THE HERTFORDSHIRE PURPLE EMPEROR

APATURA IRIS



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JUNE 2003

Report supported by

The Hertfordshire Natural History Society



Front cover illustration by Liz Goodyear

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1 ~ Abstract

During the study period from 1999 to 2002, Purple Emperor *Apatura iris* was found to be resident at low density across three 10km squares in Hertfordshire. Several colonies were found or confirmed by patient observation and increased awareness, combined with a better understanding of the habits of *A.iris*, in particular male territorial activity.

Gathered historical records indicate that *A.iris* has been present in Hertfordshire for many decades, probably since the first records in the 1800s. Colonies have been found to be associated with an abundance of sallows in coppice regrowth and plantation, generally up to 25 or 30 years old, in woodland complexes having a mature deciduous element. *A.iris* appears to have survived in Hertfordshire by being able to colonise new areas and woods, to some degree, as they have become suitable.

After the loss of many sallows through thinning at one location, sightings of *A.iris* here were severely reduced the following summer, whilst other populations nearby and elsewhere in Hertfordshire appeared to remain stable.

Notes are given on the observed lifestyle of *A.iris* and its habitats. Historical notes are presented, climate and ecology are considered, and progress with the *A.iris* Species Action Plan is detailed. Possibilities for management in favour of both *A.iris* and general woodland biodiversity are discussed.

Ideal habitat for *A.iris* was not found to be widespread in Hertfordshire at present, however, given timely and appropriate decisions regarding woodland management and sallows, the species could be relatively simple to manage for on a less than annual basis.

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5th edition ~ September 2003

2 ~ Introduction ~ Liz Goodyear (LG) and Andrew Middleton (AM), June 2003

We would like to thank the **Hertfordshire Natural History Society** for sponsoring the report. It is intended to bring together all the information which has been gathered so far regarding *A.iris* past and present in Hertfordshire, and it details any progress we may have made with the project as Purple Emperor *A.iris* species co-ordinators for the Hertfordshire & Middlesex Branch of Butterfly Conservation.

For many years we have both had a special interest in butterflies, some of the many creatures now in serious decline, but nothing could have been more rewarding than to have found such a splendid butterfly as the Purple Emperor *A.iris* still to be present in some of our woodlands.

Our first encounters with Hertfordshire's *A.iris* in 1999 have led us to spend July of the last three years searching out the species in any likely spot. Having spent so much time walking various woods in all seasons looking for suitable habitat, it became clear that *A.iris* had survived in Hertfordshire through chance rather than by any directed actions. So the project took on a wider scope in Hertfordshire of achieving a better understanding of *A.iris* and its habitat needs, and encouraging suitable woodland management.

Since 1999, we have managed to find *A.iris* at six locations in two 10km squares. We have also observed territorial activity at five of these locations, and it may be the first time that the discovery of such activity has been reported in Hertfordshire. We have also encouraged others in the search for *A.iris* in woods with public access, such as led to the finding of a territory at Tring Park by Brian Jessop in 2002, and making more observations in Broxbourne Wood Nature Reserve where Lissa Smith first had sightings in 2001. These field observations have been strongly backed by our habitat surveys and assessments, and in our view this is the only way that validated and realistic suggestions can be fed back into the woodland management process to the benefit of *A.iris* in Hertfordshire.

Luckily, Butterfly Conservation had just published the following (see 10.6 for more details), so we have found ourselves attempting to address ready made objectives as best we could using our own resources:

- Purple Emperor A.iris Species Action Plan (Bourn & Warren 2000) ~ SAP
- Regional Action Plan, Thames Region, as it relates to *A.iris* (Clarke & Bourn 2000) ~ RAP

We have also put much of our personal time and effort into raising awareness amongst those concerned with woodland management as to the presence and needs of *A.iris*, for example by sending out information packs and arranging site visits. *A.iris* is the only high priority species in the region, nominated as such by Butterfly Conservation, that has been recorded in each of the last four years in Hertfordshire and that is known to have several colonies in the county. As such, and by our efforts, the species is now to be considered as an Hertfordshire Biodiversity Action Plan Species.

However, the project is only just getting underway and we feel that there is still much to be learnt and done.

We would like to thank the following (see also Section 2.1 for contributors and 11 for references):

- All woodland owners and managers who have been helping with the project
- The increasing number of observers, many of whom have contributed to this report (2.1)
- Brian Sawford for his positive approach to records of *A.iris* in *The Butterflies of Hertfordshire*
- All those who have contributed to this report and/or allowed us to use their work
- All those organisations, and their staff, who have been helping with the project
- Ken Willmott for his various informative publications on *A.iris*
- John Murray ~ Hertfordshire & Middlesex Branch of Butterfly Conservation Annual Butterfly & Moth Reports
- Lynda Alderson, Rothamsted Research, and Richard Barker, Royston (Iceni) Weather Station, for the provision of meteorological data

Please note $\sim A.iris$ can be seen in at least two Hertfordshire woods where there is open public access. We believe there may be a few more colonies still to be found, so anyone interested in *A.iris* has every chance to contribute to the Hertfordshire project. However, positive management in private woodland is also essential to the success of the project, and this can only be achieved by respecting any wish regarding site confidentiality. Apologies are made in advance for any errors or omissions in this report.

2.1 ~ Contributors

We would like to thank the many people who have helped in so many ways with this project, such as: watching for *A.iris*; writing sightings reports both recent and historic; giving information that has helped with the study; for museum collection and literature searches; for allowing access to private woodland; and for considering positive habitat management. We hope that all contributors' names have been included – thank you to everyone!

We would especially like to thank all woodland owners, managers and neighbours who have helped with the project, and:

Nigel Agar Lynda Alderson (Rothamsted Research) Liz Anderson (Hertfordshire Biological Records Centre) **Toby Austin** Charles Baker Helen Bantock Richard Barker (Royston [Iceni] Weather Station) Allen Beechey & Kathryn Graves Pat Bonham Nigel Bourn (Head of Species Conservation, Butterfly Conservation) Nick Bowles Trevor Boyd Neil Chamberlain (The Woodland Trust) Martin Catt Tony Clancy Eric Classev **Rich** Cope Fred Currie (Wildlife & Conservation Advisor, Forestry Commission) Jeremy Dagley (Forest Ecologist, Epping Forest, Corporation of London) David G Darrell-Lambert Brian Dawton Peter Dewey (Forestry Commission) Marcus & Joan Dixon (Hertfordshire Woodland Forum) Keith French Jeremy Gaskell Tom Gladwin Terry Goddard Michael Goodyear Michael Healy Hertfordshire & Middlesex Branch of Butterfly Conservation Martin Honey

David Hope (Hertfordshire County Council) Malcolm Hull Jonathan Jack David James Trevor James Paul Jarczewski (Countryside Management Service) Stephen (Chairman, Butterfly Conservation) & Gail Jeffcoate Brian Jessop Jenny Jones (Hertfordshire Biological Records Centre) Vincent & Betty Judd Sarah Kenyon (Saffron Walden Museum) Alex Lewis Michael Majerus John Murray Steve Nash Colin Plant Caroline Rawle (Welwyn & Hatfield Museum) Alan Reynolds Nick & Angela Sampford Brian Sawford Martin Shepherd Christine Shepperson Heather Sohl (Herts & Middlesex Wildlife Trust) John Stevens Lissa & Rachel Smith & family Richard Sutcliffe (Glasgow Kelvingrove Musuem) Grahame Taylor John Tomkins Giles Whalley Ken Willmott Ian Woiwod (Rothamsted Research) Philip Woodward John Wyatt

See also 11 ~ references.

3.1 ~ Purple Emperor *A.iris* species account by Brian Sawford, reproduced with his kind permission from 'The Butterflies of Hertfordshire'

by Brian Sawford, 1987.

Purple Emperor

Apatura iris Linnaeus

J. F. Stephens – 1883

To many, the sight of the majestic Purple Emperor soaring above the tree tops or creeping 'mouselike' over the ground in search of moisture from carrion or dung is the epitome of butterfly watching. Very few observers have had this experience in Hertfordshire, but it is still possible in at least one well-wooded area. Unfortunately there are still unscrupulous collectors in Britain and, for the security of this small colony, the precise location must remain confidential.

Stephens (1834) first noted Purple Emperor 'from Hertford in July 1833' but the species remained elusive to many collectors and recorders, including Gibbs (1902), who only knew of Stephens's sighting. Foster, however, collected together a number of 19th century records, which he either passed to Gibbs (1904; 1905) or published himself, (1916; 1934; 1937). During two days in '1878, 1879 or 1880' six were seen flying over the tree tops at Oxbury Wood, on the county border with Essex, near Meesden. In 1882 or 1883 one or two specimens were taken from woods near Walkern; the precise locality was unrecorded, but it was probably St John's Wood, where sightings were made a few years later. Other late 19th century reports came from Hitch Wood, Knebworth Great Wood, woods at Mardley Heath and Welwyn Tunnel Woods (presumably Harmergreen and Lockleys Woods). Gamekeepers at Knebworth and Welwyn both informed Foster that 'they not infrequently saw a beautiful purple butterfly settling on dead birds, rats, etc., hanging in their larders'. Foster also knew of a specimen, in the collection of the cousin of Samuel Lucas of Hitchin, taken in Stagenhoe Lane, adjacent to Hitch Wood in the mid-19th century. In 1896, Foster was driving along the same lane with his friend, Frank Latchmore, when they saw a male Purple Emperor settle on some droppings at the side of the road. Hurriedly, Latchmore stopped the trap and tried to capture the butterfly by putting his hat over it, but failed.

The first record this century was not made until 1944 when 'one at Hitch Wood' was reported to Foster (1945), by Harold Course. And about a year later there were sightings at Cowheath and Brambles Woods in the Broxbourne Woods complex. Roger Ferry, in his diary, notes the finding of a pupa in Knebworth Great Wood in 1950. Other sporadic, but not entirely authenticated, sightings were made over the next thirty years, mainly in south and central Hertfordshire. These were from the Oaklands area of St Albans in the 1950s, at Broad Riding Wood, in the Broxbourne Woods area from 1953 to 1956, with nine on 28 July 1955, six on 7 August 1956 and an unrecorded number on 11 August 1956 - the last observation for the area (T. W. Gladwin, personal communication) Northaw Great Wood in 1962 (James, 1966) and Astonbury Wood near Stevenage in August 1978. None of these were accepted by the County Recorders, Bell and Waterton, and several other entomologists, who regarded the species as extinct in Hertfordshire, but they may have been a little presumptuous in their decisions.

On 25 July 1985, during Survey fieldwork, a probable male Purple Emperor was seen to rise from a pile of chicken feathers near a farm in a well-wooded part of mid-Hertfordshire. In the same year another possible sighting was made by a schoolgirl in a village garden about a mile and a half away. Both these records can now be regarded as acceptable, for on 28 July 1986 a male flew into the bedroom of a cottage at the edge of one of the larger woods only a few hundred yards from the first 1985 location. The identity of this specimen was confirmed by the author, who released it and then found another male, on the same day, taking moisture from a nearby track. It is apparent that a small but viable colony of Purple Emperor survives in this part of Hertfordshire, which is probably the only one in the county, and indeed in the whole of eastern England.

Formerly Purple Emperor was found in scattered colonies in areas of ancient woodland across southern England from Devon to Lincolnshire and into Wales. It has now largely disappeared from the west and east of this range, and only remains reasonably easy to find in well-forested parts of west Surrey and Sussex, parts of Hampshire and Wiltshire and at a few sites in Oxfordshire and Buckinghamshire. This decline is closely related to the loss and fragmentation of high forest, and emphasises the conservation importance of the Hertfordshire population. The effects of poor summers are probably also important for larval and pupal development in this species much as they are in the White Admiral, that is, warm weather accelerates early development and fewer larvae and pupae fall prey to birds. There is still much to be discovered about the detailed ecological requirements of the Purple Emperor, and it is quite possible that further colonies of this secretive butterfly may be found in Hertfordshire.

Confined almost exclusively to extensive wooded regions on heavy soils, Purple Emperors fly from mid-July to mid-August and, as they spend long periods in the tree canopy basking or feeding on honeydew, are usually extremely difficult to observe. At times, males, in particular, can be almost absurdly easily seen as they descend to the ground to take moisture, through their bright yellow proboscides, from puddles, wet mud, decaying animal carcases or dung. It is possible to use the last as 'bait' to attract males in some areas, and there are many entomologists who go to considerable lengths to prepare their own 'baits'. The first individual found in 1986 almost certainly 'dropped in' to the cottage garden attracted by dog faeces, before inadvertently entering the open bedroom window.

The flight of the Purple Emperor is strong, with long glides, the more angular wings assisting in differentiation from high flying White Admirals. Both sexes have dusky upperwings, with patches of white on the forewings and a solid band of white across the hindwings. Under certain sunlit conditions the scales of the males' upperwings refract light to produce the unforgettably beautiful iridescent purple sheen from which the species is named. Underwings show the same markings as the upperwings, on a subtle ground of pink, grey, light brown and silver-grey.

Purple Emperors are known to exist in low densities, covering quite extensive tracts of well-wooded country. On emergence, adults from a fairly wide area will congregate around a particular tree, or group of trees, usually oak (often called the 'master' oak), where courtship and mating takes place - males may often be obvious as they 'battle' for mates. After mating, females disperse into the woods to lay their eggs secretively, singly, on the upper surfaces of leaves of sheltered, partially sunlit sallows, usually *Salix caprea* L., although *S. cinerea* L. has been recorded. Newly hatched larvae feed by night until their first moult, when they enter hibernation attached to the fork of a sallow twig by silken pads. In the following May feeding resumes from resting pads of silk on the upper sides of leaves. Fully grown larvae are bright green with narrow yellow stripes down their flanks and a pair of conspicuous 'horns' at the front. Hanging beneath sallow leaves, the pale green pupae are extremely well camouflaged and difficult to find.

Brian Sawford Butterflies of Hertfordshire 1987 Castlemead Publications

3.2 ~ Original and/or additional historical notes and reports concerning *A.iris* in Hertfordshire and adjacent areas

Introduction \sim Our interest began with simply wanting to see the original papers that were published in the Transactions of the Hertfordshire Natural History Society over the past 100 years or so. However, one thing has led to another, and it is quite possible that the trail of documents and papers, and interest in museum collections, resulting from this initial quest, will take several years to follow up and may well turn into a report of its own in due course.

We first went to see Brian Sawford who kindly showed us all the papers in the North Hertfordshire Museum's Lepidoptera Archive. Several entries intrigued us, and we wanted to find out more. We then contacted Martin Honey at the London Natural History Museum, who enabled us to see whether any of the ten trays of the museum's entire A.iris collection had come from Hertfordshire – we could not find any. We searched all the Transactions of the Hertfordshire Natural History Society, and some of the many Entomological periodicals written over 100 years ago, and were also fascinated by accounts of sightings in Essex and by collections containing butterflies caught in Huntingdonshire, Suffolk, Essex and as 'far north' as Northamptonshire. We also noted with great interest the accounts of A.iris in the various Victoria County Histories of the Upper Thames and Anglia Region, but Hertfordshire had just the one record of a single sighting by Stephens in 1833, which had been missed by Newman in 1871 (Appendix I). This seems odd considering the wooded nature of Hertfordshire and the extent to which A.iris had been noted during the 1800s in all neighbouring counties (see also: 9.1; Newman in Appendix I), and according to the Victoria County Histories, more sites were known for A.iris in Norfolk than in Hertfordshire at the end of the 19th century. In contrast, E. A. Fitch (1891) in the *Butterflies of Essex* noted numerous sites and quoted many references for papers that had been written about the 'Emperor of the Woods'. Unfortunately, there does not appear to have been a comparable gathering of detailed information relating to Hertfordshire in the

1800s. In time, we would like to look more closely at these old entomological papers to see whether there may be more to be found out about the history of A.iris in Hertfordshire.

Although not part of our present study of *A.iris* in Hertfordshire, we felt that the original entries would be of interest, some of them having been written over 100 years ago. We have also included notes resulting from further research into some of the original entries.

Transactions of the Watford Nat. Hist. Soc.; Vol. II [1878] British Butterflies by Rev. C. M. Perkins

We now come to some glorious insects, larger in size and brighter in colour than those lately notices, every one of which the collector is eager to catch, as they make a great show in his cabinet. *Limenitis Sybilla*, the white admiral, said to be the most graceful in flight of all, is found in many woods in the south, feeding in the larva state upon honeysuckle. Many a mile have I walked with the hope of catching this on the wing, and many a honeysuckle have I searched in woods where I think it ought to be, for the green caterpillar with rust-coloured spines, but in vain. My eyes have never yet been gladdened with the sight of it alive, and I have to content myself with admiring two specimens which were given me. These were caught, I believe in Essex, and I should not be surprised to hear that this county also produces it. Apatura Iris, the purple emperor, comes next in order, and with most collectors first in esteem of all the butterflies. The beautiful purple with which his majesty is clothed delights the eve and make him a deserved favourite. But few who are not entomologists know him while alive, for he is not one to intrude himself upon the eve like the gaudy peacock, which seems to delight in flaunting the large purple eyes in its wings before you on any low flower, but you must look aloft for his royal highness, and only then in the secluded park or dense forest. Here on some isolated oak he sets his throne, on the very top, ever and anon dashing with bold flight into the air above, it may be to engage in fierce contest with some brother emperor, who has ventured too near to his domains, perhaps to woo some lady fair he wishes to make his empress. You may see him thus by searching for him, but how to catch him is another thing. No net will reach him, and you may wait and wait for hours, yet he won't come down to give you a chance of netting him. What is to be done? You can see at a glance, even could you climb the tree you would have little chance of netting him, he settles in such awkward places on the foliage right outside. Some persons tell us that when you have discovered his whereabouts, you should carry there the nastiest thing that you can find, say some filthy carrion, and place it near his seat, for that he will demean himself so as to make this the object of his depraved taste, and thus lowering himself he is easily captured. This rests on good authority, but I have never tried it myself, so cannot say that it is a certain plan. It may have succeeded once or twice, but possibly many not always. Another plan, and likely to be successful, is to search the sallows well in the neighbourhood of his haunts, and look for the green larvae with yellow stripes, and thus rear him in confinement. The only place I have vet taken him is in the Forest of Dean, where he was far from common in my experience, but as several contiguous counties to our own are said to produce him, we ought, I think, to find him here.

Victoria History of the Counties of England: Hertfordshire 1:110-153 [1902] *Lepidoptera* by A. E. Gibbs

Apatura iris ~ Hertford, July 1833 (Stephens, J.F., 1828-44, 'Illustrations of British Entomology', IV 381)

Transactions of the Herts. Nat. Hist. Soc.; Vol. X11 [1903] Notes on Lepidoptera observed in Hertfordshire in the year 1903 by A. E. Gibbs

An interesting result of the work of local lepidopterists during the last few seasons has been the confirmation of several records made by Stephens in the early years of the nineteenth century thus reestablishing in our list species, which it was feared had disappeared from the county. James Francis Stephens, who may be called the Father of British Entomology, was born, on the 16th September 1792, and early developed a love of this branch. At the age of 16 he commenced to compile lists of the insects of Britain, and enumerated 3,673 species, of which 1,367 were Lepidoptera. He was a clerk in the Admiralty, and devoted his spare time to collecting, and being an indefatigable worker he accumulated large and admirably-arranged collections of orders of insects. He was a Fellow of the Linnean and Zoological Societies, and a member of the Entomological Societies of London and of France. In 1817 he occupied the

presidential chair of the Entomological Society. Besides being the author of articles printed in scientific periodicals and in the Journals and Transactions of the learned societies, he published in 1828 'A Systematic Catalogue of British Insects'; in 1829, 'The Nomenclature of British Insects'; and in 1839, 'The Manual of British Coleoptera.' But his magnum opus was his 'Illustrations of British Entomology, a Synopsis of Indigenous Insects' in ten volumes dated 1827 to 1846, the four volumes on Lepidoptera appearing between 1828 and 1835. This great work, in which he intended to describe all known species of British insects, was not, however, completed, the Hemiptera and Diptera being omitted altogether, and the Hymenoptera being only partly described. In the formation of his celebrated collections Stephens made frequent visits to many localities in the vicinity of London, the neighbourhood of Hertford being a favourite hunting-ground. His "British Entomology" contains a large number of records of Lepidoptera, Coleoptera, Orthoptera and Neuroptera from that locality, and these form our first and in the case of some orders, our only local lists. So far as the Lepidoptera are concerned Stephen's Hertfordshire records were collected together by Mr. John Hartley Durrant, F.E.S. and embodied in a valuable paper which is printed in our 'Transactions'. The Coleoptera noted by Stephens have been dealt with by Mr. E. George Elliman in his able article on the Beetles of the county in the "Victoria History of Hertfordshire," and the comparatively few records of insects of other orders have been enumerated by me in the same work. Stephens died in 1852. In 'British Entomology' the monarch of British butterflies, *Apatura iris*, the purple emperor, is stated to have occurred near Hertford in July 1833, and from that time until now, so far as I am aware, no note of the presence of this insect in our county has appeared. I am glad to learn that there is the likelihood, amounting to almost a certainty, that it is still with us, and I sincerely hope that in next year's Report I may be able to definitely reinstate the purple emperor in our list. For some most interesting notes on the subject I am indebted to Mr. A. H. Foster, who saw, but having no net was unable to catch, a specimen in 1899 or 1900, settled on some dung in the middle of the road which leads by the side of Hitch Wood towards Whitwell. Mr. Foster believes that *A.iris* is to be found in Hitch Wood and also in Knebworth Great Wood, Mardley Heath Woods and Welwyn Tunnel Woods. The keepers both at Knebworth and Welwyn informed him a few years ago that they not infrequently saw a beautiful purple butterfly settling on dead birds, rats, etc., hanging in their "larders." I agree with Mr. Foster that although this only hearsay evidence it is very suggestive, and coupled with the sight which he obtained of a specimen near the wood, it appears to be conclusive. Mr. Foster further informs me that the late Mr. Frank Latchmore used to tell how, whilst driving by Hitch Wood, he saw a specimen settled in the road, and how he stopped his horse and tried to catch it with his hat, but failed, an experience very similar to Mr. Foster's.

Transactions of the Herts. Nat. Hist. Soc.; Vol. XII [1904] Notes on Lepidoptera observed in Hertfordshire in the year 1904 by A. E. Gibbs

It will be remembered in my last report I discussed the possibility of the purple emperor butterfly still surviving in some of our larger oak woods. Although I am not yet able to produce a Hertfordshire specimen of *Apatura iris* for inspection, I am glad to be able to state that Mr. Foster has obtained some further evidence of its occurrence in the county. Mr. Samuel Lucas, of Tilehouse, Hitchin, has informed our correspondent that he distinctly remembers a specimen being taken many years ago in Stagenhoe Lane. The specimen found its way into the collection of Mr. Lucas's cousin at Wratton Cottage, Hitchin, but that collection no longer exists. Stagenhoe Lane, it is interesting to note, is along the top edge of Hitch Wood, a locality which Mr. Foster mentioned last year as being still a possible haunt of the insect. I sincerely hope that *iris* is still a native of our shire, and that we may, before long, be able to show a genuine Hertfordshire specimen in the County Museum.

Transactions of the Herts. Nat. Hist. Soc.; Vol. XIV [1908] Notes on Lepidoptera observed in Hertfordshire in the year 1907 by A. E. Gibbs

Mr. Foster informs me that he had secured a specimen of the purple emperor butterfly (*Apatura iris*) which was taken about ten years ago at Southill in Bedfordshire, about six miles from Hitchin. It will be remembered that in the report for 1903* I referred to the possibility of this lovely insect still lingering in the county, and spoke of Mr. Foster's endeavours to find it and so obtain an undoubted record of its presence in Hertfordshire. Let us hope that it has not become altogether extinct in our midst, and that it may still be met with in some of the large woodlands, which seem so peculiarly fitted for its preservation.

* Transactions Vol. XII, pp 111-112

Proceedings of the South London Entomological Society; 1915-1916; 110-111

[relating to A. E. Gibbs; from the minutes of a monthly meeting, likely to be July 1915]

Mr. Gibbs said that *A.iris* formerly occurred in Hertfordshire, and that Stephens in his 'Illustrations', recorded its presence near Hertford in July, 1833. It was reported to still linger on in the county, and Dr. A. H. Foster of Hitchin, had informed him that he had seen a specimen in 1899 or 1900, just outside Hitch Wood. Gamekeepers in some of the large Hertfordshire woods confirmed Dr. Foster's statement, for they said very positively that they occasionally saw a large purple butterfly, settling on dead birds, rats, etc., hanging in their "larders." Mr. Gibbs much hoped to be able to report some day the capture of *iris* in a locality so near to London.

Letchworth Naturalists' Society Lepidoptera Report for 1915

[Read at a meeting held on 14th March 1916 by Dr. A. H. Foster and transcribed from handwritten notes]

"Another great rarity on our list is the king of all British Butterflies the Purple Emperor: this splendid Butterfly used to occur at Hitchwood but has not been seen for many years. I have had the pleasure myself of seeing one specimen on the road to Whitwell which runs by the side of the wood many years ago. The Purple Emperor has also been taken in the wood near Southill; I have in my own collection two specimens from this locality, whichwill be placed in the cabinet..."

Image 3.2.1 ~ Copy of the original document

Transactions of the Herts. Nat. Hist. Soc.; Vol. XVI [1916] A list of macro-lepidoptera occurring in North Hertfordshire with notes on each species by A. H. Foster

Apatura iris – Purple Emperor

This, the king of British butterflies, is I am glad to say to be included in our list. It occurred in Hitch Wood, especially at the top border of it, near what is called Stagenhoe Lane, until comparatively recent years. I remember seeing, about twenty years ago, a specimen of this beautiful butterfly settle on some droppings in the road running by the side of the wood. I was driving with the late Mr. Frank Latchmore at the time, and he stopped the trap, got out and tried to capture the butterfly by putting his hat over it, but failed. I have also another record of *iris*. Mr. Darby of Knebworth states that his brother, in company with a Mr. Edmunds, took one or two specimens in either 1882 or 1883 in one of the woods in the Walkern district.

The Natural History of the Hitchin Region [1934] *Butterflies and Moths* in Hine, R. L. (Ed) by A. H. Foster

The Purple Emperor (*Apatura iris*) has been found in our district, but it is now believed to be extinct; fifty years ago this gorgeous "king of British butterflies" might have been met with in Hitch Wood, Knebworth Woods, St. John's Wood near Walkern, and in the Southill and Warden Woods.

Note ~ Southill and Warden Woods are in Bedfordshire (Arnold *et al.*).

Transactions of the Herts. Nat. Hist. Soc.; Vol. XX - Part 4 [1937] *A list of the lepidoptera of Hertfordshire* by A. H. Foster

Apatura iris, Linn.

Hertford (Stephens), *Illus. Brit. Ent.*, Haust., vol. iv, p. 381; St. John's Wood, Walkern (Matthews); Hitch Wood, Hitchin "formerly" (C. Lucas, S. Lucas, Latchmore, Pryor, Foster); Oxhey Wood nr. Meesden "six specimens flying over tree tops during two days in 1878, 1879, or 1880" (Gifford-Nash) [see notes on Oxhey and Gifford-Nash below].

Annotated notes, at North Hertfordshire Museum's Lepidoptera Archive, from Foster's own copy add: '*Hitch Wood, Hitchin "one seen" H A Course*.' This does not appear to be referred to in any other historical documents to our knowledge.

Notes on Oxbury Wood and Gifford-Nash (1878, 1879 or 1880)

Whilst researching the north-east Hertfordshire area, some interesting information emerged. Brian Sawford found details of the Oxbury sighting in Foster's *List of Hertfordshire Lepidoptera* (1937), and wrote in his notes 'Oxhey {sic = Oxbury} Wood, nr Meesden (Gifford-Nash)'. However, on referring to the 1883 Ordnance Survey map (www.old-maps.co.uk), the wood was then called Hawksbury Wood. Colin Plant referred to the same sighting in *The Butterflies of London* as being in Oxhey Woods, near Northwood, which sounds plausible as de Worms mentions sightings there in the 19th century (3.2). But Foster definitely said '*near Meesden*' and Colin acknowledges this as correct.

Our first attempts at finding a Gifford-Nash, born in Hertfordshire or Essex, through the 1901 Census website were unsuccessful. However, whilst visiting Brian Sawford, we were looking at Hine's Natural History of the Hitchin Region, when we saw an entry from Gifford-Nash of Adonis Blue at Barton. There were also entries referenced to Gifford-Nash in the Foster 1937 list, and under the list of contributors was the late Dr. W. G. Nash. Returning to the 1901 Census, and simply putting in Nash as opposed to Gifford-Nash, with a keyword of Bedfordshire rather than Hertfordshire or Essex, produced a manageable list of about 50 entries. This included a Walter G. Nash, aged 38 and born at Berden in Essex, who later became a Physician and Surgeon. Berden is a few miles south-east of Oxbury Wood and further research found he had two brothers and three sisters living in 1901. It seems reasonable to assume that Gifford-Nash told Foster of his recollections of seeing *A.iris* during a walk through Oxbury Wood as a teenager in the late 1870s. Foster may have made a simple mistake in referring to the wood as Oxhey, as Gifford-Nash may not have written it down, and the exact year could not be recalled because of the time elapsed. The present owner of Oxbury Wood is also aware that it used to be called Hawksbury Wood.

At this point we should add that we were totally unaware that Charles Baker had fully researched the history of Gifford-Nash for the Butterflies and Moths of Bedfordshire (Arnold *et al.*). Charles informs us that there is a picture of Gifford-Nash hanging in Bedford Hospital where he worked, and where a ward is also named after him. Charles adds: '*There were only a few Gifford-Nash specimens in Peter Crow's*¹ collection in Glasgow. The most I saw were at the Oxford Museum Services at Standlake. The story behind this is rather sad. The Nash collection was sold in 1936, I'm not sure to whom. I have a photocopy of the sale catalogue which mentions "3 iris" ² but no data. At least part of the collection ended up with the British Entomological and Natural History Society. Evidently they didn't want it all and what they didn't want was put into their surplus drawers for disposal to members. That I understand was the route by which specimens got into the Crow and Oxford collections.'

¹ P. N. Crow lived in Harpenden and his collection was looked at for Bedfordshire specimens.

 2 We are fairly sure they would not have been Hertfordshire specimens, as he would almost certainly have told Foster if so.

The Boys and the Butterflies by James Birdsall [1988]

John Birdsall also wrote of **Tingley Wood**, near **Highdown**, '*Tingley Wood*, near Highdown, was another splendid oak wood where the Purple Emperor was reputed once to have flown, but we never saw it there. A grand butterfly wood, though it never yielded anything that we hadn't already met nearer home.'

We are not aware of any other notes or records which may support these comments.

3.3 ~ Further notes on later sightings of *A.iris* in Hertfordshire and adjoining areas, many previously unpublished, and some concerning additional records

Purple Emperor *Apatura iris* in Broxbourne Woods ~ 1940s and 50s [tetrad centred on TL3408] *by Tom Gladwin*

Thank you for your letter of the 7th December 2002 which was awaiting me on my return to Digswell yesterday. The rediscovery of the Purple Emperor in Broxbourne Woods is good news indeed.

My childhood home was close to the eastern boundary of Hertford. It was from there that my grandfather and father used to take me on regular - mostly weekly - nature walks in the surrounding countryside. In my contribution titled 'Where have all the sparrows gone' in *Enjoying Wildlife* (1988. Training Publications Limited) I wrote 'Later, in June, we would picnic in Broad Riding Wood (Broxbourne) enjoying purple emperors, fritillaries, hairstreaks and other butterflies'. The term Broxbourne Woods was then used locally to refer to the whole of the mosaic of woodlands between Broxbourne, Hoddesdon and Brickendon and I have continued to use it to mean the same in my various communications and writings.

In spring and summer we would often walk from Hertford to Monks Green, descending through Brambles Wood to our regular picnic spot in Broad Riding Wood. We would then continue on a near circular route returning to Monks Green through Cowheath Wood. The felling and replanting with conifers did not take place until after the war. Thus birds such as Wood Warblers and Redstarts still bred in most of the deciduous units. I have a vivid memory of watching Purple Emperors in both Cowheath and Broad Riding Woods in 1945 particularly. I had been shown them there in at least two of the war years but I cannot remember which. My family always maintained that it was in Broad Riding Wood, where there were sallows along the main ride, which had the largest numbers and we would picnic there specifically to see them, nearly always males, come down to drink at small puddles along that ride. I remember my father watching the tree-tops for them and it was always assumed that they were breeding there. Certainly we saw them every year from 1945, possibly earlier, until 1950. We didn't count them in those years.

By 1953 1 was keeping proper field records and the statement in Brian Sawford's *The Butterflies of Hertfordshire*, covering the years 1953 to 1956, is taken from those notes. I only made a single visit in 1955 when on leave from National Service in the Royal Navy. The species probably persisted long after 1956 when my interests turned to bird ringing at Rye Meads.

I have marked your map, returned herewith, with a red 'x' at the points where we variously saw Purple Emperors in Broad Riding and Cowheath Woods over the years. The Brambles Wood site was west of the ford and close to Spital Brook, and hence contiguous with the Broad Riding one, but I cannot be precisely sure where. Because of their proximity, we always assumed there was just one aggregation around common boundaries to Brambles Wood, Cowheath Wood and Broad Riding Wood.

Although he looked for them expectantly, my father never found Purple Emperor in Hoddesdonpark Wood.

I did at sometime make these observations available to the then recorder Mr. Bell but his rather dismissive response was a little hurtful particularly in view of the time enjoyed by my family pursuing natural history interests in the woods, and their considerable knowledge of them.

We asked Tom if he remembered his father or grandfather mentioning seeing A.iris before the 1940s.

My grandfather moved to Hertford, where he already had friends, in 1916. Whenever time permitted he continued his interests in natural history. His daughter Audrey Campbell (my aunt) born in 1913, particularly shared his enthusiasm, and continued to be actively interested in natural history, particular in botany, thereafter. Still alive, she lives in Dorset where she moved with her second husband some 25 years ago to continue his interests in the botany of that county. I know she was taken on several occasions, with my father, to see the Purple Emperors in Broxbourne Woods during her school years and I will seek more information from her when I visit her in March. In the meantime I know my father saw them in 1924, as he found a Wryneck's nest that year which he remembered as being the year before his younger sister was born. Of course my grandfather must have known about them before then but this does give you a certain date.

Tom Gladwin December 2002 and February 2003

Transactions of the Herts. Nat. Hist. Soc.; Vol. XXIV (Bell 1953)

Report on Lepidoptera observed in Hertfordshire in 1950 and 1951 by P. J. Bell (Recorder for Lepidoptera):

"....while R. S. Fer[r]y reported the White Letter Hairstreak (Strymon w-album) and the Purple Emperor (Apatura iris) – a pupa – from Knebworth Woods."

Purple Emperor at Knebworth ~ **1950** [tetrad centred on TL230230]

~ of Roger Ferry

In February 2003, whilst visiting the North Hertfordshire Museum's Lepidoptera Archive, amongst the collected material, there was a loose-leaf folder probably compiled in the 1950s, which had individual pages each detailing a species of lepidoptera found in Hertfordshire. The page for Purple Emperor noted all those sites listed in Foster (1937), as well as the entry relating to the pupa found by Roger Ferry in Knebworth Woods in 1950 (Sawford). However, the entry had been annotated to read 'EMPEROR MOTH'. This led us on an extended trail to try and find the original diary and the primary source of this record. We know that the secondary source of this record came from Bell (1953) in his *Report on the Lepidoptera observed in Hertfordshire in 1950 and 1951*, and it definitely says *Apatura iris*, but it is not clear why the entry was changed to read 'Emperor Moth'. If we could find the original diary, we could see when the entry was made, as the timing of the life-cycle of each species is different. We asked Colin Plant if he would send out an email to the Herts Moth Group, asking for any information on Roger Ferry or if anyone knew the whereabouts of the diaries. Responses were received from Trevor James, Tom Gladwin and Charles Baker, who were able to confirm that his collection and notes were given to the Welwyn and Hatfield Museum. However, we also had a reply from John Tomkins who sent us the following email, with news of a sighting of Purple Emperor that to our knowledge has not previously been published.

John Tomkins' response to an email sent out to members of the Herts Moth Group:

Saw your request for info on Roger Ferry on the Herts Moth Group. I used to take Roger out on Beetle trips when he was in his eighties! I was in my twenties at the time. He was a coleopterist but with a keen interest in all aspects of entomology. At the time he lived in Fulling Mill in Old Welwyn. He often talked about insect sites and mentioned Watery Grove (part of Knebworth Woods) as a site for Apatura. He said that he once saw two specimens feeding on a rotting rabbit carcass there. The wood still remains fairly unchanged today. It was in the 1930s a very good site for Fritillaries and the Foster collection in Hitchin Museum had several specimens from there in it. I regarded Mr. Ferry as a very respected entomologist and see no reason to doubt his record. Hope these notes are of some help!

