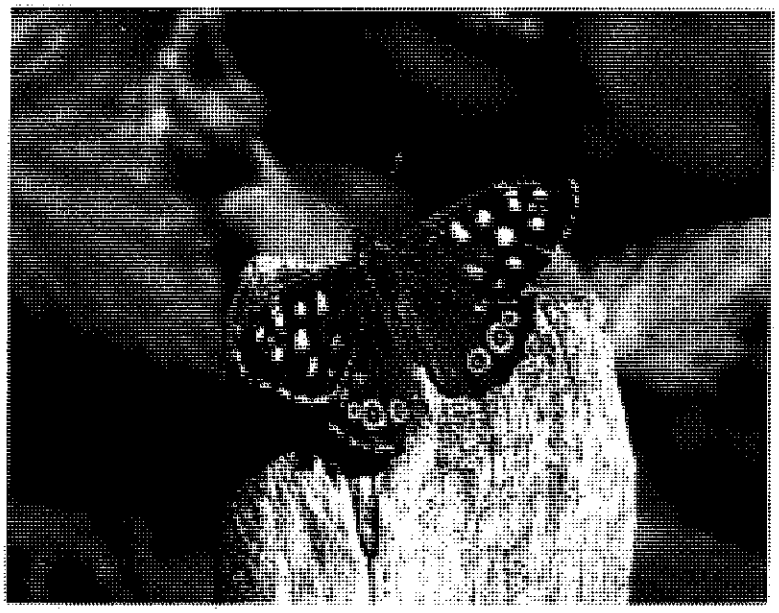
HOLLAND PARK

LEPIDOPTERA SURVEY REPORT

1997 - 1998



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A REPORT PREPARED FOR

LEISURE SERVICES, THE ROYAL BOROUGH OF KENSINGTON & CHELSEA

CONTENTS

		PAGE NUMBER
	Summary	1
	Glossary	2
	Map	3
1.	Introduction	4
2.	Materials and methods	5
3.	Results	8
4.	Discussion and management implications	27
5.	Proposals for further surveys	34
6.	Acknowledgements	35
7.	References and Bibliography	36
8.	Tables	37
9.	Appendices	45

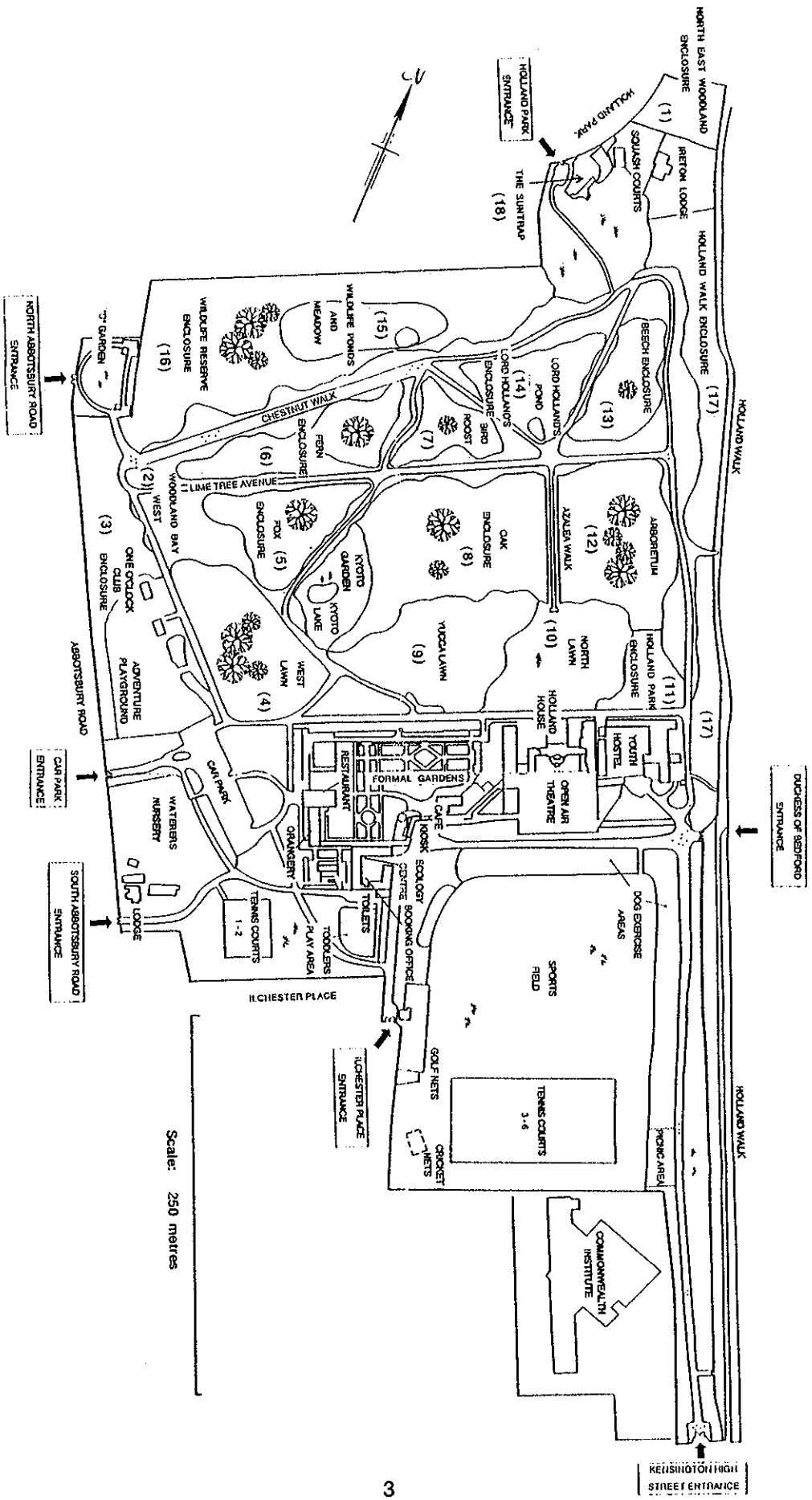
SUMMARY

The results of the 1997-8 survey combined with past records and acquired data have added the following number of butterfly and moth species to the previous totals for Holland Park and its immediate environs as shown in Plant's distribution maps (1987 and 1993): 8 of butterflies giving a new total of 19 species; 93 of macromoths giving a new total of 106 species; 99 of micromoths (as yet, no previous data readily available). This gives a combined total of exactly 200 new species of Lepidoptera for Holland Park and its immediate environs. The overall total for this area since 1980 now stands at 224 species; 14 of these were not recorded during the latest survey.

