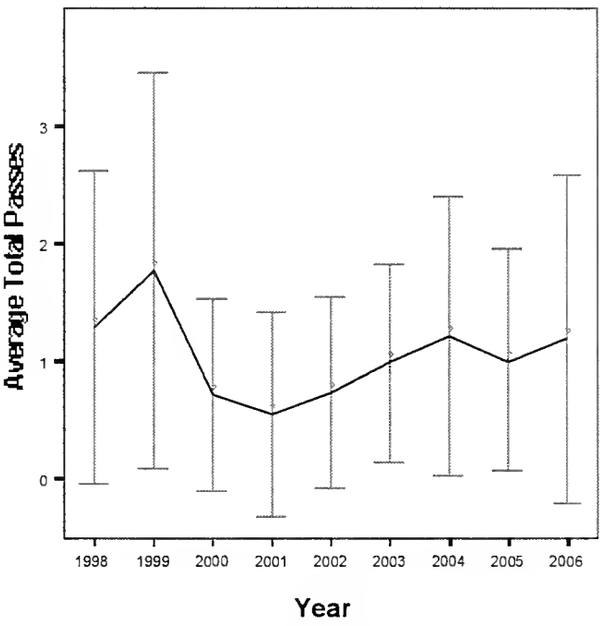

**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = 3.402$, p = .006.
This result is statistically significant ($p<0.05$).

**Greater London trend (NBMP)** – no data

FIGURE 7. Leisler's bat: bat pass activity and trend analysis.

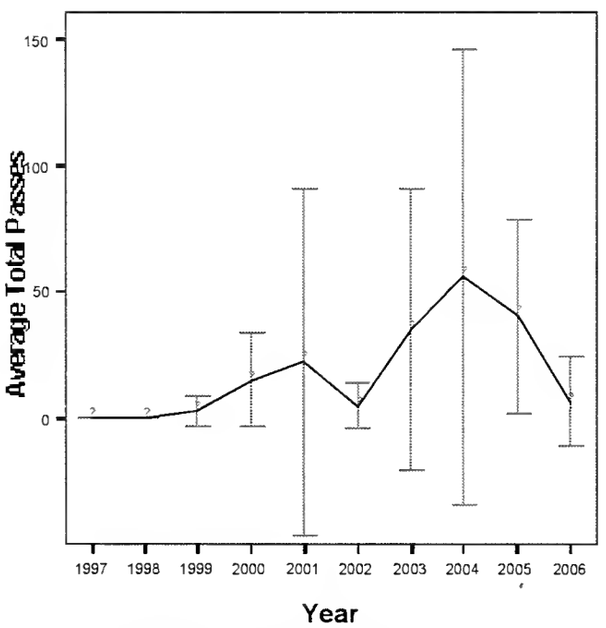



**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = .934$, $p = .511$.
This result is not statistically significant.

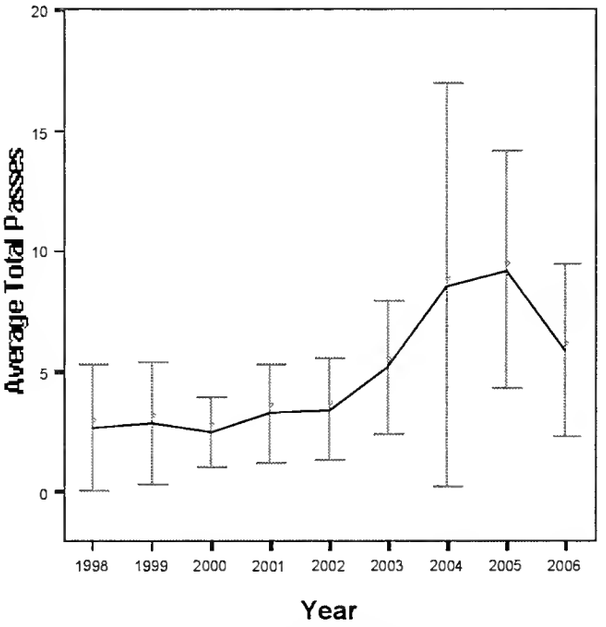



**Greater London trend (NBMP Field Survey)**
Between 16 and 27 sites surveyed per year (only 11 in 2001 due to foot-and-mouth disease).
$F_{1,8} = .373$, $p = .934$.
This result is not statistically significant.

FIGURE 8. Serotine: bat pass activity and trend analysis.

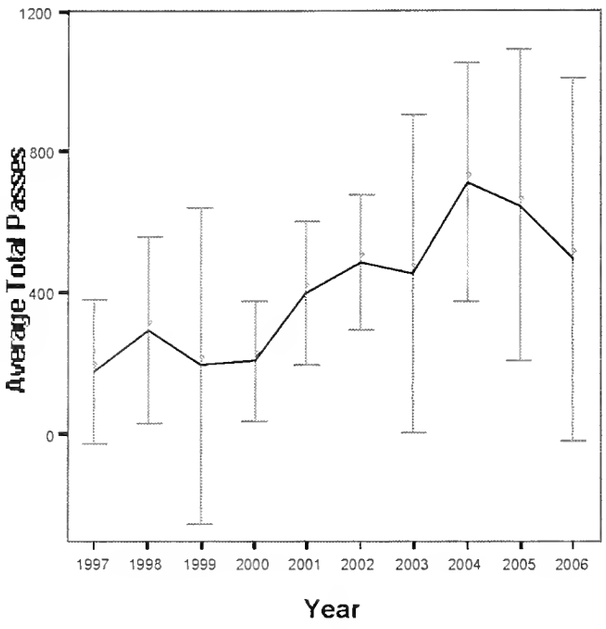



**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = 4.576$, $p = .001$.
This result is statistically significant ($p<0.05$).

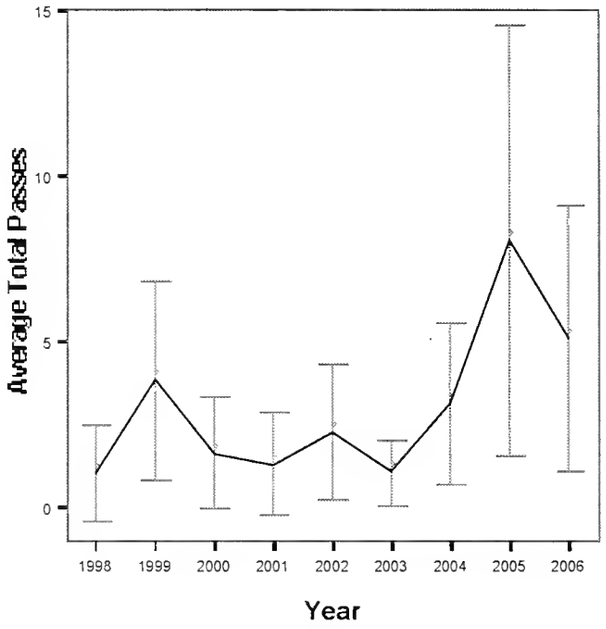



**Greater London trend (NBMP Field Survey)**
Between 16 and 27 sites surveyed per year (only 11 in 2001 due to foot-and-mouth disease).
$F_{1,8} = 1.551$, $p = .143$.
This result is not statistically significant.

FIGURE 9. Common pipistrelle: bat pass activity and trend analysis.

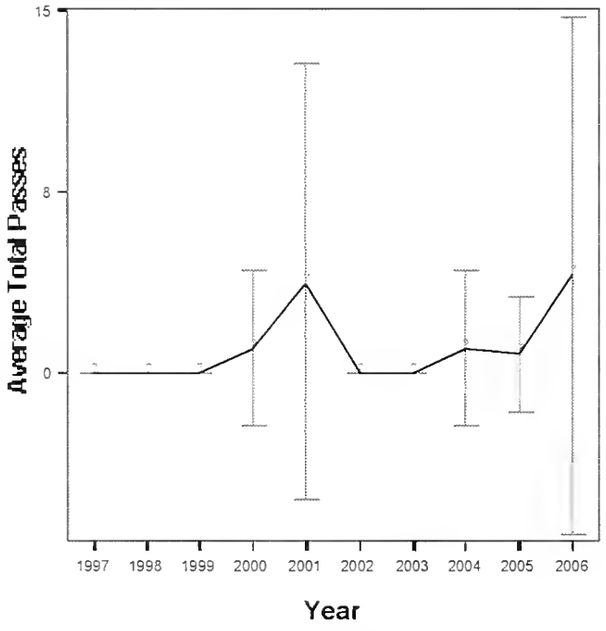



**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = 2.519$, $p = .029$.
This result is statistically significant ($p<0.05$).




**Greater London trend (NBMP Field Survey)**
Between 16 and 27 sites surveyed per year (only 11 in 2001 due to foot-and-mouth disease).
$F_{1,8} = 1.563$, $p = .139$.
This result is not statistically significant.

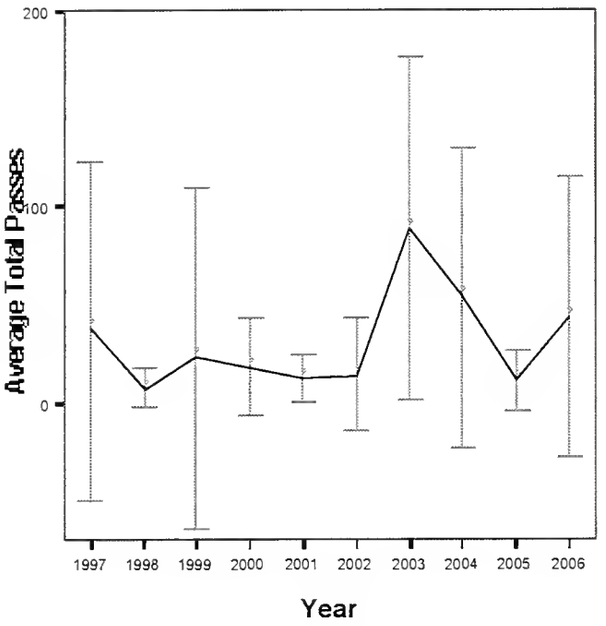
FIGURE 10. Soprano pipistrelle: bat pass activity and trend analysis.



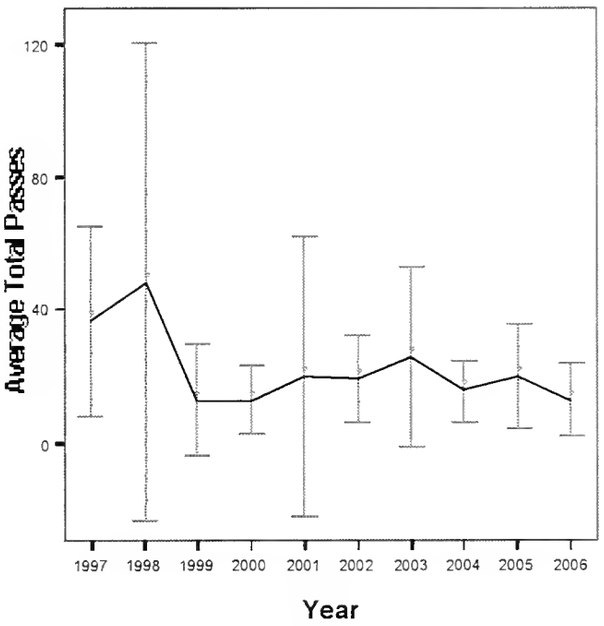

**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = 1.168$, $p = .351$.
This result is not statistically significant.

**Greater London trend (NBMP)** – no data

FIGURE 11. Nathusius' pipistrelle: bat pass activity and trend analysis.

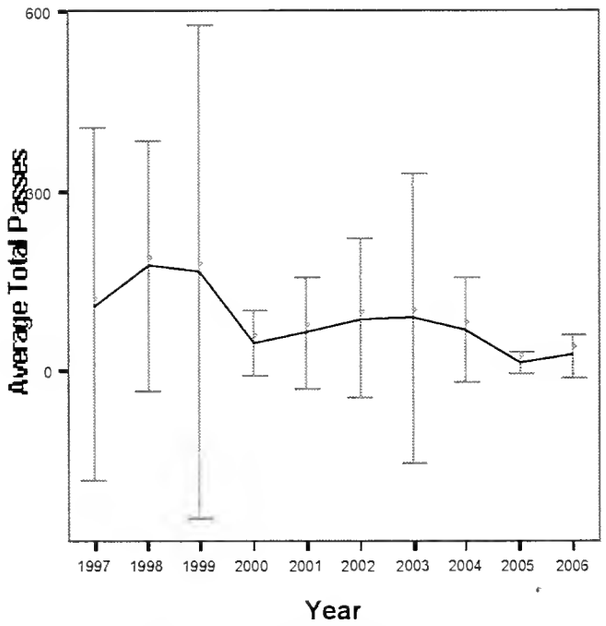



**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = 1.388$, $p = .239$.
This result is not statistically significant.

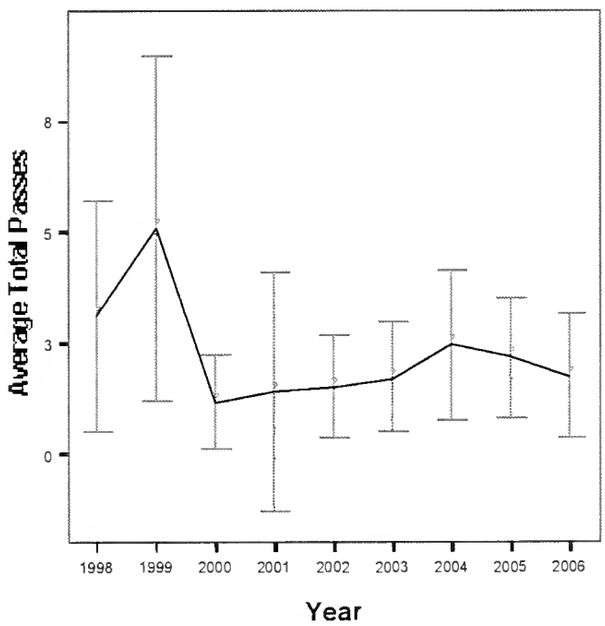



**Greater London trend (NBMP Waterway Survey)**
Between 15 and 25 sites surveyed per year (only 5 in 2001 due to foot-and-mouth disease).
$F_{1,9} = 1.346$, $p = .216$.
This result is not statistically significant.

FIGURE 12. Daubenton's bat: bat pass activity and trend analysis.




**London Wetland Centre trend**
4 surveys per year.
$F_{1,9} = .931$, $p = .514$.
This result is not statistically significant.




**Greater London trend (NBMP Field Survey)**
Between 16 and 27 sites surveyed per year (only 11 in 2001 due to foot-and-mouth disease).
$F_{1,8} = 1.537$, $p = .148$.
This result is not statistically significant.

FIGURE 13. Big bat species (noctule, Leisler's bat and serotine): bat pass activity and trend analysis.

## Discussion

### Potential influence of equipment on trends

BatBox III detectors have been used on all surveys throughout the study period. Since 2002 additional models have occasionally been used: BatBox Duet, Pettersson D100, and USA Mini III. Compared with the other models listed above, analysis by BCT has shown that the use of the BatBox Duet results in higher counts of serotine, common pipistrelle and soprano pipistrelle passes, the differences being significant for the latter two species. The Duet does not seem to be significantly more sensitive at detecting noctule and Daubenton's bat compared with these other detectors, nor are there any significant differences in sensitivity between the other models tested (Bat Conservation Trust 2006*b*). The occasional use of the Duet on LWC surveys since 2003 may have resulted in more pipistrelle and serotine passes being detected than on previous surveys, biasing the results. However, out of the sixteen surveys from 2003–2006 included in our analysis, the Duet was only used on four and was used alongside the BatBox III and other similar models. Therefore, the Duet's higher sensitivity is believed to have had a minimal influence on trends.

Time expansion detectors have several advantages over heterodyne, raising the question of whether their recent introduction as a survey tool at LWC biases the population trends of species more easily detected and identified using this system. However, time expansion detectors do not always enable identification of a bat any more precisely than with a heterodyne detector (Russ 1999, 2006). While the time expansion system has not eliminated all ambiguities in species identification, it has increased the ability to identify bats to species level. As discussed earlier, it is possible that the use of a time expansion detector in the years 2005–6 has resulted in a change in the proportion of bats correctly identified as noctule, Leisler's bat or serotine, and also the numbers of common pipistrelles detected, compared with previous years. Although some bias is likely, this is limited by a time expansion detector only being used on one survey route; on the other route, bats are identified only using heterodyne detectors.

### Species accounts

#### Noctule

The noctule (Frontispiece) is the second most regularly encountered bat at LWC (Figure 5). Noctule activity at LWC decreased by 98.8 per cent from 1997 to 2006 (Figure 6). Between 1997 and 1998 there was a 61.8 per cent increase in noctule activity levels, with bats probably responding favourably to the initial maturation of the site: in 1996 the site comprised gravel and little water; in 1997 half the site was flooded; whereas by 1998–9, the site had been flooded and planted. However, whilst there has been a tendency for pipistrelle activity to continue to increase with site maturity (Figures 9 and 10), noctule activity has declined sharply. Activity levels decreased by 73.5 per cent between 1999 and 2000, then remained at a similar level until 2004, and thereafter the species was rarely detected. The declining trend is almost statistically significant and is certainly of concern, as it might have been more dramatic were LWC not a rapidly maturing wetland and foraging resource for bats. Reports prior to the study period suggest that the noctule levels were even higher pre-1997. Bat surveys undertaken in 1992 at the reservoirs estimated that on a good evening up to 20–30 noctules visited the site, while local naturalist Rupert Hastings observed even greater numbers of noctules flying towards Barn Elms over Barnes village some years earlier (Hewlett 1992). Meanwhile, Colin Catto wrote that the amount of continuous noctule activity over the reservoirs on 15 September 1993 was the highest he had ever encountered (Catto 1994).

The loss of mature trees is thought to be contributing to the decline in noctules in Greater London. In recent years, tree surgery or tree removal programmes have been undertaken in London's parks and open spaces, either under the auspices of public health and safety or for the restoration of historic sightlines (London Bat Group 2006). Some projects have continued without appropriate ecological assessments, and bat roosts have been uncovered during the tree removal process (Alison Fure, pers. comm.). A 2007 report demonstrates that London lost 40,000 street trees from 2002–7, with mature broadleaf stock often being replaced by smaller trees which are easier to maintain (London Assembly Environment Committee 2007). Street trees are perhaps less likely to contain bat roosts, but it is still possible that roost potential has been lost as a result of this practice. Elsewhere in the South-East, a decline in noctules has also been reported in Kent, and important factors are thought to include the loss of mature trees and a reduction of grazing pasture habitat (Shirley Thompson, pers. comm.).

A possible additional pressure on the local noctule populations in south-west London is the increase in numbers of ring-necked parakeets *Psittacula krameri*, which may result in some competition for tree holes. Nesting starlings have been known to evict noctules (Richardson 2000, Altringham 2003), but the authors are not aware of any studies that have demonstrated that competition with ring-necked parakeets has had an impact on bats. However, observations of parakeets in Richmond Park exploring numerous tree holes suggest that they could disturb tree-roosting bats (pers. obs.), particularly as the birds breed in the UK as early as January (Snow and Perrins 1998) when bats are still in hibernation. Ring-necked parakeets numbers observed in the vicinity of LWC have shown a ten-fold increase between 1997 and 2006. The evidence is circumstantial without further research, but the apparent relationship between the increase of parakeets and the decline in noctules is certainly intriguing.

It is possible that the use of a time expansion detector in 2005 and 2006, and the consequent discovery of Leisler's bat at the site, might also have contributed to a reduction in noctule activity recorded in these years compared with the previous five years when the trend appeared stable. The downward trend in 2005–6 contrasts with an upward trend for Leisler's bat, and it may be that some of the 'noctules' counted in previous years were Leisler's bats. However, as discussed below, it is suggested that the first year with any substantial level of Leisler's bat activity was in 2004. As a result, bat workers at LWC are confident that noctules have been correctly identified throughout much of the ten-year study period and that the trend is largely accurate. Furthermore, Figure 13 shows that, when all 'big bat' activity is pooled together, 2005 and 2006 still demonstrate low levels of activity.

The Greater London trend shows a statistically significant decline of 73.8 per cent. There are some fluctuations, but numbers remain well below those recorded in the baseline year 1998. The relatively high counts in 1999 make the subsequent decline look even more dramatic, but this is due to an anomalously high count from a site that has been monitored in most other years and normally only has lower numbers of noctule passes. Nonetheless, it would appear that noctules are declining in London. This is supported by anecdotal evidence from specific sites, such as Beddington Sewage Farm where a peak count of at least fifty noctules was recorded in 1996, but numbers have since declined to the extent that only single figure counts have been recorded since 2001 (Derek Coleman, pers. comm.). Similarly, at Highgate Woods in north London, where regular roost monitoring is carried out each year, there have been concerns expressed about how noctules are now faring (Cindy Blaney, pers. comm.). The NBMP trend reflects the similar (almost significant) trend recorded at LWC. Both results add further weight to the concerns expressed by the London Bat Group of a decline in the populations of noctule/Leisler's bats after a survey was undertaken across Greater London in

1999 (Guest et al. 2002). The decline of noctule in Greater London also reflects the concerns nationally regarding the species (Bat Conservation Trust 2006*a*), which has recently been listed as a national Biodiversity Action Plan (BAP) priority species (Biodiversity Reporting & Information Group 2007).

### Leisler's bat

Leisler's bat (Frontispiece) was first confirmed on site in April 2005 and is now a regular visitor, with records occurring on most surveys since its discovery. It can be difficult to separate from the closely related noctule due to overlaps in the two species' identification characteristics, and also, in some situations, the serotine. The presence of Leisler's bat was confirmed through recording the calls from a time expansion bat detector (Pettersson D-980) and analysing the calls using sound analysis software (BatSound). This raises the question of how long Leisler's bats had been visiting the site before the identification was confirmed. In 2004, bats were occasionally detected which seemed to have characteristics of both noctule (similar wing shape and feeding technique) and serotine (more monotonous, less 'chip-choppy' calls with slightly higher peak frequencies). Almost certainly these were Leisler's bats due to their slightly smaller-sized profile and tendency to perform shallower swoops in flight. Furthermore, they often produce higher frequency calls which alternate between 'chip' and 'chop' type calls less regularly. In previous years the survey team had been quite confident in identifying the 'big bat' species as either noctules or serotines, apparently without the confusion of a third similar species. Therefore, it seems likely that Leisler's bat was not present at LWC before 2004, or at least not on a regular basis. As Leisler's bat has only been recorded at LWC in 2005 and 2006, it is too early to see a trend emerging, but between these two years there was an increase of 93 per cent in average numbers of passes (Figure 7).

In 2005 and 2006 volunteers carrying out the NBMP Field Survey on and around Barnes Common detected at least three Leisler's bats foraging around the boundary of Barnes and Putney Commons (*c.*1.3 km from LWC) from about twenty minutes after sunset. As Leisler's bats typically emerge ten to fifteen minutes after sunset (Jones and Walsh 2001), this suggests the possibility of a roost close to this location. Efforts to locate the exact direction from which the bats first appear have so far proved unsuccessful.

Only a few Leisler's bats were recorded in the Greater London area before 2000, when the species occurred most frequently in the east. Records include a grounded bat at Chiswick Park in 1985 (Simon Mickleburgh, pers. comm.), two dead bats found in Highgate Woods in 1986, and a roost in the Aveley area just outside Greater London in 1987 (Guest 2001). However, surveys of sites in outer south-west London suggest that Leisler's bat has started to frequent this part of London since 2004, and a maternity roost on Cannon Hill Common was uncovered by tree surgeons in 2005 (Alison Fure, pers. comm.). Data from car surveys undertaken in counties around London in the last couple of years would suggest that Leisler's bat is now being more widely reported on the outskirts of London (Jackie Wedd, pers. comm.; Alison Fure, pers. comm.) and the appearance of the species at LWC in the last couple of years reflects the increase in encounters that bat workers in the London area have made with this species in recent years.

### Serotine

Although serotines were recorded on two of the eight surveys at Barn Elms Reservoirs in 1990 (Mickleburgh 1990), they were largely absent from the restructured site during 1997–2001, only being recorded on two surveys in May 1999 (Table 2).

TABLE 2. Average monthly counts of serotine passes per survey (N/C = no counts).

| Year | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
|---|---|---|---|---|---|---|---|---|
| 1997 | N/C | 0 | 0 | 0 | 0 | 0 | 0 | N/C |
| 1998 | N/C | N/C | 0 | 0 | 0 | 0 | 0 | N/C |
| 1999 | N/C | 0 | 7 | 0 | 0 | 0 | 0 | 0 |
| 2000 | N/C | 0 | 0 | 0 | 0 | 0 | 0 | N/C |
| 2001 | N/C | N/C | 0 | 0 | 0 | 0 | 0 | N/C |
| 2002 | N/C | 0 | 50 | 0 | 80 | 1 | 0 | 0 |
| 2003 | 0 | 0 | 0 | 0 | 70 | 0 | 3 | 0 |
| 2004 | 21 | 3 | 74 | 0 | 9 | 16 | 0 | 0 |
| 2005 | 0 | 34 | 0 | 0 | 1 | 6 | 0 | 0 |
| 2006 | 0 | 0 | 1 | 0 | 41 | 0 | 0 | 0 |

The high levels of serotine activity during May and July in some years may be due to these being the peak months for a number of favoured prey items, which are known to occur at LWC: cockchafers *Melolontha* sp. and crane-flies *Tipula* sp. in May–June, summer chafers *Amphimallon solstitialis* in June–July, and crane-flies again in July–August (Kervyn 2001). Since 2002, serotines have been observed in late summer and this may be due to the introduction of horse grazing on site in autumn 2001, with dung beetles (such as *Aphodius sp.*) being a favoured prey item in the late summer and autumn (Kervyn 2001). Sheep-grazing ensued in autumn 2002, with cattle added to the livestock in autumn 2003. This form of management would provide an ideal opportunity for dung beetles to colonize the site. Other prey items include moths, a range of flies and other insects (Altringham 2003), a variety of which occur at LWC.

Figure 8 shows an overall decline of 49.3 per cent in serotine activity between 2002 and 2006, but this is not statistically significant. The wide error bars reflect the variability in counts between surveys. Serotines are known to forage far and wide, and on some nights at LWC there is much activity while on other nights the bats do not turn up at all. This species' sporadic use of LWC as a foraging site means that these observations are unlikely to reflect serotine population changes beyond the site.

The nearest known serotine roost to LWC is located about nine kilometres away in Teddington (Guest 2001). On average serotines forage within about eight kilometres of roost sites, but they can cover forty kilometres in one night, taking in up to ten foraging sites along the way (Altringham 2003).

The Greater London index shows a decline of 7.5 per cent between 1998 and 2006, although this is not statistically significant. This may be because the species' activity is too sporadic and recorded at too few sites to give a clear picture. Serotines were recorded at 17 of the 42 sites, and occurred regularly at only 4 of these. The serotine is undoubtedly a scarce bat in Greater London and continued monitoring of this species in the London area is to be recommended, particularly as the 1999 London Bat Survey suggested that the species was in decline (Guest et al. 2002). In 2004, there were several records of serotines feeding further into Central London, with one serotine detected at Regent's Park (London Borough of Westminster) and another at Clapham Common (London Borough of Wandsworth) (pers. obs.).

### Common pipistrelle

The common pipistrelle is the fourth most regular bat species detected at LWC (Figure 5). The trend shows a significant increase of 143.8 per cent between 1997 and 2006 (Figure 9). The 2006 counts were very low and may be anomalous due to factors discussed below. Common pipistrelle occurs at LWC in much lower numbers than soprano pipistrelle. This might partly be due to common pipistrelle being less specialized in its foraging requirements (Altringham 2003) and utilizing a wider range of habitats. Bats from local roosts seem to have started foraging over the site with more regularity from 1999 onwards. Apart from a sharp dip in 2002, a year with unusually low common pipistrelle activity levels throughout the summer, activity levels increased by 1,418.8 per cent between 1999 and 2004, possibly reflecting an increase in insect abundance as the site matured. This huge increase is due to very low counts in 1999, when the first few common pipistrelles were recorded. Activity increased from 2000 to 2004 by 165.6 per cent. Thereafter, another reduction in numbers occurred from 2004 to 2006. Further monitoring will help to confirm the long-term trend of this species at LWC. However, there are a number of environmental factors that might account for the downward trend in the last two years. These are alluded to in the discussion below about soprano pipistrelles.

The use of a time expansion detector in 2005 and 2006 has revealed additional common pipistrelle passes that went undetected on the heterodyne detectors, which could bias the trend in these years. However numbers of additional common pipistrelle passes detected in this way are very low and unlikely to alter the trend significantly. These two years show a downward trend and if there is any bias then removing this would actually reduce the numbers and make the decline slightly steeper.

Few common pipistrelle roosts are known in the Barnes area. The nearest known roost is in a house 1.7 kilometres from the site. The roosts of this species are more easily overlooked than soprano pipistrelle as it tends to form smaller colonies.

The Greater London trend shows an increase of 119.1 per cent between 1998 and 2006, but this is not statistically significant. The London trend is not dissimilar to the LWC trend in showing an overall increase followed by a sharp decline, but differs slightly in that the fall in activity levels is first seen in 2006 rather than 2005. However, as mentioned below in the discussion about soprano pipistrelles, the reduction in common pipistrelle activity in 2005 at LWC may be due to the impact of adjacent floodlighting. Therefore, the London and LWC trends might be more similar than they appear. The London trend is not statistically significant whereas the trend at LWC is significant. It is suggested that the latter trend has been influenced in part by the maturation of wetland foraging habitats and the likely increase in insect activity at the site.

### Soprano pipistrelle

Soprano pipistrelle (Frontispiece) is by far the most abundant bat species at LWC (Figure 5), reflecting the species' preference for wetland habitats compared to other nationally common species including the common pipistrelle. The site may well be one of the most important foraging habitats for this species in London, as a trapping survey in 2006 produced the highest soprano pipistrelle catch rates seen by the surveyors in England (Greenaway 2006). This already seemed to be the case when Simon Mickleburgh carried out bat surveys of the Barn Elms Reservoirs in 1990. He concluded that the site had no equal in London in terms of sheer numbers of bats feeding (Mickleburgh 1990). In 1992, Jan Hewlett visually estimated peak numbers of pipistrelles to be 90–120 bats (Hewlett 1992). This was prior to the 'common pipistrelle' being split into two species in 1997: common pipistrelle and soprano pipistrelle. Given our current knowledge of the two species' foraging

habits and current relative abundance at this site, the vast majority of pipistrelles recorded by Mickleburgh and Hewlett were almost certainly soprano pipistrelles. The trapping survey work undertaken in 2006 estimated the local soprano pipistrelle population at between one and three thousand individuals (Greenaway 2006). Pipistrelles (common and soprano species) appear to be one of the most abundant groups of bats in London (Hooper 1981), although the common pipistrelle is thought to be more abundant than the soprano pipistrelle (Guest et al. 2002), reflecting distribution estimates of the two species across Europe (Mayer and von Helversen 2001). Wetland sites in London, such as LWC, appear particularly well suited to soprano pipistrelles to the extent that their numbers might potentially far exceed those of other bat species.

The period 1997 to 2006 saw a statistically significant increase of 177.3 per cent in levels of soprano pipistrelle foraging activity at LWC (Figure 10), with an increase of 302 per cent from 1997 to 2004. Between 2004 and 2006 numbers of passes decreased by 40 per cent, but this downward trend is not significant. The overall increase probably reflects the site maturing and the resulting build-up of aquatic flies, a key food source for this species (Altringham 2003). The possible decline in numbers in the last two years might indicate a levelling out in the trends, perhaps suggesting that the optimal level of bat activity for the available food resource has been reached. Alternatively, a closer look at monthly activity levels (Figure 14) reveals some decreases in activity which could be linked to environmental factors. For example:

- Very poor pipistrelle activity was recorded in August 2003 after a ten-day period of excessive heat in London (30°C+). Similarly, the decline in pipistrelle activity in 2006 is particularly noticeable in June and July. Again, high summer temperatures prevailed that year across the UK: it was one of the warmest on record and the July survey followed an eleven-day period with many days exceeding 30°C. Why the hot weather might have an impact on the foraging activity of pipistrelles at LWC is unclear
- The reduction in overall pipistrelle activity in 2005 could be attributed to the poor levels of activity recorded in September that year. That particular survey was subjected to the glare of mobile floodlights being used on the neighbouring playing fields and the lighting appears to have depressed the pipistrelle activity by at least half compared to the number of bat passes reported in September 2003, 2004 and 2006
- Prolonged periods of heavy rainfall may also affect pipistrelle activity at LWC. For example, foraging activity in May 2006 was lower compared to the bat activity recorded in 2005. This could have been due to the exceptionally wet May in 2006, which was the third wettest month in that year

Environmental factors discussed above could have played a part in reducing the level of bat activity at the site, although the impact that these variables might have on bat species at LWC must be regarded as largely circumstantial without any long-term research to investigate their effects. However, Figure 14 does serve to illustrate the variance that can emerge in the collection of long-term monthly monitoring data, both seasonally (between months) and between years, even for a species that is recorded in some abundance at the site.

Typically soprano pipistrelles use foraging sites within two kilometres of their roost, but they may travel as far as five kilometres (Altringham 2003). At least three roosts are known within two kilometres of LWC.

The Greater London trend (Figure 10) shows an increase of 397.4 per cent between 1998 and 2006, but this is not statistically significant. However, as with common pipistrelle, the trend is similar to the statistically significant trend found at LWC, although the maturation of habitat at LWC must have contributed to the steady increase in foraging activity throughout the study period.

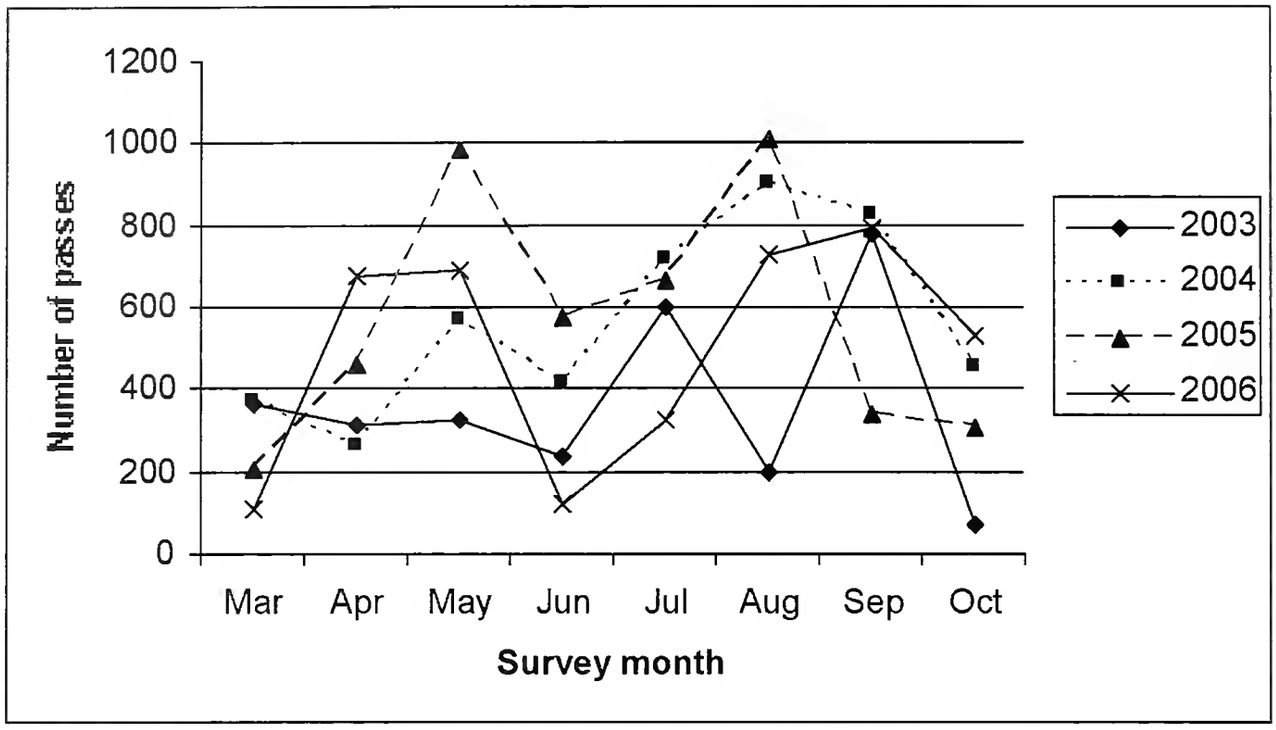



FIGURE 14. Monthly levels of soprano pipistrelle activity 2003–2006.

The increases in soprano and common pipistrelle, both across London and at LWC from 1997/8 to 2006, reflects the trend for pipistrelles noted by the London Bat Group in 1999 (Guest et al. 2002). However, the positive trends indicated across London, both in 1999 and in this study, have been found not to be statistically significant. The London and LWC trends appear to contrast with the decline of 70 per cent reported for pipistrelles nationally between 1978 and 1993 (Stebbings 1995), and hopefully this indicates better prospects for both cryptic species within the London area. However, continued monitoring of soprano pipistrelle both regionally and nationally is of high importance as the species continues to be listed as a UK BAP priority species (Biodiversity Reporting & Information Group 2007).

## NATHUSIUS' PIPISTRELLE

Nathusius' pipistrelle was only confirmed as a UK breeding species in 1995. It is still considered rare in the UK and London (Waite et al. 2004). This species was first recorded at LWC in 1999, which was the third record for London (Guest 2001). Since then it has been quite widely reported throughout London, with recent records from Richmond Park, Bushy Park, Kew Gardens, Wimbledon Common, Canbury Gardens, Hampstead Heath, Stoke Newington Reservoirs and Regent's Park (Sarah Archer, Cindy Blaney, Philip Briggs, Alison Fure, Nigel Reeve, pers. comm.). To the north of London, boat surveys along the River Lee Navigation have found that Nathusius' pipistrelles are the dominant pipistrelle bat species amongst some of the more open habitats, and they have also been recorded at some of the Walthamstow Reservoirs nearby (Alison Fure, pers. comm.).

The LWC trend (Figure 11) shows an increase of 300 per cent between 2000 and 2006, but numbers are low and the increase is not significant. Although this species is now recorded annually, the number of passes is indicative of individual bats, with 2–3 bats observed on few occasions. Solitary feeding behaviour has also been observed at other sites in the area and this may make it difficult to assess current population changes meaningfully by measuring foraging activity.

Table 3 shows the monthly Nathusius' pipistrelle activity levels. Prior to 1995, this species was considered a migrant to the UK, with most records occurring in May and September (Altringham 2003). May and

September/October show the main peaks in activity at LWC, reflecting the migratory pattern of this species into the UK. However, summer activity at LWC has been recorded in 2001, 2005 and 2006, suggesting that there could be a summer or maternity roost not too far from the site. A radio-tracking study confirmed that a juvenile Nathusius' pipistrelle was using a nearby roost in 2006 (Greenaway 2006). Summer roosting bats have also been discovered in 2000 at Bedfont Lakes Country Park in the London Borough of Hounslow (Guest 2001).

TABLE 3. Average monthly counts of Nathusius' pipistrelle passes per survey (N/C = no counts).

| Year | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
|---|---|---|---|---|---|---|---|---|
| 1997 | N/C | 0 | 0 | 0 | 0 | 0 | 0 | N/C |
| 1998 | N/C | N/C | 0 | 0 | 0 | 0 | 0 | N/C |
| 1999 | N/C | 0 | 0 | 0 | 0 | 0 | 3 | 9 |
| 2000 | N/C | 0 | 0 | 0 | 0 | 0 | 4 | N/C |
| 2001 | N/C | N/C | 0 | 0 | 12 | 3 | 0 | N/C |
| 2002 | N/C | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 2003 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2004 | 1 | 0 | 31 | 0 | 0 | 0 | 4 | 38 |
| 2005 | 0 | 30 | 1 | 4 | 0 | 0 | 0 | 0 |
| 2006 | 0 | 0 | 3 | 0 | 0 | 3 | 14 | 5 |

## DAUBENTON'S BAT

Daubenton's bat is the third most frequently reported bat at LWC (Figure 5). The number of passes recorded in 2006 was 18.2 per cent higher than in 1997 but the overall trend is not significant and there is much year-to-year variation (Figure 12). Wide error bars indicate that there is also much variation in the monthly activity levels.

The reduction in 2005 is due to consistently low activity levels from June to September. Autumn surveys typically show higher levels of Daubenton's bat activity, but the September 2005 survey appeared to have been adversely affected by floodlights on the adjacent playing fields. Daubenton's bats were completely absent from the south-eastern section of the site, much of which was bathed in bright light. This suggests that some Daubenton's bats may have been deterred from commuting to the site as a result of the floodlights. *Myotis* species, including Daubenton's bat, have a particularly low tolerance to lighting (Fure 2006, Jones 2000, Monhemius 2001).

Daubenton's bats prefer stretches of smooth water (Altringham 2003) and favour feeding on the leeward side of bank-side vegetation. This foraging behaviour has been reported at LWC (Greenaway 2006). No significant correlation between Daubenton's bat activity and wind speed has been found at LWC, probably because there is enough vegetation on site to provide sheltered feeding areas regardless of wind speed and direction. Aquatic vegetation on the water surface appears to influence the amount of Daubenton's bat activity at the site, but more work is needed in order to assess whether this has an impact on the overall trend. Coverage of water by duckweed *Lemna* sp. has been reported to have a negative influence on Daubenton's bat foraging activity (Boonman et al. 1998).

A further cause of variance in activity levels may be the fact that, although Daubenton's bats typically forage within three kilometres of their roost, they may fly fifteen kilometres or more to a variety of foraging locations in one night (Altringham 2003). Radio tracking has revealed that Daubenton's bats regularly switch between LWC and the nearby Lonsdale Road Reservoir (one kilometre west) (Greenaway 2006).

Despite these possible influences, Daubenton's bat activity levels would be expected to increase in response to site maturity emulating the soprano pipistrelle trend, particularly as both these species are often associated with wetland habitats. However, the LWC trend does not show a significant increase in bat activity, although the local population does appear to be relatively stable.

Local roosts include a known roost four kilometres away on Wimbledon Common (Guest 2001) and a suspected roost three kilometres away in Richmond Park (pers. obs.). Radio tracking has revealed that bats appear nightly on Beverley Brook commuting from the Richmond Park direction (Frank Greenaway, pers. comm.), which provides further evidence of roosts at that location. Occasional observations of Daubenton's bats appearing at LWC as early as 50 minutes after sunset may indicate a roost very close to the site, as this species typically emerges 40-50 minutes after sunset (Jones and Walsh 2001).

The Greater London trend shows a decline of 63.6 per cent between 1997 and 2006. Although this is not statistically significant it does serve as a warning that Daubenton's bats may be declining across London. This contrasts with the national trend which shows a significant increase of 20 per cent between 1998 and 2005 (Bat Conservation Trust 2006*a, b*).

### 'Big bats' group

Confusion in identification of the 'big bat' species (noctule, Leisler's bat and serotine) can occur due to overlaps in their call characteristics and the similarity of their calls when flying in cluttered environments. To allay any fears of misidentification, all 'big bats' passes have been pooled together in Figure 13 as there is rarely much ambiguity in identifying the larger-sized bat species (*Nyctalus/Eptesicus* species) in relation to other genera of bats. This criterion also includes counts of bats identified as 'big bat sp.' which were not included in individual species trends.

The LWC trend shows a decrease of 79.5 per cent, but this is not statistically significant. The Greater London trend indicates a decrease of 44.3 per cent, which is also not statistically significant. Both trends resemble the trends for noctule (Figure 6), this being the most commonly recorded 'big bat' species at LWC and throughout Greater London. Although these two trends are not significant, there is some indication that 'big bat' populations might not be faring as well as they should in London.

### Other bat species

A few other species have occasionally been recorded or suspected at the site. In 2006, a brown long-eared bat was detected in an adjacent garden (Alison Fure, pers. comm.). Therefore, there is the possibility that this species occasionally forages at LWC, but has gone unnoticed because its late emergence from roosts and its very quiet echolocation calls make it very difficult to detect. However, no brown long-eared bats were caught during the trapping surveys in 2006. As this species is normally quite easily lured into traps it was concluded that brown long-eared bat is not normally present at the site (Greenaway 2006). On a few surveys *Myotis* bat calls have been heard which resemble the calls of Natterer's bat *M. nattereri* and whiskered/Brandt's bat, species which are known to be present in London. In 2002 an English Nature volunteer heard what he strongly suspected to be a whiskered bat while taking a tour of the site (Dave Cove, pers. comm.). However, *Myotis* species are generally very difficult to identify

based on their echolocation calls alone. Daubenton's bat, which is easily identified visually through its characteristic habit of foraging close to the surface of the water, remains the only *Myotis* species confirmed with 100 per cent certainty at the site, as trapping surveys in 2006 provided no new *Myotis* records for the site (Greenaway 2006).

## Conclusions

The WWT London Wetland Centre has been successfully transformed from redundant reservoirs into an important foraging resource for London's bats. Wetlands are considered a key habitat for bats in the UK (Altringham 2003, Entwistle et al. 2001, Walsh and Harris 1996*a*), and the wetland habitat creation at LWC appears to support a relatively high diversity of bats, which has been demonstrated through regular monitoring. The ten-year run of data has enabled trends in the bat activity to be determined, as well as to suggest possible factors (including livestock grazing, surface water cover by algae, floodlighting, etc.) that might affect the various bat species, which could inform site management.

Seven species of bat regularly forage around the site, with their order of abundance being as follows: soprano pipistrelle >>> noctule > Daubenton's bat > common pipistrelle > serotine > Leisler's bat > Nathusius' pipistrelle. Species particularly attracted to freshwater habitats include six of the aforementioned species apart from serotine (Entwistle et al. 2001). LWC is of undoubted regional importance, not only for its diversity of foraging bats, but also for the abundance of soprano pipistrelles. Furthermore, a recent study has suggested that LWC could be exceptional in a national context in terms of the unprecedented number of foraging soprano pipistrelles attracted to the site (Greenaway 2006). With over 700 members of the public attending bat walks each year, bats are clearly an important part of the site's appeal as a visitor attraction. However, while several species continue to provide visitors with an excellent wildlife-watching experience, in the case of noctules, their early arrival at dusk and spectacular swooping flights may become a less predictable feature at the site if the current decline in numbers continues.

It was expected that this study might show the more abundant bat species responding favourably to the establishment and maturation of foraging habitats at LWC. However, other factors affecting bats within Greater London might also influence some of the species trends at LWC. Noctule, common pipistrelle and soprano pipistrelle monitoring results demonstrate relatively similar nine-to-ten-year trends for both LWC and Greater London. Therefore, it would appear that single-site monitoring can potentially reflect what is happening in the region. However, LWC trends for less abundant species (e.g. serotine and Daubenton's bat) do not necessarily reflect the Greater London trends, whereas rarer species (e.g. Leisler's bat and Nathusius' pipistrelle) occur too infrequently for any comparisons to be made. Species trends at single sites are affected by local influences and may not always reflect wider area trends. It is recommended that regular monitoring at sites across London is maintained and, where possible, new sites should be found that will help to clarify how scarcer species, such as the serotine, are faring. This study demonstrates that NBMP surveys can be utilized to assess bat population trends on a regional level, as well as the national level for which the NBMP was originally intended. It is recommended that more London and national sites are surveyed annually in order to obtain a significantly clearer picture about bat population trends. Regional NBMP data analysed at a regional scale might show local changes in bat populations not necessarily reflected nationally or revealed through single-site monitoring.

In a study carried out in 1999, noctule and serotine were reported to be declining in Greater London, while pipistrelles appeared to be showing a slight

but not significant increase (Guest et al. 2002). This study would suggest a continuation of these trends, with noctules and serotines continuing to decline, whilst common and soprano pipistrelle numbers appear to be increasing. Daubenton's bats appear to be doing less well in London than in the UK as a whole, and may in fact be declining. No Greater London trends are available for Nathusius' pipistrelle and Leisler's bat, but there has been an increase in numbers of records for both species in recent years, which may be due in part to increased observer effort. This study also raises wider, perhaps more subjective, questions of how bats might fare throughout the UK in future years. For example, observations of depressed bat activity at LWC following long hot spells possibly tell us something about how bats might cope with climate change, especially if bat workers and researchers notice similar patterns of activity at other study sites.

It is hoped that this study will not only encourage land managers to carry out regular bat monitoring at their sites, but also inspire bat enthusiasts to take part in NBMP surveys throughout Greater London. This will provide an ever-clearer picture of the changing fortunes of London's bats, both at individual sites and throughout the region.

## Acknowledgements

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# Book review

***Wild and fearless — the life of Margaret Fountaine.*** Natascha Scott-Stokes. Peter Owen, London, 2006. 294 pp. Hardback, £19.95, ISBN 0 7206 1276 4.

One of the great pleasures in natural history, when not actually 'doing it' oneself is to read about how others 'did it'! One can never tire of reading about the lives of one's predecessors, be they the true pioneers like Sir Joseph Banks, Charles Darwin or Alfred Russel Wallace. But they were men; what about the women?

By the eighteenth century, the model Georgian woman who could afford it, instead of a life of domestication, found the Grand Tour irresistible, providing opportunities to expand their education, but above all, to enable them to assert their independence. I'm not going to list the women pioneers here although I will mention just two — firstly Cynthia Longfield, the first lady president of the London Natural History Society, who, after her main travels were done, spent the rest of her 'hands-on' entomological career in the Natural History Museum, and secondly, Evelyn Cheeseman, who wrote widely of her travels in Asia and also spent the rest of her career in the Museum's Entomology Department. And, of course, there is Mary Kingsley, about whom at least one film has been made.

Interestingly, Margaret Fountaine (1862–1940) was also primarily an entomologist. She was a Victorian vicar's daughter from Norfolk and she became one of the foremost entomologists of her day during a long and illustrious career. Her vast collection of 22,000 specimens is housed in Norwich Castle Museum and she published a significant number of papers and short notes in British entomological journals.

But Margaret Fountaine was more than an entomologist. The book describes in vivid detail all aspects of her life and the chapter headings tell us what we are in for as we read: Unladylike behaviour; Misspent youth; Music and men; The dragoman lover; Turkish delight; The lonely lepidopterist; Bereft at sixty-six — these are just a few.

I am not going to tell you any more — just read the book. You'll find it hard to put down, so choose a comfortable easy chair, make some tea (optional) and savour Margaret Fountaine's travels in Europe, Asia (including the Himalayas), Australia and New Zealand and the Americas. She was indeed wild and fearless.

K. H. HYATT

# Growth and condition of dace *Leuciscus leuciscus* (L. 1758) in the River Lee (Hertfordshire) relative to selected populations elsewhere in Europe

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KEYWORDS: back-calculated length at age, condition, composite growth trajectories, weirs.

## Summary

From fisheries surveys in the River Lee, Hertfordshire, the frequency of occurrence and relative numbers of dace *Leuciscus leuciscus* were observed to be low relative to similar streams elsewhere in England. Length-frequency distributions were constructed from the available data, including data from Environment Agency surveys, the growth of dace captured in 1998 was back-calculated from scales, and von Bertalanffy growth parameters were applied to available length-at-age data to construct composite growth trajectories separately for English and European dace populations. Early growth in River Lee dace was fast and is similar to that observed in other chalk streams of the UK. The composite growth trajectories for English and Continental European dace populations suggest that English dace populations have generally faster early growth than those on the Continent. Apparent fluctuations in population status do not appear to result from poor growth. However, life span may be shorter and body condition may be lower than in other populations for which data are available. The survey data suggest that dace in the middle stretches of the Lee near Hertford may be the core of the population, but this requires further study.

## Introduction

The composition, growth and reproduction of fish assemblages are strongly influenced by water quality and character (Mann 1996, Karr 1998). Nutrient-rich (eutrophic) rivers, such as the River Lee (Hertfordshire, England), can receive up to 80 per cent of their discharge from treated domestic effluent during dry periods (Pilcher and Copp 1997). Fishes inhabiting the River Lee, a left-bank tributary of the River Thames, have been reported to suffer morphological disorders (e.g. Tyler and Everett 1993) and endocrine disruption due to oestrogens from the treated sewage effluents (Price et al. 1997, Jobling et al. 1998). Since 1991–2, when the last comprehensive surveys of fish density and distribution were undertaken in the River Lee (Pilcher and Copp 1997), field studies have examined fish habitat use (Watkins et al. 1997), fish and invertebrate drift patterns (Copp et al. 2002, Edmonds-Brown et al. 2004), the impacts of channelization (Pilcher et al. 2004) and the removal of riparian vegetation (Copp and Bennetts 1996) on fish abundance, the introduction of non-native fish species (Copp et al. 2003), and the diel dynamics of fish distribution (Copp 2004), fish interactions with benthic invertebrates (Copp et al. 2005) and the movements of barbel *Barbus barbus* (L.) within a stretch delineated by two water retention structures (Vilizzi et al. 2006). During these investigations, the numbers and frequencies of occurrence of dace *Leuciscus leuciscus* (L.), a rheophilic, lithophilous cyprinid, were observed to be unusually low relative to rivers in southern England with good water quality (e.g. Mann 1974, Mann and Mills 1986).