Best wishes John Tomkins

February 2003

We visited the Welwyn and Hatfield Museum in February 2003, but unfortunately, the only diary in their collection is that of the 1944-1946 period and then only a copy, not the original. We are still trying to find out if the family retained the diaries, and whether they still live in the area. We did find Roger Ferry's notes on the butterfly species seen and caught in Hertfordshire, and again the entry for Purple Emperor was unusual. Whereas for all the other species, details and dates of sightings and collections were given, the entry for Purple Emperor just said 'NHHR page 123'. This is a reference to '*The Natural History of the Hitchin Region*' and details the status of *A.iris* in 1934 as written by A. H. Foster (3.2), and makes no mention of the pupa or sighting.

Other communications have given us a clearer picture of this respected entomologist, including a letter from Peter Waterton, but we still would like to see the original diaries. Having seen the 1944-46 copies, they would almost certainly make very interesting reading.

Letter from Peter Waterton, County Lepidoptera Recorder for a period beginning 1976:

During my short time as Herts. Lep. Recorder, I do not recall receiving any reports of Purple Emperor and I certainly did not change the entry by Roger Ferry whom I met and who was a very competent entomologist. I have gone through my notebooks from 1970 onwards but cannot find any Purple Emperor sightings by me or given to me. Glad to know it is still around! Sorry I could not be of more help.

Best Wishes Peter Waterton, March 2003

Although Brian Sawford wrote '*Roger Ferry, in his diary, notes the finding of a pupa in Knebworth Great Wood in 1950*' (Sawford), the entry in the Trans. Herts. Nat. Hist. Soc. (Bell 1953), referred to in Brian's notes, says that he (Bell) had received a report from R. S. Fer[r]y. It may be that there was no diary entry and that Ferry had simply informed Bell. Also mentioned in the same entry in the transactions (Bell 1953) is a report of a sighting of White-letter Hairstreak, suggesting Ferry may have informed the Recorder of both occurrences together, in all probability both relating to June and the time a Purple Emperor pupa could be found. We may never know why the entry was changed but our feeling is that Roger Ferry found a Purple Emperor pupa at Knebworth.

Purple Emperor larva on willows at Stapleford ~ August 1954

K. Wheeler

According to Brian Sawford's notes a Purple Emperor larva was found on willows at Stapleford by K. Wheeler in 1954. This record was not discussed in 'The Butterflies of Hertfordshire' (Sawford) but was shown on the distribution map. We wrote to Andrew Harris who, as Newsletter Editor for the Hertfordshire and North Middlesex Branch of the British Naturalists' Association, was able to find in the Branch archives the original bulletin with this report.

Extract from the British Naturalists' Association (Hertfordshire and) North Middlesex Branch Bulletin No. 13 February – June 1954 [p.13]

MEMBERS' NOTES

I think members may be interested to know of a record which is not entered in the Woodhall Park ramble¹ on the 22nd August 1954 [1953]. The record is of a fully grown caterpillar of the Purple Emperor Butterfly which I found on a Sallow bush (near the Church where the Bistort was found). Being a little inexperienced at the time (not knowing what it was) I put it in my pocket and hoped It would stay there but unfortunately it disappeared! I didn't tell anyone what I had found because I was so furious with myself when I found out the prize I had let slip through my fingers.

This may be a breeding place for this species as the oak woods it frequents are near at hand, and also the sallow for the larva, so when we ramble there again in late August we must keep our eyes open for this 'Queen of the Woods' soaring high above the tallest oak.

I wonder if this is a new record for Hertford or has such a butterfly been found before???

K. Wheeler

¹ refers to a report in Bulletin No. 12 ~ August 1953 – January 1954 [p.2]

It seems unlikely that a caterpillar would have been full grown near the end of August when any larvae would be in their early stages, as the flight period (Chart 4.3) indicates pupation in June or early July. We would need some description of the larva to include this record in our tables (9.1).

Symondshyde Great Wood [tetrad centred on TL195108]

Ian Woiwod mentioned a recollection he had about being told about someone who tried to attract A.iris to the ground at Symondshyde Great Wood. We asked him what he could remember:

You put me on a spot and I am trying to rack my brains about what I was told and by whom. I think the story either came from Vic (V.H.) Chambers or Roy (R.A.) French both well known deceased entomologists so I can no longer check. It was about a keen naturalist/lepidopterist who used to live in Harpenden and possibly worked in Wheathampstead and that he eventually moved away to Wales. All I know for certain was that he was keen enough to get a bucket of animal dung to take to Symondshyde Wood to try and attract Purple Emperors. As far as I know he was unsuccessful. I guess that the event would have been in the late 1960s or early 1970s. What prompted him to do this I do not know, whether he had a possible sighting or just thought the site suitable at that time I just don't know?

Not very helpful I'm afraid. I wish I had paid more attention at the time I was told.

When suggested that the person might have been P. N. Crow, who lived in Harpenden and whose collection is at the Kelvingrove Museum in Glasgow, this was Ian's reply:

That sounds very much like him. Peter Crow was almost certainly the name, and looking at what was written by Charles Baker [*The Butterflies and Moths of Bedfordshire*, Arnold *et al.*, 1997] the incident might have happened in the late 1950s rather than the late 1960s. It might well be worth looking through his collection (if anyone is ever in Glasgow) and at his obituary (Baker, B.R. & Morgan, M.J. (1989).

Regards Ian June 2003

We had already been in touch with Richard Sutcliffe of the Kelvingrove Museum, when we were researching Gifford-Nash (3:3), and Richard had confirmed that there were no Hertfordshire *A.iris* in P. N. Crow's collection. Charles Baker has also confirmed that there is no mention of Symondshyde Great Wood in the obituary.

Purple Emperor at Northaw Great Wood ~ early 1960s [tetrad centred on TL290040] *by Jonathan Jack*

Jonathan Jack saw a Purple Emperor in Northaw Great Wood (Sawford) in the early 1960s. We emailed Trevor James who had been credited with the sighting and this is what we found out.

As for the report in Northaw Great Wood, Brian [Sawford] was mistaken in thinking it was my record. It was actually made by a friend: Jonathan Jack. He reported seeing it sitting on a frond (of bracken?) along the main E-W ride of the wood, I think at about TL279044. Interestingly, this ride was, even then, quite open, and had some good oak trees beside it, as well as one of the stronger patches of old *Salix caprea* down by the stream nearby! At the time no one believed him, but looking back on it, he was quite adamant it was not a White Admiral (which was then apparently extinct in the wood!). I can pass you down to him for any extra info, if you like, as I am still in regular touch! Tell him I passed you on! He also keeps good field notes, and is bound to have the original details.

Trevor James February 2003

And this is **Jonathan Jack's** response:

I was excited to hear about the presence of Purple Emperor at several sites in Herts in recent years, as well as the White Admiral.

I can certainly confirm my sighting of a Purple Emperor in the Northaw Great Wood in the early 1960s. I have gone through my old notebooks where I wrote up my field notes all those years ago. Unfortunately, the entry for July 1963 reads "Field notes lost". I am almost certain that that was when I saw the Purple Emperor (I could find no reference to it elsewhere). Moreover, I remember 1963 as being an exceptional year for butterflies, following the severe 1962/63 winter which killed off many parasites.

However, I do have a very clear memory of the occurrence. The location on the map you enclosed is exactly right. I remember seeing the insect glide down to settle on vegetation at about chest height. I managed to approach it very slowly to within about 18" before it finally flew off. It settled in the full sun, and I was able to see and enjoy the beautiful purple sheen on the wings. I can't remember the exact time of day, but it was probably late morning

I had the privilege, some years ago, of seeing the first Plain Tiger to be observed in mainland France. I was asked to write an article on the occurrence in the French review ALEXANOR. I'm enclosing a copy of this article, in the hope that you can understand French.

With best wishes for your continuing work and research.

Yours sincerely, Jonathan JACK February 2003

Notes on A.iris in the catchment area of Northwood, Ruislip Common and Oxhey Woods

The biennial reviews of London's Lepidoptera published in The London Naturalist Resumé of the macrolepidoptera of the London Area for 1966 and 1967 – C. G. M. de Worms (1969)

⁶Of the captures of exceptional interest by far the most remarkable was that of a male Apatura iris L. (the Purple Emperor) in July 1966 near Northwood by young Mr. J. Majerus. It is probably the first for MIDDLESEX this century, since it died out apparently from the Oxhey area in the last decade of last century.⁷

Northwood, border of Hertfordshire and Middlesex, probably July 1966 [TQ087922] *by Mike Majerus*

Goodness me, but now you are really taking me back. This is from memory, although, even back then I kept notebooks and it must still be somewhere, although it might take some time to find, probably in the attic. Anyway, from memory, it was in the grounds of St. Martins School, off Moor Park Road, Northwood. It was I think between 11 and 12 in the morning, sunny, near the end of the summer term, so probably early July. I was in a maths lesson with Mr. Wigham teaching, and this large butterfly flew past. To Mr. Wigham's amazement, I excused myself, went to the lobby and got my spring-loaded net, and went after it. I had to chase it across the playing fields and it eventually alighted low down on an oak branch and then on dog pooh on the public footpath that runs through the school. If I remember correctly, that footpath marks the boundary between Middx and Herts. The school buildings are in Middx. I netted the butterfly. It was a small male. I still have it. When I get time I will go through my old collection and find the exact date. From memory, I cannot even be sure of the year, but I think I was in form 4BI, as I would have been 12. That would make it 1966, but possible it was a year before. I can check that. For a young lad it was a red-letter day, hence the memorability.

I am very glad to hear that the butterfly is doing so well in the area. I do not recall how the Baron [Baron Charles de Worms] got to hear of it. I probably mentioned it at a meeting of the then South London Entomological and Natural History Society. It should be in the minutes of their meetings if so. Anyway, The Baron gave my mum an awful surprise turning up at the front-door of our house in Nicholas Way, Northwood, wearing a dress shirt with high wing collar, and asking to see Master Michael Majerus. I recall showing him the specimen. He remarked that it was rather a small male. Mike Majerus

March 2003 (referred to in Plant, 1987)

We have at Colin Plant's suggestion written to Eric Classey, who spent many hours looking for moths in the nearby Oxhey Woods [TQ105925], near Northwood. He collected many specimens and we wondered whether he ever saw A.iris, and this was his reply:

Thank you for your letter of 3rd February [2003] and apologies for the delay in reply - but I am now semi-retired and have just collected your communication from the office.

I regret to say that I am unable to help you as my work in and round Oxhey Woods was very largely confined to moths.

Not very much time was spent there during the daylight hours, when the Purple Emperor was likely to be encountered, but I am of the opinion (no more) that, given the nature and condition of the woods during the 3^{rd} , 4^{th} , 5^{th} decades of the 20^{th} century, its presence was highly likely.

I am very interested in your present survey and would greatly appreciate a copy of your report when it appears.

One looks back on the past and regrets the opportunities which were lost for simple observations of the kind you seek ... how easy it would have been for me to have gone there by day - just a simple and inexpensive journey on the "new" Underground line from Queens Park station to Carpenders Park Halt. BUT ... how could one have forseen the dramatic loss of countryside and of species of animals (especially invertebrates) and plants. We were young and the World was our oyster - change was not forseen.

With best wishes,

Eric Classey February 2003

The woodland complex surrounding Ruislip Common, 1999-2002

The exciting discovery of a colony of *A.iris* in the complex of woods around Ruislip Common is described in detail in the *Journal of the Ruislip and District Natural History Society No. 31* (Butterfly Report for 1997-2001, George, 2001). Table 3.2.1 lists the observations given in this report, and includes further sightings in 2002 reported to the Hertfordshire & Middlesex Branch of Butterfly Conservation.

Table 3.2.1 ~ Sightings of *A.iris* in the Ruislip Common woodland complex, 1999-2002

Date		Number
1999	5 th July	1
2000	15 th July	1
2000	20 th July	1
2000	22 nd July	1
2001	24 th July	1
2001	29 th August	1
2002	14 th July	1
2002	19 th July	1
2002	21 st July	1
2002	17 th August	1
	-	

Houndswood, near Radlett, Hertfordshire, probably 1970s [tetrad centred on TL170010]

Tony Clancy saw a Purple Emperor circling trees in the Houndswood area near Radlett, probably in the (late) 1970s. Although Tony is no longer sure of the exact date, his report may not have been accepted at the time because the species was not considered to exist in the area.

St. Ippollitts ~ 7th September 1976

A. G. Cox

According to Trevor James, the record at St. Ippollitts from Mr. Cox was a personal report to the North Hertfordshire Museum's Natural History Department and was referenced in the Day Book of the Department. It was included in Brian Sawford's notes but not included in his book. It's worth noting that St. Ippllotts is less than 2 km from Hitch Wood where *A.iris* has been present in the past (3.2; 7.2).

Purple Emperor at Astonbury Wood, 1978 [TL277213]

Jonathan Crozier

According to Brian Sawford's notes, Jonathan Crozier saw a male *A.iris* on 13th August and a pair on 20th August 1978 at Astonbury Wood near Stevenage. At the time of writing we have been unable to trace the original source of these records despite extensive searches of old reports and papers. We understand that Jonathan was an active younger member of the Stevenage Zoological & Wildlife Preservation Society. We would like to contact Jonathan, as an account of his 1978 sightings would of great interest. Our search will continue but any help would be appreciated.

Purple Emperors in the Hertfordshire/Middlesex/West Essex (M25) catchment area, 1970s and 1980s by Martin Catt - resident in Enfield 1955 to 1989

A good field naturalist will find them if they are there, but you must get the timing and weather right and take a good thumb-stick and binoculars. They can be difficult to find even where they are "common". Individuals can spend over 9 hours sitting on the same leaf, even in ideal conditions. Well-wooded hedgerows and scrubby willow habitat is as good or better than "proper" woodland. They turn up most often when you stop looking for them and try hunting for something else. They do not need a master oak, and they do not read what the "experts" say about them!

My **Epping Forest** [Essex] reported sighting [1983] is as in Colin Plant's *Butterflies of the London Area* [Plant 1987]: a male taking up moisture/minerals from a puddle-edge in the car-park of the Volunteer Pub [TQ412997, near Honey Lane Quarters]. A total of eight other sightings of adults were made by me in this area up until I moved away in 1989. This represents approximately 180 hours of field-work. I did not look for other stages but found suitably damaged food plant leaves in the area. [Note – 22.5hrs field-work for each sighting]

A work colleague found a dead female Purple Emperor at home inside the house in **Epping Town** [Essex] in September 1987.

In 1976 I was shown a dead male Purple Emperor found by the park-keeper in his shed at **Whitewebbs Park** [Middlesex TQ328999].

The woods north of the M25 and south of Goffs Oak should still repay diligent and careful fieldwork. They were known to be in the **Broxbourne Woods** complex (1980s at least), but access for me was difficult.

Readers of this report may be interested in my rules (3; 5) of wildlife study and recording – "absence of evidence must not be taken as evidence of absence" and "many wildlife books are written by readers rather than watchers – repeating errors increases their value as facts". © 1975 Martin Catt

Martin Catt December 2000

Purple Emperor at Broxbournebury, 1992 [TL 357068]

by Trevor James

In addition to helping with us with our research, and giving us information on Roger Ferry, Jonathan Jack and Jonathan Crozier, Trevor also had a probable sighting on 11th August 1992 at Broxbournebury as follows:

My notes actually say: "one large dark butterfly with white wing markings, [flying] round oaks. Steady, strong flight, high up...sallows nearby".

My recollection was of a butterfly larger than a Peacock, and it was cruising round the canopy of one of the remaining large old pollarded oaks beside the gravel pit at Broxbournebury (TL357068), in an area with bracken and scrub. The series of old fish ponds, with attendant sallows are adjacent to this area.

The time of day would have been some time in the early-mid afternoon! How's that for recall! I know it was not early in the day, because Martin Hicks and I had gone there rather late to do a quick site survey to defend the site from extraction.

Trevor James February 2003

Sighting of Purple Emperor in Broxbourne Woods, 1994 [monad centred on TL345085]

by the late Robert J. Kiln

I am 74 years and have been observing butterflies over 60 years but not in a serious way.

On the morning of August 2^{nd} 1994 I was walking Roman Ermine Street south of Goose Green in Broxbourne Wood, Hertfordshire. Just north of the Spital Brook I saw the butterfly in bright sunlight at around 10.30 a.m., temperature 26° C.

The area is heavy clay with surface water and horse droppings in places. The trees are deciduous, mainly oak with hazel and willow: ground cover grass, reeds, thistles.

The butterfly was on the west side of an open ride. At first sighting, about 25ft or so, I thought it was a large blue dragonfly. However, I approached to within 5/6 feet. The butterfly was gliding about 3ft above the ground and I had a clear view of its upper wings. It moved in strong glides across the foliage with little wing motion, very graceful. Its size was about that of a Peacock but wings angular, almost pointed white patches, but with unmistakeable iridescent blue, almost electric in the sunshine. For about a minute or so I watched it and then it was off up into the oak tree wood with a strong flight. I had no camera and could not observe it at rest.

I cannot see what other butterfly it could have been. A White Admiral is possible, I suppose, but I have observed two or three before and never seen a blue colour.

I have no doubt that I have been very fortunate in seeing a male Emperor!

Robert Kiln August 1994

Sighting of Purple Emperor in Broxbourne Woods, 2nd August 1997 [tetrad centred on TL330070] *by David G Darrell-Lambert*

Broxbourne Woods is a painful place to be when little is happening. I was looking for Common Crossbills and had seen one flock but they disappeared as quickly as they appeared. To compensate for this I was trying to photograph the butterflies and dragonflies sunbathing on the path. Moving on I had started scanning the tops of the trees for Crossbill and just as thought it was too hot, a large butterfly flew down past my head and landed on a small tree. The only large butterfly I knew of that size was a Swallowtail and this clearly wasn't one. It was dark with a white stripe going through the wings and as it flew pass me I saw a purple sheen. I didn't have the foggiest what it was, so I called my Dad. He told me it had to be a Purple Emperor. By now it had disappeared up a tree. Later I saw some White Admirals which were smaller and lacked the purple sheen.

David G Darrell-Lambert April 2003

3.4 ~ Extracts from the Hertfordshire & Middlesex Branch of Butterfly Conservation's Annual Butterfly & Moth Reports for 1995 ~ 2000

Full details of all reported sightings in Hertfordshire in 2001 and 2002 are given elsewhere in this report.

Hertfordshire & Middlesex Butterfly & Moth Report for 1995

John B. Murray

Purple Emperor

There were no sightings of the Purple Emperor in the two counties in 1995. This is slightly disappointing after a sighting of a single male from a previously unrecorded site in 1994. The 1994 sighting was the first in 11 years, so the possibility of clandestine releases cannot be ruled out, but hopefully this elusive species is still hanging on in an area where it was once more secure.

Hertfordshire & Middlesex Butterfly & Moth Report for 1996

John B. Murray Purple Emperor Sole record: July 16th in South Hertfordshire (Howard & Mary Dixon) Number seen: 2 Mean index of abundance: ? Change in abundance since 1995: None seen in 1995 Recorded in: 1 tetrad (0.2% of those covered)

It is a pleasure to report some excellent news for this species: a sighting of two males in southern Hertfordshire. Because this butterfly seems to attract irresponsible collectors like no other, it has been decided not to publish the exact location of this sighting of a species which is protected by law. Howard and Mary Dixon write as follows: "On the 16th July 1996 (early afternoon) whilst ... looking for White Admirals - which we do every year since we first saw them in these woods 4 years ago, we initially saw some 5 White Admirals and suddenly noticed another slightly larger butterfly with purple catching its wings, followed by a second. They had apparently flown down from a nearby oak tree. We watched them for about 15 minutes flying up into the tree and back down. Being fairly new to butterfly watching we did not realise the significance of this until we mentioned it to a friend who is knowledgeable about butterflies..."

This is only the 15th report of Purple Emperors from Hertfordshire and Middlesex since the beginning of the century, and the 5th since 1970. Recent sightings have been in 1985, 1986 and 1994, all in different woods from the present sighting, where the butterfly has not been recorded before. However, the butterfly is notoriously secretive and usually extremely difficult to observe, spending most of its life above the tops of the trees in heavily forested areas, so small colonies can exist for years without detection. Always keep a look out for it in any well-wooded area in mid- to late July, and you may be lucky. As with other scarce species, it is always possible that released specimens bred from stock from dealers, which are easily obtainable, have been responsible for this sighting. If you breed butterflies and release them, please read the section on Silver-washed Fritillary in last year's report (Murray 1995), and also please inform our Society of any such releases in the past. Similarly, if you know of others who are releasing rare species in Hertfordshire, please keep us informed, as sightings of these can be very misleading.

Hertfordshire & Middlesex Butterfly & Moth Report for 1997

John B. Murray & Rob Souter Purple Emperor Sole record: August 2nd in South Hertfordshire (David G Darrell-Lambert) Number seen: 1 Mean index of abundance: ? Change in abundance since 1996: not significant Recorded in: 1 tetrad (0.2% of those covered) Range change since 1996: 0%

There is more good news for the Purple Emperor, with a sighting of a male by David G Darrell-Lambert on 2nd August. As last year, the sighting was a chance encounter, by someone unfamiliar with butterflies. David is a birdwatcher who saw the butterfly whilst looking for birds, and did not realise the significance of the sighting until he mentioned it to his father. As last year, it has been decided not to advertise the precise whereabouts of the sighting, as this insect is greatly prized by collectors, despite the fact that it is now a nationally scarce species that is declining. In a recent improved Red List for Great Britain (Warren *et at* 1997), the Purple Emperor is the rarest butterfly nationally that still survives in the two counties. The sighting in southern Hertfordshire was 1.5 km from the 1996 sighting of 2 males, and 2.5 km from Robert Kiln's 1994 sighting, so unless someone is persistently releasing bred specimens, it seems that a small colony must be surviving somewhere in the area

Hertfordshire & Middlesex Butterfly & Moth Report for 1998

John B. Murray & Rob Souter Purple Emperor

There were no reports of Purple Emperor from our area in 1998. It is well worth taking binoculars with you to search for this species in well-wooded areas in late July and August, when the Purple Hairstreak is also on the wing, as both these species tend to stick to treetop level. Alternatively you could try the old Victorian trick of enticing them down to ground level with rotting meat or a decomposing carcass if you have one handy.

Hertfordshire & Middlesex Butterfly & Moth Report for 1999

John B. Murray & Rob Souter Purple Emperor *First seen:* July 6th in South Herts (Andrew Middleton) *Last seen:* July 30th at Tring (Jenny Hoare) *Peak date:* July 10th *Maximum number seen:* 1 at all locations *Mean index of abundance:* 1 *Change in abundance since 1998:* more than 100% increase *Recorded in:* 3 tetrads (0.5% of those covered) *Range change since 1998:* Not recorded in 1998

Probably the best news of the entire Millennium Atlas effort comes in its final year: the discovery of at least two new Purple Emperor sites, one clearly a breeding colony. The first sighting came from Andrew Middleton, during his systematic search, mentioned above¹ of the unvisited tetrads in July looking for White Admiral in the Broxbourne area and further afield. His discovery is a splendid lesson that if you want to see something extraordinary, search some unexplored tetrads. Whilst walking in a well wooded area on July 6th, he saw a large insect, easily the size of the Red Admiral he had just seen and probably larger, land on the roof of a building nearby. He writes: "I raised my binoculars to look at the insect at about 15 metres distance, and could not really believe what I saw. The insect took off up to the tree tops. then dived down again and re-settled, again with its wings closed. The insect flew off strongly and upward and then resettled on the roof about 5 times, before it finally disappeared up into the trees, in all the sighting lasting perhaps 5 minutes at the most. The combination of having seen 20 or so White Admirals in the previous 10 days and having watched Purple Emperors elsewhere in England in other years left me convinced that this was a Purple Emperor. Sallows bordered the woods in several areas, some large ones were also in the wood, particularly through an old coppice, with more along adjacent hedgerows." He returned three more times on July 10th, 12th and 25th, and saw a Purple Emperor again on the 10th and probably the 25th. The sighting on the 6th beats the previous record of earliest sighting of July 25th 1985. The area is private land, and the owner has seen Purple Emperors there over the past ten years, having lived in the area for several decades. His son took some photographs in 1995. He has asked for the location not to be revealed.

The second sighting came from Brian Jessop at Tring Park, and has been described in the December Newsletter. He noticed a butterfly being chased by Ringlets or Meadow Browns. "It settled on the bare ground and I crept slowly to within 3 or 4 feet of it and my brain was telling me it couldn't be what my eyes were seeing. There in all its glory, was a perfect, beautiful PURPLE EMPEROR!! - the first l had ever seen" (Jessop 1999). He watched it on the ground, apparently probing for minerals and turning around on the spot "just like Hairstreaks do but without the wing rubbing". Luckily Brian had a camera, but with only one shot left on the film he didn't dare get too close. Nevertheless, the characteristic underside of the Purple Emperor is plainly visible [see centre pages of 1999 report]. It was especially pleasing that this sighting was recorded on the transect, and means that we now have transect data for 38 species of butterflies in the two counties over the past five years. The final sighting was even more surprising. It was in a garden in Tring, less than a mile from Tring Park. Jenny Hoare writes: "I saw the butterfly mid-afternoon, on 30th July 1999, a very hot still day, settling on grass which was wet from children playing..." Jenny's photograph [see centre pages of 1999 report] shows the strange sight of the Purple Emperor and the children's toys.

These three sightings suggest that unlike its relative the White Admiral, the Purple Emperor had a good year. More fundamentally, it suggests that this butterfly, the only one in our area of Nationally Scarce (Notable) status (Warren *et al* 1997), is surviving as a breeding species in 2 or 3 areas of Hertfordshire, and may have increased since Sawford's (1987) survey.

¹ White Admiral report for 1999.

Hertfordshire & Middlesex Butterfly & Moth Report for 2000

John B. Murray & Andrew Wood Purple Emperor *First seen:* ?July 3rd at Broxbourne (Andrew Middleton) *Last seen:* July 26th in South Hertfordshire (Elizabeth Goodyear) *Peak date:* July 17th *Maximum Number Seen:* 4 at South Herts on July 17th (E. Goodyear & A. Middleton) *Mean Index of Abundance:* ? *Change in abundance since 1999:* ? *Recorded in:* 2 tetrads (0.6% of those covered) *Range change since 1999:* 4% expansion

Once again, an eventful year for the study of this species in our area, with the discovery of yet another colony. Andrew Middleton started with a probable sighting in one of its old stamping grounds on July 3rd: "...large dark insect with white wing bands flew towards me and along the ride by Cowheath Wood, and passed me at about 5 metres, below head height, and flew further along and then over the trees... too large for a White Admiral (several just seen) and it flew more erratically - without the glides". Although observations in suitable conditions at the South Herts. location found last year were limited to 1.5hrs on July 17th, one sighting of a hill-topping and territorially active male was still made. There were

1.5hrs on July 17th, one sighting of a hill-topping and territorially active male was still made. There were also two independent sightings by other observers elsewhere by the same wood around this time, including a male resting by a front door on July 14th.

Even better news came from Liz Goodyear, exploring southern Hertfordshire on a showery July 13th: "On the horizon was an area of blue sky which arrived at 3.10 pm, the sun came out and the grassland butterflies just lifted off the ground..." After an hour's watching, "I decided to take an alternative route back... past where there is a massive oak. At 4.40 1 looked up and almost immediately saw a large butterfly swoop around the tree. I saw it four times before I had to rush off I was certain of its identity and screamed out 'Purple Emperor". This was the first of over 50 sightings here, nearly all males, on 9 separate days, the last being on July 26th. It soon became obvious that the tall oak was the "master tree", as males were frequently seen gathering and chasing each other there. This is the description of activity on arrival on July 17th at 2.40: "Immediately we saw 2 or 3 clash and for the next 30 minutes these spiralling aerial clashes were almost continuous... there were regular arrivals and departures of Purple Emperor, and we were also able to observe the butterflies settled on the tree." It is on private land, and as with last year's site, the owner asked for the location not to be revealed. The first two weeks of July were dominated by cold, cloudy and often wet weather, and this may have contributed to a flush of heightened activity once the weather improved mid-month, as described by Ken Willmott in the new BC booklet 'The Purple Emperor Butterfly'.

The discovery has prompted a survey of sallows in Hertfordshire woods by Liz Goodyear and Andrew Middleton, and it is becoming obvious that the two woods next to the master tree had amongst the highest concentrations, a feature found to be shared by all the Herts woods where Purple Emperors have recently been seen. The richest woods for sallows in Herts seem to be those where coppicing and plantation has taken place and sallows have appeared in the regrowth. Sallows tend then to be lost when these areas are thinned. Encouraging sallows long-term along widened or scalloped rides has solved this problem at several Purple Emperor sites elsewhere in England, and widening rides etc is known to benefit a whole range of flora and fauna, not least butterflies.

There was an attempt to build up a good relationship with the owners of the new site, and advice was given over its management, in particular regarding the encouragement of sallows. However, unbeknown to us the larger wood concerned was already the subject of a Forest Enterprise plan, and in November this entire wood was drastically thinned, nearly all the sallows being cut down, whilst the cherry, silver birch and 'Christmas trees' were retained. Sallow numbers have been halved from around 40 trees to the 20 or so which remain in the smaller spinney - hopefully the Purple Emperor colony will still be active this summer.

This event illustrates the enormous difficulties we have to overcome if we are to be an effective conservation Organisation. With Purple Emperor the only Nationally Scarce (notable) species in our branch area, this wood was arguably our most important butterfly site. It illustrates the need for the revamping of the conservation subcommittee that took place in January. To end on an encouraging note, the discovery of yet another site suggests that Purple Emperor may be found at low population levels over much of southern Hertfordshire. It is well worth patiently exploring Salix-rich woodland from the end of June, particularly concentrating on tall oaks that stand above the rest of the canopy on high ground or hillocks.

4 ~ Surveying and results for 1999-2002



Chart 4.1 ~ Recorded numbers and distribution of *A.iris* in Hertfordshire 1998-2002

Chart 4.1 represents the increase in information gathered over recent years regarding *A.iris* in Hertfordshire, and in our view it does not represent any increase in numbers or colonies (9.1), but is the result of much effort by ourselves, and more recently by others, combined with a better understanding of how best to survey for *A.iris*. We have also been certain to follow up our sightings in subsequent years, and to build on our knowledge year by year. Chart 4.2 shows our field-work for July 2002, with similar schedules being followed in July 2000 and 2001. A great deal of time has also been spent out of season surveying for likely habitat and territorial areas.



Chart 4.2 ~ Field-work summer 2002 - Liz Goodyear & Andrew Middleton

As a major part of the project, we have tried to raise awareness as to where and when best to look for *A.iris*. The Butterfly Conservation Hertfordshire & Middlesex Branch Annual Report (Murray & Wood, 2002) and the branch website (www.hmbutterflyconservation.org.uk) have been key instruments, along with personal communication. There has also been a butterfly walk at Broxbourne Wood Nature Reserve in July, arranged with Countryside Management Service. Consequently, many more observers were able to see *A.iris* in Hertfordshire for the first time in 2002, and an unprecedented level of knowledge regarding the species in Hertfordshire has been generated by the project and people's efforts.

Chart 4.3 ~ A.iris numbers and sightings 1999-2002 (each point refers to a total for one day in one year)



Chart 4.3 illustrates the recorded flight season of *A.iris* in Hertfordshire, which appears to have been rather consistent over the study period (5; 8). *A.iris* is almost certainly still on the wing in August, but recorded male territorial activity has generally subsided by then, and sightings have been few and far between, the species being difficult to detect even at the peak of its activity.



Image 4.1 ~ recorded distribution of *A.iris* in Hertfordshire and adjoining counties

Note – for reasons of site confidentiality (2), exact locations of sightings since 1999 have not been mapped. Two sites with public access have been detailed in full (6.2; 6.5), and the present known distribution of *A.iris* in Hertfordshire is very much as illustrated by the map. It should be remembered that a colony can exist at low density over wide areas encompassing several woods and tetrads, and that *A.iris* should be considered when managing woodland throughout Hertfordshire. Please see Sections 9 and 10 for further details on this subject. All past records have been included as we see no reason to doubt particular reported observations.

5.1 ~ Annual charts for 1999

This was the first year that we saw *A.iris* in Hertfordshire, beginning more by luck than judgement, however further sightings at Site A followed later in July as a result of continued effort. So began our learning curve as to when and where best to look for *A.iris* in Hertfordshire, and we have since spent many hours waiting for this fascinating species to appear, being delighted when it did, and frustrated when it didn't.

In addition to sightings at Sites A and C, Brian Jessop encountered a grounded male at Tring Park (6.2) whilst walking his transect and Jenny Hoare found a male grounded in her garden nearby in Tring.

Like many recent summers, July was wetter than average, especially at the start of the month, but it was also sunnier than average and was suitably warm to hot for much of the July flight period. It seems likely that *A.iris* would have been able to lay at least an average number of eggs for 'Hertfordshire', whatever that may be.

See also 6.1-3 for accounts of Sites A, B and C.

See also comparisons of weather by year and season in 9.2 ~ Notes on weather in Hertfordshire during the flight period and larval stages.



Chart 5.1.1 ~ A.iris numbers and sightings in 1999











5.2 ~ Annual charts for 2000

Although no further sightings were made at Tring in 2000, LG made the exciting discovery of a territory after waiting and watching for many hours in poor weather conditions in the hope of confirming a probable sighting in 1999 (6.3).

The weather during July 2000 was the poorest for any July in the study period (1999 to 2002), being wetter, duller and colder than usual. As can be seen from the charts, from 13^{th} to 16^{th} it was quite cool, cloudy and at times wet, with temperatures hovering around 15° C, but *A.iris* used the briefest spells of sunshine to go about its business in a flush of activity between the showers (6.3). Activity soon subsided here even though the remainder of the month was more settled, sunny and warm. Despite poor weather in the first half of the month, *A.iris* appeared well able to use any opportunity to complete its life-cycle, with the subsequent drop-off in male activity suggesting that females hade been mated. The following periods of rather warm and sunny weather to the end of July at least seem likely to have been adequate for a reasonable period of egg-laying, as recorded activity declined over this period.

Early in July, *A.iris* had also been seen in the Broxbourne Woods complex, and the species was again recorded at Site A.















5.3 ~ Annual charts for 2001

We had by now completed between one and two years of observations, had read a great deal more about the subject and had spent many days out of season surveying woods for suitable habitat and potential territorial areas. Unfortunately, the habitat of the strong colony confirmed just the previous year at Site C (6.3) was now much poorer due to the felling of many sallows, and sightings here were so few that is was quite disheartening to visit the location.

However, *A.iris* was again recorded at Site A, and a probable female was seen by Brian Jessop at Tring Park on the late date of 17^{th} August. We also found the species at two new locations, Sites D and F, both on private ground. In addition, Lissa and Rachel Smith found and photographed *A.iris* in Broxbourne Wood Nature Reserve not far from the sighting in 2000, within the wider Broxbourne Woods complex, itself known to some as a traditional site for the species. Malcolm Hull also had a likely encounter in the car-park here later in the month (6.5).

The July 2001 weather was average for sunshine and warmth, although slightly wetter than usual. As in 2000, *A.iris* was quite active during sunny spells between showers towards the middle of the month, on the 12^{th} and 13^{th} . The second half of July became increasingly settled, with temperatures rising steadily to 30° C, and recorded activity steadily declined. We can only conclude that *A.iris* had again been able to mate and lay at least an average number of eggs in completing its life-cycle during this period. Although working with a limited dataset, there seemed to be no apparent negative effect on the strength of colonies as a result of the poorer weather of July 2000, and the timing of *A.iris* activity through the month seemed to closely reflect the patterns set in 1999 and 2000.

Additional sighting ~ one grounded male on an unknown date at Site F.















5.4 ~ Annual charts for 2002

In July 2002, the number of records of *A.iris* almost doubled, largely as a result of the interest and perseverance of several other observers. Details of sightings in 2001 at Tring Park and Broxbourne Wood Nature Reserve in particular were given in the Hertfordshire & Middlesex Butterfly Conservation Annual Report (Murray & Wood, 2002), and then daily news of sightings was posted on the branch website during the 2002 flight season. We tried to manage the project in such a way as to address the interests of all parties concerned, in particular the woodland owners and managers, therefore we were delighted that *A.iris* was seen by so many other keen observers and that so much more information was gathered, and that no major problems arose. For full details see 6.1-6.8, and in particular 6.2 and 6.5.

A.iris was seen again at all Sites A to F, and in addition a sighting was made elsewhere at Site G in the Broxbourne Woods complex (6.7), and a territorial area was found at a new location, Site H (6.8).