GLOSSARY

c	approximately
e	recorded earlier
forb	herbaceous pasture plant, other than grasses
g	genitalia preparation made for identification purposes
honeydew	sticky secretion from aphids e.g. on leaf surfaces
hostplant	caterpillar foodplant
HP	Holland Park
larva (*plu.* larvae)	caterpillar(s)
Lepidoptera	moths and butterflies (an order in the class Insecta)
LEU	London Ecology Unit
macromoths	larger moths (see page 8)
micromoths	smaller moths (see page 8)
MV	mercury vapour
multivoltine	having more than one brood in a year
NHM	The Natural History Museum, London
ovipositing	egg-laying
ovum (*plu.* ova)	egg(s)
P	recorded at Penzance Street
Parcel	area or enclosure with determined boundaries
pupa (*plu.* pupae)	chrysalis(es)
'stock'	Lepidoptera ova, larvae and pupae
UV	ultra violet
Vanessids	a subfamily of the Nymphalidae family of butterflies, including Red Admiral, Painted Lady, Small Tortoiseshell, Peacock and Comma
*	recorded prior to the survey in Plant (1987) for butterflies and in Plant (1993) for macromoths
[]	recorded prior to survey in Plant (1993) but not recorded since
♀	female
♂	male

MAP OF HOLLAND PARK



1. INTRODUCTION

This is a report on a survey of Lepidoptera (butterflies and moths) in Holland Park (TQ247798) (subsequently referred to as HP), carried out between July 1997 and September 1998. Past data from both personal and published sources has also been included.

A brief review of each of the 19 butterfly species recorded in HP since 1982 and some of the unusual/rare moths from the total of 192 species recorded during the survey, is given in section 3. Implications of the findings for management and enhancement of habitats are given together with comment on the current ecological management plan. Proposals are made for further survey work, a Butterfly Transect Walk to monitor species annually, and a list of potential Biodiversity species.

Up to about 15-20 years ago, important butterfly breeding habitat occurred in several southerly parts of HP but these have subsequently been lost to new developments and such habitat is now largely confined to the area north of the Formal Gardens, principally in the 'woodland' section which comprises some 8 ha. A detailed description of the various woodland Parcels, habitats and their management plans can be found in the *Holland Park Ecological Management Plan. Draft for Consultation* (RBK&C, 1997). This includes the results of a Habitat Survey conducted by the London Ecology Unit in 1993. Some confusion exists in the text concerning the numbering and naming of Parcels and so, in agreement with the Ecology Service, the following system has been employed throughout this report (refer to **Map** on page 3):

1 North East Woodland Enclosure
2 Woodland Bay West
3 One O'clock Club Enclosure
4 West Lawn
5 Cypress (Fox) Enclosure
6 Fern Enclosure
7 Bird Roost Enclosure
8 Oak Enclosure + Kyoto Garden
9 Yucca Lawn
10 North Lawn
11 Holland Park Enclosure
12 Arboretum
13 Beech Enclosure
14 Lord Holland's Enclosure
15 Wildlife Ponds and Meadow
16 Wildlife Reserve Enclosure
17 Holland Walk Enclosure
18 The Suntrap

Botanical names follow Stace (1995); exceptions are quoted as given in the literature cited. Lepidoptera names and ordering follow Emmet and Heath (1991). Common names (where they exist) are used in the text; scientific and common names are used in the Tables and Appendices.

2. MATERIALS AND METHODS

A variety of methods can be employed to survey Lepidoptera. The two main ones used were observing adults during site visits and catching moths at night in a light-trap. Both produce good and useful results for the majority of species existing at a particular site. Systematic searches for ova, larvae and pupae were not carried out although casual observations were noted.

The number of site visits agreed for the survey was 10 for butterflies and 15 for moths. For the latter, a Robinson mercury-vapour (MV) light-trap was operated at Ireton Lodge (TQ248802), a private garden within the north eastern section of the woodland. Due to the specific interest of some of the moth fauna discovered, 9 further moth trapping sessions were carried out, two of which were in other parts of the park.

Ireton Lodge was considered an ideal site for moth-trapping being a large open space adjacent to mature woodland. A wide variety of trees and shrubs were present in the garden and environs including ash, Atlantic cedar, beech, broom, butterfly bush, cherry, crab apple, cypresses, dogwood, English elm, evergreen oak, hawthorn, hazel, heathers, hedge veronicas, holly, horse chestnut, hybrid-black poplar, ivies, Japanese privet, Japanese red-cedar, junipers, lime, mulberry, pear, pedunculate oak, purple plum, silver birch, Spanish gorse, viburnums, yew etc. In addition the garden contained a small area of tall grasses, nettles, brambles and thistles.

In order to make a *comprehensive* site list for moths it would be necessary to trap on a weekly basis throughout the year and apply further methods e.g. beating and sweeping herbage for adults and larvae, and collecting larval mines. In addition, the trap(s) should be located in several different habitats in various parts of the park. Such a list might take two to three years to compile (Waring, 1994). In this survey it was not feasible to conduct more trapping sessions in different locations due to the limitations of the contract and for security reasons.

Butterflies are generally most active during warm, sunny conditions, preferring sheltered sites where nectar and hostplants are available. Main visits were made to the best sites during optimum weather conditions when adults were likely/known to be on the wing. Species, numbers and behaviour were recorded. **Many additional records were made on casual visits to other locations** e.g. the Suntrap, Ireton Lodge, the Formal Gardens, the Sports Field, the woodland pathways (which include Chestnut Walk and Lime Tree Avenue) etc. Weekly walks were made from the Suntrap and 'D' garden entrances to the Duchess of Bedford's Walk and Kensington High Street entrances on the east and south sides of HP.

Main survey visits for butterflies were made to the locations listed below on the following dates:

1997

July 8	Parcels 15, 16
August 4, 21	Parcels 15, 16, Ireton Lodge, woodland paths
September 10	Parcels 5, 15, 16, woodland paths

1998

April 27	Parcels 15, 16, D Garden, woodland paths
May 12	Parcels 6, 7, 10, 15, 16, Ireton Lodge, woodland paths
July 18, 20, 23	Parcels 7, 8, 12, 14, 15, 16, 17, woodland paths
August 1, 5, 6	Parcels 4, 8, 15, 16, 17, Ireton Lodge, Waterers Nursery, woodland paths

The moth trap was operated at Ireton Lodge on suitable evenings when adults were likely/known to have emerged. Warm, still, cloudy nights with little or no moonlight are usually the most productive. Warm, drizzly nights can be very fruitful but heavy rain during the day preceeding trapping usually results in poor catches. I had previously trapped at Ireton Lodge from mid to late June in 1993 and 1994 and therefore decided not to cover that period during the 1997-8 survey. The dates on which the trap was operated were as follows (being the dates for the evenings on which the trap was set):

1997

August 3, 21
September 4, 23

1998

February 18
March 2, 17, 27, 30
April 7, 21, 29
May 11, 15, 19, 28
June 3, 16
July 6, 16, 27
September 18

Two additional sessions were carried out using a Honda EM650 generator, one in the Arboretum on 22.9.98 and the other in the Wildlife Reserve Enclosure on 23.9.98.