The dace is considered a common species throughout most of England and Wales (Mills 1981) and is an important component (in terms of population biomass) in the many chalk streams of southern England (Mann and Mills 1986). But the species is nonetheless considered under threat at the European level and is included in the IUCN *Red Data Book* list as endangered in Europe. This endangered status is further accentuated by the fact that the distribution of dace in streams can overlap that of popular sport fishes, e.g. native brown trout *Salmo trutta* L. and stocked non-native rainbow trout *Oncorhynchus mykiss* Walbaum, and cyprinid species such as dace have sometimes been culled in parts of the Lee catchment intensively managed for these salmonid species to reduce what was perceived as competition for food and habitat resources (L. Davis, EA-NorthEast, pers. comm.). As with salmonids, dace require relatively clean, fairly fast-flowing rivers and streams with enough gravel substrate to permit spawning (Mann and Mills 1986), often occurring in large, possibly loosely aggregated shoals (Clough and Beaumont 1998). Dace also have a similar diet to salmonids, feeding on aquatic invertebrates, including insects and Crustacea but also some vegetation (Mann 1974). Dace are highly mobile, capable of extensive migrations up and downstream (Lucas 2000), including movements upstream past weirs (Clough and Beaumont 1998). Dace spawn relatively early compared with other cyprinids (Mann 1974), with annuli laid down in mainly in the second half of May in the River Frome (Mann 1974). Previous studies of dace in the UK have reported among-year variations in recruitment success (Mann and Mills 1986), faster growth during initial years of life than most other European cyprinids, especially prevalent in years with warm summers (Mills 1982), maximum total lengths of 150–250 mm and weights of over 450 g.

Dace are considered to be particularly susceptible to habitat degradation, and therefore they are considered to be good indicators of habitat quality (Mills 1981). In view of the species' reportedly low frequency of occurrence and abundance within the River Lee, and in particular the section upstream of Hertford, the aim of the present study was to evaluate the status of dace in the River Lee with the following specific objectives: 1) to review available data on the abundance of dace in the River Lee, 2) to assess the length-frequency distributions, growth and condition of dace in the River Lee in light of past and

recent monitoring data (UK Environment Agency) within the context of selected other British European populations, and 3) to appraise their distribution in the upper River Lee with reference to water quality data and physical obstructions to migration.

## Study area, material and methods

The River Lee rises from chalk springs within Luton, Bedfordshire (National Grid Reference TL 061248), flows south-east to Hertford where a number of tributary streams converge. The Lee continues south towards London, finally joining the River Thames at Stratford (Pilcher and Copp 1997). The river catchment encompasses 1,420 km$^2$ and contains a mainly urban population of approximately 2,000,000 inhabitants (Watkins et al. 1997). As such, urbanization, groundwater abstraction and treated sewage effluent discharges have imposed a pattern of daily fluctuations on the Lee's flow regime that reflect domestic water usage (Faulkner and Copp 2001); these are uncharacteristic of chalk streams, which normally should have relatively invariable discharge regimes (Mann and Mills 1986). Between the Lee's source and the start of the Lee Navigation near the town of Hertford, there are numerous weirs, most of which could be circumvented by some fish species during elevated discharge (exceptions are noted): 1) by-pass channel at Hyde Mill (TL 133170); 2) old cress beds at Batford (TL 145153) — impassable weirs; 3) broadwater at Brocket Hall (TL 214128); 4) mill at Lemsford (TL 221124); 5) broadwater at Hatfield House (TL 246097); 6) Cecil Mill wood yard (TL 250097); 7) discharge gauging weir at Water Hall Farm

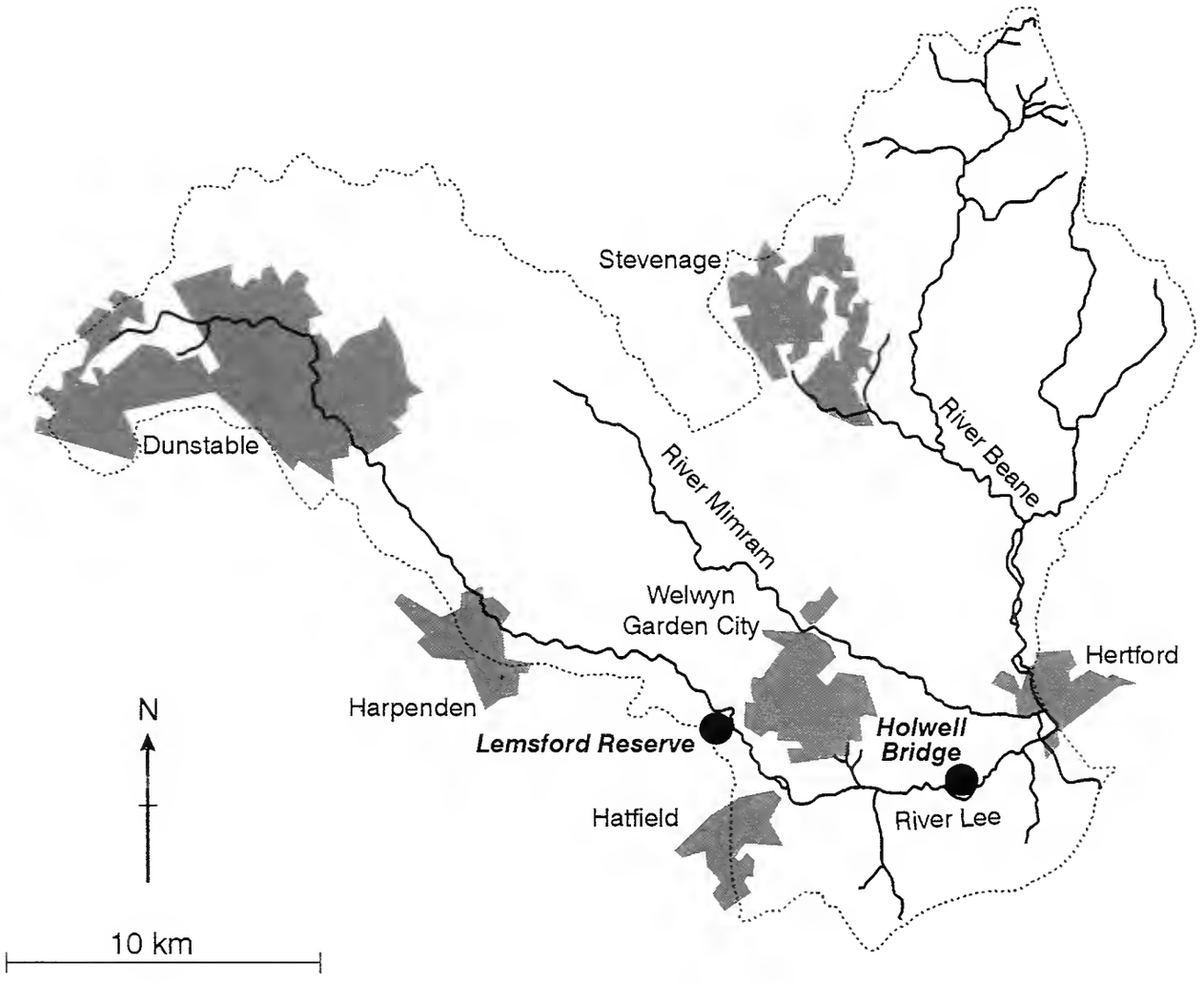


FIGURE 1. Map of upper River Lee (Hertfordshire) with the two stretches (Lemsford Nature Reserve and Holwell Bridge), filled dots, where dace *Leuciscus leuciscus* were sampled for growth and body condition studies.

(TL 2299097); 8) downstream of the garden centre opposite Bayfordbury Estate (TL 320115); 9) centre of Hertford (TL 326129) — impassable; 10) long-side, stepped weir that separates the Lee at the upstream end of the Lee Navigation canal at Hartham Common (TL 327130); 11) upstream of confluence with the River Beane at Hartham Common (TL 330134).

To assess the abundance and length-frequency distributions of dace in the upper Lee (Figure 1), we examined data from published sources (see Tables 1 and 2) and Environment Agency surveys (NRA 1992; National Fish Population Database for England and Wales); a map illustrating the NRA sites is given in Pilcher and Copp (1997). Data from 1991–3 were collected during October 1991 to March 1992 and October 1992 to March 1993 (Pilcher and Copp 1997), whereas data in 2002–3 were on 11 September 2003 at Essendon (TL 252098), 24 October 2002 and 22 August 2003 at Hartham Common (TL 329134), 18 October 2002 and 17 September 2003 at Wheathampstead (TL 185141), and on 1 November 2002 at Woolmers Park (TL 286099). To evaluate growth and condition, 124 dace were captured by electro-fishing (DC battery- or generator-powered units as appropriate to the stretch) during daylight hours at approximately monthly intervals between March and September 1998 along two stretches of the river (Figure 1): Lemsford Reserve (just downstream of Lemsford mill) and Holwell Bridge (TL 288100). The first stretch, between Lemsford Reserve and Stanborough Park (TL 225114), had a substratum comprised mainly of sand and gravel, with silt and large rocks encountered occasionally. Riparian vegetation was thick and abundant along the upstream extend of this stretch, which is bordered by the nature reserve, but patchy and relatively thin in the downstream extent of the stretch as it passed through the park. Water depth was generally <0.5 m, with maximum depth about 2 m in the few occasional pools, and channel width varied between 6 and 10 m. Located about 9 river km downstream, the second stretch extended between Holwell Bridge and the bridge at Letty Green Road (TL 283099), passing through private pasture land (sheep). The substratum in this stretch varied considerably, ranging from silt and fine sand in back-eddy areas adjacent to pools (bends) to gravel and cobbles in the riffle sections. Riparian vegetation on the upstream half of this stretch consisted of a thin strip of trees and bushes, whereas the downstream half contained only a few overhanging trees and occasional reed beds. Water depth varied greatly, ranging from <20 cm in a wide riffle that delineated the upper and lower halves of the stretch to > 1.5 m in one deep and wide meander bend. Angling activity along both stretches was low, being prohibited (and controlled) in the nature reserve and discouraged (but uncontrolled) at Holwell Bridge. Both river stretches are influenced by treated effluent discharges, but only the Lemsford Reserve stretch has occasionally been found to fail non-statutory river quality objectives (NRA 1994).

Upon capture, the dace were measured for standard length (SL) and weight, and 8–10 scales were taken (using forceps) from between the lateral line and the insertion of the anal fin. All fish were returned to the water after processing. No attempt was made to determine sex, which is virtually impossible to confirm in this species (by external inspection) outside the immediate spawning period. In the laboratory, three undamaged scales from each specimen were cleaned by immersion for twenty minutes in a 20 per cent solution of potassium hydroxide, rinsed in water and then dipped in 75 per cent industrial methylated spirits to remove imperfections on the surface of the scale and ease reading of the annuli. Each set of three scales was mounted dry between two microscope slides and the slides were held together with a mounting solution, with subsequent age determination and measurement of inter-annuli distances undertaken as per Steinmetz and Müller (1991) using a calibrated 50× microfiche reader adapted with a graduated mm scale. We were

unable, due to the low abundance of fish, to limit our growth analysis to one month of the year. Age determinations were verified by the 'blind reading' of a randomly selected sub-sample of the scales by a second person.

The linear relationship for SL (in mm) vs. weight (in g) was elaborated as per Ricker (1975) using data from the monthly samples. The slope parameter 'b' from the regression equation LogWt = b(LogSL) ± a (all available dates combined) was used as an estimator of 'generalized' (i.e. overall) body condition (*sensu* Pitcher and Hart 1992), and differences in slope relative to the isometric value of '3' were tested for using analysis of covariance (ANCOVA) and the Tukey post-hoc test. To assess monthly variations in body condition (plumpness), as per Mann (1974), the Le Cren (1951) was used: $K = w/w'$, where $w$ is the observed weight of each individual and $w'$ is the expected weight using the length-weight relationship ($W$=aL$^b$) for dace captured during that calendar month. $K$ values >1 indicate that the individual is in better condition than average individual of same length range, whereas $K$ values <1 indicate that the individual is in worse condition than average individual of same length. Owing to low dace densities, back-calculation of length at age was undertaken on specimens from March to June inclusive using the linear relationship (Creaser 1926) between scale radius (in mm) and body length (in mm): radius = 0.021SL + 0.059 (F = 411.14, df = 88, $P$ = 0.001, r$^2$ = 0.824). Because parameters from von Bertalanffy models are less reliable than lengths at age for inter-population comparisons (Zivkov et al. 1999, Copp et al. 2004), we used back-calculated SL at age for assessing the River Lee dace against other dace populations. However, for assessing the patterns in groups of populations, von Bertalanffy models can be useful for developing composite growth trajectories, i.e. mean growth curves (Hickley and Dexter 1979); these were prepared for English and Continental Europe populations using pooled data sets for each group of data. Data derived from published papers were converted, where necessary, to SL using the formula given by Mann (1974): FL = 1.08SL + 1.34 ($r^2$ = 0.999). Analysis of variance (ANOVA) was used to compare the estimates of fish density among sampling periods.

## Results and discussion

The relative abundance of dace in depletion surveys was low or nil at most sites along the River Lee (Table 1), and during the same period no young-of-the-year dace were observed in point abundance samples, which were specifically designed to capture young and small fishes (Pilcher and Copp 1997). The highest relative abundance values were observed at Pickett's Lock (Lower Lee) and in the vicinity of Hertford, the approximate mid-point between the upper and lower sections of the river. In the vicinity of Woolmers Park (Table 1), dace were captured in <4 per cent of samples and rarely exceeded 4 per cent of all fish captured on any sampling date (Table 2).

Population mean length appears to have decreased significantly over time (ANOVA, $F$ = 232.314, df = 972, $P$ = 0.0001), with the 2002-2003 mean SL (131.458, SE = 1.762, n = 306) significantly smaller (Fisher PLSD at 95 per cent) than the 1998 mean SL (138.645, SE = 2.521, n = 124) and it significantly smaller (Fisher PLSD at 95 per cent) than the 1991–3 mean SL (173.127, SE = 1.177, n = 545). Relative to the length-frequency distributions from previous (1991–3) and subsequent (2002–3) surveys, our data for 124 specimens captured in 1998 (91 of these captured during March to June) are representative of the sizes of dace encountered in the upper River Lee. There were notable concentrations of larger-bodied specimens in the vicinity of Hertford in early 1991–2 and much further upstream at Wheathamstead in 2002–3 (Figure 2). The distribution pattern suggests a size-structured population of skewed distribution along the river's course (Table 1), though this hypothesis would need to be examined in a more detailed study, possibly using mark-recapture techniques.

TABLE 1. Site code and name (for map locations, see Pilcher and Copp 1997), and the relative abundance (in %) of dace *Leuciscus leuciscus* sampled by the depletion method (Seber and Le Cren 1967), For the Point Abundance Sampling (PAS) surveys are given the sample number, frequency of occurrence (Freq. = proportion of samples, in %) and relative abundance (RA = proportion of all fish specimens, in %) of dace (Upper and Lower Lee are relative to the city of Hertford). PAS results for subsequent dates at Woolmer's Park are given in Table 2.

| | | Depletion (relative abundance in %) | | | | PAS[4] (0+) | | |
|---|---|---|---|---|---|---|---|---|
| **EA Site Code** | **Site name** | **1991–2[1]** | **6 Oct 1995[2]** | **27 Oct 1995[3]** | **15 Oct 1997[3]** | **n** | **Freq.** | **RA (%)** |
| **Upper Lee** | | | | | | | | |
| LUID | New Mill End | 0 | — | — | — | 20 | 0 | 0 |
| LUIE | Leather Bottle | 0 | — | — | — | 30 | 0 | 0 |
| LUIF | Hyde Mill | 0 | — | — | — | — | — | — |
| LUIG | Batford Common | 0 | — | — | — | — | — | — |
| LUIH | Batford Forge | 0 | — | — | — | — | — | — |
| LUGI | Leasey Bridge | 0 | — | — | — | — | — | — |
| LUGJ | Wheathampstead | 0.2 | — | — | — | — | — | — |
| LUGK | Marford Farm | 0 | — | — | — | — | — | — |
| LUGL | Water End | 2.9 | — | — | — | — | — | — |
| LUGM | Lemsford Mill | 0.3 | — | — | — | 20 | 0 | 0 |
| LUGN | Stanborough Park | 0 | — | — | — | — | — | — |
| LUGO | Stanborough Lake | 2.8 | — | — | — | — | — | — |
| LUGP | Mill Green | 1.2 | — | — | — | 20 | 0 | 0 |
| LUGQ | Essendon | 1.3 | — | — | — | 30 | 0 | 0 |
| — | Woolmer's Park | — | 1.0 | 0 | 0.7 | 20 | 0 | 0 |
| LUGR | Water Hall | 3.5 | — | — | — | 30 | 0 | 0 |
| LUGS | Bayford Farm | 0 | — | — | — | 30 | 0 | 0 |
| LUGT | Waterdale | 16.1 | — | — | — | — | — | — |
| LUDU | Hertford | 0 | — | — | — | — | — | — |
| **Lower Lee** | | | | | | | | |
| LUDV | Pickett's Lock | 79.6 | — | — | — | 30 | 0 | 0 |
| LNGN | Hertford Basin | 3.8 | — | — | — | 30 | 0 | 0 |
| LNLA | Dicker Millstream | 13.8 | — | — | — | — | — | — |
| LNDK | Kingsmead Fields | 0 | — | — | — | — | — | — |
| LNDJ | Ware Priory | 1.4 | — | — | — | — | — | — |
| LNDB | Star Street, Ware | 0 | — | — | — | — | — | — |
| LNLD | Manifold Ditch, Ware | 0 | — | — | — | — | — | — |
| LNLF | River Lynch | 0 | — | — | — | — | — | — |
| LNDE | Dobbs Weir | 0.8 | — | — | — | — | — | — |
| LNDG | Broxbourne Millstream | 0 | — | — | — | — | — | — |
| LNDR | Fisher's Green | 0 | — | — | — | — | — | — |
| LNDQ | Windmill Lane, Cheshunt | 0 | — | — | — | — | — | — |
| LNDH | Powder Mill Cut | 0 | — | — | — | — | — | — |
| LNDM | Waltham Common | 0 | — | — | — | — | — | — |
| LNDL | Enfield Lock | 0.7 | — | — | — | — | — | — |
| LNIS | Small River Lee | 7.1 | — | — | — | — | — | — |

[1] EA survey reports; [2] Present study (2 runs); [3] Present study (3 runs); [4] Pilcher and Copp (1997)

TABLE 2. Sampling dates of Point Abundance Sampling (PAS) surveys undertaken at Woolmer's Park and Holwell Bridge (River Lee, Hertfordshire), with number of samples, the frequency of occurrence (Freq. = proportion of samples, in %) and relative abundance (RA, in %) of dace *Leuciscus leuciscus*. PAS results for 1992 at Woolmer's Park are given in Table 1.

| Site/Date | n | Freq. | RA (%) | Source |
|---|---|---|---|---|
| **Woolmer's Park** | | | | |
| 10 May 1995 | 30 | 0 | 0 | Watkins et al. (1997) |
| 18 May 1995 | 30 | 0 | 0 | " |
| 25 May 1995 | 30 | 0 | 0 | " |
| 31 May 1995 | 30 | 0 | 0 | " |
| 7 Jun 1995 | 30 | 0 | 0 | " |
| 14 Jun 1995 | 30 | 0 | 0 | " |
| 23 Jun 1995 | 30 | 0 | 0 | " |
| 28 Jun 1995 | 30 | 0 | 0 | " |
| 5 Jul 1995 | 30 | 0 | 0 | " |
| 13 Jul 1995 | 30 | 0 | 0 | " |
| 18 Jul 1995 | 60 | 0 | 0 | " |
| 26 Jul 1995 | 90 | 0 | 0 | " |
| 1 Aug 1995 | 90 | 1.1 | 1.4 | " |
| 31 Aug 1995 | 45 | 0 | 0 | " |
| 8 Sep 1995 | 65 | 0 | 0 | " |
| 21 Sep 1995 | 35 | 2.9 | 0.7 | " |
| 5 Oct 1995 | 25 | 4 | 11.1 | " |
| 7 Jun 1996 | 50 | 0 | 0 | Copp and Bennetts (unpublished) |
| 14 Jun 1996 | 50 | 0 | 0 | " |
| 19 Jun 1996 | 50 | 0 | 0 | " |
| 28 Jun 1996 | 50 | 0 | 0 | " |
| 4 Jul 1996 | 50 | 0 | 0 | " |
| 12 Jul 1996 | 50 | 0 | 0 | " |
| 17 Jul 1996 | 50 | 0 | 0 | " |
| 26 Jul 1996 | 50 | 0 | 0 | " |
| 31 Jul 1996 | 50 | 2 | 4.2 | " |
| 8 Aug 1996 | 180 | 0 | 0 | Copp (2004) |
| 28 Jul 1997 | 225 | 0 | 0 | Copp et al. (2005) |
| 4 Aug 1997 | 225 | 1.3 | 0 | " |
| 7 Aug 1997 | 225 | 0.4 | 3.6 | " |
| **Holwell Bridge** | | | | |
| 27 Aug 1998 | 160 | 0.6 | 0.5 | Vilizzi and Copp (unpublished)[1] |

[1] See Vilizzi et al. (2006) for description of methods and site.

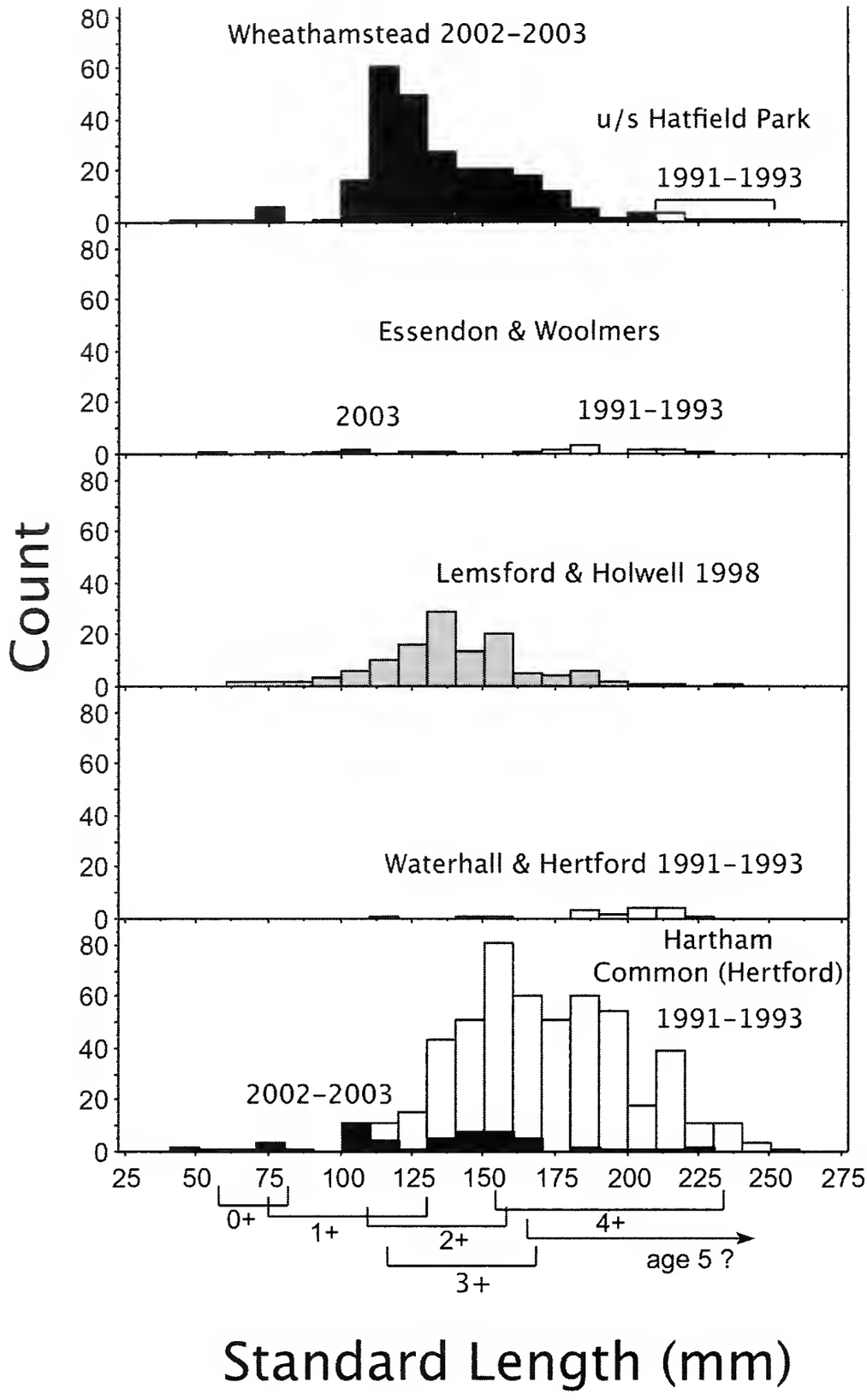


FIGURE 2. Frequency distributions of standard lengths-at-capture (in 10 mm size classes) for dace *Leuciscus leuciscus* at locations along the upper River Lee (see Table 1 for sites) in 1991–3 (data from Pilcher and Copp 1997) and 2002–3 (Essendon on 11.ix.2003, Hartham Common on 24.x.2002 and 22.viii.2003, Wheathampstead on 18.x.2002 and 17.ix.2003, Woolmer's Park on 1.xi.2002) as well as that for 1998 (Lemsford and Holwell Bridge, with the range of sizes at age indicated: u/s = upstream of.

The maximum age of dace collected in the River Lee during 1998, based on scale annuli counts, was four years (4+ fish), with a mean maximum observed SL at capture (in September) of 191.0 mm (Table 3). However, one specimen captured in March (165 mm SL) was probably just entering its fifth year, as the relatively great distance between the last annulus and the edge of the scale

suggested that 1998 annulus was about to be laid down. Overall growth was typically isometric ($Log_{10}Wt. = 3.099Log_{10}SL - 4.969$; $r^2 = 0.906$), with the slopes of the length-weight relationships not differing significantly (ANCOVA, with Tukey post-hoc test, $P > 0.05$) from '3' in all months (Figure 3A) except May ($P < 0.001$). In all months, the relationships were statistically significant ($P = 0.01$), with all $r^2$ values > 0.85 except in September, when $r^2 = 0.658$). The outlying slope value for May (Figure 3A) may have resulted from low sample number or possibly measurement/transcription errors in the field that day. Age-specific condition varied between months and age classes, with age 4+ fish demonstrating amongst the greatest variation and the highest values (Figure 3B). Age-specific (relative) condition during March to September 1998 differed somewhat with values for the same period reported for dace of the Dorset Stour for the period 1968–72 (Mann 1974). The March-to-June decline in relative condition of 1+ dace in the Lee (Figure 3) contrasts a progress rise observed during these months in the Stour (Mann 1974). Similarly, the limited variation in 2+ dace of the Lee (Figure 3) during these months contrasts a progressive rise observed in Stour dace of that age (Mann 1974), whereas, the pattern of elevated relative condition in older dace is similar in the two rivers.

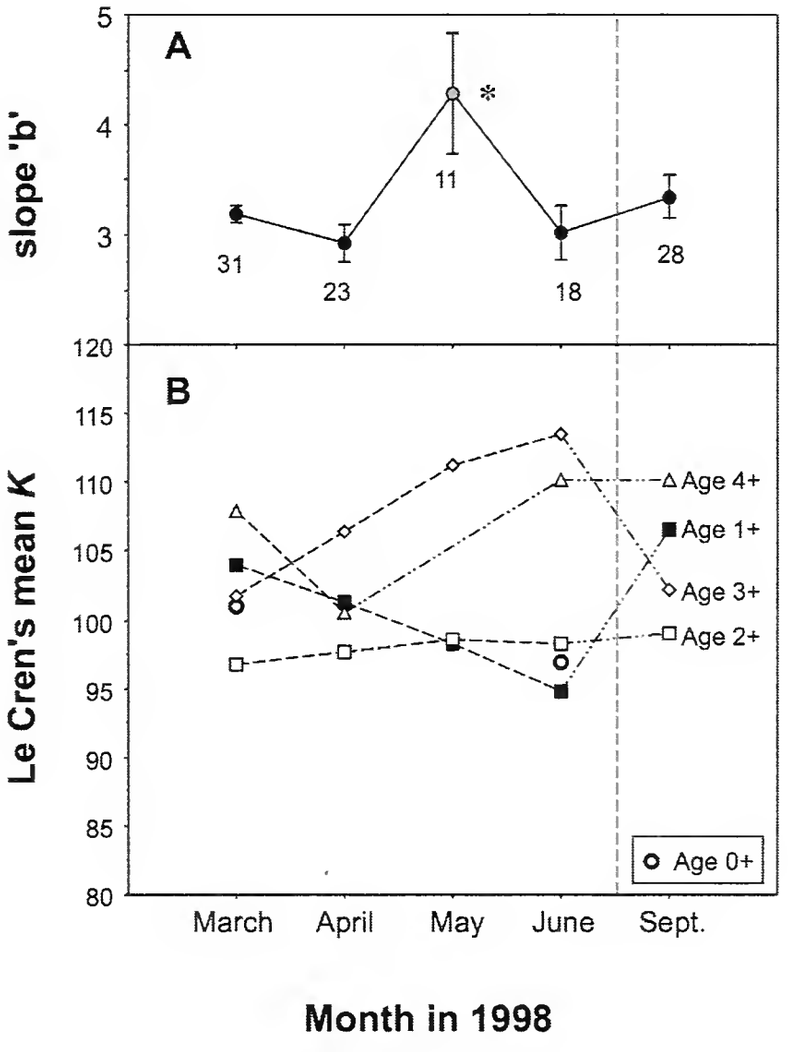


FIGURE 3. Mean monthly condition indices for dace *Leuciscus leuciscus* from the upper River Lee (see Table 3) in 1998: A) regression slope parameter 'b' values (with df values) and S.E. bars (* indicates significant difference from '3' (ANCOVA, with Tukey post-hoc test, $P < 0.001$), and B) Le Cren's index by age class. Values for May should be viewed with caution due to low sample number or to a possible systematic data transcription error in the field.

TABLE 3. Mean standard length (SL) at age, with standard error (in parenthesis), of dace *Leuciscus leuciscus* at capture from the upper River Lee (Hertfordshire) between Lemsford Nature Reserve and Woolmers Park during March to June 1998 and SL back-calculated from scales.

| | | | Back-calculated standard length (mm) at age | | | |
|---|---|---|---|---|---|---|
| **Year class (age group)** | **n** | **Mean SL at capture (mm)** | **Age 1** | **Age 2** | **Age 3** | **Age 4** |
| 1998 (0) | 3 | 67.7 (5.8) | | | | |
| 1997 (1) | 11 | 97.6 (3.9) | 48.4 (0.8) | | | |
| 1996 (2) | 36 | 131.5 (2.2) | 52.1 (1.0) | 99.0 (1.8) | | |
| 1995 (3) | 29 | 145.2 (2.8) | 51.2 (1.6) | 100.4 (2.9) | 126.6 (3.7) | |
| 1994 (4) | 12 | 184.3 (7.2) | 53.8 (1.3) | 97.3 (3.2) | 132.1 (4.6) | 148.1 (7.2) |
| Mean back-calculated SL (mm) | | | 51.4 | 98.9 | 129.4 | 148.1 |
| Mean increment (mm) | | | 47.5 | 30.5 | 18.7 | |

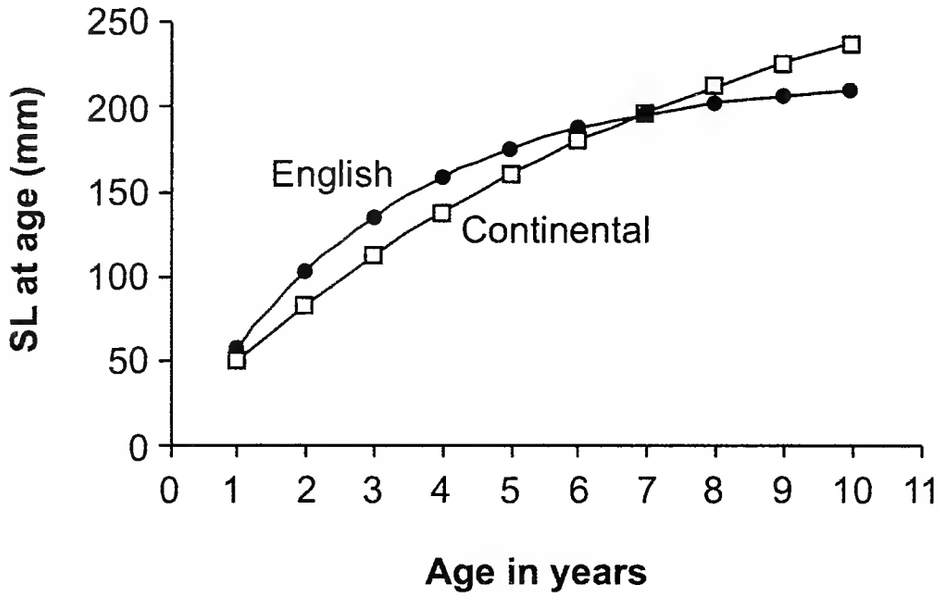


FIGURE 4. Composite growth curves generated from pooled standard lengths at age, fitted with the von Bertalanffy growth model (Hickley and Dexter 1979), for English and Continental European populations of dace *Leuciscus leuciscus*.

Early growth in River Lee dace was moderate relative to other UK populations (Table 3), with mean SL values being third lowest at age 1 and fourth lowest at age 2 (Table 4). But Lee dace at age 1 fall at the median of European population and at age 2 are exceeded in SL only by dace of the River Ourthe (Phillipart 1971). In Lithuania, Virbickas (1998) has reported water temperature-dependent growth in dace, though the populations are relatively short lived. The composite growth trajectories for English and Continental European dace populations suggest that English dace populations have generally faster early growth than those on the Continent up to about age 5 (Figure 4). For example, mean SL at age 3, i.e. first maturity of most English populations (Lobón-Cerviá et al. 1996), was significantly greater (ANOVA: $F = 6.151$, df = 18, $P < 0.03$) in English (mean = 133.6 mm, SE = 6.66) than in

TABLE 4. Comparison of back-calculated standard lengths (SL) of dace *Leuciscus leuciscus* in England and Continental Europe.

| Water course | SL at age | | | | | | | | | | Source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| **English** | | | | | | | | | | | |
| River Lee | 51 | 99 | 129 | 148 | | | | | | | Present study |
| River Clyst | 61 | 115 | 158 | 183 | 200 | 218 | 225 | | | | Cowx (1988) |
| River Eden | 61 | 97 | 127 | 143 | 157 | 166 | 181 | 185 | | | Hickley and Bailey (1982) |
| River Exe | 63 | 115 | 153 | 178 | 194 | 189 | 230 | 251 | | | Cowx (1988) |
| River Creedy | 66 | 106 | 128 | 161 | 181 | 189 | 196 | 204 | | | Cowx (1988) |
| River Stour | 46 | 78 | 115 | 144 | 161 | 174 | 189 | 198 | 205 | | Mann (1974) |
| Willow Brook | 52 | 99 | 133 | 151 | 170 | 189 | 195 | 205 | 230 | | Craig-Hine and Jones (1969) |
| River Culm | 63 | 121 | 160 | 181 | 197 | 211 | 217 | 224 | 228 | | Cowx (1988) |
| River Thames | 39 | 73 | 91 | 108 | 124 | 133 | 141 | 150 | 160 | 172 | Williams (1967) |
| River Frome | 70 | 112 | 142 | 167 | 189 | 198 | 208 | 214 | 219 | 228 | Mann (1974) |
| **Continental** | | | | | | | | | | | |
| River Ratnyčia | 54 | 70 | 117 | 141 | 161 | | | | | | Virbickas (1998) |
| River Lėvuo | 49 | 95 | 130 | 168 | 184 | | | | | | Virbickas (1998) |
| River Warta[1] | 76 | 90 | 112 | 135 | 150 | | | | | | Zielinski (1991) |
| River Vilnia | 43 | 72 | 124 | 137 | 165 | 175 | | | | | Virbickas (1998) |
| River Bilsinyčia | 63 | 73 | 100 | 122 | 142 | 172 | | | | | Virbickas (1998) |
| River Zelivka | 53 | 74 | 90 | 115 | 149 | 175 | | | | | Lentovyč (1974) |
| River Lomena | 45 | 80 | 99 | 105 | 138 | 160 | 180 | | | | Virbickas (1998) |
| River Wełna | 54 | 90 | 87 | 134 | 174 | 183 | 185 | 189 | | | Wołoszyński (1963) |
| River Jihlava | 42 | 72 | 89 | 121 | 143 | 166 | 180 | 186 | 196 | | Losos et al. (1980) |
| River Ourthe | 52 | 114 | 152 | 188 | 207 | 216 | 223 | 235 | 239 | | Phillipart (1971) |
| River Turiec | 49 | 84 | 114 | 139 | 163 | 185 | 204 | 219 | 237 | 251 | Krupka (1969) |

[1] November 1988 data set converted from TL using the formula given for the species at www.fishbase.org: SL = FL*0.835.

Continental (mean = 110.2 mm; SE = 6.68). But after about age 5, the growth rates declined in English dace and do not achieve the higher lengths at age of Continental populations (Figure 4), though the mean SL at ages 8, 9 and 10 (Table 4) did not differ significantly between English and Continental populations (ANOVA, $P > 0.05$). Such variations in growth are well known in dace and have been linked to differences in ambient water temperature regime (Lobón-Cerviá et al. 1996). Dace captured in 1998 from the upper River Lee appear to be somewhat shorter lived than other English and most Continental populations (Table 4), though dace > 5+ in the River Stour were also rare (Mann 1974) and one Siberian population (River Sudelka) achieved age 6 only (Lobón-Cerviá et al. 1996). Some larger dace were captured in the Lee in

other years, when ageing was not undertaken (up to 258 mm SL in 1992; up to 251 mm SL in 2002; Figure 2); based on the English composite growth trajectory (Figure 4), these fish may have achieved age 10 or 11.

Throughout the 1990s, the River Lee between Stanborough and Hertford was of a consistently good water quality and supported a variable number of dace, especially in the remnant side loops of the original river (Pilcher et al. 2004). Dace numbers in the upper Lee were concentrated just upstream of Hertford at Hartham Common during 1991–2, the approximate mid-point of the river's course, with relatively few dace found in stretches further upstream (Figure 2). The apparent shift in focal point for the population from Hertford in 1991–3 to Lemsford/Holwell in 1998 and Wheathamstead in 2002–3 (Figure 2) may reflect changes in water quality, which is a requirement of sustainable dace populations (Mann and Mills 1986). In the early 1990s, the biological water quality in the upper Lee (between the East Hyde sewage treatment works and Wheathampstead) was recorded (Environment Agency public archive) to of grade 'F – bad', which means 'Biology limited to a small number of species very tolerant of pollution' (Environment Agency website: http://www.environment-agency.gov.uk/). Following remedial measures to upgrade the sewage treatment works during the 1990s, the water quality improved to category 'B – good' (i.e. 'Biology is a little short of an unpolluted river'). Following these improvements in water quality, the numbers of dace appear to have increased in parts of the upper Lee (Figure 2), though numbers remain low in the section immediately downstream of Luton (Environment Agency, unpublished data). In this stretch, recolonization appears to be impeded by water retention structures (e.g. at Batford), as dace have not been captured in these upper sections since before the 1991–2 survey (Table 1).

In conclusion, the River Lee dace population may be undergoing fluctuations in density and size structure, but this does not appear to have resulted in particularly poor growth, though the values are below the mean (57 mm SL) for UK populations. However, lifespan may be shorter and body condition (plumpness) appears to be lower than in other populations for which data are available. Perceived fluctuations in the Lee dace population, based on the presented data (Tables 1 and 2, Figure 2) and field observations, could simply be the result of diel and seasonal movements, which can occur in dace populations over short periods (Garner and Clough 1996, Clough and Beaumont 1998, Lucas et al. 1999). The assessment of the dace's status, as with all fish species in the River Lee, is impeded by the lack of regular fish surveys along the river's course during the last decade. Therefore, there are important questions that require attention in order to examine the dace's status in the River Lee: 1) Do they reach a size adequate for maturation? 2) Is there sufficient and adequate spawning habitat? 3) Can the spawning habitat be reached at the appropriate time of the year? If yes, then how good is survival amongst the young-of-the-year and ≥1+ juveniles? The persistence of dace in the Lee and the available data on size structure (Figure 2) suggest that an adequate size for maturation is being achieved. Whether there is sufficient and adequate spawning habitat remains to be determined, but the stream bed of the upper Lee is known to subjected to elevated levels of nutrients and fine sediments (Faulkner and Copp 2001), which have resulted in areas of clogged and compacted gravel beds (G. H. Copp, pers. obs.). The combination of elevated nutrient levels and clogged sediments may be limiting the amount of suitable spawning habitat for this phyto-lithophilous spawning fish. Whether the suitable spawning areas can reached remains to be determined.

Dace are known to circumvent weirs elsewhere in England (Clough and Beaumont 1998, Lucas et al. 1999), with large shoals of dace reported to congregate below the weirs prior to spawning, waiting for a spate to permit passage (Clough and Ladle 1997). These migrations appear to be an important annual event in sustaining the population, but patchy distribution of dace along

the Lee (Table 1) and the absence of dace upstream of the weir at Batford suggests this obstruction cannot be circumvented. Passage of some of the other numerous weirs on the Lee may be more difficult than elsewhere in England, but this will require further study using mark-recapture and/or telemetry techniques. Finally, the question of survival rates in dace larvae and juveniles requires further study. Initial studies of young fishes on the upper Lee (Table 2) reported 0+ dace to be infrequent encountered (if at all) and in low relative densities (Pilcher and Copp 1997), and this included intensive sampling was over a twenty-four-hour period (see Table 2: Copp 2004, Copp et al. 2005; Vilizzi and Copp, unpublished) and studies of 0+ fish drift (Copp et al. 2002).

Therefore, as part the telemetry and population dynamics studies mentioned above, future research on dace in the upper Lee needs to include the evaluation of spawning habitat (suitability, availability), reproductive and early recruitment success, and the patterns of habitat use during early life (larvae, juveniles and pre-spawning adults).

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# Book reviews

***John Ray (1627–1705) — pioneer in the natural sciences. A celebration and appreciation of his life and work.*** Malcolm Bryan. The John Ray Trust, 2005. 98 pp., softback. ISBN 0 9550150 0 6. Obtainable from The John Ray Trust, The Town Hall Centre, Market Square, Braintree, Essex CM7 3YG. £6.75 post-free.

The John Ray Trust exists to spread greater awareness and understanding of the work and life of John Ray, the 'Father of Natural Historians'. In *The London Naturalist* **80** (2001) we reviewed the Trust's previous publication *John Ray and his successors: the clergyman as biologist.*

In the present volume, Malcolm Bryan, who has been chairman of the Trust since 1986, has built up a broader picture of John Ray, much of it from scattered sources, and is now able to bring to the readership greater details of Ray's life and work. The author discusses Ray's predecessors in the natural sciences, his contributions to science and his belief in God, and he explores life in the seventeenth century as it affected Ray. Finally, he interprets Ray's legacy.

This volume, published to celebrate the tercentenary of the death of John Ray, is a valuable addition to the biography of the 'English Linnaeus'.

K. H. Hyatt

***Water bugs and water beetles of Surrey.*** Jonty Denton. Surrey Wildlife Trust, Pirbright, Woking. 2007. 191 pp., 32 colour plates, colour dust-jacket. ISBN 978 0 9556188 0 2. £15, plus £2.40 p. & p. to Atlas Sales, Surrey Wildlife Trust, School Lane, Pirbright, Woking, Surrey GU24 0JN.

During the last twenty-five years the Surrey Wildlife Trust has brought out nine titles in the Atlas series. Except for one on amphibians and reptiles, they have all dealt with various groups of insects found in the county. A tenth volume bearing the above title has now been published and it is a worthy addition to the series, maintaining the high standard of production its predecessors demonstrated.

The format remains similar to the earlier volumes in that the author deals with the two orders systematically and that each species is arranged in its family sequence. Altogether, fifty-nine water bugs and 283 water beetles are described. This includes those individuals that may be rare or local on Surrey as well as those that are frequent or of common distribution throughout the county. Maps indicating distribution of records are given on a tetrad basis (i.e. in the 2 × 2 km squares into which the county is divided). Some maps show that a species present may be based on an old nineteenth or early twentieth-century record and nothing since. It is hoped therefore that this new book will stimulate further investigation and will confirm their existence today. The many clear coloured photographs as a help in identification will aid measurably towards this.

In the opening section Mr Denton, now a freelance ecologist, gives a general description of the survey area; what insects are considered as water bugs and water beetles; an outline of their biology, locomotion and dispersal, etc. A brief overview of the county's geology and land use follows together with an account of the aquatic systems (rivers, streams, lakes and ponds). The section ends with a short note on conservation and a brief list of suitable identification guides. Up till now there have been few such publications available at a reasonable price as is the the present one, and have been so well illustrated, particularly for water beetles.

To all those members and other interested in pond-dipping, whether beginner or have been following these two groups of insects for some time, this new book is one that can be highly recommended.

Eric W. Groves

# Further additions and corrections to the list of Middlesex micro-moths (Lepidoptera)

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## Abstract

An existing list the microlepidoptera of Middlesex (vice-county 21), produced in 2002 and updated in 2004, is now further updated by the addition of thirty-six species reported here for the first time in that county, by the deletion of two species whose position in the Middlesex fauna is regarded as incorrect, and by the provision of data for thirteen species whose position in the list, whilst reliable, was not previously supported by detailed data. Recent records of a further thirty-five species, previously unreported in Middlesex for at least twenty years, are presented. The total number of microlepidoptera species reliably recorded in Middlesex now rises to 931.

## Introduction

A provisional list of the microlepidoptera fauna of Middlesex was produced five years ago (Plant 2002); this reported that 880 species of microlepidoptera were positively reported for vice-county 21; a further eighteen species that had been previously reported were noted as erroneous and were deleted from the county fauna. A supplement to this work was produced two years later (Plant 2004) and added a number of species, deleted a few and provided specific validation for some that had been included without full supporting data. As a result of this revision, the Middlesex micro-moth fauna rose to 897 species, with the addition of eighteen extras and the deletion of one that subsequent investigations showed to have been included in error.

Since then, a small number of people have been intensively surveying micro-moths in various parts of Middlesex. John Hollingdale provides many records from the Stanmore area and Ray Softly continued to operate his celebrated balcony trap at Parliament Hill until the end of 2005; he is now spending his time analysing the lengthy list that he has accumulated from here over many decades. Eleven of the thirty additional species to the county fauna, as well as eight of the confirmed or significantly updated records, were made by Marcel Ashby at his garden in Hornsey, just up the road from the Wood Green Shopping Centre. His total from this unpromising location includes one species new to Britain known so far only from his garden, plus another new-to-Britain species that has also been caught in a number of other localities as well as the fifth and sixth British records of a third species! All this emphasizes both the under-recorded nature of much of the urbanized London area within Middlesex and of the rewards that are available for those who make the effort to record regularly in these places. Further out, in the Greenford area, David Howdon and Andrew Culshaw have also provided records of microlepidoptera new to Middlesex as well as a significant number of important updates. All these people, and others, have also provided a great many other records, not included here, that are invaluable additions to the Middlesex Moth Database. What is interesting, and very rewarding, is the number of people that do not specialize in the smaller moths but who are, nevertheless, willing to preserve for us the often scale-less micro-moths sometimes found dead in the bottom of light traps and in other places, passing these to us for identification through dissection of their genitalia.

All this has resulted in a further thirty-six species being added to the Middlesex fauna. It seems appropriate to summarize these here. At the same time, further investigations suggest that a further two species are incorrectly recorded and should be deleted. As a result, the number of species of micro-moths for which there is a confirmed Middlesex record rises by thirty-four overall to a new total of 931. The basis for the earlier inclusion of thirteen further species in the Middlesex list is now supported by data and the earliest available records for these species are, therefore, presented. The opportunity is also taken to update the records of a further thirty-nine species that have not been otherwise reported in the past twenty years and to highlight the apparent spread of a further species only recently recognized in Britain.

The additions, deletions, confirmations and updates are now listed. Abbreviations of recorders' initials are as indicated in the first list (Plant 2002); names not abbreviated in that work are given in full except that Rachel Terry is abbreviated to 'RTy'.

## Additions

### The following species are apparently new to Middlesex:

**11** ***Eriocrania cicatricella* (Zett.)**
Fir & Pond Woods, near Potters Bar, netted 27.iii.2007 (RTy).

**76** ***Stigmella carpinella* (Hein.)**
Fir & Pond Woods, near Potters Bar, netted 5.vii.2007 (RTy).

**90** ***Stigmella tiliae* (Frey)**
Fir & Pond Wood Nature Reserve, near Potters Bar, mines, 19.x.2006 (RTy).

**124** ***Tischeria dodonaea* Stt.**
Horsenden Hill, mines, 1.xi.2003 (RTy; det. CWP).

**143** ***Nematopogon metaxella* (Hb.)**
Woodville Road, Barnet, mvl, 15.v. & 25.v.2007 (RTy).

**159** ***Antispila treitschkiella* (F.v. R.)**
Horsenden Hill, mines, 14.ix.2004 (RTy; det. CWP).

**180** ***Diplodoma herminata* (Geoff.)**
Horsenden Hill, at mvl, 17.vi.2003 (RTy).

**238** ***Niditinea piercella* (Bent.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, 16.vi.2006 (RTy).

**233** ***Monopis fenestratella* (Heyden)**
Holland Park, one at mv light, 20.vi.2005 (TF). Probably overlooked.

**347** ***Phyllonorycter anderidae* (Fletcher)**
Horsenden Hill, mines, 1.xi.2003 (RTy; det. CWP).

**409b** ***Argyresthia cupressella* Walsingham**
Hornsey, N8, 1♂ at garden light trap, 9.vi.2006 (MA; gen. det. RTy). Almost certainly a new arrival to Middlesex, rather than a previously overlooked species.

**—** ***Prays* sp.**
**New to science** – awaiting publication. Parliament Hill, Hampstead, 1♂ at actinic light on a balcony, 15.viii.2003 (RAS) in coll. CWP; Hornsey, 1♂ at mvl, 6.ix.2005 (holotype), (MA; in coll. DJLA); Chelsea Physic Garden, 1♀ at mvl, 19.vi.2005 (TF); Greenford, 1♀ at mvl, 5.x.2005 (D. Howdon; in coll. BM(NH)); Hornsey, 1♂ at mvl, 28.vii.2006 (MA) and Woodville Road, Barnet, 1♀ at mvl, 18.x.2006 (RTy), both in coll. RTy. The discovery of six individuals at widely spaced localities in north London over a period involving four years is extraordinary.

**567** ***Colephora adspersella* Benander**
Woodville Road, Barnet, mvl, 15.vii.2007 (RTy).

**572** ***Colephora vestianella* (L.)**
Greenford, at mvl, 6.vii.2006 (A. Culshaw, gen. det. RTy).

**590** ***Perittia obscurepunctella* (Stt.)**
Fir & Pond Woods, near Potters Bar, netted, 27.iii.2007 (RTy).

**606** ***Elachista humilis* Zell.**
Woodville Road, Barnet, mvl, 12.v.2007 (RTy).

**760** ***Exotelia dodecella*** **(L.)**
Hornsey, N8, 1♂ at mvl, 21.vii.2004 (MA: gen. det. RTy). Probably an overlooked resident.

**730** ***Apodia bifractella*** **(Dup.)**
Woodville Road, Barnet, at mvl, 10.viii.2005 (RTy);

**808** ***Platyedra subcinerea*** **(Haw.)**
Hornsey, N8, 1 at garden light trap, 16.vi.2004 (MA; gen. det. RTy). Probably an overlooked resident.

**964a** ***Cochylis molliculana*** **Zell.**
Horsenden Hill, at mvl, 21.vi.2003 (RTy); Kensington Gardens, 2.viii.2005 (TF). Almost certainly a new arrival in Middlesex, rather than a previously overlooked species.

**990a** ***Dichelia histrionana*** **(Frölich)**
Hornsey, N8, 1♂ at mvl, 8.vi.2003 (MA; gen. det. PHS). **New to Britain** (see Sterling and Ashby, 2006. *Entomologist's Rec. J. Var.* **118**: 19–22).

**1034** ***Spatalistis bifasciana*** **(Hb.)**
Hornsey, N8, 1 at mvl, 14.vi.2004 (MA; gen. det. RTy). A surprising, but correct record.

**1146** ***Endothenia rubiginosana*** **(H. – S.)**
Hornsey, N8, 1♂ at garden light trap, 20.vi.2004 (MA; gen. det. RTy). Probably an overlooked resident.

**1154** ***Epinotia caprana*** **(Fabr.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, at mvl, 1.ix.2006, gen. det. (RTy).

**1222** ***Strophedra niditana*** **(Fabr.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, at mvl, 28.vi.2006, gen. det. (RTy).

**1229** ***Pammene albuginana*** **(Guen.)**
Perivale Wood, 1♂ at light 14.v.2004 (D. Howdon and A. Culshaw, gen. det. RTy). Probably an overlooked resident.

**1269** ***Cydia conicolana*** **(Heylaerts)**
Hornsey, N8, 1♀ at mvl, June 2006 (MA; gen. det. RTy). Probably an overlooked resident.

**1289** ***Euchromius ocellea*** **(Haw.)**
Wembley, 27.ix.2006 (G. Geiger; det. conf. CWP from photographs of adult, but specimen not retained). There remains the smallest possibility of this being a different *Euchromius* species, since absolute confirmation would ideally involve genitalia dissection and there is no specimen, though I consider this possibility rather remote.