Early July was quite cool and unsettled, but we persevered with our observations even though conditions were mostly cloudy and often wet. On the 7th July it had been cloudy most of the day, and it had also rained where we were. Extract from 6.1.1: '*Dull and wet most of the day. 17:13-17:57hrs, after 15 mins of hazy and broken sunshine, a male was seen struggling to reach the crown of a territory oak. 17:30hrs, probably the same male set off over the canopy of the territorial area*'. The recorded flight period was then very much as for 1999-2001, with a short-lived peak again beginning around the 13th July.

Heightened activity also began in rather unsettled weather around this date in 2000 and 2001, the difference being that in 2002 the weather began to improve from the 13^{th} with plenty of sunshine and temperatures rising to between 20°C and 30°C until the end of the month. Total sunshine and warmth were average for July, but rainfall was more than twice the mean for recent decades (9.2). Activity again peaked for a few days mid-month, then tailed off towards the month's end, suggesting that *A.iris* had again been able to mate and lay at least an average number of eggs in completing its life-cycle during this period.

Additional sightings ~ a grounded *A.iris*, probably male, on an unknown date, by the canal near Tring railway station and two recorded during Tring Park transect by Brian Jessop on 27^{th} July 2002 (6.2).

5.5 ~ Overview of the flight period

The flight and weather charts for July 1999 to 2002, and our own experience of watching the species, suggest that *A.iris* can quickly take advantage of any sunny spell to engage in territorial and pairing activity, and that the timing of this activity has followed a similar pattern in each year. This period of heightened activity has tended to subside quite quickly, especially if a period of settled weather follows (8; 9). The gravid female also appears well able to take advantage of quite short periods of sunshine to engage in egg-laying activity. The decline in observations of females during the second half of July, and when conditions have been settled, suggests that adequate egg-laying activities can be completed within perhaps a week or two, whilst no doubt extending generally unobserved well into August. It may be interesting to see how *A.iris* would cope with an especially poor July weather-wise, but it would not be something we would look forward to.

See also 8 and 9.









Chart 5.4.3 ~ A.iris male activity in 2002





6 ~ Individual accounts of locations found to have A.iris, 1999-2002

6.1 ~ Site A

Woodland description \sim Site A, part Site of Special Scientific Interest (SSSI), is a mixed woodland of 40-50 ha, which adjoins other woodland as part of a larger woodland complex. It has substantial areas of both semi-mature conifer plantation, and mature deciduous woodland consisting mainly of oak, hornbeam, ash and sweet chestnut. Some areas have an understorey of hazel, suggesting a history of hazel coppice with standards. There are also *c*.3 ha of 20-25 year old broadleaved plantation consisting mainly of ash, oak and cherry which also contains a good number of mature oaks, and where sallows and birch have also established.

The Ordnance Survey map for 1877 shows how Site A was divided into c.20 compartments, and it seems likely that sallows would then have been in good supply in at least a few of these compartments at any one time. It seems reasonable to imagine that the habitat at this time would also have been able to support a colony of *A.iris*. The surface geology is mainly London clay, but with some glacial gravel deposits on higher ground and Reading Beds (mottled clays, sands & pebbles) around the margins.

Sallows ~ in December 2001, we surveyed the woodland using Geographical Positioning System (GPS) equipment in order to quantify, map and age the sallows at Site A. 303 individual sallows were logged, the equivalent of **246 large sallows** (see 10.1 for methodology), of which 85% or more were found to have medium, mixed or large leaves rather than small leaves (10.1). Most of the sallows, *i.e.* 76%, are either in the 3 ha of broadleaved plantation, or line a nearby track. These two areas, totalling just 5 ha, are the youngest at *c*.20-30 years, and have an abundance of sallows, whereas the older and taller areas over *c*.30 years have fewer healthy sallows and more dead or dying sallows. The high canopy of the mature woodland allows for very few sallows.

Likewise, 89% of the sallows fall into the one age group of 20-30 years, and there is little regeneration. Of the total number of sallows, 86% are growing in the canopy, and will be likely to decline over the coming decade due to competition from a higher and closing canopy. The track-side sallows were considered to be growing in a 'canopy' situation, *i.e.* the canopy has almost closed above the track. Although sturdier sallows may benefit from thinning of neighbouring competition, thinning may accelerate the loss of tall and spindly sallow growth (10). Sallows tend to be more prone to wind damage than are other tree species of similar age, as could be seen after the gales of October 2002, so any thinning needs to be selective.

In order to bring about sallow regeneration and to diversify sallow age structure, actions such as coppicing, track-side management, thinning and planting may be appropriate, and a little thinning, planting and pollarding has been completed (10).

Nature of observations \sim AM's first *A.iris* sighting in Hertfordshire was of a male at Site A on 6th July 1999. It has since come to light that *A.iris* has been observed here by a local resident for a decade or so. No other historical records have been found. Other than a chance sighting of a pristine male elsewhere beside the wood on 14th July 2000, most observations have been of both females and territorial males in the vicinity of the territory. It seems that where sallows are numerous in the vicinity of a territory, heightened female activity may be observed, and this is true of Site A where 30% of its sallows lay within 200m of the territory.

The territory does not appear to be a well defined point; territorial activity can be seen in a general area approaching 100m x 100m (1 ha). This is situated at one of the high points of the wood, and consists of c.10 well-spaced mature oaks growing both on the edge of the wood and up to 50m into the wood. There are two small clearings amongst these oaks where heightened male territorial activity has been observed. Viewing from one clearing, the *A.iris* activity around and between surrounding oaks suggests features of a 'canopy gap', whilst the second clearing nearby is dominated by a single oak which has been used rather like a 'master tree'. Territorial males have also been seen to over-fly the general area and to make tours of the woodland edge canopy. Several of the oaks receive the afternoon sun, having open west or south-west aspects. The area has certainly been used as a territory every year from 1999-2002, and activity has been observed here over the last decade at least.

The frequency of male activity at Site A has not been charted in detail at present because it was felt that
there were too many uncertainties and inconsistencies to allow for any meaningful comparison between years, reasons being that: viewing is awkward and it is not clear which viewpoint consistently yields most sightings; a point of heightened territorial activity may exist nearby which has not yet been found; territorial activity may occur elsewhere in the wood; conversely, the territory may attract *A.iris* emerged from neighbouring woods beyond the boundaries of Site A where habitat changes and effects are difficult to assess and interpret, *i.e.* the territorial catchment area is uncertain; recording has been less than regular, and it has not always been possible to observe in ideal or comparable weather conditions. Nevertheless, it is a territorial area, and may best be described as a 'hilltop' and 'woodland edge' territory with 'canopy gap' and 'master tree' elements.

Table 6.1.1 ~ Notes on selected observations at Site A

Date Notes taken on the day

10 Jul 99 ~ 11:30: 13:00hrs, no sightings in fine weather. 13:25-14.30hrs, 3 sightings of territorial male, one time perched for c.3 mins on outside of wood-edge oak.

14 Jul 00 \sim 10:45hrs, a pristine male found resting on a wall by the far side of the wood.

17 Jul 00 ~ 13:00-14:30hrs, viewing from outside the wood in fine weather, at 13:32hrs a territorial male flew out around the canopy-edge of the wood before returning out of view.

13 Jul 01 ~ Between 13:10hrs & 16:01hrs, 17 sightings/flights in 2 hrs 16 mins of observations. 13:25hrs, a male flew briefly from its perch in the canopy gap to chase a Great-spotted Woodpecker, which flew through the territory. 15:01hrs, 2 males clashed and flew off west.

15 Jul 01 ~ 17:00-17:15hrs, 3 clashing males within the wood around a prominent territory oak.

24 Jul 01 ~ 11:30-13:40hrs, light wind, constant sunshine, 20-23°C. 4 *A.iris* recorded.

11:49hrs, a female flew north at half tree height through the canopy gap.

12:00hrs, a female flew down from half height of a territorial oak and went low north-east through the canopy gap.

12:05hrs, a female with a missing wing section flying over the birch and sallow scrub just east of the territory, landed on 3m high birch leaves, rested for c.3 minutes then flew off over the scrub.

12:09hrs, a female with complete wings circled over the east scrub canopy, then settled on birch, then perched on sallow at 3m height. Images taken at 2m distance (Image C, 9.1a). Seen on and off over the scrub until 12:20hrs, flight manner associated with typical egg-laying behaviour, but no egg-laying actually observed.

12:30hrs, a female flew at half height through the canopy gap onto birch, then further into a territory oak.

13:00-13:40hrs, 4 sightings of males at the canopy gap.

01 Aug 01 \sim 12:00-14:00hrs. At 13:47hrs, a male flew west then east back over canopy gap.

07 Jul 02 \sim Dull and wet most of the day. 17:13-17:57hrs, after 15 mins of hazy and broken sunshine, a male was seen struggling to reach the crown of a territory oak. 17:30hrs, probably the same male set off over the canopy of the territorial area.

16 Jul 02 \sim 12:08-13:50hrs. 1.5hrs sunshine and 25°C. A total of 8 sightings of males, 5 of which were after 13:00hrs.

Description

Males seen ~ 1 (or 2) Frequency of territorial activity after 13:00hrs ~ 22 mins or 2.7 per hr Grounded male ~ 1 at 10:45 Males seen ~ 1 Frequency of territorial activity after 13:00hrs ~ 90 mins or 0.6 per hr Males seen ~ 3

Clashing males ~ 2 Frequency of territorial activity after 13:00hrs ~ 8 mins or 7.5 per hr Clashing males ~ 3

Females seen ~ 2 Behaviour indicative of siteselection for egg-laying

Males seen ~ 2 . Frequency of territorial activity after 13:00hrs ~ 10 mins or 6 per hr

Males seen ~ 1 Frequency of territorial activity after 13:00hrs ~ 24 mins or 2.5 per hr Males seen ~ 1 Frequency of territorial activity after 13:00hrs ~ 22 mins or 2.7 per hr. Males seen ~ 2 Frequency territorial of activity after 13:00hrs ~ 10 mins or 6 per hr













Chart 6.1.4 *A.iris* - male activity recorded after 13:00hrs at Site A, annual peaks 1999-2002



6.2 ~ Site B Tring Park (SP930105)

Woodland description ~ Tring Park is situated in the far west of the county just south of the town of Tring and differs from the other *A.iris* sites in Hertfordshire in that it is more commonly associated with butterfly species of chalk grassland than of woodland. However, on closer inspection of the geological features of the area, the site can be split into three different areas. There is the main parkland area, comprising a large expanse of unimproved chalk grassland, a chalk escarpment that catches the sun from the west, and at the top of the escarpment a wooded ridge. The geology of the ridge is clay with flints over the upper chalk. Most of Tring Park, apart from the wooded ridge, is a SSSI, and was bought by Dacorum Borough Council in 1995 and leased (999 years) to the present managers of the site, the Woodland Trust. A local farmer grazes both sheep and cattle on its grassland areas (Hertfordshire Biological Records Centre Annual Report 2001/2002). Brian Jessop has walked a butterfly transect at Tring Park since 1996 (Murray & Wood 2001).



Image 6.2.1 Geological Map of the Tring Area

Sallows ~ Although there are a few sallow bushes scattered across the parkland, close to the Wigginton entrance is a young conifer plantation with an abundance of sallows. **North Pest House Wood** is approximately 7 ha and contains conifer, sallow, silver birch and beech and is probably about 20 years old. On a visit to Tring Park in December 2002, we walked 2 sallow transects through this wood. The results showed that this plantation alone holds an estimated **357 large sallows** (equiv.; see 10.1 for methodology). However, we found that there were fewer sallows in the centre of the wood. Just north of North Pest House Wood is Park Wood, which is older and probably contained numerous sallows in the past (there is one massive sallow by one of the paths), but those still present are old and being crowded out by the more dominant slower growing trees. Other mature woods on the ridge in Tring Park have very few sallows.

There are also some sallows in the clearings on the ridge and Brian Jessop reported in July that some appeared to have received the unwanted attention of a collector looking for eggs, as ground beneath a bush had been trampled and some of the sallow branches broken down. It was agreed with John Murray that this should be publicised on the branch website. Our own feeling is that the more people that know about a site, the less confident the unscrupulous collector would feel of not being caught, and that habitat management is likely to be a far more important factor for the fortunes of this colony over the longer term.

The female is believed to lay perhaps 100 eggs in total, possibly about 6-10 at one time, repeated over several days (Willmott 1990; Heslop *et al.*; Morris; 8.2.3). Females may choose to oviposit repeatedly in the canopy of one or more favoured sallows or may travel widely over the canopy laying here and there. If an egg collector finds one egg, there will be many more that are left. We feel that birds probably account for the greatest amount of larval predation, especially, no doubt, when looking for big fat juicy *A.iris* larvae during their breeding season, and that the greatest threat to a colony is the loss of its sallows (10).

Probably the greater risk presented by a collector would be the capture of a male before mating or a female before egg-laying, as the life-cycle would then be halted prior to fertilisation and/or the placing of a good

number of eggs over a wide area. But the collector would probably prefer to work in secret and private sites may therefore be at greater risk. See 10 for a detailed and referenced discussion of habitat and *A.iris*.



Image 6.2.2 Sallows in winter near the Wigginton entrance

Nature of observations ~ In the early 1990s, Brian Jessop was walking in a wood not far from Tring Park, when he saw an *A.iris* fly around a possible territorial area: '*It would have been around 1993 or 1994 on a Sunday around midday. Flying around and between two very tall oaks, I saw what I believed was, or could have been a Purple Emperor. I saw it for probably about 10 seconds, then it must have settled out of sight. I hung around for a few minutes and then left the area. Having never heard of Emperors in Herts, I thought perhaps it was a Peacock, although it did seem unusual for Peacock to be so high up. Knowing what I know now, I am convinced that it was a Purple Emperor.' Despite returning on several occasions since then, Brian has not been able to repeat this sighting. We visited the site in December 2002, and agree with Brian that the site has the right feel to have been a territorial area. However, it is likely that this colony would have since declined, as during the intervening years the wood has been subject to clearance and the remaining sallows are now being out-competed. There is the possibility that the species has moved on to another more suitable wooded area either in Hertfordshire or Buckinghamshire. Research has shown that <i>A.iris* has been reported from the Buckinghamshire Chilterns for a few recent years (Nick Bowles, personal correspondence; Upper Thames Butterfly Conservation Branch Website; see also 6.2 Notes on Observations).

In 1999, Brian Jessop was walking his weekly butterfly transect in Tring Park, when he saw a grounded male on 10th July (Table 6.2.1). In that same year on 30th July, Jenny Hoare also saw a grounded male in her garden in Tring about a mile away. The butterfly appeared to be taking moisture from her wet lawn (Murray & Souter 1999). Although Brian Jessop did not see *A.iris* in 2000, he did see an almost certain female on 19th August 2001. Publicity in the 2002 Annual Report lead to several other observers visiting Tring Park in 2002, and on the 19th July, Philip Woodward rang John Murray to say that he had seen a male and female in the Park that morning. Brian Jessop visited the next day, still during the peak of the flight period, and managed to locate a territorial area. On the 27th July, Allen Beechey and Kathryn Graves visited the Park and also witnessed several episodes of female activity. In March 2003, Nick Bowles informed us that he had received a report of a probable male seen along the towpath of the canal near Tring Railway Station in the summer of 2002.

The territory – Brian Jessop located a territorial area on 20^{th} July 2002, amongst the vast number of tall old beech trees. He has asked that the exact location is not made public. Although the time of day of the sightings is quite early for territorial activity, the description Brian gives is of typical territorial behaviour, although it is possible that he also saw male and female activity prior to pairing (8.2.3). The ridge is a very prominent high point in the landscape and it can not be ruled out that some *A.iris* may arrive from areas beyond the boundaries of Tring Park.



Chart 6.2.1 *A.iris* ~ total recorded in one day based on individual accounts at Site B, 1999-2002



Chart 6.2.2 *A.iris* ~ all activity based on individual accounts at Site B, 1999-2002

Note \sim Additional sightings of grounded butterflies seen in 1999 and 2002 away from Tring Park have not been included in the table.

6.2 ~ Summary

There is no doubt that Tring Park is a site of great regional importance, as more butterfly species have been seen here in recent years than at any other site in Hertfordshire (Murray & Souter 1999). The knowledge that there is also a colony of *A.iris* here is really exciting as initially it was thought by some that the first sightings '*were just chance sightings*'. However, after our first visit when we found at least one area that was sallow-rich, we were confident that the butterfly was indeed breeding here. Brian Jessop and the other observers proved this beyond doubt in 2002.

The management of Tring Park as a whole is very important, as there is such a great diversity of flora and fauna to be considered. As has quite clearly been found elsewhere (6.3), such a strong colony of *A.iris* is the result of an abundance of sallows, the majority of which is presently found at Tring Park in one panel. We hope that the management plan will maintain some age diversity, with younger areas for the future where the next generation of sallows will appear. As *A.iris* is both a Hertfordshire Biodiversity Action Plan Species and a Butterfly Conservation High Priority Species, we feel it is essential to be pro-active in maintaining the present level of sallow abundance at Tring Park so that the colony remains strong. If the wood is to be managed as high canopy, there will be little room for new sallows to prosper in rotation. In this case, we hope that the present sallow-rich panel will be managed to provide a succession of sallow-rich areas of regeneration over the long term. Such regeneration is widely acknowledged as being essential in maintaining a strong colony of *A.iris* (10).

Sat 10th July 1999

Extract from the Hertfordshire & Middlesex Branch of Butterfly Conservation Newsletter Issue 19 September 1999

On Saturday 10^{th} July at 12.10 I set out on my transect. It was a near perfect day. The sun was out with a temperature of 24 degrees C and a slight breeze. I decided to take my camera with me for some unknown reason – I do not usually take it on the transect walk because it gets in the way. It started off well with 12 Speckled Wood where normally only 3 or 4 would be seen.

Further into the walk I was counting with great difficulty the dozens of Marbled Whites, Meadow Browns, Ringlets, Gatekeepers and Skippers that were flying up with every couple of steps taken. I am sure most of you will know what I mean when I say that my head was buzzing, trying to identify the Ringlets from the male Meadow Browns, with so much activity going on all around. However, I had a quick look at an area of scrub, which had been cleared the previous winter, which was still fairly free from plant life. At the bottom end I noticed a butterfly, which was different from anything else. It was gliding with a couple of Meadow Browns or Ringlets chasing after it. It gave a couple of beats with its wings and came towards me. That's when I noticed the white bands on the wings and my first instinct said "White Admiral". It settled on the bare ground and I crept slowly to within 3 or 4 feet (1 metre) of it and my brain was telling me it couldn't be what my eyes were seeing. There, in all its glory, was a perfect, beautiful, PURPLE EMPEROR!! – the first I had ever seen. My heart was pounding like mad and I thought "nobody will believe me when I tell them". I watched it for about 5 minutes as it kept flying a couple of metres and settling on the found again, oblivious of me as it probed the ground for minerals or whatever.

At this point I remembered I had my camera in my backpack. I backed off while I got it out, not daring to take my eyes off the Purple Emperor. It was then that I realised that I had already taken 24 pictures on the 24-exposure roll of film. There was only one (number 25) to take. I got as close as I dared, got it in focus, and clicked. I hope it come out OK.

I watched it for a few minutes more. It was turning around on the spot just like Hairstreaks do but without the wing rubbing. What a wonderful sight to see the purple sheen come and go as it turned and opened and closed its wings. I felt rather sad when it flew off, but at the same time privileged that I was around at the right place at the right time to see such a beautiful insect.

I was rather disorientated after, when I had to get back to recording Marbled Whites and Meadow Browns. I kept looking back to see if it had returned but once away from the area things got back to normal.

What a great recording season this is turning out to be. What with Grizzled Skipper being recorded for the first time and now a Purple Emperor, what next??

Brian Jessop

Fri 30th July 1999

Extract from the Hertfordshire & Middlesex Butterfly & Moth Report for 1999

It was in a garden in Tring, less than a mile from Tring Park. Jenny Hoare writes: 'I saw the butterfly midafternoon, on 30th July 1999, a very hot still day, settling on grass which was wet from children playing.'

Sat 17th August 2001

Extract from the Hertfordshire & Middlesex Butterfly & Moth Report for 2001

"..... a large butterfly flew from one section of woodland towards me very fast. As it came towards me I could see white markings on a brown background. It flew quite close to my face and then disappeared into the other section of woods. I am 99% sure it was a Purple Emperor, but it happened so quickly I decided not to record it."

Brian Jessop

Thurs 18th July 2002

On Thursday 18th July in section three of my transect in Tring Park, I saw what I thought was a Purple Emperor. As I could not positively identify it, I did not record it. Since on hearing about Philip Woodward's two sightings, I am convinced that it was. The time was about 3 o'clock and near sallow.

Brian Jessop

Fri 19th July 2002

On Friday 19th July, **Philip Woodward** rang John Murray to report that whilst visiting Tring Park that day, he had seen two Purple Emperor, a male and a female.

My first sighting of the Purple Emperor – July 2002

<u>Summer Holidays 2002</u>: As a schoolteacher I awoke cheerfully to the blissful prospect of a few weeks respite from work. I was looking forward to fresh air, exercise and most of all, time to search for butterflies. It was a sunny warm morning, ideal conditions to go for a walk in nearby Tring Park. As I wandered through the field it was pleasing to see several Meadow Browns, Ringlets and Marbled Whites fluttering amongst the wild flowers. I felt in a very tranquil, relaxed frame of mind as I wandered on the path alongside the slope but was suddenly shaken from my dream like state by a large, dark butterfly flying up in front of me. Immediately my feelings were a mixture of excitement and anxiety in case this butterfly should fly away before identification.

However, thankfully it returned to its original position and as I moved slowly towards it my excitement mounted. It was the moment of a lifetime; I really could not believe it! There in front on me was a **male Purple Emperor** feeding contentedly from some dried cow dung, the striking blue sheen very apparent on its wings. As I moved closer it continued feeding, oblivious to my scrutiny and appearing to be settled in the same position for some time. After several minutes my "prize" butterfly flew up into he woods above. In a euphoric state, I extended my walk around the Park, excited and hopeful of further possible sightings. I wandered further up the slope towards the woods at the top and relished in the sight of large numbers of butterflies feeding from the wildflowers and brambles.

At about 12.30pm I walked up the slope to the woodland glade at the top. From a distance I could see a large butterfly gliding underneath a lime tree on the main path. My adrenaline started to rush again as on closer inspection I realised another Purple Emperor was in my sight. It settled on the path near the lime tree and I could see that this butterfly was a larger specimen than the one seen earlier that day. Its wings lacked the blue coloration and I knew that I had sighted both male and female Purple Emperors with the space of a few hours.

After 10-15 minutes of gliding backwards and forwards, the female Purple Emperor flew high up into the trees above despite an extensive search in the wooded area I was unable to spot my "prize" again.

It was certainly a never to be forgotten day and one that made me realise why butterfly enthusiasts enjoy their hobby so much. Such a rare and unexpected discovery as spotting a Purple Emperor makes all those fruitless hours of searching for butterflies worthwhile.

I look forward to seeing more Purple Emperors again next summer.

Philip Woodward – February 2003

He returned with his father about a week later - but didn't see anything. Philip said 'seeing the Purple Emperor made my year, I thought I would have to go further south to see them and I never expected to see them in Hertfordshire.'

Brian Jessop met Philip, and Philip was able to show Brian where all his sightings had been made.

Sat 20th July 2002

....I believe I may have found the Master Tree. From where I was watching, you could only see the top of the tree and there was nothing but space around it. I definitely saw three Purple Emperors fly about the top of the tree chasing each other and then disappearing back into the tree. I saw two fly off away from the tree in different directions. After a while I saw two more chasing each other, going up high in the air and diving back down into the tree-top again. The time was between 11.30 and 12.00, and quite cloudy, with the sun coming out every now and again. I decided to see if I could find the 'Master Tree' and on finding my way around the woodland I finally found it and although not much could be seen from below, I saw two more chasing one another above a couple of oak trees nearby. It was only a very short sighting before they disappeared into the oak tree.

Brian Jessop

Sat 27th July 2002

On Saturday 27th July 2002, Kathryn [Graves] and I decided to go and look for Purple Emperors at Tring Park following the reports of sightings in the locality on the Herts and Middx BC web page. We arrived at 12:40pm just as the cloud cover was beginning to break up and took a walk across the grassland from the Hastoe end (by the avenue of horse chestnut trees) to the monument. Butterflies on the wing included: Meadow Brown, Ringlet, Gatekeeper, Small Skipper, Large White, Green Veined White and Marbled White.

After walking along the main ride from the monument we took a small path up onto the top of the ridge, at the back of the wood. Along this path there are several sallow trees along with a stand of willows. The path passes through a small clearing, which contains one large sallow tree and two smaller sallows (there are also two rather large buddleia plants). As we walked up the path into the clearing we spotted a female Purple Emperor circling the clearing (1:15pm). Over the next 5-10 minutes, the butterfly continued to circle the clearing occasionally pausing high in the trees. On at least two occasions the butterfly settled in the shaded side of the large sallow tree, unfortunately just out of sight. Eventually the butterfly flew off over the trees.

We continued our walk along the path, which passes a group of sallows and a stand of willows before diving into an area of tall hawthorn scrub. In this scrub, Kathryn spotted a large butterfly flying high across the path into the hawthorn scrub. Following it, we managed to get another glimpse of it shortly afterwards when it took off from its perch and headed off the way it came. This second sighting was very brief and it was impossible to tell whether it was the same female that we had seen earlier although I think that there is a fair chance that it was.

Returning along the path a short while later we were treated to another air display by a female Purple Emperor in the first clearing. We did have a look for a master tree but with literally 100s of tall prominent trees on the top of the ridge, fortunes weren't in our favour!! However, for a first time out looking for Purple Emperors we didn't do too badly!

Allen Beechey

Summer 2002

Last night I heard from someone who lives in Chesham, Bucks [name not known] to say that he saw a Purple Emperor on the canal towpath near Tring railway station, between the station and the next bridge near Aldbury Nowers last summer. This was most likely a male as he described it as presumed to be a piece of plastic bag on the path until it flew away in front of him. It was then that he first thought White Admiral but as it soared around him realised that size alone showed it to be Purple Emperor. *Unfortunately the exact date was not known*.

Nick Bowles March 2003

October 2002 - notes on recent sightings of A.iris in Buckinghamshire

You will be interested to hear that there have been several sightings of the Purple Emperor in the Buckinghamshire Chilterns in recent years. Seen several times near Princes Risborough 1998-2001 and one claimed at Dancersend 2000, (just west of Tring) and this summer I saw one at Coombe Hill (National Trust) near Wendover. It seems that there is a small colony that ranges widely across the Chiltern woods. I tried hard to find one a Wendover Woods (Halton Forest) where one found dead in 1999 (squashed on the tarmac of the car park!), and adjoining Dancersend this July, but no joy - though some of the hours I spent there were in very indifferent weather.

Old records almost certainly have it for this area of the Chilterns as virtually everything was found here (High Brown Fritillary, Small Pearl-bordered Fritillary, Pearl-bordered Fritillary, Marsh Fritillary etc. etc.). Don't have the relevant books to check site by site, for certain, but *Steel and Steel* show it absent (unrecorded) from 1975-1984 and *Asher* [Asher 1994] continues the theme of absence in his first atlas for the Upper Thames Branch.

Nick Bowles

Footnote June 2003, additional sightings ~ two recorded during Tring Park transect by Brian Jessop on 27th July 2002 (Murray & Wood 2003).

6.3 ~ Site C

Woodland description – Site C is a private area of mixed deciduous woodland of c.18 ha. LG was given permission to survey a larger area (containing Site C) for butterflies over a three year period from 1999. Years one and two were completed, but the 2001 Foot and Mouth outbreak prevented the completion of a third year. Over the two year survey period, 26 species of butterfly were observed in the area.

Site C is considerably smaller than the other woods in this area, and with younger growth since it had been cleared about 25 years ago. Amongst the hornbeam and hazel coppice, several other species were planted including elm, oak, alder, ash and wild cherry. Subsequently, some of the tree plantings failed, due in part to shading caused by strong coppice re-growth, especially hornbeam, whilst sallows and silver birch were able to prosper. During earlier felling operations, a few standards were retained including some oak. The wood is divided into two sections referred to as North and South. Site C North is only *c*.4 ha with two access tracks, whereas Site C South is much larger, and has a wide central ride running north to south. Although the central ride is a new addition to the wood, the present network of tracks is clearly visible on the Ordnance Survey Map for 1883.

The geology of the area is very similar to that found at several of the other *A.iris* sites in Hertfordshire, although the surface geology appears to be predominantly London Clay without the pebble gravel outcrops found elsewhere in the area.

Sallows ~ At the beginning of LG's survey period, Site C was sallow-rich, however, issues regarding the sallows in this wood will be discussed later in this section (6.3). The sallows at Site C and the associated colony of *A.iris* are particularly important because adjacent woodland in the survey area is, in contrast, almost devoid of sallows. Lesser amounts of sallow and crack willow are also present in a small coppice (approximately 350m north of Site C) and further afield in the survey area (hedge, field and stream-side).

Nature of observations ~ LG's first sighting of *A.iris* came on 13^{th} July 1999, when a large and dark butterfly flew over her head at speed, but it was not until the following year, and with more experience, that LG realised that this 'un-identified' butterfly had almost certainly been a female *A.iris*. There are no known observations of *A.iris* from Site C before 1999. Since 2000, both females and territorial males have been seen, the majority of which have been within the vicinity of the main territorial area, but some sightings have also been made elsewhere. No grounded *A.iris* has been recorded. Females have been observed showing behaviour characteristic of egg-laying on sallows, but no eggs or larvae have been found despite some searching. It could be worthwhile surveying for *A.iris* elsewhere in the area where sallows and crack willows are present (6.3).

The territory ~ Unlike some of the other *A.iris* locations, Site C has a definite territorial area centred around a single 'master tree' (8.1). This 'master tree' was discovered early in the 2000 flight season and has been the principle point for most observations of territorial males at Site C. It is a *c*.100 year old oak, which stands out over the surrounding trees and is clearly visible for some distance, although it is not quite at the highest point in the wood. Also of note is the fact the 'master tree' is not located near the perimeter of the wood, unlike the other territorial areas we have found. During the 2000 flight period, a territorial male was seen briefly to use a field-edge oak as a 'secondary' territory. Although smaller than the 'master tree', it is at the highest point of the wood.

Recording observations of *A.iris* at Site C is considerably easier than, for example, at Site A, because a small clearing beside the 'master tree' gives good views of flight directions and nearby sallows, and it is possible to get an almost complete picture of activity. The various directions by which butterflies arrive and depart are easily observed, as are clashes and the location of perching males. At the peak of the 2000 flight period, *A.iris* was seen to arrive and depart from the tree at regular intervals and on several occasions clashing males were observed (Image 6.3.1)



Image $6.3.1 \sim$ This diagram clearly shows the arrival and departure times with flight direction of A.iris between 09:35hrs and 11:05hrs on the 17^{th} July 2000. By noting the times of arrival and departure it was possible to confirm that there were at least three butterflies on the tree at 10:47hrs that day.

Our inexperience in 2000 meant that female activity was not easily recognised and few records were noted as such, despite numerous sightings of *A.iris*. Some sightings in 2001 and 2002 were very brief, to the point that on several occasions it has been difficult to identify some as male or female. However, more female activity has been identified. In 2000, 2001 and 2002, males and females displayed probable pre-pairing activity, and in 2001 and 2002, females have been observed displaying behaviour indicative of egg-laying, although no eggs were subsequently found (8.2.3).

Sallows and unforeseen events ~ LG has always had a good relationship with management at Site C, and quickly informed them of the significance of finding *A.iris* on their land. Unfortunately, the information was not passed to their Forestry Consultant, and unknown to us a Forestry Commission Woodland Grant Scheme (WGS) plan was in place. In the autumn of 2000, Site C South was thinned and in this process a very large percentage of the sallows was felled. Permission was granted for a site meeting with representatives of Butterfly Conservation (Head Office) to discuss the situation, and for the felled sallows to be searched for larvae, although none was found. Our main concern was that any sallow stump re-growth would soon be shaded out as the canopy of the remaining trees closes above. Whilst many of the sallows were successful in regenerating in 2001 and 2002 (Image 6.3.2), without some thinning the closing canopy will inevitably shade out this new growth over the coming years. It is hoped that some of the silver birch and other competing trees beside the rides can be thinned, to give some of the sallow regrowth the space and light needed to grow on and develop once again into mature shrubs and trees. The sallow regeneration has benefited from two relatively wet summers where growth has been substantial. First year sallow regrowth was in the region of between 2 and 2.5 metres, and despite muntiac deer being present in the wood, there has been little evidence of negative grazing impact, especially where cut brash from the felling has protected the stumps.

Sallow survey results

In 2001, we surveyed Site C using GPS equipment in order to quantify, map and age its sallows, as well as locating, sizing and mapping as many of the felled sallows as possible. Although a brief study of flowering sallows in spring 2000 estimated a total of c.50, the detailed survey found that there had in fact been about **300 large sallows**, with ages ranging from young ride-side regeneration to mature 30 year old trees (see 10.1 for methodology). It has been calculated that **a minimum of 175 sallows** (equivalent), **or 58%, was felled** during the thinning operations, and that c.135 sallows (equivalent) were left intact. The major sallow loss was in the southern half of Site C South, and beside the track between Site C South and North. The generally older sallows in Site C North, and a few more on the edge of Site C South, were left intact (Chart 6.3.1).



Image 6.3.2 ~ Strong first-year sallow regrowth beside the central ride in late summer 2001. Unless the taller trees beside the rides can be thinned to let through more light, the canopy will soon close above, and will in time kill off much of the lower re-growth (compare Image 6.5.2).





Chart 6.3.1 illustrates the principle areas where sallows were felled. Although Site C North still has at least 50 sallows, they are generally older and, due to the processes of succession, some are beginning to show show signs of being out-competed by surrounding trees (10).

Note ~ Charts 6.3.2, 6.3.3 and 6.3.4 present the data as noted over the three year period. Although no grounded males have been observed, several other types of activity have, and all follow the patterns of timing demonstrated at other sites where A.iris is present.



Chart 6.3.3 ~ *A.iris* male activity at Site C, 1999-2002



(all data refers to one day in one year)

Chart 6.3.4 ~ *A.iris* female and other activity at Site C, 1999-2002 (all data refers to one day in one year)





Chart 6.3.5 ~ A.iris male activity recorded after 13:00hrs at Site C ~ 2000

Chart 6.3.6 ~ A.iris male activity recorded after 13:00hrs at Site C ~ 2001







Notes to accompany charts 6.3.5-7

- 1999 ~ No male activity charts have been prepared as the only record was of a female.
- 2000 ~ Chart 6.3.5 illustrates the extent of male activity at this site before the sallows were felled. In 2000, most survey work was done from mid-morning until mid-afternoon due to family commitments. This is reflected when details of the time spent observing territorial activity after 13:00hrs is compared with years 2001 and 2002. It should also be noted that considerably more time was spent at Site C in 2000, as at that time it was the only *A.iris* location being monitored by LG. Despite quite poor weather at the beginning of the 2000 flight period, *A.iris* was active at every opportunity. **Exceptional activity, with a peak of three clashing males,** was noted on the 17th, the first day of good sunshine after poor weather, but it quickly tailed off despite the weather remaining hot and sunny.
- 2001 ~ Chart 6.3.6. Although several visits were made to Site C in July 2001, very little activity was observed and **no activity at all was seen around the 'master tree'**. Chart 6.3.6 shows a territorial male being seen, but this was over the sallows in the North wood and not around the 'master tree'. In contrast with 2000, a very low emergence was implied by the lack of any sightings of territorial activity at the 'master tree'. With only a very few butterflies thought to have been on the wing at any one time, no significant competitive territorial activity seemed to develop. The observed male may just have patrolled the area and found a female over the sallows (see diary for 5th July), all without the need for any territorial behaviour at the 'master tree'. Contemporary sightings at Site A indicate that male activity was normal and that the reduced activity at Site C was not caused by any factors other than the sallows being cut down the previous winter. However, female activity was observed, with a female(s) using one particular sallow bush on three occasions. This same sallow bush was used again in 2002.
- 2002 ~ Chart 6.3.7. Visits to Site C during the peak flight period for *A.iris* in July 2002 were restricted to just the 13th and 16th, with a brief visit on the 17th July. Having confirmed that *A.iris* numbers were showing signs of recovery, LG concentrated her surveying on other less researched sites. **Chart 6.3.7 clearly shows the return of some territorial activity around the 'master tree', although no clashing males were seen**. A male was seen to follow a female, and females again showed behaviour characteristic of egg-laying. For the first time *A.iris* was seen in the South wood (a female around sallows).