At Ireton Lodge the trap was operated from dusk to dawn using a time-switch connected to a mains outlet. The 125W HSL bulb was protected from rain by an inverted pyrex bowl. The trap was positioned on the garden lawn in an open situation so that light was transmitted with maximum effect. Moths entering the trap settled on egg-boxes which had been placed inside the apparatus. These were then examined at leisure the following morning before being released undamaged. Moths found in the vicinity of the trap were also included in the results. All macromoths were counted and recorded in a notebook It is difficult to make accurate counts of very small micromoths and for the mostpart sample specimens were tubed singly and taken away for identification.

Limitations of Robinson traps include their unsuitability for catching diurnal species (e.g. most zygaenids, sesiids and various others), although some moths fly both in the day and at night. They are less than ideal for trapping geometrids. A major problem when using light-traps is the tendency for birds to learn that easy feeding can be had at the site. They will congregate in the early morning and pick off specimens resting outside the apparatus, on the lawn, or on nearby bushes etc. To counter this it is necessary either to attend the trap during operation and examine the moths as they arrive, or to sort the catch very early in the morning before the birds have started to feed. Neither option was feasible for this survey. Once a catch has been sorted it is important to take the moths to dense undergrowth and scatter them safely where they will be hidden from predators. This was carried out after each session.

Several types of moths are almost identical in appearance and the only way to identify them correctly is by examining their genitalia under a microscope. With some species this is possible whilst the moth is alive, but with others it is necessary to kill the insect and mount the genitalia on a slide. This entails placing the abdomen in warm 10% sodium hydroxide (NaOH) solution for c15 minutes, cleaning in distilled water, separating the genitalia, washing in alcohol and mounting in Euparal using a slide and coverslip before viewing with a microscope. Examination is possible without mounting if a permanent preparation is not required. The correct identification of many micromoths is a skilled and time-consuming task; difficult specimens were 'tubed' and taken to the Natural History Museum, London for determination.

A Heath Portable moth trap was operated at 25 Penzance Street (TQ242803), about 650 m north west of Ireton Lodge. This model utilises a 12 volt actinic fluorescent UV tube. The trap was placed on a first-floor roof surface overlooking the back garden. Catches in Heath traps are c40% less in quantity and species compared with Robinson traps (Waring, 1994). Since the Heath and HP traps occured in monad TQ2480, it was decided to incorporate additional species recorded in the former into the overall results for the park.

3. RESULTS

The separation of Lepidoptera into three groups - Butterflies, Macromoths and Micromoths is entirely artificial. About 54 families of Lepidoptera are represented in Great Britain and Ireland, 32 of these being micromoths, 17 macromoths and 5 butterflies. Inspite of the names micro and macro, there are no defined size limits for each group. Some micro species are large e.g. the female of the pyralid Schoenobius gigantella which can measure up to 46 mm wingspan, and some macro species are very small e.g. Haworth's Pug Eupithecia haworthiata which can measure as little as 12 mm wingspan. Generally speaking however, micromoths are much smaller than macromoths and butterflies.

3.1. Past Records; Tables 1 and 2.

In the following text, the system described by Plant (1993 pp xiv-xv) to record and locate species on LNHS distribution maps has been used. TQ27P and TQ28K refer to the two tetrads in which HP is located. **The greatest bulk of the park occurs in the former** whilst Ireton Lodge and Parcels 1, 18 and the northern part of 17 occur in the latter.

3.1.1 Butterflies:

For the period 1980-86 the following species were recorded in these two tetrads (see Plant, 1987 and 1993 distribution maps). Records from TQ27P for 1982 were supplied to Plant by myself:

TQ27P - Large White, Small White, Green-veined White, Small Copper, Common Blue, Holly Blue, Red Admiral, Painted Lady, Small Tortoiseshell, Peacock, Comma.

TQ28K - Large White, Common Blue, Red Admiral, Painted Lady, Small Tortoiseshell, Comma.

During the 1993 Habitat Survey of HP carried out by the London Ecology Unit, the following species were recorded: Large Skipper, Purple Hairstreak **(incorrectly described as the 'Green Hairstreak' in RBK&C (1997))**, Small Tortoiseshell, Peacock, Comma and Speckled Wood.

Records for Hertfordshire and Middlesex prior to the current survey period are shown in distribution map form in Murray (1996 and 1997). These maps also give an indication of abundance. The following species were recorded in the HP tetrads between 1995-6. Records for HP were supplied to Murray by myself:

TQ27P: Small Skipper, Essex Skipper, Large Skipper, Small White, Purple Hairstreak, White-letter Hairstreak, Holly Blue, Red Admiral, Painted Lady, Small Tortoiseshell, Peacock, Comma, Speckled Wood and Meadow Brown.

TQ28K: Large White, Small White, Green-veined White, Common Blue, Holly Blue, Red Admiral, Painted Lady, Small Tortoiseshell, Peacock, Comma. (The record of Common Blue did not originate from HP).

This brings the total number of species for HP between 1980-96 to 18. Surprisingly, neither the Brimstone nor the Orange-tip were included although hostplants of both grow in the park in one or two locations. The Brimstone has infrequently been seen flying through inner London in the spring (e.g. Kensal Green Cemetery, Westway Wildlife Garden and Hyde Park in recent years) whilst a sizeable breeding population of the Orange-tip exists in Kensal Green Cemetery. This species has also been recorded from Brompton Cemetery, Westway Wildlife Garden and very rarely from Hyde Park.

As far as it is known, most of these past records were made by myself. Details of dates and abundance are given in Tables 1 and 2. The commonest species in HP are Small White, Purple Hairstreak, Holly Blue, Comma and Speckled Wood. The White-letter Hairstreak, Small Copper and Gatekeeper were each recorded only once and only three specimens of the Common Blue have been observed. Whilst the White-letter Hairstreak is extremely unusual in inner London, it could be easily overlooked in HP due to its elusive nature. The Small Copper and Common Blue were discovered in August 1982 on rough ground where Waterers nursery buildings now stand. The Gatekeeper is a species which has been gradually spreading into inner London sites since the early 1990s and it is likely that its appearance will increase in HP in the coming years if its breeding habitat is maintained (tallish stands of bent and fescue grasses).

Lists of butterflies for other nearby sites include: Kensal Green Cemetery 1989-97, 23 species (Freed, 1992 and 1997); Brompton Cemetery 1987-98, 19 species (Freed, 1999a); Hyde Park and Kensington Gardens late 1980s-1998, 16 species (Freed, 1993 and 1999b); The Wildlife Garden (NHM) 1995-7, 15 species (Honey et al, 1998).