**1374a** ***Sclerocona acutellus*** **(Eversmann)**
Woodville Road, Barnet, at mvl, 9.vi.2004 (RTy) (Terry 2004).

**1403a** ***Duponchelia fovealis*** **Zell.**
Hornsey, N8, 1 at garden light trap, 8.ix.2005 (MA).

**1404** ***Hymenia recurvalis*** **(Fabr.)**
Woodville Road, Barnet, at mvl, 28.x.2006 (RTy).

**1414** ***Synaphe punctalis*** **(Fabr.)**
Bushy Park, 5 in acid grassland area, 1.viii.2007 (TF).

**1441** ***Oncocera semirubella*** **(Scop.)**
Greenford, 1 at mvl, 23.vi.2005 (D. Howdon det. CWP).

**1451a** ***Etiella zinckenella*** **(Tr.)**
Hornsey, N8, at garden light trap, 1♂ on 27.vii.2006 and 1♀ on 9.viii.2006 (MA, det. CWP). Fifth and sixth British records (see Ashby 2006. *Entomologist's Rec. J. Var.* **118**: 200–201).

**1477** ***Ephestia figulilella*** **(Gregson)**
Hornsey, N8, 1 at mvl, 14.vi.2003 (MA; gen. det. RTy).

**1478b** ***Vitula biviella*** **(Zell.)**
Woodville Road, Barnet, mvl, 12.vii.2007 (RTy).

## Confirmation of previously unsupported records

**The following twelve species were included in the original listing for Middlesex (Plant 2002) on the basis of a dot for Middlesex appearing in the vice-county distribution map in the relevant volume of *MBGBI*. The data in support of those records is not available. The following**

**records therefore provide the first confirmed records for VC 21 that are supported by data:**

64 ***Stigmella continuella* (Stt.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, mines, 13.ix.2006 (RTy; det. B. Goodey);

115 ***Stigmella alnetella* (Stt.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, mines, 19.x.2006 (RTy; det. CWP);

498 ***Coleophora alnifoliae* Barasch**
Woodville Road, Barnet, mvl, 9.vii.2007 (RTy).

602 ***Elachista apicipunctella* Stt.**
Fir & Pond Woods, near Potters Bar, netted, 19.iv. & 5.vii.2007 (RTy).

631 ***Cosmiotes freyerella* (Hb.)**
Hornsey, 1♂ at mvl, 26.vii.2002 (MA; gen. det. RTy); Horsenden Hill, at mvl, 14.viii.2004 (RTy).

724 ***Metzneria lappella* (L.)**
Hornsey, 1♂ at mvl, 10.vii.2006 (MA; det RTy; genitalia slide seen CWP).

801 ***Gelechia scotinella* (H.- S.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, 1♂ at mvl, 5.viii.2006, gen. det. (RTy);

936 ***Cochylimorpha straminea* (Haw.)**
Horsenden Hill, at mvl, 19.vii.2003 (RTy). Overlooked resident — several records since.

1016 ***Cnephasia longana* (Haw.)**
Hornsey, 1♂ at mvl, 24.vii.2006 (MA; gen. det. RTy).

1047 ***Acleris schalleriana* (L.)**
Hornsey, N8, at mvl, 16.vi.2004 (MA; gen. det. RTy).

1245 ***Grapholita janthinana* (Dup.)**
Horsenden Hill, at mvl, 23.vii.2004 (RTy).

1257 ***Cydia nigricana* (Fabr.)**
Yeading Meadows Nature Reserve, Ealing, 1 at mvl, 16.vi.2004 (RTy).

**The existing record of the following species was not based on genitalia dissection and the specimen was not available for examination. The following record has been confirmed by genitalia dissection:**

849 ***Syncopacma cinctella* (Cl.)**
Chelsea Physic Garden, 1 on 19.vi.2005 (TF).

## Significant updates of species already listed

**The following records significantly update existing records for thirty-nine species previously unreported in Middlesex (Plant 2002), but which do not appear to have been otherwise reported here for at least twenty years. The place and year of the last record as reported in Plant (2002) is also given:**

36a ***Ectoedemia heringella* Mariani**
Apparently spreading from Buckingham Palace Garden, where it was first noted for Britain in 2001. More recent records of larval mines on *Quercus ilex* include Adelaide Road Local Nature Reserve, Camden, 21.ii.2006 (CWP), Broomfield Park, Enfield, 15.1.2007 (E. Goodyear; det. CWP) and Pymmes Park, Enfield, 15.1.2007 (E. Goodyear; det. CWP).

136 ***Lampronia corticella* (L.)**
Woodville Road, Barnet, netted from garden raspberry, 8.vi.2005 (RTy). Last recorded at Ruislip, 1959.

154 ***Heliozella sericiella* (Haw.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, netted 19.x.2006 (RTy). Last recorded Buckingham Palace Garden, 1982.

189 ***Epichnopterix plumella* (D.& S.)**
Yeading Meadows Nature Reserve, Ealing, netted, 16.v.2004 (RTy). Last recorded at Ruislip, 1959.

**267** ***Bucculatrix maritima* Stt.**
Hornsey, N8, at mvl, 5.viii.2004 (MA; det RTy). Last recorded Buckingham Palace Garden, 1982.

**299** ***Parectopa ononidis* (Zell.)**
Woodville Road, Barnet, at mvl, 25.vii.2006 (RTy); Last recorded Scratch Wood, 1981.

**333** ***Phyllonorycter salictella* (Zell.) ssp. *viminiella* (Sirc.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, 19.x.2006, (RTy; det. CWP). Last recorded Enfield, 1972.

**335** ***Phyllonorycter salicicolella* (Sirc.)**
Horsenden Hill, Greenford, mines and pupa, 5.xii.2004 (RTy); Fir & Pond Wood Nature Reserve, near Potters Bar, 23.ix.2006, (RTy; det. B. Goodey). Last recorded Ruislip, 1959.

**409** ***Argyresthia ivella* (Haw.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, netted, 1.ix.2006, (RTy). Last recorded Enfield Highway, 1972.

**416** ***Argyresthia glaucinella* Zell.**
Horsenden Hill, Greenford, at mvl, 21.vi.2003 (RTy). Last recorded Harrow Weald Common, 1965.

**431** ***Yponomeuta sedella* Tr.**
Greenford, at mvl, 4.viii.2006 (A. Culshaw; det. RTy). Last recorded Enfield, 1978.

**442** ***Cedestis gysseleniella* (Zell.)**
Greenford, at mvl, 23.vi.2005 (D. Howdon; det. RTy). Last recorded Whitewebbs Park, 1980.

**445** ***Ocnerostoma friesei* Svensson**
Woodville Road, Barnet, at mvl, 4.v.2006 (RTy). Last recorded Trent Park, Enfield, 1975.

**581** ***Coleophora taeniipennella* H.- S.**
Hornsey, N8, 1♀ at mvl, 8.vii.2003 (MA; det RTy). Last recorded Buckingham Palace Garden between 1965 and 1989 but no further data available.

**589** ***Coleophora clypeiferella* Hofmann**
Woodville Road, Barnet, at mvl, 15.viii.2004 (RTy). Last recorded Buckingham Palace Garden. 1967.

**661** ***Pseudatemelia flavifrontella* (D.& S.)**
Woodville Road, Barnet, at mvl, 29.vii.2004 (RTy); Holland Park, 9.vi.2005, gen. det. (TF). Last recorded Stanmore Common, without date.

**758** ***Recurvaria leucatella* (Cl.)**
Greenford, at mvl, 6.vii.2006 (A. Culshaw; det. RTy). Last recorded Stanmore Common. 1965.

**762** ***Athrips mouffetella* (L.)**
Woodville Road, Barnet, at mvl, 14.vii.2004 (RTy). Last recorded Hampstead 1984.

**825** ***Phthorimaea operculella* (Zell.)**
Parliament Hill, at actinic light, 24.vii.2002 (RAS; det. RTy). Last recorded Regent's Canal Dock, 1938.

**854** ***Anacampsis blattariella* (Hb.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, at mvl, 1.ix.2006, (gen. det. RTy). Last recorded Hampstead, 1983.

**858** ***Hypatima rhomboidella* (L.)**
Parliament Hill, at actinic light, 1.viii.2002 (RAS; det RTy); Fir & Pond Wood Nature Reserve, near Potters Bar, at mvl, 19.vii.2006, (RTy). Last recorded Ruislip, 1959.

**907** ***Dystebenna stephensi* (Stt.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, at mvl, 19.vii.2006, (RTy). Last recorded Fulham Palace Gardens, 1998.

**982** ***Choristoneura diversana* (Hb.)**
Perivale Wood, at mvl, 1.vi.1990 (Peter Edwards).

**1002** ***Lozotaenia forsterana* (Fabr.)**
Woodville Road, Barnet, at mvl, 11.vi.2003 (RTy). Last recorded Ruislip, 1959.

**1018** ***Cnephasia communana* (H.- S.)**
Horsenden Hill, Greenford, at mvl, 21.vi.2003 (RTy). Last recorded Ruislip, 1959.

**1022** ***Cnephasia pasiuana* (Hb.)**
Woodville Road, Barnet, at mvl, 12.vii.2006 (RTy). Last recorded Buckingham Palace Garden, 1963.

1027 ***Neosphaleroptera nubilana* (Hb.)**
Ickenham Marsh, 19.vi.2002, males attracted to *Synanthedon formicaeformis* pheromones (CWP — see Plant 2003); Fir & Pond Wood Nature Reserve, near Potters Bar, netted, 22.vi.2006, (RTy). Last recorded at Enfield, 1977.

1045 ***Acleris notana* (Donovan)**
Yeading Meadows Nature Reserve, Ealing, at mvl, 9.vii.2003 (RTy). Last recorded at Hampstead, 1982.

1064 ***Celypha rosaceana* (Schl.)**
Woodville Road, Barnet, at mvl, 19.viii.2006 (RTy). Last recorded Enfield Highway, 1971.

1107 ***Lobesia botrana* (D.& S.)**
Hornsey, at mvl, 20.vii.2006. (MA; gen. det. RTy). Last recorded at Hampstead, 1985.

1120 ***Ancylis mitterbacheriana* (D.& S.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, 3.v.2006 (RTy). Last recorded Ruislip, 1959.

1142 ***Epinotia tedella* (Cl.)**
Melville Avenue, Greenford, at mvl, 23.vi.2005 (D. Howdon; det. RTy). Last recorded Buckingham Palace Garden, 1984.

1184a ***Epiblema cirsiana* (Zell.)**
North Greenford Countryside Park, netted, 24.v.2003 (RTy). Last recorded Enfield, 1974.

1227 ***Pammene giganteana* (Peyerimhoff)**
Perivale Wood, 1♂ at mvl, 24.iii.2005 (A. Culshaw and D. Howdon; gen. det. RTy). Last recorded Ruislip, 1959.

1239 ***Pammene rhediella* (Cl.)**
Perivale Wood, at mvl, 14.v.2005 (A. Culshaw and D. Howdon; det. RTy). Last recorded Enfield, 1972.

1290 ***Chilo phragmitella* (Hb.)**
Kensington Gardens, 26.vii.2005 (TF). The last report was from Ruislip in 1957.

1430 ***Paralipsa gularis* (Zell.)**
Hornsey, 13.vi.2004 (MA; gen. det. RTy). Last recorded at Finsbury Park, 1932 and Ruislip, 1957.

1433 ***Cryptoblabes bistriga* (Haw.)**
Fir & Pond Wood Nature Reserve, near Potters Bar, at mvl, 16.vi.2006, (RTy). Last recorded Ruislip, 1959.

1485 ***Phycitodes maritima* (Tengst.)**
Woodville Road, Barnet, at mvl, 29.vii.2004 (RTy). Last recorded Enfield Highway, 1972.

## Deletions

**The following species must be deleted from the Middlesex list for the reasons stated:**

1374 ***Paratalanta hyalinalis* (Hb.)**
The reliability of the only Middlesex record, that from Osterley Park in 1987, is now regarded as highly dubious. It was recorded by the same person who reported 1447: *Sciota hostilis* (see next deleted species) and as far as we are able to ascertain is not supported by a voucher specimen.

1447 ***Sciota hostilis* (Steph.)**
Evidence has surfaced that indicates that the only Middlesex record of this species, from Osterley Park on 2.vii.1987, represents an error. It was originally published by the captor in his checklist (Bradley 2000) as unconfirmed. Discussion with Bernard Skinner indicates that the date is somewhat late in comparison with other British records, the location improbable, no specimen was retained and the captor was unfamiliar with this species, which is similar to several other expected species.

## Acknowledgements

We are grateful to the many people who are now submitting either records for consideration or specimens for examination; the absence of a person's name in the

present update does not in any way indicate that their records are not wanted. CWP wishes to add thanks to Bernard Skinner for useful discussion on the subject of the two deleted species and to John Langmaid, who is custodian of the microlepidoptera data behind the distribution maps in the series *Moths and butterflies of Great Britain and Ireland*, for discussing and checking various other records.

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TERRY, R. 2004. *Scleroconus acutellus* (Eversmann) (Lep.: Pyralidae) new to Middlesex, as a probably primary immigrant. *Entomologist's Rec. J. Var.* **116**: 145–146.

# Book review

***Domino guide to the insects of Britain and western Europe.*** Michael Chinery. Revised edition, 2007. A & C Black, London. 320 pp., softback, £14.99. ISBN 978 0 7136 7239 8.

I bought my Collins version of this book in 1991, which was originally published in 1986, but has unfortunaley been out of print for many years. The new revised 2007 edition is now a Domino guide. Chinery is a prolific and much-respected author with many titles under his belt on general and garden wildlife as well as insect guides including the similarly titled *Insects of Britain and Northern Europe,* and in 2005 we had the Collins photoguide *Complete British Insects.*

So how does this revised edition compare with the earlier volume? On first glance it looks very much the same as the original. The cover illustrations are unchanged as are the plates inside with no new additions. The text on the whole is similar for most species, though there are some changes for a few species, for instance under long-winged conehead, that this species has recently begun extending its range inland, yet under Roesel's bush-cricket there is no mention of the similar dynamic expansion of this species! Another bush-cricket is mentioned in this new version for the first time — *Meconema meridionale,* though not given its English name of southern oak bush-cricket, which has recently become established in the south of England.

One of the more obvious changes in the text from the original is that virtually all of the British Odonata are given their standard English names (even if some would like us to change some of these!), whereas in the original only three dragonflies were given English names. The nomenclature has been updated with *Agrion* becoming *Calopteryx,* though for some strange reason, *C. splendens* hasn't been given its English name of beautiful demoiselle.

There seems to be some inconsistency in that some of the ladybirds are given English names whereas othere which have generally accepted English names are referred to only by their scientific name. I think this is a missed opportunity as many casual naturalists are still imtimidated by scientific names and it makes the guide slightly less accessible for easily learnt species. Personally, I would have liked to have seen the increasingly common spider *Argiope bruennichi* given its English name of wasp spider, as this is the sort of beast that attracts the attention of young schoolchildren who can grasp this name far easier than its tongue-twisting scientific name. Nor is there any mention of the rapid change in status of this spider. Also, the scientific nomenclature hasn't always been updated. The familiar longhorn beetle that was known as *Strangalia maculata* (the name used here) has long since been moved by the taxonomists, initially to *Leptura* and currently *Rutpela.*

Overall I still thoroughly recommend this volume as by far the best general insect fieldguide to the insects found in this country, though if you have the original version, the small changes don't justify buying the new edition. It is good news to have this guide available again but I think an opportunity to incorporate some new species which have become prominent in out insect fauna was wasted. I would certainly have included the newly established harlequin ladybird *Harmonia axyridis,* which is now possibly the commonest ladybird around the London area, and probably the rosemary beetle *Chrysolina americana,* as another incresingly common introduction that is the sort of insect that attracts general interest of both gardener and naturalist, and maybe another dynamic recent colonist, the small red-eyed damselfly *Erythromma viridulum.*

Until a more heavily revised version appears I will still be out in the field with my original version, but if you don't have this, then this is an essential purchase to aid insect identification, provided you remember the huge number of insect species that occur in the UK and that no guide could ever include more than a fraction of these.

NEIL ANDERSON

# The macrolepidoptera (Heterocera) of High Beach, Epping Forest, 1979–1981, with a comparison of some modern distributions

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## Abstract

A species list of nocturnal macrolepidoptera for the High Beach area of Epping Forest was compiled from 1979 to 1981, including estimates of the annual abundance for each species. Of the 283 species recorded, 70 had not been noted since 1950. Eight species appeared to represent new records for the Forest at the time the survey was carried out. The distribution of some of the more unusual species is compared with modern data. A discussion of melanic forms and variations is included.

## Introduction

For many years now the authors have been in possession of an extensive data set of the Lepidoptera for a historically important area of Essex, namely High Beach in Epping Forest. With the advent of a new millennium and recent emphasis on preserving biodiversity we felt it may prove useful to future entomologists to put these data on record and discuss their significance.

Epping Forest is not noted for the diversity of its Lepidoptera, particularly butterflies. Emmet (1979), in an article on the historical recording of Epping Forest's Lepidoptera, showed that 89 per cent of the total number of lepidopterous species ever recorded from Essex have been recorded somewhere in the county since 1950. However, for Epping Forest only 51 per cent of the species ever recorded there had been seen since 1950. He attributed this low figure to under-recording, particularly since there was little evidence of recent fieldwork. In view of this, the authors decided to survey the larger moths of the High Beach area, concentrating on the nocturnal species.

## Methods

The grounds of the Conservation Centre at High Beach (OS Map Ref. TQ 413981) were the focus of the survey. These cover approximately one hectare and were comprised of rough grassland and a small pond and gardens, the whole being bordered by lime *Tilia platyphyllos* trees interspersed with oaks *Quercus robur*, silver birch *Betula pendula*, hornbeam *Carpinus betulus*, sallow

*Salix caprea*, sycamore *Acer pseudoplatanus* and Scots pine *Pinus sylvestris*. The surrounding Forest is comprised mainly of pollarded beech *Fagus sylvatica* with stands of birch. The undergrowth is predominately bracken *Pteridium aquilinum* and bramble *Rubus* spp. and there are open areas of grasses.

The survey commenced during April 1979 and concluded in December 1981. A 125W mercury-vapour Robinson light trap was the main sampling technique used. This was powered from the Conservation Centre and operated on a sheet. The trap was usually run from dusk until after dawn, approximately every other week from May until October. During 1980 and 1981 the sampling frequency was increased to once or twice each week over the summer months. On most occasions the light was attended until around 01.00 in order to record taxa drawn to the lamp but not entering the collection chamber. In addition, on a number of occasions during 1980 and 1981 a small portable 6W actinic trap was deployed at various sites in the nearby Forest. Dusking proved successful on numerous occasions and sugar was an additional technique used, occasionally to advantage, mostly during the spring and autumn. Sweep nets and beating trays were employed for larval surveys.

## Results

In total 283 species from thirteen families were recorded from within and around the Conservation Centre (see Appendix). Taxa apparently unrecorded since 1950 are indicated with a single asterisk, while those apparently then new to the Forest are indicated with a double asterisk. The abundance of each species is given on a yearly basis to assist in evaluating their relative frequencies and to illustrate short-term trends in population change. Critical species were verified by reference to published keys such as Classey (1954), collections at the Natural History Museum and the British Entomological and Natural History Society.

## Discussion

In preparation for his historical appraisal of the Lepidoptera of Epping Forest in 1979, Emmet compiled a list of species recorded up to 1977. This unpublished list was deposited at the Conservation Centre and has been used as a baseline for the current survey. As Emmet pointed out, his list is not exhaustive but summarizes the more obvious literature. Unpublished records for the Forest, i.e. in collections, were not included. Despite these limitations, Emmet's list makes a valuable contribution to our knowledge of the Lepidoptera of Epping Forest and has provided a firm basis from which to comment on the data from this survey. From this list it is evident that at least 989 species of Lepidoptera had, at that time, been recorded from the Forest. Some 487 of these are 'macrolepidoptera – Heterocera'. However, since 1950 only 264 species of macros from fourteen families had been observed.

The number of taxa per family recorded during the survey are compared with a similar breakdown for the taxa recorded since 1950 on Emmet's list (Table 1). The two families with the largest change in numbers of species as a result of this survey are the Geometridae, increasing by nineteen compared with Emmet's post-1950 list, and the Noctuidae, increasing by six. That these two families should show the greatest numerical change is not surprising, as they are the largest families of macrolepidoptera.

In total, 283 species from thirteen families were recorded from this very limited area of Epping Forest during our survey. This number of species from such a small area clearly supports the view of Emmet that Epping Forest as a whole has been under-recorded, at least since 1950. Furthermore, on comparison with Emmet's unpublished list it was found that some seventy species from this survey (25 per cent of the total recorded) had not been noted from the Forest since 1950, and eight of these were apparently new to the

Forest at the time of this survey. Almost half of these seventy species (43 per cent) appear in the adult state at some time from October to April of the following year. These are the taxa most likely to be overlooked if fieldwork is conducted only during the warmer months.

From Emmet's list it was clear that several species had been recorded widely from the Forest since 1950 but were not observed during our survey at High Beach. This does not imply that they had disappeared from the Forest, merely that they were not seen at this locality during 1979 to 1981. This is particularly true for members of the Sesiidae and Zygaenidae, since the current survey concentrated on nocturnal species.

**Species new to Epping Forest**

Eight species were recorded as new to the Forest at the time of this survey: *Horisme tersata* fern, *Eupithecia millefoliata* yarrow pug, *Macaria notata* peacock moth, *Hypomecis punctinalis* pale oak beauty, *Bupalus piniaria* bordered white, *Hylaea fasciaria* barred red, *Panolis flammea* pine beauty and *Autographa pulchrina* beautiful golden Y. Of these, *H. tersata*, *B. piniaria* and *P. flammea* occurred as singletons during the three-year survey. The contemporary literature (Firmin et al. 1975) describe these as local and scarce in Essex at that time, and this was certainly the case at High Beach. If they were then recent colonists they may have been overlooked due to low numbers. However, as they were scarce elsewhere in Essex at that time their true status was probably that of adventives.

*Eupithecia millefoliata* was discovered as new to Britain in 1939, being first found in Kent that year (Anon. 1981). This species is extending its range, and comparatively large numbers have been reared from larvae swept by the authors in Hainault Forest, Essex. It is not surprising therefore to find it at High Beach, both as adults and larvae.

The occasional occurrence of *Macaria notata* during 1979 and 1980 is of interest, as its status in Essex in the late seventies was described by Firmin et al. (1975) as local and scarce with few recent Essex records. It was first noted by the authors at High Beach prior to this survey (in 1978) and also at Gernon Bushes, a locality near to Epping and the Forest, that same year. Clearly, the moth was resident in the area at that time.

It appears that *Hypomecis punctinalis* was much commoner at High Beach than formerly, as it was of occasional occurrence each year of the survey, but was unrecorded for the Forest prior to this. It is unlikely that such a large and obvious species would have been overlooked in the past, so colonization from surrounding woods is probable. From the authors' personal experience it was common at nearby Hainault Forest and at Thorndon Park near Brentwood during the period of this survey. Similarly, *Autographa pulchrina* is another large and obvious species seen at least once each year during the survey. As such it is probably another recent colonist from surrounding habitats outside the Forest, as it too occurred then in Hainault Forest and at Thorndon Park during this period.

It is interesting, and perhaps significant, that three of these eight species feed on pines in their larval state. The records for *Hylaea fasciaria* in 1979 are of interest. These represent three individuals all seen within a week or two of each other. This moth was not noted in subsequent years of the survey. The larval foodplant (pine) grew in the Forest near to the Conservation Centre grounds and the moth was not rare elsewhere in the county at that time. Consequently, the low numbers of this normally common species are rather perplexing.

**Species unrecorded from the Forest since 1950**

Of the species on Emmet's list that had not been recorded since 1950, mention should be made of *Gastropacha quercifolia* lappet and *Saturnia pavonia*

emperor. The former was seen only once, at light during 1979, despite there being abundant blackthorn *Prunus spinosa* in the High Beach area. Firmin et al. (1975) described the lappet as generally distributed but far from common. By 1985 (Emmet and Pyman 1985) it was considered to be widespread and locally fairly common. No other Essex example has been seen by the authors, before or after the period of this survey. A gravid *S. pavonia* female, which subsequently laid twenty-four fertile ova before release, was recorded at light on 7 May 1981. This was believed by Emmet (pers. comm.) to be the first recorded for Epping Forest that century. Emmet (1979) states 'it is surprising that it had not been recorded in the Forest lately because it is not uncommon in other parts of the county'. However, staff at the Conservation Centre reported that it was seen more frequently there in the years after this survey was concluded.

Of the Thyatiridae, Emmet's list refers to two species not recorded since 1950, *Achylia flavicornis* yellow horned and *Polyploca ridens* frosted green. The imagines of both species emerge early in the year and have probably been overlooked as a result. Both were recorded at High Beach during the survey, the former coming to light in large numbers during 1981.

From the Geometridae, *Archiearis parthenias* orange underwing was recorded once, by day in an open grassy area near the Conservation Centre. Another species, *Idaea straminata* plain wave was recorded at light on several occasions in 1979 and 1981. Firmin et al. (1975) described it as scarce in Essex, with only seven known localities at that time.

Species which are most likely to be overlooked are those which fly early or late in the season. For this reason *Anticlea badiata* shoulder stripe had probably been under-recorded since 1950. Outside this locality it was present in many of the surrounding areas of woodland around this time.

It is surprising that a woodland species such as *Mesoleuca albicillata* beautiful carpet was not seen more frequently during the High Beach survey than the limited number of records indicate. The last published sighting for Essex at the time of this survey was apparently in 1974 (Firmin et al. 1975), so it appears to be a rare species in the county generally.

Harwood, writing in the *Victoria County History* (VCH) for Essex (1903), states that *Abraxas sylvata* clouded magpie was only found in two localities, Epping Forest and Laindon. Firmin et al. (1975) stated that it was still to be found at Laindon, so the singleton seen at light in the grounds of the Conservation Centre in 1979 appears to represent the only record of this species for the Forest at that time. The advent of Dutch elm disease may have had an impact on the abundance of this species, but its larval preference for wych elm *Ulmus glabra* (South 1972), which is more resistant to this disease than other native *Ulmus* species, is problematic in this respect. Indeed, Plant (1993) states that its decline in the London area began long before the epidemic of Dutch elm disease began in the 1970s.

The common occurrence of *Selenia tetralunaria* purple thorn throughout the sampling period is of interest, as the VCH gives only Epping and Hainault Forests, together with Harwich, as Essex localities. However, Firmin et al. (1975) wrote that it was extending its range in the county. It was well established in the High Beach area at the time of this survey, the second generation being abundant in 1979.

Another species of common occurrence, which flies early in the season, *Biston strataria* oak beauty, appears to have been overlooked as it was recorded during all three years of this survey. *Lymantria monacha* black arches had not been seen in the Forest during the twentieth century. A single example, a male, was noted at rest on an illuminated wall of the Conservation Centre during 1979. However, this was one of three or four sightings within the county that year (Emmet, pers. comm.).

A most unusual event occurred in 1980 when *Acronicta alni* alder moth was noted as abundant. It was seen as a singleton in 1979 and was common in 1981. However, in 1980 twelve examples were seen simultaneously on a single night, at rest around and in the Robinson trap. This is another species that has not been noted in the Forest since 1950.

### Melanics and varieties

For many years Epping Forest has been a noted locality in the south of England for the occurrence of melanic varieties of Lepidoptera. The melanic forms and other varieties seen at High Beach, together with their estimated proportion of the sample seen over the three-year survey period (Table 2), show that the Forest still had a high population of melanic forms. Of the more notable taxa the following may be mentioned:

The High Beach populations of *Ochropacha duplaris* common lutestring and *Polyploca ridens* frosted green appear to be 100 per cent melanic, no typical forms having been seen despite the common status of these species. The population of *Biston betularia* peppered moth had a lower incidence of melanism. At the time of this survey its population at High Beach was approximately 30 per cent typical, 30 per cent intermediate and 40 per cent ab. *carbonaria* Jordan. At the other end of the scale, *Eupithecia nanata* narrow-winged pug exhibited a much lower incidence of melanism. Usually seen as the typical form, a single individual of the melanic ab. *oliveri* Prout was recorded in 1979.

One of the more interesting melanics seen during the survey was ab. *nigra* Prout. of *Odontopera bidentata* scalloped hazel. Until 1981 all examples of this fairly common species had been of the typical form. However, on 13 May 1981 a single striking melanic male came to light. Given the reputation of this locality for melanics it is perhaps surprising that ab. *nigra* did not comprise a greater proportion of the population, although South (1972) states that it was then confined to the mosses of Lancashire and Yorkshire.

Another unusual melanic, recorded at light on 14 June 1981, was a single male ab. *concolor* Cockayne of *Calliteara pudibunda* pale tussock. All other examples of this common species were of the typical form. Epping Forest is a noted historical locality for ab. *columbina* Image of *Nola confusalis* least black arches. This was still the case at the time of this survey, as all but one example (recorded in 1981) were of this form. Another species with a population comprised entirely of melanics was *Allophyes oxyacanthae* green-brindled crescent. Here, ab. *capucina* Mill. was commonly recorded during the autumn but the typical form was never seen.

The melanic ab. *plumbea* Cockayne of *Abrostola tripartita* spectacle appeared to increase as a proportion of the population of this species over the period of the survey. By 1981 it represented 70–80 per cent of the population, whereas in 1979 very few melanics were seen.

## Conclusions

Epping Forest is clearly an important Essex site for macrolepidoptera, despite its proximity to the capital. The results of this survey are in agreement with Emmet's position that the area had been under-recorded for many years. Eight species were apparently new to the Forest at the time of the survey, with a further sixty-two not recorded in the previous thirty years or more, and all being recorded from a very limited area of the Forest. Many of these taxa have flight times early or late in the season, hence would be missed by surveys conducted during the 'summer months', whilst several are pine specialists. Thus, it appears that an increase in the planting of pines due to local forestry activity had influenced the distribution of these species in the area. Our survey demonstrated that Epping Forest was still an important locality for melanic forms of Lepidoptera at the time, with some populations being comprised entirely of melanic individuals.

## Acknowledgements

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TABLE 1. Numbers of taxa per family recorded for Epping Forest to 1977 (Emmet 1979) and during this survey at High Beach in 1979–1981.

| Family | Number of taxa | |
|---|---|---|
| | **Epping Forest 1950–1977** | **High Beach 1979–1981** |
| HEPIALIDAE | 4 | 4 |
| COSSIDAE | 2 | 1 |
| ZYGAENIDAE | 4 | 0 |
| SESIIDAE | 1 | 0 |
| LASIOCAMPIDAE | 2 | 3 |
| SATURNIIDAE | 0 | 1 |
| DREPANIDAE | 5 | 5 |
| THYATIRIDAE | 5 | 6 |
| GEOMETRIDAE | 89 | 108 |
| SPHINGIDAE | 7 | 5 |
| NOTODONTIDAE | 13 | 13 |
| LYMANTRIIDAE | 5 | 4 |
| ARCTIIDAE | 7 | 7 |
| NOLIDAE | 2 | 2 |
| NOCTUIDAE | 118 | 124 |
| **Total** | **264** | **283** |

TABLE 2. Melanic forms and variations of Lepidoptera at High Beach, May 1979 to December 1981.

| Species | Aberration | Abundance/comments |
|---|---|---|
| *Ochropacha duplaris* | melanic | 100% |
| *Polyploca ridens* | ab. *fumosa* Warn. | 100% |
| *Pseudoterpna pruinata* | ab. *fasciata* Prout | 1 in 1980 |
| *Idea aversata* | ab. *remutata* Linn. | A common form here |
| *Scotopteryx chenopodiata* | ab. *monodii* Th.-Mieg. | 1 in 1981 |
| *Camptogramma bilineata* | ab. *infuscata* Gumpp. | 10–20% |
| *Ecliptopera silaceata* | ab. *insulata* Haw. | 20%, few very extreme |
| *Chloroclysta truncata* | ab. *rufescens* Strom. | 10% |
| *Thera obeliscata* | ab. *obliterata* White | 100% |
| *Electrophaes corylata* | ab. *ruptata* Hb. | 30% |
| *Hydriomena furcata* | ab. *sordidata* Fabr. | 80% |
| | ab. *obscura* Peyer. | 9% |
| | ab. *obliterata* Prout | 1% |
| *Epirrita dilutata* | ab. *melana* Prout | 1 or 2 in 1979 |
| *Operophtera brumata* | ab. *hueni* Prout | Common |
| | ab. *unicolor* Lam. | 1 in 1979 |
| *Eupithecia subfuscata* | ab. *obscurissima* Prout | 1 in 1981 |
| *E. nanata* | ab. *oliveri* Prout | 1 in 1979 |
| *E. abbreviata* | ab. *herschekei* Bast. | 99% |
| *Lobophora halterata* | ab. *zonata* Thunb. | 1 in 1981 |
| *Odontopera bidentata* | ab. *nigra* Prout | 1 in 1981 |
| *Apocheima hispidaria* | ab. *obscura* Kuhne | 99% |
| *Phigalia pilosaria* | ab. *monacharia* Staud. | 1% |
| *Biston betularia* | ab. *carbonaria* Jordan | 40% melanic |
| | | 30% intermediate |
| | | 30% typical |
| *Agriopis leucophaearia* | ab. *marmorinaria* Esp. | 1 in 1981 |
| *Erannis defoliaria* | ab. *obscurata* Staud. | 60–70% |
| *Peribatodes rhomboidaria* | ab. *australaria* Curt. | 70% |
| *Alcis repandata* | ab. *nigricata* Fuchs | 50% |
| *Hypomecis punctinalis* | ab. *consorbrinaria* Borkh. | 1 in 1981 |
| *Bupalus piniaria* | ab. *flavescens* White | 1 in 1981 |
| *Calliteara pudibunda* | ab. *unicolor* Cockayne | 1 in 1981 |
| *Nola confusalis* | ab. *columbina* Image | 99% |
| *Noctua pronuba* | ab. *ochreabrunnea* Tutt | All of these forms occurred |
| | ab. *brunnea* Tutt | with about the same |
| | ab. *innuba* Tutt | frequency in this locality, |
| | ab. *ochrea* Tutt | except ab. *innuba* which |
| | ab. *caerulescens* Tutt | was much rarer. |
| | ab. *rufa* Tutt | |
| *N. fimbriata* | ab. *solani* Fabr. | All forms were found most years |
| | ab. *rufa* Tutt | |
| | ab. *brunnea* Tutt | |

| Species | Aberration | Abundance/comments |
|---|---|---|
| *Polia nebulosa* | ab. *plumbosa* Mansb. | Rare |
| *Panolis flammea* | ab. *griseovariegata* Goeze | 1 in 1981 |
| *Orthosia cruda* | ab. *nana* Haw. | 1 in 1981 |
| *O. cerasi* | ab. *fasciata* Lenz. | Common |
| *O. incerta* | ab. *melaleuca* Lenz. | 90% |
| | ab. *nebulosus* Haw. | 1 in 1981 |
| *Mythimna pallens* | ab. *ectypha* Hb. | 1 or 2% |
| *Allophyes oxyacanthae* | ab. *capucina* Mill. | 100% |
| *Conistra vaccinii* | ab. *rufa* Tutt | 50% |
| | ab. *unicolor* Tutt | 1–2% |
| *C. ligula* | ab. *subnigra* Haw. | 1 in 1981 |
| *Agrochola macilenta* | ab. *obsoleta* Tutt | 1 in 1980 |
| *Omphaloscelis lunosa* | ab. *agrotoides* Guenée | 1 in 1981 |
| *Xanthia icteritia* | ab. *flavescens* Esp. | 1 in 1980 |
| *Acronicta leporina* | ab. *semivirga* Tutt | 1–2% |
| *A. rumicis* | ab. *salicis* Curt. | 1 in 1979 |
| *Cryphia domestica* | melanic | 50% |
| *Parastichtis suspecta* | ab. *rufa* Tutt | 1 in 1979 |
| | ab. *nigrescens* Tutt | 2% in 1979 |
| *Cosmia trapezina* | ab. *rufa* Tutt | 10% |
| | ab. *ochrea* Tutt | 10% |
| *Apamea crenata* | ab. *alopecurus* Esp. | 90% |
| | ab. *nigro-rubida* Tutt | 5% |
| *A. epomidion* | ab. *lipara* Tams | 60% |
| *A. remissa* | ab. *obscurata* Haw. | 90% |
| *Oligia strigilis* | ab. *aethiops* Haw. | 95% |
| *O. latruncula* | ab. *aeruginis* Edel & Tams | 90% |
| *Mesapamea secalis* | ab. *leucostigmata* Esp. | Common |
| | ab. *nicticans* Esp. | Common |
| | ab. *i-niger* Haw. | Scarce |
| *Diachrysia chrysitis* | ab. *juncta* Tutt | 70% |
| *Abrostola tripartita* | ab. *plumbea* Cockayne | 70% |

# Appendix

## Macrolepidoptera — Heterocera recorded during the High Beach survey

| Family | Genus | Species | Abundance | | |
|---|---|---|---|---|---|
| | | | 1979 | 1980 | 1981 |
| HEPIALIDAE | *Hepialus* | *humuli* | O | O | O |
| | | *sylvina* | | O | O |
| | | *hecta* | O | O | O |
| | | *lupulinus* | C | C | C |
| COSSIDAE | *Zeuzera* | *pyrina* | O | O | R* |
| LASIOCAMPIDAE | *Poecilocampa* | **populi* [1] | O | | |
| | *Malacosoma* | *neustria* | C | C | O |
| | *Gastropacha* | **quercifolia* | R* | | |
| SATURNIIDAE | *Saturnia* | **pavonia* | | | R* |
| DREPANIDAE | *Falcaria* | **lacertinaria* | C | C | C |
| | *Watsonalla* | *binaria* | C | C | C |
| | | *cultraria* | C | C | C |
| | *Drepana* | *falcataria* | C | O | O |
| | *Cilix* | *glaucata* | O | O | |
| THYATIRIDAE | *Thyatira* | *batis* | C | C | C |
| | *Habrosyne* | *pyritoides* | C | C | C |
| | *Tethea* | *ocularis* | R | | R* |
| | *Ochropacha* | *duplaris* | C | O | |
| | *Achyla* | **flavicornis* | R* | | A |
| | *Polyploca* | **ridens* | | | O |
| GEOMETRIDAE | *Archiearis* | **parthenias* | | | R* |
| | *Alsophila* | *aescularia* | O | O | C |
| | *Pseudoterpna* | *pruinata* | | R* | |
| | *Geometra* | *papilionaria* | O | O | O |
| | *Comibaena* | *bajularia* | R* | | O |
| | *Hemithea* | *aestivaria* | C | C | C |
| | *Jodis* | *lactearia* | | | R |
| | *Cyclophora* | *linearia* | O | O | O |
| | *Timandra* | *comae* | O | C | |
| | *Scopula* | *immutata* | R | | |
| | *Idaea* | *rusticata* | O | C | |
| | | **biselata* | | | R* |
| | | *fuscovenosa* | C | | |
| | | *seriata* | C | C | |
| | | **dimidiata* | O | C | C |
| | | **trigeminata* | C | C | |
| | | **emarginata* | O | | |
| | | *aversata* | A | C | C |
| | | **straminata* | | | R |
| | *Xanthorhoe* | *spadicearia* | | | O |
| | | *ferrugata* | O | C | O |
| | | *montanata* | C | O | C |
| | | *fluctuata* | C | C | O |
| | *Scotopteryx* | *chenopodiata* | | | R* |
| | *Epirrhoe* | *alternata* | C | O | C |
| | *Camptogramma* | *bilineata* | C | | O |
| | *Larentia* | **clavaria* | | R* | |
| | *Anticlea* | **badiata* | | | O |
| | *Mesoleuca* | **albicillata* | R* | | |
| | *Pelurga* | *comitata* | | R | R* |

| Family | Genus | Species | Abundance | | |
|---|---|---|---|---|---|
| | | | 1979 | 1980 | 1981 |
| GEOMETRIDAE | *Cosmorhoe* | *ocellata* | | R* | |
| cont. | *Eulithis* | *mellinata* | O | O | O |
| | | *pyraliata* | C | | C |
| | *Ecliptoptera* | *silaceata* | C | C | A |
| | *Chloroclysta* | **citrata* | R* | | |
| | | *truncata* | C | C | O |
| | *Thera* | *obeliscata* | O | O | O |
| | *Electrophaes* | *corylata* | O | A | C |
| | *Hydriomena* | *furcata* | C | C | C |
| | *Horisme* | ***tersata* [2] | | | R* |
| | *Epirrita* | *dilutata* | C | | |
| | *Operophtera* | *brumata* | C | C | C |
| | *Perizoma* | **affinitata* | | R* | |
| | | **alchemillata* | O | R* | |
| | | **flavofasciata* | | | O |
| | *Eupithecia* | **tenuiata* | O | O | O |
| | | **exiguata* | | R | |
| | | *centaureata* | | | O |
| | | *intricata* | | | R |
| | | **absinthiata* | R | R | |
| | | *assimilata* | | R* | |
| | | *vulgata* | O | R | O |
| | | **subfuscata* | | R | R |
| | | *icterata* | O | O | O |
| | | *succenturiata* | R* | | |
| | | ***millefoliata* | R | | R |
| | | **nanata* | R* | R | R |
| | | *abbreviata* | | O | |
| | *Chloroclystis* | **v-ata* | R | R | |
| | *Pasiphila* | **rectangulata* | O | O | O |
| | *Gymnoscelis* | **rufifasciata* | O | O | |
| | *Asthena* | **albulata* | O | | |
| | *Hydrelia* | *flammeolaria* | O | O | O |
| | *Lobophora* | *halterata* | | R* | R* |
| | *Acasis* | *viretata* | O | | |
| | *Abraxas* | *grossulariata* | | | R* |
| | | **sylvata* | R* | | |
| | *Lomaspilis* | *marginata* | C | C | A |
| | *Ligdia* | *adustata* | O | | |
| | *Macaria* | ***notata* | O | O | |
| | | *liturata* | R | | R |
| | | **wauaria* | | | R* |
| | *Petrophora* | *chlorosata* | C | C | C |
| | *Plagodis* | *dolabraria* | C | C | O |
| | *Opisthograptis* | *luteolata* | A | C | C |
| | *Apeira* | **syringaria* | | | R |
| | *Ennomos* | *quercinaria* | C | O | O |
| | | *alniaria* | C | C | O |
| | | **erosaria* | C | C | C |
| | *Selenia* | *dentaria* | C | C | O |
| | | *lunularia* | | R* | |
| | | **tetralunaria* | A | C | C |
| | *Odontopera* | *bidentata* | O | O | O |
| | *Crocallis* | *elinguaria* | C | C | O |
| | *Ourapteryx* | *sambucaria* | A | C | C |

| Family | Genus | Species | Abundance | | |
|---|---|---|---|---|---|
| | | | 1979 | 1980 | 1981 |
| GEOMETRIDAE cont. | *Colotois* | *pennaria* | O | | R* |
| | *Apocheima* | **hispidaria* | | | O |
| | | *pilosaria* | O | C | O |
| | *Lycia* | *hirtaria* | O | C | O |
| | *Biston* | *strataria* | C | O | C |
| | | *betularia* | C | A | C |
| | *Agriopis* | *leucophaearia* | | | O |
| | | *marginaria* | | | C |
| | *Erannis* | *defoliaria* | | R | |
| | *Menophra* | **abruptaria* | | | R |
| | *Peribatodes* | *rhomboidaria* | C | O | O |
| | *Alcis* | *repandata* | C | C | C |
| | *Hypomecis* | ***punctinalis* | O | O | O |
| | *Ectropis* | *bistortata* | O | R* | R |
| | | **crepuscularia* | C | | C |
| | *Aethalura* | *punctulata* | | R* | |
| | *Bupalus* | ***piniaria* | | | R* |
| | *Cabera* | *pusaria* | C | C | C |
| | | *exanthemata* | C | O | C |
| | *Lomographa* | *temerata* | C | C | C |
| | *Theria* | **primaria* | | | C |
| | *Campaea* | *margaritata* | C | O | C |
| | *Hylaea* | ***fasciaria* | R | | |
| SPHINGIDAE | *Mimas* | *tiliae* | R | O | O |
| | *Smerinthus* | *ocellata* | | R* | |
| | *Laothoe* | *populi* | C | C | C |
| | *Deilephila* | *elpenor* | O | O | C |
| | | *porcellus* | | O | C |
| NOTODONTIDAE | *Cerura* | *vinula* | | R* | |
| | *Furcula* | *bifida* | | R* | |
| | *Notodonta* | *dromedarius* | C | C | C |
| | | *ziczac* | O | C | C |
| | *Pheosia* | *gnoma* | C | C | C |
| | | *tremula* | R | | R |
| | *Ptilodon* | *capucina* | C | C | C |
| | *Pterostoma* | *palpina* | O | O | O |
| | *Drymonia* | *ruficornis* | | O | O |
| | *Colostera* | *curtula* | | R* | |
| | *Phalera* | *bucephala* | C | C | C |
| | *Stauropus* | *fagi* | O | C | C |
| | *Diloba* | **caeruleocephala* | | R* | |
| LYMANTRIIDAE | *Calliteara* | *pudibunda* | C | C | C |
| | *Euproctis* | *chrysorrhoea* | C | C | R |
| | | *similis* | O | O | |
| | *Lymantria* | **monacha* | R* | | |
| ARCTIIDAE | *Eilema* | **complana* | R | R | |
| | | *lurideola* | R | | |
| | *Arctia* | *caja* | R* | O | R |
| | *Spilosoma* | *lubricipeda* | O | O | O |
| | | *luteum* | C | C | C |
| | *Diaphora* | *mendica* | | R | |
| | *Phragmatobia* | *fuliginosa* | R* | O | O |
| NOLIDAE | *Nola* | *cucullatella* | C | C | C |
| | | *confusalis* | | O | R |

| Family | Genus | Species | Abundance | | |
|---|---|---|---|---|---|
| | | | 1979 | 1980 | 1981 |
| NOCTUIDAE | *Agrotis* | *segetum* | C | O | O |
| | | *exclamationis* | C | A | C |
| | | *ipsilon* | O | O | O |
| | | *puta* | C | C | C |
| | *Axylia* | *putris* | C | C | C |
| | *Ochropleura* | *plecta* | C | C | C |
| | *Noctua* | *pronuba* | C | C | C |
| | | *comes* | C | A | R |
| | | *fimbriata* | C | C | R |
| | | *janthe* | C | C | O |
| | | *interjecta* | O | O | |
| | *Graphiphora* | *augur* | O | O | O |
| | *Lycophotia* | *porphyrea* | C | O | C |
| | *Diarsia* | *mendica* | C | C | C |
| | | *brunnea* | C | C | C |
| | | *rubi* | C | C | C |
| | *Xestia* | *c-nigrum* | C | O | O |
| | | *triangulum* | C | O | O |
| | | *baja* | O | O | |
| | | *sextrigata* | | R* | |
| | | *xanthographa* | R* | R* | R |
| | *Cerastis* | **rubricosa* | | | R |
| | *Hada* | **plebeja* | | | O |
| | *Polia* | *nebulosa* | O | C | O |
| | *Mamestra* | *brassicae* | C | C | O |
| | *Melanchra* | *persicariae* | O | C | O |
| | *Lacanobia* | *thalassina* | | | R |
| | | *oleracea* | C | C | O |
| | *Hecatera* | *bicolorata* | O | | |
| | *Hadena* | **bicruris* | | | O |
| | *Cerapteryx* | *graminis* | O | O | O |
| | *Tholera* | *cespitis* | | R | R |
| | | *decimalis* | R* | R | R |
| | *Panolis* | ***flammea* | | | R* |
| | *Orthosia* | **cruda* | A | A | C |
| | | **gracilis* | | | R* |
| | | *cerasi* | C | A | C |
| | | *incerta* | C | C | C |
| | | **munda* | O | O | O |
| | | *gothica* | C | A | C |
| | *Mythimna* | *conigera* | R | R | R |
| | | *ferrago* | C | O | O |
| | | *impura* | C | C | C |
| | | *pallens* | C | C | C |
| | | *comma* | R | R | O |
| | *Cucullia* | **umbratica* | | R* | |
| | *Lithophane* | **ornitopus* | | | O |
| | *Xylocampa* | **areola* | O | C | O |
| | *Allophyes* | *oxyacanthae* | | O | |
| | *Dryobotodes* | *eremita* | | R* | R* |
| | *Eupsilia* | *transversa* | C | C | C |
| | *Conistra* | *vaccinii* | C | C | C |
| | | **ligula* | | | R* |
| | *Agrochola* | *lota* | | R* | |
| | | *macilenta* | | R | |

| Family | Genus | Species | Abundance | | |
|---|---|---|---|---|---|
| | | | 1979 | 1980 | 1981 |
| NOCTUIDAE cont. | | **helvola* | | | R* |
| | | *litura* | | R | |
| | *Atethmia* | **centrago* | R* | R* | |
| | *Omphaloscelis* | *lunosa* | | | R* |
| | *Xanthia* | *citrago* | O | O | |
| | | *togata* | R | R | |
| | | *icteritia* | | O | |
| | *Acronicta* | *aceris* | | | R |
| | | *leponia* | C | O | O |
| | | **alni* | R* | A | O |
| | | *tridens* ~ | | R* | |
| | | *psi* ~ | O | O | |
| | | **rumicis* | O | O | |
| | *Cryphia* | *domestica* | O | O | O |
| | *Amphipyra* | *pyramidea* | C | C | C |
| | | *berbera* | O | O | O |
| | | *tragopoginis* | R | O | O |
| | *Mormo* | *maura* | R* | R* | |
| | *Dypterygia* | *scabriuscula* | O | O | R |
| | *Rusina* | *ferruginea* | | O | O |
| | *Thalpophila* | *matura* | C | C | C |
| | *Euplexia* | *lucipara* | O | O | O |
| | *Phlogophora* | *meticulosa* | C | C | C |
| | *Parastichtis* | *suspecta* | C | O | O |
| | | *ypsillon* | | R | |
| | *Cosmia* | **affinis* | | R | |
| | | *trapezina* | C | C | C |
| | | **pyralina* | | R* | |
| | *Apamea* | *monoglypha* | C | C | A |
| | | *lithoxylaea* | O | O | O |
| | | *crenata* | O | C | C |
| | | *epomidion* | | R | |
| | | *remissa* | O | C | O |
| | | *anceps* | | | R |
| | | *sordens* | | R* | |
| | | **scolopacina* | C | C | |
| | *Oligia* | *strigilis* ~ | O | O | |
| | | *latruncula* ~ | C | C | C |
| | | *fasciuncula* | C | O | O |
| | *Mesoligia* | *furuncula* | C | O | O |
| | *Mesapamea* | *secalis* ~ | A | C | C |
| | *Photedes* | *minima* | C | C | C |
| | *Chortodes* | *pygmina* | O | R | R |
| | *Luperina* | *testacea* | C | C | C |
| | *Amphipoea* | *oculea* | | O | O |
| | *Hydraecia* | *micacea* | | O | C |
| | *Gortyna* | **flavago* | | | R* |
| | *Coenobia* | **rufa* | R* | R | R |
| | *Hoplodrina* | *alsines* | C | C | C |
| | | *blanda* | O | O | |
| | | **ambigua* | O | | |
| | *Caradrina* | *morpheus* | C | C | C |
| | *Paradrina* | *clavipalpis* | O | | O |
| | *Pyrrhia* | *umbra* | | R* | |
| | *Protodeltote* | *pygarga* | | R | C |

| Family | Genus | Species | Abundance | | |
|---|---|---|---|---|---|
| | | | 1979 | 1980 | 1981 |
| NOCTUIDAE cont. | *Bena* | **bicolorana* | O | C | O |
| | *Pseudoips* | *prasinana* | O | O | O |
| | *Colocasia* | *coryli* | A | C | C |
| | *Diachrysia* | *chrysitis* | O | O | O |
| | *Autographa* | *gamma* | C | C | C |
| | | ***pulchrina* | R* | R | R |
| | | **jota* | | | R* |
| | *Abrostola* | *triplasia* | O | C | C |
| | *Catocala* | *nupta* | R* | | |
| | *Scoliopteryx* | *libatrix* | O | C | O |
| | *Laspeyria* | *flexula* | O | O | O |
| | *Hypena* | *proboscidalis* | C | C | C |
| | *Zanclognatha* | *tarsipennalis* | C | C | O |
| | *Herminia* | *grisealis* | C | R* | C |

Nomenclature follows Bradley (2000).

The 'abundance rating' was made on the following basis:

A – abundant (51+ individuals per annum)
C – common (11–50 individuals per annum)
O – occasional (6–10 individuals per annum)
R – rare (2–5 individuals per annum)
R* – taxa represented by a single example
~ – samples examined microscopically
[1] specific name preceded by one asterisk = not recorded for Epping Forest since 1950 at the time of this survey.
[2] specific name preceded by two asterisks = new record for Epping Forest at the time of this survey

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# Book review

***Orchids of Europe, North Africa and the Middle East.*** Pierre Delforge. A & C Black, London. 2006. 640 pp., hardback. £29.99. ISBN 0 7136 7525 X.

My reaction on receiving this was 'oh no not another orchid book'. This one however has the advantage over others recently published of not just covering the UK. This means that it would be of considerable use when travelling abroad. Its hardback format would be a turnoff however when trying to keep weight of luggage to a minimum.

A fascinating section at the beginning of the book explains the nomenclature of orchids, their classification and life cycle, before we get into the main part of the guide.