When presented with the sudden loss of more than half the sallows at Site C, the questions we found ourselves asking were:

- 1. How many larvae had been present on the felled sallows? How important were these sallows?
- 2. Were sufficient butterflies going to emerge in July 2001 to retain the short-term viability of the colony?
- 3. Would there be sufficient sallows left for the few emergent females to lay their eggs on, for the colony to remain viable over the medium term?

 $1 \sim$ The previous charts and following diary clearly illustrate the extreme negative effect the loss of 58% of the sallows had on the colony. How many larvae were lost on the felled sallows will never be known, but sufficient survived on the remaining sallows for a small emergence in July 2001. The low number of sightings in July 2001 compared with 2000 strongly suggests that the sallows felled throughout the wood were being used by *A.iris* for egg-laying, and that the previous strength of the colony was due to the abundance of sallows.

2 and $3 \sim$ Sufficient *A.iris* must have emerged in July 2001 to retain the viability of the colony, and enough sallow (remaining and regrowth) must then have been available, because in July 2002 limited territorial activity was again observed at the 'master tree'. It is also worth noting that the colony appeared to survive without any obvious territorial activity in July 2001, and that it seems likely that the 2m sallow regrowth that year contributed to the modest recovery of the colony in 2002.

We can only hope that in future years the colony will rebuild to the activity levels of 2000, however, this will only happen if the site is managed sympathetically and sallow numbers are allowed to recover.

Events at Site C form as controlled a field experiment as one could wish to design regarding the study of a colony of *A.iris* **and its habitat requirements:** territorial activity is easily observed, changes in sallow numbers have been recorded, and comparisons can be drawn with a series of 'control' colonies. Positive management at Site C over the next decade, combined with regular flight season monitoring, could show exactly how closely the long-term viability and strength of the colony is related to the number of available sallows. Such a controlled and quantitative long-term study would be an exciting prospect.

Much has been learnt at Site C about the actual scale of sallow numbers needed to support a strong colony of *A.iris* in Hertfordshire, and this information will undoubtedly help the survival of the butterfly here and in neighbouring counties.

Notes on observations at Site C

Charts of the male activity seen during 2000 (6.3.5), 2001 (6.3.6) and 2002 (6.3.7) can not on their own illustrate the full extent of activity seen in 2000, and show the subsequent loss of activity and eventual modest recovery in 2002. These notes tell the whole story.

Table 6.3.1 ~ 1999

Date Notes taken on the day

13-Jul 1999 ~ Whilst carrying out butterfly survey work at Site C, LG was walking along one of the woodland paths in the North wood when a large butterfly flew past. Notes for the day said 'large dark fast.' LG remembers thinking to herself 'what the hell was that?' It was not until the following year, and with more experience, that LG realised that this 'un-identified' butterfly had almost certainly been a female A.iris.

Description

Females seen ~ 1

Table 6.3.2 ~ 2000

15:05hrs, less activity. 15:06hrs, 1 seen on right side.

15:26hrs, 2 left tree. 15:40hrs, left site.

Date Notes taken on the day Description 3-Jul 00 ~ A possible sighting ~ whilst looking at elm in the North wood for White-Unknown letter Hairstreak, LG had a brief sighting of a large butterfly flying over. **13-Jul 00** ~ 13:00-16:50 hrs, rain then sun, c. 19°C moderate breeze. Males seen ~ 1 After several days of unsettled weather, LG arrived at Site C hoping that the weather forecast of rain then brightening up would be correct for once! 4 sightings of a territorial 13:00hrs, rain. male over a 10 minute period 15:10hrs, sun started to shine, but the search for A.iris was targetted at the wrong area. 16:40hrs, whilst walking back to car, LG stopped beneath a large 'master tree' and immediately saw A.iris fly around the tree. The 'master tree' had been found. 14-Jul 00 ~ 11:45-15:35 hrs, mainly cloud, c.19 °C, moderate breeze. Weather poor; Males seen ~ 2 mainly cloud but occasional periods of brightness. Clashing males ~ 2 11:45hrs, arrived in territorial area. 12:00hrs, first sighting. 12:10hrs, sighting. Frequency of territorial 13:40-14:45hrs, 3 sightings. activity after 13:00hrs ~ 5.8 15:15-15:35hrs, 3 separate clashes of 2 males, 5 minutes apart. mins or 10.4 per hr. AM followed at least 3 sightings and managed to watch the butterfly land on the tree - in three different places. During strong wind and a duller period, 1 hung on to its leaf clump as the branch swayed about violently in the wind. This butterfly tilted at times - showing purple uppers with white bands. **16-Jul 00** ~ 15:15-18:00hrs, weather still poor. Males seen ~ 2 16:55hrs, less wind and 2 males clash. AM commented 'Nothing happened until a spell of continuous sunshine and less Clashing males ~ 2 wind from 16:55, when 2 A.iris flew up together towards the top of the tree. Followed 1 onto its perch, where it stayed until 18:00, when I left. From 16:55 until Frequency territorial of 18:00 it was not continuously sunny and the butterfly just sat there, most of the time activity after 13:00hrs ~ 0.7 with its wings closed, although these would half open if the sun shone for a spell. mins or 82.5 per hr. Good activity from Purple Hairstreak around the oak - especially after 17:00 when perhaps 30 were present." **17-Jul 00** ~ 09:35-13:20hrs and 14:40-15:40hrs, good sunshine for most day, $c.16^{\circ}$ -Males seen ~ 3 22°C, light breeze. 09:35hrs, arrived in territorial area. Clashing males ~ 3 09:50hrs, a male flew from 'master tree' to an ash and then flew over ash. 10:10hrs, 1 flew down over clearing and around and off back over North wood. Females ~ 1 10:25 hrs, 1 flew from in tree and around. 10:41hrs, 1 flight in from right (2 in tree). Frequency of territorial 10:47hrs, 1 in from left side of tree (3 in tree). activity after 13:00hrs ~ 4 11:02hrs, 1 seen flying in middle of 'master tree'. mins or 5.3 per hr. 11:08hrs, 1 flew around clearing and into hedge near tree but not into tree. 11:23hrs, 1 flew across end of clearing. It appeared to go into bramble bush near ash and large sallow, back out and in and then appeared above as if it used During the period between undergrowth like a chimney flew off towards North wood ~ female. 14:40hrs and 15:05hrs, 11:30hrs, 1 flight over North wood. numerous clashes, many 11:35hrs, although hot and sunny no activity although, 2 left in tree. arrivals and departures and 11:38hrs, 1 flight round from back of 'master tree'. butterflies perched on oak 11:40hrs, 1 flight right out. Apart leaves. from the 12:15hrs, 1 flew into tree on the right side. 11:23hrs sighting which was 13:20hrs, left territorial area. of a large butterfly no other 14:40hrs, back at territorial area and immediate sightings of 2 or 3. Continuous females were seen activity with numerous clashes.

18-Jul 00 \sim 12:10-12:30hrs and 15:05-15:50hrs, sun, but periods of slow Males seen ~ 2 moving heavy cloud, c.22°C, light breeze. 12:10hrs, a territorial male seen flying round and perching in secondary oak. Frequency of territorial 12:22hrs, 1 flight around 'master tree'. activity after 13:00hrs ~ 15 12:30-15:05hrs, left territorial area. mins or 4 per hr. 15:12hrs, 1 flight from left to right of 'master tree' and then over trees. 15:15hrs, 1 flight across clearing, high but not to 'master tree', 15:47hrs, 1 seen flying around secondary oak but no other activity in area. 15:50hrs, left site. 19 Jul 00 \sim 09:40-13:30hrs and 14:20-15:10hrs, sun with some cloud at times Males seen ~ 2 c.19°-22°C, slight breeze. of 11:22hrs, 1 A.iris flying near 'master tree'. Frequency territorial 11:40hrs, 1 flew right high into tree. activity after 13:00hrs 11:42hrs, 1 across clearing from North wood to tree and away to right. 15.8mins or 3.8 per hr. 11:45hrs, 1 seen on the left side of clearing above trees and flew away. 12:10hrs, a territorial male seen fly round secondary oak coming from nearby woods (almost exact time of yesterday morning's sighting). 12:43hrs, 1 flight left to right and across clearing. 12:50hrs, probable return trip. 13:08hrs, 1 flight up left side of clearing and flying over LG to South wood. 13:20-14:20hrs, left territorial area. 14:55hrs, secondary oak immediate sighting of male flying around top of tree. 14:58hrs, again around tree - although its difficult to get a good general viewpoint of this tree. 15:05hrs, around tree again and appeared to fly away towards nearby woods. 15:10hrs, left site. 22 Jul 00 ~ 16:00-17:30hrs, sunny. Males seen ~ 1 16:20hrs, 2 butterflies fly toward the tree from the south, but then flew west Females seen ~ 1 over the sallows over the North wood. 1 seemed to be following or chasing the Behaviour indicative of other - about 6 feet behind. pairing activity 16:20-17:30hrs, no more sightings. 17:30hrs, left site. 25-Jul 00 ~ 11:40hrs-11:50hrs and 14:10hrs-17:30hrs, 10% cloud although Males seen ~ 1 occasional glimpses of brightness, c.17°-19°C, light breeze. 14:20hrs, 1 sighting when A.iris seen to fly left to right, past tree and then Frequency of territorial dropped down near path. activity after 13:00hrs ~ Good Purple Hairstreak activity late afternoon especially as sky brightened near 15.8mins or 3.8 per hr. end of day. 26-Jul 00 ~ 10:40hrs -13:30hrs, moving around site, thundery clouds kept Unknown - too brief to covering sun for some long periods, c.20°-22°C, light winds, humid. confirm whether male or 10:40hrs, arrived secondary oak - a lot of Purple Hairstreak activity observed female nor presumed activity which continued in all oaks during visit. 10:50hrs, A.iris seen in air over large sallow (or oak behind) near wood edge. 11:52hrs, at secondary oak brief sighting of probable male, just appeared and then flew off. 12:05hrs, seen from path a butterfly flew down out of oak towards sallows wrong angle to get positive identification but went straight to sallow area. 12:42hrs, a butterfly flies out of oak behind sallows out of sight and immediately returns. Again wrong angle to get good identification. 13:30hrs, left area. **29-Jul 00** ~ 11:00hrs -12:00hrs and 13:45hrs -15:00hrs, sun. No activity observed **31-Jul 00** ~ 10:50-11:20hrs and 13:25-16:20hrs, sun with cloud, c.21°-25°C, No activity observed moderate breeze. 10:50hrs, arrived at sallows and moved around territorial area. 12:00hrs, White Admiral seen. **Dec 00** \sim Whilst visiting the area, to assess sallow density in nearby woodland, saw that the South wood at Site C had been subjected to a massive clearance programme. Many sallows felled. Site meeting arranged with AM, LG, John

Murray, Stephen and Gail Jeffcoate. Felled sallows searched for larvae, but

none found.

Table 6.3.3 ~ 2001

 16-May 01 ~ Site meeting attended by Site C's Forestry Consultant, LG, John Murray, Trevor James (HBRC) and Nigel Bourn (Butterfly Conservation). 04-Jul 01 ~ Permission given for LG to resume survey at Site C (Foot and Mouth) 	2 possible sightings, but too
restrictions). 11:40 -16:31hrs sun with slight haze, moderate breeze	brief to confirm that <i>A.iris</i>
12:06hrs. arrived at 2000 territorial area.	were seen
12:46hrs, something ' <i>A.iris like</i> ' flew across clearing left to right in front of 'master tree' at hedge line height	
16:07hrs AM sees a butterfly glide nast 'master tree' right side	
05-Jul 01 \sim 11.57-17.00 hrs. weather poor	Males seen ~ 1 behaving in a
13:32hrs, first <i>A.iris</i> seen– in front of 'master tree' at hedge line height – a large butterfly.	territorial manner over sallows
AM texts with sightings at Site A at almost exactly the same time!	
14:05hrs, moved to area of sallows in North wood, 2 chasing each other - then	Females seen ~ 1
confirmed in gap near lower sallows.	
14:10hrs, flight above trees near sallows. 14:30hrs - 14:31hrs, c.2 brief sightings.	Behaviour indicative of
15:35hrs, definite A.iris – probable female, circled, flew left and then back into	pairing activity
sallows.	
16:56hrs, brief sighting over sallows (disturbed by low helicopter).	
06-Jul 01 ~ 10:00-16:30hrs, cloud at first then sun $c.21$ °C.	Females seen ~ 1
12:31hrs, definite large saw markings.	
12:42hrs, brief flight above sallow.	No territorial behaviour
12:46hrs, possible movement.	observed
09-Jul 01 ~ 09.53 -13.09 hrs and 14.04 -17.30 hrs c 17°C light breeze	No territorial behaviour
10:13hrs. left side ash. male.	observed
10:32hrs, over ash to rear of clearing.	00501700
10:48hrs, around sallow and tall ash flew to 'master tree' and straight back.	
16:05hrs, right of 'master tree' back across clearing, appeared to be a slightly smaller	
butterfly.	
16:40hrs, 1 flew south-west over the trees in the clearing and sallows.	
Stayed until 17:30hrs but no activity when brighter weather arrived for a while.	
11-Jul 01 ~ 11:01-12:54hrs, although very windy, several bright spells, clearing	No activity observed
sheltered and several butterflies flying. Tops of trees very windswept and no A.iris	-
activity seen at all, although 4 Comma seen in a sheltered area.	
12:48hrs, good numbers of Purple Hairstreak on sallows.	
12:54hrs, went home – too windy for <i>A.iris</i> !	
13-Jul 01 ~ 11:29-14:40hrs, weather still blustery, although cloudy on arrival, good periods of sunshine through out watch although air temperature cool only $c.17^{\circ}$ C	Males seen ~ 1
Good Purple Hairstreak activity throughout day. 12:11hrs, flight over maple appeared small, flew over North wood.	Females seen ~ 1
13:21hrs, 1 seen to fly into a sallow. Had sight in binoculars so walked closer, never	Female behaviour indicative
found it, but convinced it didn't fly out again, never saw it leave! About 12 feet up	of site-selection for egg
tree – searched continuously but could not be found. Noted that Purple Hairstreak	laving
flew around sallow and nothing confronted them. (AM at Site A from 13:00hrs and	laying
has continuous activity all afternoon)	
13:52hrs, flight head height along edge of clearing towards north end.	
14:20hrs, confronts a dragonfly.	
16-Jul 01 ~ 11:06-15:30hrs, sun with heavy cloud building up, $c.18^{\circ}$ C, light breeze.	Females seen ~ 1
11:22hrs, first sighting.	
12:05hrs, 1 appeared in gap under 'master tree'.	Behaviour indicative of site-
12:05hrs, in sun saw a female fly around sallows, egg-laying 5+ eggs within sallow,	selection for egg-laying
the butterfly would fly around tree and resettle at head height – cloud.	
12:12hrs, activity stopped.	
13:54hrs, after very brief sun, the butterfly seen at back of tree then flew around a	
few times and resettled, high in tree.	

15:00 -15:20hrs, good sunshine but did not re emerge!

13-Jul 02 ~ 11:15-17:12hrs, mostly sun $c.19$ °C. Watched 'master tree' all day! 11:54hrs, brief glimpse of large butterfly into hornbeam scrub right of 'master'	Males seen ~ 2
tree'. 12:52hrs, one flew from right across clearing. 12:58hrs, male across clearing from right. 13:03hrs, flight across clearing right to left	Frequency of territorial activity after 13:00hrs ~ 17mins or 15 per hr.
13:06hrs, towards 'master tree' then around left edge side. 13:08hrs, across clearing from right.	Females seen ~ 1
 13:10hrs, brief sighting over edge end of clearing, then 2 chasing each other to south end of clearing 13:35hrs, left tree across clearing to left side. 14:22hrs, from left, not sure if it went to 'master tree' or across 14:44hrs, one flying around top of 'master tree' 15:36hrs, flying into 'master tree' from left and back, (cloud cover 25%) 14:40-15:45hrs, continuous activity around tree by one butterfly, video and photo, probably 2 in tree. 15:37hrs, appeared in at the right, same as before and may have flown over the top. No more sightings until leaving, some cloud and appeared cooler. 	Behaviour indicative of pairing activity
1/:12hrs, left site. 16-Jul 02 ~ 11:27-13:40hrs, a hot day, $c.23$ °C, with varied cloud cover. Mostly cloud until 13:00hrs and then full sup until departure	Males seen ~ 1
11:27hrs, almost immediately a female <i>A.iris</i> seen flying around the 'usual' sallow. It perched on tree and then disappeared from sight, it did not appear to fly off.	Frequency of territorial activity after 13:00hrs ~ 10mins or 6 per hr.
13:00hrs, flight from left at north end of clearing. Possibility, this was the same <i>A.iris</i> seen earlier having flown out from very back of sallow but this can not be confirmed	Females seen ~ 1
13:15hrs, one seen flying across trees to north of clearing, and back, in a patrolling manner, and again at 13:20hrs and 13:27hrs. 13:40hrs, left territorial area.	Behaviour indicative of site- selection for egg-laying
butterfly visible flying low over field, possible female <i>A.iris</i> . 17-Jul 02 ~ 14:15-15:00hrs, 90% cloud. 14:40-14:50hrs, female spotted flying in and around sallow scrub in South wood, particularly rather young growth around 20ft high seen in 90% cloud, also perched on birch leaves then carried on flying around scrub canopy.	Females seen ~ 1 Behaviour indicative of site- selection for egg-laying First sighting from this area of wood

6.4 ~ Site D

Woodland description ~ Site D is a small deciduous wood of c.5 ha close to the Broxbourne Woods complex. The surrounding 1km^2 contains a variety of woodland habitats, such as distinct areas of mature oak, hornbeam, and conifer, as well as younger mixed plantations. Site D lies on a border between London clay and chalky boulder clay.

Sallows \sim There are a few, but still valuable, sallows around the woodland edge and rides of Site D, although far more can be found throughout the wider Broxbourne Woods complex. These sallows are of all ages and range from very young growth in some of the clearings, to large mature ride-side and canopy sallows. One can get an impression of the sallow abundance across the Broxbourne Woods complex by looking over its canopy from neighbouring hills when the sallows are in flower in spring.

Nature of observations \sim There have been occasional records over many years of *A.iris* from the Broxbourne Woods complex, but none appear to have been from a possible territorial area. In view of this, we were keen to try and locate a territory, but the size and diversity of the complex suggested that this would be an almost impossible task. By first looking at the map and then by looking across to the complex from Cock Lane, the high points could be seen, as well as prominent trees. But the Broxbourne Woods complex presents a particular problem in that it is shaped not unlike a very large bowl, and high-points for potential territorial activity extend for several kilometres around its perimeter. Nevertheless, in the spring of 2001, several visits were made in order to identify potential areas for territorial activity, and Site D was considered to be one of several likely spots.

Whilst walking the Broxbourne Woods complex the following summer, on the 12^{th} July 2001, we had our first sightings. Whilst LG was counting White Admirals nectaring on a bramble bush, AM saw a female *A.iris* flying low over a field beside the wood, and a few minutes later whilst looking up at a gap between woodland, LG saw a male fly across in a territorial manner.

The territory – We were sure that this woodland gap, with several large oaks at a high point, was the principal territorial area and we returned in July 2002, expecting to see more activity. Although we got a brief sighting of a territorial male here on 14th July, it seemed odd that activity was rather limited considering that on the previous day at Sites A, B and C activity had been intense. On 15th July, AM decided to investigate the area further and, on reaching a certain high point, he almost immediately saw a male fly across a dip in the canopy of the wood that was visible from the woodland edge. He quickly realised that this was the centre of the territorial area, and that the butterfly seen in July 2001 had simply been patrolling the woodland gap as part of a secondary or larger territorial area. The centre of the territorial area does not consist of one master tree or even a gap in the canopy, but is probably best described as being like a 'bowl' formed from the canopy of several prominent and adjoining oaks. We returned on several more occasions, and took video footage of the territorial activity on quite a cloudy day when males were still active. Although clashing males were seen on 22nd July, no more activity was observed after that date despite two more visits.

There are no known records of *A.iris* from this site before 2001, but its proximity to the Broxbourne Woods complex means that some *A.iris* seen over the years in the wider complex will no doubt have been using this site as a territorial area. However, our experience of *A.iris* elsewhere in Hertfordshire suggests that, since this large complex contains sallow-rich habitat at various widespread locations, there are almost certainly more scattered territorial areas still to be found. In our opinion, *A.iris* seen recently in the Broxbourne Wood Nature Reserve (6.5) may not necessarily have been using Site D as their territory. It will take many years of study before the true extent of territorial activity in the Broxbourne Woods complex can be more fully understood.

In our opinion, Site D undoubtedly serves as a territorial area for *A.iris* associated with sallow-rich habitat well beyond its own boundaries through a far wider area of the Broxbourne Woods complex.



Chart 6.4.1 A.iris - male activity recorded after 13:00hrs at Site D, 2002

Table 6.4.1 Notes on observations at Site D

Date Notes taken on the day Description 12 Jul 01 ~ Weather variable: good sunshine, but also periods of cloud and Males seen ~ 1 showers. c. 18°C, moderate breeze. Spent the day in Broxbourne Woods complex, by mid-afternoon LG & AM Females seen ~ 1 were walking near the woodland edge. At 15:12hrs, a very large dark insect with white bands travelling low was seen over the meadow along the edge of a wood. Larger than a Large White nearby and undoubtedly a female A.iris. At 15:18hrs a male A.iris was seen to cross an open ride between woodland and flew around an oak. 15:24hrs, it flew towards the Broxbourne Woods complex. 14 Jul 02 ~ LG & AM returned to the woodland gap site expecting to see Males seen ~ 1 frequent activity! 13:54-16:00hrs, sun, 25°C 2 sightings in 2 hours at 15:06hrs, a male flew south-west from central north oak towards the woodland gap site Broxbourne Woods complex, then back over the ride, half way along the east section 15:09hrs, seen again being chased by a Purple Hairstreak. 15 Jul 02 ~ Late morning, one sighting of a probable female flying low near the Low flying female ~ 1 woodland scrub edge by two other observers. 15 Jul 0214:20-18:10hrs, 4 hours Males seen ~ 2 of observations, variable sunshine, 20-25°C light north-east wind. 14:59hrs in 100% sunshine, a male flew out over the ride then back towards the Frequency of territorial oaks and birch, and then flew over the tree-tops before flying back north. activity after 13:00hrs ~ 4.2 50% sun from 15:00hrs and 25% from 15:30hrs to 16:00hrs. mins or 14.4 per hr. 16:10hrs, AM walked through the wood and at 16:15hrs on arrival at the edge of the wood, an A.iris was seen to fly around the canopy 'bowl'. All subsequent 14 sightings in 2 hours at flights refer to the bowl unless stated otherwise. centre of territorial activity 16:26hrs, flight. 16:29hrs, flight. (1 sighting in 1 hour at 16:31hrs, 2 flights. woodland gap site) 16:34hrs, flight. 16:38hrs, one perched in the middle of the 'bowl', 3 flights, 2 A.iris. 16:43hrs, walked to view the canopy 'bowl' from another angle. 16:46hrs, flight. 16:52hrs, flight. 16:52hrs, flight. Returned to the original viewpoint, then from 17:10hrs to 17:23hrs walked around the area before returning to the original viewpoint.

15 Jul 02 cont 17:43hrs, a tit flew to the top of an oak in the canopy 'bowl', disturbing a male into flight which had been settled there unseen. 17:53hrs, a second male flew from left to right in front of the canopy 'bowl'. 18:03hrs, a male descended west from the canopy and drifted down into the adjacent coppice and scrub. 18:10hrs, left site for home. 17 Jul 02 ~ 16:00-17:40hrs, 25% sun, cooling off. Males seen ~ 1 16:46hrs, a male seen in flight above canopy just to south of the 'bowl'. Frequency of territorial activity after 13:00hrs ~ 1 mins or 1 per hr 1 brief sighting of male 18 Jul 02 ~ 15:10-16:40hrs, 25% sun, 20+°C, light north-east breeze, 1.5hrs Males seen ~ 3 observations, most flights were in the "bowl", but a few times flew over crown and out towards our observation point. Video footage taken. Frequency of territorial 15:10hrs, 2 flights in rather dull conditions. activity after 13:00hrs ~ 2.8 15:12hrs, extensive flight. mins or 21.3 per hr. 15:16hrs, flight. 15:17hrs, chased by dragonfly across 'bowl'. 32 flights, 5 times perching 15:24hrs, 2 flights. and used 3 or 4 perches all 15:28-15:42hrs, cloud. within 3 or 4 metres of one 15:45hrs, 3 fights and chased by small brown butterfly. another 15.46-15:49hrs, 5 flights. 15:50hrs, settled for 2 mins. 15.52hrs, settled. 16:04hrs, flight, then settled. 16:13hrs, flight from perch. 16:31hrs, 5 flights then settled. 16:36hrs, still settled. 16:39hrs, flight. 16:40hrs, left site. 22 Jul 02 \sim 13:52-14:30hrs, moderate north-west breeze moving tree top Males seen ~ 2 branches, 80% cloud cover, not bright sunshine, 20+°C. 13:52hrs, flight. Clashing males ~ 2 13:55hrs, flight. 14:10hrs, flight. Frequency of territorial 14:14hrs, two males clashed and flew high into the sky, then 1 min later they activity after 13:00hrs ~ clashed again, one returning to the 'bowl', the other moving away to the south 4.7mins or 12.6 per hr. and down. 14:15hrs, two clashed again. 8 sightings, 2 males present 14:18hrs, flight. at least 14:20hrs, flight. 14:27hrs, 2 clashed lower in the canopy just to the south of the bowl - always the possibility of more than two present. 24-Jul 02 ~ Visited 'bowl' briefly for 15 minutes around 15:00hrs, some No activity observed sunshine.

26-Jul 02 ~ Watched 'bowl' in perfect weather from 15:23hrs to 16:26hrs. No activity observed

6.5 ~ Site E Broxbourne Wood Nature Reserve (TL326073)

Woodland description ~ Site E (c.35 ha) forms part of the larger Broxbourne Woods National Nature Reserve (NNR; SSSI), and is managed by Countryside Management Service/Hertfordshire County Council with conservation and biodiversity as major considerations.

Site E is a mixed habitat comprising variously aged blocks of coniferous plantation with deciduous elements, younger broad-leaved plantation and regeneration, several open glades and rides, and smaller areas of older broadleaved trees (Image 6.5.1). This diverse pattern of habitats is the result of a combination of several decades of commercial management in the form of conifer plantation, and more recently conservation management, such as the felling and thinning of conifers, the planting of broadleaved stands with associated regeneration, and ride widening. In the north of the reserve there are two floristically rich clearings, created in part by fire damage, which are now managed for their biodiversity value.

The surface geology of Site E is mostly London clay where damp conditions would be likely to favour sallow establishment and growth, and this is bordered by glacial gravels on the higher ground. The wider Broxbourne Woods NNR has similar surface geology, whilst adjacent soils formed over chalky boulder clay tend to have been used for agriculture.



Image 6.5.1 Broxbourne Wood. The paler areas represent younger plantation and regeneration, glades and rides, which contribute to the general habitat mosaic. The reserve is approximately 1km from east to west.

Sallows ~ Site E appears to have an abundance of sallows likely to be comparable with the other Hertfordshire woods where *A.iris* has recently been found, and has much in common with these locations in that numerous sallows are present in its younger areas of regeneration and plantation (mixed, broadleaved and coniferous). Where Site E differs markedly from the other locations is that many sallow-rich areas adjoin its network of open rides and glades (Image 6.5.2).

In addition, Site E has a diverse age structure, from mature blocks to young areas of plantation and regeneration. Although natural progression is likely to reduce the number of sallows in certain areas as they mature over the coming decades, more sallows are becoming available to egg-laying *A.iris* in younger areas, and further areas could develop if older panels are felled. Retention of sallow growth in areas of plantation and regeneration would allow *A.iris* to benefit from these cyclical changes, and would help to maintain the strength of the colony (10).

Maintaining this age diversity and cyclical abundance of sallows would seem to be the surest way of retaining a strong population of *A.iris* on the reserve over the very long term (6.3; 10). However, moving towards maintaining a high canopy across wider areas of the reserve, with selective felling of individual mature trees, may not provide the conditions for abundant sallow growth presently associated with *A.iris* habitats in Hertfordshire (10).

We have made some very basic estimates of sallow numbers at Site E, but have found that such estimates made at other sites have proved to be inaccurate once a detailed survey has been completed. A detailed

sallow survey at Site E would:

- Improve our understanding of the habitat. How many sallows are there, where are they and why?
- It would allow for a more meaningful comparison between sites
- It would provide quantifiable information which could help guide future management decisions in an informed way, both at Site E and elsewhere.

Prior to the sightings in July 2001 by Lissa Smith (6.5.1), we alerted the reserve's management team to the likely presence of *A.iris*, as AM had recently seen *A.iris* nearby and the reserve appeared to provide perfect habitat. As a result, the management plan was suitably adjusted to accommodate the needs of the species, for example, suitable areas of sallow regeneration have recently been retained in the general area of the glades.



Image 6.5.2 ~ a sallow-lined ride in Broxbourne Wood Nature Reserve.

Nature of observations ~ Unlike the other Hertfordshire woods where *A.iris* has recently been found, many of the sightings at Site E have been of females. Observations have been made from the network of managed rides that are either lined with sallows or are adjacent to sallow-rich belts, and female *A.iris* are no doubt attracted by this abundance of sallow growth. They have been seen to enjoy the micro-climate of the rides for sunning, but have just as often been seen flying off and over the canopy. Females and males have also been seen to land on the ground of both the main and north rides (8.3). Comparing Chart 6.5.1 for Site E (2002) with Charts 4.3 (all sightings 1999-2002), 5.4.1 (all sightings 2002) and 8.1.1 (male activity), sightings at Site E in 2002, being predominantly of female activity associated with sallows, tended to be a little later than these other charts which relate more strongly to male activity, and few sightings came in the first half of July despite good coverage. It will be interesting to see if this pattern continues.

Although there appears to have been no record of *A.iris* at Site E prior to 2001, sightings of singles in 1997 and 2000 were made within 1km of the Reserve's boundary, and there have also been occasional records spanning many decades from the wider Broxbourne Woods NNR (3). Although the situation of sallow-lined rides at Site E allows for *A.iris* to be observed as it takes the opportunity to fly below head height in this microclimate, it seems that the species can also thrive in woods where the majority of sallows are in the canopy and where there are few if any rides for either butterfly or observer (10).

It was agreed with the reserve's management that the public should be encouraged to visit the location to look for *A.iris*, so increasing coverage and raising general awareness as widely as possible. Sightings from Broxbourne Woods in 2000 and 2001 were detailed in the Hertfordshire & Middlesex Butterfly & Moth Reports (Murray & Wood 2000; 2001), and details of sightings in July 2002 were posted on the branch website as and when the news came in. This generated a great deal of interest amongst observers, resulting in almost daily coverage from mid-month, and several people enjoyed their first ever sighting of *A.iris* in Hertfordshire.

Territory \sim Site E is rather low-lying and no obvious or consistent territorial activity has yet been observed. It may be that territorial activity takes place on higher ground somewhere beyond the bounds of the reserve.

See 6.5.1 ~ Notes on observations ~ We would like to thank all those who spent many hours in Broxbourne Wood Nature Reserve waiting for *A.iris* to appear. All comments and notes have been much appreciated and are reproduced in full in 6.5.1. These comments and notes have been used to estimate daily numbers (reasonable minima – probably more seen on some days) and to interpret activity (Charts 6.5.1-3) as has been done for the other sites, and it is hoped that they give a fair and reasonable picture of events. The daily duration of observations has not been calculated for Site E because sightings and estimated numbers (Chart 6.5.1) are also strongly related to the number of observers (and hence the area that can be monitored), and not just the hours 'on site'. Also, most sightings have been of females, whereas 'frequency of sightings' will hopefully prove more useful for monitoring territorial activity.



Chart 6.5.1 *A.iris* - numbers and sightings at Site E, 2002



Chart 6.5.2 A.iris - male activity at Site E, 2002





6.5.1 ~ Notes on observations of *A.iris* at Site E Broxbourne Wood

Lissa Smith's notes on her observations of A.iris in July 2001 & July 2002

Over the past two years I have been lucky enough to have seen a Purple Emperor *A.iris* on six separate occasions and have managed to photograph them three or four times. I am happy to tell you about our experience of them on these occasions and hope it might contribute and help you with your conservation work in the future.

July 2001 ~ Last year we saw and photographed a Purple Emperor *A.iris* twice, the first time was at 12.25pm on 15^{th} July when it was sitting in the middle of the path, the second time at 2.15pm on 20^{th} July when it was on a small oak sapling at the side of the path sitting about six feet from the ground. These sightings were at the back [north] of the wood, in very warm and sunny conditions.

Both times they were female and when they flew up they glided around for thirty to forty seconds coming very close to us before eventually landing up in a birch tree, the same tree both times. After about two minutes they flew off over the treetops, on both occasions flying in the same direction. With the first sighting my daughter Rachel and I approached it, both kneeling down on the path, and we managed to take a close-up photo. I was surprised at how still the butterfly remained, it was only with the noise of the gravel when we got up that it flew off. Each of these sightings lasted a total of about 5 minutes.

July 2002 ~ This year, I have seen a Purple Emperor on four separate occasions between 15^{th} July and 28^{th} July, with five sightings in total. Late morning on one of the days, I saw what I am fairly certain was a female rather than a male flying over the tree tops at the far end of the path, and crossing over the path three times before disappearing. Then when I returned to the wood later on that afternoon, myself and a couple of other people saw a male Purple Emperor [on the main path from the west car-park]. Although this year I managed to get a few more photographs, it was more difficult because there were many more people at the wood compared to last year.

In my opinion the behaviour of the Purple Emperor does appear to be different when surrounded or confronted by a lot of people to the way it is when there are less, and I suppose not as much noise. I thought the time the butterfly spent in sight gliding around seemed to be less and it didn't seem to glide down as low or come as near, consequently my experience of seeing them last year was a very different one to this.

My sightings have occurred in three different areas of the wood, although directly over the treetops these areas are quite near to each other. They all have one thing in common, they are quite small open sunny areas with enough room for the butterfly to fly and glide around quite low. On more than one occasion I have watched the butterfly flying around the tree tops before gliding down about eight feet from the ground, then flying up and out of sight only to return a couple of minutes later to do the same thing again. All apart from one sighting have occurred between 11.30 midday to 2.30pm, although most have occurred between 12 midday and 1pm when the sun has been out. Four were female and one was male. The time scale of each sighting has varied depending on whether they have landed or not, but the longest sighting has been about 5 minutes and the shortest about 30 seconds. The average seems to have been just a couple of minutes or less and on four occasions I have watched them land in birch trees.

I think there were between three and five Purple Emperor seen in the wood this year, possibly more but definitely a minimum of three and no less.

I feel quite lucky to have seen and photographed the Purple Emperor, it is without doubt a wonderful butterfly.

Lissa Smith

Sat 28th July 2001

'The location was in the west car-park. The butterfly swooped down low over the dark metallic blue car soon after I parked it. It passed over once or twice and then was gone. At the time I wasn't sure what it was, but looked like a large White Admiral, no purple glints. I think it was after I'd had an e-mail describing this as behaviour characteristic of a Purple Emperor that I thought it was likely it could have been one.' **Malcolm Hull**

July 2002

Sat 13th July 2002

One probable sighting of a female *A.iris* along the main ride from the west car-park. Around mid-day **Terry Goddard** saw a large butterfly, unlike a White Admiral, fly around the sallows before entering one particular sallow.

Sun 14th July 2002

'One possible brief sighting yesterday down the main ride from the west car-park. Fairly sure it was one but can't rule White Admiral out on views. I saw it very briefly fly from the ride to the top of an oak; it looked too big for a White Admiral but I was some distance away. I assume it then settled on top of the oak out of view as it was not seen flying whilst I was walking to the tree in question. By standing on a bench (the first bench you come to whilst walking down the ride from the west car-park) I was able to partially see one corner of the upper-side of the upper-wing as it lay flat on the leaf. It didn't look right for White Admiral. The area of white between the stripe looked more pronounced (fitting most photos I have since seen of Purple Emperor). The white stripe (from what I could see) looked to be more solid (*i.e.* less like a set of 'blocks' making up the line - more continuous); again from photos I've seen since, this fits female *Purple* Emperor but in this case it may have been the acute angle giving this appearance. I can't really say the wing shape looked more pointed, and the angle didn't allow for a decent impression of size, but for some reason - apart from the above - it did strike me as being in someway different from a White Admiral.' **Toby Austin**

Mon 15th July 2002

'I thought you might like to know that following your report of a Purple Emperor earlier in the week at Broxbourne Wood, my husband and I went there today and at mid-day we saw a Purple Emperor not far from where we saw last year's one [outer north ride west of hemp-agrimony patch]. It landed briefly on a tree trunk at eye level before flying off over the tree-tops. It took off before I could get a photo although I tried to take one anyway - shall see if anything comes out!'