3.1.2 Moths:

Recent records for micromoths in the Inner London area are not readily available except for occassional reviews compiled by Plant in *The London Naturalist*; A major publication is in preparation and this will include results from the HP survey. Information on macromoths is available in *Larger Moths of the London Area* (Plant, 1993). This shows distribution maps for most of the species recorded within a 20 mile radius of St Paul's Cathedral, their occurrence being signified by dots in tetrads. Plant registered 423 species which were naturally occurring residents in Middlesex between 1980-1991. In addition, 32 immigrant, 10 vagrant, 13 introduced alien and 10 species of uncertain status were also recorded. 84 former residents of Middlesex have not been recorded since 1979.

The combined total number of species recorded in tetrads TQ27P and TQ28K between 1980-91 was 13 (Plant, 1993). This very low total is indicative of under recording as opposed to a lack of species. All but the Pale Brindled Beauty and Cinnabar were rerecorded during the survey. In 1993 and 1994, I carried out six trapping sessions (three in each year) in the latter part of June using a Robinson trap at Ireton Lodge. 4 species of micromoths and 31 species of macromoths were recorded. 1 micro and 4 macro species were not rerecorded during the survey: Bird-cherry Ermine, Green Pug, Bright-line Brown-eye, Dusky Brocade and Scarce Silver-lines. 3 other records were made prior to these additions: Elephant Hawk-moth, Cabbage Moth and Red Underwing. These are not included in Plant (1993).

Tetrad TQ27N, directly below TQ27P, had c200 macromoth and c85 micromoth species recorded in it between 1980-1991 (Plant, 1985, 1987 and 1993). Virtually all of these came from Mr J. Burge's Robinson trap in Bradbourne Street, Fulham between 1983-6. Many scarce or unusual species were taken. Burge trapped on a fairly continuous basis throughout these years and there is no doubt that his very large list owes much to this and to the proximity of Hurlingham Park which lies within 0.5 km of his trap site. Brompton Cemetery, also in tetrad TQ27N is quite close by. Hurlingham Park is c4 km due south of HP and Brompton Cemetery, c2.5 km south.

Other recent lists, some more comprehensive than others, are also available for nearby sites: Hyde Park 1993-6, 47 micro and 67 macromoth species (Freed, 1993 and 1998a); Brompton Cemetery 1993 and 1997-8, c90 micro and 108 macromoth species (Freed, 1999a), and The Wildlife Garden (NHM) 1995-7, 158 micro and 112 macromoth species (Honey et al, 1998).

3.2. Survey Results.

Results are shown in Tables 1 and 2. The following information is given for each species: index number, common name (if available), scientific name, category (where applicable), date(s) of capture and combined total recorded. Species are grouped in families.

INFORMATION TO ASSIST INTERPRETATION OF TABLES 1 and 2

Index Numbers: In the system of nomenclature and arrangement (see Emmet and Heath, 1991 p. 61) each species has been allocated an index number. This appears in front of the species name in Tables 1 and 2. The three 'groups' of Lepidoptera incorporate the following index numbers:

Micromoths : 1-13; 19-159; 175-369; 385-1524

Macromoths : 14-18; 160-174; 370-384; 1631-2496

Butterflies : 1525-1630

Symbols placed after Index Numbers: in Table 1, an asterisk, * = recorded in tetrad(s) TQ27P/TQ28K between 1980-86 in Plant (1987); in Table 2 = recorded in these tetrads between 1980-91 in Plant (1993). **g** = genitalia examined (this was also carried out at the NHM on a number of difficult micro species). **P** = captured at Penzance Street. If an entry is enclosed by parenthesis [] the species was recorded from tetrad(s) TQ27P/TQ28K in Plant (1993) but has not been rerecorded since 1991. **e** = an earlier recording or from another source.

Category status follows the system devised by Plant (1993) to allocate **macromoths** into groups according to their distribution and status in the London Area (land within a 20 mile radius of St Paul's Cathedral). A detailed description of each category is given in Plant (1993 pp. xv-xviii). An abbreviated version for categories of species noted in the survey is given below. The number of species recorded in the survey for each category is shown on the right.

Applicable Categories of status and distribution for macromoths in the London Area

Category		No. of Species in Survey
1A	widespread and common species occurring in all urban and suburban areas.	52
1B	as for 1A but generally absent from highly urbanised areas.	17
1C	species which are generally widespread and common in suburbia.	9
2A	roughly equates with 1B but occurring more locally.	5
2B	roughly equates with 1C but occurring more locally.	12
2C	a few species which are widespread only in urban areas where their hostplant occurs.	1
2E	species which are locally distributed but quite common where they occur.	3
3	very local residents occurring in only 10-30 tetrads in the London Area.	4
5	immigrant species unable to survive the winter in this country.	2
6	vagrant species, probably blown off course.	1

Date(s) of capture and combined total these refer to the date(s) and/or extreme dates of capture together with with the total number of specimens observed. Numbers of

macromoths recorded for each session were added to give a combined total. This appears immediately after the month(s) (shown as Roman numerals) e.g. 29.vi,1 in the 1993 column means that on 29 June 1993 one specimen was recorded. Similarly, 15-28.v,7;18.ix,1 in the 1998 column means that between 15 and 28 May 1998, seven specimens were recorded and later, on 18 September 1998, one specimen was recorded. Where it was not possible to make exact counts (e.g. the situation with most micromoths) a brief description has been used e.g. a 'few' or 'several'. Because most micros are very small and elusive it was only practical to tube voucher specimens rather than to attempt total counts.

3.2.1 Butterflies; Table 1.

In 1997, 8 species were recorded in HP between July and September - Small Skipper, Essex Skipper, Small White, Green-veined White, Holly Blue, Red Admiral, Comma and Speckled Wood. In 1998, 14 species were recorded between April and August - Essex Skipper, Large Skipper, Large White, Small White, Green-veined White, Purple Hairstreak, Holly Blue, Red Admiral, Small Tortoiseshell, Peacock, Comma, Speckled Wood, Gatekeeper and Meadow Brown.

This brings the combined total of butterfly species recorded in HP since 1982 to 19. These may be categorised as follows:

Breeding residents: Small, Essex and Large Skippers; Small and Green-veined Whites; Purple and White-letter Hairstreaks*; Holly Blue; (Small Tortoiseshell); Peacock; Comma; Speckled Wood; Meadow Brown.
Regular and occasional breeding migrants: Large White; Red Admiral; Painted Lady.
Newcomer: Gatekeeper.
Former residents: Small Copper; Common Blue.

* the White-letter Hairstreak, usually a very sedentary species, was recorded only once (15.7.96) but may persist in suitable habitat in the woodlands (Parcel 16).

The most abundant and widespread species was the Speckled Wood. The Small White, Green-veined White, Purple Hairstreak, Holly Blue and Comma were widespread and common. The rarest, most unusual resident species was the White-letter Hairstreak.