The book contains many superb photographs of the different orchid species and I spent several happy sessions looking up old friends found on European holidays. The descriptions of individual species are excellent and very detailed. These together with the photographs would be of great help.

This is not the cheapest option in print at the moment but to all those orchidoholics out there it will be a vital addition to their libraries.

PIPPA HYDE

# Spider records for the London Area in 2006

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## Abstract

New and interesting spider records in 2006 for the London Area, including parts of London within the LNHS recording area at the edge of both Essex and Kent, are detailed. There was one new record for London county and five new records for Middlesex.

## Introduction

This year some additional sites are included which are in the LNHS recording area but come into the counties of Essex and Kent as opposed to either the old county of London, or the county of Middlesex. The old county of London area is the centre of the conurbation and continues to be subject to the highest levels of pollution (and possibly the island heat effect). In former times (until the Clean Air Acts of the 1950s) air pollution was caused mostly by smoke and sulphur, and while air pollution has been reduced it is still significant and must affect habitats in the capital (Milner 2006*a*). The author therefore feels, as previously discussed, that maintaining records for the old county of London is still relevant.

In 2006, altogether 211 species were recorded in the two counties of London and Middlesex (compared with 192 in 2005 and 180 in 2004), of which one was new to London and five were new to Middlesex.

## Spider activities in 2006

The Society held spider forays at Poor's Field and Ruislip Woods on 14 May, at Old Park Wood meadow and woodland on 10 December, also for the Society's Hampstead Heath Study Group on Sunday 28 May. As spider recorder the author also led public spider forays at Regent's Park on Saturday 20 May, at Mile End Park on Sunday 4 June, and for the Heath and Hampstead Society on Sunday 3 September. The London Heathland Heritage Initiative also ran a number of introductory identification training days for different taxa, and the author conducted training during the summer at Hounslow Heath, Keston Common, Stanmore Common, Barnes Common, Wimbledon Common, Lesnes Abbey Woods, Mitcham Common and Addington Hills. During these days, unfortunately only some of which were held in dry weather, small collections were made and the species recorded. In fact it is doubtful if there has ever been a summer when so much attention has been paid to London spiders!

Pitfall trapping has continued at Queen's Wood for the eighteenth consecutive year (and two new species added to the list!); at Mile End Park (London); Hounslow Heath; Claybury Wood (London Borough of Redbridge); Harmondsworth Moor (until July); and (until August) at several sites near Heathrow airport. Trapping for a limited time was done at Cranford Park (London Borough of Hounslow), Pot Kiln Wood (Upminster), and from November onwards at Mitcham Common. The pitfall trapping at High Elms, Hayes Common and Scadbury Park (both in the London Borough of Bromley) was continued until July.

In the list below those marked * are new to London and those marked ** new to Middlesex. All records are by the writer unless indicated. Trapped means pitfall-trapped unless otherwise stated. Nomenclature and the new order in the list of families are according to Merrett and Murphy (2000) with amendments by Harvey et al. (2002).

SEGESTRIIDAE

*Segestria florentina.* This spectacular spider with metallic green chelicerae was trapped in a pitfall near old oak trees at Harmondsworth Moor in July, and found by Mick Massie at Chiswick in November.

MIMETIDAE

*Ero aphana*** 'RDBK' (status uncertain). This recent arrival was first found in 1974 near Southampton (Harvey et al. 2002). In 2006, single females were collected at Horsenden Hill by Mick Massie, and during one of the London Heathland Initiative days at Hounslow Heath, both in June.

THERIDIIDAE

*Crustulina guttata.* This small, attractively marked spider has not been recorded for the counties of London or Middlesex, but during 2006 a male was trapped at Hayes Common in August, and a female was swept from vegetation at Keston Common in June. Both localities are in the county of Kent.

*Steatoda grossa***. This spectacular spider has only been recorded from very few localities in the south-east of England, but it appears to have reached London. In July 2006 the author found an adult male walking up the wall of his bathroom in Crouch End!

*Anelosimus aulicus*** Notable B. The male of this rare theridiid has spectacular palps with an array of parallel hairs. In June a single specimen was trapped in old acid grassland on Hounslow Heath.

LINYPHIIDAE

*Dicymbium nigrum.* This less common (in the London Area) relative of *D. brevisetosum* was taken in Queen's Wood, when a single male was trapped in October.

*Agyneta subtilis.* This small heathland spider has not been recorded in the counties of London or Middlesex, but in 2006 a single male was trapped at Hayes Common in June.

*Agyneta conigera.* A single female was trapped in Queen's Wood (the third known locality in Middlesex: it has yet to be recorded in London county) in November 2006. This was a new record for the wood which, together with *D.nigrum* (above), has brought the number of species recorded up to 123.

*Syedra gracilis* Notable B. This tiny money spider was first reported from the London Area when single individuals were trapped at Mile End Park (London) in 2004 (Milner 2005) and at Hounslow Heath (Middlesex) in 2005 (Milner 2006*b*). Further specimens have been trapped at both localities in 2006, and thirteen specimens were trapped at Claybury Wood, all between May and July as well as a single female in December.

*Centromerus serratus* Notable B. This tiny, rare spider was trapped at High Elms (London Borough of Bromley) in March 2006, and thirteen specimens of both sexes were trapped at Claybury Wood in the winter months (December 2005 to April 2006).

*Sintula cornigera.* This species was only previously recorded in Greater London from Oxleas Wood (old county of London); in 2006, three specimens were trapped at Claybury Wood in April and May.

*Lepthyphantes insignis* Notable B. In 2006, both sexes were trapped in acid grassland at Hounslow Heath in January; this remains the only recorded locality in Middlesex.

ARANEIDAE

*Mangora acalypha**. A single female of this attractive heathland orb-web spider was found on its web in the tall heather planted from seed about six years ago on Sandy Heath, Hampstead. This is the first record for anywhere within the London North and South Circular Roads, although it is common on heathland around the edges of London (Stanmore Common, Hounslow Heath, Keston Common, etc.). How it reached Sandy Heath is not known.

LYCOSIDAE

*Xerolycosa nemoralis* Notable B. This scarce wolf spider has not been recorded from London or Middlesex so far but it is known (from 2005) from High Elms (London Borough of Bromley), and in August 2006 a single male was trapped at Hayes Common, also in Bromley.

*Alopecosa barbipes***. This scarce heathland winter-active species was recorded as occurring in London by Locket et al. (1974), although it has not been seen since in the county. In 2006 females were trapped in April at both Hounslow Heath and at Harmondsworth Moor, the first records for the species in Middlesex.

HAHNIIDAE

*Hahnia montana* and *Hahnia helveola.* Although both these species are recorded from several sites in London and Middlesex counties (*H. helveola* apparently being restricted to ancient woodland), in 2006 they were found for the first time at Hampstead Heath when females were swept from bushes in May. This brings the total of species recorded for Hampstead Heath to 220 (Milner 2006*a*).

LIOCRANIDAE

*Agroeca brunnea.* This woodland spider, the largest British member of the genus, has been recorded from Coldfall Wood (Middlesex) but not in the old county of London. Trapping at Claybury Wood revealed that it was one of the most abundant spiders present in the leaf litter in that (ancient) wood during most months of the year.

*Scotina celans.* This woodland/heathland spider has not been recorded in London or Middlesex counties, but in 2006 large numbers (290 in all months) were trapped in leaf litter in Claybury Wood with most specimens being found in the period October to December.

CLUBIONIDAE

*Cheiracanthium virescens***. Several specimens were found at Hounslow Heath Nature Reserve both by sweeping and pitfall trapping in May.

GNAPHOSIDAE

*Haplodrassus signifer.* Records of this species in London are very scarce; there is an old record from Greenwich Park and contemporary records from Vanbrugh Pits on Blackheath. In 2006 a single immature female was trapped at Mile End Park, the second immature specimen to be found at the park.

*Zelotes petrensis* Notable A. First reported for the London Area from Hounslow Heath in 2005 (Milner 2006*b*), this rare hunting spider has been trapped again at the same locality in 2006, and a single male was also found in old acid grassland at Addington Hills (London Borough of Croydon) in September.

*Trachyzelotes pedestris* Notable B. Two specimens of this rare hunting spider were trapped at Claybury Wood in June (male) and July (female). *T. pedestris* has not been recorded in London or Middlesex but there are previous records from chalk grassland at High Elms, and in dry grassland at Potkiln Wood, Upminster (Essex).

THOMISIDAE

*Xysticus lanio.* This woodland crab spider has not been recorded in the counties of London or Middlesex but this year a single female was swept from bushes at Lesnes Abbey Woods, just outside the old county of London, and although the species is rare in Essex (Harvey et al. 2002) numerous individuals were trapped at Claybury Wood from May through to August.

SALTICIDAE

*Evarcha falcata.* This woodland jumping spider, historically recorded from London by F. P. Smith (Savory and Le Gros 1957) has not been found within the old county of London since the early years of the twentieth century. In 2006, several individuals of both sexes were swept from bushes and trees at three sites just outside the old county boundary at Keston and Hayes Commons and at Lesnes Abbey Woods. It seems quite likely that it does occur within the old county boundary but has yet to be found. Sweeping bushes and the lower branches of trees in patches of ancient woodland would appear to offer the best chance of finding this attractive spider in London.

## Acknowledgements

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# A note on some exotic spiders found in London

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In the past few years a number of exotic spiders have been found in London and although in most cases these were clearly accidental arrivals, there is always the possibility that these species will become established. A number of species now accepted as part of the British fauna are assumed to be relatively recent arrivals; some examples are *Segestria florentina, Tegenaria agrestis, Erigone aletris* and *Zodarion italicum*.

At the stage where the first few individuals are found it is not clear whether these are chance arrivals or potential immigrants. In Shetland *Pholcus phalangioides* is currently known from one garage near Sumburgh where it has been well established for at least fifteen years; so far there are no records of it having spread to other places, but the possibility is there. On the other hand, several specimens of the common agelenid *Tegenaria gigantea* have been reported at Lerwick in recent years, but in each case these have been traced back to the arrival of packing cases or large parcels shipped from mainland Scotland or from further afield (Paul Harvey, Shetland Biological Records Centre, Lerwick, pers. comm.). So far no successful establishment or breeding of this species on Shetland has been observed, but like the possible spread of *Pholcus phalangioides*, this may only be a matter of time.

*Tegenaria agrestis,* known from only one site, Wilverley Plain, Hampshire in the early 1950s, but now common throughout much of England, and as far north as the Edinburgh area. *Photo: Dick Jones*

New arrivals in London which have become established in recent years have included *Erigone aletris* (a North American species previously known only from Peterborough and Edinburgh), and the Mile End jumping spider *Macaroeris nidicolens* (Milner 2003); three more spectacular finds of exotic arrivals which have not yet become established, are now reported.

In 1990, a bright red jumping spider, probably *Phidippus johnsoni,* was found inside the laboratories at St Mary's Hospital in west London. This is an American species and the spider was found after some computer equipment had been unpacked from boxes shipped direct from the USA, suggesting an obvious conclusion about the spider. No further specimens have been seen.

In 2004 a large but moribund spider was found by Ken Greenway on a pavement at Isle of Dogs in east London. The specimen was provisionally recognized as a member of the largely tropical family Sparassidae and quite definitely not a native species. It was sent to Dr Peter Jaeger at the Senckenburg Museum in Frankfurt; he concluded that it was an *Olios* sp. probably new to science but one of an unrevised group from the Indian subcontinent (Jaeger 2005). His assumption was that this spider had been transported to UK in a batch of tropical fruit such as mangoes.

Previously unknown *Olios* sp. found on a pavement in east London in 2004.
*Photo: Ken Greenway*

A more puzzling case is that of the pan-tropical wasteland spider *Coleosoma blandum* O.P.-Cambridge, 1882, a single female of which was trapped in a pitfall in the middle of Queen's Wood, north London in July 1993 (and briefly reported although erroneously named *Coleosoma blanda*) at the time by the author (Milner 1994). This remains the only record of this species, but the fact that it was found in a pitfall trap in leaf litter in the middle of the wood is difficult to explain; how did it get there?

## Acknowledgements

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# London butterfly monitoring report for 2006

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## Abstract

Butterflies were monitored by the use of transect walks at sites in London. Completed data for 2006 and for at least one previous year were available from twenty transect sites. The data were was used to calculate collated indices. Records from some other sites in London are also presented.

## Introduction

Monitoring of butterflies was undertaken by a standard method at sites throughout London in 2006. This provided data for the preparation of collated indices for changes in the abundance of butterfly species in London as compared with previous years. London is defined for the purposes of this paper as Greater London or the area encompassed by the London boroughs, though additional records from the wider London Natural History Society (LNHS) recording area are noted.

## Methods

Monitoring was undertaken by the transect walk method, a standard method adopted throughout the United Kingdom. Details of the method are described elsewhere (see Pollard and Yates 1993, and Williams 2000 and the references cited there). Basically, at each site a walk was undertaken along the same route, each week, between April and September inclusive, within a standard range of weather conditions conducive to butterfly flight. Counts were made of the number of adult butterflies observed to provide a total for each species for the year at each transect. Totals used for this paper include calculated estimates for weeks missed due to poor weather or the unavailability of the recorders. However, for inclusion in the index, data from each transect needs to have been obtained with good coverage during the recording season and with the minimum of missed weeks. Collated indices were calculated from the data as described by Williams (2000), but see also Crawford (1991) for an introduction to the use of collated indices in wildlife monitoring; and also Pollard and Yates (1993) and Roy and Rothery (2002). Note that neither the original site counts nor the collated indices are absolute counts of the population, but indices of abundance. The indices are relative from year to year, not from species to species. Estimates of the relative changes in the populations of each species from year to year are given by the difference in the indices. For example, a species with an index of 50 in one year and 25 in the following year would have had approximately half the adult population in the second year as compared with the first year. Indices have been rounded to the nearest whole number and have usually been set at 100 in 1990 or the first year of record: for a technical discussion see Crawford (1991). Reliability of indices increases with the number of transects which were relatively few in the earlier years, e.g. one transect was walked in 1978, two in 1986, three in 1988 and eight in 1990. Reliability of the indices may be lower for species with low

counts and/or local distribution in London. The 'Total count on transects' provides an indication of the size of the count from which the analysis was made in 2006 using the data from the complete transects for that species, including estimated counts for missing weeks; but excluding the computed estimated counts for transects that were not walked or had insufficient data in 2006. Indices were calculated from the data from transects for which there was suitable data available for at least two years.

Transects that contributed data in 2006, the years for which data were available and the Borough in which the transect is located are listed below: **Hampstead Heath** (Camden) 1978–2006, **Fryent Country Park** (Brent) 1986–2006, **Beane Hill** (Brent) 1988–2006, **Gutteridge Wood** (Hillingdon) 1990–2006, four transects managed by the Corporation of London (located in the London Borough of Croydon): **Coulsdon Common** 1990–2006, **Farthing Downs** 1990–2006, **Kenley Common** 1990–2006, **Riddlesdown** 1990–2006; **Mitcham Common 'route A'** (Merton) 1994–2001, 2003–2006, **Mitcham Common 'route B'** (Merton) 1995–2006, **Wildfowl and Wetlands Trust Wetland Centre at Barn Elms** (Richmond upon Thames) 1996–2006, **Railway Fields** (Haringey) 1997–2006, **South Norwood Country Park** (Croydon/Bromley) 1998–2006, **Tower Hamlets Cemetery Park** (Tower Hamlets) 1999–2006, **Gunnersbury Triangle** (Hounslow) 1999–2006, **Brent Reservoir** (Barnet/Brent) 2000–2006, **Featherbed Lane Roadside Verge** (Croydon) 2000–2003, 2006, **Regent's Canal towpath from Mile End Road to Mare Street** (Tower Hamlets/Hackney) 2001–2006, **Kenwood Estate** (Camden) 2005–2006, and **Farthing Downs New Hill** (Croydon) 2005–2006. Recorders for 2006 are listed in the Acknowledgements.

In addition, data for 2006 were available for some weeks for transects at Hutchinson's Bank Nature Reserve (Croydon) and Chapel Bank (Croydon); and for some species there was sufficient coverage to contribute to the indices. The transect at Cranford Park (Hounslow) was walked in 2006 but with too many missing weeks for inclusion in the indices. Transect data for 2006 was also received from transects at Horsenden Hill East, Horsenden Hill West and Perivale Wood (all in Ealing), Camley Street Nature Park (Camden) and Spring Park (Croydon / Bromley). Records from these transects and from other observations by LNHS observers have been included in the species accounts where appropriate. Records also contribute towards the county and national databases maintained by Butterfly Conservation.

## Results

The order and nomenclature of the species accounts follow Asher et al. (2001). The species accounts are based on the collated indices, which for the years 1996 to 2006 are presented in Table 1. Since some year-to-year variations are to be expected, the comments below are generally focused on the more pronounced changes or on longer term trends

### Small skipper *Thymelicus sylvestris* and Essex skipper *Thymelicus lineola*

Small and the Essex skippers are often counted together by transect walkers due to the difficulty of separating these species in flight. They are species of rough grassland habitats and in London tend to be confined to sites with sufficient habitat. Small and / or Essex skippers were recorded on most transects. At seven transects attempts were made to identify some individuals to the two species separately. Of 210 skippers, 74 per cent (155) were identified as small skippers, and 26 per cent (55) as Essex skippers. Total count on transects: 1,447.

### Large skipper *Ochlodes sylvanus*

A species of grassland with scrub, the index was below average for recent years. Total count on transects: 294.

DINGY SKIPPER *Erynnis tages*

Records were received from only two sites, both on the southern edge of London. Total count on transects: 28.

GRIZZLED SKIPPER *Pyrgus malvae*

Records were received from only two sites, both on the southern edge of London. Total count on transects: 9.

CLOUDED YELLOW *Colias croceus*

Migrations of the clouded yellow were recorded throughout London. On the transects there were records from seven of the sites. Of these, sixteen were at the London Wetland Centre which also recorded the highest transect count in 2000, a year during which large migrations were noted. Richard Bullock commented that a female was seen ovipositing on red clover on 7 June 2006 at the London Wetland Centre, suggesting that some of the site records from later in the summer could have been the result of local breeding by early migrants. Plant (1984) considered that the Thames may act as corridor for migrations of the clouded yellow. Another favoured habitat is chalk downland and four of these transects accounted for a further ten of the total transect count including seven from the Farthing Downs New Hill transect. Calculating the index proved problematic due to the zero counts in some years, but a manual like-for-like comparison suggested that the 2006 flights were approximately a quarter of that of 2000 based on the number of butterflies involved. However this did not take into account the 2006 influx in late September through to late October, noted below, which may have been more significant than during years of noted migrations in 1983 and 2000. Away from the transects there were five observations from the Trent Park area between 17 September 2006 and 29 October 2006, one at Gladstone Park on 4 October 2006 and one at the Brent Reservoir on 20 October 2006. Total count on transects: 29.

BRIMSTONE *Gonepteryx rhamni*

Brimstones were recorded all but one transect. Planting of one of the larval food-plants, alder buckthorn *Frangula alnus*, continued in Brent and elsewhere. As an example of the affinity of the larval food-plants and the brimstone, a female was observed laying eggs on alder buckthorns that were in pots awaiting delivery to other sites while in the driveway of a suburban house in Harrow at TQ 169895. Over twenty of the eggs developed into caterpillars though it is not known if any reached the adult stage. Total count on transects: 473.

LARGE WHITE *Pieris brassicae*

Widely distributed in London but with high counts at only a few sites. Total count on transects: 742.

SMALL WHITE *Pieris rapae*

Widely distributed in London, numbers appeared to be higher at green spaces in urban London rather than at sites in the green belt areas. Total count on transects: 1,775.

GREEN-VEINED WHITE *Pieris napi*

The Green-veined white appeared to be at its lowest index since 1996. Widely distributed, but most of the total count was at a small number of sites. Total count on transects: 813.

ORANGE TIP *Anthocharis cardamines*

Most of the total count was from three transect sites with damp grasslands. Total count on transects: 212.

TABLE 1. Collated indices for butterfly species in London, 1996–2006. Indices have been rounded to the nearest whole number and have usually been set at 100 in 1990 or the first year of record, though indices may be set at 100 in other years or at a different figure where this aids interpretation. A blank indicates no transect records for that species in that year. A zero implies that that species was not observed on transects in that year. A question mark indicates that a species was present in that year, but that there was insufficient data to calculate and index. See the text for further information.

| | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Small and Essex skippers | 169 | 161 | 92 | 98 | 83 | 97 | 75 | 80 | 83 | 95 | 83 |
| Large skipper | 73 | 64 | 43 | 62 | 57 | 42 | 73 | 103 | 69 | 80 | 52 |
| Dingy skipper | ? | 100 | 58 | 51 | 63 | 33 | 46 | 117 | 77 | 53 | 27 |
| Grizzled skipper | ? | 100 | 25 | 63 | 27 | 16 | 47 | 40 | 80 | 21 | 26 |
| Clouded yellow | 100 | 0 | 109 | 0 | 2,255 | 0 | 62 | 114 | 118 | 0 | 554 |
| Brimstone | 104 | 91 | 81 | 77 | 122 | 93 | 93 | 81 | 119 | 133 | 118 |
| Large white | 46 | 143 | 280 | 123 | 130 | 112 | 176 | 120 | 146 | 175 | 160 |
| Small white | 111 | 321 | 165 | 92 | 136 | 121 | 152 | 174 | 256 | 212 | 191 |
| Green-veined white | 58 | 139 | 187 | 92 | 99 | 63 | 101 | 79 | 101 | 67 | 59 |
| Orange tip | 36 | 79 | 65 | 48 | 77 | 64 | 79 | 43 | 65 | 84 | 61 |
| Green hairstreak | 45 | 67 | 34 | 17 | 15 | 60 | 40 | 52 | 64 | 35 | 25 |
| Purple hairstreak | 76 | 245 | 412 | 372 | 390 | 263 | 426 | 268 | 394 | 620 | 424 |
| White-letter hairstreak | 104 | 67 | 31 | 11 | 10 | 24 | 14 | 16 | 11 | 57 | 53 |
| Small copper | 67 | 71 | 60 | 45 | 25 | 6 | 4 | 67 | 60 | 23 | 60 |
| Small blue | ? | 100 | 225 | 175 | 188 | 338 | 0 | 38 | 25 | 25 | 463 |
| Brown argus | 81 | 94 | 10 | 11 | 17 | 6 | 6 | 39 | 38 | 11 | 45 |
| Common blue | 61 | 82 | 42 | 83 | 68 | 41 | 41 | 138 | 63 | 60 | 138 |
| Chalkhill blue | 109 | 288 | 75 | 180 | 90 | 80 | 41 | 41 | 93 | 29 | 129 |
| Holly blue | 101 | 20 | 67 | 39 | 46 | 54 | 42 | 45 | 65 | 75 | 43 |
| White admiral | | | 100 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 |
| Purple emperor | | | | | | | | | | 100 | 0 |
| Red admiral | 208 | 101 | 138 | 128 | 264 | 194 | 209 | 422 | 134 | 173 | 369 |
| Painted lady | 735 | 12 | 7 | 10 | 62 | 8 | 73 | 378 | 39 | 3 | 215 |
| Small tortoiseshell | 122 | 306 | 185 | 153 | 72 | 43 | 25 | 66 | 144 | 49 | 30 |
| Peacock | 789 | 780 | 1,121 | 1,107 | 1,495 | 1,065 | 646 | 398 | 595 | 561 | 325 |
| Comma | 106 | 128 | 134 | 119 | 206 | 154 | 136 | 207 | 150 | 123 | 228 |
| Dark green fritillary | | 100 | 148 | 181 | 63 | 7 | 11 | 91 | 9 | ? | 0 |
| Silver-washed fritillary | | | | 100 | 300 | 100 | 0 | 0 | 0 | ? | 500 |
| Speckled wood | 72 | 122 | 143 | 164 | 178 | 149 | 207 | 233 | 143 | 152 | 134 |
| Wall brown | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Marbled white | ? | 100 | 61 | 54 | 40 | 15 | 18 | 37 | 27 | 22 | 37 |
| Gatekeeper | 136 | 135 | 105 | 151 | 165 | 144 | 137 | 177 | 228 | 307 | 229 |
| Meadow brown | 136 | 116 | 164 | 154 | 150 | 95 | 69 | 143 | 115 | 166 | 134 |
| Ringlet | 64 | 224 | 295 | 350 | 471 | 239 | 289 | 394 | 220 | 229 | 206 |
| Small heath | 21 | 23 | 17 | 3 | 2 | 1 | 1 | 8 | 7 | 10 | 9 |

GREEN HAIRSTREAK *Callophrys rubi*

There were records from three transects on the southern edge of London; while away from the transects, five were recorded at Mitcham Common. Total count on transects: 10.

PURPLE HAIRSTREAK *Neozephyrus quercus*

Though recorded on five transects, the large majority of records were from the Kenwood Estate and the Brent Reservoir transects. Other records from Kenwood on 15 July 2006 suggested that it was widespread there with adults recorded over grasslands, on brambles and in the vicinity of buildings. Purple hairstreaks generally fly in the evening and therefore were probably more frequent and more widespread than suggested by the daytime transects, particularly where there are oak trees and woodland with oak. Total count on transects: 55.

WHITE-LETTER HAIRSTREAK *Satyrium w-album*

The transect records were from the Brent Reservoir; and there were additional records from this site including at least four on 1 July 2006. Though not yet in the index, thirty-one were recorded at the new Horsenden Hill west transect, and three on the 'east' transect. There were also records at Trent Park (TQ 290970) and away from the transects at Mitcham Common. Total count on transects: 3.

SMALL COPPER *Lycaena phlaeas*

The index was higher than in 2005. The highest counts were at transects on sites with relatively large areas of semi-natural grasslands, particularly at Mitcham Common route A. However, some transects had zero counts. Total count on transects: 194.

SMALL BLUE *Cupido minimus*

All of the transect count was from Hutchinson's Bank Nature Reserve, a site with chalk downland. Numbers were the highest there since monitoring commenced in 1997. Two were recorded at Spring Park. Total count on transects: 37.

BROWN ARGUS *Aricia agestis*

Transect records were from sites on the chalk downland on the southern edge of London and from South Norwood Country Park. The index was the highest since 1997. Away from the transects there were records from Mitcham Common. Total count on transects: 32.

COMMON BLUE *Polyommatus icarus*

The index was the same as in 2003, the previous highest since that of 1995. Much of the total count was from four of the transect sites on chalk downland on the southern edge of London. Whilst the three transects with zero counts in 2006 were towards inner London, the count at Tower Hamlets Cemetery Park was 51. There was a count of 79 at the London Wetland Centre. Whilst a singleton was recorded at Fryent Country Park, Gutteridge Wood had a count of 72 and the highest since transect monitoring commenced on that site in 1990. Total count on transects: 1,136.

CHALKHILL BLUE *Polyommatus coridon*

A species of chalk downland, recorded on three transects on the southern edge of London, and in particular from Riddlesdown and from Farthing Down. The index was the highest since 1999. Total count on transects: 89.

HOLLY BLUE *Celastrina argiolus*

Recorded on most transects. Total count on transects: 253.

WHITE ADMIRAL *Limenitis camilla*

Though there were no records on the transects, they were seen regularly between 28 June and 17 July 2006 in a garden at West Wickham (TQ 396644) and followed a single record there in 2005. Other records were from Epsom Common. Total count on transects: 0.

RED ADMIRAL *Vanessa atalanta*

The year 2006 was one of the best for the red admiral on London transects since 1978, though the index was higher in 2003. It was widespread in London; and in terms of the flight periods throughout the year. Total count on transects: 252.

PAINTED LADY *Vanessa cardui*

Following the low number of records in 2005 (when just three were recorded on the transects), the painted lady was recorded on most transects in 2006. Away from the transects there were records until 4 November 2006. Total count on transects: 175.

SMALL TORTOISESHELL *Aglais urticae*

The index for the small tortoiseshell was not much higher than the low of 2002; and there were four transects on which it was not recorded in 2006. There is some debate on the reason for its decline in recent years. Parasitism by a tachinid fly is supported by recent observations in southern England, though that may not be the only reason for the decline in London and south-east England. National indices for 1976–2005 were graphically represented by Greatorex-Davies et al. (2006); and it was noted that the 2005 index was the second lowest for this species. Also for 2005, Vickery (2006) noted that whereas it was recorded in 90–100 per cent of gardens in the 1990s, the 2005 figures for Kent, Sussex, Surrey and Essex were in the range of 67–79 per cent, and 36 per cent for London. Total count on transects: 93.

CAMBERWELL BEAUTY *Nymphalis antiopa*

A Camberwell beauty was observed by Graham Dawson on a footpath between Park Royal Station and North Acton Cemetery on 22 August 2006. There were also a number of reports to the north of London from Hertfordshire. These were probably part of a migration from Europe that had reached Holland by early August 2006, according to a report on the website of the Hertfordshire and Middlesex branch of Butterfly Conservation. Total count on transects: 0.

PEACOCK *Inachis io*

Numbers can fluctuate considerably from year to year; and the index in 2006 was the lowest since 1991. Total count on transects: 277.

COMMA *Polygonia c-album*

By contrast, the index for the comma was the best since 1992. Recorded on all the transects in London in 2006; it is particularly a species of open woodland and woodland edges, such as at Tower Hamlets Cemetery Park. Total count on transects: 467.

QUEEN OF SPAIN FRITILLARY *Issoria lathonia*

Robert Callf observed a Queen of Spain fritillary at Vicarage Farm, Enfield (TQ 302979) on 26 September 2006. This is a migratory species from Continental Europe with a high proportion of UK records from the Suffolk coast and more rarely in southern England. Total count on transects: 0.

SILVER-WASHED FRITILLARY *Argynnis paphia*

An influx of the silver-washed fritillary was noted during July and August 2006. A consequence was a large number of observations from atypical locations and from sites in London. On the transects, three were recorded at Tower Hamlets Cemetery Park with further sightings away from the transect. At Chapel Bank, five were sighted away from the transect. Due to the prevalence of zero counts for some recent years in London, the index for 2006 was estimated by a manual calculation and appeared to be the highest since the index for this species commenced in 1998. Other records were of two at Cranford Park, one at the London Wetland Centre, one in a garden at Highgate Wood, at Stanmore Country Park, in a garden at West Wickham (TQ 396644), at Enfield Lock, and one that flew into the room of residential building in Purley (TQ 295620) and was temporarily caught before being released on 23 July 2006 (report and photograph by Peggy Dawe in the August 2006 *Newsletter* of the LNHS, No. 197: 16). Total count on transects: 3.

SPECKLED WOOD *Pararge aegeria*

The index was the lowest since 1997. At Railway Fields in Haringey one was seen on 5 November 2006. Total count on transects: 1,634.

MARBLED WHITE *Melanargia galathea*

The marbled white was recorded on nine transects, mainly chalk downland sites on the southern edge of London. It was possible to include data from Hutchinson's Bank Nature Reserve and which represented the majority of the count. After Featherbed Lane Roadside Verge, the third highest count (48) was from the Brent Reservoir, in urban north-west London. There was a single record from Gutteridge Wood. There was also a record from the new transect at Horsenden Hill East. Total count on transects: 367.

GATEKEEPER *Pyronia tithonus*

Recorded on all of the transects, though the index was lower than the recent record high for 2005. Total count on transects: 2,492.

MEADOW BROWN *Maniola jurtina*

Recorded on all of the transects, the meadow brown is primarily a butterfly of grasslands such as those on the chalk at Farthing Downs or of hay meadows on London Clay as at Fryent Country Park. Total count on transects: 8,738.

RINGLET *Aphantopus hyperantus*

The index was relatively low as compared with the years back to 1997, though there were increases at some sites including on both transects at Mitcham Common, whilst a singleton was recorded at Tower Hamlets Cemetery Park. Total count on transects: 817.

SMALL HEATH *Coenonympha pamphilus*

The index was calculated without the data from Trent Country Park which was not walked in 2006 but which was numerically the best transect site during recent years. Whilst numbers increased to fifty-eight at Farthing Downs, it was recorded at less than half of the transects. The index was similar to that of the previous three years, and though higher than for 1999–2002, it remains low compared with that from the late 1980s to 1992. Butterfly Conservation (Fox et al. 2007) has proposed that the small heath be added to the list of Priority Species as part of the UK Biodiversity Action Plan Priority Review due to a severe decline in abundance. Nationally it had declined in distribution by 29 per cent between 1970–1982 and 1995–2004.

Other records from London in 2006 were at Wimbledon Common, Bushy Park, and Alexandra Park. Total count on transects: 85.

A species of unconfirmed identification recorded in London was that of a swallowtail. Observed by John Palmer and others in Finsbury Park on 22 July 2006, a blurred image was obtained on the camera of a mobile phone. The consensus was that the butterfly could have been a chequered swallowtail *Papilio demoleus*. This species, of which there are a number of subspecies, has a widespread distribution from a range of habitats in Asia, Australasia, the Middle East and the Caribbean. It is probable that the London observation was of an escaped or released butterfly.

For details of species that were recorded beyond Greater London but within the wider LNHS recording area, reference should be made to the respective county reports produced by Butterfly Conservation and others, e.g. see Murray and Wood (2006). The following 2006 records were received of species recorded in the wider LNHS recording area but not from within Greater London:

SILVER-STUDDED BLUE *Plebeius argus*. Recorded at a site at Fairmile Common.

PURPLE EMPEROR *Apatura iris*. Recorded in the Broxbourne Wood area as reported by Andrew Middleton and Liz Goodyear in the Hertfordshire and Middlesex Butterfly Conservation Branch *Newsletter*, September 2006: 10–12.

## Discussion

An innovation in the recording systems was the integration during 2006 of the two main butterfly recording networks in the UK. The UK Butterfly Monitoring Scheme will bring together the data and analysis from the Butterfly Monitoring Scheme transects coordinated by the Centre for Ecology and Hydrology and the now more numerous independent transects that have come to be coordinated through Butterfly Conservation. The first combined national report covered 2005 (Greatorex-Davis et al. 2006).

Butterfly Conservation (Fox et al. 2007) propose that a number of species now meet the criteria for the UK BAP Priority Species list based on declines in range and / or abundance. Of these the following occur, or have recently been either recorded in or presumed lost from the London (boroughs) area: dingy skipper, grizzled skipper, wood white, white-letter hairstreak, small blue, white admiral, wall, and small heath; to which could be added brown hairstreak, silver-studded blue, Duke of Burgundy, pearl-bordered fritillary and grayling from the wider LNHS recording area. Two species of the wider LNHS recording area, the silver-spotted skipper and the adonis blue, no longer meet the Priority Species criteria but would still meet the criteria for Species of Conservation Concern. Changes in the distribution of these species in the wider LNHS recording area are quantified and discussed by Fox and Williams (2006).

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Andy Brown at Gunnersbury Triangle, Andrew Self and Roy Beddard at the Brent Reservoir, Donald Rooum at Regent's Canal towpath, Mike Taylor at Kenwood, Joan Lowe at Featherbed Lane Roadside Verge, David Howdon, Andy Culshaw, Paul Thrush and Jo Wilson at Horsenden Hill East, Andy Culshaw and David Howdon at Horsenden Hill West and at Perivale Wood, and Julia Rolf at Camley Street Nature Park. Records were also received from some of the transect walkers listed above and from, Diane Andrews, Terry Burleug, R. M. Callf, Catriona Corfield, Peggy Dawe, Graham Dawson, John Gowland, Michael Hammerson, John Hollingdale, David Howdon, Leva Hunt, Peter Jupp, Ron Kettle, Dan Monk, Arthur Myers, R. F. Neil, John Palmer, Catherine Schmitt, Stephen Spooner, G. Tingey, David Widdowson, Alan Wingrove and from London Natural History Society field meetings / LNHS *Newsletter*, and the Butterfly Conservation Hertfordshire and Middlesex Branch *Newsletter*. Landowners and land managers of the sites have an important role in undertaking habitat management and supporting monitoring. These include a significant number of the London boroughs (see the Methods), the Corporation of London, other public authorities, the London Wildlife Trust, the Mitcham Common Conservators, the Friends of Tower Hamlets Cemetery Park, Barn Hill Conservation Group and the Welsh Harp Conservation Group. The co-operation with the county co-ordinators for Butterfly Conservation is noted particularly from Surrey, and John Murray and Andrew Wood for Hertfordshire and Middlesex. Dr Dave Dawson had previously advised on the statistical method for the collations and the programming of the spreadsheets. Simon Mercer helped develop the series of linked spreadsheets. I also thank Colin Plant, Richard Fox, the Greater London Authority, the Millennium Awards, British Trust for Conservation Volunteers, and Caroline Williams.

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# Book review

***Flights of fancy — birds in myth, legend and superstition.*** Peter Tate. Random House, London. 2007. 180 pp., hardback. £10. ISBN 978 1 90 521161 6.

Peter Tate has provided, through his description of the myths connected to thirty bird species, an excellent book to provoke interest initially in the early explanatory stories, such as whether blackbirds were once white and then became black through events, whether good or bad. This interest then moves to the surprise that some stories such as cranes attacking pygmies have currency the world over without an obvious explanation through common contact. The ability of myth and superstition to explain the natural world is well explained, although I suspect this book would make a better present for the partner of a birdwatcher as the interest is in the stories rather than as an example of which species of diver links to which legend. I fear the keen birder would retreat to their North American field guides for the precise loon!

As you would expect, the fish or fowl advantages for Lent of the barnacle goose are included as are the stories on magpies, storks, swallows and nightingales. I might have expected more on the pelican, but in contrast I was most intrigued by the entries under owl. The opening words summed up my expectation 'Nocturnal birds tend, not surprisingly, to be the subject of deep fear and suspicion, and owls, with their silent flight and eerie calls, are no exception.' After the various stories of owls containing the souls of the departed and examples of fearing owls from the Romans to the Pima Indians of Arizona, there is the counter-tradition of the Greeks who saw owls as a symbol of sagacity and would release a number of owls before battle for good luck. The image that lingers though is the Ancient Egyptian approach of sending someone a picture of an owl — it was an invitation to suicide.

The examples chosen in this book are worldwide if with a leaning to Greek myth and Christian teaching together with the apparent randomness of superstition as whether you need to be standing or sitting when first hearing some summer migrants. The fun of story telling and linking particular birds to a particular message was clearly not resisted in the past and I wonder what stories are being made up now to explain the changes in distribution we see around us; surely the collared dove will replace the turtle dove in myth as the latter declines. Similarly, the Biblical stories of the quail make more sense when there were vast flocks rather than current depleted numbers.

The author has used a lifetime of accumulating stories and distilled that knowledge into a very readable and entertaining summary of the particular stories that have intrigued and amused him. I would recommend this book as an enjoyable read. It is excellent value, well produced and would make a good present, although see the comments above on the recipient. While this is indeed rather light-hearted, I found several items more thought provoking, as for instance the early belief that cuckoos turned into sparrowhawks for the winter; without any idea of migration this probably seemed pretty logical. Still an easy misidentification on first sight!

MICHAEL WILSDON

# Survey of Bookham Common

## SIXTY-FIFTH YEAR

## Progress Report for 2006



### **General** (Ian Menzies)

The 'invasion' by hawfinches in the Bayfield Plain area (see bird report by Dr Alan Prowse), together with the records of firecrest, were clearly the most interesting natural ornithological events for 2006. Spring butterflies showed a reduction in the peacock and an almost complete absence of small tortoiseshells, but the white admiral, silver-washed fritillary and purple emperor did well during July. Grasshoppers and bush crickets also did well, especially on the Plains where major scrub clearances have been recently undertaken. For many years the growth of scrub and sapling trees has been encroaching upon the open areas of grass and ground flora producing, in the case of blackthorn, an impenetrable monoculture. Substantial clearance was long overdue, but now that The National Trust have been able to undertake this necessary task it was unfortunate that areas of scrub inhabited by visiting hawfinches and nightingales were inadvertently removed in the process. Management by rotational scrub clearance should be compatible with the requirements of the nightingale and hawfinch provided sufficient flexibility is practised. Further such mistakes should be reduced by improving exchange of information between naturalist and National Trust management. The recent choice of Ian Swinney, resident warden on the Common, as chairman of the LNHS Bookham Common Survey Team in place of myself, now experiencing difficulty in reaching the Common, should improve such communication.

### **Management tasks on the Bookham Commons, 2006** (Ian Swinney, National Trust warden for the Bookham Commons SSSI)

One of the most important developments in 2006 has been the undertaking of a veteran tree survey. This is a project The National Trust has been contemplating for several years and has only become possible thanks to the co-operation of the London Natural History Society's Bookham Common Survey. We have found and recorded over a hundred veteran trees (250–450 years old) and two specimens that can be classified as ancient (over 500 years old).

Why have we been so anxious to find and record these trees and what will we do with the information? Most of the ancient trees found in Europe are growing (and dying!) in the British Isles; they are a valuable and not easily replaceable resource. To look at such impressive living organisms is awe-inspiring: they represent the climax of British vegetation noted for their importance to the landscape and the communities of ancient woodland wildlife they support. Rather like the human species, the older they get the more interesting they become. They are the opposite of what foresters look for in

timber production — the more gnarled, split, deformed and decayed the better they are for nature conservation. We have therefore been anxious to record them on the Woodland Trust's database so that a map can be made which will be very useful for future management.

Whilst undertaking the survey it was plain that the majority of these ancient trees were very broad-crowned (spreading) and had obviously grown in the open, i.e. exposed to light from all sides. This is because much of the woodland was grazed by domestic stock, creating wood pasture — a habitat more akin to natural woodland where large wild animals would have kept substantial areas of former wildwood open. Some had been pollarded; many have holes and decay from die-back or damage. They all have valuable dead wood, some were nearly dead and indeed there are others that have died in recent years, which have been included in the survey as they continue to be important hosts for many invertebrates and fungi. It was also very noticeable that many trees had large lower limbs that had died-off due to shading by the much younger oak trees crowding them in.

While considering ancient trees, a simple yet fundamentally important question concerns the replacement of this magnificent part of our environmental heritage. To answer this it is necessary to be thinking several hundred years ahead, being the time required for today's sprouting acorn to reach that size. With many of the densely packed trees already drawn-up tall and thin competing for light, it is important that a proportion of the young oaks be given plenty of room to spread if they are to grow into more desirable broad-crowned trees that will live longer. It is important to select future replacements in good time, therefore the next stage in our survey will be to identify and record suitable intermediate and young trees, across a broad age-range, to ensure a continuity of eventual successors. All this information is valuable for the management of the Commons, and there are many sites where good management strategies have already been developed, notably Ashtead Common and Hatfield Forest.

In the grassland areas rotational clearance of a proportion of young trees and thorn scrub was initially driven by necessity. A linear clearance was required along the boundary of Station Copse on Central Plain in order to access the old fence line which is constantly being breached by fallen willows, and elms with Dutch elm disease, making an easy escape route for livestock. Several breaches to the fence appear to have been an attempt by the cattle to reach an alternative water source when the Central and Isle of Wight ditches, and Bookham Stream, dried up during the hot summer of 2006, necessitating the urgent installation of a water trough on Isle of Wight Plain.

A small horseshoe-shaped area on the northern side of Central Plain, which required very little management to maintain as open grassland in the past, has in recent times been rapidly encroached by blackthorn requiring clearance. This area supported many specimens of the southern marsh orchid, being the original stronghold of this species on the Common. This sudden change in the growth-rate of blackthorn was almost certainly linked to a lowering of the water table during the past ten or so years. The area also had many young hawthorns exhibiting die-back at a surprisingly young age, suggesting, perhaps, that it was the very waterlogged nature of this ground that had previously been restricting scrub encroachment.

Another important clearance was undertaken on Western Plain where the grassland had also largely disappeared under the growth of scrub and trees. Evidence, again, of a lowered water table? This fine patch of wet, ancient pasture was considered far too precious to allow to be shaded out and dried by woodland, the latter we already have in quantity — the countryside having lost about 98 per cent of unimproved grassland since 1945, primarily a consequence of 'improvement' due to increased agricultural usage. The carefully cleared area has the added advantage of increasing the landscape

value of the site, as we have now restored the fine views over grassland and scrub to the woodland of Hill House Wood.

During August 2006 a mixed group of British residents and European students on a National Trust Working Holiday performed sterling work on Bayfield Plain, clearing young birch trees in the searing heat. This was the week that the national temperature record was broken at Wisley, only a few miles away from us at Bookham. Himalayan balsam was pulled up and cut in the woodland near Mark Oak and from Western Plain, and a section of Rydal Path was scalloped, near to Woodland Path where a former glade is being restored.

Bracken control was also continued on Eastern Plain, and tree safety work undertaken on a priority basis according to risk (roadsides and car parks first, main rides, then footpaths). The usual, careful rotational mowing of path edges continued, and rather too much time spent collecting litter and fly-tipping (mentioned here because it takes much valuable time that otherwise would be available for the more important nature conservation tasks).

The National Trust would like to thank the members of the London Natural History Society's Survey Team for their invaluable contribution to the management of this wonderful site. I am also grateful to Ted Green and Jill Butler of the Woodland Trust and Ancient Tree Forum for their generous support and encouragement of our tree survey, together with the staff of Ashtead Common NNR, The National Trust's Hatfield Forest staff, and Sue Webber of Surrey Wildlife Trust for their visits, exchange of information and support.

## **Vegetation** (Steve Mellor)

Three native species have been recorded for the first time on the Common in 2006: bogbean *Menyanthes trifoliata* has been seen for a number of years, but only from a distance on inaccessible deep-water banks and on the island in Isle of Wight Pond. This year it spread to shallows where it could be collected for formal identification, and is added to the accumulative plant list. Wood small-reed *Calamagrostis epigejos* is an impressive coarse grass that was noticed by several members of the LNHS survey groups in a rough meadow on Western Plain. It can grow to two metres and, as its common name implies, feathery fruiting panicles give it the appearance of a small common reed *Phragmites australis*. *C. epigejos* has little value for grazing or hay/silage and is often found on heavy soils that are too wet for cultivation and where it can sometimes form very extensive patches from its creeping rhizomes. It will however grow well on chalk and sand if allowed to remain there when it appears. Hard-fern *Blechnum spicant* was a most unexpected find under trees among bracken at the edge of Eastern Plain. In Surrey it is common on acid soils, for example in woods and wet heaths on the lower greensand. Bookham Common had not been considered a suitable habitat for *B. spicant*, being crossed by a number of chalk streams and having soil acidity often close to neutral.

As usual, a number of alien species have ventured into the survey area this year. Cockspur *Echinochloa crus-galli* is an annual grass from the tropics that appeared on disturbed soil near Tunnel car park. Locally it is probably a bird-seed alien; it can produce viable grain and sometimes becomes established for a few years in Britain. Broad bean *Vicia faba* was recorded near Isle of Wight ditch. As a widely cultivated annual, the origins of *V. faba* are uncertain but it is a frequent casual and was probably brought onto the Common by birds. Norway spruce *Picea abies* has been present as an established tree near the 'White House' at the western boundary of the Common. This year it produced a bumper crop of the long pendulous cones that prompted us to make a definitive identification. It is probably a planted family Christmas tree that outgrew its usefulness, but is worth recording as this species can produce seedlings, and another alien tree spreading across the Common is to be avoided.

There are two main habitats on the Common, established woodland and more or less wet meadows. Each habitat has its characteristic diverse flora that became established over many generations of traditional usage and each is important if we are to maintain the wide diversity of species that have been recorded by the LNHS on the Common. A number of authors have listed ancient woodland indicator plants (Rose 2006: 558–561), and 64 species of the 99 listed for the south-east of England have been recorded on the Bookham Common survey area. This is a very impressive total of woodland indicator species for a small wood with a limited range of the possible soil types. Maps published during the early years of the survey (e.g. Castell 1945) show that about 60 per cent of Bookham Common was at that time classified as woodland, and this is no doubt the extent of the ancient woodland.

The Plains meadows in 1944 covered the remaining 40 per cent of the Common, largely in a wide strip along the western flank. It contained scattered scrub and some larger trees on western and southern boundaries. As traditional use declined, the meadows have disappeared at an alarming rate and less than half of the original meadow remains today. The progression for unmanaged meadow is for it to be invaded by expanding blackthorn *Prunus spinosa* and hawthorn *Crataegus monogyna* scrub with scattered trees, and this gradually reverts to secondary woodland. Dense scrub is poor botanically having virtually no ground flora, though plants are likely to flower and set seed at a scrub edge and possibly nowhere else on heavily grazed meadows. Secondary woodland is very poor habitat with no prospect of it becoming ancient woodland. As it forms, a dense ground flora often appears comprising a very few rank species which die back as the canopy closes. Then there are often no understory shrubs and some areas of secondary woodland have virtually no ground flora because the seedbank there is of meadow plants that require open habitats. It is ironic that the rarest plant species known on Bookham Common, green hound's-tongue *Cynoglossum germanicum,* thrives in developing secondary woodland, though it will no doubt disappear as light levels decline as the canopy closes. This species is protected by Schedule 8 legislation and is categorized as critically endangered nationally. Our remaining colony of *C. germanicum,* in secondary woodland to the west of South East Wood, this year increased to about 150 plants many of which flowered and set fruit.

Numerous plant species recorded on the Plains areas of the Common are included in a developing draft version of a 'Surrey Rare Plants Register'. Some of these have not been seen for many years on the Common whilst others have been refound after a long absence following scrub/wood clearances. Such meadows are a valuable and declining habitat in Surrey and should be preserved to conserve the flora and fauna that flourish there. It is clear from discussion elsewhere in this survey report that blackthorn scrub is a valuable component of the meadows vegetation for rare bird species that use it. However, the meadow areas must be aggressively managed if we are to prevent further losses and this would involve some scrub removal. I would hope that in future we might establish robust channels of communication between the LNHS and The National Trust that will satisfy the diverse interests of LNHS groups within the NT management plan for Bookham Common, and that inadvertent damage to valuable habitats might be avoided in future.

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**Birds** (Alan Prowse)

In the early part of the year the main event was an invasion of hawfinches. Bookham Common has been, for some years, the only site in Surrey where the species can be found in winter. There are usually a few (a maximum of thirteen) present, which are probably of local stock, and which pair off in February/March. In 2006 there was an irruption from the Continent with birds seen in many places. Bookham became a focus for birders; birds were seen on Bayfield Plain from 30 January to 14 March with a maximum of twenty-one birds (Robert Warden) on 9 February. The birds fed in a very limited area of blackthorn scrub, appearing to feed deep down in the scrub. It is thought they probably fed on the sloe stones dropped by the feeding winter thrushes, but no explanation is forthcoming for the very limited area which the species has habitually used since the late 1970s. When the wintering flock departed a pair took territory on the Isle of Wight, being seen on several occasions until 14 April, when bud break made further observations impossible. There have been, over several decades, occasional breeding-season records of calls and family parties in Kelsey's Wood in the hornbeam area; the most recent of these was a record during the Scarce Woodland Species survey in 2005. Unfortunately, The National Trust in its wisdom bulldozed the wintering site, traditional for the species since the 1970s, in the autumn of 2006, so that no birds appeared in the winter of 2006/7.

A consequence of this happening, with birders exploring the area, was a record of willow tit on the allotments by Bayfield Plain on 7 February (Robert Warden). This is the first winter record for the Common and its immediate environment for at least ten years, though another of this now unusual species was photographed on Bayfield Plain in January 2007 by Graham Carey.

On 14 April, Ruth Iredale saw a red kite flying over, the second record for the Common, the first being in 2003.

On 27 November a firecrest was found in a flock of tits by the Isle of Wight Pond (ADP), and seen by many observers in the following weeks, with two present on 12 December (ADP). These stayed in the area into the New Year. This was the first record since 23 April 2000.

**Breeding season.** Little grebes nested successfully on Ponds 1 and 3, and coot were successful on Ponds 1, 2, and 3; grey herons had twenty successful nests, with only three failing.

Birds of prey continued their recent success. Sparrowhawks had at least two pairs in the area, with the known fledging of two young, one of each sex from one nest; kestrels had two pairs on the Common and an additional pair to the north on Chasemore farm, though, as usual, no evidence of successful fledging was noted; there were two pairs of buzzards in the immediate area with others nearby.

The stock dove was uncommon a decade ago, but is now met with in the spring and summer throughout the woodland areas, with, perhaps, ten pairs; collared doves nest on the southern and south-western borders; there were no records of turtle doves this year. Cuckoos had a better year, despite their severe decline in the country; three males were known, and courtship and copulation were seen on 31 May. Ring-necked parakeets continued to show, with up to fourteen in aerial gymnastics over the southern woods on 22 February and 25 March. The lesser spotted woodpecker is still found near Bayfield Pond and at the eastern border of the Common; calls were heard near the Fetcham car park, and a bird was seen and heard drumming in the spring behind the warden's cottage. All of these areas are light woodland/orchard types of habitat; the species is not found in the more forested areas.

Two pairs each of swallows and house martins nested within the confines of the Common, with further pairs on Chasemore Farm. The only grasshopper

warbler of the year was near Bookham Station on 14 May (RK). There were two territories of lesser whitethroat and one other singing male. Once again, there was a low population of willow warblers, with only three pairs.

Eight territories of nightingales were established, with two singing males at other sites. Unfortunately, at the end of the year The National Trust bulldozed much of the nightingale area on Central Plain, destroying five of the newest territories. The National Trust knew the importance of this site in the rotation necessary to keep the nightingales. As the Western Plain area is now less attractive to the species because the scrub has matured, the hope of retaining a good population of the species at Bookham is receding.

A reed bunting was heard singing on IoW Plain on two occasions. A pair of yellowhammers had territory on the northern boundary with Chasemore Farm.