Lissa & Jeremy Smith

Tue 16th July 2002

After six days of looking, **Terry Goddard** saw a female Purple Emperor on the ground along the main ride from the west car-park at 12:00hrs today. Terry was able to get within 2m of it, but a dog walker disturbed the butterfly and it flew up. The butterfly appeared somewhat sleepy, but it was cloudy at the time. However, the butterfly was still visible and Terry pointed it out to the dog walker who was equally thrilled. The Purple Emperor flew off, but then he saw it flying around the dog walker's head before it disappeared over the trees.

Thu 18th July 2002

Purple Emperor at last!

'A female [Purple Emperor] seen extremely well on two occasions on the main ride from the west car-park of Broxbourne Wood shortly after 3.00pm and seen until around 3.20pm. It was first seen at about 2.45pm by two others (Martin Shepherd and Jeremy Gaskell) who alerted me to the fact that they were pretty sure that they had had a brief sighting. Being in exactly the same spot as my own probable sighting on the 14th and Terry Goddard's sighting on the 16th, I agreed that they may well have. I then re-found it and we all had fairly brief but good views as it settled around the area by the first bench (where the cross-roads are); that is until Sam, my three year old, unfortunately flushed it! About ten minutes later it was seen flying down the ride where it settled on a muddy patch by the remains of the stream at the lowest point in the dip of the ride. Here we all (including Sam, but from further back!) had superb views for about five minutes before it departed. What is odd is that after the views by the bench, we all agreed that it was a very worn individual and Jeremy Gaskell actually said he was fairly sure that he had seen tears in the wings. However, when seen well ten minutes later, it appeared reasonably fresh. Trick of the light? We were looking into the sun on the first views which may have shone through the wings making them appear paler and more worn? I find it hard to believe that after looking - admittedly not always in the same area - for six of the last eight days, a total of about twenty hours, that I should see two different females in the space of five minutes! But, it did appear remarkably different and you never know.'

Toby Austin

Thu 18th and Fri 19th July 2002 ~ Jeremy Gaskell

Other observers: Toby Austin [TA], Martin Shepherd [MS], Nick & Angela Sampford [NS, AS].

^cAs the paths through the coniferous parts of Broxbourne Woods held little of interest, I decided to make for the main ride leading from the Brickendon Road to try to find White Admirals at a spot where I had encountered them in a previous season. On my reaching the site all seemed still, and the heat of the early afternoon slightly oppressive. TA who had also taken up position in the ride told me of the hours he had already spent trying to obtain an indisputable sighting of a Purple Emperor. We were joined by MS who was also in search of Emperors, as well as any other butterfly species of interest.

After some discussion I felt drawn back to the sunnier part of the ride that leads up to the west car park. MS decided to accompany me and as we walked slowly up I scanned the wayside briars for White Admirals. Suddenly there was an exclamation from MS who had what we both took to be a butterfly of this species flying round his feet, evidently endeavouring to return to a favourite spot from which it had been dislodged. Eventually, after a few more rapid spirals, the insect settled about 15m ahead of us on the ride, wings spread open. With MS's consent I approached to take a photograph, pre-setting my camera lens for the optimum range as I did so. Anyone interested in photography will know that at close range the depth of field is greatly reduced so that the image I could see as I made my final approach was at first no more than a blur. As the insect came into focus very suddenly, the presence of an inconspicuous but distinct iridescence of purple across the wings, and of a small tawny circle towards the anal corner of the hindwing, so startled me that I neglected to release the shutter. In that instant the insect flew off. Somewhat incredulous, MS and I retraced our steps in order to tell TA what we had seen.

Returning to the scene a few minutes later all three of us encountered a second Purple Emperor at approximately the same place on the ride. This insect appeared large, slightly faded and, through field glasses, I could detect the presence of small tears in the extremity of one of the forewings. This individual did not remain still for long but a few minutes later we thought we had relocated it. On this occasion, however, the butterfly appeared to be in pristine condition. Because the wings were closed this time we were able to observe the pattern on the underside with its conspicuous reddish brown dab on the apex of the forewing and broad silvery panel along the trailing edge of the hind-wing.

Subsequently four or more White Admirals put in their appearance. I was struck by the fact that it was only when one was able to observe the under-wing, or to assess size with complete confidence, that identification seemed straightforward.

After discussion of the Purple Emperor's habits with AM that evening, I resolved to return next day to secure a photograph. Shortly after my arrival at midday I saw a Purple Emperor fly down to a slightly damp patch at the lowest point of the ride. I spent a minute or two observing the insect as it coiled and uncoiled its greenish proboscis in search of minerals in the soil. As the accompanying photograph shows this individual was in superb condition and was very probably the third insect seen on the previous day. At the sound of the shutter it took flight heading away from me up into the trees. As it was only 12:10hrs when I met MS again I was confident that there would be ample opportunity to study specimens of the butterfly again at close quarters. However, such is the unpredictability of this magnificent flier that for the next three hours we saw nothing of note beyond a female Purple Hairstreak ovipositing on a leaf stem low down on the bough of an oak. Finally, at 15:15hrs, together with NS and AS who had arrived, we had a brief but clear view of a fairly large individual flying close to the canopy at a height of *c*.30 feet. Unfortunately it did not settle. I returned home feeling sufficiently rewarded but aware of how easy it would be to spend an entire day searching for this elusive species with little to show for one's labours.' **Jeremy Gaskell**

Fri 19th July 2002

Three sightings of Purple Emperor, a female photographed at 12:10hrs, another in flight at 15:15hrs, and a third sighting later by the Sampfords - Nick & Angela Sampford, Martin Shepherd and Jeremy Gaskell

Sat 20th July 2002

'Just returned from Broxbourne Wood after seeing my first ever Purple Emperor on the ground along the main ride from the west car-park - brilliant! First sighting was of a female flying around sallows at about 12.15pm just after the sun came out. Then just before 1.30pm we saw a White Admiral egg-laying and AM had climbed up a tree to take a photo, when a female Purple Emperor flew around and down onto the ride. The butterfly was observed on the ground for about 10 minutes: it would settle, then fly around, then resettle and several times flew around our heads at speed before flying off back over the sallows. Observers - Helen Bantock, Tony Clancy, Liz & Rachel Goodyear, Alex Lewis, Andrew Middleton, Nick & Angela Sampford, Lissa Smith & family, Giles Whalley.' - LG

Sat 20th July 2002

Two sightings. 20+°C, moderate breeze but fairly still in the wood. Main ride. 12:45-12:50hrs, a female Purple Emperor spotted over sallows and around sallows, at one point entered sallow and flew around inside. 13:27-13:35hrs, a female came down and landed on side of path, crept around and moved wings open and shut, was not actually seen using its proboscis, but probably looking for moisture/salts, moved two or three times and after ten minutes flew back over trees - various observers.

Two sightings of female Purple Emperor, possibly involving two butterflies. **Tony Clancy**

Mon 22nd July 2002

'11:30-12:45hrs, 80-100% cloud. At 12:10hrs, one thought to have been a male Purple Emperor flew quickly eastward over sallows beside the main ride from the west car-park. A little later a possible female was seen very briefly in the back of a sallow but far from confirmed.' - LG & AM

Mon 22nd July 2002

'We went to Broxbourne Wood yesterday (Mon 22nd) along the main ride from the west car-park and were there from about 13:30hrs to 17:00hrs. We had no Purple Emperor sightings at all, but did see the regular butterflies: there were 100s of Purple Hairstreaks and quite a few White Admirals.'

Nick & Angela Sampford

Wed 24th July 2002

'We went to Broxbourne Wood today from 11:30hrs to 13:30hrs. We had three sightings of Purple Emperor along the main ride from the west car-park, all of which were brief.

12:00hrs - one over sallows by the big oak.

12:45hrs - one sighting over sallows east of the bench involving two Purple Emperor, which were almost certainly a male and a female due to the size difference.'

Nick & Angela Sampford

Fri 26th July 2002, no sightings of Purple Emperor reported today in seemingly ideal conditions from midmorning to 15:00hrs. Several sightings of White Admiral with a minimum of two present - several observers.

Sat 27th July 2002

'We went to Broxbourne Wood at about 12:00hrs and had one sighting of Purple Emperor along the main ride from the west car-park. Helen Bantock and Toby Austin were there already but had not yet had any sightings. There were plenty of common butterflies about, then at 13:45hrs Angela picked up a large butterfly flying along the sallows which appeared to land. Toby found it roosting high in the sallows where it sat for a good ten minutes before flying over our heads, when it was lost to view. We sat there until gone 15:00hrs with no more sightings. White Admirals seem to be dwindling, only saw one all the time we were there, but loads of Purple Hairstreaks.'

Nick & Angela Sampford

Sun 28th July 2002

Mid-morning to 16:30hrs, 25-30°C, still and sunny. Sightings of two or three females and one male. 12:10hrs, three sightings of female around sallows on east half of east-west ride. *c*.15:30hrs, smaller butterfly thought to be a male, spotted by NS over sallows landed on scrub high up for 10 minutes and image taken. Female activity in sallow also seen. Several observers including: **Allen Beechey & Kathryn Graves, David James, Andrew Middleton, Nick & Angela Sampford.**

'One of my sightings on 28th was a female Purple Emperor towards the top (far end) of the main path.' Lissa Smith

'Female Purple Emperor seen in flight briefly at 12:06hrs just above the tree-line from the bench on main ride from the west car-park. Also close sightings of Purple Hairstreaks and Peacock, and others had also seen a White Admiral.' **Martin Shepherd**

Martin Shepheru

Mon 29th July 2002

'Went to Broxbourne Wood today. One very probable Purple Emperor flying over from sallows to the large oak on the right of the main ride from the west car-park. Further along the track at least three White Admirals. Hopefully got a picture of Purple Hairstreak on a low oak on the left of the main ride just beyond the barricade.'

Nigel Agar

Tue 30th July 2002

'I was walking down the ride slope about 10 metres from the west car park at about 13:30hrs when I spotted a large butterfly with pale marks. It flapped and glided quite markedly along top of sallows then settled with wings folded. I could tell from the underwing pattern that this was a Purple Emperor \sim probably a female. It stayed about 30 seconds then flew off and could not be relocated.' **Brian Dawton**

Thu 1st August 2002

'The "possible" sighting I had was on 1st August 2002 at about 3pm. Seen on an old tree stump on the eastern side of the wood. As I remember, it seemed to be like a White Admiral with a red hue to it. I've seen plenty of admirals and I was left thinking it had to be something else.' **Paul Jarczewski** (Countryside Management Service)

Fri 2nd August 2002

No sightings in four hours of observations - AM

Sat 3rd August 2002

One sighting by Nick & Angela Sampford.



Images 6.5.3 and 6.5.4 \sim A female Purple Emperor A.iris (left) and the smaller White Admiral L.camilla (right) for comparison, both photographed in Broxbourne Wood Nature Reserve in July 2002 by Jeremy Gaskell. The scalloped trailing edge to the forewing of A.iris and its more intricate white patterning are well illustrated by these images.



Image $6.5.5 \sim A$.iris having just flown up from the ground, Broxbourne Wood Nature Reserve, 15^{th} July 2001 ~ Rachel Smith

6.6 ~ Site F

Woodland description \sim Site F covers several km² and contains a diversity of woodland habitats. Its surface geology is generally a mix of glacial gravels, London clay and Reading Beds (mottled clay, sands and pebbles).

Sallows \sim Our studies suggest that, although any concentration of sallows at Site F may be less than known to be present at the other sites, the overall total may still be relatively high and appears sufficient to support *A.iris* at low density over a wide area. However, one moderately sized younger plantation does have a higher density of established sallows and there are further plantations with potential for suitable habitat to develop over coming years. In addition, there are numerous sallows along various track, field and woodland edges, and more are visible on roadside verges further afield. It may be that the females are dispersing some distance to find suitable sallow, and that the colony spans a large area encompassing several woods and other sallow-rich habitat.

The positive retention of edge sallows and the present woodland management style should both be of further benefit to the colony of *A.iris* in this area over many years to come.

Nature of observations ~ We saw a male behaving in a territorial manner on 26^{th} July 2001. There had been no known records of *A.iris* from this area prior to 2001, but it was subsequently learnt that another *A.iris*, a grounded male, had been seen here in July 2001 by an unknown observer. We visited the site on two occasions during the 2002 flight season, and although no males were encountered, a female was seen near sallows on 18^{th} July.

The territory – After our first sighting here in 2001, we were confident that we had found a territory. The male was seen to patrol the space between three large oaks beside a small wood at a high point in the area. Although this seemed a likely territorial point, no male A.iris was seen here in 2002.

These observations echo our experiences at Site D (6.4), where sightings were made in July 2001 at what was thought to be the principal territorial area, a woodland edge/gap at a high point. In 2002, this proved not to be the case and the actual centre of territorial activity was found elsewhere in the vicinity. It is quite possible that the main territorial area at Site F could be somewhere in or by the adjacent wood, but is perhaps not easily observed, or merely awaits discovery. There is also the possibility that the territorial area could be extensive rather than compact, and that the butterfly seen in July 2001 was just scouting a larger area. Whatever the form of the territorial activity, it may take more than another year of study to better understand this complex and fascinating site.

Although we feel very lucky to have found this colony at our first attempt, we would like to suggest that we did not stumble upon it completely by chance. The site was found by carefully looking at the maps, noting the high points and being aware that there were adequate sallows in the area.

There is insufficient data for the creation of a flight chart but full notes are given below.

Table 6.6.1 ~ Notes on selected observations at Site F

Date	Notes taken on the day	Description
26 Jul Site F At aro point t 15:44h and ret LG/AN	01 ~ A very hot day ~ 100% sun, $c.27^{\circ}$ C, spent walking around for the first time und 15:30hrs AM/LG sat down under an oak tree near the highest o rest and cool down irs, A male <i>A.iris</i> flew out from the nearby wood between 2 oaks urned to the wood immediately <i>M</i> totally speechless!	Males seen ~ 1
Jul 01 2001	\sim One reported sighting of a grounded male near sallows in July	Grounded male ~ 1
16 Jul 15:40- Circula activity	02 ~ Total site visit time, 15:38-18:00hrs 16:40hrs 95% sun, $c.24$ °C, moderate N breeze ar walk around wood and watched site of last year's territorial y	No activity observed
18 Jul 12:50- 12:50- glimps 13:00h before	02 ~ Weather conditions poor, $c.20^{\circ}$ C, light NE breeze, 75% cloud 14:15hrs, at site of last year's territorial activity - no activity 13:20hrs (AM only) 12:55hrs, walking around the woodland edge ed dark/white insect twice over sallow, dismissed sighting, but at irs in sunshine just after a dull period, a large female appeared AM at head height just across path. The butterfly climbed higher	Female seen ~ 1 No male activity observed

and around the middle of an oak and possibly returned to nearby sallows

6.7 ~ Site G Broxbourne Common / Broad Riding Wood (TL343075)

Woodland description ~ Site G is situated in the central southern half of the Broxbourne Woods complex. The surrounding 1km^2 contains a variety of woodland habitats, such as distinct areas of mature oak, hornbeam and conifer. The surface geology is mainly glacial gravels with some London clay.

Sallows ~ Although sallows are present in small numbers along woodland edges in the vicinity of the 2002 sighting, far more are present within 1km in woodland along the Spital Brook valley and beyond (TL340/50 080).

Nature of observations

2002 ~ One sighting of a grounded Purple Emperor.

Historical ~ Sightings from 1953 to 1956 by Tom Gladwin with numbers seen varying between six and nine (Sawford 1987). For further historical notes contributed recently by Tom Gladwin see 3.2.

Territory ~ unknown.

Notes on observations at Site G

13th July 2002 ~ 100% sun, 22°C, still. 12:45hrs. Grounded Purple Emperor ~ one, probably female.

by Helen Bantock

Hearing about recent sightings of Purple Emperor in the Broxbourne Woods complex, I thought I would pay a visit. Leaving the track from Cock Lane, I mistook the path for Broxbourne Common, and walked instead off to the left through Broad Riding Wood. I retraced my steps and was about 200-300 metres from the track to Cock Lane, when, at about 12.45 pm, I saw what looked like a large, upright, pale leaf in a pool of water on the path, about 10 metres away. Raising my binoculars, I realised it was a Purple Emperor! Colouration was female, though I know they are said to come down to the ground much less often than the males. Got out my camera, but found the *A.iris* had moved ahead another 10 metres and then it flew off.

Habitat:	Dappled sunlight (quite shady). Pool of water on the bridleway.
Size:	As big as a Swallowtail.
Posture:	Wings together, until it flew off. The forewing was pointed.
Colour:	The underwing colour had a pearly sheen and a buff ground colour. The white markings on the underside of the hindwing were triangular shaped with brown on either side. The hind wing did not have the orange colouration with contrasting white band seen in the White Admiral. As the butterfly flew off, the upper side appeared relatively pale, not dark with distinct white markings, as in a White Admiral. I did not see any purple colouration, but this may have been because it wasn't sunny enough or that the individual was a female.

I have seen Purple Emperor once before, at Bentley Wood, Salisbury, when a male was on the ground. I've seen lots of White Admirals at Broxbourne and elsewhere in the country.

Helen Bantock July 2002

6.8 ~ Site H

Woodland description \sim Site H is a mixed woodland of 30-40 ha which adjoins other woodland as part of a larger woodland complex, and is approximately one-third mixed plantation and two-thirds mature broadleaved woodland. The surface geology is a mix of London clay, glacial gravel and Reading Beds (mottled clays, sands and pebbles).

Sallows ~ The plantation is known to hold substantial amounts of sallow.

Nature of observations \sim Territorial male activity was located and observed during July 2002. No historical records found.

The territory is a general area of mature oak with ash of c.1 ha that is centred c.50m in from the edge of the wood at a high point. The mature trees are widely spaced and this makes it possible to observe much of the territorial activity from a single location. Very few sallows grow in the vicinity of the territory and female activity has yet to be observed there. The territory has elements of hilltop and woodland edge, although all observed activity was well within the boundaries of the wood. The crowns of at least five trees were used for territorial patrols, with the more isolated or dominant trees being favoured for perching. A canopy feature in the form of a 'V' between two oak-crowns was especially popular for patrols. We had previously thought that the general area showed several features which could make it attractive to territorial males, but it was still a very pleasant surprise to find *A.iris* here during the July 2002 flight season. A rather small male which lacked prominent white areas on the upper-wing (aberration *iole* or *semi-iole*) was in territorial activity here on 13^{th} July 2002.



Chart 6.8.1 A.iris - male activity recorded after 13:00hrs at Site H, 2002
Table 6.8.1 ~ Notes on observations at Site H

Date Notes taken on the day	Description
 13 Jul 02 ~ 100% sun, c.21°C, light to moderate N breeze. 16:33-16:25hrs, 8 flights by two territorial males. 16:33hrs, one male through 'V' gap. 16:48hrs, 1 male in 'V' edge and tree tops. 16:52hrs, perching atop high oak. 17:00hra, male metral. 	Males seen ~ 2 Frequency of territorial activity after 13:00hrs ~ 11 mins or 5.5 per hr.
 17:00nrs, male patrol. 17:13hrs, a male patrolling back and forth for <i>c</i>.2 mins along the edge of oaks forming a canopy 'V' appeared to be a rather small and all-dark individual. 17:20hrs, a male of normal size and pattern flew from north oak to territory centre, clashed with 2 or 3 Purple Hairstreaks and returned to a perch on north oak. 18:00hrs, this male flew around north oak, settled on its crown, then flew off low to the west. No more activity to 18:25hrs when observations ceased. 	Duration of observations of territorial activity taken as 16:33hrs to 18:00hrs, when a male flying down from the territory appeared to signal the end of the day's activities
 16 Jul 02 ~ 95% sun, <i>c</i>.24°C, moderate north breeze. 14:00-14:42hrs, 7 flights by three territorial males. 14:09hrs, a male flew north. 14:11hrs, a male flew south to oak. 14:12-14:22hrs, cloud. 14:23hrs, a male flew and a second male flew high over the south oaks. 14:23hrs, a third male flew to perch on the top of the ash. 14:25hrs, it flew through the 'V' gap. 	Males seen ~ 3 Frequency of territorial activity after 13:00hrs ~ 6 mins or 10 per hr.
17 Jul 02 ~ 10% sun, $c.22$ °C, still. 13:00-13:54hrs, 2 flights. 13:11hrs, a male flew in from west and went to Turkey Oak, then a probable sighting of two in chase, but only one confirmed.	Males seen ~ 1 Frequency of territorial activity after 13:00hrs ~ 27 mins or 2.2 per hr.

29 Jul 02 ~ 30°C, 80% sun, still.

13:30-14:30hrs, no certain sightings. One probable male flew high through the canopy. Very uncertain and brief views, but big and dark enough.

per hr.

Males seen ~ 0 . Frequency of territorial activity after 13:00hrs ~ 0 per hr.

7 ~ Historic and potential areas for *A.iris*.

- 7.1 ~ Wormley, Bencroft, Danemead, Hoddesdonpark and Box Woods (TL30)
- 7.2 ~ North Hertfordshire (Hitch Wood, Knebworth, Astonbury Wood and St. John's Woods)
- **7.3** \sim The Welwyn area (TL11 and TL21)
- $7.4 \sim \text{Northaw}$ and Cuffley area
- $\textbf{7.5} \sim \text{North-east Hertfordshire}$
- $7.6 \sim \text{South-west Hertfordshire}$
- $7.7 \sim West Hertfordshire$

Introduction

It would be impossible for us to visit every wood in Hertfordshire and identify all those that may have suitable *A.iris* habitat, especially in cases where there is no public access. For this section, we have looked at historical data and tried to make visits to most of the identified areas. We have also used our own local knowledge, studied maps and taken many walks into the countryside to visit areas well away from roads. In springtime, we have studied the canopy of wooded hillsides and looked for sallows in flower, which is an easy way to see them and to estimate their abundance (10.1).

The Internet has also been an invaluable tool. Two websites that have proved very useful are the *Old Maps* website which displays many of the pre 1900 Ordnance Survey maps, and the *Multimap* aerial photo facility. From the Ordnance Survey maps, it is possible to see past woodland structure and in particular whether any wood was once divided into panels. This might indicate that coppicing had taken place and that there could have been good age diversity at some stage. Then using the *Multimap* aerial photo facility it is possible to get an idea of what the wood looks like today in the 21st century. One can see if the rides are still wide and open, and whether any areas have been cleared, both factors associated with sallow regeneration. The combined use of these maps can also show areas where woodland has disappeared and in some instances woods that are new. Despite the suggestion that many woods have been lost and that habitat has become fragmented, this does not appear to be the case in Hertfordshire at least over the last 100 years. In fact since the maps of the late 1800s, only a few examples of woodland loss were found, in general concerning smaller areas, whereas in several places woodlands boundaries have been extended.

The woods mentioned in this section give only a brief snapshot of what is present in Hertfordshire, and many woods and areas have not been included. Even when we have visited a wood, there is only so much that can be seen with limited time and there will have been cases where sallow was present, but we just did not see it on that visit. In time and with funding that situation might one day be addressed?

Additional information would always be welcome.

7.1 ~ Wormley Wood, Bencroft Wood, Danemead, Hoddesdonpark Wood and Box Wood (TL30)

TL 30 is the most wooded 10 km square in Hertfordshire and many other important areas of woodland exist here in addition to the main Broxbourne Woods complex. The proximity of these woods to sites D, E and G makes the area very important.

The **Wormley Wood** complex is owned and managed by the Woodland Trust. **Bencroft Wood** is managed by Countryside Management Service on behalf of Hertfordshire County Council. These woods form part of the Broxbourne Woods NNR SSSI. The total area south of White Stubbs Lane is *c*.200 ha.

Wormley Wood is the name used by the Woodland Trust for their Reserve, but that name applies in particular to the northern large mature woodland section. The southern half of the Reserve contains several small woods including Westfield Grove, Derry's Wood, Long Grove and Wellfield Grove. Baisley's Wood and Firs Wood are privately owned. The Wormleybury Brook runs eastwards through the wood, whilst the Cuffley Brook runs southwards.

On 16th July 1996, Howard and Mary Dixon were walking through Wormley Woods looking for White Admiral, when they saw two *A.iris.* "*Being fairly new to butterfly watching we did not realise the significance of this until we mentioned it to a friend who is knowledgeable about butterflies...*" (Murray & Souter 1996; 3.4)

We first surveyed a small area of the complex in the winter of 2000, where we found very few sallows! The main area of Wormley Wood, which also includes some of the highest points in the complex, is mostly mature, high and closed canopy woodland, comprised mainly of oak, hornbeam and ash, and with little age diversity. However, the southern half is a much younger area of woodland, and each woodland section appears to have been felled at different times. Overall, the sallow densities and totals in these woods are undoubtedly the highest we have come across in all the woods we have visited, although the density varies depending on the age and structure of each section. In the autumn of 2001, the Woodland Trust thinned an area of woodland on the west side of Derry's Wood and retained many sallows in the section, as a result we believe of our having alerted the relevant authorities to the presence of *A.iris* in the complex.

In October 2001, we conducted a few sallow density transect surveys in different areas of the wood, to determine where the highest density of sallows was and the approximate number of sallows in each woodland section (10.1). Wellfield Wood was the youngest section and had the highest density of sallows, so much so that it was almost impossible to count them. The Derry's Wood transect took a course across c.500 metres of the southern section of the wood between the two public footpaths. This part of the wood is older, and the density varied from moderate on the woodland edge to none in the centre of the wood. Because the wood is larger than Wellfield, the figure of c.501 sallows is probably less accurate than the c.1020 sallows estimated for Wellfield Wood.

Wood	Size	Transect length (50m wide strip)	Number of sallows	Sallows per ha	Estimated number of sallows in wood
Derry's Wood	19 ha	500 metres	66	26.4	500
Wellfield Wood	8.5 ha	350 metres	230.5	131.8	1020

Although we felt quite hopeful that we would see *A.iris* in the Wormley Wood area, none was found in several visits by either Terry Goddard or ourselves during the 2002 flight period. However, a large dark butterfly was observed flying high across a gap in the canopy by LG on 15th July 2002 but it could not be confirmed as *A.iris*, although LG felt it '*looked good*'. For anyone willing to try, *A.iris* is almost certainly waiting to be 'found' in this large wood.

Bencroft Wood is to the east of Wormley Wood. Countryside Management Service has created some nice wide rides but little sallow has regenerated alongside them. There is less sallow in this part of the complex but there are several prominent trees that have potential to be territorial areas.

We shall continue to visit these woods, as the possibility of seeing *A.iris* seems likely. We just haven't managed to find them yet.

Part of **Danemead Wood** is owned and managed by the Herts & Middlesex Wildlife Trust, and **Hoddesdonpark Wood** is owned and managed by the Woodland Trust. Hoddesdonpark Wood is almost entirely high deciduous woodland of oak with some hornbeam. In the autumn of 2001 and summer of 2002, the wood was subject to a programme of thinning and the remaining oaks have been left to mature. There is virtually no sallow in this wood, but alongside Ermine Street, and especially near the pond, there are sallows. There are also many mature sallows beside the Spital Brook in Danemead Wood, and sallows can be found in good numbers in the adjacent woodland complexes.

It was whilst walking along Ermine Street, just north of Spital Brook that Robert Kiln saw a male *A.iris* on 2^{nd} August 1994 (3.3).

Numerous sallows can also been seen from the A10 along field edges and on the embankments. The dual carriageway leading from the A10 into Hoddesdon also has an abundance of sallows.

Box Wood is a privately owned wood just north of Lord Street and Hoddesdonpark Wood. Ermine Street acts as its western boundary. Numerous sallows are visible in the wood and along Ermine Street. A high point by Elbow Lane Farm makes this an area of some potential. A section of Box Wood has just had planning permission granted (subject to Government approval) by Broxbourne Borough Council, to allow a cemetery to be built in the woodland. Approval was given despite objections from Hertfordshire Biological Records Centre and Herts & Middlesex Wildlife Trust (www.broxbourne.gov.uk).

7.2 ~ North Hertfordshire ~ Hitch Wood area, Knebworth, Astonbury Wood and St. John's Woods

The area described in this report as North Hertfordshire encompasses mainly the three 10 km squares of **TL12**, **TL22** and **TL33**. All three 10 km squares have had records of *A.iris* and woods in this area could still hold colonies.

Historically, the woods in the **Hitch Wood area (TL12)**, between Preston and Whitwell have been very important for *A.iris*. From the late 1800s, well-documented records were received from this area, including one in the late 1890s, seen by Foster himself in Stagenhoe Lane (Foster 1916; 3.1; 3.2)

However, the most important and exciting records were made during the 1980s. Nigel Agar was helping with Brian Sawford's survey work for *The Butterflies of Hertfordshire* when on 25th July 1985, he passed a cottage on the path between Preston and Whitwell, and saw a Purple Emperor fly up from a pile of chicken feathers, between 11 and 12 o'clock. Nigel says '*About the same time I gave a talk on butterflies to the children of St Paul's Walden School in Whitwell, and a girl in the class said she had seen one in their garden in the village and said she had got a book out the library to see what it was'. Nigel is convinced the girl had seen a Purple Emperor.*

A year later, on 28^{th} July 1986, Brian Sawford went to a cottage in the same area and released a male *A.iris* that had flown into a bedroom. On the same day, around 11 o'clock, he found another male which was seen to be taking 'moisture' from the track (Sawford; 3.1).

We would like to thank Brian Sawford for allowing us to divulge where these sightings were made.

Unfortunately, there have been no reported sightings since then. We have made two visits to the area during the *A.iris* flight period. The first visit was on the 20th July 2000, in glorious sunshine and was the first time we had ever visited the area. Not being familiar with this part of Hertfordshire and with no previous research, it was difficult to find potential territorial areas. A second visit was made on 19th July 2002, and although we watched what we felt could be suitable areas, nothing was seen. We have made two out-ofseason visits, with one in January 2003 taking in a larger surrounding area, and our main conclusions were that there appears to be only limited numbers of sallows in the area at present. Brian Sawford reported in his notes that a wood near the cottage 'has plenty of sallow and oak.' This does not seem to be the case any longer, and most of the woods in the area now have relatively high canopies with few rides and therefore few sallows. The 1884 map of the area shows Hitch Wood as having a large network of tracks or rides within it, several of which met at a central point. There was likely to have been a wide age variation between the panels at this time. The modern aerial photograph shows an almost uniform canopy structure. with what appears to be just one central clearing, and any tracks marked on the maps are now under the tree canopy. There are some woods in the area where sallow can be found but we feel, sallow numbers may not be sufficient here to maintain a colony of *A.iris*, or at most to maintain a colony of similar strength to those found elsewhere in Hertfordshire. We have also noted that whilst walking along the paths and tracks between woods, we have seen virtually no wayside sallows either.

This is still an important area that must continue to be monitored as the butterfly may well just have moved along to another more suitable wood, but where that may be is hard to know at present

The **Knebworth area**, (TL22) is another that should be considered for more serious monitoring. Historical observations do exist, the most recent in 1950, when a pupa was found by Roger Ferry (Bell; 3.3). We have made no visits to this area during the flight period, but initial study of aerial photos show that the woods in the area have a good age diversity with several clearings and rides. A visit in January 2003, which took in Graffidge Wood, Newton Wood and Watery Grove, confirmed that there were several regenerating areas of coppice and plantation, and some wide rides. Sallow of differing age was noted in Watery Grove and the northern section of Newton Wood, but few were visible in the southern half of Newton Wood or Graffidge Wood although they were of mixed age. Whilst researching this section, we received information from John Tomkins that Roger Ferry also saw two males on a rabbit carcass near Watery Grove (3.3). We do not believe this to have been previously published.

In 1978, *A.iris* was reported to have been seen at **Astonbury Wood**, near Stevenage (TL22) (Sawford). Brian Sawford's research notes state that a male was seen on 13th August and a pair on 20th August.

Astonbury was established in 1972 as a Hertfordshire County Council field centre and nature reserve and covers 26 ha of mature Hertfordshire woodland with hornbeam and oak. In the past the woodland was managed for timber and fuel. Today it is a woodland nature reserve and is managed for wildlife diversity and the protection of notable species. (Hertfordshire Outdoors). Access is restricted and no visits have been made. Again aerial photographs show the wood to be of fairly high canopy, but there are many sallows on the road verges towards and in nearby Watton-at-Stone near the River Beane.

St John's Wood (TL32) ~ Just west of Walkern, near the hamlet of Bassus Green lies St. John's Wood and neighbouring Lord's Wood. Historical records mention Walkern and St. John's Wood. According to Foster (1916), *A.iris* had been seen in the Walkern district by a Mr. Edmunds and Mr. Darby in 1882 or 1883. However, in Foster (1937) *A. iris* was seen at St. John's Wood and attributed to Matthews, who also reported other butterfly sightings in the Stevenage and Knebworth area at that time. We have not as yet found any further details regarding 'Matthews'. St. John's Wood is mentioned and described in *The Boys and the Butterflies* by James Birdsall as follows:

'The majestic Purple Emperor flew in St John's Wood within then living memory but although we looked for it meticulously, we never saw one. The iridescent purple males are said to have a liking for rotting carcasses – about the only thing that brings them down from the tops of the oak trees – and we visited dead rabbits and stoats and carrion crows; we even sugared tree trunks with treacle, to no avail.'

The open rides mentioned in this book (3.2) no longer exist although there has been some ground clearance to benefit the pheasant shooting that now takes place in the wood. The wood structure is generally high canopy, with little age diversity, and there is just one small clearing, which may suit Ringlet. Lord's Wood is very similar, and visiting the woods in January 2003, we found abundant sallow alongside tracks in the area, but very little in the two woods, and that present was very mature and being out-competed.

There are several other woods in the area that we have not visited.

7.3 ~ **The Welwyn area (TL11 and TL21)** ~ There are several woods in **TL11 and TL21** that could hold colonies of *A.iris*. There are historical records from the areas around the **Welwyn North railway tunnels** (3.2). We have looked at **Harmergreen Wood** and there are some sallows present. **Sherrardspark Wood** is now very high canopy and almost devoid of sallows. **Symondshyde Great Wood**, was historically an important butterfly wood (Sawford; 3.3), and White Admiral are seen there most years. However, we have little knowledge of the wood and whether there are any sallows.

However, in the autumn of 2000, we started to visit the **Bramfield** area. The two main woods in the Bramfield area are **Bramfield Wood and Bramfield Park Wood**, which are both leased to the Forestry Commission and managed by Forest Enterprise. The two woods are in complete contrast to one another. Bramfield Wood has been extensively managed and is 'very tidy'. The wood is now a mix of conifers and fairly high canopy deciduous woodland with virtually no under-storey, little honeysuckle and only a few sallows. The wood has public access with several trails and tracks and is a popular recreational area.

Warning: Please note that we have heard several reports of cars being broken into whilst parked in the carpark at grid ref.: TL282165.

Although Bramfield Park Wood appears to have been well-managed over the years, the positive influence of management for pheasant shooting has resulted in the retention of smaller panels where the understorey and secondary growth have been allowed to flourish. There is a mix of conifers, mature trees, newer plantations, clearings and areas which have recently been felled. The age diversity of the wood is excellent and like Wormley, the sallow density is extremely high. The woods are also rich in honeysuckle, and during the summer of 2001, whilst looking for *A.iris*, we saw several White Admiral. Access to Bramfield Park Wood is restricted as the owner has maintained shooting rights in the wood. There is a wide central ride which has permissive access and some public footpaths but there is no access to the rest of the wood. The highest point is unfortunately in a large back garden, so when we looked for *A.iris* in July 2001 our viewing areas were very restricted.

Although we have not found *A.iris* at Bramfield Park Wood, we still feel confident that it could be in the area, and time permitting we shall continue to monitor here. Forest Enterprise has just undertaken some felling and thinning of conifer in the wood, although at the time of writing we have not seen what actual work has been done.

7.4 ~ The Northaw/Cuffley area (c.225 ha in total) ~ The best known wood in this area is Northaw Great Wood. This 120 ha country park is located off the B157 road near Cuffley. The wood comprises mainly oak, birch and hornbeam with areas of ash, sycamore and sweet chestnut and there is a great variety of flora and fauna. The wood has a resident warden and visitor centre, and in addition, picnic areas, woodland trails and a horse trail. Declared a SSSI in 1953 and as a Country Park in 1968, Northaw Great Wood is managed by Welwyn Hatfield Council (www.welhat.gov.uk). The main east-west ride through the centre of the wood may have potential areas where some sallow regeneration could mature. More sallows can be found beside Grimes Brook, with lower numbers through the eastern section of the wood, where several large sallows have been retained in a newly coppiced area of hornbeam towards the County School Camp.

In 1965 Jonathan Jack saw *A.iris* along the main ride (3.3; Sawford; Plant; personal correspondence).