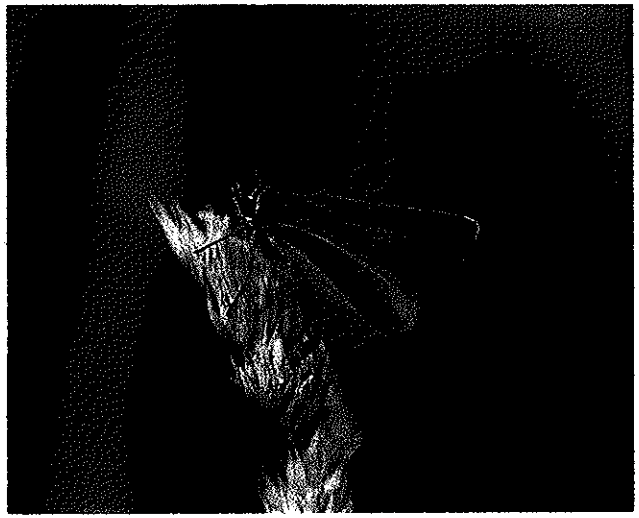
Accounts of each species recorded in HP are given below (species are grouped into families); these should be viewed in conjunction with the **Map** and **Table 1**. In **Appendix 1** the usual hostplants for each species are given together with the usual months of larval occurrence. For details of life-histories, refer to a suitable text e.g. Brooks and Knight (1982), Thomas and Lewington (1991).

HESPERIIDAE - SKIPPERS

The **Small Skipper** was first recorded in HP in 1996. A total of only three sightings were made (including both ♂ and ♀ specimens) all in the 'meadow' of Parcel 15 in July 1996 and 1997. Careful searching of the main hostplant, Yorkshire-fog, did not produce any ova. The 'meadow' has only been in existence since the mid 1990s (before that it was a leaf-dump yard) and therefore Small Skippers have colonised it from other sites probably beyond HP. Surprisingly, this butterfly was not recorded from Parcel 12 although suitable hostplants and nectar sources (tufted vetch, meadow vetchling, creeping thistle, red clover, common bird's-foot-trefoil) grow there. Another greatly favoured source is common knapweed which has been recorded sparsely in Parcel 15. Appropriate management of Parcels 12 and 15 could greatly increase the abundance of this species as well as Essex and Large Skippers (see section 4). In hot, sunny conditions, all three species readily disperse to new sites where tall, herb-rich grassland in sheltered, sunny locations exists. In inner London, such habitat may be found in old cemeteries, park enclosures, on reservoir embankments, along canal tow-paths, on railway embankments and cuttings and on wasteground etc.

The **Essex Skipper** is very similar in appearance and habit to the Small Skipper. In Parcel 15, five adults were recorded (both ♂ and ♀ specimens) in late July-early August; it has been recorded from this Parcel each year since 1996. Careful searching of grasses produced evidence of ovipositing: seven ova were found in two sheaths of Yorkshire-fog. It is very unusual for Essex Skippers to utilise this grass (normally cock's-foot, creeping soft-grass or common couch are used). As with the previous species, the ova are laid in rows of up to c5 at a time within the leaf sheaths. Several females may use the same sheath resulting in rows of up to c30 ova. The sheaths protect the early stages through the winter before the larvae emerge to feed on new leaf growth in the spring. Management suggestions advocated for the Small Skipper also apply to this species; both share the same preferences for nectar sources and habitats. Essex Skippers appear to be slightly less abundant than Small Skippers in inner London.

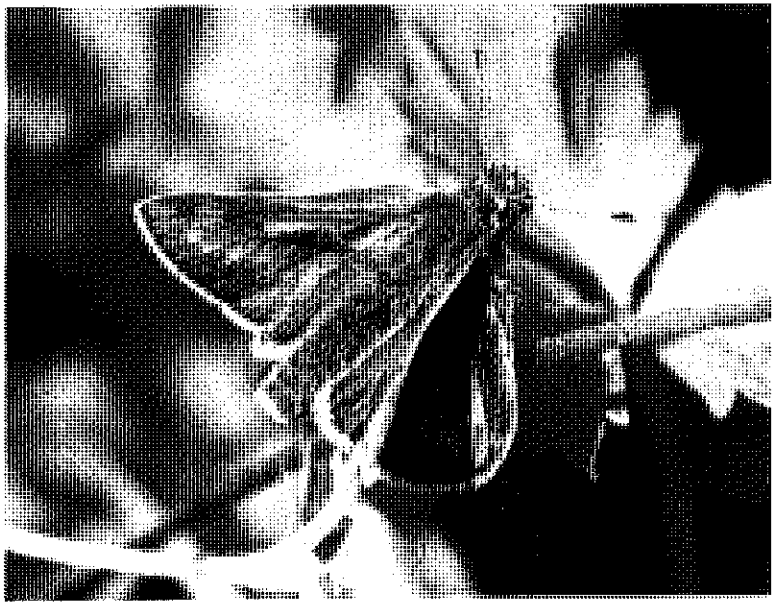
The **Large Skipper** is the most widely distributed hesperiid in the park being recorded in Parcels 12 and 15, a bay in Lime Tree Avenue and from the entrance to the Wildlife Area. A total of six (including ♂ and ♀ specimens) were noted in all in 1996 and 1998. Two of these were feeding, one on spear thistle and the other on great bindweed. Other favoured nectar sources are tufted vetch, meadow vetchling and common knapweed. This Skipper flies from late May to August. It is a larger, more powerful and territorial butterfly than the other Skippers and has a preference for rather more sheltered grassland in woody, scrubby habitats where its hostplant, cock's-foot grows. The ova are laid singly on the blades of this grass and the young larvae overwinter in a hibernaculum amongst the leaves.