**Woodland walks.** In the last report I described the two walks which were part of the Scarcer Woodland Bird Survey by the BTO. Each survey involved two walks along a one-kilometre route; the first goes from Hundred Pound Bridge to Kelsey's Pond; the second is from the main car park along Tunnel Path. Evaluating the results, I felt that so much of what was there did not appear during the walks that the technique would be of little use in monitoring population changes in the woods. Table 1 details, for selected species, the known territories along each path in each of the two years from many more observations of the route than the two prescribed. Records were kept of birds within a hundred metres of the path. On a one-kilometre walk a 200-metre-wide belt would be twenty hectares. Because territories would extend outside the area of observation, it would be unsafe to extrapolate the results into calculations of density; such calculations would overestimate the density. My detection distance for treecreeper and marsh tit is probably not much greater than fifty metres, but no allowance for this is made in the table.

TABLE 1. Woodland walk surveys. Bookham Common territories identified for selected species within a hundred metres of transect path from two one-km walks in 2005 and 2006.

| | **Woodland walk 1** | | **Woodland walk 2** | |
|---|---|---|---|---|
| | **2005** | **2006** | **2005** | **2006** |
| Great spotted woodpecker | 7 | 7 | 12 | 9 |
| Green woodpecker | 6 | 4 | 4 | 5 |
| Nuthatch | 5 | 5 | 5 | 3 |
| Blackcap | 12 | 7 | 6 | 11 |
| Missel thrush | 3 | 3 | 2 | 2 |
| Marsh tit | 2 | 3 | 2 | 2 |
| Treecreeper | 2 | 6 | 4 | 6 |

**Conservation problems.** It is mentioned in this report that destruction of habitat is adversely affecting two flagship species on Bookham Common, the nightingale and the hawfinch. The National Trust was fully aware of the importance of Central Plain for these species, yet engaged in extensive bulldozing. Both these species are mentioned as important in the SSSI schedule for Bookham Common. Another affected species is the lesser whitethroat, again mentioned in the schedule, which in recent years has become a regular breeder in small numbers. There have been no hawfinches

in the winter 2006/7. At the time of writing (6 May 2007) there are five nightingale territories (only two in traditional areas), and no lesser whitethroats. Representations to The National Trust at regional level have received an unsatisfactory response. This is sad, as the expertise of The National Trust allied to the extensive knowledge of the LNHS team could make Bookham Common the best-managed SSSI in the UK. My file is being sent to Natural England, the body which oversees the management of SSSIs.

## Acknowledgements

I would like to thank Lance Gibbs, Ruth Iredale, Ron Kettle, Colin Pettigrew and Ian Swinney for their help and recording.

## **Mammals** (Alison Fure)

Four nesting box checks have been undertaken during the last twelve months:

1. 2.iv.2006 — to try and avoid the main bird breeding season
2. 1.x.2006 — 'cleaning and repair'
3. 31.x.2006 — 'cleaning and repair'
4. 4.ii.2007 — a 'lid-replacing visit' following January gales

**Dormice *Muscardinus avellanarius* appeared to have occupied three boxes**

During the April visit a dormouse nest was found in a Hundred Pound Wood nesting box, its tightly woven construction resting on top of a wood mouse *Apodemus sylvaticus* winter nest of loose oak leaves. The beginnings of a blue tit *Parus caeruleus* nest (recorded as being constructed on 2.iv.2006) had been converted by a dormouse into a ball in Stents Wood. Squirrel *Sciurus carolinensis* damage to boxes is a common problem at this location and a squirrel (or weasel *Mustela nivalis*) had been able to move the lid, allowing rainwater into the box, which may have led to desertion. The stripped bark within a third box (Isle of White Plain) was most likely a dormouse nest.

**Other occupants.** Forty-eight per cent of boxes were initially occupied by blue, and great tits *Parus major,* the earliest recorded nest building was that of great tit in Stents Wood (3.ii.2007). Again there was evidence that bats had used at least three of the boxes and wood mice were using several either as winter nests or food stores (a large cache of ash keys was found in a box in Stents Wood, 4.ii.2007). Common *Sorex araneus* and pygmy *Sorex minutus* shrews (Figure 3) were found at two locations. Large droppings (with no white urine caps and a large amount of earth) from two boxes cannot be identified and if anyone is adept at faecal identification, I would like to hear from them.

**Predation.** The boxes were cleaned out during the October visits with some removed for repairs. In three cases, blue tits had failed to thrive after hatching and others had been predated, leaving piles of wings (Figure 1). Weasels are thought to be predating birds and mice in nearby boxes in Stent's Wood with one case in Hundred Pound Wood during January 2007 (Table 1).

In Stent's Wood, two wood mice seen in their winter nest of oak leaves (1.x.2006) had been predated probably by a weasel (before 29.x.2006) leaving a string of tail, fur and feet (Figure 2). Two boxes contained very neatly predated eggs. In a recent edition of the *Dormouse Monitor* (Autumn 2006) it was suggested that dormice could predate birds' eggs (based on observations from Ham Street Woods NNR).

Only thirty-six of the fifty mammal boxes now remain. Some have been 'lost' during management operations or are in areas too overgrown to access. Management was one of the issues discussed during our second 'meet the rangers' of the year (Figure 4, October 2006). When the boxes were originally

FIGURES 1 and 2. Weasel predation on blue tits and wood mice (tails to left, feet to right).

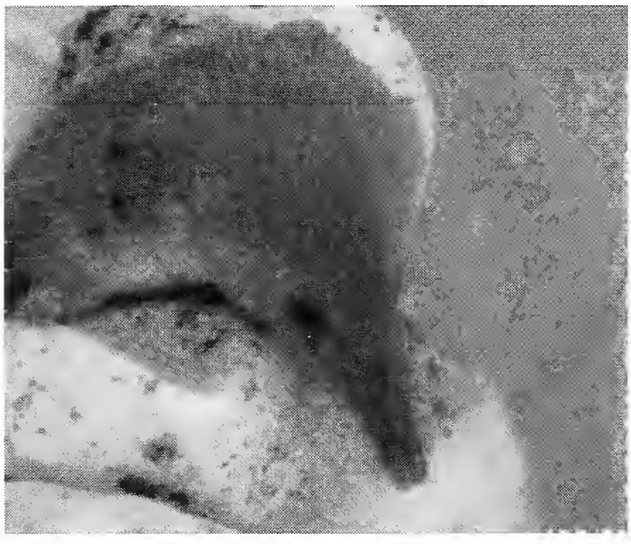

FIGURE 3. Pygmy shrew.

FIGURE 4. Meet the rangers, October 2006.

TABLE 1. Brief results, 2006–2007.

| Species | Location | Number | Comments |
|---|---|---|---|
| Blue tit | Throughout | 20 | At least three predated nests, in one case by weasel (Figure 1) |
| Wood mice | Hundred Pound Wood and Stents Wood | 10 | Two mice predated by a weasel in Stents Wood (Figure 2) |
| Dormouse | Hundred Pound Wood<br>Isle of White Plain<br><br>Stents Wood | 3 | Nest remains on top of an old wood mouse nest<br>Stripped bark<br>Blue tit nest rolled into a ball |
| Common shrew | Isle of Wight | 1 | In old blue tit nest |
| Pygmy shrew | Kelsey's Wood | 1 | In old blue tit nest. |
| Bat droppings | | 3 | |

distributed around the Common, two compartments had been managed as follows:

1. Western Plain: the rolling of bracken (2004) gave the Plain the appearance of accessibility. The effect was short lived and currently the bracken forms an impenetrable barrier. Any boxes which could be salvaged from here have been moved to Banks Plain.
2. Hundred Pound Wood: lack of deer browsing has led to rapid growth in vegetation and suckers of the poplar trees (clear felled in 2004). Local gamekeepers continue to take advantage of this cover, shooting over the wood and on one occasion forty dead woodpigeons *Columba palumbus* were found lying by the brook.

**Ten new boxes have supplemented dwindling box numbers but are of two new designs:**

1. Adapted orange-juice cartons with a plywood nest-bed which are suspended from branches. These have the following advantages: they cannot be occupied so easily by birds (thereby excluding small mammals) they are lightweight and easy to transport around the Common and have an inspection hatch (the original stopper). This design comes courtesy of M. Anderson and N. Dale (Blean Woods NNR).
2. Plastic drain pipes used in a Romanian study (*Dormouse Monitor*, Autumn 2006). These are fitted with similar plywood nest beds as are used in the orange-juice cartons. Romania has four species of dormice: *Glis glis*, *Muscardinus avellanarius*, *Eliomys quercinus* and *Dryomys nitedula*.

## Invertebrate Field Study Days

## Dragonflies and other insects Field Study Day, 8 July 2006

(Neil Anderson)

After a cloudy start the sun appeared and the temperature peaked at 25°C. As usual we had a good attendance for this meeting with a broad range of age and expertise! A good total of eighteen butterfly species were recorded. Only one small tortoiseshell *Aglais urticae*, was seen, in line with the recent decline which has been linked by some experts to a recently arrived parasite. Amongst some of Bookham's specialities good numbers of white admiral *Limenitis camilla*, and silver-washed fritillary *Argynnis paphia*, were seen, some providing ideal photo opportunities as they basked and nectared from brambles. The highlight was to observe five purple emperors *Apatura iris* making passes over the master tree along High Point Path in Hill House Wood. At one point two and three males were seen chasing each other simultaneously. Also seen here were a couple of purple hairstreaks *Neozephyrus quercus* seeking honeydew on leaves.

Odonata activity was unremarkable with most action on IoW Pond. Species recorded here included a couple of emperors *Anax imperator*, a single broad-bodied chaser *Libellula depressor*, several basking and duelling black-tailed skimmers *Orthetrum cancellatum*, a pair of common darters *Sympetrum striolatum* and several emerald damselflies *Lestes sponsa*. Both southern hawker *Aeshna cyanea*, and brown hawker *Aeshna grandis* were encountered hunting along Glade Path. A single banded demoiselle *Calopteryx splendens* and a pair (male and female) of ruddy sympetrums *Sympetrum sanguineum* were also seen.

Amongst the Hemiptera a handsome *Miris striatus* was beaten from oak, whilst the mosquito bug *Metatropis rufescens* was swept from enchanter's nightshade in South East Wood. Five species of shieldbug and allies were discovered including the gorse shieldbug *Piezodorus literatus* which, together with nymphs, was beaten from gorse on Central Plain.

As is customary on this annual meeting we found some of Bookham's most showy chrysomelid beetles such as *Chrysolina herbacea, C. polita* and *Phyllobrotica quadrimaculata* on lakeside vegetation by IoW Pond. Much rarer was the weevil *Hypera venusta* swept by Oliver Crundall, which has not been recorded here since about 1942.

Apart from entomological interest, a weasel *Mustela nivalis,* was seen running across High Point Path, while avian highlights included a hobby *Falco subbuteo,* over Merritt's Cottage, and a pair of bullfinches *Pyrrhula pyrrhula.*

## Grasshoppers and other insects Field Study Day, 12 August 2006 (Gavin Hawgood and Ian Menzies)

Seven members met at the railway station at 10.30 on a rather dull morning. The more notable grasshopper discoveries were single examples of *Gomphocerippus rufus,* rufous grasshopper, on Central Plain and near Merritt's Cottage, and the continued presence of a small colony (about six) of *Conocephalus dorsalis,* the short-winged conehead bush-cricket, amongst marshy vegetation on the east side of Isle of Wight Pond. In addition *Pholidoptera griseoaptera* dark bush-cricket, *Conocephalus discolor* long-winged conehead, *Leptophyes punctatissima* speckled bush-cricket, *Meconema thalassina* oak bush-cricket, *Metrioptera roeselii* Roesel's bush-cricket, *Chorthippus brunneus* field grasshopper, *C. parallelus* meadow grasshopper, all familiar Bookham species, were noted. *Omocestus rufipes* woodland grasshopper, *Stenobothrus lineatus* stripe-winged grasshopper and *Chorthippus albomarginatus* lesser marsh grasshopper, species that have been (though briefly) noted at Bookham in the past, could not be found and, as was the case last year, the presence of the common green grasshopper *Omocestus viridulus,* was indicated by the occasional burst of stridulation. Previously this species has been regular and plentiful at Bookham, but has now become quite scarce. This year the field grasshopper, was particularly plentiful on Central Plain, probably because rabbit activity had reduced turf height and created bare patches of ground, conditions appreciated by this species. Oliver Crundall found a fully grown elephant hawkmoth *Deilephila elpenor* larva on heath bedstraw, also two wasp spiders *Argiope bruennichi,* on Central Plain, the latter an indication of the increase in grasshopper numbers. Two heather ladybirds *Chilocorus bipustulatus* were obtained by beating old hawthorn bushes on Central Plain where heather does not exist!

## Spiders Field Study Day, 9 September 2006 (Oliver Crundall)

Ten members attended, starting 10.30 a.m. at Bookham Station, on a fine nearly windless day, temperature 24°C. At first our party visited the Arboretum where *Araneus diadematus,* the familiar large orb weaver, was present, the female large and visible to all while the surprisingly small male lurked inconspicuously at the periphery of the orb web. The male locates the female by sensing the pheromones she involuntarily leaves on her silk.

Later *Theridion tinctum* (Theridiidae) was beaten from hawthorn: females reach 0.75 cm in length and build an irregular tangle web typical of theridiids. The male (not seen) is small enough to employ aeronautical dispersal as a means of transport when searching for females, as they had previously been noticed landing on the leader's clothing.

Entering the oak woodland and beating holly yielded a female *Diaea dorsata* (Thomisidae). This species is one of only two truly green spiders in the UK, the other being *Nigma walckenaerii* (Dictynidae). *D. dorsata* neither spins a web nor actively hunts, but ambushes its prey on green leaves. The same holly produced a female *Cyclosa conica* (Araneidae) a small orb weaver which is

known to arrange a vertical column of detritus (stabilimentum) at the centre of its web. Araneologists have provided several theories to explain this singular behaviour, but none is satisfactory.

Members enjoyed a leisurely lunch at the LNHS Survey Hut before investigating the western side of the Common. It was here in a grassy area that a female of the large orb weaver *Argiope bruennichi* (Araneidae) was discovered. Like *C. conica* this species also builds a stabilimentum, but comprised entirely of silk. We were lucky to find this species for the adult season is normally limited to August. *Argiope* mimics the abdominal markings of the common wasp, and in doing so gains protection from birds. *Agalenatea redii* (Araneidae) was found by sweeping in the same meadow. This local orb weaver is rotund, reaching 1.5 cm in length and sometimes sports a large black dot against its cream-coloured abdomen.

Beneath the boardwalk that spans a marshy border of the Isle of Wight Pond a female orb spider *Metellina merianae* (Tetragnathidae) was found which had, in view of a shrunken abdomen, recently oviposited. This species is a specialist of damp, shady, situations. In a nearby grassy area of Eastern Plain a fallen oak leaf seemed to be hovering amongst the grass stems. Closer inspection revealed the leaf to be fixed in position by a few silken threads. Hiding inside the leaf was a rotund crimson coloured spider of 2 cm length: several members of the group at once announced that this was a female specimen of the rare strawberry spider *Araneus alsine* (Araneidae).

During the course of the spider study day a single lesser marsh grasshopper *Chorthippus albomarginatus* was noted from Central Plain, and further specimens of the rufous grasshopper *Gomphocerripus rufus* and short-winged conehead bush-cricket found. Two mosquito bugs *Metrioptera rufescens* were also obtained by sweeping enchanter's nightshade in the Arboretum.

## **Invertebrate field notes** (Ian Menzies)

**The brown hairstreak** *Thecla betulae*. In total forty-one eggs of were found on blackthorn, mostly less than five feet from ground level on small sapling bushes growing in open areas of Bayfield, Central and Isle of Wight Plains, also by Merritt's Cottage and along Banks Path (**1, 14** and **17.ii; 11.iii; 5.iv** and **8.iv.2006)**. On **10.vi.2006** a fully grown larva was beaten from blackthorn, Central Plain: this pupated **20.vi.2006,** and emerged **14.vii.2006**, and eggs were found again in the autumn, 2 from Central Plain **21.x.2006**, 15 from Central and Bayfield Plains **30.xi.2006** and one from IoW Plain **9.xii.2006**. As for last year the adult of this elusive butterfly could not be detected, although sought for, during the July–September period. It must spend lengthy periods at rest or crawling over foliage rather than flying.

**8.iv.2006:** seven commas *Polygonia c-album*, and four brimstones *Gonepteryx rhamni* were counted. The peacock *Nymphalis io* was present in reduced numbers and small tortoiseshell *Aglais urticae* absent

**13.v.2006:** the following beetle species were obtained, mainly by beating hawthorn blossom: *Grammoptera ruficornis* (quite plentiful), *Grammoptera variegata* (a single specimen of this rare species was found at rest on ground vegetation in the Arboretum), *Rhagium mordax* (one), *Alosterna tabacicolor* (one), *Anaglyptus mysticus* (about four), black-headed cardinal beetle *Pyrochroa coccinia* (two), cream-spot ladybird *Calvia 14-guttata* (one), pine ladybird *Exochomus quadripustulata* (several), 14-spot ladybird *Propylea 14-guttata* (one), and orange ladybird *Halyzia 16-guttata* (eight).

**15.v.2006:** three brimstones, several orange tips *Anthocharis cardamines* and speckled woods *Pararge aegeria*, were seen. A red admiral *Vanessa atalanta*, and a painted lady *Vanessa cardui* were observed visiting the flowers of ground ivy on

Central Plain, and one red-headed cardinal beetle *Pyrochroa serraticornis* was found in the Arboretum.

**10.vi.2006:** two rather worn peacock butterflies, several brimstones, three common blues *Polyommatus icarus* and a single small copper *Lycaena phlaeas* were seen on Bayfield Plain. A fresh speckled wood was also seen — could be the commencement of a second generation or from an over-wintering larva rather than pupa? *Leiopus nebulosus* (a longicorn beetle) usually found on dead oak branches, was found by Oliver Crundall on Bayfield Plain.

**21.vi.2006:** the first silver washed fritillary *Argynnis paphia* was seen at Bookham by Ian Swinney, also eight white admirals *Limenitis camilla* and two red admirals. Several *Chrysolina polita* (a leaf beetle from water mint and gipsywort) were seen on lakeside vegetation by IoW Pond.

**24.vi.2006:** during the course of our botanical field meeting (leader Steve Mellor) many of the midsummer butterflies were in evidence. Two adult red admirals were flying, also several of the larvae found on nettles. About twenty white admirals, four commas and two silver-washed fritillaries were seen, meadow browns *Maniola jurtina* were plentiful, four very fresh ringlets *Aphantopus hyperantus,* three rather worn speckled woods, two brimstones, about a dozen large skippers *Ochlodes venata*, two common blues *Polyommatus icarus* and a single painted lady were seen on Central Plain. A wasp beetle *Clytus arietis* was also noted.

**28.vi.2006:** *Phytodecta decemnotata* a leaf beetle from aspen: only a single one could be found. The closely related *Phytodecta viminalis*, on sallow, has also become very scarce: both these species being continually abundant both as adults and groups of larvae during 1980s and early 1990s.

**5.vii.2006:** one purple emperor *Apatura iris* was seen flying over tall oaks on Western Plain at the southern end of the Common.

**7.vii.2006:** the BBC South Unit (filming for 'Nature's Calendar') visited Bookham Common: they successfully photographed silver-washed fritillary, white admiral and purple hairstreak as they recovered from a short spell in the LNHS Hut refrigerator! A single small tortoiseshell was seen visiting bramble flowers near Merritt's Cottage: this, together with a further sighting on 8.vii.2006 (Neil Anderson) and a nest of larvae on nettles noted by Ian Swinney in late May, seem to be the only sightings for this species on Bookham Common during 2006.

**12.vii.2006** (I. Menzies and S. Mellor): purple emperor again seen flying over the Hill House master trees (3.00–3.30 p.m.). Purple hairstreak *Neozephyrus quercus* abundant, several flying at ground level, and white-letter hairstreak *Satyrium w-album*, two seen on variegate privet in blossom at south end of Banks Path. The gatekeeper (= hedge brown) *Maniola tithonus* was commencing emergence. Ian Swinney mentioned seeing purple emperors in the Sheepbell area at the north of the Common.

**17.vii.2006:** during the afternoon twenty white admirals, forty-three silver-washed fritillaries, a single purple emperor, two red admirals, two peacocks and many purple hairstreaks were sighted. Only a single example of *Strangalia maculata*, a longicorn beetle wasp-mimic, usually abundant at Bookham, could be found.

**29.vii.2006:** Central Plain: overcast afternoon with little sunlight. Heather, kidney-spot and pine ladybirds (*Chilocorus bipustulatus, C. renipustulatus* and *Exochomus quadripustulatus*), were beaten from old hawthorns. One small copper butterfly *Lycaena phlaeas* seen on Central Plain.

**5.viii.2006:** a pleasant sunny day. Two silver-washed fritillaries and three painted ladies seen visiting teasel flowers opposite Banks Cottages. Second

generation speckled woods frequent, also common blues near Merritt's Cottage, at south end of Banks Path, and on IoW and Bayfield Plains — obviously doing well. One brown argus *Aricia agestis* was visiting devil's bit scabious at the south end of Banks Path.

**14.x.2006:** *Chrysolina brunsvicensis* (a leaf beetle), two obtained by sweeping in a recently cleared area between Lower Eastern and East Hollows Ponds: this coincides with the reappearance of its foodplant, square-stalked St John's wort, *Hypericum tetrapterum* beside the Greendell Stream TQ129/563 .

**21.x.2006:** A further *Chrysolina brunsvicensis* found on *Hypericum tetrapterum* by the Greendell Stream, also single examples of *Chilocoris bipustulatus* and *Exochomus quadripustulatus*, heather and pine ladybirds respectively, by beating old hawthorns on Central Plain.

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# Book review

***Birds in a village a century on.*** Brian Clews. WILDGuides Ltd, Old Basing. 2006. 132 pp., many coloured and black and white photographs. £14.50. ISBN 1 903657 15 6. Obtainable on sales@wildguides.co.uk or by phoning 01628 529297.

This small book is based on a nice idea. In the early part of the last century, W. H. Hudson wrote an account of a visit to a village in the Chilterns one spring and summer and the bird-life and people he met there. Brian Clews, who now lives in the same village, has matched this work with his own contemporary account. Thus each chapter is presented in two parts, the first by Hudson and the second by Clews. The distinction between the two parts is highlighted by the Hudson pages being grey with feint artificial 'foxing' (though in a modern typeface), while the Clews pages are conventionally printed on white. Hudson's work was not illustrated, but this book contains reproductions of contemporary photographs printed in sepia and modern ones in colour. Neither author identified the village concerned, though it is clear from the outset that it is in the Chilterns and by the early part of the second chapter Clews has given sufficient information to pin-point it precisely. There is no index, which I think is a mistake.

Given the book's title it is a surprise to find the first chapter dealing with St James's Park (Hudson) and the modern bird scene in Britain (Clews), but the succeeding ten chapters deal mainly, but by no means exclusively, with the village and various aspects of its bird-life, interspersed with social commentary. To give a flavour of the latter, these include the suspicious attitude of 'rustics' to strangers and bird-scaring in cherry orchards (Hudson) and the attitude of locals to birds, the pressures of commuting to London and some side-ways digs at foreign holiday travel and 4 × 4s (Clews). The introduction refers to the changing fortunes of many bird species in the village and it is, indeed, fascinating to read Hudson's references to, for instance, cirl buntings being more frequently noticed than goldfinches or bullfinches and to learn that he would 'gladly have traded a turtle dove for a magpie' (which he had not seen for a year!), while Clews reminds us of the all too familiar loss of wood warblers, tree pipits and the rest, as well as the appearance of red kites, Canada geese and parakeets.

Clews has sought to follow Hudson's rather discursive style and also emulates his somewhat anthropomorphic descriptions of bird behaviour, which may be appropriate to his intended lay audience, though a bit more attention to the scientific facts underlying some of the assertions (for instance on factors controlling bird populations) might have been wise. Clews concludes the book with the hope that 'it might inspire the reader to go out, look and listen, to wonder at and explore, the life of the village birds'. The subject matter chosen is certainly ideal for that task, but whether the style of writing of either author is up to inspiring the uninitiated to get out and look in the twenty-first century is perhaps less certain. The book nevertheless provides a fascinating commentary on changes not only in bird-life, but also in social attitudes, over the past century.

PETER OLIVER

# Blooms of algae on Hampstead Heath in 2006

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## Abstract

This paper details the freshwater algae forming blooms on the ponds of Hampstead Heath in 2006 and considers the dangers they pose to health.

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The City of London Corporation has responsibility for Hampstead Heath, a large open space in north-west London. There are twenty-eight permanent ponds on the Heath; two linked chains of ponds on the main Heath, in the valleys of Hampstead and of Highgate, have been created along tributaries of the River Fleet. A linked chain of ponds in Golders Hill Park and West Heath have been formed along a stream feeding into the River Brent and another of small ponds, the Seven Sisters, is on Hampstead Heath Extension (Delf 1915). There are other isolated ponds in the Vale of Health and on Sandy Heath.

Six of the ponds are designated for fishing, three for swimming and one for model boating. Three of the ponds are reservoirs under the 1975 Reservoirs Act (Hampstead No. 1, Men's Bathing Pond and Model Boating Pond).

The ponds are heavily used by the public, and the Corporation has added various safety measures to reassure the public and fulfil statutory obligations.

One of the things the Corporation does is to monitor the water quality of the ponds. In the case of the bathing ponds this includes regular checks for faecal bacteria. The ecologists working for the Corporation also check for blue-green algae (Cyanobacteria/Cyanophyta). Although the toxins produced by these organisms have never killed a human, save in exceptional circumstances, they have been responsible for the deaths of cattle and dogs (Nehring 1993) — and there are a great number of dogs on the Heath.

Checking the identity of algae involves the Corporation in sending samples away to be analysed, which can mean a delay of up to two weeks. In 2006, Julie Brownbridge, an ecologist for the Corporation, asked if I could help. The advantage was that I could tell them what their alga was within twenty-four hours, so they could react that much faster to an emergency, or have peace of mind sooner.

The first reported bloom in 2006 was at the Men's Bathing Pond Highgate (TQ 278865), which I visited on 1 July. The pond was an almost pure culture of *Pediastrum simplex* Meyen, a colonial green alga (Chlorophyta). I was able to tell the Corporation that it was not a danger to health and that the pond could remain open. The Men's Bathing Pond used to suffer from blooms of blue-green algae, but the installation of two diffusers in 2005 seems to have solved, or at least ameliorated, the problem.

The Men's Bathing Pond is downstream from the Model Boating Pond (TQ 278867), scene of the next alarm on 29 July. When I made surveys of the Model Boating Pond in 2004, it could always be relied on to provide blooms of blue-green algae from early spring through summer. The installation of mixers in February 2005 went some way to help, and they usually stop any one species gaining dominance. The bloom at the end of July 2006 was of blue-green algae and was dominated by *Gomphosphaeria aponina* Kützing followed by *Microcystis flos-aquae* (Wittrock) von Kirchner with a few colonies of *Anabaena flos-aquae* (Lyngbye) de Brébisson *sensu* Geitler. The mixing of the water meant that none of the species gained dominance and the blue-greens were swiftly (three days or so) overtaken in numbers by green algae. The dominant species was *Closteriopsis longissima* (Lemmermann) Lemmermann with a good number of

*Ulothrix* Kützing. There were quite a few specimens of the diatom *Asterionella formosa* Hassall, which caused a bloom of its own on Highgate No. 1 Pond (TQ 280864) in August 1996, the dinoflagellate *Ceratium hirundinella* (O. F. Müller) Dujardin and even the desmid *Closterium acerosum* (Schrank) Ehrenberg ex Ralfs.

The next bloom occurred on Hampstead No. 1 Pond (TQ 273859) at the end of July. Great yellow-green cushions of algae covered most of the water's surface. It was another green alga, *Cladophora glomerata* (Linnaeus) Kützing. *Cladophora* produces a brominated diphenyl that can cause a contact dermatitis (Gabrielson 1983 et al.). It has been implicated in 'swimmers' itch', but this may be because of its ability to harbour great quantities of *E. coli* (Whitman 2003 et al.). Swimming is not allowed in Hampstead No. 1, however, and it is difficult to think of anyone wanting to try. Blooms of filamentous algae on this pond are common and tend to last longer. Normally a bloom exhausts all the nutrients and crashes (Dodds 1991), but in No. 1 Pond, the nutrients are constantly topped up by the faeces of birds, rats and dogs. In 2005, a bloom of *Oedogonium* Link covered most of the pond by the middle of June and should, by rights, have lasted a matter of weeks. But it carried on well into August.

In mid September an algal scum formed on the Highgate No. 1 Pond (TQ 280864), and a couple of dead fish were found there. The algae proved to be a bloom of *Microcystis aeruginosa* Kützing em. Elenkin and *Aphanizomenon flos-aquae* (Linnaeus) Ralfs. *Microcystis aeruginosa* is responsible for microcystins; the most common of the cyanobacterial toxins found in water, as well as being the ones most often responsible for poisoning animals. I telephoned Ray Poole at the Corporation and the pond was closed.

I checked on the progress of the bloom in the following weeks. By 8 October 2006 the population had shifted; the *Aphanizomenon flos-aquae* had taken over completely and the pond was virtually a monoculture.

Recent studies have shown the probability that a bloom containing *Anabaena*, *Microcystis*, and/or *Aphanizomenon* could be toxic is between 45 and 75 per cent (Carmichael 1992). 'Toxic' really means by massive ingestion or injection. Human deaths attributable to poisoning by cyanobacteria are rare; the most recent case was in 1996 when dialysis patients where exposed to a contaminated water supply. Even here there were contributing factors: apart from the vulnerability of the patients, the filters on the equipment had not been changed, nor had the water been chlorinated. A second clinic, taking its supplies from the same reservoir but observing the precaution of chlorinating the water, reported no deaths, or even illnesses (Jochimsen et al. 1998).

It is still best not to ingest blue-green algae and I am always surprised to see it, usually *Spirulina* and *Aphanizomenon flos-aquae*, touted as a 'health food' in various shops in Hampstead. Gilroy did a survey of commercially available blue-green algae supplements and found that 85 out of 87 of the samples tested positive for toxins, most notably microcystins long-term exposure which has been connected with the appearance of liver tumors (Gilroy et al. 2000).

The co-operation between a member of the LNHS and the Corporation of London is fruitful and mutually beneficial. The corporation gets a swift diagnosis of the algae and I have the ecologists and wardens of the Heath acting as a sort of phycological 'twitchers' hotline'.

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# Book reviews

***Silent fields. The long decline of a nation's wildlife.*** Roger Lovegrove. Oxford University Press. 2007. 404 pp., hardback. £25. ISBN 978 0 19 852071 9.

A scholarly work, Roger Lovegrove's book represents a bold attempt to decipher the impact of 'vermin control' on Britain's wildlife. It first introduces us to the practice of vermin control, from the advent of the 1566 Vermin Act, as organized through rural parishes. The author has undertaken painstaking research into church wardens' accounts, sections of which are reproduced in the text, giving us a glimpse into the wide range of species controlled (including kingfisher and dipper in some areas), and bounties given (fourpence for a hedgehog, or sixpence for a badger in Hambledon in 1736). Local idiosyncrasies are brought out, such as the huge numbers of house sparrows culled in the eighteenth to early nineteenth centuries on the Isle of Wight.

He then goes on to scrutinize shooting-bag records from some of the major game estates, which grew up especially after the eighteenth-century Enclosure Acts, and identifies a severe impact on predatory species. In the Glengarrie Estate near Inverness, for example, over 1,700 diurnal raptors, as well as over a hundred owls and hundreds of martens, polecats, stoats and weasels were taken in just four years between 1837 and 1840. Records from a once-thriving fur trade, including the annual Dumfries Fur Fair, are also examined, with entries for polecat (or foumart) noted as ' below average' in 1834, then 'increasingly scarce' around 1860 until 'no foumart' by 1871, as this once-common species approached extinction across England and Scotland.

Later sections consider individual species in more detail. The author attempts to tease out how far control itself was a major cause of decline, reducing once widespread species, such as wild cat or red kite, to minute populations in just a few remote localities, and in the worst cases, such as sea eagle and goshawk, to national extinction. For some, control was compounded by other environmental factors, such as food-chain effects of pesticides in the otter. By contrast, other species, such as house sparrow, seemed to be able to withstand enormous levels of carnage but still maintain high numbers. How times have changed for this species! But it is not all bad news. The book also shows how recent wildlife legislation and other conservation measures, as well as changes in public attitude, are helping to bring some species, such as otter and osprey, back from the brink.

This is a highly readable book, rich in detail. In some respects it is the last three chapters, which explore the whole issue of vermin control in the context of twenty-first-century political debate, including the controversy around fox hunting, and the impact of biodiversity legislation on sporting and farming interests, which are the most thought provoking and interesting. It might have been better for the flow of the main thesis to have the detailed species information set out later as a reference section in the appendix. Overall, however, this book is strongly recommended to anyone with a serious interest in conservation of our native fauna.

JAN HEWLETT

***A complete guide to Arctic wildlife.*** Richard Sale. Christopher Helm, London, 2006. 464 pp., profusely illustrated with more than 450 photographs, 294 maps and 38 colour plates. Hardback, £40. ISBN 0 7136 7039 8.

This is a heavy book, printed on glossy paper, but it is not heavy reading. It is attractively produced and is illustrated throughout with habitat and species photographs by the author and by polar expert Per Michelson.

After defining the Arctic and describing the area's geology, climate, habitats and, at times, fragile and changing ecosystems, we move on to the birds, which occupy the largest section of the book, then the mammals. Many of the birds are familiar to British naturalists, either as residents or as vagrants from more-northern latitudes, but, of course, there are species we are not likely to see in Britain. There are more species of mammals in the Arctic regions than one would have thought at first, compared to our rather sparse fauna. A short section at the end is a visitor's guide to the Arctic, but as it states, Arctic travel is expanding and such a guide will be quickly out of date.

The book is a joy to study and it sets the scene for a visit. But, how much travel should we encourage to such an important ecological region?

K. H. HYATT

# Foliose and fruticose lichen records and a checklist of crustose lichens in the London Area

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## Abstract

This paper gives a broad-brush view of lichens (apart from *Cladonia* and *Stereocaulon*) in the London Natural History Society's recording area. **Part I** looks at the records of over 100 taxa of foliose and fruticose lichens; they have been coming back into London since the 1980s and have the most rapid growth and are therefore are most noticeable. For ease of identification they have been divided up into five groups: 1) Jelly lichens, 2) *Peltigera*, 3) Fruticose, 4) *Parmelia* s.l. and 5) the nitrogen-tolerant ones (the Xanthorion: *Physcia, Xanthoria* and related genera). The first three groups have declined and the last two increased, especially the Xanthorion.

In **Part II** over 300 crustose lichens in the LNHS area are listed on the basis of 10 × 10-km squares (32) of the British Lichen Society's mapping database as of September 2006. Numbers with an asterisk are pre-twentieth century records. Additional taxa are marked with a cross. Names follow the current online BLS checklist. Notes on substrata are provided. There are two type localities, from the twentieth century, for crustose lichens in London: *Lepraria eburnea* in Fulham and *Vezdea leprosa* in Blackheath. It is hoped this will provide a useful reference for what has been recorded and a base for future recording. **Part III** is a recorder's note updating previous papers and current news.

## Part I — Foliose and fruticose lichen records



### Introduction

This paper is a response to requests for information and is part of an ongoing project to assess all London lichen records. This part of the paper deals with the more conspicuous and usually the fastest growing lichens. They are most noticeable as they come back into London. The pattern of recolonization is different from that of disappearance (Gilbert 1992, Hawksworth and McManus 1989). It has not been possible to assess all taxa because of difficulties tracing sites and lack of vouchers.

For ease of identification I have divided them into five groups, starting with 1) Jelly lichens which have cyanobacteria rather than algae as their photosymbiont partner. Cyanobacteria fix nitrogen so are important in soil fertilization. There are two main genera distinguished by their structure — *Collema* and *Leptogium*. *Lempholemma* is also included here. They are not

common in London. 2) *Peltigera*. These are large, fast-growing, lichens and play an important role in nutrient circulation as they also have cyanobacteria as their photosymbiont partner. 3) Fruticose lichens are usually the first to disappear when air pollution is high as they have the most surface exposed to the atmosphere. 4) *Parmelia* s.l. is the commonest group of the foliose lichens and *Parmelia sulcata* is usually one of the first to return. However it appears the genotype is limited (Crespo et al. 1997, 1999); of the three genotypes found 580bp, 622bp, and 835bp, it is the middle one that comes back after the entire loss of the lichen population, whereas all three are evenly distributed in an unaffected area. Gilbert (1971) was the first to notice that something was different but did not have the techniques to study the differences. DNA research has become an important adjunct to morphological work. The change in bark pH is important for the diversity of lichens. The pH tolerance in this group ranges from acidophytes like *Hypogymnia* to *Puntelia* which are mainly on basic bark. 5) The Xanthorion (*Physcia, Xanthoria*, and related genera) is usually associated with high nitrogen and pH levels. This is the group that has most benefited from modern atmospheric conditions. I have been unable to trace records for some species which are recorded as present on the BLS database but have included them for completeness. The framework of records is based on the British Lichen Society database at Bradford University and, although I have been unable to fill in all the details, I hope this compilation will be of use to those recording lichens in London. First records have not been listed as it is difficult to say when these are made as there is no collating centre. I am, however, always eager to hear of earlier, and even more, records.

## Alphabetical list of species

Numbers refer to sections, Disc – Discussion only, EXC – excluded, EXT – extinct in London, D – in Dobson 2005.

*Anaptychia ciliaris* subsp *ciliaris* [3] [EXT] D.
*Bryoria fuscescens* [Disc] [EXT] D.
*Candelaria concolor* [5] D.
*Cetraria aculeata* [3] D.
*C. muricata* [3] D.
*Collema auriforme* [1] D.
*C. crispum* var. *crispum* [1] D.
*C. cristatum* [1] D.
*C. fragrans* [1] [EXT]
*C. fuscovirens* [1] [EXT] D.
*C. limosum* [1]
*C. tenax* s.l. [1] D.
*C. tenax v. ceranoides* [1]
*C. tenax v. tenax* [1]
*C. tenax. v. vulgare* [1]
*Evernia prunastri* [3] D.
*Flavoparmelia caperata* [4] D.
*F. soredians* [4] D.
*Hyperphyscia adglutinata* [5] D.
*Hypogymnia physodes* [4] D.
*H. tubulosa* [4] D.
*Hypotrachyna revoluta* [4] D.
*Imshaugia aleurites* [4] D.
*Lempholemma polyanthes* [1] D.
*Leptogium corniculataum* [1] [syn.]
*L. gelatinosum* [1] D.
*L. lichenoides* [1] D.
*L. palmatum* [1]
*L. schraderi* [1] D.
*L. subtile* [1] [EXT]
*L. tenuissimum* [1]
*L. teretiusculum* [1] D.
*L. turgidum*[1] [syn] D.
*Lobaria pulmonaria* [Disc] [EXT] D.
*Melanelia elegantula* [4] D.
*M. exasperatula* [4] D.
*M. fuliginosa fuliginosa* [4] D.
*M. fuliginosa glabratula* [4] D.
*M. lacinatula* [4] D.
*M. subaurifera* [4] D.
*Neofuscelia verruculifera* [4] D.
*Parmelia saxatilis* [4] D.
*P.* cf. *submontana* [4] [EXC] D.
*P. sulcata* [4] D.
*Parmelina quercina* [4] [EXC] D.
*P. tiliacea*[4] D.
*Parmeliopsis ambigua* [4] D.
*Parmotrema perlatum* [4] D.
*P. reticulatum* [4] D.
*Peltigera canina* [2] [EXC] D.
*P. didactyla* [2] D.
*P. hymenina* [2] D.
*P. membranacea* [2] D.
*P. neckeri* [2] D.
*P. polydactylon* [2] D.
*P. praetextata* [2] D.
*P. rufescens* [2] D.
*Phaeophyscia nigricans* [5] D.
*P. orbicularis* [5] D.
*Physcia adscendens* [5] D.
*P. aipolia* [5] D.
*P. caesia* [5] D.

*P. clementii* [5] [EXT] D.
*P. dubia* [5] D.
*P. leptalea* [5] [EXT] D.
*P. tenella* subsp. *tenella* [5] D.
*P. tribacia* [5] D.
*Physconia distorta* [5] D.
*P. grisea* [5] D.
*P. perisidiosa* [5] D.
*Platismatia glauca* [4] D.
*Pleurosticta acetabulum*[4] D.
*Punctelia borreri* [4] D.
*P. reddenda* [4] D.
*P. subrudecta* [4] D.
*P. ulophylla* [4] D.
*Ramalina canariensis* [3] [EXT] D.
*R. farinacea* [3] D.
*R. fastigiata* [3] D.
*R. fraxinea* [3] [EXT] D.
*R. lacera* [3] [EXT] D.
*Sticta sylvatica* [Disc] [EXT] D.
*Teloschistes flavicans* [3] [EXT] D.
*Tuckermanopsis chlorophylla* [4] D.
*Usnea articulata* [3] [EXT] D.
*U. cornuta* [3] D.
*U. flammea* [3] D.
*U. florida* [3] [EXT] D.
*U. fragilescens* [3] [EXT] D.
*U. glabrata* [3] [EXT]
*U. glabrescens* [3] D.
*U. hirta* [3] D.
*U. rubicunda* [3] [EXT] D.
*U. subfloridana* [3] D.
*Xanthoparmelia conspera* [4] D.
*X. mougeotii* [4] D.
*Xanthoria calcicola* [5] D.
*X. candelaria* [5] D.
*X. elegans* [5] D.
*X. parietina* [5] D.
*X. polycarpa* [5] D.
*X. ucrainica* [5] D.

The recording area of the London Natural History Society is a circle with a radius of 20 miles (32 kilometres) from St Paul's Cathedral, thus the squares do not map exactly on to this but serve to give a broad-brush picture of lichen record distribution across the area.

Sqs — refers to the 10 km squares of the BLS Mapping Scheme. Each number should be prefixed by 51, or 52 where noted. To help people relate to which square they are in (or are interested in) I have assigned names to the squares taken from Ken Osborne's little map that was distributed to members in 2006.

**Squares**: 51 [TQ]

| | | | |
|---|---|---|---|
| 06 Walton | 18 Harrow | 35 Surrey | 47 Thamesmead |
| 07 Staines | 19 Watford | 36 Croydon | 48 Barking |
| 08 Uxbridge | 25 Redhill | 37 Greenwich | 49 Roding |
| 09 Rickmansworth | 26 Wandle | 38 Walthamstow | 56 Darent |
| 15 Leatherhead | 27 Barnes | 39 Enfield | 57 Dartford |
| 16 Kingston (Esher) | 28 Hampstead | 45 Limpsfield | 58 Romford |
| 17 Richmond (Kew) | 29 Barnet | 46 Bromley | 59 Brentwood |

52 [TL] – 10 St Albans; 20 Potters Bar; 30 Cheshunt; 40 Epping. See also Table 1 in Part III.

Each entry contains some key characters and ecology, followed by herbarium and field records. Squares where the species have been recorded are listed. Historical records refer to Laundon (1970). Records for species imported into London and surviving I count as valid.

To maximize space some of the collectors have been shortened to initials: AAp – Andre Aptroot; AA – Ann Allen; AR – A. Richards; BJC – Brian Coppins; BJS – B.J. Starkey; BLS – British Lichen Society; BMS – Brian Spooner; BW – Brian Wurzell; CH – Chris Hitch; DLH – David Hawksworth; EWB – Ted Brown; FHB – Frank Brightman; FR – Francis Rose; IB – Isphi Blatchley, JFS – John Skinner; JLG – John Gilbert; JRL – Jack Laundon; KH – Ken Hill; KP – Keith Palmer; MBAH – Begoña Aguirre-Hudson (sometimes accompanied by KH, her husband Ken Hudson, and HH, Harri, her son); LD – Linda Davies; PEB – Peter Earland-Bennett; PWJ – Peter James; RL – Rene Larsen; RV – Roy Vickery; SD – Simon Davey.

In the chemistry: C – cortex, M – medulla, S – soredia. r = red, y = yellow, o = orange, p = purple, g = green. T.l.c. = thin-layer chromatography. {CR} is a chemical race.

Substrates: Fx = *Fraxinus*; Qp = *Quercus petraea*;

Collections: **K(M)** = Kew Mycology Herbtrack (database) entry, NDB = not databased, **BM** = the Natural History Museum, **SLBI** = the South London Botanical Institute, **E** = Edinburgh, **DBN** = Dublin. For synonyms and photographs see *Index Fungorum* and ITALIC websites.

Boroughs for Rene Larsen's sites as supplied by RL: Ashstead Common, Mole Valley; Alexandra Park, Harrow; Beckenham Place Park, Bromley; Brent Lodge Park, Ealing; Bunhill Fields Burial Ground, Camden; Bushy Park, Ealing; Canon Hill Common, Merton; Canons Park, Harrow; Cassiobury Park Golf Course, Watford; Danson Park, Bexley; Downhlls Park, Haringey; Epping Forest, Epping Forest; Geraldine Mary Harmsworth Park, Southwark; Greenwich Park, Greenwich; Grovelands Park, Enfield; Hainault Forest, Redbridge; Hampstead Heath, Camden; Harrow Recreational Ground, Harrow; Headstone Manor Park, Harrow; Heathland School, Hounslow; Hillingden Park, Ealing; Honor Oak Allotment, Lewisham; Hyde Park, Westminster; Morden Park, Merton; Norman Park, Bromley; Pratt's Bottom, Sevenoaks; Primrose Hill, Camden; Ravenscourt Park, Hammersmith and Fulham; Regent's Park, Westminster; Sevenoaks, Sevenoaks; Springfield, Hackney; Walpole Park, Ealing; Waterlow Park, Camden; Wimbledon Common, Richmond upon Thames [Merton].

Below are the lichens, treated in the five groups, names as in Coppins (2002) with additional notes on nomenclature where this has changed. The *Flora* (Purvis et al. 1992), *Atlas* (Seaward ed. 1995, 1998), and Dobson (2005) are the main sources of information for descriptions. Laundon (1970) is the basis of historical records and my previous papers also hold records (Waterfield 2002, 2003, 2004). Some records have not been confirmed, such as those of Linda Davies (Waterfield 2005), but they have been noted so when more information is available the picture will be more complete. The main aim of the current paper is to assess current status and give some idea of the likelihood of occurrence.

## 1. Jelly lichens

This group of lichens contains cyanobacteria, which have the ability to fix nitrogen from the air. Cyanobacteria are particularly interesting as they are related to the chloroplasts found in plants. Known as the jelly lichens, they have a different structure with the cyanobacteria being intermixed rather than in a distinct layer. The cyanobacterium *Nostoc* is sometimes found in large quantities, especially where there is a very basic substrate and can sometimes be mistaken for one of these lichens. There are two main genera and *Collema* differs from *Leptogium* in the absence of a cell-thick upper and lower cortex, also *Collema* are inclined to be greenish-black as opposed to red-brown or bluish. No lichen products have been detected by TLC. The latest treatment is in the Sonoran *Flora* by Jørgensen and Nash (2004) and Schultz et al. (2004). They are not common in the London Area and personally I have seen only one *Leptogium*, and the two commonest *Collema*.

*Collema auriforme* (With.) Coppins & J.R. Laundon (1984)

Thallus dark green-brown, lobes swollen when wet, covered in large globose isidia, which arise in patches. Apothecia rare with isidiate margin. Spores 26–36 × 8–13 μm, submuriform.
Ecology: on calciferous rocks, usually moist and shaded, among mosses.
Keston churchyard, TQ418629, 1990, IB; Chislehurst St Nicholas Church, TQ444699, 1990, IB; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Bromley Hill Cemetery, TQ393707, 15.iii.1996, IB; St Mary Cray churchyard, TQ472684, 14.x.1999, IB; Cudham Lane South, TQ4459, 2000, IB; Bromley, 12 Winchester Park, TQ396687, 29.i.2002, IB; Kensal Green Cemetery, 2002, CH & AW. Sqs: 07, 15, 28, 29, 37, 45, 46, 56, 57.

*C. crispum* (Huds.) F.H. Wigg. (1780) var. *crispum*

Thallus green-black, lobes thin, not swelling so much, rounded. Isidia swollen, becoming flattened and scale-like, mainly in centre. Apothecia rare, often irregular, with thin margin. Pale rhizines on underside.
Ecology: on calciferous rocks. Probably the most common *Collema* in London.

Historical records and **K(M)**137054 on carboniferous sandstone, Princess of Wales Conservatory, RBG Kew, 3.v.2005, MBAH & AW, conf. CH; and Richmond Park, abundant on old concrete in open woodland NW of Roehampton Gate, 51/209744., 8.xi.1970, BJC (**BM**); Wimbledon, St Mary's churchyard, at base of limestone chest tomb, 9.i.1994, KP; Orpington, All Saints churchyard, TQ467665, 8.ii.1998, IB; St Mary Cray churchyard, TQ472684, 14.x.1999, IB; Cudham Lane South, TQ4459, 2000, IB; Bromley, 12 Winchester Park, TQ396687, 29.i.2002, IB; on sandstone in rockery, RBG Kew, 2005, BLS. Sqs: 06, 08, 15, 17, 18, 19, 25, 26, 27, 29, 35, 36, 37, 38*, 45, 46, 56, 57, 58, 59; 52/10.

*C. cristatum* (L.) F.H. Wigg. (1780) var. *cristatum*

Incised, lobate margins; lower surface with clusters of pale rhizines. Apothecia frequent.
Ecology: hard limestone, more rarely on mortar and soil.
Sq: 15.

*C. fragrans* (Sm.) Ach. (1814)

Thallus small, deeply lobed, forming rosettes. Apothecia often numerous and crowded in centre.
Ecology: on nutrient-enriched bark, especially Ulmus.
Historical record only. Sq: 52/40*.

*C. fuscovirens* (With.) J.R. Laundon (1984)

Lobes to 5 cm wide, few and contorted, translucent when wet. Closely related to *C. auriformе*, but does not swell up so much when wet. More commonly fertile, margins of apothecia can be isidiate. Spores muriform.
Ecology: damp clay or sandy soil, especially pathways; calciferous rocks and occasionally asbestos roofs.
Historical records. Sqs: 15, 29*, 38*.

*C. limosum* (Ach.) Ach. (1810)

Thallus crustose without distinct lobes. Asci 2(–4)-spored. Ascospores 26–34 × 10–15 µm, ovoid-ellipsoid, muriform.
Ecology: on soil and calciferous clay.
Historical records and Kensington Gardens, common at side of bridge by Serpentine, 1971, T.W. Ottley. (Due to renovation work on the bridge I have been unable to check this record.) Sqs: 17*, 36*, 39*.

*C. tenax* (Swartz) Ach. (1810) s.l.

This species has been divided into several varieties but from my understanding more as a solution to the problem than they are true taxonomic entities. This underlines one of the problems of taxonomy — how do you deal with variety? For a more modern treatment than the *Flora* see the Sonoran *Flora* (Schultz et al. 2004).
Ecology: on soil and mortar.
Wimbledon, St Mary's churchyard, 9.i.1994, KP.

*C. tenax* var. *ceranoides* (Borrer) Degel. (1954)

Erect lobes, apothecia small, scarce.
Ecology: on basic sandy soils. According to the *Flora* an adaptation to a shifting substrate.
Down House, TQ431612, 1.iii.1997, IB; Ruxley Gravel Pits, TQ474698, 10.x.1998, IB; West Norwood Cemetery, 2002, SD. Sqs: 15, 46, 58.

*C. tenax* (Sw.) Ach. (1810) var. *tenax*

Apothecia predominant.
'Near London Mr Hoy' [no date], Menzies herb. In Edinburgh [**E**], probably late eighteenth century; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB. Sq: 06, 07, 15, 17, 25*, 27, 35, 46.

*C. tenax* var. *vulgare* (Schreber) Degel. (1954)

Chunky lobes in small confluent rosettes, usually abundantly fertile.
Ecology: on mortar. Sq: 15.

**Note:** *C. tenax* var. *corallinum* (A. Massal) Degel. (1854) does not appear to have been recorded in London. This subspecies is almost crustose.

*Lempholemma polyanthes* (Bernh.) Malme (1924)

Thallus forming a membranous or strandlike film over mosses, with irregular fissures and densely covered in warty granules; apothecia on swollen tips of these granules.
Ecology: on terricolous and epilithic mosses, soil, walls.
Sq: 08. I have not seen this taxon and do not know of a voucher.

*Leptogium gelatinosum* (With.) J.R. Laundon (1984)

Thallus variable, of erect, overlapping lobes, with crenate margins; apothecia usually numerous.
Ecology: among mosses on basic substrates. Probably the commonest *Leptogium* in London.
Sq: 15, 46.

*L. lichenoides* (L.) Zahlbr. (1924)
Larger lobes than *L. gelatinosum*, but often mistakenly identified. The isidia are cylindrical.
Ecology: among mosses, especially at base of old trees, also rocks, walls and soil in damp situations.
No voucher known so this record remains questionable. Sq: 15.

*L. palmatum* (Huds.) Mont. (1846)
In checklist as *L. corniculataum* (Hoffm.) Minks (1873) but this is a synonym according to Jørgensen (pers. comm.).
Ecology: on mosses among boulders, on ground in old dunes, rarely on trees.
Historical records. 'in the Forest near Hale End. E. Forster' [**BM**]. Sqs: 28*, 39*. Not recently recorded in London.