One of the highest places in the complex is near the car-park on the Ridgeway, and it is an area that should be monitored during the flight season. Northaw has an abundance of honeysuckle, and White Admiral is regularly seen.

Just south of Northaw Great Wood is the privately owned **Well Wood**. A springtime view of the wood from Hemps Hill indicated that there are some sallows in this mixed age wood. Time and funding permitting, this area would certainly warrant further investigation.

The woods in this area are quite significant because of their proximity to other *A.iris* sites in the county, and in addressing Action 4 of the Thames Region Regional Action Plan:

4. Continue to raise awareness of the need to maintain and develop networks of woodlands that include areas of mature deciduous habitat (Clarke & Bourn: Purple Emperor)

7.5 North-east Hertfordshire ~ This is an often overlooked area of Hertfordshire, where intensive farming has left some of the landscape rather featureless and in general, butterflies in this area can be hard to find. However, there are some woods here, although in most cases they are quite fragmented and isolated. Of the woods we have visited, all have contained sallows, and in some cases in good numbers. The possibility of this area having colonies of *A.iris* should not be dismissed. 'During two days in "1878, 1879 or 1880" six were seen flying over the tree tops at Oxbury Wood, on the county border with Essex, near Meesden' (Foster 1937). There are also records of sightings at Rickling near Stanstead in 1879 (Carter). We have also contacted Saffron Walden Museum to see whether there is any possibility that more information from Hertfordshire might be in the Saffron Walden Museum archives. At the time of writing nothing has come to light.

In March 2003, we were shown around the area by Keith French, who had permission to take us into three woods on the Essex/Hertfordshire border and we were able to walk through Oxbury Wood. Oxbury was felled about 30 or 40 years ago and subsequently the wood had an abundance of sallow. Unfortunately the sallows are now being out-competed, with many examples of wind-blown trees. Several of the woods in this area of Hertfordshire and Essex are private with no public right of way.

7.6 ~ South-west Hertfordshire (TQ09, TQ19, TL00 and Tl0) ~ Proximity to other *A.iris* sites makes the woodland in these areas quite important, but the majority of visits to these four 10 km squares have been whilst travelling through by car! Bricket Wood Common has been visited on one occasion and some sallows were noted but not in abundance. Coombe Wood, now seems to be quite mature but some sallows can be found on the roadside edges in the area. No other woods have been visited in this area during the study period.

It was at **Hound's Wood** in the 70s that Tony Clancy was positive of an *A.iris* sighting (3.3). There is also a record from the Oaklands area of St. Albans in the early 1950s (Sawford) but we have at present no additional information on this sighting.

The wooded areas around **Oxhey and Northwood** are also quite significant for in 1966 Mike Majerus saw a male *A.iris* on the Hertfordshire/Middlesex border in Northwood (3.3). At Colin Plant's suggestion, we also wrote to Eric Classey of Classey Books, who spent many hours looking for moths in **Oxhey Wood**. Eric replied that although he never saw Purple Emperor in the wood, '....*I am of the opinion (no more) that, given the nature and condition of the woods during the* 3^{rd} , 4^{th} and 5^{th} decades of the 20^{th} century, its presence was highly likely' (3.3).

A. iris has also been seen recently in Middlesex in the Ruislip area (George 2002; 3.3).

 $7.7 \sim$ West Hertfordshire \sim The proximity to the Tring/Chiltern sites makes this area very important. However, time and distance has limited us to one brief visit to the Ashridge Estate when we did not discover any significant numbers of sallows. More information on this area is needed.

8.1 ~ Male territorial activity

Characteristics of male territorial areas ~ *A.iris* needs an abundance of sallows located within a woodland situation having an adequate number of broadleaved trees, the species being a honeydew feeder. Therefore, suitable habitat occurs over quite large areas across which the species breeds at low density (10.2; Bourn & Warren 2000), and 'hill-topping' is the strategy used to find a mate. The territorial areas found to date in Hertfordshire have much in common in that they all serve as watch-towers where males can perch and patrol, and at times the defence of these areas results in clashes between males, as can be seen to occur with many other species of butterfly.

All these territorial areas are at or close to high points (Table 8.1.1), four are near or at a woodland edge, whilst two appear to be centred on single trees which tower over the woodland canopy. The woodland edge territories all appear to extend to several large trees, often with gaps between, which may improve visibility. These woodland territories contain favoured perches and gaps, but may also extend over c. 1 ha of woodland. In one case (6.4), the focal point within a larger territorial area is a bowl-shaped depression formed high up in the canopy of several adjoining oaks. At Site C (6.3), brief territorial activity has been observed c.150m away from the master tree, on a smaller oak situated on the woodland edge at a slightly higher location. All the territorial areas appear to have somewhat favourable westerly aspects, or certainly contain areas which catch the afternoon sun. Most of the trees concerned have been oaks, one of the single trees is a beech, and territorial males have also been seen to perch on a tall ash growing within a territorial area.

Table 8.1.1 ~ Focal point elements and activity

;	Site	Α	В	С	D	F	Н
High point		✓	\checkmark	✓	\checkmark	\checkmark	✓
Woodland edge (or near)		\checkmark			\checkmark	\checkmark	\checkmark
'Master tree'			\checkmark	\checkmark			
Group of trees		\checkmark			\checkmark	\checkmark	\checkmark
Canopy gap element		\checkmark				\checkmark	\checkmark
Wandering activity		\checkmark		\checkmark	\checkmark	\checkmark	\checkmark
Secondary or temporary focal point	nts			\checkmark	\checkmark		

Overview ~ We have found that male activity has been generally as described by Ken Willmott (Willmott: 1987; 1990; 1994), and his work has been a great help in our search for, and interpretation of, male activity. However, our experiences may differ in that populations of *A.iris* in the woods of Hertfordshire appear to be relatively weak, male activity is rarely strong or sustained and soon subsides. This may explain why so few sightings have ever been made in the county. For example, at Site C (6.3) the colony survived July 2001 with barely one sighting of a male. Once the flush of a few days of peak activity subsides, numbers may be so low that focal point activity breaks down, and one passage of a high-flying male overhead in several hours of observations is then a typical but still appreciated event. The sighting of a male flying over and around the canopy at a high point may indicate that stronger activity could be found at some focal point nearby, if woods in the vicinity have abundant sallows. However, it may take a few years to encounter any male territorial activity in a suitable wood, and it may take a few more to locate a focal point, if there is one. Male territorial activity, as observed by us in Hertfordshire, is rather unlike an exact science and is probably all the more interesting for that.

Timing ~ Males have been seen to make occasional flights at moderate heights in the vicinity of a focal point as the morning progresses to the middle of the day (13:00hrs). For example, at 11:25hrs on 13^{th} July 2002 at Site A, at 22°C in sunshine, a male *A.iris* was seen in flight and landed 4m high on the sunny side of a silver birch. It remained there for 2 hours and 20 minutes, regulating its temperature by slowly varying its wing position between 25% and 100% open, before moving up onto the canopy of the territorial oaks and beginning its patrols at 13:45hrs. A male *A.iris* has also been seen to come down at around 11:30hrs to take salts from hard surfaces in a territorial area (8.2.1). All high level territorial activity observed by us has been between 13:00hrs and 18:00hrs, and all frequency data relates to this time period. Males have been seen to descend from a territorial area towards adjacent scrub on two occasions, at 18:03hrs (6.4) and at 18:00hrs (6.8), and no further territorial activity was seen on either evening. In all probability, these males appeared to take refuge in the scrub to roost overnight.

The timing of activity in each of the study years, 1999 to 2002, appears to have been fairly constant. First sightings have been in the first week of July, with heightened or peak activity from around the 13th and lasting for less than a week to ten days. Male activity has tailed off dramatically in the last week or ten days of July, and the rate of decline in activity may relate to the strength or otherwise of any particular colony. Male activity has been extremely difficult to detect in August. In general, the majority of sites have shown frequent activity for only a few days in the middle of the month. That makes it rather difficult to locate new territorial areas as, after these few days of peak activity, one has then to observe any potential area for many hours in the hope of encountering a male.

Recording methodology \sim We would like in the future to be able to compare male territorial activity levels and timing in Hertfordshire with elsewhere in the U.K., although the methodology for recording is still being developed (Bourn & Warren, 2000).

We chose the following as suitable parameters for recording territorial activity in Hertfordshire:

- Number of males present (best estimate)
- Number of males involved in any clashes
- Frequency of flights in the focal area (per hour)

Frequency ~ The frequency of territorial activity, flights or sightings has varied greatly between locations, and from day to day during July. Please see 6 for male activity charts for individual sites. The peak frequency of territorial activity observed by us to date, in the form of patrol flights between perching, was from 15:10hrs to 16:40hrs in weak sunshine and $c.22^{\circ}$ C, on 18th July 2002 (6.4) as follows: males seen ~ 3 (no clashes); frequency of territorial flights after 13:00hrs ~ 2.8 minutes between flights or 21.3 flights per hour; totals ~ 32 flights, seen perched 5 times (perched out of view at other times), seen to use 3 or 4 perches all within 3 or 4 metres of one another.

Clashing ~ Two or more males can be present in a territorial area without clashing. Clashing males have been observed on just six dates during this study. Clashing males can spiral high into the sky in dispute, usually directly over the focal or 'best' point which dominates the territorial area. On separate occasions, male *A.iris* perched on territory have been seen to set off in brief pursuit of a hawker dragonfly and a great spotted woodpecker, both of which flew through the gaps between trees in territorial areas. Once, at 17:20hrs, a territorial male clashed with 2 or 3 Purple Hairstreaks during a flight between oaks.

Unsettled weather ~ Males seem able to contend with less than perfect conditions by taking quick advantage of quite brief sunny spells. During showers, and windy or overcast conditions, males on territory have been seen to close their wings and hold tight to their perches. Given a brighter interlude, the large dark wings of the butterfly are opened and within minutes the male may launch itself on a patrol. For example, two clashing males were observed on 14^{th} July 2000, between showers and with very little sunshine when the maximum temperature was around 15° C (6.3). See 5 for more notes on the effects of poor weather on flight activity.



8.2 ~ All other activity including grounding and female activity

Introduction ~ In 1999 and 2000, most observations had been of territorial males and only a few observations of grounding and female *A.iris* were made. This lack of female observations was due mainly to our inexperience in interpreting behaviour. However, since 2001, females have been recorded, and a behavioural picture has slowly built up, although this is nowhere near as detailed as for our observations of territorial males. As with male activity (8.1), we have found the activities detailed in this section to be generally as described by Ken Willmott (Willmott 1987; 1990; 1994).

During our studies we have not yet seen *A.iris* feeding at sap flows or making visits to flowers. Nectaring is said to be an extremely rare occurrence although *A.iris* has been recorded on sweet chestnut flowers (Willmott 1994), and this tree can be found at some sites.

8.2.1 ~ Grounding activity

During this study we have seen very few *A.iris* on the ground, although this may be the way many people assume *A.iris* will most easily be encountered. Despite our lack of sightings of grounded *A.iris*, other Hertfordshire observers have been more successful in this respect.

Male Grounding \sim As detailed by Ken Willmott and many others, a male will come down to the ground in the early stages of its flight period in order to take up salts as a necessary requirement of the reproductive process, and this most often occurs in the morning. Later on, such activity may simply be to take up moisture. Further detailed observations would be useful on each occasion to better identify the observed activity.

All reported times of grounded males in the morning have been between 10:30hrs and 12:15hrs, which reflects Ken Willmott's comment that the best time to see a grounded male taking salts is generally *'between 10.30 and 11.30 in the morning'* (Willmott 1990). Chart 8.1.2 clearly shows a gap between sightings of grounded males in the morning (4 records to 12:15hrs) and in the afternoon (2 records from 14:45hrs), and it is worth noting that male territorial activity in the canopy generally begins in the middle of this time slot at around 13:00hrs (8.1). The only grounded male that either of us has seen relates to AM's first sighting in 1999. The male butterfly was technically grounded as it was thought to be taking salts from a roofing tile. Only at Site B (Tring Park) has a male been seen to take salts from faeces, in this case cattle dung, all other sightings being associated with bare or sparsely vegetated ground.

Female Grounding ~ We had been under the impression that it was unusual to see a female grounded, but females account for 50% of grounded *A.iris* identified to sex during the study period and have been seen on several occasions at Site E (Broxbourne Wood Nature Reserve). Here it has been presumed that they are taking moisture from an apparently dry track lined by sallows, although confirmation of this would be welcome.

Unlike males, grounded females have been seen from 12:00hrs to 15:15hrs (Chart 8.2.1.2), and whereas all males grounded in the morning were observed in full sunshine, some females have grounded in less sunny although still warm weather conditions.

Reference note for Willmott 1987: Of 38 observations of grounded *A.iris* from 1975 to 1986, 34 were of males. Four instances of female grounding were noted, on 2nd, 3rd and 4th July 1976. Ken Willmott remarks: *'female observations made during hot, dry summer of 1976 and thus exceptional.'* Rainfall in Hertfordshire in July 2002 was more than twice the long term average (9.2).

Table 8.2.1.1 ~ Grounding Activity

	Site	А	В	С	D	Е	F	G	Н
Grounded male, presume	ed taking salts	✓	\checkmark				1		
Grounded female, presume	med taking moisu	sture					v √		✓

No grounded butterflies have been seen at Site C despite many hours of observations.



Note ~ Chart 8.2.1.1 only includes sightings where the sex has been confirmed.



Chart 8.2.1.2 ~ *A.iris* - time of groundings, 1999-2002

Note ~ Chart 8.2.1.2 only includes records with a clear time of grounding.

8.2.2 ~ Wandering *A.iris*

This is a description we have given to any *A.iris* seen well away from any known or recognised habitat or territory. In 1999, a male was seen in a garden near the centre of Tring town. In addition, we have recently learnt of a sighting of *A.iris* on the canal bank near Tring Station. It may be that the high point in Tring Park, which is prominent in the landscape, attracts butterflies from considerably further distances than initially thought. We know that there are sallows beside the canal at Tring (John Wyatt, personal communication), so it may be that a gravid female has dispersed some distance from Tring Park in search of suitable sallows, and that the male had just emerged. The sighting in 1999 appears to be of a male taking moisture from a wet lawn.

It may also be that if a male emerges relatively late in the flight period (the dated Tring sighting was 30th July 1999), the chance of finding a female is reduced. As observed (8.1), males do wander over wide areas especially once the main peak is over, and it may be that he therefore sometimes travels away from the traditional area in search of a female. Also, males and females may wander further afield once their main breeding activities have been completed in July. This might explain why several of the historic records were quite late in what we now know to be the typical flight period, since the butterfly has at times been seen wandering some distance from its normal haunts. One example of a wandering male, reported to Nigel Agar in 1985 (7.2), was seen in the village of Whitwell by a schoolgirl, although unfortunately in this case the sighting was not dated.

See also 8.2.3 *Female showing behaviour indicative of egg-laying* for further discussion of female dispersal.

8.2.3 ~ Other female activity

We have separated the female activity into the following categories:

- Grounded female (8.2.1)
- Honey-dew feeding
- Female in flight
- Pre-pairing flight (with a male)
- Female showing behaviour indicative of egg-laying
- Other behaviour
- Rejection of a male by a gravid female (not yet observed)
- Pairing activity (not yet observed)
- Egg-laying (not yet observed)

Table 8.2.3.1 ~ Sites where characteristic female behaviour has been identified

Site	Α	В	С	D	Ε	F
Flight from or to a possible honeydew/dropping-off site	\checkmark		\checkmark		\checkmark	
Pre-pairing flight (with a male)		\checkmark			\checkmark	
Female displaying probable egg-laying behaviour		\checkmark	\checkmark		\checkmark	
Female seen in the vicinity of sallows	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark
Other record of female in flight		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark

General timing ~ The occurrence of female sightings early in the flight season has been similar to that of the males in being occasional for the first 10 days or so. Female sightings have then peaked around the 13^{th} , at a time when recorded male activity has also increased towards its maximum (Chart 8.1.1). However, there follows a much slower and gradual drop-off in recorded female activity through to the end of July, in comparison with the more intense but relatively short-lived flush of male activity observed in mid-July (8.1). The latest record of a (probable) female in the study period was of one flying down the escarpment at Tring Park on 17^{th} August 2001, seen by Brian Jessop (6.2). No doubt further occasional sightings of females could be made in August if intensive observations were continued.

Honeydew feeding and dropping-off points

A.iris butterflies feed on the ample supply of sweet honeydew that aphids secrete on the leaves of various broad-leaved trees. Naturally occurring sap-runs are an additional food source. As with other honey-dew feeders, such as White-letter Hairstreak and Brown Hairstreak, *A.iris* can spend some time feeding, and favoured trees are usually oak (Heslop *et al.*; Willmott 1987, etc). A female *A.iris* may use a particular oak both for honey-dew feeding, and more simply as a place to wait, until perhaps the following day, when she may drop-off or down from her perch to engage in her next session of egglaying amongst nearby sallows (Chart 8.2.3.3). Extracts from Heslop *et al.*: '*Female A.iris usually selects a dropping-off point affording rest and refreshment, which is usually on oak but sometimes on ash..with sallows growing in the immediate vicinity. On leaving her perch she soars straight down and over the sallows, selects a suitable bush and slowly flies in amongst the branches until she finds a leaf to her liking and deposits one egg.'*

At Site A in 2001, we saw a female at exactly 12:00hrs drop out of an oak, we believe used for honeydew feeding and/or resting. This was quite remarkable, as we had been watching the tree for 30 minutes in sunny weather, not realising she was there, when suddenly she flew down and off through a gap in the trees. She soon reappeared and alighted on a nearby sallow, where we were able to take a photograph (Image C 9.1a). She continued her intermittent tour of the sallow canopy for approximately 30 minutes and was last seen returning towards the territory oaks at 12:30hrs (6.1). Similar sightings have been made of females flying from oak towards sallows around midday at Sites C and F. *A.iris* has also been reported to fly to a single large oak from sallows lining a ride at Site D in the early afternoon. This may be part of the same process, *i.e.* a return to a feeding and roosting tree after egg-laying, although in one case the sex of the butterfly is not known. We have not as yet recorded the use of sap-runs or observed honeydew feeding in detail, although we have seen a female extend its large and yellow proboscis on to the surface of a sallow leaf.

Note for tables and charts in $8.2 \sim$ there will be discrepancies between tables and charts since whereas some female observations may be interpreted in detail; others can only be noted as a female sighting.



Chart 8.2.3.2 ~ A.iris - female activity and possible pre-pairing, 1999-2002 (each point refers to





Chart 8.2.3.3 ~ A.iris - time of female behaviour, 1999-2002

Female in flight ~ This category basically describes a mobile female. The first female sightings were mainly noted in flight, because of their larger size and dark colouring. They also have an inclination to fly past rather fast and at a lower level than the male. Our earliest time for a reported sighting of a female in flight has been at 11:23hrs on 17^{th} July 2000 at Site C, when one flew at speed across the north end of the clearing. LG commented: '*It appeared to go into the bramble bush near the ash and large sallow, back out and in and then appeared above as if it used the undergrowth like a chimney and then flew off towards the north wood'* (Table 6.3.2). The weather was hot and sunny that day, unlike on the 12^{th} July 2001, when our latest afternoon female sighting was of one in flight at 15:12hrs flying quickly, at a height of only 1 or 2m, over a field by the edge of a wood, after we had experienced several periods of rain and cloud. We could speculate that this female may have been returning to the main body of the wood after mating, as she was flying from the direction of a nearby territory *c*.200m away. Low flight has been noted to deter the attentions of a male upon a mated female (Willmott: 1990; 1994). See also Chart 8.2.1.2 for female groundings in the afternoon.

Pre-pairing flight with a male, rejection and mating ~ We have observed the flight of male and female together, we believe prior to pairing, but not that of a gravid female rejecting the advances of a male as described by Ken Willmott (Willmott 1987; 1990; 1994). All pre-pairing sightings have been very brief, but have always been of two butterflies in close pursuit at moderate heights, unlike the high level clashes of territorial males. These 'pairs' have been identified either as a female and a following male, or at least one larger and one smaller individual. The timings for this behaviour have all been much later than other female activity, with the latest sighting in good weather conditions at 16:20hrs on 17^{th} July 2000 at Site C (6.3), where most of these observations have been made. The clearing at this site has probably helped us make observations of this activity. **Pairing activity** has not yet been observed.

Female showing behaviour indicative of egg-laying \sim Several females have been seen behaving in a manner we believe to be indicative of egg-laying. On several occasions at Site C a female has gone into a preferred sallow. Even by carefully noting where she had flown, on closer inspection the female has on all occasions disappeared from our sight. Despite watching for some time, we have not been lucky enough to see a female fly out of these sallows again, although almost certainly she does! We have made several attempts to locate larvae, and pupae, but the size of the trees and the low density of female sightings over wide areas, combined with limits on our time, have made this as yet an impossible task for us.

At most of the Hertfordshire sites, females have been seen in the vicinity of sallows, although they have not always displayed egg-laying behaviour. These females have been included separately in Chart 8.2.3.3 as part of the egg-laying process.

Ken Willmott has found, through careful study, that: 'Egg-laying is a carefully timed operation which takes place between noon and 2 p.m....The reason that egg-laying is so carefully timed is so that the female can select a sallow leaf that is shaded from the sun during the remainder of the summer in order to protect the young larvae from desiccation' (Willmott 1990; also 1987; 1994).

The earliest time that we have observed a female was at 11:27hrs on the 16th July 2002 at Site C when a female appeared and then subsequently disappeared into a sallow, which we can only assume was for the purpose of laying eggs. This activity has been noted through to 13:45hrs at Site E (Broxbourne Wood Nature Reserve) on the 28th July 2002. There is no doubt that female activity in Hertfordshire around sallows does nearly always occur during this period (Chart 8.2.3.3). The one anomaly of a female active around sallows at 14:45hrs during a day of relatively cloudy but warm conditions, although male activity had earlier been observed in stronger sunshine (6.3).

The need for an abundance of sallows located within a woodland situation is paramount, although it is impossible to know how far a female may fly to find a suitable sallow on which to lay her eggs. A male has been seen well away from Tring Park (6.2), which may suggest that a female has or could also travel some distance to find suitable sallows for egg-laying. All sightings of females have been close to the territorial areas, apart from at Broxbourne Wood Nature Reserve (6.5), where the territorial area has not been identified. Sites A and C both have crack willow (see also 10.1 Sallows) in the vicinity of the territorial area but we have no knowledge as to whether it has been used by *A.iris* at these sites. However, a male was

seen basking on the brick walls of a house beside Site A on the 14th July 2000, close to some old Crack Willows (since pollarded), which may possibly have been used for egg-laying.

There is no doubt that a colony can survive over a large area, if suitable conditions are maintained. We can only speculate on matters such as colony catchment areas, dispersal and colonisation, but see also 9 and 10, and in particular 9.1, for further discussion.

Other female behaviour \sim It has been noted that females have been seen to fly up into or from silver birch on several occasions. Silver birch is usually a complementary tree to sallow, having grown up in plantations at the same time and in nearly all cases the trees are growing side by side, and it perhaps just by chance that a birch has been used as a convenient place to rest in the sun.

Some females have been seen for such a brief period of time that the recorder has not been able to make a decision on behaviour. These records have been included in the total numbers but do no appear in the more detailed charts.

Overview \sim There is no doubt that further observations will improve our understanding of female behaviour. The female is relatively inactive and once mated has the potential to spend many hours just waiting for the middle of the day to complete a bout of egg-laying.

The female is believed to lay as many as 100 or more eggs over a period of several days. Under the right weather conditions she will lay some 6 to 10 eggs in a day's session, laying singly on different leaves, and rarely taking more than 10 minutes (Willmott 1990; Heslop *et al.*; Morris).

Therefore she may be active egg-laying over at least a 10 day period, which increases the possibility of observing the female if one is in the right place at the right time. She may choose to return to the same sallows on subsequent days; she may visit a selection of sallows in the neighbourhood, or wander further afield over a wider area of woodland and perhaps beyond. This range of behaviour is likely to have allowed *A.iris* in Hertfordshire, to a certain degree, to survive successional declines in its habitat, and to colonise any new habitat as it becomes suitable.

Weather conditions \sim Females appear to remain fairly active in duller conditions, although the air temperature has always been relatively warm when we have observed them in cloudy conditions. On several occasions, despite no male activity being observed, we have seen grounded females and females behaving in a manner indicative of egg-laying, although they are still most active in sunshine and more likely to travel further distances in these conditions.

9.1 ~ A look back at the recorded distribution of *A.iris* by decade

Overview ~ Since the late 19^{th} century, *A.iris* has been reported as being seen at *c*.26 sites (Sawford; Murray 1995; Murray & Souter 1996; 1999; Hertfordshire Biological Records Centre; personal records; correspondence). Old records did not always give a clear indication of behaviour, nor whether any sighting was at a presumed territorial area. Some of the oldest records came from collections or were accounts from gamekeepers (Gibbs 1903). At the end of the 19^{th} century, six sites were known in five 10km squares widely scattered across the county. Interestingly, there have been no records from any of these areas for over 15 years.

However, since 1999, we have found five previously unrecorded territorial areas by targetted surveying (8.1), and Brian Jessop has located the Tring territorial area. We now know of nine sites where *A.iris* has been seen in Hertfordshire since 2000, however these are restricted to just three 10km squares, two of which are situated in the southern half of the county, the third lying close to the Buckinghamshire border.

Recording from the 1800s (see also 3.1 and 3.2) ~ When Arthur Ernest Gibbs, the County Recorder, wrote the section on Lepidoptera in the Victoria County History of Hertfordshire (Gibbs 1902), he mentioned just one record of *A.iris* (3.1), whereas some neighbouring *Victoria County Histories* included quite extensive lists for this species. Within a year though, Gibbs began to include possible sightings of A.iris in the Hertfordshire Natural History Society Transactions (3.2). Many of these records had been gathered by Dr. Arthur Herbert Foster (Gibbs 1903), who became County Recorder for Lepidoptera after Gibbs' death in 1917. For most of his term of office, Foster produced few reports, but in 1934 he contributed a section on butterflies and moths for The Natural History of the Hitchin Region (Foster 1934), where several of the historical sites for *A.iris* in the Hitchin area were mentioned. A major work of Foster's was *A list of the* Lepidoptera of Hertfordshire, published by the Hertfordshire Natural History Society in 1937. Here Foster listed several sites for A.iris, one of which does not seem to have appeared in any previous Hertfordshire Natural History Society transaction. Unfortunately, many of these records were undated, making it very difficult to determine when or for how long *A.iris* was recorded at any site during the 19th century. There is little doubt that at the turn of the 19^{th} century, the presence of *A.iris* in Hertfordshire would have required a specimen for acceptance by the authorities of the day, and the lack of such a specimen may have resulted in a less favorable response to those sightings which were occasionally reported.

Recording through the 1900s: attitudes, problems and awareness \sim During the first half of the 20th century there were very few records of *A.iris* in Hertfordshire. Although the country went through wars, and economic and industrial turmoil at this time, there were still several entomologists active in the county. This absence of records or specimens may have led many to believe that *A.iris* had become extinct in Hertfordshire, and after Foster, subsequent County Recorders and several other entomologists believed this to be the case and as a result several records that were received were discounted (Sawford). This attitude would have done little to encourage observers to submit records of sightings. Thankfully, attitudes have recently changed, and more records are forthcoming, from both the present and from living memory, and are often accompanied by fascinating accounts of the events (see also 3).

Without doubt *A.iris* has been mistaken on occasion for White Admiral in the Broxbourne complex at least, and we know from our own experience that there are times when telling the two apart can be difficult. The main reason for our limited success in finding *A.iris* is that from the beginning of our study we have searched for territorial areas, although this in itself has been a far from easy task and something which seems either not to have been attempted or successful in the county.

Our feeling is that the increase in sightings by other observers in Hertfordshire is due to a greater awareness of the butterfly being present, in part as a result of our work and subsequent publicity in particular concerning the colonies at Broxbourne Woods and Tring Park.

Ken Willmott (Willmott 1994) wrote the following: 'Occasionally it reappears in its old haunts, where it has probably remained unobserved for many years. A recent increase in awareness and knowledge has fostered a lot of interest in this species, and many more people are investigating suitable woodland areas in the hope of locating and recording the prized Purple Emperor.'

Movement of colonies: decline and colonisation ~ Charts 9.1.1 & 2 appear to show that as new sites have been found over the long term, so old ones are lost. This situation may have arisen from the following

events. Having walked many of the woods in the county, it is apparent that many, apart from the larger complexes, have tended to be managed in one operation concerning the whole of each wood. After felling, sallows tend to flourish and the woodland may become suitable for *A.iris* to colonise. Then, over the following decades as the wood matures, the sallows are outgrown and fail, and the *A.iris* colony weakens or is lost. In the meantime, another nearby wood may have been felled, allowing *A.iris* to colonise or strengthen its existing population, only to be lost or decline beyond detection as this second wood matures. If no further woods in the area have been subject to any 'sallow producing' management then the area would be in danger of losing its *A.iris* population (10). It appears to us that low numbers of *A.iris* have survived in Hertfordshire, probably since the first records were made here, through its ability to colonise new areas as they have become suitable over the decades. Undoubtedly, the well-wooded nature of the county and the continued availability of some sallow-rich habitat has been just sufficient to maintain this population. We believe that the difficulties and uncertainties of interpreting the status and ecology of this species on a landscape scale should not be underestimated.

Stockley (Heslop *et al.*, 1964, p.154) comments as follows on extinctions: 'A large area of separate woodlands in various stages of growth offers the best chance of survival. When a favoured wood becomes too overgrown the females are well able to find other suitable areas, within flying distance, to deposit....had there been a suitable wood in the vicinity the species would in all probability have returned.....when conditions improved.'

Northward expansion? ~ In recent years there has been a national increase in sightings and it has been suggested that the range of the butterfly is expanding northwards (Asher *et al.* 2001, Parmesan *et al.* 1999), global warming being one possible explanation (9.3). Our studies have found that, over the last 100 years, the recorded distribution of *A.iris* seems, if any trend is detectable, to have receded southwards in Hertfordshire (Image 4.1), which does not appear to support the 'expansion due to global warming' theory. However, we do acknowledge that much of our surveying has been in the south of the county, nevertheless woodland in this area does appear to contain rather more suitable habitat than we have found to be the case in the north of the county (7).





Note: The 1833 'Hertford' and 1985 Whitwell sightings have not been included, and all Tring sightings have been treated as one site. However, the 'Broxbourne' records have been associated with particular woodland areas within the wider complex.





Releases and (re)introductions ~ We believe that the vast majority of *A.iris* records in Hertfordshire past and present have been of wild insects relating to naturally occurring populations in areas of suitable habitat. It is unfortunate that people may still wish to release such butterflies, and this can have confusing and thus negative effects on the work of conservationists trying to better understand the ecology of *A.iris* and other scarce butterflies, in order to bring about positive management. Also, releases cause harm in that the possibility of the butterfly being genuinely present is then put in question, and can prevent woods being managed favourably for the butterfly, which is essential if the species is to thrive. This could be the case in some counties, where *A.iris* has been recorded in the past, and where a present-day sighting of the species may tend to be viewed, rightly or wrongly, as resulting from a release. Our studies also suggest that any introduction of *A.iris* into a wild situation could never be 'closely monitored', as its activities are wideranging and because no such understanding of the status of naturally occurring populations has yet been achieved. Nor should one easily be certain that *A.iris* is not present in an area or nearby, and efforts towards positive habitat management and detailed study would seem a better use of resources.

Summary \sim We feel that *A.iris* has been present in Hertfordshire since the first records were made, that strong and detectable colonies may still appear in woods where sallows are abundant, and that the species may have survived because the county has retained enough 'managed' woodland for the butterfly to 'move' from wood to wood as these have become suitable. It also suggests another very good reason for creating age diversity within each wood when planning any woodland management, so that the species is retained within that wood rather than having to rely on the uncertainty that suitable habitat may becomes available elsewhere in another wood. This approach would certainly strengthen the grip of the species in Hertfordshire.

9.1a ~ Colour images facing page

Image B ~ a female A.iris	Image D ~ a female A.iris
grounded along the main ride at	grounded along the main ride at
Site E Broxbourne Wood Nature	Site E Broxbourne Wood Nature
Reserve around 13:30hrs on 20 th	Reserve around 13:30hrs on 20 th
July 2002 ~ Nick Sampford	July 2002 ~ Liz Goodyear
Image A ~ a grounded female A.iris at Site E Broxbourne Wood Nature Reserve in July 2001 ~ Lissa Smith	Image C ~ a female A.iris come to rest on sallow leaves between bouts of activity indicative of egg- laying at midday on 24 th July 2001 at Site A ~ Andrew Middleton



9.2 ~ Notes on weather in Hertfordshire during the flight period and larval stages

Chart 9.2.1 illustrates some weather trends over the last 100 years. The 1990s and 2000-2 were warmer than average, whilst rainfall and sunshine levels appear to be have remained close to previous levels.

Chart 9.2.2 shows recent conditions in more detail. The survey years of 1999 to 2002 have been warmer than the 1970s and 80s, and as warm or warmer than the 1990s. There appear to be no significant trends for sunshine or rainfall levels.

These charts for Hertfordshire reflect the data in Chart 9.3.1 (*Central England Temperatures*, Climatic Research Unit, University of East Anglia, see 9.3a).

Chart 9.2.3 presents some interesting data in that much of the recent increase in mean annual accumulated day-degrees has been during the winter months, with moderate increases during larval growth periods, and no significant change during the flight period. Some percentage changes are given in Table 9.2.1. The pupal stage is quite short, averaging 17-18 days (Willmott), with pupation likely to commence in the second half of June (Chart 4.3).

Table 9.2.1 ~ Recent changes in seasonal temperatures in Hertfordshire

Life-cycle stage of <i>A.iris</i> >	Flight period	Larval	Hibernation	Larval
% relate to accumulated day	Jul	Aug-Oct	Nov-Mar	Apr-Jun
degrees				
Change from 1970s & 80s to 1990-2002	+5%	+5%	+17%	+7%
Range during study period 1999-2002	-5% to +10%	+4% to +11%	+9% to +25%	+8% to +13%

Please see '9.3c ~ *A.iris* distribution, climate and habitat associations' for discussion and notes on how these changes may or may not benefit *A.iris*. Our investigations suggest that slightly warmer periods for larval growth may benefit *A.iris* to a similar degree *i.e.* 'slightly', but that weather during the flight period shows no significant change, and that warmer winter temperatures may not benefit the species, or could have a negative effect. Our studies in Hertfordshire show that changes in habitat quality do have a strong effect, and may be more important than recent changes in climate, which may or may not continue over the long term. It will certainly be interesting to see how the U.K. climate may change in the future, and we intend to continue looking closely at the weather data. We would like to compare the Hertfordshire flight charts with those from different latitudes and climates in the U.K., and elsewhere, and will do so as soon as this information becomes available. *A.iris* is limited to the north (and west) in the U.K. by July isotherms (9.3b and c), and more comparative data may clarify how this relationship has its effect. For example, perhaps cooler climates to the north slow larval growth or restrict the flight period, or maybe both are negatively affected.

Chart 9.2.4 illustrates how the weather in July has fluctuated during the study period 1999-2002, being especially wet of late.

Please see 5 and '5.5 ~ Overview of the flight period' for an analysis of how A.iris has been able to deal with the vagaries of our July weather during the study period, 1999 to 2002.

















9.3 ~ Reference material and notes for *A.iris* distribution, climate and habitat associations

During our studies of A.iris, it has been suggested that there may be a link between global warming and the recent increase in records of A.iris in Hertfordshire. The following reference material and tentative notes on A.iris distribution, and associated habitats and climates may be of interest on their own, or when considering climate change, but this section (9.3) is in no way a detailed study and contains no original work of our own. We hope that it may help readers to come to their own conclusions on this complicated subject.

This section contains:

- $\textbf{9.3.a} \sim \text{Climate research extracts} \sim \text{notes and chart}$
- **9.3.b** \sim U.K. distribution and winter and summer isotherms \sim images
- **9.3.c** ~ *A.iris* distribution, wider climate and habitat associations ~ notes
- 9.3.d ~ A.iris distribution, climate and habitat associations ~ images
- **9.3.e** ~ Poleward shifts in geographical ranges of butterfly species associated with regional warming ~ notes

9.3.a ~ Information sheet extracts from Climatic Research Unit, University of East Anglia, Norwich NR4 7TJ U.K.

Sheet 1: Global Temperature Record (1856-2002) ~ Jean Palutikof

http://www.cru.uea.ac.uk/cru/info/warming/

'The 1990s were the warmest decade in the series. The warmest two years of the entire series have been 2002 and 1998, with the latter the warmest at 0.58°C above the 1961-90 mean. The nine warmest years globally have now occurred in the 1990s and 2000s. They are, in descending order, 1998, 2002, 2001, 1997, 1995, 1990 & 1999 (joint), 1991 & 2000 (joint). Analyses of over 400 proxy climate series (from trees, corals, ice cores and historical records) show that the 1990s is the warmest decade of the millennium and the 20th century the warmest century. The warmest year of the millennium was 1998, and the coldest was probably 1601.'