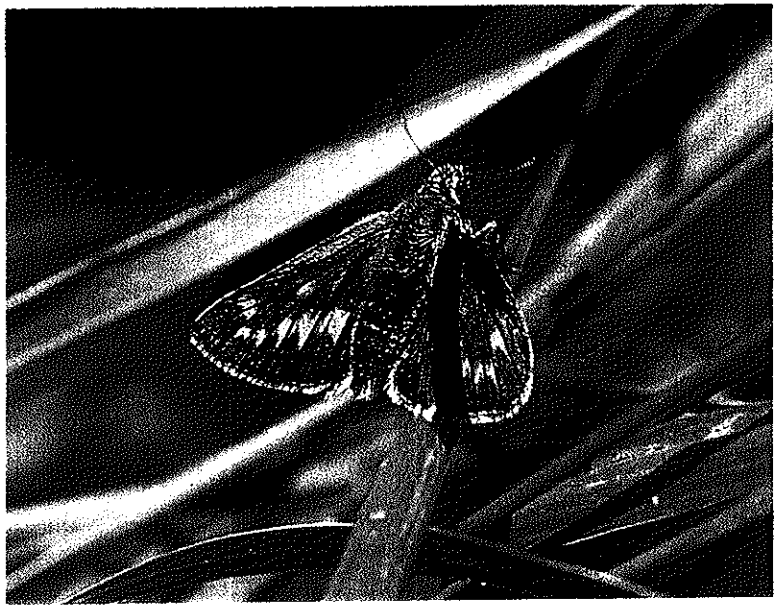
Small Skipper ♂ x 2.3

Essex Skipper ♂ x 1.2

Essex Skipper ♀ x 1.7



Large Skipper ♂ x 2.6



Large Skipper ♀ x 2

PIERIDAE - WHITES AND YELLOWS

The **Large White**, commonly known as a 'cabbage white' is a migrant which occasionally appears in Britain in very large numbers. In the survey it was not recorded until 1998 when 13 were noted between May and August. It is a double-brooded species of gardens, allotments and of arable and improved pasture. Most records were made from Parcel 12, the woodland paths and occasionally on lavender in the Formal Gardens. The Large White also favours dandelion, bluebell, fleabanes, ragworts, common knapweed, thistles, butterfly bush, lobelia, aubretia, wallflower, catmint, marjoram, scabious, naturtium, phlox etc.

The **Small White** like the previous species is a double-brooded 'cabbage white'. It is a nomadic species whose populations are regularly enforced by migrants from abroad. It is frequently seen in the park, mostly in Parcel 15 and along Chestnut Avenue, Lime Tree Avenue and in the Formal Gardens. It is widely distributed in inner London and is on the wing from April to September. Its favoured nectar sources include dandelion, bluebell, red campion, fleabanes, hawkweeds, ragworts, thistles, lavender, butterfly bush, wallflower, aubretia, marjoram, hedge veronica etc.

The **Green-veined White** is similar superficially to the two previously described Whites but quite different in many ways in its habits and habitat preferences. It is a fairly common double-brooded resident of HP and dwells in sheltered, damp habitats in Parcels 12, 15 and 16 as well as in woodland bays and clearings. It is on the wing from April to September and its hostplants in HP include hoary cress and hedge and garlic mustard. It is not a pest of cabbages. Favoured nectar sources include garlic mustard, bluebell, dandelion, red campion, fleabanes, thistles, ragworts, lavender, aubretia, forget-me-not, dame's violet.

LYCAENIDAE - HAIRSTREAKS, COPPERS AND BLUES

The **Purple Hairstreak** remained officially unrecorded in the park until 1993. However, it was almost certainly already well established there due to the presence of many mature oaks. It is common in the park as well as in some other inner London sites but is easily overlooked since it spends most of its life in the tree canopy. I have also recorded it in Kensal Green and Brompton Cemeteries. Its population size can fluctuate considerably from year to year. Records have been made in Parcels 4, 8, 12, 15, 16 and from a large oak on the south east side of the Youth Hostel. Females oviposit on oak twigs, utilising a wide variety of oak species including evergreen oak (Freed, 1999b). The best time to observe this butterfly is on warm, sunny evenings (c7 pm) in the last week of July when it can be seen flying around sunlit tree tops in the vicinity of oaks. Adults of this and the following species favour bramble flowers and honeydew on leaf surfaces.

Green-veined White ♂ resting on cow parsley. x 2.7

White-letter Hairstreak ♀ x 1.9

The **White-letter Hairstreak**, though not a rare butterfly in much of England and Wales, is very scarce in Central London. There are small colonies on Hampstead Heath and Barnes Common and another used to exist at Battersea Park (now thought to be extinct). The sighting of a solitary ♀ in Parcel 15 on 15.7.96 was a complete surprise and one of the most exciting butterfly discoveries in inner London that year (Freed, 1996). The females oviposit on elm twigs in July, having a preference for wych elms. Both this and English elm are present in Parcels 15 and 16 although many of the latter have died/are dying having succumbed to Dutch elm disease; this could critically effect the survival of the White-letter Hairstreak in HP. Very little can be done to avert the situation other than by removing and burning infected trees, encouraging new suckering elm growth and planting more wych elms (which are more resilient to the disease than English elm). This butterfly is very elusive and as a rule, lives in highly sedentary colonies. It is possible that a small population still persists in the park. Adults feed on honeydew, creeping thistle, ragworts etc.

The **Small Copper** was not recorded during the survey. The only observation made in the park was in August 1982 on wasteground in the old Nursery (now Waterers Nursery). It is a common species in Britain but appears to prefer large areas of unimproved, grassland where its hostplants, sorrels and docks, grow. Common sorrel has been recorded in Parcel 12 and both this and broad-leaved dock are widespread in inner London. However, the Small Copper appears to be absent from much of this area except for Kensal Green Cemetery (a small colony is also present in Brompton Cemetery). It is a fairly mobile species and probably uses green corridors to move between sites. It might reappear in HP if suitable habitats can be created (see section 4). Favoured nectear sources include fleabanes, hawkweeds, ragworts, yarrow, heather, lavender, thyme etc.

The **Common Blue** is another species which was recorded prior to the survey. Two ♀ and one ♂ were observed and photographed at the old Nursery site in August 1982. With suitable management, it could recolonise grassland habitats in Parcels 12 and 15 where its main hostplant, common bird's-foot-trefoil grows. In hot, sunny conditions adults will disperse from breeding habitats to new sites which will then be colonised if ecological requirements are satisfied. The Common Blue is double-brooded with an occasional third brood in very hot summers. It is found in a few inner London sites where its hostplant grows and has been recorded abundantly in Kensal Green Cemetery, moderately in Brompton Cemetery and very occasionally in the Central Royal Parks. Its favoured nectar sources include red clover, white clover, common bird's-foot-trefoil, fleabanes, common knapweed, marjoram, lavender, mints, thyme etc.

Common Blue ♂ life-size, and Common Blue ♀ on common bird's-foot-trefoil x 1.5
(This species was recorded in the park in August 1982).

Holly Blue ♀ (second brood) resting on holly. x 1.1

Holly Blue underside. life-size

Holly Blue larva (second brood) feeding on ivy flowerbud. Full grown x 3.8

The **Holly Blue** is one of the most widespread and common butterflies in the park and indeed, in inner London as a whole. It was recorded from Parcels 5, 6, 7, 8, 15, 16, 17, Ireton Lodge and along the woodland paths. A singleton was also observed flying across the middle of the Sports Field (19.7.98). Its main hostplants are holly flowerbuds for the first brood and ivy flowerbuds for the second. Other potential hostplants for first brood larvae include firethorn, snowberry, spindle, dogwood, heather, ceanothus etc. Sheltered hollies (preferably ♀ plants) situated in sunny locations in the proximity of mature, flowering ivy (also growing in full sunshine) are the ideal components for a perfect Holly Blue habitat. This butterfly is renowned for its dramatic population fluctuations. These are due to the attacks of the host specific ichneumonid parasite Listrodromus nycthemerus which lays its eggs in newly hatched Holly Blue larvae. Huge declines in population size can occur even when other biotic factors are favourable (e.g. see Revels, 1994). Recent years of abundance in Middlesex were 1989, 1990 and 1996. The presence and success of this species in so many central tetrads is due to several factors e.g. widespread planting of holly, ivy and other potential hostplants in parks, gardens and squares, and the fact that these plants avoid the high degree of disturbance which is generally effectuated to grassland habitats in inner London.