*L. schraderi* (Ach.) Nyl. (1856)
Small thick lobes, sometimes appearing shrubby, wrinkled upper surface often densely granular-isidiate.
Ecology: on calciferous rocks, soil and mosses.
Down House, TQ431612, 1.iii.1997, IB. Sq: 15, 46. See also records for *L. turgidum* which might be a synonym, Jorgensen (pers. comm.).

*L. subtile* (Schrad.) Torss. (1843)
Thallus minutely foliose, apothecia usually abundant.
Ecology: basic bark, usually fallen trees.
K(M)135294 Epping Forest, E. Forster. Historical only.

*L. tenuissimum* (Dicks.) Körb. (1855)
Lobes less than 2 mm wide, centre of thallus (in section) paraplectenchymatous throughout, fimbriate margins. Numerous globose, small, orange, concave, apothecia 0.8 mm diam. frequent, stellately surrounded by narrow, nearly cylindrical, spreading lobes.
Ecology: basic bark and rotten wood of old, usually fallen trees.
Historical records. According to the *Flora* this species has been over-recorded owing to confusion with small morphs of *L. gelatinosum*, it is therefore difficult to say what the status of this species is. Sq: 15, 39*.

*L. teretiusculum* (Wallr.) Arnold (1892)
Cylindrical to coralloid lobes dark red-brown (grey in shade). Its crustose look makes it look like *Placynthiella icmalea*, which has simple spores.
Ecology: shaded bark of old deciduous trees, especially at base, and calcareous soil and rock.
No known voucher. Sq: 26, 45.

*L. turgidum* (Ach.) Crombie (1870) (Note: this might just be a squamulose form of *L. schraderi.*)
Lobes indistinct, nodulose and crowded, less than 1 mm wide.
Ecology: calcareous walls, especially crumbling mortar and soils.
Kew, BLS visit Jan 2005. Sq: 15, 17.

## 2. *Peltigera* Willd. (1787)

Large, fast-growing, lichens with cyanobacteria (*Nostoc*) and (or) chlorococcoid alga (*Coccomyxa*). All the ones in London have a cyanobacterial partner. They play an important role in nutrient cycling in some habitats because of their ability to fix nitrogen. Although the genus is easily recognized they are difficult to key to species, especially if the material is poor. Key characters are tomentum on the upper surface, the colour of the veins on the lower surface and type of rhizines. Dobson (2005) has a table of key characters. The apothecia of the commonest ones are similar, e.g. tall and narrow in *P. didactyla, P. hymenina* and *P. polydactylon. P. membranacea* has short, broad apothecia but also a much more bullate thallus.

*Peltigera canina* (L.) Willd. (1787)
This name was used in earlier times for *Peltigera membranacea*. I know of no correct record in London. See under *P. membranacea*. Old records of '*canina*' in squares: 15, 16, 17, 28, 45, 46, 56, 57. This has been recorded at Kew but I think is used in the old way, i.e. meaning *P. membranacea*. I have therefore excluded this species.

*P. didactyla* (With.) J.R. Laundon (1984)
The commonest *Peltigera* in London. Thallus small, lobes ascending. Apothecia upright and narrow. Lower surface with raised pale cream to ochraceous veins, netlike; rhizines simple, downy, occasionally bottle-brush like, separate and often evenly arranged. A juvenile sorediate state is

superseded by a fertile, non-sorediate state. Soredium to death can be less than a year (Gilbert 1990).
Ecology: recently disturbed sites.
Historical and K(M)76185 sandy acid soil, edge of grassy area near *Ulex*, W. side of Esher Common, near A3 bypass, 16.i.1994, BMS, det JFS; K(M)109918 on damp, sandy soil, hill S. of bypass, Esher Common, 29.iii.2002, BMS, det. MBAH (same area); K(M) 125237 on soil, Fairmile Common, Esher, BMS, det. MBAH, 19.ix.2004; and Nunhead Embankment to rear of Aspinall Road, SE4, TQ359756, on thin soil developed on cinders and ballast, (?1987), Lewisham Group of London Wildlife Trust; Tottenham Cemetery (Hackney), juvenile near Bruce Castle Park, 23.ii.1990, BW; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB. Sqs: 06, 15, 16, 17, 19, 28, 35, 36, 37, 45, 46, 47, 48, 49*, 57.

*P. hymenina* (Ach.) Delise ex Duby (1830)
[Syn. *P. lactucifolia* auct. non (With.) ]
Upper surface usually glossy, thallus quite large (up to 15 cm diam.) with ascending margins. Apothecia tall, narrow. Lower surface with veins flattened, often indistinct, pale, ochre to dark tan with pale interstices; rhizines simple, often with split ends, pale to tan, separate, often widely dispersed.
Ecology: on soil, mosses and rocks, lawns and tree bases.
**K(M)**109917, on damp, sandy soil, hill S. of bypass, Esher Common, 29.iii.2002, BMS, det. MBAH; **K(M)**109325 on soil and mosses, Esher Common, 9.iii.2003, BMS, det. MBAH; K(M)109916, amongst short turf on old grave, Elmbridge Cemetery, West Molesey, 16.iii.2003, BMS, det. MBAH; K(M)125238 on soil, footbridge over A3 (near), Round Hill, Esher Common, 19.ix.2004, BMS det. MBAH; Down House, TQ431612, 1.iii.1997, IB.
Sq: 07, 15, 17, 37, 46; 52/10.

*P. membranacea* (Ach.) Nyl. (1887)
Large, bullate, tomentose. Apothecia wide. Lower surface veins raised and rounded, netlike, concolorous; rhizines separate, simple becoming bottlebrushlike. In times past it was referred to as *P. canina* because the large white rhizines which show when the edges curl back reminded people of dogs' teeth, thus is was, according to the Doctrine of Signatures, suitable for treatment of rabies.
Ecology: damp mossy ground or tree roots.
Sq: 15, 46, 57.

*P. neckeri* Hepp ex Müll.Arg. (1862)
Like *P. hymenina* but upper surface thinly pruinose towards margin, shiny with slash-like cracks exposing medulla. Undersurface with veins flattened, wide, rather indistinct, ochre to black with white interstices; rhizines poorly formed, simple, sparse and often in groups.
Ecology: over mosses on soil, even metal contaminated.
Brompton Cemetery, BLS, 2000.

*P. polydactylon* (Neck.) Hoffm. (1790)
Apothecia upright. Lower surface with veins netlike, prominent and dark brown to margins with pale insterstices; rhizines, simple, pale to dark brown, confluent.
Ecology: amongst mosses on tree bases and rocks.
Historical records. Old records *P. 'poly'* 28, 46, 47, 52/10. Sq: 36. I am uncertain as to the status of this species in London as this is a more northern species. I believe it is unlikely to occur in London.

*P. praetextata* (Flörke ex Sommerf.) Zopf (1909)
Thallus slightly bullate, tomentose, like *P. membranacea*, with isidioid folioles (schizidia) along cracks. Undersurface with veins flattened, sometimes indistinct, concolorous to tan; rhizines separate, simple, becoming slightly fluffy. The diagnostic feature is the schizidia.
Ecology: sheltered damp places.
Sq: 48.

*Peltigera rufescens* (Weiss) Humb. (1793)
Rosette-forming. tomentose; apothecia often present. Lower surface with raised veins, concolourous, darker in the centre; rhizines brown, broad becoming confluent.
Ecology: on more basic soils.
Historical records and Wimbledon Common, on ground, 5.i.1992, FR. Sqs: 06, 15, 36, 46, 47*.

## 3. Fruticose

*Anaptychia ciliaris* (L.) Körb. ex Massal. (1853) subsp. *ciliaris*
Thallus much branched grey to brownish, tomentose with long pale cilia. A member of the Physciaceae, it is a rapidly declining species as it does not like hypertrophication; the loss of the elms is another key factor.
Ecology: nutrient-enriched bark in dry well-lit situations.
Historical records only — Hampstead *c.*1790, Dublin Herbarium [**DBN**]; 'from the Pales in Richmond Park' (eighteenth century, handwriting not determined) Dublin Herbarium [**DBN**]. Extinct in London. Sqs: 09*,19*, 25*, 27*, 38*, 45: 10*, 20*.

*Cetraria aculeata* (Schreb.) Fr. (1825)
Glossy dark brown flattened branches, terminating in short blunt spines, with elongated pale pseudocyphellae in depressions near the axils. Chemical reactions negative.

Ecology: acid soil amongst *Calluna*.
Historical records and Richmond Park, near Sheen Gate, Jan 1971, T.W. Ottley; in small area on N. side of Barnes Common, Jan. 1971, T.W. Ottley; Wimbledon Common by side of Robin Hood Road, 223714, 22 iv.1978, JRL; Wimbledon Common, at head of Farm Bog, 24.x.1981, JRL; Wimbledon Common, scattered thalli in heather area near the windmill, 9.i.1994, JRL. Not common now, loss probably due to loss of habitat, particularly heathland. Sqs: 06, 15, 17, 25, 27, 28*, 36, 46, 49.

*Cetraria muricata* (Ach.) Eckfeldt (1895)
Similar to *C. aculeata* but more densely branched, with small spinules forming dense mats.
Ecology: similar to *C. aculeata* but not so common.
I have not seen this species or a voucher. Sq. 25.

*Evernia prunastri* (L.) Ach. (1910)
Strap-shaped green-grey thallus, with white underside, pendant. K + y.
Ecology: on deciduous trees, rarely rocks and fence posts.
Historical records and K(M)76188 West End Common, Esher, Surrey, on ?*Rubus* stems, 29.iii.1983, BMS, det. JFS; K(M)116205 Elmbridge, Esher Common, Surrey, on bark coll. JFS & BMS, vi.1994, det. MBAH; K(M)92009 W. side Esher Common, on fallen trunk of *Quercus robur*, 5.xi.2000, MBAH; K(M)110102 Oxshott Heath (by sandpit), Surrey, on branches of *Quercus robur*, 30.iii.2003, MBAH & KH & HH; K(M)125231 Polesden Lacy on branch of *Acer pseudoplatanus*, 19.ix.2004, MBAH; and Wimbledon Common, near The Causeway, on elm stump, one thalus one cm. long, 24.x.1981, JRL; Richmond Park, one tiny thallus on stump, 16.x.1982, JRL; Wimbledon Common, scarce on trunks of trees, 9.i.1994, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, High Beach and Hollow Pond A104/406, 2003, PJ & LD; Ashtead Common, Alexandra Park, Beckenham Place Park, Brent Lodge Park, Bushy Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Grovelands Park, Hainault Forest, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Heathland School, Hillingden Park, Hyde Park, Morden Park, Norman Park, Pratt's Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL;on *Quercus petraea* Kew, 2005, BLS. Sqs: 06, 08, 09,15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 38, 39, 49, 59.
*Evernia prunastri* var. *herinii* (P.A.Duvign.) Maas Gest.; as *Evernia prunastri* f. *herinii* Morden, 14 Victory Avenue, two small thalli on sloping branch of pear tree,1996, JRL. This form has been incorporated into the main species.

*Ramalina canariensis* Steiner (1904)
Wide, matt lobes, inflated at tips which split open and reveal farinose soredia.
Ecology: well-lit, relatively basic bark, mainly coastal.
Hampstead [c.1790?] ?Dickson. Dublin herbarium [**DBN**]. Sq: 16. Extinct in London.

*R. farinacea* (L.) Ach. (1810)
Flattened, narrow strands with farinose soredia in oval soralia along margin. Four chemotypes: a) K- or orange-brown, P+ orange-red, UV- (protocetraric acid); b) K+ yellow-red, P+ yellow-orange, UV- (salazinic acid, ± norstictic acids); c) K-, P-, UV + blue-white (hypoprotocetraric acid); d) K-, P-, UV- (lichen products not detected)., but not usually distinguished in records.
Ecology: exposed to shaded trunks of trees, often wind exposed. The commonest Ramalina in London.
Historical records and K(M)110105 on branches of *Quercus robur*, by sandpit, Oxshott Heath, Esher, 20.iii.2003, MBAH, KH & HH; and Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, and Monks Wood, 2003, PWJ & LD; Cassiobury Park Golf Course, Danson Park, Headstone Manor Park, Norman Park, Sevenoaks, Wimbledon Common, all on Quercus, 2003, RL; on *Fraxinus* RBG Kew, 2005, BLS. Sqs: 06. 07*, 08, 15, 16, 17, 18, 19, 25, 28, 29, 38, 49, 59.

*R. fastigiata* (Pers.) Ach. (1810)
Erect tufts with apothecia at tips.
Ecology: on well-lit, wind-exposed, nutrient-rich trunks and twigs.
Historical records – Hampstead [*c.*1790?] ?Dickson. Dublin herbarium [**DBN**]. On *Quercus*, Sevenoaks, 2003, RL. Sqs: 06*, 15*, 19*, 25*, 39, 49.

*R. fraxinea* (L.) Ach. (1810)
Branches widening from base with apothecia laminal and marginal.
Ecology: nutrient-rich bark in windy, well-lit sites. Sensitive to air pollution.
Historical records – Hampstead [*c.*1790?] ?Dickson. Dublin herbarium [**DBN**]. Extinct in London. Sqs: 06*, 39.

*R. lacera* (With.) J.R. Laundon (1984)
A very polymorphic species, not known fertile. Medulla dense. Soralia laminal and marginal. C-, K-, KC-, P-, UV- (bourgeanic acid). [cf. *R. pollinaria* with evernic acid and *R. canariensis* with divaricatic acid.]
Ecology: on trees or rocks.
Historical records including part of original material from Beddington and Carshalton [Dillenius] (Laundon 1984); 'near Walthamstow' herb. E. Forster [**BM**]. Not recorded since nineteenth century. Extinct in London. Sq: 25*.

*Teloschistes flavicans* (Swartz) Norman (1853)
The golden hair lichen still holds on in the West but has long been extinct in London.
Historical records only. Extinct in London. Sqs: 29*, 38*.

*Usnea articulata* (L.) Hoffm. (1796)
The sausage lichen. A fine specimen from Enfield Chase is in the **BM** collection.
Historical records. Extinct in London. Sqs: 29.

*U. cornuta* Körb. (1859)
Not blackened at base, main branches stout, side branches constricted at join. Isidia and granular soredia give it a rough look.
Ecology: on trees, rarely rocks, in more shaded sites.
Historical records and K(M)56760 fallen onto ground under *Salix* tree, Ruislip Local Nature Reserve, Hillingdon, 1993, DLH; Alexandra Park, and Headstone Manor Park, on *Quercus*, 2003, RL. Sqs: 15, 59.

*Usnea flammea* Stirton (1881)
Erect, irregularly branched, pale annulations and holdfast.
Ecology: exposed situations, mossy trees and heather.
Sevenoaks, on *Quercus*, 2003, RL.

*U. florida* (L.) F. H. Wigg. (1780)
Usually richly fertile with apothecia surrounded by spinulose branches.
Ecology: tree canopy twigs and branches, usually found on fallen branches.
(cf.) K(M)106424 on fallen branch of *Quercus robur*, Horseshoe Clump, Esher Common, 5.xi.2000.

*Usnea fragilescens* Havaas ex Lynge (1921)
Thallus subpendulous, flaccid, medulla lax, 'combed' look, papillae numerous, soralia large and conspicuous; darkened shiny base. Var. *mollis* (Vain.) Clerc (1987) is the the most likely to have been in London.
Ecology: broadleaved trees in moist woodland and *Salix* carr.
Walthamstow, 'on a rail in our field' Forster (**BM**). Extinct in London.

*U. glabrata* (Ach.) Vain. (1915)
Because it has the same chemistry as *U. articulata* I sometimes wonder if small specimens of this species are mistaken for *U. glabrata*. Neither is now extant in London.
Ecology: on deciduous trees and shrubs.
Historical record. Walthamstow, 'on a rail in our field' Forster (**BM**) Extinct. Sqs: 38.

*U. glabrescens* (Nyl. ex Vain.) Vain. (1925)
Like a robust *U. subfloridana* except for pale ulcer-like soralia and no isidia. Three chemical races.
Ecology: humid sites, especially willow carr.
Bookham Common.

*U. hirta* (L.) Weber ex F.H. Wigg. (1780)
Dark, almost olive, bushy and pendant. Soft and flaccid when wet, rough when dry. Long thin isidia.
Ecology: conifers and fences, acid sites, often exposed.
Kew BLS, 2005. Sq; 17.

*U. rubicunda* Stirton (1881)
Dull brownish red. Do not confuse with species in poor condition with salazinic acid.
Ecology: on trees, rarely rocks.
Historical record. Sqs: 49.

*U. subfloridana* Stirt. (1882)
Very variable, distinctly blackened at base.'
Ecology: on trees, especially twigs, and fences, rarely rock.
Wimbledon Common, small specimen on sloping trunk in Putney Vale/Putney Heath, 9.i.1994, JRL; Alexandra Park, and Headstone Manor Park, on *Quercus*, 2003, RL; Hampstead on bench, 2005. Sqs: 08, 09, 15, 17, 25, 26, 28, 29.

## 4. *Parmelia* s.l.

*Flavoparmelia caperata* (L.) Hale (1986)
Yellow- green thallus with large rounded lobes, wrinkled in centre, soredia coarse; under surface black with simple rhizines. Apothecia not seen in London.
Ecology: mainly an epiphyte of broadleaved trees with bark pH 4.5–5.5. Avoids highly eutrophicated substrates.
Historical records and **K(M)**128230 Egham, on bridge over the Thames, on wood,18.vi.2004, T. Kokobum, det. MBAH; and Wimbledon Common, one small specimen in Putney Vale/Putney Heath, 9.i.1994, JRL; Esher on Betula 20.vi.1994; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St

Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PWJ & LD; Alexandra Park, Brent Lodge Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Morden Park, Norman Park, Pratt's Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL; on deciduous trees Kew, 2005, BLS. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 38, 49, 59.

*F. soredians* (Nyl.) Hale (1986)

Smaller lobes than the previous species and finer soredia. Medulla K+ yellow turning red.
Ecology: on bark and wood in sunny situations. Increasing in London.
Bromley, Norman Park and Watford, Casiobury Park Golf Course – on *Quercus*, 2003, RL; Esher, on *Quercus*, 20.iii.2003; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PJ & LD; Cassiobury Park Golf Course, Norman Park, 2003, RL; Hampstead Heath, Kenwood, on bench, 2005, AW; on *Fraxinus* RBG Kew, 2005, BLS. Sqs: 15, 17, 28.

*Hypogymnia physodes* (L.) Nyl. (1896)

Thallus grey, narrow radiating, inflated lobes, which often turn up and split to expose farinose soredia; under surface light brown at margin , darker to centre. Cortex: K+y, UV+ purplish; Medulla and soredia KC+red, P + o-r, UV+ ice-blue.
Ecology: trees, rocks, moss, prefers acidic substrates.
Historical records and Brent Reservoir, one thallus on *Populus tremula* at end of Binden Grove, 17.ix.1972, R.H. Bailey; Enfield Chase, Pond Wood, three thalli on fallen tree, TL278005, xii.1973, J.P. Widgery; Richmond Park, a few thalli on stump on *Salix* branch, 16.x.1982, JRL; Hampstead Heath, three small thalli, a few mm long, in cracks of *Salix* bark at Vale of Health pond, 22.x.1983, JRL; Chelsea Physic Garden, scattered thalli on old tree of *Catalpa*, 8.v.1987, JRL; Wimbledon Common, on oak and brick, 5.i.1992, FR; Esher, on *Betula* and *Quercus*, 20.vi.1994; Morden, 14 Victory Avenue, scattered thalli on sloping branch of old pear tree, July 1994, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; on *Aesculus* trunks Holland Park, 2003, LD; Epping, Wintry Wood, Monks Wood and Hollow Pond A104/406, 2003, PJ & LD; Ashtead Common, Alexandra Park, Cassiobury Park Golf Course, Grovelands Park, Hampstead Heath, Headstone Manor Park, Hyde Park, Norman Park, Sevenoaks, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL; on deciduous trees RBG Kew, 2005, BLS. Sqs: 06, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 38, 39, 49, 59.

*H. tubulosa* (Schaer.) Hav. (1918)

Similar to *H. physodes* but more erect and tubular lobes, tips often darken and become covered in farinose soredia.
Ecology: prefers more humid sites than *H. physodes*, and is not so common.
Historical records and K(M)123496 on fallen branch *Fraxinus excelsior*, Herbarium Car Park, Royal Botanic Gardens, Kew, 16.vi.2004, MBAH; K(M)125234 on branch of *Acer pseudoplatanus*, Polesden Lacy, Surrey, 19.ix.2004, MBAH; and Epping, Hollow Pond A104/406, 2003, PJ & LD; Esher; on *Quercus*, Sevenoaks, 2003, RL; on deciduous trees, RBG Kew, 2005, BLS; abundant on roof of icehouse, Hampton Court Park, 2006, AW. Sqs: 08, 15, 17, 18, 25, 29.

*Hypotrachyna revoluta* (Flörke) Hale (1975)

Thallus light grey, lobes revolute at tips; under surface dark with short simple or slightly branched rhizines to the margins. Medulla C+ r, UV- or dull orange.
Ecology: trees, rocks and memorials, more common to the west.
K(M)1101110 on branches of *Quercus robur*, Oxshott Heath (by sandpit), Esher, Surrey, 30.iii.2003, MBAH, KH & HH; K(M)116856 on bark of *Betula alba*, West End Common, Esher, Surrey, 7.ix.2003, MBAH; Down House, TQ431612, 1.iii.1997, IB; Epping, Wintry Wood, High Beach, MonksWood, 2003, PWJ & LD; Cassiobury Park Golf Course, Hainault Forest, Norman Park, all on *Quercus*, 2003, RL; on *Fraxinus* RBG Kew, 2005, BLS. Sqs: 08, 15, 16, 17, 18, 25, 26, 28, 38, 49, 59.

*Imshaugia aleurites* (Ach.) S. Meyer (1985)

Thallus grey, adpressed, much divided rosette with lobes to 3 mm wide, centre covered in coralloid isidia, soon eroded. Apothecia rare. P+yo, K+y, UV-.
Ecology: acid wood, stone or peat in upland areas, palings in the south.
High Elms estate, TQ4462, 1998, IB.

*Melanelia elegantula* (Zahlbr.) Essl. (1978) (now *Melanohalea elegantula* (Zahlbr.) O. Blanco et al.)

Thallus brown, adpressed, lobes narrow, centre covered in coralloid solid isidia; under surface pale brown with simple rhizines. Seldom fertile, apothecia with isidiate margins. Reactions negative.
Ecology: mainly on twigs and horizontal branches on nutrient-enriched trees, rarely rocks.
Hampstead Heath, 2002, AW & CH. Sq: 25.

*M. exasperatula* (Nyl.) Essl. (1978) (now *Melanohalea exasperatula* (Nyl.) O. Blanco et al.)

Thallus olive-green, adpressed, often with wavy marginal lobes, isidia inflated, spathulate. Chemical reactions negative.
Ecology: trunks and branches of trees, sometimes rocks, usually slightly nutrient-enriched.
Linda Davies has claimed this as a new record for London but I have been unable to trace a site or voucher. I am, therefore, uncertain of the status of this species in London.

*M. fuliginosa* (Fr. ex Duby) Essl. (1987) ssp. *fuliginosa* (now *Melanelixia fuliginosa* (Fr. ex Duby) O. Blanco et al. ssp. *fuliginosa*)

Thallus dark greenish brown, the centre covered in dense small isidia which give it a black velvet appearance. M: C+r.
Ecology: mainly on rocks and gravestones, also on branches.
Sq: 08, 09, 15, 25.
Note: *Melanelixia* covers the C+r species of *Melanelia* (Blanco et al. 2004).

*M. fuliginosa* ssp. *glabratula* (Lamy) Coppins (2002) (now *Melanelixia fuliginosa* ssp. *glabratula* (Lamy) J.R. Laundon (2006))

Thallus green-brown, shiny, adpressed, lobes notched, isidia simple to coralloid, often crowded in centre; under surface black at centre with simple rhizines. M: K-, C+r, KC+r, UV-.
Ecology: on trees and fences, rarely on saxicolous substrates.
Lichenicolous fungi *Lichenoconium usneae* (Anzi) D. Hawksw., *Marchandiomyces corallinus* (Roberge) Diederich & D. Hawksw., *Abrothallus bertianus* de Not.
Historical records and Hampstead, cemetery; Richmond Park, a few tiny thalli on fallen *Salix* branch, 16.x.1982, JRL; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; on *Quercus*, Norman Park and Regent's Park, 2003, RL. Sqs: 06, 08, 15, 16, 17, 18, 25, 26, 28, 59.

*M. laciniatula* (H. Olivier) Essl. (1978) (now *Melanohalea laciniatula* (Flagey ex H. Olivier) O. Blanco et al.)

Thallus brown to green-brown, adpressed, narrow lobes, centre of thallus covered in flattened folioles, lower surface pale with simple rhizines. Chemical reactions negative.
Ecology: well-lit branches and twigs, expecially where eutrophicated, often with *Parmelina pastilifera*.
According to Dobson (2005) first recorded from Dorking about 1930.
Sq: 15.

*M. subaurifera* (Nyl.) Essl. (1978) (Now *Melanelixia subaurifera* (Nyl.) O. Blanco et al.)

Thallus brown to green-brown, adpressed, lobed, not as shiny as *M. fuliginosa*, isidia simple, breaking down to form soredia which appear pale yellow when gently rubbed; undersurface black with simple rhizines. M: C+r, KC+r, K-, P-, UV-.
Ecology: the commonest *Melanelia* in London on twigs, branches, fences and sometimes stone.
Historical records and (with specimen of *Lecanora carpinea*) (on smooth bark) on tree near London, 1790, Menzies, Edinburgh Herbarium [**E**]; and **K(M)**39539 on branch of *Sambucus nigra*, edge of old tip area, West End Common, near Esher, Surrey, 27.v.1996, MBAH & BMS, det. MBAH; **K(M)**92054 on branch of *Malus* sp., West End Common, Esher, 27.v.1996, BMS det. MBAH; **K(M)**92007, on fallen trunk of *Quercus robur*, near Horseshoe Clump, edge of West End Common, Esher, Surrey, 5.xi. 2000, MBAH; **K(M)**108929 (*Quercus*) and **K(M)**108946 (*Salix*) towards the Ledges, West End Common, Esher, 2.ii.2003, BMS & MBAH; **K(M)**110100, on branches of *Quercus robur*, by sandpit, Oxshott Heath, Esher, 30.iii.2003, MBAH, KH & HH; **K(M)**128231 on wood on bridge over the Thames, Egham, Surrey, 18.vii.2004, T. Kokobum, det MBAH; and Chelsea Physic Garden, one unhealthy thalus on *Catalpa bignonioides*, 8.v.1987, JRL; Gunnersbury Triangle, Hounslow, several thalli on the *Salix* trunks, 1991, JRL; Wimbledon Common, several thalli on several trees, 9.i.1994, JRL; Morden, 14 Victory Avenue, several thalli on sloping branch of old pear tree, July 1994, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PWJ & LD; on pear twig, 93 Elmhurst Drive, Hornchurch, RMll lNZ, 2003, KH; Ashtead Common, Alexandra Park, Beckenham Place Park, Brent Lodge Park, Bunhill Fields Burial Ground, Bushy Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Epping Forest, Grovelands Park, Hainault Forest, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Heathland School, Hillingdon Park, Honor Oak Allotment, Hyde Park, Morden Park, Norman Park, Pratt's Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL; on *Fraxinus*, RBG Kew, 2005, BLS; on rail to field, Wildlife Garden, Natural History Museum, 2006, AAp; Hampstead, cemetery. Sqs: 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 38, 59.

*Neofuscelia verruculifera* (Nyl.) Essl. (1978)

Thallus pale yellowish-brown, isidia clustered in pustulate outgrowth; apothecia frequent with thalline margin often isidiate; lower surface black, rhizines simple. It is debatable whether *Neofuscelia* is a brown form of *Xanthoparmelia*. P-, K-, KC- or + pink, C- or C + pink-red, UV + white (divaricatic and gyrophoric acids).
Ecology: siliceous rocks in well-lit, dry sites, also on memorials, walls and tiles.
Sqs: 06, 09, 15, 29.

*Parmelia saxatilis* (L.) Ach. (1803)

Thallus grey with brownish tips, network of pseudocyphellae along which isidia develop; lower surface covered in rhizines to margin; apothecia infrequent. M:K+o to r, P+o, UV-.
Ecology: acid-barked trees and shrubs and siliceous rocks.
Host to *Marchandiomyces corallinus*.
Historical records and K(M)59748 on bark of *Salix fragilis*, Ruislip Local Nature Reserve, 23.iii.1996, DLH; K(M)120165 on leaning branch of *Quercus robur*, near car park, West End, Esher, 16.xi.2003,

MBAH; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; on *Quercus*, Norman Park and Sevenoaks, 2003, RL; on *Fraxinus*, RBG Kew, 2005, BLS. Sqs: 08, 09, 15, 16, 17, 27, 28, 39.

*P. submontana* Nádv. ex Hale (1981)

A record was made by Begoñia Aguirre-Hudson of this species, under a tentative 'cf.' category, at Esher. I have seen it abundant in Scotland at Wanlockhead and do not feel confident that it is in London so I exclude it.

*P. sulcata* Taylor (1836)

Thallus grey, with brownish tips, with coarse network of pseudocyphellae along which soralia develop; lower surface black with simple or squarrose rhizines. M&S: K+o-r, P+o, UV-.
Ecology: on trees and rocks. Common.
Historical records and **K(M)**92053 on branch of *Quercus robur*, West End Common, Esher, Surrey, 23.vii.1996, BMS det. MBAH; **K(M)**92008 on fallen trunk of *Quercus robur*, W. side of Esher Common, Surrey, 5.xi.2000, MBAH; **K(M)**121195 on bark of fallen branch, near Golf course, Royal Botanic Gardens, Kew, 20.i.2004, EWB, det. MBAH; and Enfield Chase, Pond Wood, TL278005, xii.1973, J.P. Widgery; Hammersmith, Brook Green, on basic coping, 1975, P.W. James; Richmond Park, several small thalli on stumps and bark of *Salix* tree, 16.x.1982, JRL; Gunnersbury Triangle, Hounslow, small thalli on two *Salix* trunks, 1991, JRL; Wimbledon Common, on oak and birch, 5.i.1992, FR; Wimbledon Common, several thalli on several trees, 9.i.1994, JRL; Morden, 14 Victory Avenue, several thalli on sloping branch of old pear tree, July 1994, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PWJ & LD; on pear twig, 93 Elmhurst Drive, Hornchurch, RMll lNZ, 2003, KH; Ashtead Common, Alexandra Park, Beckenham Place Park, Brent Lodge Park, Bushy Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Greenwich Park, Grovelands Park, Hainault Forest, Hampstead Heath, Headstone Manor Park, Heathland School, Hillingdon Park, Honor Oak Allotment, Hyde Park, Morden Park, Norman Park, Pratt's Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL; on *Fraxinus* RBG Kew, 2005, BLS; on rail to field, Wildlife Garden, Natural History Museum, 2006, AAp; Hampstead, cemetery. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 38, 39, 47, 49, 59.

*Parmelina quercina* (Willd.) Hale (1974)

Similar to *P. tiliacea* but abundantly fruiting.
Ecology: horizontal well-lit branches.
**K(M)**110104 on branches of *Quercus robur*, Oxshott Heath (by sandpit), Esher, Surrey, 30.iii.2003, MBAH. This specimen is very young and has no defining features so could also be a young *P. tiliacea*, which according to the distribution map is more likely. The distribution of *P. quercina* in the British Isles is more coastal. David Hawksworth (pers. comm.) suggests that all *P. quercina* in Britain are actually *P. carporrhizans*; it needs DNA work to clarify the status of this species in Britain.
Sq: 16*.

*P. tiliacea* (Hoffm.) Hale (1974)

Thallus pale, smooth, sometimes slightly pruinose, lobes neat and notched at tips; lower surface black in centre, light brown at margin with simple rhizines. M: C + r, UV-.
Ecology: nutrient-rich trees, roofs, rocks and sunlit asphalt paths.
K(M)131460 on *Castanea sativa*, East Molesey, Surrey; Herb. Borrer; Esher; Regent's Park on *Quercus*. Sqs: 16*, 28.

*Parmeliopsis ambigua* (Wulfen.) Nyl. (1866)

Thallus yellow-grey to greenish, lobes adpressed, palmately divided, tips with discrete soralia and the centre of thallus becomes covered in powdery soredia; lower surface black in centre with stout simple rhizines; apothecia rare. C: K+very pale yellow, KC ± y, M: UV + white; cf. *Xanthoparmelia mougeotii* which is P + o, K+ y with more convex and shiny lobes and coarser soredia.
Ecology: coniferous trees and acidified bark of deciduous trees, wood and rock.
**K(M)**NDB as *Foraminella ambigua* on *Quercus robur*, Ruislip, Middx., 20.viii.1988; K(M)116882, on bark of *Betula alba*, near Horse Shoe Clump C.P., West End Common, Esher, Surrey, 7.ix.2003, MBAH; K(M)120171 on leaning branch of *Quercus robur*, near West End Common car park, Esher, 16.xi.2003, MBAH; and (as *Foraminella ambigua*) Epping, 2003, PWJ & LD; Richmond Park, xii.2006, Frank Dobson. Sqs: 08, 09, 15, 26.

*Parmotrema perlatum* (Huds.) M. Choisy (1952) (syn: *P. chinense* (Osbeck) Hale & Ahti (1986))

Pearl-grey rounded lobes with undulating margins sometimes with black cilia or sorediate; underneath smooth tan-coloured at edge, black at centre.
Ecology: trees and rocks. Although pollution-sensitive it seems to be making a rapid return.
**K(M)**24918 on *Fagus* trunk, N.W. part of Esher Common, Surrey, 19.ix.1993, BMS det. JFS; **K(M)**68714, on old tree stump, ?*Betula*, E. of Black Pond, Esher Common, 20.xi.1995, JFS & L.E. Watts, det. JFS; **K(M)**108945, on bark of *Acer pseudoplatanus*, West End Common, Esher, 2.ii.2003, BMS & MBAH; **K(M)**108924 on bark of *Salix*, towards the Ledges, West End Common, Esher, 2.ii.2003, BMS & MBAH; **K(M)**120164, on leaning branch of *Quercus robur*, near West End

Common car park, 16.xi.2003, MBAH; Epping, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PWJ & LD; Canons Park, Cassiobury Park Golf Course, Hampstead Heath, Headstone Manor Park, Norman Park, Regent's Park, Waterlow Park, Wimbledon Common, 2003, RL. Sqs: 06, 08, 15, 16, 17, 18, 25, 26, 27, 28, 29, 39, 49, 59.

*P. reticulatum* (Taylor) M. Choisy (1952)

No naked marginal zone. Tiny cracks, best seen with a hand lens, gives it its specific name. M:K+y-r (cf. *P. perlata* K+y)
Ecology: well-lit trees and exposed coastal rocks.
West Norwood Cemetery, small thallus recorded by SD. No voucher thus this record remains questionable.
Lichenicolous fungus: *Phoma cytospora* (Vouaux) D. Hawksw.

*Platismatia glauca* (L.) W.L. Culb. & C.F. Culb. (1968)

Thallus grey, thin, with wide wavy lobes; lower surface with few rhizines. K + y, UV-.
Ecology: acid-barked trees and rocks.
**K(M)**11681 Esher, West End Common, Horse Shoe Clump C.P. (near) on the ground, fallen, 7.ix.2003, KH det. MBAH; and Enfield Chase, Pond Wood, three thalli on fallen tree, TL 278005, xii.1973, J.P. Widgery; Down House, TQ431612, 1.iii.1997, IB; High Elms Estate, TQ4462, 1998, IB; Orpington, Cloonmore Ave, TQ462644, 2000, IB; Epping, High Beach, 2003, PJ & LD. Sqs: 06*, 07*, 08, 15, 17, 28, 29, 39, 49.

*Pleurosticta acetabulum* (Neck.) Elix & Lumbsch (1988)

Thallus darkish green especially when wet, lobes rounded; under surface light brown; apothecia brown-red with contorted margin, frequently fertile.
Ecology: mainly eastern distribution, on nutrient-enriched bark of *Acer, Fraxinus, Aesculus,* especially where organic nutrient-enriched dust settles on trees in low rainfall areas (<800 mm). Usually fertile. Inorganic fertilizers are a threat. The relationship to planted trees coming from the Continent is worth investigating.
Bromley, Crystal Palace Park, TQ3471, 3.xii.2000, IB; Regent's Park (not fertile) on *Quercus*, 2003, RL, (this tree orginally came from Italy and was planted as a young tree). Sqs: 09*, 15, 28, 49.

*Punctelia borreri* (Sm.) Krog (1982)

Thallus grey, closely adpressed except for tips of lobes, punctiform soralia irregular, coarse soredia; lower surface black. C + pinkish red.
Ecology: well-lit, nutrient-rich trees and moss-covered rocks.
Lichenicolous fungi: *Lichenoconium lecanorae* (Jaap) D. Hawksw.; *Cornutispora lichenicola* D. Hawksw. & B. Sutton.
Kew, 2005, BLS. Sq: 17.

*P. reddenda* (Stirton) Krog (1982)

Like *P. subrudecta* but lower surface entirely black at centre, soredia coarser, often partly corticate so looks knobbly. Reactions negative but contains fatty acids.
Ecology: shaded trees and moss-covered rocks. Old woodland indicator.
Kew on Fx and Qp, 2005, BLS. Sq: 17

*P. subrudecta* (Nyl.) Krog (1982)

Thallus mostly adpressed, smooth, rounded lobes with punctiform soralia; lower surface light brown at edges, darker at centre with simple rhizines. Rarely fertile. Medulla and soredia C + r, KC + r, UV -.
Ecology: well-lit trees. Probably the commonest *Punctelia*. Most records are s.l. as *P. ulophylla* only recently recognized.
Historical records and **K(M)**108934 Esher, West End Common, towards the Ledges, on bark of *Salix*, 2.ii.2003, BMS & MBAH; **K(M)**108938 West End Common, towards the Ledges, on bark of *Quercus robur*, 2.ii.2003, BMS & MBAH; and Wimbledon Common, one thallus in PutneyVale/Putney Heath, 9.i.1994, JRL; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PJ & LD; Alexandra Park, Bushy Park, Canons Park, Cassiobury Park Golf Course, Danson Park, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Heathland School, Hillingdon Park, Hyde Park, Norman Park, Pratt's Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Waterlow Park, all on *Quercus*, 2003, RL; Kew on Fx, 2005, BLS. Records are s.l. as *P. ulophylla* was not distinguished. Sqs: 06, 07, 08, 09, 15, 16,s.s. & s.l., 17, 18, 25, 26, 28,29,38,39,49,59.

*P. ulophylla* (Ach.) Herk & Aptroot (2000)

Similar to *P. subrudecta* but edge of lobes a dark pinkish brown and pruinose.
Ecology: on basic bark.
K(M) 132417, Esher, Arbrook Common, by car park, on branches of *Sambucus nigra*, 21.viii.2005, MBAH; and Epping, Hollow Pond A104/406, 2003, PJ & LD; Hampstead Heath on *Salix*, AW; on *Quercus*, Sevenoaks, 2003, RL; Kew on Fx, 2005, BLS. This species has only recently been recognized as separate from *P. subrudecta* and is probably more common than records indicate. Sq: 17.

*Tuckermanopsis chlorophylla* (Willd.) Hale (1987)
Thallus dark green to brown, lobes erect, incised, with soralia on margins; under surface pale, shiny and wrinkled, few simple rhizines at centre. Reactions negative (cf. *Platismatia glauca* K+y).
Ecology: on trees.
Sq: 15.

*Xanthoparmelia conspersa* (Ehrh. Ex Ach.) Hale (1974)
Thallus yellow-green, glossy, lobes overlapping and divided with coralloid isidia. M: K+y-o, P+ o.
Ecology: acid rocks, walls and roofs.
This is an upland species and has probably been imported. Sq: 15.

*X. mougeotii* (Schaer. ex D. Dietr.) Hale (1974)
Can be confused with *Parmeliopsis ambigua*, which is normally corticolous and has wider thallus lobes.
[M&S] P+o, K+o, KC+o, UV-.
Ecology: siliceous rocks, tombstones and pebbles.
Lichenicolous fungi: *Nesolechia oxyspora* (Tul.) Massal., *Roselliniella atlantica* Matzer & Hafellner.
Wimbledon, St Mary's churchyard, one thallus on a granite kerb, 9.i.1994, KP; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Kensal Green Cemetery, many small thalli on flat top of chest tomb, 2003, AW; Sqs: 06, 08, 09, 15, 17, 25, 28, 29, 38.

## 5. The Xanthorion: *Physcia* and *Xanthoria* and related genera — the nitrogen-tolerant lichens.

See also *Anaptychia ciliaris* under Fruticose [now extinct].

*Candelaria concolor* (Dicks.) Stein (1879)
Small discrete cushions of tiny lobes, sometimes dissolving into granules. May be mistaken for the *Xanthoria candelaria* group but is K-, P-, KC-, C-, UV- (or ± orange-black). This species is in the Candelariaceae as opposed to the Teloschistaceae of the *Xanthoria*.
Ecology: nutrient-rich bark, especially rain tracks, of well-lit, broad-leaved trees with basic bark; also wooden fences and occasionally on rocks and walls.
On Fx and Qp, Kew 2005 BLS. Sqs: 17, 27, 28, 37, 38*, 49.

*Hyperphyscia adglutinata* (Flörke) H. Mayrhofer & Poelt (1979)
Thallus greenish brown, closely adpressed, lobes long and thin, palmate at tips, coalescing to cover large areas, upper surface splits and fill with greenish soredia; under surface white with minute simple rhizines; apothecia uncommon.
Ecology: shaded nutrient-enriched bark, especially elder, rarely rock.
Historical records and Sydenham,on bark, May 1857, Dr Murray Lindsay, Edinburgh herbarium [**E**] (with *X. parietina*); Epping, Hollow Pond A104/406, 2003, PWJ & LD. Sqs: 18, 26, 28, 29, 59.

*Phaeophyscia nigricans* (Flörke) Moberg (1977)
Thallus small, with narrow lobes c.0.4 mm wide, dark grey to brown, greenish when wet, soralia along the margins, spreading over thallus eventually; under surface white to tan with pale rhizines. Negative reactions.
Ecology: bird-perching sites such as limestone gravestones, roofs, rarely at base of trees in enriched situations.
Historical records and one thallus on bridge over Beverley Brook in Richmond Park, 4.x.1970, BJC; Brompton Cemetery, 2003, BLS; on field entrance gatepost, Wildlife Garden, Natural History Museum, 2006, AAp. Sqs: 15, 16, 18, 25, 26, 27.

*P. orbicularis* (Neck.) Moberg (1977)
Thallus very variable from pale to brown, when wet green, orbicular to 3 cm diam, lobes long and adpressed, becoming palmate at tips, soralia laminal and marginal; lower surface black with dark rhizines. Medulla K-.
Ecology: common and widespread on saxicolous and corticolous substrates.
Historical records and **K(M)** 76167 as *Physcia orbicularis* (Neck.) Poetsch, Middlesex, Twickenham, on concrete capping of wall by Warren footpath, 16.xii.1956, JLG; **K(M)** 76168 Surrey, Richmond, Thames bank, on concrete wall, 9.xii.1956, JLG (Nos.91 & 93); and frequent on bridge over Beverley Brook in Richmond Park, 4.x.1970, BJC; Osterley Park, on red-brick wall coping near house, 12.vi.1971, BJC; Beckenham: abundant at western end of wall in Eden Park Avenue, 1972, AR; abundant on concrete coping of bank of River Wandle, Watermeads, Mitcham, 1973, JRL.; Morden: 14 Victory Avenue, several thalli on asbestos cement roof of garage, 1973, JRL.; Forest Hill: Horniman Gardens, on roof of wooden shingles of Dutch barn, 1973, BJS; on asbestos cement roof of shed at 5 Elsenham Street, SW18 5NU, W.D. Carpenter (?1976); one thallus 7 mm diam. At base of sycamore, Holland Park, xii.1976, JRL; Regent's Park, The Holme, common on inner edge of Fountain Pond in Rose Garden, xii.1977, J.P. Widgery; one thallus on bird bath in garden of 14 Victory Avenue, Morden, 1977, JRL; Highgate Cemetery, 1977, R.E. Galtsmith-Clarke; Kensal Green Cemetery, 1977, R.E. Galtsmith-Clarke; Wandsworth Cemetery, 1977, R.E. Galtsmith-Clarke;

Wimbledon, St Mary's churchyard, occasional, 22.iv.1978, JRL; Beddington Sewage Farm, on dead elm stump, 27.ix.1981, FHB; Wimbledon Common, near The Causeway, on elm stump, 24.x.1981, JRL; Richmond Park, a few thalli on wood of stump, 16.x.1982, JRL; Beddington Sewage Farm, numerous thalli on dead wood of elm trunks, 6.iii.1983, JRL; Camden Lock, Chalk Farm Road, on sandstone bridge at 51/287841, 5.vi.1983, PEB; Chelsea Physic Garden, large thallus 8 cm across, at base of *Diospyra lotus*, 8.v.1987, JRL; All Saints, Fulham, churchyard, on two limestone headstones, 14.iv.1989, JRL; Gunnersbury Triangle, Hounslow, a few thalli on older, 1991, JRL; Wimbledon Common on stump of oak, 5.i.1992, FR; Wimbledon Common, several thalli on bark and wood, 9.i.1994, JRL; and twenty-one records in the City between 1998 and 2006, JRL; Wimbledon, St Mary's churchyard, on limestone memorial, 9.i.1994, KP; Hayes St Mary the Virgin churchyard, TQ405663, 1995, IB; Morden, 14 Victory Avenue, frequent on cement of brick gate pier, 1996, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PWJ & LD; Beckenham Place Park, Brent Lodge Park, Bunhill Fields Burial Ground, Bushy Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Epping Forest, Grovelands Park, Hainault Forest, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Heathland School, Hillingdon Park, Honor Oak Allotment, Hyde Park, Morden Park, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, all on *Quercus*, 2003, RL; on *Acer pseudoplatanus*, Hillgrove Estate, TQ263846, 2004, AA; Kew on Fx, 2005, BLS; and on field entrance gatepost, Wildlife Garden, Natural History Museum, 2006, AAp; Hampstead, cemetery. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 28, 29, 38, 39, 49, 59.

*Physcia adscendens* H. Olivier (1882)

Long pale lobes with helmet-shaped sorediate tips and cilia. The shape of the tip tells it apart from *P. tenella* but sometime if the tip has been eroded this distinction is difficult.
Ecology: base-rich well-lit rocks and stonework, where nutrient-enriched and basic bark.
Historical and Beckenham, scattered on limestone wall of St Paul's churchyard in Brackley Road, 1972, A. Richards; Morden, 14 Victory Avenue, several thalli on asbestos cement roof of garage, 1973, JRL; on asbestos cement roof of shed at 5 Elsenham Street, SW18 5NU, W.D. Carpenter (?1976); Wimbledon, St Mary's churchyard, scarce, on one headstone only, 22.iv.1978, JRL; Richmond Park, a few thalli on wood of stumps, 16.x.1982, JRL; Beddington Sewage Farm, one thallus on dead wood of elm trunk, 6.iii.1983, JRL; plentiful at Elmstead Woods Station, 1988, I.B; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Morden, 16 Victory Avenue, on wall and old apple tree, 1996, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PJ & LD; Alexandra Park, Beckenham Place Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Epping Forest, Grovelands Park, Harrow Recreational Ground, Headstone Manor Park, Hillingdon Park, Honor Oak Allotment, Morden Park, Norman Park, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, all on *Quercus*, 2003, RL; on *Platanus* trunks, Hamilton Terrace, NW8, 2004, AA; Kew on Fx, 2005, BLS; on field entrance gatepost, Wildlife Garden, Natural History Museum, 2006, AAp; Hampstead, cemetery. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 28, 29, 38, 39, 49, 59,

*P. aipolia* (Ehrh.ex Humb.) Fürnr. (1839)

Lobes speckled, apothecia pruinose. No soredia or isidia. K+y atranorin and zeorin.
Ecology: corticolous on basic barked trees. Decline due to loss of elms.
Historical records and Epping, High Beach, 2003, PWJ & LD; Alexandra Palace, Beckenham Place Park, Danson Park, Grovelands Park, Headstone Manor Park, all on *Quercus*, 2003, RL; Kew on Qp, 2005, BLS. I have yet to see this species in London but it is quite distinctive. Sqs: 15, 16, 17, 19, 25, 26, 27, 28, 38, 39.

*P. caesia* (Hoffm.) Fürnr. (1839)

Lobes speckled with maculae with numerous blue-grey globose soralia. (*P. wainioi* was originally separated because of marginal soralia.)
Ecology: on well-lit basic rocks, especially when moderately eutrophicated, also on dust-impregnated bark and lignum.
Historical records and Beckenham, abundant on wall in Eden Park Avenue, 1972, A. Richards; Mitcham, Watermeads, a few thalli on concrete coping of bank of River Wandle, 1973, JRL; Forest Hill, Horniman Gardens, on roof of wooden shingle of Dutch barn, 1973, B.J. Starkey; on asbestos cement roof of shed at 5 Elsenham Street, SW18 5NU, W.D. Carpenter (?1976); Regent's Park, The Holme, one thallus on paving stone at east end of tennis court, Dec. 1977, J.P. Widgery; South Metropolitan Cemetery, locally frequent, 1977, FHB and J.R. Laundon; Wimbledon, St Mary's churchyard, occasional (fertile), 22.iv.1978, JRL; Morden, 14 Victory Avenue, one thallus on asbestos cement roof of garage, 1979, JRL; Morden churchyard, 1981, JRL; Beddington Sewage Farm, on dead elm stump, 27.ix.1981, FHB; Richmond Park, two thalli on wood of stumps, 16.x.1982, JRL; Beddington Sewage Farm, a few thalli on dead wood of elm trunks, 6.iii.1983, JRL; All Saints, Fulham churchyard, on two limestone headstones, 14.iv.1987, JRL; Wimbledon, St Mary's churchyard on two limestone memorials, 9.i.1994, KP; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Morden, Ravensbury Avenue, abundant on tarmac verge, 1996, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Hollow Pond A104/406, 2003, PJ & LD; Kew on Fx, 2005, BLS; on field entrance gatepost, Wildlife Garden, Natural History Museum, 2006, AAp; Hampstead, cemetery. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 28, 29, 38, 39, 49, 59.

*P. clementei* (Sm.) Maas. Geest. (1952)
Light grey thallus, adpressed, orbicular, often joined to form larger colonies. Centre densely covered in granular isidia, which can break down to form coarse soredia.
Ecology: nutrient-rich trees but now rare.
Historical records Sqs: 26*, 49*. Extinct in London.

*P. dubia* (Hoffm.) Lettau (1912)
Soralia lip-shaped on the ends of side lobes. Cortex K+y and medulla K- (cf. K+ in *P. caesia*). Atranorin.
Ecology: acidic siliceous stonework, tolerant of some enrichment.
Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Morden, 14 Victory Avenue, scarce on shaded fence rail, 2001, JRL, 3306; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Alexandra Park, Greenwich Park, Headstone Manor Park, Honor Oak Allotment, Waterlow Park, all on *Quercus*, 2003, RL; on wall of the Temple Gardens, near Embankment, 2006, AW. Sqs: 06, 08, 09, 15, 16, 17, 19, 25, 26, 29, 59.

*P. leptalea* (Ach.) DC. (1805)
Lobes long with white maculae, long marginal cilia, usually abundantly fertile.
Ecology: on moderately basic bark, especially twigs. Does not like eutrophication.
Historical records. Sqs: 38. Not recorded recently in London.

*P. tenella* (Scop.) DC. (1805)
Long pale lobes with reflexed lip-shaped soralia and cilia. Can be fertile, even in London. C: K+y, M: K-. Atranorin.
Ecology: mainly corticolous, particularly on twigs, always enriched sites. Tolerant of pollution and eutrophication.
Historical records and Beddington Sewage Farm, on dead elm stump, 27.ix.1981, FHB; Richmond Park, one on bark of fallen *Salix* branch, 16.x.1982, JRL; Morden, 14 Victory Avenue, several thalli on sloping branch of old pear tree, vii.1994, JRL; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PJ & LD; on pear twig, 93 Elmhurst Drive, Hornchurch, RMll lNZ, 2003, KH; Ashtead Common, Alexandra Park, Beckenham Place Park, Brent Lodge Park, Bunhill Fields Burial Ground, Bushy Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Epping Forest, Grovelands Park, Hainault Forest, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Heathland School, Hillingdon Park, Honor Oak Allotment, Hyde Park, Morden Park, Norman Park, Pratts Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL; on *Acer pseudoplatanus*, Hillgrove Estate, TQ263846, 2004, AA; on *Platanus* trunks, Hamilton Terrace, NW8, 2004, AA; City, four records 1998–2005, JRL; Kew on Fx, 2005, BLS; on *Fraxinus* and several sites including field entrance gatepost, Wildlife Garden, Natural History Museum, 2006, AAp; Hampstead Heath, cemetery. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 25, 26, 29, 38, 39, 49, 59.

*P. tribacia* (Ach.) Nyl. (1874)
Irregularly lobed, often pruinose, whitish grey thallus. Soralia on crenulations along margin of thallus. Apothecia and pycnidia rare. C: K+y, M: K-. Atranorin, leucotylin, zeorin, unidentified terpenoids, physcia-1 and physcia -2.
Ecology: calcareous enriched rock and stonework; dust-impregnated bark. Decline due to loss of elms.
Bookham Common, on *Quercus*, Bushy Park, 2003, RL. Sqs: 06, 15, 28.