The key references for this time series are:

Jones, P.D., New, M., Parker, D.E., Martin, S. and Rigor, I.G., 1999: Surface air temperature and its changes over the past 150 years. *Reviews of Geophysics*, 37, 173-199. Jones, P.D. and Moberg, A., 2003: Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001. *Journal of Climate*, 16, 206-223.

Sheet 3: U.K. Weather and Climate (Central England Temperatues/England & Wales Precipitation) ~ Phil Jones

http://www.cru.uea.ac.uk/cru/info/ukweather/

Temperature ~ 'All [charts] show unprecedented warmth during the 1990s, but earlier decades such as the 1730s and 1820s are comparable. Variability is greatest in winter compared to the other seasons.'

Precipitation ~ 'There is no evidence of longer-term trends but winters have been wetter since 1860 and summers have become drier since then.....'

Chart 9.3.1 ~ Climatic Research Unit, University of East Anglia



9.3.b ~ U.K. distribution and winter and summer isotherms

Images 9.3.1 & 2







9.3.c ~ *A.iris* distribution, wider climate and habitat associations ~ notes

Eurasian distribution – *A.iris* (Linnaeus, 1758) has a disjunctive or Amphipalaearctic distribution, with widely separated populations in east and west Eurasia. The range of *A.iris* reflects the range of broadleaved (nemoral) forest across Eurasia, which itself is absent from a wide area of central Asia due to climate (low humidity), being replaced by coniferous/birch forest and tiaga to the north, and scrub, steppe, desert and mountains to the south. *A.iris* is also to be found in mixed forest and tiaga in both the east and west of its range where suitable broadleaved trees are present (see also Dubatolov & Kosterin, 2000.)

Its western range is Europe, Middle and South Ural and Tyumen Province. It has recently been found as rare in northern Omsk Province, east of Tyumen Province (Oleg Kosterin, personal comment, 2002). In Europe, *A.iris* occurs from north Spain to central Russia, is absent from Italy and the Mediterranean islands, is declining in several western and central European countries (Asher *et al.*), including north France (S.E.N.F.), and is spreading at the north of its range in Scandinavia and Russia (Bourn & Warren 2000, Asher *et al.*).

In the east, the subspecies *Apatura iris amurensis* (Stichel, 1909) is found, in E. Transbaikalia, Priamurye, Primorye, Central and North-East China and Korea. *A.i.amurensis* has its most westerly location in the Argun River Valley in E. Transbaikalia, situated in a transitional zone between Siberian (steppe and tiaga) and Manchurian vegetation (where Mongolian oak first appears) (Dubatolov & Kosterin, 1999). *A.iris* is not recorded in Japan (although often stated as being present), but *A.metis* is (personal comment Dr.Yoshiomi Kato, Butterfly Society of Japan & Dept. Biol. ICU, 3-10-2, Osawa, Mitaka, Tokyo).

January isotherms - Russia, Oleg Kosterin (personal comment, 2002) ~ 'All the range of *A.iris* within European Russia lies within the mean January isotherms of $-8^{\circ}C$ to $-16^{\circ}C$ (the minus $16^{\circ}C$ isotherm runs along the Ural Mountains), whilst the West Siberian habitats seem to be outlined by the January isotherm of $-18^{\circ}C$. All the range in Primorye (the southern Russian Far East) lies within the January isotherms of $-24^{\circ}C$ to $-30^{\circ}C$. The specific region of the lower Argun River Valley (easternmost Transbaikalia) where we found it (Dubatolov & Kosterin, 1999) is outlined by the $-32^{\circ}C$ isotherm! And this is not a joke - this is an extremely frosty region indeed.'

Extreme winter cold, and a suggested association with increased predation by birds, does not appear to be a limiting factor for *A.iris* elsewhere in continental Europe where *A.iris* can be abundant (personal observations: Tony Clancy; Vincent & Betty Judd; LG), so recent increases in winter temperatures in the U.K. may not have a positive effect. Perhaps mild winters may be a limiting factor for *A.iris* (5°C January isotherm), by increasing loss through fungal and parasitic attack, but this also needs further investigation. The distribution of *A.iris* probably has its southern limit in Europe where adequate broadleaved woodland gives way to Mediterranean scrub.

July isotherms - All known extant colonies of *A.iris* in the U.K. are 'south' of the 16°C mean July isotherm, as were the majority of historical locations, the remaining few falling 'south' of the 15°C July isotherm. Higher spring, summer and autumn temperatures in the U.K. could strengthen populations of *A.iris*, thereby generating more re-colonisation events. Towards the edge of its U.K. range (N & NW), where climate becomes a greater limiting factor, *A.iris* may be able to colonise previously unsuitable areas. Perhaps sub-optimal habitats could also be colonised within its present range where climate may be a weaker limiting factor. However, we believe that habitat quality is the major limiting factor within the historical range of *A.iris* in the U.K. (6.3; 10; Green, 2001).

The U.K. climate is both warmer in winter and cooler in summer than for much of the continental Eurasian range of *A.iris*. Although climate indirectly affects *A.iris* in Eurasia by limiting the distribution of broadleaved forest, the species' U.K. range appears to be directly limited to the north and north-west by cooler growing and/or flight seasons. It may be that the U.K. climate has a negative effect to the north and north-west by limiting larval development and/or flight period activity. Recent local climate trends show significant increases in winter temperatures (hibernation ~ uncertain effect), small increases in spring and autumn temperatures (larval and pupal stages ~ likely positive effect), and no significant change in summer temperatures (flight period ~ no change > no effect).

A.iris has retracted its range towards the south and central areas of the U.K. over the last 100-150 years, probably due to habitat loss. Our research suggests that *A.iris* has not been recorded as having moved north into or through Hertfordshire as a result of warming in the county over the last 10, 50 or 100 years. Intensive study of *A.iris* in Hertfordshire has only just begun, and perhaps a longer period of investigation is needed to separate out the effects of changes in habitat, climate and observer coverage.

9.3.d ~ A.iris distribution, climate and habitat associations ~ images



Image 9.3.4 Satellite view of Eurasian vegetation.

Courtesy of NASDA http://spaceboy.nasda.go.jp /lib/notes_e.html Public Relations Office, National Space Development Agency of Japan (NASDA), World Trade Center Bldg., 2-4-1, Hamamatsu-cho, Minato-ku, Tokyo 105-8060.

Image 9.3.5 Approximate Eurasian distribution of *A.iris*.

Based on maps from Dubatolov & Kosterin 2000, Friedrich 1996, and from Dr. Yoshiomi Kato (pers. comment), Butterfly Society of Japan, and other information, including various internet locations.



broadle aved forest forest-steppe-tiaga tiaga

Image 9.3.6 General & very approximate zones of broadleaved forest (natural vegetation), forest steppe & tiaga.

Based on maps from Philips's New World Atlas 1976, Knystautas 1993, and other information sourced from various internet locations.

Notes ~ Image 9.3.5 is based on information from a variety of sources which do not always agree, and is likely to contain errors. Neither does *A.iris* have a continuous distribution within this marked range. Image $9.3.6 \sim$ These zones are not uniform, in particular vast areas of broadleaved forest have been lost, and habitat types are not as simply defined or separated as the map suggests.

9.3.e ~ Poleward shifts in geographical ranges of butterfly species associated with regional warming

Ref.: **Parmesan.** C et al. 1999. 'Poleward shifts in geographical ranges of butterfly species associated with regional warming' Nature, Vol 399, p579-583, 10th June 1999 (www.nature.com)

For anyone interested in shifts in ranges of butterfly species due to climatic changes, this paper contains a wide analysis of European trends, and many references for further reading.

 $p.579 \sim$ 'Mean global temperatures have risen this century, and further warming is predicted to continue for the next 50–100 years. Some migratory species can respond rapidly to yearly climate variation by altering the timing or destination of migration, but most wildlife is sedentary and so is incapable of such a rapid response. For these species, responses to the warming trend should be slower, reflected in poleward shifts of the range. Such changes in distribution would occur at the level of the population, stemming not from changes in the pattern of individuals' movements, but from changes in the ratios of extinctions to colonizations at the northern and southern boundaries of the range. A northward range shift therefore occurs when there is net extinction at the southern boundary or net colonization at the northern boundary. However, previous evidence has been limited to a single species or to only a portion of the species' range. Here we provide the first large-scale evidence of poleward shifts in entire species' ranges. In a sample of 35 non-migratory European butterflies, 63% have ranges that have shifted to the north by 35–240 km during this century, and only 3% have shifted to the south.'

p.580: The northern boundary analysis used data for 52 species, of which the northern boundaries have extended northwards in the past 30-100 years for 65%, been stable for 34%, and retracted southwards for 2%.

p.582: Europe has warmed by about 0.8° C this century, shifting the climatic isotherms northwards by an average of 120 km, on the same order of magnitude as the detected range shifts.

Nymphalinae ~ *A.iris* ~ *northern limit: extension* ~ *southern limit: stable*

 $p.583 \sim$ Data quality. The data are not of consistent resolution or temporal span within or among countries.

Assessment within a country. A species' boundary was defined as stable where census data show that populations recorded from earlier in this century are still present; it was defined as extended where recent censuses found new populations in areas outside the known historical distribution that had been visited by earlier collectors or recorders; and it was defined as retracted where historically recorded populations that defined a boundary are absent in recent censuses whose sampling effort was sufficient for absence of a record to indicate true absence of the species.

Assessment among countries, along a boundary. A single status for each boundary (northern or southern) was determined by the following: a boundary is deemed stable if it shows no changes in any country along the same boundary; a boundary is retracting if it has moved towards the centre of the distribution within one or more countries and is stable in other countries along the same boundary; a boundary is extending if it has moved away from the centre of the distribution within one or more countries and is stable in other same boundary.

Supplementary notes http://www.nature.com/nature/journal/v399/n6736/extref/399579_s1.doc

Finland and Great Britain: Assessment of distributional changes came from decades of publications specifically on distributional changes (many by the current authors), which in turn were based on thousands of individual records from hundreds of amateur collectors and recorders, from personal interactions with the most active collectors and recorders, and from personal and scientific observations by current authors over the past 30 years. Many species have been well-documented in the literature and distributional changes are known back to the turn of the century at the scale of years or decades.'

Discussion relating to *A.iris* **in Hertfordshire** ~ The report (Parmesan *et al.*) concludes that *A.iris* has extended its European range northwards, whilst maintaining its southern limit. *A.iris* is spreading at the north of its range in Scandinavia and Russia (Bourn & Warren, 2000).

Records of *A.iris* in the U.K. (Asher *et al.*, 2001; Image 9.3.3) show an historic range extending beyond the present-day range, away from its continental range centre and N & NW into areas with cooler summer temperatures positioned 'down' the mean July isotherm gradient (Image 9.3.2).

If the sample of U.K. distribution change for *A.iris* is taken over the last century or more, its 'northern' limit has retracted over a wide front. This particular time-sample does not seem to support the analysis (Parmesan. *et al.*) that *A.iris* has extended its range northwards. For the analysis to be true (see above for assessment criteria), *A.iris* should at least have maintained its historical northern limits in all countries along that boundary. Perhaps this time-scale has been rejected because the associated long-term retraction of *A.iris* in the U.K. is reasonably considered to have been due to habitat change and loss. However, is it certain that habitat and recording parameters have remained any more constant during the selected period than over the last century (see 'Data quality' above)? Perhaps the effects of changes in climate, habitat and recording cannot be separated so easily when considering *A.iris* in the U.K..

10.1 ~ Sallows ~ flowers and seeds, species and leaves, lifespan, windblow and leaf-loss, biodiversity, surveying.

Taken from *The Purple Emperor Butterfly* (Willmott 1990): 'Goat Willow' (or Great Sallow) [Pussy Willow], *Salix caprea*, is far and away the foodplant most commonly used by *A.iris* and it would appear that the full grown larva has a better chance of survival if it is resting on the broad leaves of this tree. Common Sallow (or Grey Sallow), *Salix cinerea*, is also chosen and eggs have been found on both species where they grow alongside one another. More rarely, Crack Willow, *Salix fragilis* is selected but this tree is not as common in most Purple Emperor habitats as the sallows.'

Regeneration ~ Sallows (*S.caprea & S.cinerea*) flower early in spring and estimates of sallow abundance in woodland can be made at this time given suitable views across the canopy. The downy **seeds** are soon shed in their thousands and can be seen drifting throughout sallow-rich woodland in early summer. In damp conditions, these seeds will soon germinate and, if bare ground receiving sunlight is present due to recent felling or coppicing work, the seedlings will be able to grow on. As might be expected, establishment appears to be strongest in those woods that already have a high presence of flowering sallows. As with many other woodland seeds, those which germinate under canopy soon die off. Sallows generally do very well after **coppicing or pollarding** given full light and can put on 2m of growth in the first year (Image 10.7). Although we have had success with propagating hard and semi-hardwood cuttings of poplar, willow and various other shrubs and fruiting plants, we have not as yet had great success with sallow cuttings as a means of propagation. Heslop reported similar results (Heslop 1964). We have yet to try thicker stakes cut from sallow in late winter, as suggested by Fred Currie (Forestry Commission), and if these take, it could reduce the negative impact of deer grazing and competition from bracken.

Species of sallow ~ *S.caprea* prefers a heavier soil and can be moderately competitive when growing in a tree-like form, whilst *S.cinerea* does well on thinner and more acidic substrates, and tends to be rather shrub-like (personal observations, Andrews & Rebane 1994). It is beyond our abilities to separate with certainty the great variety of leaf size and shape into *S.caprea* or *S.cinerea*, and by many accounts *salix* hybrids are frequent (Dony 1967). However, in a survey of *salix* within one Hertfordshire wood having a colony of *A.iris*, we classified 86% of the *salix* as being broadleaved, *i.e.* better suited to the larvae of *A.iris* (Willmott 1990), and this seems generally to be the case in other woods in the county.

Image $10.1 \sim A$ typical selection of various sallow leaves from a Hertfordshire Wood, in this case Wormley Wood, October 2001. The larger and broader leaves with fewer veins are probably *S.caprea*, whereas the smaller, narrower leaves with more veins are probably *S.cinerea*.



Sallows are early successional woodland shrubs and trees, and as plantation and regrowth matures beyond 25 years, sallow numbers begin to decline (Images 3; 5; 6). Given suitable conditions, *S.caprea* can grow into a sturdy tree many decades old. However, when competing with such trees as birch, ash, oak, cherry, hornbeam or conifer over 2-3 decades, *salix* generally begins to die off as a direct result of light competition or, having grown in a spindly fashion to compete upwards for light, its higher branches are then more likely to snap off. This is compounded by the effects of gales, as sallows tend to be one of the first trees to suffer, both through the loss of boughs and the uprooting of whole trees. One may also wonder what effect the sudden loss of many leaves in an autumn storm could have on the number of larvae.



Image $10.2 \sim$ This sallow, at an estimated 15m high, is about as tall as they come, and probably around 25 to 30 years old.



Image $10.4 \sim$ Silver birch adjacent to this sturdy sallow has since been thinned in the hope of benefiting this well-formed tree for many years to come. However, thinning around straggly sallow growth may accelerate loss.



Image 10.3 \sim This large sallow, in an older conifer plantation, can no longer compete with its taller neighbours. It has regrown from a low pollard predating the plantation, and its girth at the base suggests a total age of *c*.75 years.



Image $10.5 \sim$ Sallows can suffer breakage and uprooting more often than other species. Strong winds in autumn 2002 broke off and uprooted many sallows, including the above.

Biodiversity ~ Sallows also play an important role in wider woodland ecology, particularly as a foodplant for invertebrates and by providing a valuable nectar source in early spring. Positive management for sallows, which encourages regeneration and age diversity within woods, will also bring diversity of habitat structure and plant communities, with associated benefits for biodiversity (Fuller & Warren 1993a & b). One impressive insect, which feeds as a larva in the base of sallow *S.caprea* trunks, is the Lunar Hornet Moth, given as an extremely local resident in the wider London area including south Hertfordshire (Plant 1993). A relatively high ecological value for sallows is suggested in that the *Salix* species group as a whole tops the list of numbers of insect and mite species found feeding on native tree species (Andrews & Rebane 1994):

Salix species	450	Beech	98
Oak	423	Ash	68
Birch	334	Sweet Chestnut	11

Surveying ~ We have tried to quantify the abundance of sallows in various woods, as our resources allow, by two methods. For an **estimate of sallow density**, we have begun by establishing where any sallow-rich areas may be in a wood. Transects have then been walked through an area, such as a plantation, and sallows have been counted in a 50m wide strip, 25m to each side, with estimated densities and totals being calculated from this. For two sites we have mapped fairly **exact and complete sallow distributions**, using Geographical Positioning System equipment (GPS) made available by Jeremy Dagley (Forest Ecologist, Corporation of London, Epping Forest). Such detailed information can be extremely useful in understanding and comparing habitats, and as guidance for future management decisions.

Willmott (1987) recorded the number, girth and age of sallows at eight ovipositing sites in six woods in Sussex and Surrey. We devised a not dissimilar method of grading sallows by features such as: number of stems (habit); leaf size; *salix* species where possible; position in wood (edge, clearing, ride, canopy etc); and size. **Recording the comparative 'size' of sallows,** growing in such a variety of forms, presents an obvious problem, but after looking at hundreds if not thousands of sallows over the last four years, we feel that some kind of consistency has been reached as follows:

- Thin, crowded trees, or smaller multi-stemmed shrubs, for example, have been noted as medium (0.5 points).
- A large tree has a crown or spread of foliage typical of a good sized sallow growing in a relatively unrestricted fashion. Broadly speaking then, a 'large tree' is over 10 years old, over 5m in height, and has a canopy of *c*.10 sq. metres or more (1 point).
- Mature sallows with giant crowns presenting an abundance of foliage were recorded as extra-large (1.5 points).

Valuable young growth or regeneration was also noted. A 'sallow equivalent' has then been calculated from the sum of the points, to better represent the amount of sallow leaf or canopy which would be available to *A.iris*. Even if recording could be more consistent, we do not have the additional time needed, and can see little value in more detailed surveying beyond that achieved. More importantly, having gone through this recording process, we feel we now have a far better understanding of sallow growth in woodland habitats.

10.2 ~ Discussion of sallow numbers, larval predation and numbers of adult *A.iris*

Low density populations over wide areas of woodland \sim It is generally accepted that, in England, adults of *A.iris* can be extremely elusive, they occur at low densities over large areas, populations are associated with well-wooded districts, and colonies require suitable woodland in larger blocks or as complexes of smaller woods (Asher *et al.* 2001; Bourn & Warren, 2000), and from our studies, this appears to be the situation in Hertfordshire.

A relationship between sallow numbers and colony strength ~ Events at Site C have given us some quantifiable information as to how changes in sallow numbers appear to have affected the strength of a colony of *A.iris*, although several years more comparative study will be needed to confirm this ~ please read the full account in 6.3. Male activity had been strong at this location in July 2000, then at least 175 of a minimum total of 300 large sallows (58%) were felled in the autumn of 2000. As expected, this population of *A.iris* crashed in July 2001 and showed only the slightest of improvements in July 2002, whilst sightings at 'control' colonies nearby and elsewhere were maintained. This strongly suggests that female *A.iris* had been egg-laying on sallows throughout the wood, and that the strength of the colony had been related to both edge and canopy sallows (6.3). It would seem reasonable to believe that a similarly

large number of sallows would be needed to sustain a strong colony of *A.iris* elsewhere in Hertfordshire. However, it would be pure speculation as to how many *A.iris* emerged at Site C in either July 2000, 2001 or 2002, but the maximum count of four was in July 2000, with 89% of the day-totals being of just one or two butterflies, and on many dates, particularly in July 2001 and 2002, none at all have been seen. Regarding the relative use of sallows in **edge or canopy** situations, if it is accepted that large numbers of sallows are needed to support a visibly active colony (6.3), it can be seen that the abundance of sallows in the known Hertfordshire *A.iris* sites tends at present to be associated with canopy rather than edge sallows (Table 10.3.1). Although more *A.iris* will be seen around edge sallows, being open to human observation, most of the sallows at certain *A.iris* sites are to be found in the canopy of plantations.

Predation and parasitic attack \sim Suggested figures for the number of eggs laid by a female *A.iris* vary from around 50 to 100 or more (Heslop *et al.*; Morris). The larvae are then open to predation, and parasitic, bacterial and viral attack for the relatively long time of 10 months or more, over which extended period losses may be expected to be correspondingly high.

Discussion ~ Considering the above (10.2; also 6.3), it would be hard to believe that, in Hertfordshire, anything less than several or more sallows would need to be available for egg-laying, if one adult *A.iris* is to emerge ten or eleven months later. It may be that the larvae of *A.iris* are generally predated down to a certain level, whereby only a few survive to adulthood by chance, and that the major controlling factor for a colony is the abundance of sallows available for egg-laying. We certainly believe that several hundred sallows are needed to support a strong colony and our study at Site C, where positive management for sallow regrowth is proposed, may provide further evidence over future years.

Notes ~ Sallow numbers and *A.iris* are also discussed by Willmott (1987; 1990), Robertson (1980), and Heslop (1964), and reported estimates of number of larvae on sallows in May (Robertson 1980) are in the order of 5-15 larvae per 100 sallows. This very approximate number for the 'sallow/adult' relationship may not be unreasonable, given the observations noted above. Willmott (1987) surveyed the number, girth and age of sallows at eight ovipositing sites in six woods in Sussex and Surrey, finding totals of 45, 47, 47, 68, 36, 64 and 194. Most were estimated to be less than 20 years old, with just nine of 30 or older, the oldest being an estimated 39.

10.3 ~ Past management in Hertfordshire that has resulted in gains and losses of habitat for A.iris

Gains ~ Over the last three or four years, we have visited as many Hertfordshire woods as resources allow, and it appears that sallow-rich woodland is presently limited to those areas which have been subject to some form of commercial forestry over the last 2 or 3 decades. Likewise, all the woods with *A.iris* over the last 10 years have in some part been subject to commercial forestry and, as a result, have relatively high sallow densities due to natural regeneration in plantation or coppice.

Table 10.3.1 Site & area		Site with younger panel(s) rich in sallows.	Where available, estimated number of sallows in the 'area' (equiv. number)	Part of a larger woodland complex	Hedge and roadside sallows nearby
А	50ha	\checkmark	246 (GPS survey, 10.1)	\checkmark	\checkmark
В	c.47 ha	\checkmark	357 (transect estimate)		
С	18 ha	\checkmark	135 (GPS; c.300 prior to thinning)	\checkmark	\checkmark
D	5 ha	\checkmark	Several hundred (flowering in canopy)	\checkmark	
Е	35 ha	\checkmark	Several hundred (estimate)	\checkmark	
F	? ha	\checkmark	Several hundred (est. over a wide area)	\checkmark	\checkmark
G	? ha	\checkmark	Several hundred (estimate)	\checkmark	
Н	40 ha	\checkmark	Minimum est. 100 (flowering in canopy)	\checkmark	\checkmark

Note \sim As many of the above sites form part of far larger and continuous woodland complexes, associating quite specific catchment areas with any territorial activity would be a less than certain process. Table 10.3.1 definitely has its limitations.

Losses ~ Early in our study, we found that *A.iris* and sallows (along with honeysuckle) were generally not being considered in woodland management, and their ecological value seemed to be overlooked. In many cases, sallows were being treated as weeds and vast numbers were being lost during thinning, prior to

simple loss through competition (10.1). Similar management appears to have been in place across Hertfordshire for many years, and *A.iris* may only have survived where coppice and plantation have been 'neglected' and sallows have flourished.

The 1877 map of Site A shows its division into *c*.25 small panels, a system that would surely have created a diverse age structure providing an abundant and continuous supply of sallows on which *A.iris* could have thrived. Presently, high canopy woodland may be increasing at the expense of age diversity and panelisation, either through management systems or under-management, and these areas offer few locations for abundant sallow growth. The combined effects of uniform age, thinning and high canopy, working in different ways in different woods, can be seen to have led to very low numbers of sallows across wide swaths of forest. This is a worrying situation for both *A.iris* and general biodiversity, and one that we would like countered.

Notes \sim A very similar situation has been noted in Hampshire and is detailed by David Green (initially published on the website of the Hampshire and Isle of Wight Branch of Butterfly Conservation, and reproduced with the kind permission of the author):

Hampshire Butterflies – Purple Emperor by David Green (2001)

Although there have been no records from the Isle of Wight for over a century, this majestic butterfly occurs in most wooded areas of Hampshire, with the notable exception of the New Forest where suitable sallows are rare. It is probably under-recorded because it is an elusive species, occurring nowadays at low population levels with a short and unpredictable flight season. It is a highly mobile species and individuals can appear almost anywhere.

The flight period is variable and hard to predict. In the 1990s, the first recorded dates have varied between 24th June and 20th July and the last dates between 25th July and 20th August. In most years, the butterfly is on the wing for some four weeks, numbers quickly reaching a peak that lasts for some seven to ten days, after which numbers are low and the butterfly exceedingly hard to find.

The Purple Emperor breeds in and around woods where sallows abound. The majority of late twentieth century breeding grounds in Hampshire have been in unweeded, thicket-stage conifer plantations which remain suitable for 10/15 years. Obviously, plantations of broad-leaved trees can also hold high sallow densities and retain the butterfly for longer, but these have become relatively scarce in Hampshire. Ride-side sallows are particularly important, but there have been many instances of felling just as they become ideal for the butterfly. The species also regularly breeds on sallows protruding through the canopy of derelict coppice woodland and on sallows invading woodland clearings and derelict land, notably on neglected damp heathland and along road verges.

It is difficult to assess numbers of such an elusive species and no methodology exists for monitoring populations. At most Hampshire localities one would do well to see the butterfly in any one visit. On a good day at one of the better sites one may have between 10 and 20 sightings, which may consist of one or two individuals. Only exceptionally will more be seen, suggesting that the species is not currently common anywhere in Hampshire, although it was certainly so at some sites as recently as the mid-1970s.

The Victoria County History (1900), William Fassnidge (1924 & 1930) and Barry Goater (1974) list a large number of Hampshire sites, many of which retain the species today, though in greatly reduced numbers. The 1990s saw a significant decrease in the occurrence of sallow-infested young plantations due to fewer conifer plantings and the regular thinning and weeding of plantations. There has also been a steady loss of sallows from neglected coppice woodland. These important breeding habitats have not been replaced by new forms of breeding grounds. Roadside sallows are now probably of considerable importance for the species in Hampshire and it would seem that the Purple Emperor enters the new millennium in a state of decline in Hampshire.

Heslop (Heslop et al. 1964, p.32) also discussed age diversity and cleanliness of crops: 'But the remedy to the present situation seems to lie in reversion to the old and natural system of felling blocks in rotation. By this means there is always a sufficient reservoir of nature to refill the cropped portion: and these themselves should be allowed to regenerate naturally as far as the minor growth is concerned, and in small part even as regards timber trees.' Similarly, **Morris** (Morris 1938) commenting on age diversity: 'A systematic clearance of the underwood in our large woods is essential to the well-being of the insect. It [*A.iris*] will quickly disappear from those woods which are allowed to look after themselves, and where the underwood is not subject to periodical cutting in rotation. Neither must the timber be too thick. Crowded woods are not favoured by the insect.'

10.4 ~ Recent efforts for positive habitat management

a) & b) ~ Several woodland managers are now considering the problem. On the Broxbourne Wood Nature Reserve, Paul Jarczewski of **Countryside Management Service** is accommodating the needs of *A.iris* in a very positive fashion, and habitat management for *A.iris* has already been put in place by Neil Chamberlain of the **Woodland Trust**. When 4 ha of regrowth at the Woodland Trust's Wormley Woods Nature Reserve was thinned in late autumn 2001, many sallows were retained.

c) ~ With regards to 10.3, one woodland manager has accommodated, as far as is practical, the needs of *A.iris* in the management system. Age diversity is established within larger woods, and **additional growth** including sallows is retained in plantations to 'draw up' the crop trees, encouraging apical rather than lateral growth, towards the production of timber of higher quality. We feel that such management at one location (Site F) improved habitat quality to the point that the species was then detected, *A.iris* having either colonised or strengthened here over recent years.

d) ~ At Site A, some sallows of c.25 years were given more room, by thinning adjacent birch, in the hope that the sallows will thicken out and last for many more years (Image 10.4). This is probably best done on the sturdiest of trees, and even then, they may still be liable to crack or blow over. Thinning and **pollarding** are likely to be worthwhile operations in maintaining sallow abundance, but age diversity and sallow regeneration will insure against any possibility of the sudden loss of numerous mature sallows. At Site C, where many sallows were felled, thinning is planned beside rides to allow more light to reach the sallow regeneration which has grown from stumps in the understorey. In this case, muntjac deer are present, but brash from the felling appears to have helped protect much of the regrowth from, for example, sallow, birch and hornbeam stumps. However, fallow and muntjac deer, where present, can create major problems through browsing in plantations *etc*, and regrowth may need to be protected.

e) ~ We have experimented with **transplanting** small sallows recently established near woodland, in this case set-aside, but the process is time-consuming and involves the suppression of weeds and the use of plant protectors. We feel that transplanting, thinning and pollarding of sallows could prove useful, but that natural and cyclical regeneration as part of sustainable forest management could quite easily provide a continuum of sallow-rich habitat for *A.iris* within many woods.

f) ~ We have been pleasantly surprised to find an increase in the choice of sallows (often *S.caprea*) for **planting schemes**, for example, a newly established broadleaved plantation between Broxbourne Woods and Wormley Woods (near Paradise Wildlife Park) includes a high number of sallows. Roadsides and hedges are often sallow-rich and these plants may be useful for *A.iris*, but to what degree is uncertain. Some recently planted scrub belts by roads and on reclaimed land mimic this effect by the inclusion of sallows, and they may provide additional habitat of benefit to *A.iris*, particularly in its catchment areas or near to woodland.

10.5 ~ Suggestions for managing for *A.iris* within different woodland systems

We hope that positive management for *A.iris* will be a consideration within all woodland complexes where the species has been found. Appropriate and timely decisions regarding sallows in woods could tilt the balance in favour of *A.iris* for many years to come. Of all our endangered species of butterfly, it seems likely that *A.iris* could be relatively simple to manage for on a less than annual basis, given the right decisions at the right times. Likewise, we believe that forestry plans throughout Hertfordshire should have both *A.iris* and general biodiversity as important considerations.

Our suggestions as to the possibilities for positive management relate to the great differences between woods and management styles. They are quite simple, but they could have positive effects for many years and decades to come.

Age diversity \sim If an area of woodland is to be cropped by 'clear-felling', then plans could be adjusted to work panels of reasonable number and size to increase age diversity, rather than felling as a single unit across a larger area or whole wood.

Cleanliness \sim There is little point in creating age diversity for *A.iris* and biodiversity, if plantation and coppice is then kept clean of herbaceous and shrubby plants through the first decades of its life. There appears to be a wide variation in approach to this matter amongst foresters, but see 10.4 c) for comments regarding the positive effects of retaining some herbaceous and shrubby plants.

Rides ~ In woodland to be managed as continuous high canopy, where there may be little opportunity for abundant sallow growth, suitable areas could be provided by wide rides and junctions. Herbaceous strips can be established adjacent to rides and managed by rotational mowing over a few years' cycle. Shrubby belts with sallows can be allowed to develop between this lower vegetation and the main body of the wood, and would be managed by the occasional coppicing of small sections. Such areas in taller woods provide warm microclimates, increase the diversity of plant species and nectar sources such as bramble and sallow flowers, and can make an important contribution to woodland biodiversity, and is supported by the Forestry Commission. See '*Woodland rides and glades: their management for wildlife*' by Fuller & Warren (1993).

Coppicing, pollarding and regeneration ~ Sallows respond extremely well to cutting if the regrowth receives full sun. In our main study areas in the south of Hertfordshire, there are few fallow deer and grazing by muntjac deer does not seem to have had a major impact on regrowth. However, we are aware that deer can be and often are a serious problem elsewhere, and that plantation and regeneration needs to be protected against browsing damage. In woodlands managed as reserves, and having *A.iris* in association with sallow-rich plantation of little commercial value, it may be appropriate to manage these areas by rotational regeneration, rather than leave sallow numbers to decline. Coppicing of small areas of sallow-rich plantation would not jeopardise a colony, but the regenerating sallows would soon become suitable again for *A.iris*, and the habitat would be maintained over the longer term. Pollarding could also be a useful way of retaining sallows, especially those of some age and in danger of collapse. There are a few examples of sallows, in Hertfordshire, regrown from low pollards *c*.1m high and estimated to be *c*.75 years old (Image 10.3). *See 10.1 & 10.4 for discussion of thinning, seeding, propagation and planting*.



Image $10.6 \sim$ sallow breakage after strong winds in autumn 2002.



Image $10.7 \sim$ Sallow regrowth from a stump in the first year.

10.6 ~ Overview of progress in addressing the Regional, County and Species Action Plans

RAP: Butterfly Conservation ~ Regional Action Plan: Thames Region. Clarke & Bourn, 2000.

BAP: Biodiversity Action Plan for Hertfordshire presently under review.

SAP: Butterfly Conservation ~ Species Action Plan: Purple Emperor Apatura Iris. Bourn & Warren, 2000.

Using our own resources, all landowners and site managers known to be managing woodland where *A.iris* has been found to be present, have been sent A.iris information packs, flight season survey results, and habitat survey information where available. In addition, site visits have been offered to owners and managers, and many such visits have been arranged in this way. We have also written short articles for Countryside Management Service (Eastern Area, Hertfordshire; Wood Warden News) and the Herts & Middlesex Wildlife Trust (Wildlife Matters) to raise general awareness of the species. RAP Actions 1, 2, 3 & 5 have all been addressed as far as our personal resources will allow, as have the SAP Actions listed below. Each tick P represents an action which we feel we have reasonably addressed given that all such work to date has been funded by our own resources. We will continue with these actions to the best of our abilities and as resources allow. All the lead organisations associated with the specific actions below have been alerted to the presence of *A.iris* in Hertfordshire and this project.

Actions relating to *A.iris* in the Thames Regional Action Plan (RAP) (Clarke & Bourn, 2000)

- 1. Survey previous sites and possible sites for adults and for habitat quality. \checkmark
- 2. Monitor a sample of known colonies, including identifying "master trees". ✓
- 3. Provide management advice. Encourage favourable management of all known sites and of associated potential areas, to encourage the formation of site networks. ✓
- 4. Continue to raise awareness of the need to maintain and develop networks of woodlands that include areas of mature deciduous habitat.
- 5. Provide feedback to all landowners and site managers wherever this species is found so that its habitat can be protected. ✓

Extracts from: Butterfly Conservation (BC) Species Action Plan (SAP) ~ Purple Emperor *A.iris* (Bourn & Warren 2000).

The Action Plan was prepared in consultation with the following organisations in the hope that they will participate in the actions outlined: English Nature (EN), Countryside Council for Wales, The National Trust, MAFF/ADAS, WWF-UK, CEH, RSPB, the Forestry Commission (FC), Forest Enterprise (FE), the Woodland Trust and the Wildlife Trusts (WTs). The SAP has the following broad objectives:

- Maintain viable networks of populations throughout its current range.
- To ensure that the partial recovery of the Purple Emperor in the U.K. continues.
- Conduct research on the ecology and distribution of the species to enable its effective conservation. \checkmark

Part 3 Actions and Work Programme ~ *We have tried to address the following actions:*

Action 6 PRIORITY: HIGH \checkmark Encourage suitable habitat management in all regions where the Purple Emperor survives	All
Action 7 PRIORITY: MEDIUM ✓	EN, FC
Encourage restoration of suitable breeding habitat within current range in	FE, LAs
Britain where there is potential for re-establishing extensive habitats or	BC, WT
viable networks of populations	WTs

Lead organisations

Action 9 PRIORITY: HIGH ✓ Advise land management agencies and site owners/managers on practical habitat management for the Purple Emperor and how to incorporate this with other management priorities and interests	BC WTs EN
Action 11 PRIORITY: HIGH ✓	BC
Ensure the conservation importance and management requirements of the Purple Emperor are	WTs
incorporated into any relevant national and Local Biodiversity Action Plans	LAs, EN
Action 14 PRIORITY: HIGH ✓	BC
Conduct further research on habitat requirements, dispersal and colonisation and management	EN, FC
techniques	FE
Action 15 PRIORITY: MEDIUM ✓	BC, EN
Investigate techniques for monitoring and establish a monitoring programme	CEH
Key to additional abbreviations: FC ~ Forestry Commission (= FA ~ Forest Authority in original do CEH ~ Centre for Ecology and Hydrology; LAs ~ Local Authorities	cument);
We regard the following Butterfly Conservation Species Action Plan high priority actions to be extre important key objectives for safeguarding the future of A.iris in Hertfordshire:	emely

Ι	ead organisations
Action 1 PRIORITY: HIGH Improve financial incentives for sympathetic woodland management throughout range	FC
Action 2 PRIORITY: HIGH Include habitat requirements of the Purple Emperor when drawing up or revising manage prescriptions in Forest Design Plans	FE ment
Action 5 PRIORITY: HIGH Incorporate needs of the Purple Emperor in all management plans, site management statements agreements covering SSSIs with colonies.	EN s and

The lead organisations concerned with addressing these three actions are Forestry Commission, Forest Enterprise and English Nature. All three bodies have been given full details of the project.
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London Natural History Museum

North Hertfordshire Museums Natural History Department: Lepidoptera collection. Dr. A. H. Foster's manuscripts and letters from correspondents

Saffron Walden Museum

Welwyn-Hatfield Museum: The Collection and selected diaries of Roger S. Ferry of Welwyn

See also 2.1 ~ Contributors

Purple Emperor

p. 71-77

Natural Order II. - SLUG-SHAPED CATERPILLARS (in science (Limacieformes)).