NYMPHALIDAE - VANESSIDS, EMPERORS, FRITILLARIES AND BROWNS

The **Red Admiral** is a regular migrant visitor which breeds in the park in most years. Up to 5 specimens have been noted annually. Sightings were from Parcels 5 (feeding on ivy flowers), 12, 15, Ireton Lodge, Chestnut Walk and other woodland paths. Females have been observed ovipositing on common nettle growing outside the entrance to the Wildlife Area. In recent years there has been much evidence of red admirals successfully overwintering in Britain, a consequence of global warming. I have recorded adults in Kensington on 11.1.98 and 17.1.96, the former being the earliest all time record for Herts & Middlesex. The Red Admiral is regularly seen in gardens and open spaces in inner London where common nettle and its favoured nectar sources grow. These include butterfly bush, Michaelmas daisy, butterfly stonecrop, ivy, hemp agrimony, bramble etc.

The **Painted Lady** was only recorded in 1996, the year of the huge invasion when many thousands arrived in Britain in late May-early June (Roper, 1996). None were seen on a short visit to the park on 6.6.96 although nearly 100 specimens were observed at Kensal Green Cemetery in the second week of June. The main migration had moved north by the time I was able to make my first visit to Parcel 15 on 26.7.96; this produced one record and another was seen on 26.8.96 to the east of Parcel 12. I observed spear and creeping thistles being used as hostplant in other parts of Middlesex.

Red Admiral feeding on ivy. life-size

Painted Lady feeding on thistle. x 1.1

Comma var. *hutchinsoni* feeding on thistle. x 0.6

Comma, normal form, feeding on ivy. life-size

The **Small Tortoiseshell** is the most widespread nymphalid in the London Area. However, it is rarely recorded in the park, preferring gardens and open, neutral grassland where common nettles grow. Surprisingly, only one specimen was noted in the survey, at Ireton Lodge (1.8.98). It is regularly seen in Kensal Green and Brompton Cemeteries and occasionally in the Central Royal Parks. It must be concluded that at present, HP does not provide this species with its preferred habitat. The development of large nettlebeds in full sunshine with shelter from the north and east, and an abundance of suitable nectar sources close by e.g. thistles, ivy, butterfly stonecrop, Michaelmas daisy and butterfly bush would greatly benefit this and other vanessids. This species often flies into houses, sheds, churches and other open buildings in the autumn in order to locate hibernation sites.

The **Peacock** is often plentiful in woody habitats. Eight were seen in 1998 including a surprise late sighting on 14.12.98 at the entrance to the Wildlife Area. This specimen had ventured out of hibernation during particularly mild weather. The Peacock uses dark, dry places such as tree hollows or recesses beneath ivy in which to hibernate. Sightings came from Parcel 15, North Lawn and Ireton Lodge. Specimens seen up until mid-June are hibernators from the previous year whilst those recorded from late July onwards are their progeny. The females oviposit on common nettle. No larvae were found during the survey. Favoured nectar sources include dandelion, bluebell, thistles, butterfly bush, hemp agrimony, water mint, fleabanes etc.

The **Comma** is fond of woodland habitats. It is common in certain Parcels in HP where common nettle, elms and suitable nectar sources exist. Only one post-hibernation specimens was recorded during the survey (12.5.98), all others being the beautiful golden orange *hutchinsoni* form which flies in July and August. 1998 was an exceptional year for the Comma. This was partly due to the large number of second brood adults produced in 1997 which successfully hibernated through the winter into 1998. Twenty observations were made in 1998 from Parcels 12 and 15, Lime Tree Avenue and other woodland paths. Thirteen of these (all freshly emerged *hutchinsoni* specimens) were recorded on 18.7.98. Two females were seen ovipositing on common nettle growing around the borders of Parcel 15 on 8.7.97. (A second post-hibernation specimen has since been noted on nettles in Parcel 4 on 28.3.99). Nettles growing in semi-shaded situations are often utilised as well as those in sunnier habitats. Elm is also frequently used for hostplant. Preferred nectar sources include thistles, ivy, bramble, butterfly bush, butterfly stonecrop, Michaelmas daisy etc.

The **Speckled Wood** is *the* butterfly of HP being widespread and common most years and occasionally abundant in others. In inner London it is greatly restricted by the availability of suitable habitat, this being semi-shaded woodland with an understorey of grasses,

bramble and ivy etc. Such habitat exists in parts of some old cemeteries, parks and nature reserves. HP is one of the best sites for this species in inner London. Records have been made in Parcels 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, and 17, Ireton Lodge, Lime Tree Avenue, Chestnut Walk and other woodland paths especially those on the east side of the park. A singleton was seen well away from the woodlands near the southern end of Holland Walk (25.6.98), not far from Kensington High Street and another was just outside the north gate near the Suntrap (1.8.98). Maximum numbers seen on peak days were 11 on 14.9.97, 12 on 21.8.97 and 15 on 23.7.98. 1997 and 1998 were years of abundance; 43 specimens were recorded in the former and 58 in the latter. The best sites were found to be in and around Parcels 8, 12, 16, and 17. The woodland path along the east side of the park is a favourite area for males to set up territories. They do this in sunlit patches on the grassy bays growing beside enclosures. The Speckled Wood is multi-brooded and can be seen from late March through to October. Numbers peak in April, June and late July/early August. Females have larger pale yellow patches on their wings than males and spend much of their lives in the tree canopy. They descend to ground level to court, mate and oviposit. Grasses such as cock's-foot and Yorkshire-fog are utilised for hostplant and small, isolated plants growing along the edges of woody areas are preferred by ovipositing females. Favourite nectar sources include bramble, ragworts, ivy and honeydew. The latter is acquired from the surface of leaves in the tree canopy.