*Physconia distorta* (With.) Laundon (1984)
Thick pruinose lobes, white pruinose discs. Dark pycnidia in small warts. Bottle-brush rhizinae black.
Ecology: well-lit nutrient-rich bark and rock.
Historical records 'on an old tree, Edgware' Crombie [**BM**] and Sqs: 06*, 15, 28, 29.

*P. grisea* (Lam.) Poelt (1965)
Thallus lobes radiating and overlapping, usually pruinose at tips. Fragile isidia or granular soredia along lobe margins or on surface in centre. Apothecia uncommon. Pycnidia frequent but inconspicuous. Simple rhizines whitish. Four unidentified substances detected by t.l.c.
Ecology: on nutrient-enriched bark of well-lit trees and stonework. Quite tolerant of hypertrophication and dust and therefore common.
Historical records and Sydenham, on bark, v.1857, Dr Murray Lindsay, Edinburgh herbarium [**E**] (with *X. parietina*); **K(M)**132416, Esher, Arbrook Common, by car park, on branches and trunk of *Sambucus nigra*, 21.viii.2005, MBAH; fertile, near London, Forster in Menzies herbarium in Edinburgh (**E**); and Beckenham: common limestone wall of St Paul's churchyard in Bracklegh Park Road, 1977, AR; Morden churchyard, many thalli at base of south wall of church, 1981, JRL; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Cassiobury Park Golf Course, Wimbledon Common, on *Quercus*, 2003, RL; Kew on Fx, 2005, BLS. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 28, 29, 49, 59.

*P. perisidiosa* (Erichsen) Moberg (1977)
Thallus imbricate, dark brown often tinted mauve, especially the granular isidiate soralia. Bottle-brush rhizines black. No chemical reactions.
Ecology: moderately enriched bark of well-lit deciduous trees, can also be on stonework. Not tolerant of heavy enrichment.
**K(M)**108939 Esher, West End Common, towards the Ledges, on bark of *Salix*, 2.ii.2003, BMS & MBAH, det. MBAH; and Kew, AAp. Sq: 07.

*Xanthoria calcicola* Oxner (1937)
Similar to *X. parietina* but covered in isidia. K+ crimson.
Ecology: similar habitats to *X. parietina* but usually more exposed to sunlight.
Historical records and **K(M)**108732 on concrete post Fairmile Common, near Esher, Surrey, 24.i.2003, EWB, MBAH; and Richmond Park, on brick wall near Roehampton Gate, 51/210742, 8.xi.1970, BJC [**BM**]; Beckenham, Copers Cope Road, on wall TQ(51)36-70-, no date, P.D. Crittenden; Forest Hill, Horniman Gardens, on roof of wooden shingle of Dutch barn, 1973, BJS; Beddington Sewage Farm, frequent on parapet of irrigation bridge, 28.ii.1981, JRL; Morden, 14 Victory Avenue, TQ 264678, on garage roof of asbestos cement, 28.xii.1981, JRL; Morden, 54a The Drive, several thalli of asbestos cement roof of shed, 7.iii.1982, JRL; Beddington Sewage Farm, 12 thalli on Hundred Acre Bridge, plus a few specimens on effluent channels, 6.ii.1982, JRL; several large thalli at Elmstead Woods Station, 1988, IB; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; City, Sugar Quay Walk, one thallus on top of brick river wall, 1998, JRL; Hampstead, cemetery; Rainham RSPB Reserve, 2006.
Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 28, 29, 38, 49, 59.

*X. candelaria* (L.) Th. Fr. (1861)
Yellow-orange small upright lobes with granular soredia on margins. K+ crimson. This group has been divided into several species, the commonest is now *X. ucrainica*, old records of *X. candelaria* might be referable to this species, so records are considered sensu lato.
Ecology: nutrient-rich rocks, fences and gravestones.
**K(M)**110106 on branches of Quercus robur, by sandpit Oxshott Heath, Esher, Surrey, 30.iii.2003, MBAH, KH & HH; Sydenham, on bark, May 1857, Dr Murray Lindsay, Edinburgh herbarium [**E**] (with *X. parietina*); and Morden, 14 Victory Avenue, several thalli on sloping branch of old pear tree, July 1994, JRL; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PJ & LD; Ashtead Common, Alexandra Park, Beckenham Place Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Epping Forest, Greenwich Park, Grovelands Park, Hainault Forest, Harrow Recreational Ground, Headstone Manor Park, Hillingdon Park, Honor Oak Allotment, Morden Park, Norman Park, Pratt's Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Wimbledon Common, all on Quercus, 2003, RL;. Sqs: 06, 08, 09, 15, 16, 17, 18, 19, 25, 28, 38, 49, 59.

*X. elegans* (Link) Th. Fr. (1860)
A dark orange, closely adpressed, orbicular thallus; apothecia usually present. K+ crimson.
Ecology: well-lit nutrient-rich rocks and monuments.
Morden, 14 Victory Avenue, one thallus on asbestos cement roof of garage, 1973, JRL; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Brompton Cemetery, 2003, AW. Sqs: 07, 15, 16, 18, 19.

*X. parietina* (L.) Th. Fr. (1860)
Bright orange to greenish-grey orbicular patches which die out in the centre with age. Apothecia usually abundant in centre. A very common lichen but the green form seems to have become more common in London. K + crimson.
Ecology: nutrient-rich trees, rocks, walls, bird-perching sites.
Historical records and (**E**) Sydenham, on bark, May 1857, Dr Murray Lindsay; **K(M)**108211 on Populus bark, Molesey Heath, Elmbridge, 29.xii.2002, BMS det. MBAH; **K(M)**107187 on concrete posts, Fairmile Common, near Esher, 29.xii.2002, BMS, det. MBAH; **K(M)**108925 on bark of *Salix*, towards the Ledges, West End Common, Esher, 2.ii.2003, BMS & MBAH; and Mitcham, Watermeads, one thallus with abundant apothecia on concrete coping of bank of River Wandle, 1973, JRL; Morden, 14 Victory Avenue, on asbestos cement roof of garage, 1973, JRL; Forest Hill, Horniman Gardens, on roof of wooden shingle of Dutch barn, 1973, B.J. Starkey; on asbestos cement roof of shed at 5 Elsenham Street, SW18 5NU, ?1976, W.D. Carpenter; Beddington Sewage Farm, on dead elm stump, 27.ix.1981, FHB; Wimbledon Common, near The Causway, on elm stump, 28.x.1981, JRL; Beddington Sewage Farm, one specimen on effluent channel, 6.ii.1982, and also a few small thalli on dead wood of elm trunk, 6.iii.1982, JRL; Morden, 54a The Drive, several thalli on asbestos cement roof of shed, 7.iii.1882, JRL; Richmond Park, on bark of *Fagus* stump, 4 mm across, 16.x.1982, JRL; Camden Lock, Chalk Farm Road, on sandstone bridge at 51/287841, 5.vi.1983, PEB; a dozen thali 3–4 cm diam., at high-water mark on wooden piles, Cousin Lane, City, 1988, PEB; one thallus on mortar at Fulham Palace garden walls, 14.ix.1990, JRL; Gunnersbury Triangle, Hounslow, one thallus on elm, 1991, JRL; Wimbledon Common, 5.i.1992, FR; Wimbledon, St Mary's churchyard, 9.i.1994, KP; Hayes, St Mary the Virgin churchyard, TQ405663, 1995, IB; Down House, TQ431612, 1.iii.1997, IB; Chelsfield, St Martin churchyard, TQ479640, 4.iv.1998, IB; Morden, 14 Victory Avenue, one thallus on sloping branch of dead pear tree, 1998, JRL; eleven records from the City between 1988 and 2006, JRL; on *Aesculus* trunks, Hyde Park, 2003, LD;

Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PJ & LD; on apple twig, 93 Elmhurst Drive, Hornchurch, RMll lNZ, 2003, KH; Ashtead Common, Alexandra Park, Beckenham Place Park, Brent Lodge Park, Bunhill Fields Burial Ground, Bushy Park, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Downhills Park, Epping Forest, Geraldine Mary Harmsworth Park, Greenwich Park, Grovelands Park, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Heathland School, Hillingdon Park, Honor Oak Allotment, Hyde Park, Morden Park, Norman Park, Pratt's Bottom, Ravenscourt Park, Regent's Park, Sevenoaks, Springfield, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL; on *Acer pseudoplatanus*, Hillgrove Estate, TQ263846, 2004, AA; on *Platanus* trunks, Hamilton Terrace, NW8, 2004, AA; Kew on Fx, 2005, BLS; on *Fraxinus* and field entrance gatepost, Wildlife Garden, Natural History Museum, 2006, AAp. Sqs: 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 28, 29, 38, 49, 59.

*X. polycarpa* (Hoffm.) Th.Fr. ex Rieber (1891)

Small much-incised lobes and abundantly fertile. K + crimson.
Ecology: nutrient-enriched trees, especially on twigs, also on fences and benches.
Historical records and **K(M)**116213 on bark of *Buddleja* sp., Esher Common, Surrey, June 1994, JFS & BMS, det. MBAH; **K(M)**9210 on attached twig of *Malus* sp., West End Common, Esher, Surrey, 27.v.1996, MBAH; **K(M)**39537 on bark of *Sambucus nigra*, W. edge of old tip area, West End Common, near Esher, Surrey, 27.v.1996, MBAH & BMS; **K(M)**108212 on bark of *Populus*, Molesey Heath, Elmbridge, Surrey, 29.xii.2002, BMS det. MBAH; **K(M)**130913 on concrete, Clifden House, Windmill Road, Brentford, 24.v.2005, N.W. Legon, det. MBAH; and Down House, TQ431612, 1.iii.1997, IB; Morden, 14 Victory Avenue, six thalli on dying twigs of *Prunus domestica*, 1998, JRL; on *Aesculus* trunks, Holland Park, and Hyde Park, 2003, LD; Epping, Wintry Wood, High Beach, Monks Wood and Hollow Pond A104/406, 2003, PWJ & LD; on pear twig, 93 Elmhurst Drive, Hornchurch, RMll lNZ, 2003, KH; Ashtead Common, Alexandra Park, Beckenham Place Park, Brent Lodge Park, Bunhill Fields Burial Ground, Canon Hill Common, Canons Park, Cassiobury Park Golf Course, Danson Park, Geraldine Mary Harmsworth Park, Greenwich Park, Grovelands Park, Hampstead Heath, Harrow Recreational Ground, Headstone Manor Park, Heathland School, Hillingdon Park, Honor Oak Allotment, Hyde Park, Morden Park, Primrose Hill, Ravenscourt Park, Regent's Park, Sevenoaks, Walpole Park, Waterlow Park, Wimbledon Common, all on *Quercus*, 2003, RL; on *Acer pseudoplatanus*, Hillgrove Estate, TQ263846, 2004, AA; on *Platanus* trunks, Hamilton Terrace, NW8, 2004, AA; Kew on Fx, 2005, BLS; on *Fraxinus* and rails, Wildlife Garden, Natural History Museum, 2006, AAp; Hampstead, cemetery. A species that has increased lately. Sqs: 07, 08, 15, 16, 17, 18, 19, 25, 28, 29, 38.

*X. ucrainica* S. Kondratyuk (1997)

Lemon-yellow to yellow-green fan-shaped small lobes with granular soredia at tips, sometimes eroded into a sorediate crust. No rhizines. K +crimson. Part of the *X. candelaria* group. Probably the most frequent according to Dobson (2005); but some people do not think it is a good species.
Ecology: nutrient-enriched trees, fences, walls and rocks, especially bird-perch sites.
Regent's Park, BLS, 2003. The lack of records reflects the knowledge of the species rather than its distribution. Sq: 28.

## Discussion

Air pollution and lichens have become linked in the public mind since the 1970s when sulphur dioxide was the main pollutant. The Hawksworth and Rose (1970) qualitative scale of sulphur dioxide pollution has become a standard. Sulphur is an important component of the nutrients of plants but so also is nitrogen, which is now the main factor affecting lichen distribution. The sulphur dioxide effect was easier to see than the different forms of nitrogen and other pollutants which make the current story more complex. The increase in the Xanthorion community was first noticed in the countryside (Benfield 1994) and has since been noticed in urban area but the causal factors are not necessarily exactly the same. Recording can track these changes. Recent work, e.g. (Larsen et al. 2007) has concentrated on the air pollution caused by traffic, especially nitrogen oxides, but as yet no clear strategy for a scale equivalent to that for sulphur dioxide has been attained.

No community is totally stable and each has its own succession. The Lobarion is considered the climax community in Britain but it has long been extinct in London. This is mainly due to habitat change. I have not included *Sticta sylvatica* (Enfield Chase), *Lobaria pulmonaria* and *Bryoria fuscescens* (Epping) as all are extinct and do not fit into my categories. Many other lichens have probably also gone extinct but as no record has been made we will never know. The demise of lichens was noted in Victorian times and was highlighted in 1970 when the European Year of Conservation was held and

Laundon (1970) published his account in *The London Naturalist*. Recording is important to track change and try to understand how living organisms react to their changing environment. Records from Neasden (Gilbert 1990), show that at that time there was not the abundance of foliose lichens there are now. The only foliose ones were *Hypogymnia physodes, Parmelia sulcata, Physcia tenella, Xanthoria candelaria* and *X. parietina*, and there were no fruticose. The species for Neasden represent less than a quarter of his overall list, i.e. 22 out of 100. The increase in foliose species has been rapid and recent. Spore dispersal is important and it is interesting that *Lecanora muralis* and *Xanthoria parietina*, two of the commonest lichens in London, both have apothecia. The lifespan of the apothecia is not known. Whilst doing work on lichens in the Azores I found that the sorediate species were more common in the foliose lichens, and it may be that for long-distance dispersal this is true. The urban story appears to be different.

The urban environment represents a different ecological niche from forest, field or woodland. Wasteland, which is so much associated with the urban landscape, is a diminishing resource. A drive to build on brownfield sites has meant not only this resource but also many large gardens have disappeared under new developments; but perhaps the increase in 'green roofs' will create a new habitat for transient species.

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## Part II — A preliminary checklist of crustose lichens in the London Area

This part of the paper serves as a reference for the many crustose species that have been recorded in London. The London Natural History Society's recording area consists of a circle of radius 20 miles (32 km) from St Paul's Cathedral. The central squares of this area are 28, 38, 27 and 37, with St Paul's to the south-west of 38. The whole area is diverse and includes countryside, thus the list is longer than would be expected of a purely urban area. Squares covered: 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.

Abbreviations: D = In Dobson 2005 {CR} = Chemical race; RDB = *Red Data Book.*

**Note.** Linda Davies, in studying lichens for her PhD with Peter James, made new records for London but has not yet published sites so I have included these with no square number but marked LD.

Professor Mark Seaward is thanked for providing the records for squares, reading through the list and making additions. Names follow the BLS online checklist: www.thebls.org.uk (Coppins, B. 2006).

*Acarospora fuscata* 51/ 06, 09, 15, 16, 17, 19, 35, 36, 37, 45, 46, 47, 48, 49, 56, 57, 58; 52/ 10, 20*, 30*, 40.
Saxicolous – nutrient-rich siliceous rock. D.

*A. rufescens* 51/ 15, 17, 35, 45, 47, 49, 56, 57, 58.
Saxicolous – siliceous rock.

*A. smaragdula* 51/ 09, 15, 17, 45, 46, 47.
Saxicolous – siliceous rock, especially in metal-rich areas. D.

*A. veronensis* 51/ 17, 46; 52/ 10.
Saxicolous – nutrient enriched siliceous rock.

*Acrocordia conoidea* 51/ 36, 45.
Saxicolous – hard limestone and calcareous walls, usually shaded and moist. D.

*A. gemmata* 51/ 39*, 45, 49*.
Corticolous – on rough bark of old trees. D.

*A. salweyi* 51/ 08, 15, 25, 26, 35, 45, 46, 56, 57.
Saxicolous – soft damp calcareous rock and old mortar. D.

*Agonimia gelatinosa* 51/ 15.
On soil over pebbles.

*A. tristicula* 51/ 06, 07, 09, 15, 16, 26, 37, 46.
Base-rich mortar, moss or bark. D.

*Amandinea punctata* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10,20,30, 40.
Nutrient-enriched bark. D.

*Anisomeridium biforme* 51/ 15, 38*.
Corticolous – smooth bark. D.

*A. polypori* 51/ 08, 15, 16, 17, 19, 46, 49, 56, 59.
Corticolous – rough bark in damp shade. D.

*Arthonia cinnabarina* 51/ 28*.
Corticolous – shaded smooth barked trees. D.

*A. didyma* 51/ 15, 56.
Corticolous – smooth bark, especially hazel. D.

*A. lapidicola* 51/ 09, 15, 17, 25, 37.
Saxicolous – calcareous rock and mortar. D.

*A. muscigena* 51/ 27.
Corticolous – twigs especially elder. Probably under-recorded. D.

*A. pruinata* 52/ 10*.
Corticolous – dry side of old trees. D.

*A. punctiformis* [LD] +52/40
Corticolous – primary coloniser of twigs. D.

*A. radiata* 51/ 09, 15, 16, 17, 26, 38*, 39*, 55, 56.
Corticolous – smooth bark, common. D.

*A. spadicea* 52/ 40,
Corticolous – rough-barked trees, especially at base. D.

*Arthopyrenia analepta* 51/ 16
Corticolous – twigs and smooth bark. D.

*A. punctiformis* 51/ 09, 17.
Corticolous – smooth bark, moderately shaded. D.

*Aspicilia caesiocinerea* 51/ 15, 25.
Saxicolous – nutrient-enriched rock, seepage tracks. D.

*A. calcarea* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 59; 52/ 10, 20, 40.
Saxicolous – hard limestone, often large patches. D.

*A. contorta* subsp. *contorta* 51/ 07, 08, 09, 15, 16, 18, 19, 25, 26, 27, 28, 29, 35, 36, 45, 46, 47, 48, 49, 56, 57, 58. 59; 52/ 20, 40.
Saxicolous – hard calcareous rock. D.

*A. radiosa* 51/ 15, 25.
Saxicolous – well-lit calcareous rock. D.

*Bacidia adastra* 51/ 17.
Saxicolous and corticolous.

*B. arceutina* 51/ 09*, 17.
Corticolous – nutrient-enriched bark, sometimes saxicolous. D.

*B. arnoldiana* 51/ 08, 15, 16, 17, 27, 28, 48, 49, 58, 59; 52/ 30.
Corticolous – especially at base of trees, also saxicolous. D.

*B. bagliettoana* 51/ 15.
Over mosses and plant debris on calcareous rocks. D.

*B. caligans* 51/ 08, 16, 17, 49.
Saxicolous – sheltered calcareous rocks and stonework, rarely bark.

*B. chloroticula* 51/ 08, 27.
Shaded substrates, trees to brick rubble.

*B. delicata* 51/ 09, 17, 18, 19, 26, 27, 28, 46, 49, 55.
Saxicolous and corticolous – shaded. D.

*B. egenula* 51/ 17, 25.
Saxicolous – shaded, sometimes over mosses, rarely bark.

*B. friesiana* +LD
Corticolous – nutrient-rich bark.

*B. herbarum* 51/ 26.
Calcareous grassland. D.

*B. incompta* 51/ 08*, 15, 45; 52/ 10*.
Corticolous – basic bark, decline due to loss of elms. RDB sp. D.

*B. laurocerasi* +LD
Corticolous – basic rough-barked trees. D.

*B. neosquamulosa* 51/ 17, 27, 38, 58.
Corticolous – nutrient-rich bark.

*B. rubella* 51/ 15, 17*, 18, 35, 49*, 56, 59*.
Corticolous – basic bark, sometimes stone. D.

*Baeomyces rufus* 51/ 08, 15, 16, 25, 28*, 35, 38*, 45, 46, 49*, 59*; 52/ 20*.
Damp siliceous rock and peaty soil. D.

*Belonia nidarosiensis* 51/ 06, 07, 15, 45.
Saxicolous – vertical shaded basic stone and mortar. D.

*Biatora sphaeroides* 51/ 49*.
Corticolous – mature deciduous trees, near base. D.

*Bilimbia sabuletorum* 51/ 08, 09, 15, 17, 19, 25, 26, 27, 28, 29, 35, 36, 45, 46, 47, 49, 56, 57, 58, 59; 52/ 10, 30.
Over mosses on basic-barked trees and stone. D as *Myxobilimbia*.

*Botryolepraria lesdainii* 51/ 06, 15, 26, 39, 46; 52/30.
Saxicolous – damp shaded limestone and mortar. D as *Lepraria*.

*Buellia aethalea* 51/ 06, 15, 16, 17, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 56, 57.
Saxicolous – well-lit siliceous rock. Pioneer. D.

*B. badia* 51/ 25.
Initially lichenicolous, associated with *Xanthoparmelia*.

*B. griseovirens* 51/ 17, 37, 38, 46.
Corticolous, benches. D.

*B. ocellata* 51/ 06, 08, 15, 16, 25, 26, 35, 36, 45, 46, 47, 56, 57; 52/20.
Saxicolous – pioneer species. D.

*B. stellulata* 51/ 15, 35, 36, 45, 48, 56, 57.
Saxicolous – well lit siliceous rock, usually maritime. D.

*Calicium abietinum* 51/ 18*, 29*, 38*.
Corticolous – decorticated wood, old trees, particularly conifers.
Note: *C. glaucellum* is often recorded for *C. abietinum*.

*C. salicinum* 51/ 38*, 56; 52/ 40.
Corticolous – dry decorticated wood and bark. D.

*C. viride* 51/ 15, 17, 35, 45, 46, 49*, 56, 59*.
Corticolous. D.

*Caloplaca aurantia* 51/ 07, 09, 15, 17, 18, 25, 26, 27, 29, 35, 36, 37, 45, 46, 47, 56, 57, 58, 59; 52/ 10, 20, 30.
Saxicolous – nutrient-rich, well-lit hard calcareous rock. D.

*C. cerina* var. *cerina*
Corticolous – basic bark, especially elder. D.

*C. chlorina* 51/ 15, 17, 36, 45, 56.
Saxicolous – limestone, rarely on bark. D.

*C. citrina* s.l. 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous, corticolous – walls and bark. D.

*C. crenularia* 51/ 15, 45.
Saxicolous – siliceous rocks. D.

*C. crenulatella* 51/ 16, 17, 26, 36, 37, 38, 46.
Saxicolous – concrete, especially paths.D.

*C. dalmatica* 51/ 15, 17, 35, 36, 46, 57.
Saxicolous – well-lit calcareous stone. D.

*C. decipiens* 51/ 06, 07, 09, 15, 16, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 56, 57, 59; 52/ 10, 20, 30, 40.
Saxicolous – mortar and limestone. D.

*C. ferruginea* 51/ 49*.
Corticolous. D.

*C. flavescens* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – hard calcareous rock. D.

*C. flavocitrina* 51/ 17, 28, 36, 37, 58.
Saxicolous – recently recognised as different from *C. citrina*. D.

*C. flavorubescens* 51/ 28*, 37*, 46*.
Corticolous. Historical – a Hudson species from Hampstead and Highgate. D.

*C. flavovirescens* 51/ 15, 47; 52/ 10.
Saxicolous – basic or acid affected by basic wash. D.

*C. holocarpa* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30.
Saxicolous – nutrient-enriched, well-lit stone or cement. D.

*C. lactea* 51/ 08, 15, 35, 46.
Saxicolous – often on flat tops or where water retained. D.

*C. luteoalba* 51/ 09*, 19*, 29*, 36*, 38*, 39*, 56*.
Corticolous – basic bark. Decline with loss of elm. RDB sp. D.

*C. marina* 51/ 57.
Saxicolous – maritime rock and cement. D.

*C. obscurella* 51/ 08, 17.
Corticolous – nutrient-enriched bark in damp situations. D.

*C. ruderum* 51/ 56, 57.
Saxicolous – soft calcareous stone. D.

*C. saxicola* 51/ 07, 08, 09, 15, 16, 17, 18, 25, 26, 27, 28, 29, 35, 36, 37, 45, 46, 47, 56, 57, 58, 59; 52/ 10, 20, 40.
Saxicolous – hard calcareous rock. D.

*C. teicholyta* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – calcareous, especially on flat tops. D.

*C. variabilis* 51/ 15.
Saxicolous – nutrient-enriched, hard calcareous rock. D.

*Candellariella aurella* f. *aurella* 51/ 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – nutrient-enriched hard calcareous rock. D.
+ f. *smaragdula* {CR} 51/ 27, 37, 46. [specimens with yellow-green fruits] D.

*C. medians* f. *medians* 51/ 06, 07, 08, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – especially man-made substrates. D.
+ f. *steepholmensis* {CR} 51/ 45, 46, 57. [specimens with yellow-green fruits] D.

*C. reflexa* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 26, 27, 28, 36, 37, 38, 45, 46, 49, 55, 56, 58.
Corticolous – nutrient-enriched trees. D.

*C. vitellina* f. *vitellina* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – nutrient-enriched siliceous rock. D.
+ f. *flavovirella* {CR} 51/ 35, 36, 46, 47, 56, 57. [specimens with yellow-green fruits.]

*C. xanthostigma* 51/ 39*.
Corticolous – nutrient-enriched bark. D.

*Catapyreneum lachneum* 51/ 15, 36*, 38*.
Calcareous soils. D.

*C. michelii* 51/ 15.
Sandy soils.

*C. squamulosum* 51/ 15.
Calcareous soils. D.

*Catillaria chalybea* var. *chalybeia* 51/ 06, 07, 08, 15, 16, 17, 19, 25, 26, 27, 35, 36, 37, 38, 45, 46, 47, 48, 56, 57, 58, 59; 52/ 40.
Saxicolous – nutrient-enriched acid stone. D.

*C. lenticularis* 51/ 06, 08, 15, 16, 17, 19, 25, 27, 28, 36, 38, 46.
Saxicolous – basic rock and mortar. D.

*C. nigroclavata* 51/ 17.
Corticolous – deciduous trees.

*Catinaria atropurpurea* 51/ 36*, 56.
Corticolous – rough-barked trees and over mosses. D.

*Chaenotheca brachypoda* 51/ 15.
Corticolous. D.

*C. chrysocephela* 51/ 38*.
Corticolous. D.

*C. ferruginea* 51/ 08, 09, 15, 16, 19, 29, 36, 38*, 45, 46, 49, 56; 52/ 20, 30, 40.
Corticolous – acid bark. D.

*C. furfuracea* 51/ 16*, 38*, 39*.
Corticolous. D.

*C. trichialis* 51/ 28*.
Corticolous. D.

*Chrysothrix candelaris* 51/ 15, 25, 28, 29, 35, 37*, 38*, 45.
Corticolous – dry shaded crevices in rough bark of deciduous trees. D.

*C. flavovirens* +52/40 [LD]
Corticolous – dry side of old trees. D.

*Clauzadea immersa* 51/ 47*.
Saxicolous – well-lit limestone. D.

*C. metzleri* 51/ 15.
Saxicolous – shaded, moister sites. D.

*C. monticola* 51/ 06, 09, 15, 29, 35, 48, 59.
Saxicolous – calcareous substrates. D.

*Cliostomum corrugatum* 51/ 27*.
On wood of old buildings. Rare.

*C. griffithii* 51/ 08, 15, 16, 17, 25, 27, 28, 35, 45, 46, 47, 56; 52/ 10, 20, 40.
Corticolous – drier sides of trees. D.

*Cresponea premnea* 51/ 15, 45, 49*, 56; 52/ 20, 30*.
Corticolous – north side of lightly shaded old trees. D.

*Cresporhaphis weinkampii* 51/15
Salix at Bookham – first British record.

*Cyphelium inquinans* 51/ 15, 19*, 28*, 29*, 35, 38*, 45, 56; 52/ 10*, 20*, 30.
Corticolous – old trees or exposed fence posts. D.

*C. notarisii* 51/ 17, 26, 27, 38*, 49*.
Worked wood especially benches. D.

*C. sessile* +52/40
On *Pertusaria* species. D.

*C. tigillare*
Historical records. D.

*Cyrtidula hippocastani* {F} 51/ 08, 28, 58.
Corticolous – twigs and branches of *Populus tremula*.

*C. quercus* {F} 51/ 08, 16, 18, 19, 25, 26, 28, 37, 38, 47.
Corticolous – young branches of oak, and more rarely hazel. D.

*Dibaeis baeomyces* 51/ 15, 25, 38*, 45, 49*.
Peaty soil.

*Dimerella pineti* 51/ 08, 15, 16, 36, 38, 46, 49, 56, 59.
Corticolous – especially at base of *Fraxinus*. D.

*Diploicia canescens* 51/ 06, 07, 08, 09, 15, 16, 19, 25, 26, 28*, 29, 35, 36, 37, 38, 39*, 45, 46, 47, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Corticolous and saxicolous – nutrient-enriched trees, rocks and walls. D.

*Diploschistes muscorum* 51/ 08, 15, 26, 47, 49*.
Cladonia and mosses. D.

*D. scruposus* 51/ 06, 08, 09, 15, 17, 18, 25, 35, 38*, 45, 46, 56; 52/ 30.
Saxicolous – nutrient-enriched acid rocks and walls. D.

*Diplotomma alboatrum* 51/ 07, 09, 15, 25, 35, 38*, 45, 46, 49, 56, 57, 59; 52/ 20, 30.
Saxicolous – calcareous rock, also corticolous on nutrient-enriched trees. D.

*Dirina massiliensis* f. *sorediata* 51/ 15, 45, 46, 56, 57, 59.
Saxicolous – basic rock and walls. D.

*Enterographa crassa* 51/ 15, 28*, 35*, 39*, 45, 49, 56; 52/ 10*, 20*, 30, 40.
Corticolous – shaded bark, sometimes saxicolous. D.

*Fellhanera ochracea* 51/ 19.
Corticolous – particularly *Quercus*.

*Fellhaneropsis vezdae* 51/ 35.
Corticolous – shaded trees and moss. D.

*Fuscidea lightfootii* 51/ 15, 38*, 56.
Corticolous – smooth bark, particularly twigs. D.

*Graphina anguina* 51/ 49*.
Corticolous – shaded, smooth-barked trees. D.

*Graphis elegans* 51/ 15, 45, 49*; 52/30.
Corticolous – smooth-barked trees and twigs. D.

*G. scripta* 51/ 08, 17, 38*, 39*, 45, 49*, 56, 59*; 52/ 40.
Corticolous – smooth-barked trees. D.

*Haematomma ochroleucum* var. *ochroleucum* 51/ 56.
Saxicolous. D.

*H. ochroleucum* var. *porphyrium* {CR} 51/ 08, 15, 17, 25, 35, 36, 45, 56, 59; 52/ 10, 40.
Saxicolous, rarely corticolous. D.

*Hymenelia prevostii* 51/ 17.
Saxicolous – hard limestone, shaded. D.

*Hypocenomyce caradocensis* 51/ 19*, 25*, 28*, 29*, 49*.
Corticolous – used to grow with *Lecanora conizaeoides.*

*H. scalaris* 51/ 08, 15, 19, 25, 26, 28*, 29, 35, 36, 38*, 45, 46, 49, 56; 52/ 20, 30.
Corticolous – acid-barked trees, fences and sometimes saxicolous on sheltered rocks. D.

*Lecanactis abietina* 51/ 15, 45, 56.
Corticolous – shaded acid-barked trees. D.

*Lecania cyrtella* 51/ 15, 17, 26, 27, 28, 38*, 39, 45, 46, 48, 49, 56.
Corticolous – nutrient-enriched bark. D.

*L. cyrtellina* 51/ 27.
Corticolous – basic-barked trees, not in the Xanthorion.

*L. erysibe* 51/ 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10.
Saxicolous – nutrient-enriched substrates. Urban. D.
[+ f. *sorediata* – not recognized in Checklist] 51/ 15, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 56, 57, 58, 59; 52/ 10, 40. [pollution-tolerant form.]

*L. naegelii* 51/ 15, 17, 28*, 49.
Corticolous – basic-barked trees. D.

*L. rabenhorstii* 51/ 17.
Saxicolous – more coastal than *L. turicensis.* D.

*L. turicensis* 51/ 09.
Saxicolous – especially calcareous rock. D.

*Lecanographa lyncea* 51/ 49*, 56; 52/40*.
Corticolous – ancient oak. D.

*Lecanora albella* 51/39
Corticolous – smooth-barked more acid trees. D.

*L. albellula* [*L. piniperda*] 51/ 19*, 29.
Corticolous – wood and worked timber.

*L. albescens* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 56, 57, 58, 59; 52/ 20, 30, 40.
Saxicolous – especially hard limestone. D.

*L. barkmaniana* +LD
Corticolous – well-lit wayside trees. D.

*L. campestris* subsp. *campestris* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 49, 56, 57, 58, 59; 52/ 10, 20, 30.
Saxicolous – basic but also on nutrient-enriched acid rock. D.
+ subsp. *dolomitica* 51/ 36. [with pale convex soralia] D.

*L. carpinea* 51/ 17, 18, 26, 28, 38*, 46, 55, 56, 58.
Corticolous – smooth-barked trees. D.

*L. chlarotera* 51/ 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 35, 36, 37, 38, 45, 46, 47, 49, 56; 52/ 30, 40.
Corticolous – early colonizer, frequently with *Lecidella elaeochroma*, of smooth bark. D.

*L. compallens* 51/ 16, 17, 26, 27, 28, 37, 46, 49.
Corticolous – on well-lit side. D.

*L. conferta* 51/ 15, 46. [NB. Under investigation as there is some confusion over this species and as used by auct. brit. It may be something different.]
Saxicolous – mortared walls. D.

*L. confusa* 51/ 17, 28, 36, 46, 56.
Corticolous – smooth-barked trees. D.

*L. conizaeoides* f. *conizaeoides* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Corticolous and saxicolous. Tolerant of sulphur dioxide, now in decline. D.

*L. crenulata* 51/ 06, 07, 15, 16, 27, 29, 36, 45, 46, 56, 57, 58; 52/ 10.
Saxicolous – basic substrates. D.

*L. dispersa* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Corticolous and saxicolous s.l. was the one lichen in central London in 1970.

*L. expallens* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 40.
Corticolous – shaded side of trees. D.

*L. flotoviana* 51/ 17, 27,
Saxicolous – part of the *L. dispersa* agg. D.

*L. hagenii* f. *hagenii* [*L. umbrina*] 51/+ 28
Corticolous – nutrient-enriched bark. D.

*L. intricata* 51/ 15, 17; 52/ 30.
Saxicolous – acid rock and occasionally on sawn wood. D.

*L. intumescens* 51/ 49
Corticolous – well-lit smooth-barked trees. D.

*L. jamesii* 51/ 26.
Corticolous – smooth-barked trees in sheltered damp wood. D.

*L. muralis* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – common on manmade substrates. D.

*L. orosthea* 51/ 09, 35, 36, 45, 46, 56.
Saxicolous – acid, especially under overhangs. D.

*L. persimilis* +LD
Corticolous – bark.

*L. polytropa* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 58; 52/ 10, 20, 30.
Saxicolous – acid stone, sometimes on sawn wood. D.

*L. pulicaris* 51/ 15, 17, 18, 38*.
Corticolous – acid bark, mainly twigs and small branches. D.

*L. rupicola* var. *rupicola* 51/ 45.
Saxicolous – well-lit acid rock. D.

*L. saligna* 51/ 15, 16, 17, 18, 19, 26, 27, 29*, 36, 56, 58.
Well-lit wood – especially benches. D.

*L. soralifera* 51/ 08, 15, 35, 45, 46, 49.
Saxicolous – acid rocks. D.

*L. stenotropa* 51/ 19, 28, 29, 48, 59.
Saxicolous – similar to *L. polytropa* so often overlooked. D.

*L. sublivescens* 51/ 49*, 56.
Corticolous – dry bark on ancient trees.

*L. sulphurea* 51/ 07, 09, 15, 25, 26, 35, 38*, 45, 46, 56, 57; 52/ 30.
Saxicolous – nutrient-enriched acid rocks and walls. Parasitizes *Lecanora* and *Tephromela* species.

*L. symmicta* 51/ 08, 09, 15, 16, 17, 18, 19, 26, 27, 28, 29*, 36, 37, 38, 39, 46, 47, 49, 56, 58.
Corticolous – acid-barked trees and decorticate wood. D.

*L. varia* 51/ 16*, 29*, 35, 37*, 38*, 46, 56.
Corticolous – and early colonizer of worked wood. D.

*Lecidea fuscoatra* 51/ 06, 07, 09, 15, 17, 18, 19, 25, 26, 27, 28, 35, 36, 37, 38*, 45, 46, 47, 48, 56, 57, 58; 52/ 10, 30, 40.
Saxicolous – nutrient-enriched rocks and brick walls. D.

*L. lichenicola* 51/ 15.
Colonizes unstable chalk pebbles around rabbit burrows. D.

*Lecidella carpathica* 51/ 17, 36, 48; 52/20.
*L. elaeochroma* f. *elaeochroma* 51/ 08, 15, 16, 17, 18, 19, 26, 27, 28, 35, 36, 37, 38, 39*, 45, 46, 47, 49*, 56, 59*; 52/ 20*,30.
Corticolous – an early colonizer of smooth bark. D.

*L. elaeochroma* f. *soralifera* 51/ 15, 46, 56.
Corticolous. D.

*L. scabra* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10,20,30, 40.
Saxicolous – hard acid rocks and walls, occasionally wood. D.

*L. stigmatea* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 40.
Saxicolous – common on calcareous substrates, thinner thallus on siliceous substrates.

*Lepraria diffusum* var. *diffusum* 51/ 15, 26, 27.
On mosses over stone.

*L. eburnea* 51/ 27. Type locality.
Bricks, mortar and mosses, slightly shaded.

*L. incana* s.l. 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Corticolous and saxicolous – shaded. D.

*L. lobificans* 51/ 08, 09, 15, 16, 17, 27, 28, 46.
Shaded damp habitats. D.

*L. vouauxii* 51/ 06, 07, 08, 09, 15, 16, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 39, 45, 46, 56, 57, 58, 59; 52/ 20, 30.
Shaded rocks and trees. D.

*Leproplaca chrysodeta* [*Caloplaca*] 51/ 09, 15, 35, 45, 46, 57.
Saxicolous – dry, sheltered crevices of hard calcareous rocks and walls, over mosses. D.

*Leproplaca xantholyta* [*Caloplaca*] 51/ 06.
Saxicolous – damp, sheltered, hard calcareous rock. D.

*Leptorhaphis atomaria* 51/ 16.
Corticolous – nutrient-enriched bark.

*Lichenomphalina ericetorum* 51/ 16.
Terricolous – damp. D.

*Lichenomphalina hudsoniana* 51/ 16*, 45.
Terricolous – damp, acid. D.

*Loxospora elatina* 51/45, 56.
Corticolous – shaded, rough-barked trees. D.

*Macentina stigonemoides* 51/49.
Corticolous – shaded, humid bark, *Sambucus* and *Ulmus*.

*Micarea botryoides* 51/ 19.
Shaded rocks and tree bases. D.

*M. denigrata* 51/ 06, 08, 15, 16*, 17, 18, 19, 25, 26, 27, 28, 29, 37, 45, 46, 48, 49, 56; 52/ 10, 30.
Decorticated trees and fences. D.

*M. erratica* 51/ 09, 15, 16, 25, 27, 35, 46, 47, 58.
Saxicolous – siliceous pebbles, rarely old fences. D.

*M. lignaria* var. *lignaria* 51/ 45*.
Many substrates especially metal-rich. D.

*M. lithinella* 51/ 27.
Shaded stone and ground.

*M. melaena* 51/ 49.
Corticolous – also fences. D.

*M. nitschkeana* 51/ 16, 25.
Corticolous – twigs, rarely stones.

*M. prasina* s.l. 51/ 08, 16, 19, 26, 28, 35, 46, 48, 49, 59; 52/ 30, 40.
Many substrates. Commonest *Micarea*. D.

*Mycoblastus fucatus* 51/ 26, 27, 46, 49, 56.
Corticolous – smooth bark and wood. D.

*Normandina pulchella* 51/ 56, 59.
Mosses on trees and stones. D.

*Ochrolechia androgyna* 51/ 15, 27, 35, 45, 56.
Acid-barked trees and siliceous rock, often over mosses. D.

*O. inversa* 51/ 56.
Corticolous on acid-barked trees in damp areas, rarely rock. D.

*O. parella* 51/ 08, 09, 15, 35, 37*, 45, 46, 47*; 52/ 10, 20, 30.
Saxicolous – smooth siliceous rock, rarely trees. D.

*O. subviridis* 51/ 15, 25, 35, 45, 46, 56.
Corticolous – nutrient-rich, rough-barked deciduous trees. D.

*O. turneri* s.l. 51/ 15, 35, 45, 46, 56; 52/ 20.
Corticolous – basic-barked trees. D.

*Opegrapha atra* 51/ 15, 16, 17, 38*, 39*, 46, 49, 56; 52/ 40.
Corticolous – smooth bark. D.

*O. corticola* 51/ 56
Corticolous – shaded deciduous trees.

*O. gyrocarpa* 51/ 17, 58.
Saxicolous – shaded recesses and underhangs of siliceous rock. D.

*O. herbarum* 51/ 17, 38*.
Corticolous – smooth bark, plant stems and rarely sandstone. D.

*O. ochrocheila* 52/ 40.
Corticolous – old shaded trees, rarely rock. D.

*O. prosodea* 51/ 35*, 56.
Corticolous – shaded vertical cracks of old oaks and yews. D.

*O. rufescens* 51/ 28*.
Corticolous – smooth, basic-barked trees. D.

*O. varia* 51/ 15, 29*, 39*, 45, 46.
Corticolous – rough-barked trees in shade. D.

*O. vermicillifera* 51/ 15, 16*, 35, 45, 56; 52/ 40.
Corticolous – dry recesses of shaded basic-barked trees. D.

*O. vulgata* 51/ 15, 35, 38*, 45, 46, 56; 52/ 40.
Corticolous – shaded, smooth-barked trees. D.

*Pertusaria albescens* var. *albescens* 51/ 15, 19, 29*, 35, 37*, 38*, 45, 46, 56.
Corticolous – light shade, rarer on mosses and acid rocks. D.

*P. albescens* var. *corallina* 51/ 15, 35, 45, 46, 56.
Corticolous. D.

*P. amara* f. *amara* 51/ 08, 09, 15, 25, 28*, 35, 38*, 45, 46, 49*, 56; 52/ 10, 30.
Corticolous – sometimes overgrowing mosses and rock. D.

*P. coccodes* 51/ 15, 25, 35, 36*, 39*, 45, 46, 49*, 56; 52/ 30*.
Corticolous – well-lit, old, rough-barked wayside trees; rarely siliceous rock. D.

*P. flavida* 51/ 38*, 49*.
Corticolous – well-lit, rough-barked trees. D.

*P. hemisphaerica* 51/ 15, 45, 56.
Corticolous – rough-barked mossy trees; rarely rock. D.

*P. hymenea* 51/ 15, 17, 28*, 45, 46, 49*, 56, 59*; 52/ 40.
Corticolous – shaded smooth bark; rarely rock. D.

*P. leioplaca* 51/ 17, 56; 52/ 40.
Corticolous – shaded, smooth-barked trees. D.

*P. multipuncta* 51/ 56.
Corticolous – smooth, acid-barked trees. D.

*P. pertusa* 51/ 15, 16, 35, 45, 46, 49*, 56; 52/ 40.
Corticolous – common; sometimes on siliceous rock. D.

*Petractis clausa* 51/ 15.
Saxicolous – hard, damp limestone, moderately shaded. D.

*Phaeographis dendritica* 51/ 15, 17, 39*, 49*, 56.
Corticolous – smooth acid-barked trees. D.

*P. smithii* 51/ 49*.
Corticolous. D.

*Phlyctis agelaea* 51/ 49*.
Corticolous – sheltered, damp, smooth-barked trees; rarely rock.

*P. argena* 51/ 07, 15, 16, 25, 35, 45, 46, 56; 52/ 10, 30, 40.
Corticolous – well-lit, nutrient-rich trees; rarely mosses and walls. D.

*Placynthiella dasaea* 51/ 16, 28.
Damp peat, rarely acid-barked trees. D.

*P. icmalea* 51/ 08, 15, 16, 17, 18, 25, 26, 27, 29, 35, 37, 38, 45, 46, 48, 49, 57, 58, 59; 52/ 10, 30.
Common on fence-posts, stumps and on soil in acid heathland. D.

*P. uliginosa* 51/ 08, 15, 16, 17, 25, 26, 27, 28*, 29*, 36, 46, 47, 48, 49, 56, 57; 52/ 20, 40.
Soil and dead bark. D.

*Placynthium nigrum* 51/ 07, 15, 16, 25, 26, 29, 35, 36, 45, 46, 56.
Saxicolous – hard, slow-drying, calcareous substrates. D.

*P. tantaleum* 51/ 15.
Saxicolous – calcareous rock.

*P. tremniacum* 51/ 15.
Saxicolous – hard calcareous rocks subject to flushing.

*Polyblastia albida* 51/ 26.
Saxicolous – hard limestone or mortar. D.

*P. dermatodes* 51/ 15, 37.
Saxicolous – hard limestone or mortar in sunny situations.

*Polysporina simplex* 51/ 15, 19, 25, 29, 35, 36, 46, 56.
Saxicolous – acid to basic rock and pebbles. D.

*Porina aenea* 51/ 17, 56.
Corticolous – lightly shaded, smooth-barked trees, especially hazel and ash. D.

*P. chlorotica* f. *chlorotica* 51/ 15, 27, 46.
Saxicolous – damp often vertical rocks and pebbles, rarely smooth-barked trees. D.

*Porpidia crustulata* 51/ 15, 17, 36, 38.
Saxicolous – acid rocks, small stones are rarely on old fences. D.

*P. macrocarpa* f. *macrocarpa* 51/ 09, 15, 17, 36, 45.
Saxicolous – acid rocks, rarely old wood. D.

*P. soredizodes* 51/ 15, 17, 27, 28, 36, 37, 46, 48.
Saxicolous – acid stone and brick. D.

*P. tuberculosa* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 45, 46, 47, 49, 56, 57, 58, 59; 52/ 10, 20, 30.
Saxicolous – exposed, acid rock and pebbles, rarely fences. D.

*Protoblastenia rupestris* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10.
Saxicolous – calcareous substrates. D.

*Protopannaria pezizoides* 51/ 17*.
Sheltered damp rocks, trees, mosses and on ground. D.

*Psilolechia leprosa* 51/ 09, 15, 25, 27, 29, 36, 46, 47, 56.
Saxicolous – especially where copper runoff. D.

*P. lucida* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – sheltered shaded acid rock and brick. D.

*Psora decipiens* 51/ 15, 25*.
Terricolous – base-rich substrates. D.

*Pyrenocollema monense* 51/ 15.
Saxicolous – chalk stones and shaded mortar.

*Pyrenula chlorospila* 51/ 17, 28*, 56; 52/ 40.
Corticolous – smooth-bark shaded woodland. D.

*P. macrospora* 51/ 15.
Corticolous – shaded smooth-barked trees. D.

*P. nitida* 51/ 56.
Corticolous – shaded smooth-barked trees. D.

*Pyrrhospora quernea* 51/ 15, 25, 35, 37, 45, 46, 56; 52/ 40.
Corticolous – nutrient-rich, rough-barked trees. D.

*Ramonia interjecta* 51/ 08, 27.
Corticolous – especially elder.

*Rhizocarpon distinctum* 51/ 09.
Saxicolous – siliceous substrates. D.

*R. geographicum* 51/ 15, 45.
Saxicolous – hard siliceous rock – usually imported into London area. D.

*R. petraeum* 51/ 15, 17.
Saxicolous – slightly basic rock. D.

*R. reductum* 51/ 06, 08, 09, 15, 16, 17, 19, 25, 28, 35, 36, 37, 38*, 45, 46, 47, 56, 57, 58, 59.
Saxicolous – smooth siliceous rock and pebbles. D.

*Rinodina gennarii* 51/ 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 30.
Saxicolous – well-lit, calcareous or nutrient-enriched rocks and other substrates. D.

*R. oleae* 51/ 08, 17, 18, 27, 28, 29, 45, 46, 49, 56; 52/ 10.
Corticolous – rough-barked trees. D.

*R. pityrea* 51/ 17.
Corticolous – dusty deciduous trees.

*R. roboris* var. *roboris* 51/ 15*, 39*, 56.
Corticolous – well-lit deciduous mainly rough-barked trees. D.

*R. sophodes* 51/ 18, 26, 28, 46.
Corticolous – smooth-barked trees, usually on branches. D.

*R. teichophila* 51/ 18, 59; 52/ 20.
Saxicolous – nutrient-enriched rocks; rarely on trees. D.

*Sarcogyne privigna* 51/ 27.
Saxicolous – damp, hard, acid rocks. D.

*S. regularis* 51/ 07, 09, 15, 16, 17, 19, 25, 26, 27, 29, 35, 36, 37, 45, 46, 47, 48, 56, 57, 58; 52/ 10.
Saxicolous – calcareous substrates. D.

*Sarcopyrenia gibba* var. *geisleri* 51/ 08, 09, 15, 16, 18, 19, 25, 26, 27, 28, 29, 35, 36, 45, 46, 47.
Saxicolous – well-lit calcareous rock. D.

*Schismatomma decolorans* 51/ 15, 45, 46, 56; 52/ 20, 40.
Corticolous – dry bark on old rough-barked trees; rarely rock. D.

*Scoliciosporum chlorococcum* 51/ 08, 09, 15, 16, 17, 18, 19, 26, 27, 28, 35, 36, 37, 38, 39, 46, 47, 48, 49, 56, 58.
Corticolous – damp, nutrient-enriched trees. D.

*S. pruinosum* 51/ 35.
Corticolous – dry bark in sheltered situations.

*S. umbrinum* 51/ 06, 07, 08, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 58; 52/ 10, 20, 30, 40.
Wide range of substrates, especially if metal-rich, mainly acidic. D.

*Solenopsora candicans* 51/ 45, 47.
Saxicolous – well-lit hard calcareous rock. D.

*Staurothele rugulosa* 51/ 15.
Saxicolous – dry limestone.

*Steinia geophana* 51/ +27
Ephemeral species of pebbles and miscellaneous substrates. D.

*Strangospora moriformis* 51/ 28*, 29*, 38.
Corticolous – bark and fences. D.

*S. pinicola* +LD
Corticolous. D.

*Tephromela atra* var. *atra* 51/ 09, 15, 16, 25, 26, 35, 36, 45, 46, 47, 56, 57; 52/ 30.
Saxicolous – well-lit siliceous rocks and walls; rarely trees. D.

*Thelidium decipiens* 51/ 15, 25, 26.
Saxicolous – hard calcareous rock. D.

*T. incavatum* 51/ 15, 16, 26, 29, 48, 49.
Saxicolous – hard limestone. D.

*T. minutulum* 51/ 28.
Saxicolous – shaded rock and pebbles. D.

*T. zwackhii* 51/ 15.
Saxicolous – moist, shaded rocks and pebbles.

*Thelocarpon epibolum* var. *epibolum* 51/ 27.
On decaying lichens, rotten wood and soil.

*T. intermediellum* 52/ 10.
On rotten wood, leather and moist rocks.

*T. laureri* 51/ 18, 27.
On wood, burnt ground, brick, leather and other miscellaneous substrates.

*Thelotrema lepadinum* 51/ 35, 38*, 45, 49*, 56; 52/ 30.
Corticolous – sheltered smooth bark of deciduous trees. D.

*Toninia aromatica* 51/ 07, 08, 09, 15, 18, 25, 26, 27, 28, 29, 35, 36, 37, 45, 46, 47*, 49, 56, 57; 52/ 30.
Saxicolous – soft calcareous rock and mortar. D.

*T. sedifolia* 51/ 15.
Saxicolous – crevices in limestone and calcareous soils. D.

*Trapelia coarctata* 51/ 06, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58; 52/ 10, 30.
Saxicolous – well-lit siliceous rock, pebbles and very common on walls. D.

*T. glebulosa* 51/ 06, 08, 09, 15, 16, 17, 18, 19, 26, 27, 29, 36, 45, 46, 48, 49, 58; 52/ 10, 20, 30.
Saxicolous. D.

*T. obtegens* 51/15, 17, 26*, 27, 45, 58; 52/ 10, 40.
Saxicolous – acid rocks, bricks, nutrient enriched sites.

*T. placodioides* 51/ 06, 08, 09, 15, 16, 17, 18, 19, 25, 29, 36, 46, 48, 57, 58, 59; 52/ 10.
Saxicolous – acid rock, especially metal-rich. D.

*Trapeliopsis flexuosa* 51/ 08, 15, 16, 17, 18, 19, 26, 27, 28, 35, 36, 45, 46, 47, 48, 56, 58.
Corticolous – stumps, fences and benches. D.

*T. gelatinosa* 51/ 49.
Shaded peaty or clay soil.

*T. granulosa* 51/ 06, 08, 09, 15, 16, 17, 18, 19, 25, 27, 28, 29, 35, 36, 37*, 38, 45, 46, 47, 49, 56, 57, 59; 52/ 10, 20, 40.
Acid soils and decaying plant material. A primary, often short-lived, colonizer of heathland soils. D.

*T. pseudogelatinosa* 51/ 45, 56.
Damp, shaded acid soils. D.

*Verrucaria baldensis* 51/ 07, 08, 09, 15, 16, 18, 19, 25, 26, 27, 28, 29, 35, 36, 45, 46, 47, 48, 49, 56, 57, 59; 52/ 20, 30.
Saxicolous – hard limestone. D.