The distinguishing character, and that to which we have no exception among the British species of the Order, is the slug-like form of the caterpillar: it is generally covered with minute warts, giving the surface the appearance of very fine shagreen; it is without spines, and the body terminates in two points, which are directed backwards. The chrysalis is angled, but not sharply so; its head is broad, often as though cut off abruptly: in some species it is rounded or very blunt; in others it has two rather distant short points, generally described as ears; it is always, or almost always, suspended by the tail, and hangs head downwards. The perfect insect has the fore feet totally unfitted for walking, and without claws. The British species are divided into two families. Family 5. - EMPERORS (in science - *apaturidae*).

The caterpillar is very stout in the middle, but more slender towards the head, the crown of which is produced into two horns (which are usually directed forwards when the creature is crawling), and very much, although gradually, tapered towards the tail. The chrysalis is always suspended by the tail; it is stout but rather compressed on the sides; its head is divided into two blunt points or ears. The perfect insect has only four perfect legs, and has very gradually thickened antennae, ample wings, and a most powerful flight. We have but one British genus or species, commonly known as the Emperor (in science - *Apatura Iris*).

Obs. The word *-Apatura* is probably mis-printed for *Apodura*, signifying that the caterpillar has no feet at the tail or caudal extremity - a very striking character, but not confined to this particular genus, as will be seen in my descriptions of the Satyrs the spelling cannot now be altered, having been so generally adopted.

19. PURPLE EMPEROR. The antennae are rather long, and the club very gradually thickened: the fore wing are slightly arched on the costal margin, rounded at the tip, and without angles on the hind margin: the hind margin of the hind wings is scalloped, and the anal angle produced: the ground colour is rusty-black, the male being decorated with a purple lustre, which, in certain positions, is very beautiful; the female is without the purple gloss; on the fore wings are seven white spots, the position of which will be seen in the figure; it has also a portion of a transverse white band, which commences near the middle of the wing, proceeds to the inner margin, and is continued obliquely across the middle of the hind wing; in the male these markings are pure white, in the female they are tinged with yellow: there is a faint and undefined bar parallel to the hind margin of all the wings; the anal angle is tinged with rust-colour; and near the anal angle is an ocellated black spot, with a blue pupil and a rust-coloured circumscription. The under side is very different from the upper, as will be seen from the very perfect representation given below: the general tint is dull rust-colour, shaded to gray along the hind margin of all the wings: on the costal margin of the fore wings are two white blotches, one near the middle, the other smaller, and half way between the middle and the tip - between the larger white costal blotch and the base is a vague whitish space, containing two transverse black markings; towards the anal angle is an eve-like spot, black with a blue pupil and a broad rust-coloured circumscription, which is interrupted by two white spots; between this eyelike spot and the base is a short transverse white bar, extending from near the middle of the wing to the hind margin.- the hind wings have an oblique wedge-shaped median white band, the base of the wedge resting on the costal margin; there is a small blue-pupilled spot below this band, and equidistant between the hind and inner margins.

Varieties. - This insect is liable to variation, which shows itself particularly in the absence or partial absence of the white spots and band.

At page 5923, of the "Zoologist" for 1858 the Rev. William Bree describes such a variety in these words:-"On the 13th of July, 1857, I had the good fortune to capture, in Ashton Wood, near Oundle, Northamptonshire, a very singular and interesting variety of – *Apatura Iris*. There is an entire absence of the beautiful white band which in ordinary specimens, crossing the middle of the hind wing, extends into the middle of the fore wing: of the five white spots extending in a curve from the costa to the anal angle, one spot only, namely the fourth, is visible; the two spots near the tip are smaller than usual, the second of the two being little more than a speck; the costal margin and the tip are strongly powdered with fulvous, and the usual fulvous ring of the bind wing being broken on its lower side extends in a strong fulvous marking over the anal angle: the rich purple shade is spread over the wings as in the ordinary specimens, blended, however, in parts with fulvous. The under side is equally remarkable, though difficult to describe; the colouring and markings are much confused."

A very beautiful example of this variety is figure on the opposite page. It is in the cabinet of Mr. Bond and has been most kindly lent purposely to illustrate this work [not illustrated].

LIFE HISTORY. - Dr. Maclean, to whom I am indebted for the early history of this butterfly, watched a female deposit two eggs on the upper side of two leaves of the sallow, or great goat-willow (*Salix caprea*), on the 16th of July: the EGG somewhat resembles a fossil *Echinue* which has lost its spines. One of these eggs the doctor took home, and it hatched on the 25th of July, just nine days after it was laid: the egg left on the leaf

where its parent had deposited it, hatched on the 28th of the same month, having been in the egg state twelve days. The little caterpillars are of a dark brown colour: on the eighth day after being hatched they change their skin, and then are furnished with two horns or processes, attached to and forming part of the head; and it is curious that now, on the first appearance of these horns, they are proportionally larger and longer than at any other period of the creature's caterpillar life, and are evidently, although not deeply, cleft at the tip. With the first change of skin the caterpillar loses every tinge of its original brown colour, and becomes exactly of the same hue as the sallow-leaf on which it feeds: a portion of the leaf is consumed every day, but the mid-rib is left intact; and the little creature, when resting from its alimentary labours, climbs to the denuded bristle-like tip of this mid-rib, and there remains perfectly motionless, with the anterior extremity raised as we see it in the caterpillars of the privet hawk moth and the puss moth. Dr. Maclean's caterpillar continued this mode of life until the 15th of November, when it descended from the leaf, and, covering with silk the rind of the twig immediately below the attachment of the leaf, grasped this web firmly with its claspers, stretched itself out at full length, with its horns porrected before it, and thus settled itself done to endure the winter's cold and the winter's storms. This is always the case; its modus operandi is the same whether in a state of nature or in the vivarium of an entomologist. Instinct, that infallible and inscrutable guide, tells the unreasoning caterpillar that dehiscence of the leaf-stalk will take place after the first frost, and that the leaf will fall to the ground: the leaf does fall, but not until its falling is a matter of indifference to the caterpillar; not until the caterpillar has attached itself so firmly to the twig that neither wind nor rain can remove it. In the ensuing spring, the same influences which compel the sallow to throw out new twigs and now leaves also resuscitate the torpid or dormant caterpillar; its eating propensities are aroused, and it feeds greedily until the period of its first metamorphosis has arrived.

The full-fed CATERPILLAR rests on the sallow leaf in a nearly straight position, holding on by its claspers to a little silken coating which it spins on the under side of the leaf; but when feeding it bends its somewhat obese body with the facility, and I would almost say *elegance*, of a slug, but I fear many of my readers will scarcely appreciate the comparison. When annoyed, it contracts and incrassates its body, assuming a very lumpy appearance: the head is so exactly the same width as the second segment that it appears continuous therewith; the face is rather flattened, and the crown slightly notched, and produced into two slug-like horns, which are of nearly equal size throughout, but are very slightly incrassated towards the tip; they are rough, with raised points, more particularly on the under side; these strange appendages move with the head, but possess no capacity for motion independently of the head; when the mouth is stretched out, as in feeding, the horns point backwards, but when the mouth is brought up to the chest their position is exactly reversed, and they point forwards; the width of the face is nearly the same at the mouth as at the forehead: the body is slug-shaped, tapering to both extremities, more particularly to the caudal extremity, which terminates in two short, parallel, closely approximate points, directed back- wards; the surface of the body is rough, like shagreen, a character due to transverse series, of warts, one of which series is on each section of a segment, and a fifth on a rather conspicuous skinfold which intervenes between segments.

The colour requires a rather minute description; the horns may be called glaucous green, inclining to blue in front, to white behind, and to black at the tips; the space between them is of a pale yellow colour, approaching to white, but there is a pointed triangular green plate above the mouth, which enters into and almost divides the vellow part: I have said that each horn may be called white behind, thus presenting a white stripe from near the tip to the base; this white stripe is continued on the second, third, fourth, and partly on the fifth segment, where it fades into, the general green colour of the back; on each side of the body is a very narrow yellow stripe traversing the region of the spiracles, extending the entire length of the caterpillar, and terminating in the anal point; there are; moreover, seven oblique lines on each side, all of them commencing near the lateral stripe which I have just described, and running upwards and backwards, but not meeting an the back; the third of these oblique lines is the longest, reaching nearly, but not quite, to the middle of the back; this line is also rather stouter than the others; they are all of a yellow-white tint, the third being rather conspicuously bordered at the upper anterior extremity with purple; the ventral surface is glaucous green, and the legs and claspers are nearly concolorous. When full fed the caterpillar fastens itself by the anal claspers to a silken carpet it has previously spun on the under side of a sallow-leaf, and, thus suspended, changes to a CHRYSALIS, which is obese, dumpy, awkward-looking, somewhat compressed laterally, and somewhat keeled dorsally: the head terminates in two approximate short points or ears: the colour is apple green, the wing-cases being rather darker, and the body rather yellower, and the seven oblique lateral stripes which I described in the caterpillar are still to be observed on the sides of the chrysalis.

TIME OF APPEARANCE. The full fed caterpillar in May and June, the chrysalis in June, and the butterfly in July.

Obs. The Purple Emperor has achieved a great reputation among English entomologists for his lofty flight, and the extreme difficulty of securing him with the hand-net. Haworth says, "The Emperor invariably fixes his throne upon the summit of a lofty oak, from the utmost sprigs of which on sunny days he performs his aerial excursions, and in these he ascends to a much greater elevation than any other insect: I have even seen him sometimes mounting higher than the eye can follow; especially if he happens to quarrel with another Emperor, the monarch of some neighbouring oak they never meet without a battle, flying upwards all the while, and combating with each other as much as possible: after which they will frequently return again to the identical sprigs from which they ascended. The wings of this fine species are of a stronger texture than those of any other

in Great Britain, and more calculated for that gay and powerful flight which is so much admired by entomologists. The Purple Emperor commences his aerial movements from ten to twelve o'clock in the morning, but does, not perform his loftiest flights till noon, decreasing them after this hour until he quite ceases to fly about four in the afternoon: thus emulating the motions of that source of all his strength, the sun. " Let us next consider another phase of imperial life presented to us by Mr. Hewitson, at page 315 of the first volume of the " Entomologist ": - " At the end of a long and very rapid flight at the outskirts of the wood they (the Emperors) would enter its more shaded recesses, and settling wherever moisture was to be met with, would protrude into it, their thin long trunks, and were soon heedless of my approach. I found a flat, bagless net by far the best when their wings were thus expanded, allowing them no room for motion. Instead of employing their sunny hours in sipping sweets, and

'Gathering honey all the day From every opening flower,'

their delight was to extract the juices of each swamp-like hole, and the filthier the puddle the more it seemed adapted to their taste. Herds of swine are brought to pasture on the borders of the forest, and it was their droppings that seemed to supply the Purple Emperors with their choicest feast. Seating myself near one of these, I selected the finest specimens as they settled down, and watched them till they closed their wings; and so intent were they on their occupation that they would usually permit me to take them between my finger and thumb. They were so numerous that I have had no less than seven under a small net at one time, and even then they showed but little anxiety to get away." Again, Mr. Sturgess writes thus, at page 59 of the volume of the "Intelligencer": - "You may judge how agreeably surprised I was to learn, one scorching day in July, that the Purple Emperor had been caught regaling himself upon the imperial delicacies of dead stoats, weasels &c., hanging upon some low bushes as a terror to evil-doers. I need not say that I did not neglect the first opportunity of visiting the spot, and had the satisfaction of seeing within the space of an hour three Emperors descend from their thrones to breakfast upon the delicious viands." And again, Mr. Russell, writing from Ashford, in Kent, informs us at page 139 of the same volume, " that on the 18th he captured two males of this insect in fine condition, one of them from the head of a dead cat nailed to a lodge in the wood." A few pages further on in the same instructive journal (page 155) Mr. Sturgess again reports progress thus: - " Some of your readers may be glad to learn the results of the captures indicated above; I believe the following is a correct list: three specimens; on 13th, six; on the 14th, seventeen; on the 15th, twenty; the 16th, eight; on the 17th, six; 18th, fourteen; on the 23rd, three; and on the 24th, three; eighty specimens in nine days. The experiment was not tried in the same place as last year, but in a wood some thirteen hundred acres, where the Emperor appeared to be more plentiful: the keeper kindly consented to nail a portion of rabbit-skin and the wing of a bird to the end of a house; a similar bait was also placed on lime heap about a dozen yards distant." Here is sufficient evidence of the kind of delicacies best adapted to the imperial palate: an adaptation which, however I may regret, I am unable to dispute. I would gladly have depicted the Emperor of our insect word as banqueting on ambrosia, an esculent of which, by the way, I have no clearly defined idea, or quaffing the nectar of flowers, but this would not be truthful: in this and other cases of depraved appetite, we can only lament a fact as incontrovertible as it is unsatisfactory, repeating the somewhat trite, but ever sapient axiom, de gustibus non est disputandum. I am able, however, to assign his imperial majesty one instance of more refined taste - Dr. Knaggs records, at page 165 of the fourth volume of the "Entomologist's Weekly Intelligencer," that he succeeded in decoying an Emperor by painting the trunk of a tree with sugar, and thus secured him.

LOCALITIES. - This beautiful insect is unknown in Ireland, Scotland, and the Isle of Man, and its range in England is restricted to the oak woods of the midland, eastern, and southern counties. I give a list of the localities it is known to visit: -

Bedfordshire. Clapham Park Woods - Stainton's "Manual."

Berkshire. Burghfield, near Reading - C. S. Bird.

Buckinghamshire. At Claydon I observed, several specimens flying about the tops of the oaks in the woods here last month (August), but although I procured a pole about twenty feet long for my net I was unable to take any *H. H. Crewe*.

Cambridgeshire. Woods near Cambridge - Thomas Brown.

Devonshire. Occurs occasionally near Barnstaple, North Devon - G. P. Mathew.

Dorsetshire. Woodland Wood, near Hanford, the seat of the late H. Seymer, F.L.S., and near Cranborne - *J. C. Dale.*

Essex. Very rare at Epping, but common at Colchester – Edward Doubleday, in 1833; formerly common in the High Woods, Colchester, but I have not seen a specimen since 1860, and it has disappeared from all the other woods where it formerly occurred in the vicinity of Colchester. The last specimen taken here was flying round a moderator lamp in the evening, in the town itself. It still occurs at Coggeshall, and in Storr Wood, near Ramsay - *W. H. Harwood;* Saffron Walden - *W. R. Jeffrey.*

Gloucestershire. Forest of Dean - W. Langley.

Hampshire. Near Lyndhurst and Brockenhurst - *F. Bond*; occasionally in the Now Forest, but uncommon - *J. B. Corbyn;* Burton, near Christchurch - *J. C. Dale*; Southwick - *Henry Moncreaff;* Emsworth. - *W. H. Draper;* Ringwood. - *W. G. Wilkinson.*

Huntingdonshire. Monkswood and Brampton Wood, not uncommon, but very difficult to capture - *J. H. White*; Woods near Peterborough - *F. Bond*

Kent. Tenterden - *S. C. Tress Beale*; Darenth Wood – *William Machin*; Perry Wood, Selling - *H.A. Stowell*; it is stated to occur in the woods round Pluckley, but I cannot report this from personal knowledge - W. *0. Hammond;* Knowle Park, near Sevenoaks –*Stainton's "Manual*"; in the town of Ashford, settling on the front of a house – *A. Russell.*

Leicestershire. Leicester - Stainton's "Manual"

Lincolnshire. About Lincoln, Bardney Wood, and in South Lincolnshire - T. H. Allis.

Middlesex. Caen Wood, near Hampstead - J. F. Stephens.

Monmouthshire. In the Forest of Dean - *W. Langley*.

Northamptonshire. "Early in the morning, and on damp, gloomy days, I have several times seen to the greatest advantage, as I conceive, the most splendid of all our butterflies (*Apatura Iris*) at Barnwell and Aston Wolds, sailing along the ridings, and settling upon the ruts and other moist and muddy spots, often assailed by the impudent attack of *Epinephele Janira and Melanagria Galathea*, which appear to be the foremost in attacking him when he thus condescends to leave for a while his lofty oak to visit the regions inhabited by his less honourable kindred. The partiality which this insect exhibits for individual sprigs of particular trees has often been remarked upon by entomologists, and is certainly confirmed by the Emperors of this neighbourhood. And it should almost seem as if this partiality were, if I may use the expression, hereditary; for upon a certain sprig of a small ash tree, by the side of one of the ridings in Barnwell Wold, I have each year since 1847 succeeded in capturing the Purple Emperor; and in all instances, upon the capture of one, the identical sprig has in the course-of a few days, if not within a few hours, been invariably occupied by another Emperor" *William Brea;* the Lynches - *F. Bond;* Kettering—*William Sturgess*.

Nottinghamshire. Occurs occasionally at Ollerton; in 1859 I had a fine female given me alive. It was taken inside a pigsty near the edge of Willow Wood, three miles from Ollerton – R. E. Brameld; occasionally near Newark -George Gascoyne.

Somersetshire. A friend informs me he has taken *Iris* at Clive Coombe, about two miles from Bristol -*F. D. Wheeler;* a specimen reported from Brockley - *W. H. Gregg.*

Suffolk. Bentley, Coombs, &c. - H. H. Crewe; Redisham and Wolsingham Parks- *W. M. Crowfoot*; in Old-hall Wood very rare, Haverhill- *William Gaze*; Assingham Wood, near Sudbury - *John Grubb*; so common near Ipswich in 1868 that many of our collectors have taken eight or ten dozen each - *Garrett Garrett*.

Surrey. Haslemere - *C. O. Barrett;* formerly abundant near Godalming. The late Mr. Howard, of Elstead, used to take the females in his garden resting on the trunks of trees. I have seen at least a dozen so taken: the males were seen flying about the oaks, but I did not hear of one being taken - E. *Newman*.

Sussex. Poyning's Wood - *W. Buckler*; Plashet, between Balcombe and Newick, and elsewhere in the woody district of the Weald –*E. Jenner*; Chichester – *W. H. Draper*; Brighton, Bourne, and Ticehurst- *Stainton's* "*Manual*"

Wight, Isle of. Has been taken at Freshwater and Brading - J. Pristo; near Yarmouth - F. Bond.

Wiltshire. Said to have been taken in Savernake Forest, but this is very doubtful - T. A. Preston.

Obs.-A great deal which I thought it unnecessary to transcribe has been written as to the mode of capturing the Emperor with a net on the end of an enormously long pole - I know of no record of success with this strange instrument and cannot imagine myself possessed of the power to use it. The unsavoury baits already described seem to offer a more likely chance of capture.

Appendix II ~ Some historical notes regarding A.iris in Essex, gathered during our studies.

Published in two parts, the first part of the following article (pages 147-159) describes the study area, and discusses its entomology in a more general sense, although there is a list of lepidoptera which includes *A.iris*. The second part gives a more detailed account of the lepidoptera found in the area described.

Entomological Magazine Vol 3; 147-159, 283-292 [1836] Remarks on the entomology of Epping and its vicinity by Edward Doubleday

p.149

....it is almost soley to this part [east of the London Road] that my remarks in this paper will apply. The eastern half of a circle, whose radius is about four miles, and whose centre is situated about a quarter of a mile west of the town [Epping], includes the place where nearly all the insects mentioned in this paper have been taken, with one or two exceptions, by my brother, Mr. H. Doubleday, and myself.

Part one; p.152-153

....To the east and south-east of the town are the woods belonging to M.C. Marsh, Esq of Park-hall, to Sir J. Smyth, of Hill-hall, and the woods called Ongar Park-woods, the property of Capel Cure, Esq., of Blake-hall.... *Part two*; *p.285*

....*Apatura iris* is very rare here. I have only taken one specimen, a male, in a field adjoining Mr. Marsh's woods. It had settled on the footpath. I have heard of others seen by persons whose judgement I can trust.

M. C. Marsh, Esq., Ongar Parkhall (Grid Ref.: TL513 038)

Sir J. Smyth, Hill Hall (Grid Ref.: TL486 995)

Capel Cure, Esq lived at Blake Hall, although the 1901 census does not record anyone with the surname Cure living there. However, at this time a Harry Cure, aged 42, lived at Stapleford Tawney and was "Living On Own Means".

Entomological Magazine Vol 4; 230-234 [1837]

Notes of captures by \cong *Delta p.231* [credited to Edward Doubleday]

For the first time in my life I saw this beautiful butterfly [White Admiral] near Colchester last July and its elegant appearance when on the wing will not soon be effaced from my mind. It is vain to try to describe it, but any entomologist who would journey from London to Colchester, would be well repaid all expense, trouble and time, were he only to pass one fine July day in the woods bordering the road from Colchester to Ipswich. There he will find *Liminitis camilla* in profusion, *Apatura iris, Melitœa athalia, &c.;* ^a and should be fond of the fossorial Hymenoptera and bees, he will find every sunny bank alive with them. The larva of *L. camilla* may be found by carefully hunting the leaves of honeysuckles. The figure in Curtis is not the larva of Camilla, but of some other European species. I hear also made remark that *Apatura iris* was more common at Epping this summer than we have ever known it before but alas none could be taken. Had I been at home I should have tried a plan, which I know has proved very successful at Colchester. This is merely to have a quantity of black very wet mud spread in some open place in the woods where *Iris* is seen.

Mille trahens varios, adverso sole, colores

They will soon come down to it to enjoy its coolness and moisture and are then easily taken.

^a Specimens of all these may also be purchased for a trifle off a person named Biggs residing in these woods.

This following report by E. A. Fitch is so well researched and comprehensive that we felt it should be included in full, although many of the sites mentioned may not be not relevant to our current study area.

Essex Naturalist Vol. 5; 74-108 [1891] Lepidoptera of Essex by E. A. Fitch p.94-96

Apatura iris, L. Purple Emperor.

Geographical Distribution - Central and South-west Europe, rare in Asia Minor, China (doubtful), England, south of Humber.

Larva - Green with yellowish spots, yellow or pinkish stripes at sides in front and oblique yellow stripes in middle; horns bluish-green in front with brownish-red tips. *Food* - Sallow, aspen, poplar. *Imago* - June and July; hibernates as larva.

Rare and local; restricted to oak woods; of lofty and noble flight. More often seen than caught. Like *V*. *Atalanta* this fine butterfly has been taken both at light and sugar.

The larva appears to have been first discovered in Essex (and in England) by Mr. Drury. Moses Harris, in his "Aurelian: or Natural History of English Insects, namely, Moths and Butterflies" (1766), gives in plate iii, two figures of the caterpillar, and remark upon them as follows: "On the 26th of May, in the year 1758, Mr. Drury, an ingenious Aurelian, in searching for caterpillars, beat four off sallow, near Brentwood, in Essex, which in their shape and motion differed from any hitherto discovered, being furnished with two horns of the same hard substance as their heads, resembling the telescopes of a snail, and in their progressive motion seemed rather to glide along, like that animal, than crawl, as most caterpillars do." After carefully describing the larvae, he expresses his gratitude to his "generous and worthy friend, Mr. Drury, for the discovery of the caterpillar of one of the most beautiful flies in the universe, and which had hitherto eluded the search of the most skilful and industrious aurelians."

"The Purple Emperor of the British oaks is not undeservedly the greatest favourite of our English aurelians." (*Haworth: Lep. Brit.* i. 19 [1803]). He gives an entertaining description of its habits (*reprinted: V.M.* 117-119; *B.B.* 74-5). Haworth says: "In three days I took myself twenty-three (nine of them in one day), but never took a female at all" (*Lep. Brit.* i. 20).

"Apatura iris was common in Hartley Wood and Riddles Wood: between eighty and one hundred were seen performing their graceful and rapid evolutions about the tops of the oaks and aspens, gliding among the foliage, and not returning to any particular tree, as Haworth has stated to be its habit. From the frequency with which they visited the aspens, and their greater inclination to settle on them, we are inclined to think that the larvae feed on those trees, as well as on the broad-leaved sallows. There was not a wet spot to be found in the wood, or we should have tried the method of capture mentioned by Mr. Hewitson (*Ent.324*): only four were taken" (*J.W. Douglas, Ent.* i. 384).

Caught in July, 1695, near Heveningham [Hedingham] Castle, in Essex, by Mr. Courtman (Ray; H.I. 127). Hedingham and Blackmore End (Benj. Allen; M.S.). Larva on sallow, Brentwood, May 26th, 1758 (D. Drury). Great and Little Stour Woods, Wrabness and Ramsey (Jermyn; V.M. 69). Woods bordering road from Colchester to Ipswich (≅ E.Doubleday; Ent. Mag. iv. 231). Hartley Wood, St. Osyth; Riddles Wood, between Walton-on-Naze and Brightlingsea, July 1842 (A. Lambert and J.W. Douglas; Ent. i. 384). Woods round Colchester and wood on Mersea Island (H. Doubleday; Z. iv. 1399). Eggs from Dr. Maclean, Colchester, July 16th 1861 (Newman; Z. xix. 7820). Egg from Harwood, Colchester July 31st, 1875 (W. Buckler; E.M.M. xii. 3; Larvae 45). "Formerly common in the High Woods, Colchester, but I have not seen a specimen since 1860, and it has disappeared from all the other woods where it formerly occurred in the vicinity of Colchester. The last specimen taken here was flying round a moderator lamp in the evening in the town itself [X in Dr. Laver's Collection.]. It still occurs at Coggeshall and in Stour Wood, near Ramsey." (Harwood B. B. 76). Has reappeared in most of the larger woods in the Colchester district, but is scarce (Harwood). Some seasons not very scarce, Witham (E. H. Burnell; M.N.H. (2) i. 602). Two, Sudbury, 1838 (W. D. King?; F.S.J., Dec., 1838). Occasionally, near Halstead, larva on sallow, pupated June 15th, 1875 (S. R. Bentall; Ent. viii. 182). Kedington and Haverhill, 1833-5 (W. Gaze; Ent. i. 278). Very rare, Old Hall Wood [Steeple Bumpstead] (W. Gaze; B.B. 77). Saffron Walden (Jeffrey; B.B. 76). Occasionally, Saffron Walden (Cat. S.W.M. 49). Twice seen near Walden (J. Clarke). "The late Mr. Joshua Clarke has told me that he formerly took this beautiful butterfly in the woods near Debden, Essex. We have four English caught ones in our 'Old Collection' 3 that I believe he presented to the Museum, and if so, they may be from the above-named locality." (G. N. Maynard, in litt.). Rickling, near Stanstead, Aug. 11th, 1879 (J. Carter; F. liv. 287). Two, Brentwood, July 1st, 1882 (W.J.V. Vandenbergh; Ent. xv. 187). Two, captured five or six years ago in, woods around Thoby Priory by the sons of Major Arkwright; also two in 1890 (Raynor). It was formerly not uncommon in Epping Forest, though it is evidently very local. It is also found in several parts of Essex and Suffolk (Stephens; I.B.E. Haust i. 51). Very rare, Epping, 1835 (E.Doubleday; Ent. Mag., iii. 285). Epping, has occurred commonly (S.M. i. 35). Now rare in Epping Forest, Mr.

B. G. Cole has seen two of late years, one in Bury Wood, Sewardstone, the other towards Epping. [I have several times *seen* the butterfly in the forest - *W Cole*.]

³ In explanation of the words "Old Collection " which occur in connection with records, from Saffron Walden, Mr. Maynard, the Curator of the Museum, writes as follows: "The words 'old collection' you ask me about, allude to the collection of Lepidoptera that I found in the Museum here ten years ago, when I first took charge of it; how, long they had previously been there I cannot say; but probably, many of them from the commencement of the collection (1834), over fifty years. At the time I allude to I found none of them labelled as to locality of capture, & c., but for my own convenience, to distinguish them when they came into the general collection, since got together (from various parts of the country, many from Mr. James Backhouse of York), I had them labeled "Old collection." Mr. Joseph Clarke, our oldest Trustee, and the only person now living who can give any *positive* information about their locality of capture, & c., him I have interrogated, and he says 'Many of them were taken in the *neighbourhood* of Saffron Walden, or this part of the country of Essex,' some of which he speaks more positively about in this respect than others." – ED

Further details from Sarah Kenyon, Saffron Walden Museum

Please find below a transcript of a piece of manuscript documentation that mentions field collection locations for Purple Emperor butterflies in Essex - Brentwood, Debden and Castle Heveringham (this last location may be present day Castle Hedingham?). The document was found in a card index to the museum's Fish, Insects and Mollusc collections for the period 1833 to circa 1890. It appears to be have been compiled by curator George Nathan Maynard when he worked at the museum between 1880 and 1904. The collector he mentions, Joshua Clarke, lived 1807 to 1891.

Apatura Iris

Purple Emperor – The late Mr Joshua Clarke has told me that he formerly took this beautiful insect in the woods near Debden Essex. We have four English caught ones in our old collection that I believe he presented to the Museum. If so most probably they may have come from that locality. - The first account we have of this insect being a British species is in John Ray's "Historia Insectorum" published in 1710, where he informs us that it was taken in the month of July, in the neighbourhood of Heveringham Castle Essex, in the year 1695, by D. Courtman.

Moses Harris also alludes to it as having been found in his "Aurelian" in 1758 near Brentwood in Essex, where he gives a most interesting account of its discovery etc.

We have been able to find the original entries for the following reports mentioned by Fitch (1891):

Ref.: Rickling, near Stanstead, Aug. 11th, 1879 (*J. Carter; F.* liv. 287). **The Field, the Country Gentlemans Newspaper Vol 54; 287** [1879] **Notes on butterflies**

A specimen of the Purple Emperor (*Apatura iris*) was captured by some children at Rickling, near Stanstead, Essex on the 11th of this month, and was set out by a lady friend, who is now visiting at my house. She informs me a second specimen was seen but not captured James Carter (Burton House, Bedale)

Ref.: Two, Brentwood, July 1st, 1882 (W.J.V. Vandenbergh; Ent. xv. 187).

The Entomologist Vol 15; 187 [1882]

Entomoglogical Notes, Captures, &c.

APATURA IRIS AT BRENTWOOD – When at Brentwood, on the 1st inst. I observed two splendid specimens of Apatura iris flying round the tops of some tall oaks. We watched them for more than 10 minutes, but were unable to capture either.

W. J V. Vandenbergh; July 6, 1882

The Victoria History of the Counties of England: Essex 1:136-177 [1903] *Lepidoptera* by W. H. Harwood

The White Admiral is found in most of the larger woods in north Essex and in the closing year of the past century was very abundant in some of them. It seems however to be scarce in the other districts. Mr. Fitch reports a single specimen from Hazeleigh in 1899. Mr. Geoffrey gives Saffron Walden as a locality and formerly

it occurred in Epping Forest. As the larvae feed on the honeysuckle that grows among the tallest underwood, it follows that large numbers of them must be perish every winter when the annual clearances are made. Where these are unusually extensive and continued for three or four years the species may be reduced to the verge of extinction and this is probably the main cause of the fluctuation in its numbers in restricted localities.

The Purple Emperor doubtless suffers from the same cause, the larvae hibernate upon the sallow. In some of its most favoured haunts there are only a few scattered bushes and when these are cut, the larvae necessarily perish. In many woods sallows abound and their struggle for existence is carried on under more favourable conditions, but in these estates the species must always be much scarcer than it was formerly when thousands of acres of grand old trees stood where only a few miserable sticks stand today. With the green woods of England disappeared in all directions, inevitably wild flowers, birds and insects have to a very considerable extent gone with them. But even under the most favourable circumstances this butterfly was always more or less sporadic. In 1855 this species was common in the Colchester district and then again for two or three years in the early 80s was comparatively common, but since then it has become exceedingly rare, not only in Essex but also in Kent where it occurred freely about the same time. Though its disappearance has been attributed to the rapacity of collectors, but here it cannot have been due to this cause for certainly not more than 5% of the specimens seen were captured as far as can be ascertained. This seems to have occurred in all the larger Essex woods in past years and doubtless still exists in some of them, and may again recover its lost ground for a time in the near future.

Appendix III ~ Abbreviations used within text

Andrew Middleton	AM	Hours	hrs
Apatura iris	A.iris	Liz Goodyear	LG
Biodiversity Action Plan	BAP	Minutes	mins
Butterfly Conservation	BC	National Nature Reserve	NNR
Geographical Positioning System	GPS	Regional Action Plan	RAP
Hectare	ha	Site of Special Scientific Interest	SSSI
Hertfordshire Biological Records Centre	HBRC	Species Action Plan	SAP

Appendix IV ~ Scientific names of taxa referred to in text

Ash	Fraxinus excelsior	Brown Hairstreak	Thecla betulae
Alder	Alnus glutinosa	Comma	Polygonia c-album
Aspen	Populus tremula	Dark Green Fritillary	Argynnis aglaja
Beech	Fagus sylvatica	Essex Skipper	Thymelicus lineola
Birch sp	Betula spp.	Emperor Moth	Pavonia pavonia
Bistort	Persicaria spp.	Freyer's Purple Emperor	Apatura metis
Blackthorn	Prunus spinosa	Gatekeeper (Hedge Brown	n)Pyronia tithonus
Bracken	Dennstaedtiaceae spp.	Green-veined White	Pieris napi
Bramble	Rubus spp.	Grizzled Skipper	Pyrgus malvae
Buddleia	Buddleja	Heath Fritillary	Mellicta athalia
Cherry	Prunus spp.	High Brown Fritillary	Argynnis adippe
Common/Grey Sallow	Salix cinerea	Large White	Pieris brassicae
Crack Willow	Salix fragilis	Lunar Hornet Moth	Sesia bembeciformis
Elm	Ulmus spp.	Marbled White	Melanargia galathea
Goat or Pussy Willow, Gr	eat or	Marsh Fritillary	Eurodryas aurinia
Broad-leaved Sallow	Salix caprea	Meadow Brown	Maniola jurtina
Hawthorn	Crataegus spp.		(Epinephele janira)
Hazel	Corvlus avellana	Painted Lady	Cynthia cardui
Hemp-agrimony	Eupatorium cannabinum	Peacock	Inachis io
Holly	Ilex aquifolium	Plain Tiger	Danaus chrysippus
Honeysuckle	Lonicera spp.	Purple Hairstreak	Quercusia quercus
Hornbeam	Carpinus betulus	Pearl-bordered Fritillary	Boloria euphrosyne
Mongolian Oak	Quercus mongolica	Purple Emperor	Apatura iris
Oak	\tilde{O} uercus spp.	Purple Emperor eastern race	
Sycamore	<i>Acer pseudoplatanus</i>	1 1	Apatura iris amurensis
Sweet Chestnut	Castanea stiva	Red Admiral	Vanessa atalanta
Turkey Oak	<i>Ouercus cerris</i>	Ringlet	Aphantopus hyperantus
5	~	Silver-washed Fritillary	Argynnis paphia
		Small Pearl-bordered Friti	illary
Black Redstart	Phoenicurus ochruros		Boloria selene
Brown Hare	Lepus europaeus	Small Skipper	Thymelicus sylvestris
Common Crossbill	Loxia curvirostra	Small Tortoiseshell	Aglais urticae
Common Redstart	Phoenicurus	Speckled Wood	Pararge aegeria
	phoenicurus	Swallowtail	Papilio machaon
Fallow Deer	Dama dama	White Admiral	Limenitis (Ladoga)
Great-spotted Woodpecke	r Dendrocopos major		camilla
Muntjac Deer	Muntiacus reeves	White-letter Hairstreak	Satyrium w-album
Stoat	Mustela erminea		•
Tit sp.	Parus sp.	Hawker Dragonfly spp.	Aeshnidae spp.,
Weasel	Mustela nivalis	C 7 11	11
Wood Warbler	Phylloscopus sibilatrix		
Wryneck	Jynx torquilla		

<u>Notes</u>