*V. bryoctona* 51/ 48.
Associated with acrocarpous mosses on basic soils.

*V. dolosa* 51/ 15, 17, 45, 46, 48.
Saxicolous – limestone and flint.

*V. elaeina* 51/ 38.
Saxicolous – shaded damp limestone or siliceous rock.

*V. fuscella* 51/ 06, 07, 08, 09, 15, 16, 25, 26, 28, 29, 35, 36, 37, 45, 46, 47, 48, 49, 56, 57, 58.
Saxicolous – basic rock and mortar. (*V. glaucina* auct. brit.) D.

*V. hochstetteri* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 20.
Saxicolous – limestone and mortar. D.

*V. macrostoma* f. *macrostoma* 51/ 07, 15, 16, 17, 26, 28, 29, 37, 46; 52/ 20.
Saxicolous – calcareous rocks, rarely acid rock. D.

*V. macrostoma* f. *furfuracea* 51/ 09, 15, 16, 17, 25, 26, 27, 35, 36, 37, 45, 46, 48, 56, 57, 58, 59; 52/ 10.

*V. muralis* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10.
Saxicolous – soft calcareous rocks and mortar, rare on hard limestone. D.

*V. murina* 51/ 15.
Saxicolous – hard limestone.

*V. nigrescens* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 39, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – calcareous walls and rocks, rarely siliceous stone. D.

*V. viridula* 51/ 06, 07, 08, 09, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 56, 57, 58, 59; 52/ 10, 20, 30, 40.
Saxicolous – basic rocks and brick. D.

*Vezdaea leprosa* 51/ 37. Type locality.
Terricolous on old vegetation, disturbed ground and especially where metal rich. D.

*Xylographa vitiligo* 51/+17.
Corticolous – decorticated wood and benches. D.

This concludes a broad-brush approach to the lichens of London. I have attempted to make available to everyone information on what has been recorded and roughly where. I am grateful to all the recorders who send records into the British Lichen Society Recording Scheme. Species concepts change and I cannot guarantee that all these are correct records because not all will have been vouchered.

## Part III — Recorder's note

***Cladonia* update.** Unfortunately I seem to have given the wrong impression — things are not improving for *Cladonia* in London, only the recording. Heathland sites seem to be particularly impoverished. I have to note some changes. The record I had for *Cladonia arbuscula* in Richmond Park arose from the misreading of a recording card by a third person and is not correct; therefore this species might be extinct in London. *Cladonia foliacea* should be in extinct rather than excluded as Laundon has determined a specimen from Esher in the Borrer herbarium as *C. foliacea*. *Cladonia rei* has been synonymized with *C. subulata* (Spier and Aptroot 2007) and it is claimed the chemotypes can only be distinguished in the laboratory. The good news is that John Skinner has a specimen of *C. caespiticia* in the Southend Museum collected from The

Chase, Dagenham, in 1999; this was confirmed by Chris Hitch who also had a specimen, collected at the same time, in his personal herbarium. Hopefully it is not extinct in London. They, together with Peter Earland-Bennett, also found *C. cervicornis, C. fimbriata, C. furcata, C. humilis, C. ramulosa, C. subulata and C. rangiformis* at the same site. Some of the Esher records came from the Elmbridge Natural History Society Bulletins (Aguirre-Hudson 2004*a,b,* 2005). It should be noted that copies of local natural history society publications are kept in the General Library of the Natural History Museum.

Professor David Hawksworth (2005) published further fungal records, including lichens, in the Ruislip NNR. The total fungal list is now 624, 63 being added in this paper, of which 17 are lichens bringing the lichen total to 58 species. Lichens listed in this paper are: *Anisomeridium polypori, Bacidia caligans, B. laurocerasi, Caloplaca obscurella, Candelariella reflexa, Cladonia ochrochlora, Dimerella pineti, Lecanora jamesii, Phlyctis argena, Ramonia interjecta* and *Usnea cornuta,* all on *Salix; Bacidia chloroticula* and *Thelocarpon lauereri* on fence rails; *Cyrtidula hippocastani* on *Cratageus* twigs; *C. major* on *Betula* and *C. quercus* on *Quercus*; *Lecanora chlarotera* and *Lecidella elaeochroma* on *Fraxinus*; *Micarea denigrata* and *M. nitschkeana* on wooden tables. He claims this makes it the most important site for lichens in the Greater London area, however Kew probably holds this title and more work needs to be done to ascertain the best lichen sites. Parks appear to be the best sites as they allow the light to reach the trees.

Professor Mark Seaward has drawn my attention to London collections by de Crespigny (1877) in the Manchester Museum (**MANCH**).

Table 1 shows the total number of species recorded per square, taken from the Bradford database. It should be noted that this indicates recording intensity rather than true distribution.

TABLE 1. Total number of species per 10 km sq. St Paul's Cathedral is marked†.

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 0 | | St Albans **82** | Potters Bar **80** | Cheshunt **79** | Epping **70** | |
| 9 | Rickmansworth **95** | Watford **91** | Barnet **105** | Enfield **62** | Roding **128** | Brentwood **84** |
| 8 | Uxbridge **116** | Harrow **82** | Hampstead **138** | Walthamstow † **110** | Barking **81** | Romford **92** |
| 7 | Staines **59** | Richmond **164** | Barnes **126** | Greenwich **107** | Thamesmead **104** | Dartford **95** |
| 6 | Walton **85** | Kingston **138** | Wandle **117** | Croydon **128** | Bromley **205** | Darent **177** |
| 5 | | Leatherhead **257** | Redhill **138** | Surrey **141** | Limpsfield **181** | |

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# Botanical records for 2006

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## Abstract

This is a compilation of records of vascular plants from the area within 32 km of St Paul's Cathedral in London ('the London Area'). It includes the first British records of casual aliens *Euodia hupehensis* Dode, *Mimosa sensitiva* L., *Pelargonium peltatum* Aiton, *Pimpinella peregrina* L., *Prunus* × *simmleri* Palézieux, *Scilla mischtschenkoana* Grossheim, *Viburnum carlesii* Hemsley and *Vitis riparia* Michaux, the first records from the London Area of casual or established aliens *Capsella rubella*, *Cortaderia richardii*, *Cotoneaster perpusillus*, *Geranium maderense* and *Parthenocissus inserta* × *P. quinquefolia*, the first records for London of native *Callitriche truncata* and more or less established alien *Polycarpon tetraphyllum*, the first record for Middlesex of *Tragopogon* × *mirabilis* and the second, after an interval of over a century, of *Beta vulgaris* subsp. *maritima*. A new map of the distribution of *Senecio inaequidens* in the London Area is presented. Also recorded is the discovery of heather *Calluna vulgaris* in Kensington Gardens.

## Introduction

In this series of annual papers in *The London Naturalist*, begun by Lousley (1945), this is the thirty-second and last by the present author. The papers present recent records from the London Area, described as a circle of 32-km radius centred on St Paul's Cathedral, in a sequence developed by Lousley and since further refined, which puts the localities from which plants are recorded first in number order of the 'vice-counties' devised by Watson (1873) and then in London boroughs, counties and unitary authorities from those nearest the centre outwards. The names of the boroughs are given in bold case for ease of navigation through the paper. Records worthy of inclusion are not received every year from all the vice-counties, boroughs, etc. in the area so there are gaps in the sequence.

There has been a notable change of emphasis during the sixty-three years covered by these papers. In the early years, except for those who concentrated their attention on the flora of sites cleared of buildings by wartime bombing (Jones 1958), it was easier than now to make exciting discoveries of native plants in appropriate habitats, whereas now it is easier than before to find alien plants of diverse origin. The recorder's task in this connection is to pick out the novelties. These can be either new taxa for the area as a whole or for significant parts of it, or in the case of naturalized species significant extensions of range. In the case of rapidly increasing species, frequent updates are needed as a basis for evaluation of significance of records. Kent (1955, 1956, 1957, 1960, 1963, 1964*a,b,c*) produced a succession of papers charting the spread nationally of Oxford ragwort *Senecio squalidus*; this was necessary because the numerous observations he found in local publications collected in the libraries at Kew and the Natural History Museum had mostly not been made with an eye to the overall picture of the change in its distribution. Kent did not have the modern advantage of mapping software; he did not even use the Ordnance Survey's national grid for any purpose other than contributing to mapping schemes. *S. squalidus* is now universally established in almost all the more urbanized parts of England and Wales and its story is being repeated in many respects by the spread of narrow-leaved ragwort *S. inaequidens*, but whereas the windborne seed of the former was largely dispersed by the slipstream of trains, the latter has a slight tendency to spread along main roads, where it is favoured by the change from mechanical to chemical weed control (Jovet et al. 1985: 717). The vice-county census catalogue (Stace et al. 2003: 299) shows *S. inaequidens* as a post-1970 neophyte in ten British (mostly south-east English) vice-counties and a casual in eleven more, but the neophyte / casual distinction is not always easy to make.

Five years ago (Burton 2002: 218) I published a map of its distribution in the London Area in which three outlying records known to refer to single plants only (which in two cases are known to have not persisted) were shown by crosses, whereas the remainder, all in the east of our area except for one in Tower Hamlets, were known or assumed to represent established populations shown by circles. In my new map (Figure 1) all the records from five years ago are shown by circles, and the additional records are shown by crosses. The diagonal crosses are records from what has been until recently my own database, the sources of which are LNHS members and Mary Smith, who supplied me with data from the London Borough of Havering (where the plant was first seen in quantity in the map area) collected for the Essex Field Club's current flora survey. The vertical crosses are other records available in May 2007 from the National Biodiversity Network (www.nbn.org.uk), the source for which is 'GIGL professional survey records' supplied by Greenspace Information for Greater London, the records centre created by the London Biodiversity Partnership of which the LNHS is one of the partners. At first sight the map appears to indicate that *S. inaequidens* has strengthened its hold in its core area on both sides of the tidal Thames below London, and has also drifted westwards up-river and across Middlesex. Mrs Smith's observations in square TQ58 prove that the first of these indications is accurate but the second takes no account of the incompleteness of the data. There is certainly more of the plant further east in Essex up to and beyond the arbitrary boundary of our map. I know that the plant has been seen recently within its north boundary in Herts. but I do not have sufficiently accurate data to include the record on the map. The GIGL data are biased towards those boroughs which had recently been surveyed for the Greater London Authority, such as Ealing mentioned last year (Burton 2006: 248). The records of our own members were contributed by a small number of people and have obvious observer bias, though the scarcity of records south of central London appears to be genuine. What can be concluded is that there is certainly more *Senecio inaequidens* in and east of London than anywhere else in Britain, and that its range is increasing rapidly.

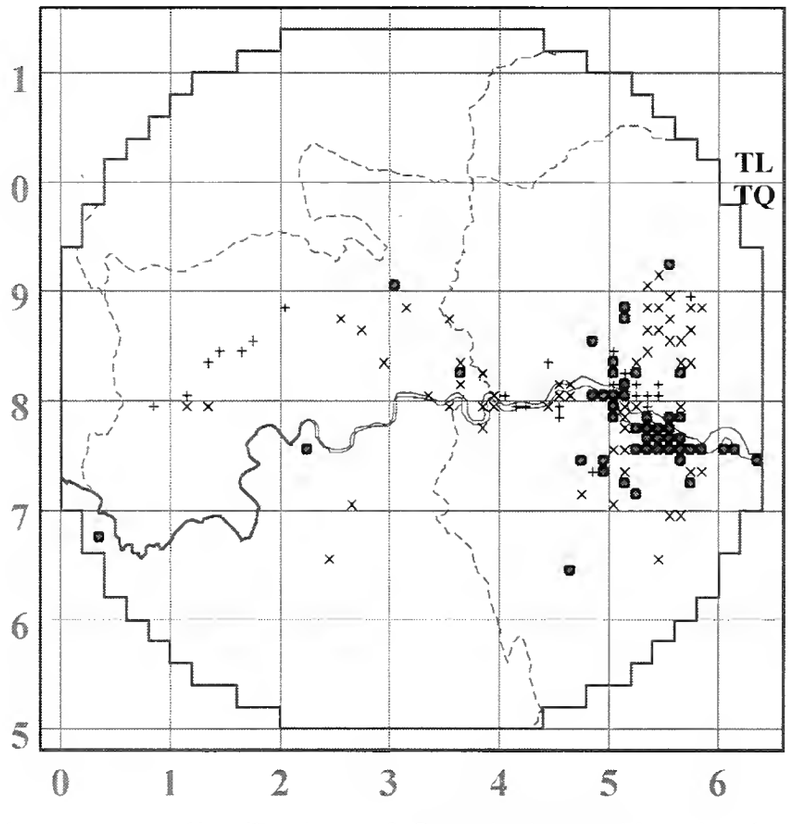


FIGURE 1. 1×1-km square distribution of *Senecio inaequidens* in the London Area to 2006. See text for explanation of symbols.

Though records of aliens in the following paragraphs preponderate, there have also been some outstanding records of native plants in 2006. I should mention in particular the first certain record of long-stalked yellow-sedge *Carex viridula* subsp. *brachyrrhyncha* in our area, from Hertfordshire, the first London record of short-leaved water-starwort *Callitriche truncata*, in Havering, the first record of suffocated clover *Trifolium suffocatum* in our area since 1945 (discounting probably erroneous records from Mitcham Common), in Kent, the rediscovery of *Beta vulgaris* subsp. *maritima* in what may be the same locality as its only previous Middlesex site and, perhaps most remarkable of all, the discovery of heather *Calluna vulgaris* in Kensington Gardens.

## V.C. 16, West Kent

Our meeting of 28 June visited the Trust for Urban Ecology's North **Greenwich** Ecology Park, a surprisingly wild-looking site near the Thames. I have seen a list of plants for this site which unfortunately does not indicate which ones were introduced when it was created, as presumably most of them were. Nor does it include the single bee orchid *Ophrys apifera* found then by Ian Kitching under a cut-back willow at the edge of the board walk, surely spontaneous, or two aliens determined by Mark Spencer which it must be assumed were planted: sword-leaved rush *Juncus ensifolius* with a native range from Japan to Utah and gratiole *Gratiola officinalis* from Portugal to Siberia. Both have very few previous British records, none from our area. Also in North Greenwich Nick Bertrand found Danish scurvygrass *Cochlearia danica* by Bugsby's Way; this seaside plant is now a common sight in spring by salted arterial roads, but still a rare one by urban roads. Moving out to **Bexley**, Margot Godfrey found convincing material of three different water-crowfoots *Ranunculus aquatilis, R. penicillatus* and *R. trichophyllus* in the River Cray, in the course of a survey of Foots Cray Meadows being conducted by the Sidcup and District Natural History Society. Whilst her plant list suggests that the native plants of this once-rich grassland site continue to decline, it also includes newly arrived but already established aliens Balkan anemone *Anemone blanda* and Turkish squill *Scilla bithynica*. In the same borough, Geoffrey Kitchener reports several patches of *Cynodon dactylon* on a sandy bank by an athletics track at Erith. Three plants taken by John Palmer from the Crayford Marshes landfill area in successive years and grown on in his garden are noteworthy, loquat *Eriobotrya japonica* (2001) because it produced edible fruit in 2006, and *Viburnum carlesii* (2002), which grew to a fragrant flowering shrub eight feet tall, and *Mimosa sensitiva* (2003) because they do not appear to have been recorded as casual aliens in Britain before. I may have offended Elizabeth Norman, one of our most experienced botanical members, by casting doubt on her identification of greater yellow-rattle *Rhinanthus angustifolius* from a meadow at High Elms in **Bromley** which has been used experimentally for studying the effects of different mowing regimes. In justification, I referred to the compilation of records of rare plants in London which I had recently received, among them the *Rhinanthus* mentioned, and included the results of very recent surveys of the area of the proposed Unesco world heritage site centred on Charles Darwin's Down House, only a mile from the meadow. *R. angustifolius* was not among them, though I have seen the much commoner *R. minor* nearby. However Mrs Norman's observation is confirmed by Joyce Pitt, who believes it may have been introduced by mowing machinery in the same way as to other sites in Bromley I mentioned last year (Burton 2006: 244).

Mr Palmer's records from **Kent** beyond the London boundary in 2006 include two more plants new to Britain and several with no previously published record from the London Area. One of the national novelties was *Scilla mischtschenkoana*, which gardeners understandably prefer to call *S. tubergeniana*, flowering in woodland near Darenth Road, Dartford. The other

is the cherry-plum / blackthorn hybrid *Prunus* × *simmleri*, which he found well established on the wooded embankment of Princes Road in the same area. Plum *Prunus domestica* is considered to have been derived in antiquity from the same cross, and *P.* × *simmleri* would be extremely difficult to identify, but for the fact that the *P. cerasifera* parent in this case as in Palézieux's type specimen, was the purplish-leaved var. *pissardii*. There is further discussion of this plant in Kitchener and Palmer (2007), where all the records mentioned in this paragraph and the next one have got into print more quickly than they do here. In the same place was a small colony of *Cotoneaster perpusillus*, which is very like the familiar wall cotoneaster *C. horizontalis* but has much smaller leaves. The hybrid *Parthenocissus inserta* × *P. quinquefolia* grew extensively, as its parent species commonly do, on old brick walls by an alleyway at Sutton at Hone. There were small trees of sugar maple *Acer saccharum* in roadside copses in two places in Hextable, *Anemone pavonina* coming up from large dumps of sludge in grassland at New Barn, a hybrid evening-primrose *Oenothera biennis* × *O. cambrica* by a track in Darenth, abundant *Vitis riparia* in a hedge again at Darenth, and a vast spread of the winter-flowering *Clematis cirrhosa* var. *balearica* on the bank of the 'Green River' (part of the Darent) at Sutton at Hone. The latter might have been planted here but is certainly well established now, having been there for over twenty-five years. Lesser milk-vetch *Astragalus odoratus* has one previous record from the London Area, fifty years ago in v.c. 18. Mr Palmer's plant appeared on a street in Sutton at Hone, of unknown source although there was a dump of garden rubbish not far away. The hybrid of small balsam *Impatiens parviflora* and touch-me-not balsam *I. noli-tangere* would be completely new, but I cannot agree that this plant, seen as a garden weed, again at Sutton, should have been confidently identified as such; it was like *I. parviflora* except that the flowers had numerous red-brown marks and a more curved spur. *I. parviflora* is a variable plant in its native range, whereas a slight pinkish tinge to the corollas is the only variation seen in naturalized European populations; if the features described above match one of the native Asiatic forms, that would be almost as exciting as a new hybrid.

Mrs Pitt found suffocated clover *Trifolium suffocatum* with other uncommon clovers of gravelly soils on Green Street Green, south-east of Dartford. The last record of this rather inconspicuous national rarity in this area, and probably in the vice-county as a whole, was made by Francis Rose, Duggie Kent and two others at Lane End in 1945. It remains to be seen whether the flora of this rich site will have been damaged by pipe-laying work later in 2006. She also found a large colony of orpine *Sedum telephium* on the edge of Church Wood, West Kingsdown. Mr Kitchener found a pink-headed knotweed *Persicaria capitata* as a pavement weed at Westerham, and added to the localities for summer cypress *Bassia scoparia* mentioned last year (Burton 2006:245) the central reservation of the M20 near Farningham and of the M25 at its junction with the M20. At the same junction, below the slip-road from the clockwise M25 to the roundabout, I saw a single huge plant of the giant fennel *Ferula communis*, a new species for Kent. In the vice-county census catalogue (Stace et al. 2003: 197) this is shown as a neophyte in Bucks and West Suffolk and as a casual in Oxon and Northants. Buckinghamshire botanists know nothing about it in their county (R. Maycock, pers. comm.) but the recent flora of Berkshire (Crawley 2005: 744) has a single record of it as a casual garden-escape. Only the Suffolk population, by the A11, is well known, and it is interesting to speculate whether it could have any connection with the plant in Kent and the one in Essex mentioned two years ago (Burton 2005: 221). The last two are in remarkably similar situations, with the M25 traffic whizzing past above, but it is hard to imagine *Ferula* fruit, which measure about 15 × 8 mm, being drawn along in the slipstream of lorries.

## V.C. 17, Surrey

I put first in this section my own record of four-leaved allseed *Polycarpon tetraphyllum*, of which I found about a hundred plants between paving blocks on the north side of Greenland Dock in the extreme east of **Southwark**. As a native plant it occurs commonly in Mediterranean countries, thinning out up the Atlantic coast as far as Dorset. The only previous record from London had an obvious origin in a garden, although the species has no obvious attraction; my plants are better established than that, but their claim to be native is no better. Nearby I found four plants of Italian alder *Alnus cordata*, one of them fruiting, rooted in wooden posts supporting shattering of the Thames wall. Other worthwhile records from this borough are thanks to Nick Bertrand, who found rue-leaved saxifrage *Saxifraga tridactylites* and American winter-cress *Barbarea verna* in the 'Silwood triangle', Rotherhithe, and a number of plants even closer to the centre of London, which he showed us at our meeting on 23 September. Of these the most novel was the ivy geranium *Pelargonium peltatum* rooted on a pavement, which had evidently fallen out of a window box above. I cannot find another record of this out of cultivation in Britain. Ian Kitching took away from this meeting an amaranth specimen which he subsequently identified as *Amaranthus bouchonii*, also recorded by him from four other sites in the vice-county. It is likely that many of the street weeds reported as '*A. hybridus* agg.' belong to *A. bouchonii*, which is only certainly separable if its capsules can be observed to fall off the plant instead of splitting open to release their single seed. The meeting started in **Lambeth**, whence Roy Vickery reported mistletoe *Viscum album* high up in a lime at the north-east corner of Streatham Common, a rare instance of a completely new record since our survey of mistletoe in 2000/01. The only mistletoe previously known in the borough was an obviously planted one on *Acer saccharinum* in Lambeth Walk. In **Wandsworth**, John Edgington found an apparently bird-sown *Euodia hupehensis* on the Thames wall of Battersea Park, a first British record. This attractive small tree of the rue family Rutaceae went on to set some seed. Also at Battersea was *Alnus cordata* in a similar situation to my Southwark plants mentioned above.

In Merton, Dr Kitching found Dieffenbach's hebe *Hebe dieffenbachii* self-sowing behind the garden centre in Morden Hall Park, the first London record. Ron Parker's records include nettle-leaved goosefoot *Chenopodium murale* in Wimbledon Cemetery, further evidence of its increase in London. The joint meeting of our Society and the Botanical Society of the British Isles on 14 May in **Richmond upon Thames** found a plant of bastard agrimony *Aremonia agrimonioides* on the Thames path outside Kew Gardens; the only previous London record was from St Ann's churchyard close by on Kew Green, by Mary Clare Sheahan in 2001. In 2006 in the churchyard, George Hounsome found three plants of Jersey cudweed *Gnaphalium luteoalbum*; curiously, this is also the site where American cudweed *G. purpureum* was established for a few years. Moving south to **Kingston upon Thames**, John Dobson found at least twenty plants of yellow vetchling *Lathyrus aphaca* on the Tolworth Court Farm Fields Local Nature Reserve. At the extreme edge of this borough near Old Malden, if not outside it, Dr Kitching found *Clerodendron bungei* escaping from cultivation by the spread of its suckers; our only previous record of this verbenaceous shrub, by Mr Palmer in 1983, was in similar circumstances in Blackheath. Dr Kitching also found a single *Solanum rostratum* on a road-making site in North Cheam in **Sutton**. Another casual plant in this borough and another new plant for London was giant herb-Robert *Geranium maderense*, found by Mr Parker at the base of a wall near his home.

Dr Kitching's records include some important finds from West Ewell, outside London in **Surrey**. The subspecies *bonannii* of strawberry clover *Trifolium fragiferum* has been recorded previously in our area only by him and in Herts.

by Ann Boucher, so it may well have been overlooked by others (not that the species is at all common!); the subspecies can only be distinguished at the fruiting 'strawberry' stage, when it has a smaller inflated calyx with the persistent corolla obviously exserted. On a new golf course Dr Kitching found very large numbers of both *Conyza sumatrensis* and *C. bilbaoana* around the holes, an excellent though perhaps transient opportunity to compare these two alien relatives of the once familiar Canadian fleabane. Near the southern limit of our area, John Dicker found corn parsley *Petroselinum segetum*, a rarity in Surrey, by the A24 at Mickleham, and narrow-fruited corn-salad *Valerianella dentata* on an embankment near Bockett's Farm.

## V.C. 18, South Essex

Starting just across the Lea in **Newham**, M.G. Gibbs's record of wall bedstraw *Galium parisiense* on a bank close to the CCTV mast at Pudding Mill Lane DLR station was passed on to me from the BSBI website; it is a new plant for the vice-county, about 5,500 metres from the plants in v.c. 21. David Bevan communicated to me Dave Miller's discovery of common cudweed *Filago vulgaris* in the 'pennyroyal hollow' on Coppermill Fields in **Waltham Forest**, certainly a recent arrival in this often visited site. Both of these scarce plants have shown modest increases in recent years. Mary Smith's plants from **Havering** included pink shepherd's purse *Capsella rubella* new to Essex and London in a couple of places, field gromwell *Lithospermum arvense* on a bank surrounding a car park and common gromwell *L. officinale* now in its third year on a roadside bank. It was also she who passed on to me the remaining records in this paragraph. Ken Adams found short-leaved water-starwort *Callitriche truncata* in a temporary pond in an area of gravel extraction near South Hornchurch; this is a scarce plant nationally and a new plant for London, though there are previous records from the Society's area in Kent until about 1974 and Essex in 1988 (Adams 1988). The same site produced a single plant of nodding bur-marigold *Bidens cernua*, a rarity in Essex, and thousands of *Senecio inaequidens*. There were a few good-sized plants of bean broomrape *Orobanche crenata* in a pea crop near Emerson Park, first found by Bob Creber; this locality is not quite two miles from the area near Cranham where it appeared fairly regularly from 1975 until recently, reaching a climax in 1997 when there were over 400,000 plants in a pea crop which was ploughed in an attempt to prevent the pest from seeding itself (Adams 2003).

## V.C. 20, Herts.

Phil Attewell confirmed the continued presence, always in small quantity, of heath-grass *Danthonia decumbens* on Rowley Green Common, Croxley Moor and Bricket Wood Common. The first of these localities is in the London Borough of **Barnet**, all others in this paragraph have always been in **Hertfordshire**. The flora of Bricket Wood Common is the subject of a paper in *Hertfordshire Naturalist* in preparation by Prof. Edgington, which reports the refinding of marsh willowherb *Epilobium palustre*, reliable records of which from any part of our area are now very rare. Narrow-leaved bird's-foot trefoil *Lotus tenuis* is another rarity away from the tidal Thames, but a good colony of it was found in a rough pasture near Croxley Hall Wood by a meeting of the Herts Flora Group. On the same occasion *Cortaderia richardii* was found near Croxley Moor, a new plant for the vice-county and the LNHS area, though we have several records of the larger and more commonly cultivated pampas grass *C. selloana*. Another record, like the last three previously published in the *Herts Flora Group Newsletter* No. 17, is that of long-stalked yellow-sedge *Carex viridula* subsp. *brachyrrhyncha*, in good quantity and well attested, on the ride through Cowheath Wood. We used to call this plant *'C. lepidocarpa'* and regard it as requiring much more base-rich conditions than the generally commoner

*'C. demissa'* (now *C. viridula* subsp. *oedocarpa*), suggesting that there is a small calcareous area in the clay of Cowheath Wood, despite the proximity of the strongly calcifuge hard fern *Blechnum spicant*. The only previous record of subsp. *brachyrrhyncha* in our area, from Holwood Park in 1948, was unsupported by a specimen and doubted by the editors of the 'Handlist' (Kent and Lousley 1956: 296); perhaps it was right after all.

## V.C. 21, Middlesex

The surprising discovery of heather in Kensington Gardens has already been mentioned. The colony was first found in August 2006 by Robert Dowling of the Gardens staff and has since been studied by Nigel Reeve the Royal Parks ecologist, Caroline Ware of the Natural History Museum and Elinor Wiltshire. There are nine principal clumps scattered in an area of about 300 $m^2$, some surrounded by clusters of small plants, and several smaller ones. In Mrs Wiltshire's photographs (Figures 2–4) their appearance is completely natural. It is extraordinary that the plant should be so well established yet there has never been any previous record of heather in the gardens. Even so it is my view that the colony is most probably a survival from a period when the site was not surrounded by the growth of London. The alternative explanations of natural seed dispersal by wind or bird and a deliberate introduction appear to me even more unlikely. This view is speculative, as I do not have sufficient knowledge of the plant's growth rates and dispersal biology and the history of the site before enclosure and of its management since, nor the time to acquire such knowledge. Regent's Park is also in the City of **Westminster** and also still presents surprises. Prof. Edgington found common spotted-orchid *Dactylorhiza fuchsii* and pyramidal orchid *Anacamptis pyramidalis*, the latter also seen in 2004. Aaron Woods found quite large numbers of purple toothwort *Lathraea clandestina* near the pond in Queen Mary's Gardens, apparently a naturalized parasite on the roots of weeping willow but coming up even through pavements. He also followed up Prof. Edgington's discovery of the rarer subspecies *intermedia* of greater plantain *Plantago major* by the steps up to Park Road from the Regent's Canal, establishing that the plant is present along about a mile of canal path, though very scattered, in spite of the availability of much apparently suitable habitat.

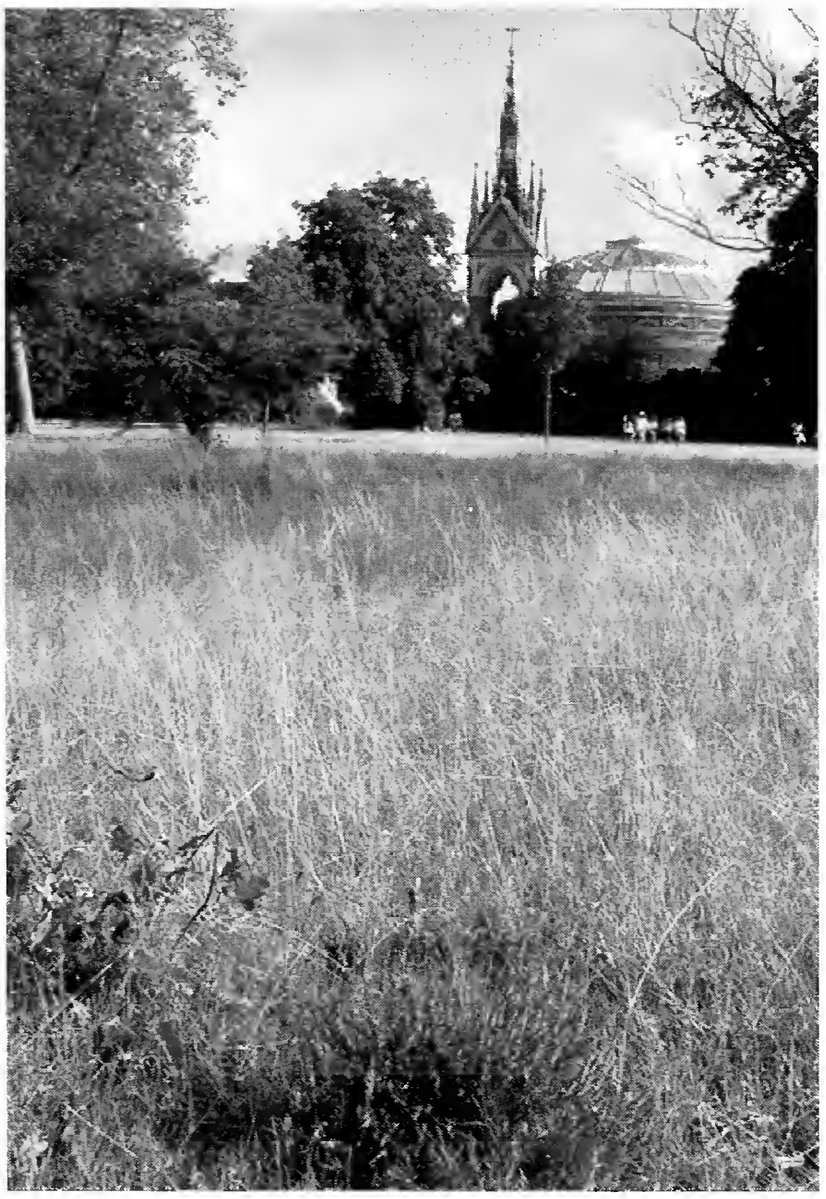

FIGURE 2. *Calluna vulgaris* in Kensington Gardens, August 2006. *Photo: Elinor Wiltshire*

FIGURES 3 and 4.
*Calluna vulgaris* in Kensington Gardens, August 2006.
*Photos: Elinor Wiltshire*

Next come records from three boroughs adjacent to the City of London. Prof. Edgington found a single rosette of sea beet *Beta vulgaris* subsp. *maritima* on the shingly foreshore at Amsterdam Road on the Isle of Dogs in **Tower Hamlets**. He had previously reported seeing what could be the same plant in 1999–2000, when I regret to say I had overlooked its significance. The only previous known Middlesex occurrence of sea beet is Benbow's 1887 specimen in the Natural History Museum, discovered by Kent (1975: 225); this also came from the Isle of Dogs. In the same borough, Stella Taylor, a visitor from Norfolk, collected annual knawel *Scleranthus annuus*, rapidly declining as a native plant in Britain, as a garden weed on Tower Hill. Our meeting on 12 July found an aberrant plant of *Senecio squalidus* in Prescot Street, differing by having ray flowers only about half the normal length. A white-flowered plant found by Prof. Edgington almost inaccessible behind wire on waste ground near King's Cross in **Islington** turned out to be another aberrant *S. squalidus*, differing from the usual plant also in lacking black tips to the phyllaries. A cutting taken from this plant produced ray florets of a pale creamy yellow when opening. Yet another substantial London population of early meadow-grass *Poa infirma* was found by Dr Spencer in Hall Street outside Peregrine House. He also discovered what may be the largest population in Britain of London rocket *Sisymbrium irio* spread across several streets north of Clerkenwell Green. Mr Woods's records from **Camden** include a group of plants of *Pimpinella peregrina* in St Pancras Gardens, first seen in 2005 but not immediately identified by Mervyn Southam. This umbellifer, which was probably introduced accidentally as a contaminant of a 'wildflower mix', has not previously been recorded from Britain; it is an annual with hairy fruit. He also found sweet-William catchfly *Silene armeria* in full flower on Boxing Day in Mornington Terrace; this is the second record from London, the first having been made by Mr Parker in Mile End Park in 2001. In the same borough, Prof. Edgington found a plant of *Sutera cordata* (the form known in cultivation as *Bacopa* 'Snowflake') in Russell Square, also the second record from London; this gives me the opportunity to confess that I wrongly claimed that the first (Burton 2003: 258) was another new plant for Britain.

A certain London first is the *Nicotiana langsdorffii* J.A. Weinm. seen by a number of members together on 14 July on a pavement in Queensberry Place, **Kensington & Chelsea**. It was George Hounsome whose photograph I saw and Dr Spencer who had the identification confirmed by Dr Sandra Knapp, the global Solanaceae expert based at the Natural History Museum. In **Haringey**, Mr Woods found a plant of *Arachis hypogaea*, presumably from a discarded peanut, and the first Middlesex record of the hybrid goatsbeard *Tragopogon* × *mirabilis* was made at our 10 September meeting on the southern approach to Tottenham Marsh; curiously its rarer parent salsify *T. porrifolius* has never been seen here. Mr Attewell's sites for *Danthonia decumbens* include Hadley Common in **Barnet** and Stanmore Country Park near the south side of Pear Wood in **Harrow**, the latter a new locality for it. Prof. Edgington's *Senecio inaequidens* in a ditch in the Hampstead Heath Extension is an extension of range to the former borough, and Howard Matthews's rustyback *Ceterach officinarum* on a doorstep in South Harrow is new to the latter. In the course of a survey of bluebells in Ruislip Woods in **Hillingdon**, David Bevan found a large population of fringe-cups *Tellima grandiflora* at the edge of Copse Wood and leopard's-bane *Doronicum pardalianches* well naturalized, Italian lords-and-ladies *Arum italicum* less so, near the perimeter path of Park Wood.

There are also records from parts of the former Middlesex now in other counties. Fir and Pond Woods east of Potters Bar are now a nature reserve of the Herts & Middlesex Wildlife Trust in **Hertfordshire**, including a rough meadow where the warden David Gompertz collected a specimen of tor-grass *Brachypodium pinnatum*. This species is now split into two; the commoner in Britain is *B. rupestre* which is usually in calcareous grassland and has never

been confirmed from v.c. 21, whereas the Fir and Pond Woods plant is *B. pinnatum* in the strict sense, in its second certain locality in the vice-county. It is easily identified in the field by running a finger along the underside of a leaf in the direction tip to sheath, to feel the roughness caused by minute bristles between the nerves all pointing towards the tip; *B. rupestre* lacks this roughness. John Dicker visited sites on the west side of Queen Mary Reservoir in modern **Surrey**, finding houndstongue *Cynoglossum officinale* and other plants uncommon in v.c. 21; by accident a selection of these has already been reported in the Surrey Botanical Society's *Newsletter* No.9, pages 16–17.

## Acknowledgements

I would not have been able to give an account of the Kensington Gardens *Calluna* without the help generously given by Elinor Wiltshire and Nigel Reeve. Trevor James has kindly kept me up-to-date about discoveries in Hertfordshire. The map was produced using Alan Morton's programme Dmap. None of these papers could have been written without the constant willingness of LNHS members and others to communicate with me, and I have also to acknowledge frequent support not only from Mr James but from other vice-county recorders, notably Ann Sankey, Dr Adams and Roy Maycock. Finally I must thank Dr Spencer warmly for his willingness to take over from me.

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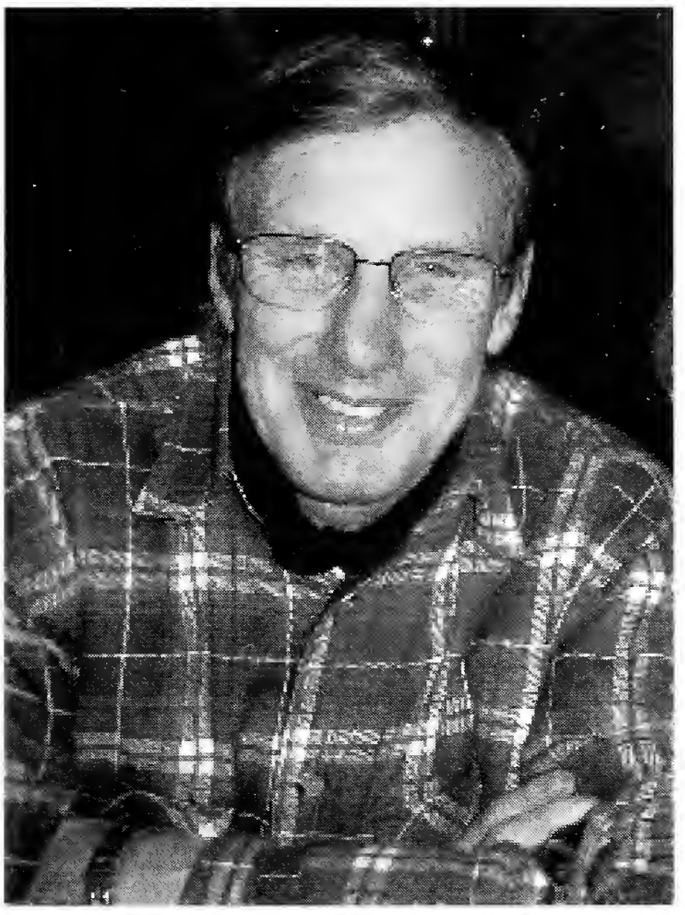
# Obituary



## MIKE DENNIS, 1949–2006

Mike Dennis died on 11 August 2006 after a short illness. In so doing, the London Natural History Society has lost a long-serving recorder and officer, and a man of depth and breadth.

Mike was born in Romford on 2 November 1949, the elder child of Cyril, a playwright, and Win. By the age of five he had already demonstrated an abiding interest in natural history, an enthusiasm which was fired initially by his mother. This interest would soon evolve into a passion for ornithology in particular, and one which would sustain him for the rest of his life. It was as a boy that he was introduced to Hainault Forest by his parents, a site that was to become his local birding patch for the next forty years. He visited the site practically every week, and came to know its every nook and cranny. He logged and mapped the fluctuations of every bird species there, the resulting dataset becoming one of the most comprehensive of any site in the London area. A few years later Rainham Marshes became another local patch, Mike logging bird fluctuations there in much the same way as he was doing at Hainault. Points in between, such as the Ingrebourne Valley, also came in for long-term scrutiny, especially in relation to their breeding birds.

Mike was passionate about the conservation of these sites, and about the conservation of Rainham Marshes in particular. He sat on various local conservation committees in both the statutory and voluntary sectors, and was particularly active in the campaign to conserve Rainham Marshes. Indeed it would be hard to think of any individual who had a greater impact on the eventual successful transfer of the Marshes into the sympathetic management of the RSPB. The current health of wildlife on such sites thus owes much to Mike's efforts.

In his earlier birding years, Mike did his fair share of rarity hunting, undertaking many an overnight twitch with fellow London birders, as well as spending at least six autumn seasons on Scilly. Although he never counted his

list, it was quite likely that he would have qualified for the UK 400 Club had he been so minded. During this time he also did a fair amount of foreign birding, visiting various destinations in North America and the near-Continent. His ornithological interests soon matured, however, into a primary passion for monitoring his local sites, and their breeding birds in particular. He saw this as of far greater consequence and import than a competitive obsession with listing.

In spite of Mike's unassuming nature, his ornithological abilities soon came to the attention of those in ornithological office. He joined the LNHS in 1976. He was engaged by the Society initially as an assistant editor for the *London Bird Report* in 1982, and shortly after became the recorder for the Essex sector. Similar roles soon followed for the Essex Birdwatching Society, for whom he was joint county recorder from 1987 until 2001. These roles saw both Societies through a rapid period of modernization, as recording was computerized to cope with the large rise in records submitted. In addition to his recording and sub-editing roles for the LNHS, Mike took on the chairmanship of the Ornithology Research Committee, the body which co-ordinated bird surveying effort, and also continued to serve on the Records Committee. During this period Mike also contributed many authoritative articles to the *London Bird Report*.

Bird surveys were a particular passion for Mike. This led to his co-ordinating survey work for what became the *Tetrad Atlas of the Breeding Birds of Essex*, published in his name in 1996 and covering intensive survey work carried out between 1988 and 1994 by more than a hundred birders whom Mike had persuaded to take part. He carried out parallel work in London, where he served on the Editorial Advisory Group for the publication in 2002 of *The Breeding Birds of the London Area*, for which he also served on the Data Handling Group.

Mike participated in our conference 'The Thames Revisited' in October 2000. His presentation, 'The birds of the Inner Thames — an avian highway', was published in *The London Naturalist* **80**, 2001.

Among Mike's recording legacies was the recognition of 'Metropolitan Essex' — a phrase he coined — as a recording unit. Originally simply a construct for dividing the LNHS recording area, it became a recording unit attracting a remarkable degree of loyalty among local birders, and a unit around which later groups such as the East London Birders' Forum have based their activities.

There was, however, much more to Mike than just his ornithology. He was a highly cultured man who was deeply rooted in his community. His father had helped to build the Catholic Church of Corpus Christi in Collier Row, a church in which Mike was later to serve as a minister of the Eucharist and a reader for many years. Mike also spent twenty-five of his thirty-five teaching years in Collier Row at Mawney Junior School, where he was later to become deputy head. There he was also in charge of the choir, leading them to performances at the Music Festivals at the Queen's Theatre. He was deeply committed to the inspiration of schoolchildren, and even involved his pupils in data input for interim maps for the *Tetrad Atlas*.

As well as being active in local charitable work, Mike was also active in local amateur dramatics, even managing successfully to take on a string of comic roles. He also had a long interest in local history, and could keenly explain the origin of local place names and the personalities behind them. Mike also took much pleasure from classical music, and effectively had a thirty-year season ticket at the annual Proms season. The Last Night was a highlight of his calendar, where he could be spotted *promenading* as enthusiastically as those half his age. By contrast, a perhaps more surprising passion of his was *Star Trek*, where he openly admitted his diagnosis as a 'trekkie'. It was a fitting tribute to the breadth and depth of Mike's personality that his funeral mass

opened with verses from Mahler's Resurrection Symphony and closed to the theme tune from *Star Trek*, while the order of service was decorated with a portrait of a swallow.

Thanks primarily to his recording role, Mike was known to a large number of London naturalists. My first memory of him was from 1984. While on my half-term break from boarding school in the spring of that year, I found two countersinging wood warblers in Wintry Wood, Epping. I didn't know much at the time, but I did know that that was a significant record and therefore that I needed to tell somebody. I therefore took myself to Epping library, the then equivalent of the internet, and was given the name of Mike to contact. I nervously telephoned him and, instead of the brush-off I expected, I found a kind and interested gentleman who set aside an hour of his time to give me much appreciated hints and tips on birding in the local area. The following year when I went up to university I acquired my first bird report, that for 1984, and within it was my record of two wood warblers, complete with accreditation to my name. It would be hard to underestimate the inspiration that gave me to take part in bird recording in a more systematic way in the years ahead.

But perhaps the most fitting tribute to Mike came from no less than Bill Oddie, who knew Mike through various of his LNHS activities. In his preface to the *Tetrad Atlas*, he wrote:

> *'If you asked me who impresses me more: the latest qualifier for the 400 Club or the bloke who has been censusing Hainault Forest and Rainham Marshes for thirty odd years . . . . Well, it is no contest is it? And I suspect I know who the birds prefer too.'*

The Society's condolences go to Mike's surviving family, and in particular to his sister Shealagh and her children Barney and Molly. Mike had a close and inspirational bond with Barney and Molly, and it was they, with Shealagh, who cared for him during his final illness. Our thoughts are with them at this difficult time.

ADRIAN DALLY

# Book review

***The emerald planet — how plants changed Earth's history.*** David Beerling. Oxford University Press. 2007. 288 pp., 13 figures, 16 black-and-white plates. £14.99 hardback. ISBN 978 0 19 280602 4.

The carbon cycle, which shuffles the element between the oceans, the atmosphere, and sedimentary rocks, is mediated by green plants. Mankind, greedy for the energy released by converting organic hydrocarbons to carbon dioxide, has intervened in this cycle on a grand scale, with results our descendents will have to live with. This splendid book describes how this is only the latest in a series of great environmental changes whose consequences can be read from the fossil record and in some cases even attributed to changes in the flora itself.

The author is a leader in the field of palaeobiology where the disciplines of geochemistry, plant physiology and computer modelling allow ancient climates to be deduced from study of the morphology and isotopic composition of fossil plants and sedimentary rock. He has an eloquent and attractive style, beginning each chapter with historical vignettes and anecdotes that give the reader sufficient background to understand the technical aspects that follow.

An example concerns the origin of large leaves. The 'Cambrian explosion' of the animal kingdom is well known, the 'Devonian explosion' of terrestrial plants less so. In the space of fifty million years land plants evolved from bryophyte-like organisms with tiny leaves to large-leaved plants with a dense array of stomatal openings. This was a time when the atmospheric concentration of carbon dioxide fell by a factor of ten. Beerling shows that these events were intimately linked. The decline in carbon dioxide necessitated a higher respiration rate, which favoured a greater stomatal density leading to an increase in transpiration and hence greater evaporative cooling. Leaves could increase their area, and so their photosynthetic efficiency, while avoiding fatal overheating. The evidence for this is well described, as is the corollary — that the plants themselves, through root fungal systems and decay of leaf litter, effected the conversion of siliceous rocks into carbonates that were eventually deposited on the ocean bed, depleting the atmosphere of its carbon dioxide. The argument that plants brought about the dramatic change in atmospheric composition which in turn allowed them to evolve their present-day form is convincingly presented.

Other chapters pick up the theme of plants as both the evidence, through their fossil remains, for changes in palaeoclimates, and as a driving force behind such changes. The book is a distillation of the incisive and robust experimental work for which Beerling and his colleagues have gained an international reputation. A fact that has puzzled palaeobotanists relates to the forests that carpeted polar regions, north and south, in the balmy climate of the Mesozoic and early Cenozoic. The trees appeared to be deciduous, leading to the orthodox view (actually, an *ad hoc* hypothesis) that evergreens were disadvantaged because their loss of carbon through respiration during the dark polar winter would be greater than that of deciduous trees, dormant in winter and losing carbon only by leaf shedding. Beerling describes how his group's experimental studies of tree growth in conditions simulating the Cretaceous polar climate confounded this — in fact the evergreen habit is favoured over the deciduous. And if you wonder how this finding can be reconciled with the observation that most such fossil trees are indeed deciduous, you will find the answer to this too in his book.

These examples give a flavour of the science covered. Other topics include the Permian/Triassic mass extinction, linked, via the seemingly unrelated discovery that the spores of certain lycopsids, ancestral to our fern lineage, suffered severe mutagenic damage at just this time, to a catastrophic collapse of the ozone layer; a study, using variations in the stable oxygen isotopic ratio, of the Eocene 'climatic optimum' when temperatures were 10°–15° higher than now; and a discussion of the appearance of grasses, with their novel $C_4$ photosynthetic pathway, in the Miocene, which asks (and tries to answer) the question, why did this evolutionary development take so long to appear?

Controversy is not avoided. The giant insects of the Carboniferous hint at a high atmospheric density at the time. Beerling argues that this was due to elevated oxygen levels, up to 35 per cent compared with the present-day 21 per cent. The evidence, a mix of isotope fractionation data, chemical equilibrium theory and computer simulation, is outlined, and the uncertainty of the conclusions stated clearly. Here, and throughout, there are detailed references to the research literature, both for and against Beerling's views.

Anyone interested in our planet's history will enjoy this book. There are a few misprints but I noticed only one scientific error, where the preferential take-up of the lighter carbon isotope in photosynthesis is attributed to chemical reaction energetics; it is, I believe, due to a difference in diffusion rates. The lack of colour illustrations is a pity. The plates are the poorer for it, and some of the figures, which were originally colour-coded, are impossible to interpret correctly. I enjoyed the photograph on the dust-jacket, which is not captioned but appears to illustrate a filmy fern, as sensitive an indicator of climate as can be imagined.

JOHN EDGINGTON

# Book reviews index

# The London Naturalist

## Instructions to contributors

### Submission of papers

Papers **must be submitted in duplicate** to the editor, Mr K. H. Hyatt at his home address, 1 Tremcelynog, Rhandirmwyn, Llandovery, Carmarthenshire SA20 0NU. Please contact the editor before the end of January if you wish to contribute to the forthcoming issue. However, the editor may be contacted at any time on 01550 760346 to discuss possible contributions, and will be pleased to send a recent offprint to show our style, and as a guide to preparing the manuscript, **which should be followed as closely as possible in regard to layout and typefaces.** Manuscripts **must be double spaced throughout on one side of the paper only** and with wide (3-cm) margins. **Authors must retain a copy.** Papers should include at the beginning an **abstract, summary** or **synopsis. Sheets must be numbered.** Papers are peer-reviewed as appropriate. After acceptance, the editor would be pleased to receive contributions as Microsoft Word-compatible files **together with two matching hard copies of the final text.** Papers should be relevant to the natural history and archaeology of the London Area. This includes comparisons between London and its surrounding countryside with other localities, as well as work relating to or comparing species or habitats which occur in the London Area. Contributions of relevance nationally will also be considered.

### Text

Locality spellings should follow the latest editions of maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials (except for proper nouns), and **only** Latin names of genera and species must be underlined unless typed in italic. When both common and Latin names are given there should be no brackets or commas separating them. **Genus names should appear in full where first used within each paragraph.** When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers up to a hundred should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year, i.e., 25 December 1971, but in lists may be as 25.xii.1971. Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs, or St. Lists should be in systematic, alphabetic or numerical order. **Hyphens should not appear at the ends of lines** as the right-hand margins of manuscripts do not need to be justified: **turn off the hyphenation option. Tables and figure legends should be typed on separate sheets at the end of the text. Word-processed text should not use italic, bold or compressed typeface. Paragraphs should be indented. Sentences must not begin with numerals.**

### References

Reference citation should be based on the Madison rules (*Bull. Torrey bot. Club* **22:** 130–132 (1895)), except that a colon should always precede a page number. Capitalization in titles of books and papers in journals should be kept to a minimum. Journal titles should be in full, or follow the abbreviations in the *World list of scientific periodicals,* and be underlined or in italics. Book titles should also be underlined or in italics.

Examples are as follows:

In text:

Meadows (1970: 80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964–9. *Lond. Nat.* **49:** 76–81.

MELLANBY, K. 1970. *Pesticides and pollution.* Ed.2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92:** 39–45.

**Authors must ensure that all references are cited accurately:** they will not be checked by the editor.

### Illustrations

Distribution maps should be submitted in the form of a recording map with symbols in Indian ink and stencilled or by transfers, e.g., 'Letraset'. Solid dots are used to indicate contemporary or recent presence, circles for old records, and crosses (not pluses) for other information, such as introduced species. The caption should be written outside the frame of the map and will be set up by the printer. Scale bars must be included **within** the frame of the map.

Line drawings should be in Indian ink on white card or tracing paper, larger than the printed size, but no larger than A4. Place names, etc., must be produced with stencils, Letraset, or with sharp typing. Captions should be separate as they will be set up by the printer, but keys that include special characters should be included **within** the border of the figure.

Photographs should be glossy black-and-white prints, of good contrast, preferably plate or half-plate in size, or, following consultation with the editor, in the form of colour transparencies, either 35 mm or larger. Colour prints are also suitable for reproduction in the text in black and white.

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Proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

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