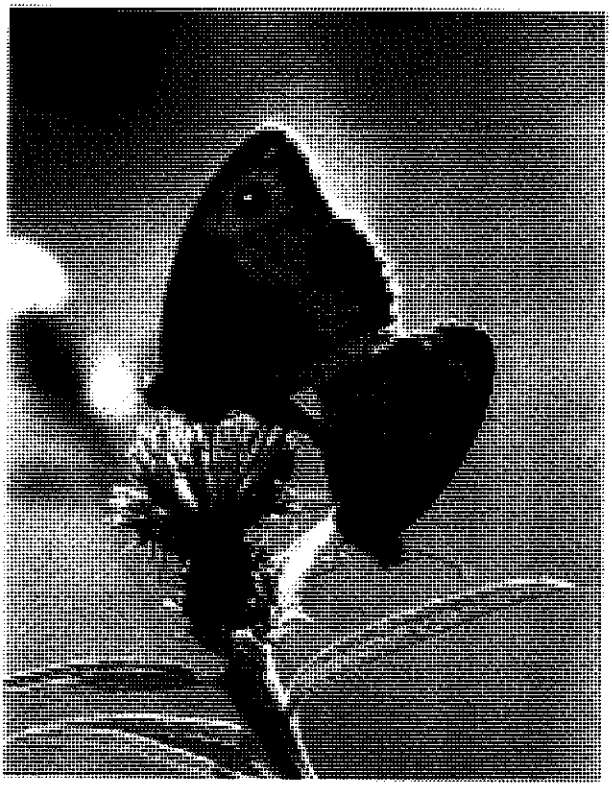
The **Gatekeeper** has only been recorded once in the park - in Parcel 15 on 5.8.98. This species has been slowly moving into inner London over the last few years. It was first recorded on Hampstead Heath in 1991, in Kensal Green Cemetery and Gunnersbury Triangle in 1994, in The Wildlife Garden at the Natural History Museum in 1995, and in Brompton Cemetery in 1998. Green corridors probably facilitate its movements in built up areas. It is likely that the Gatekeeper will increase in HP since there is a definite trend for its continued dispersal into inner London, a fact unrecognised even as recently as 1991 (e.g. in Thomas and Lewington, 1991 pp. 175-6). Its breeding habitat consists of stands of tall grasses growing along the base of shrubs and hedgerows in sunny sheltered locations. Females utilise common couch, bents, fescues and meadow grasses for ovipositing. Favoured nectar sources include bramble, thistles, ragworts, fleabanes, hemp agrimony, marjoram, butterfly bush etc.

The **Meadow Brown** was recorded in Parcels 8, 12 and 15. A pair were found in copulation in Parcel 12 on 20.7.98. It is a very common and widespread species of semi and unimproved grassland throughout most of Great Britain and Ireland. However, it appears to be largely absent from inner London apart from a few colonies in some old cemetery land. In the field, Meadow Browns are superficially similar to Gatekeepers especially when their wings are closed; careful observation of the undersides helps to differentiate between the

Speckled Wood ♀ x 1.1 (compare with ♂ on front cover)

Speckled Wood feeding on ivy x 1.3

Above: Gatekeeper ♀ feeding on thistle x 1.7



Right: Meadow Browns mating on knapweed - the ♀ is the larger x 1.5. (Compare the undersides with the Gatekeeper's to aid identification when wings are closed).

Gatekeeper ♂ feeding on thistle. x 1.6

two species. They fly together at the same time of year, although the Meadow Brown has a longer flight period, lasting from the middle of June to early September. In hot, sunny weather individuals will emigrate from local breeding sites, crossing inhospitable terrain to colonise new areas. An example of this was the sighting of a specimen flying out of the park across Phillimore Gardens on 15.7.96. Locally, large colonies of Meadow Browns occur in Kensal Green and Brompton Cemeteries. A specimen was recently seen in The Wildlife Garden (NHM) (27.7.96). I first noted the Meadow Brown in HP in 1996 and again in 1998 when 16 specimens were recorded. I am unsure of its status in the park before 1996. The larval hostplants are Yorkshire-fog, bents and meadow grasses. Females will oviposit in both short and long swards and favoured nectar sources include thistles, common knapweed, ragworts, fleabanes, yarrow, bramble, lavender, mints, scabious, butterfly bush etc.

3.2.2 Micromoths; Table 2.

99 species from 18 families have been recorded in the park: 1 eriocraniid, 1 tischeriid, 2 incurvariids, 4 tineids, 1 lyonetiid, 2 bucculatricids, 7 gracillariids, 1 choreutid, 13 yponomeutids, 4 oecophorids, 8 gelechiids, 1 blastobasid, 1 momphid, 1 cosmopterigid, 28 tortricids, 1 alucitid, 22 pyralids and 1 pterophorid. One species, the Ash Bud moth, was not rerecorded during the 1997-8 survey.

Common and interesting species include: Apple Leaf Miner; Caloptilia rufipennella (invasive since 1970, originally from Europe); Phyllonorycter leucographella (invasive since 1989, originally from S. Europe); Diamond-back Moth (regular migrant which is also resident in U.K.); Light Brown Apple Moth (invasive since 1936, originally from Australia); Lozotaeniodes formosanus (invasive since 1945, originally from Europe); Green Oak Tortrix; Olethreutes lacunana; Chrysoteuchia culmella; Mother of Pearl; Endotricha flammealis and Phycita roborella.

Unusual and rare species include the following new records for Middlesex: Monopis imella (one on 11.5.98); the Cypress Tip Moth Argyresthia cupressella (one on 3.6.98) and Gelechia senticella (one on 27.7.98). Oegoconia caradjai (one on 27.7.98) and the local and uncommon pyralid Catoptria falsella (one on 16.7.98) were also taken.

A recent article by Agassiz and Tuck on the yponomeutid A. cupressella appears in the *Entomologist's Gazette* (1999, **50**: 11-16) together with a note on the HP specimen. A copy is included in **Appendix 4**. This species was first recorded in Europe from Suffolk, England in 1997. The HP specimen was of considerable entomological interest being the first specimen recorded well away from the locality of initial colonisation. A postscript with information on other notable species will be available shortly.

3.2.3. Macromoths; Table 2.

106 species from 7 families were recorded: 1 drepanid, 1 thyatirid, 35 geometrids, 3 sphingids, 1 lymantriid, 2 arctiids and 63 noctuids. 9 species were not rerecorded in the 1997-8 survey - Green Pug, Pale Brindled Beauty, Elephant Hawk-moth, Cinnabar, Cabbage Moth, Bright-line Brown-eye, Dusky Brocade, Scarce Silver-lines and Red Underwing.

Common species include: Riband Wave, Garden Carpet, Common Marbled Carpet, Grey Pine Carpet, Brindled Pug, Willow Beauty, Light Emerald, Heart and Dart, Large Yellow Underwing, Lesser Yellow Underwing, Lesser Broad-bordered Yellow Underwing, Square-spot Rustic, Common Quaker, Clouded Drab, Hebrew Character, Early Grey, Copper Underwing, Dun-bar, Dark Arches, the Uncertain and Pale Mottled Willow.

Interesting species included: Figure of Eighty, Maiden's Blush, Least Carpet, Small Rivulet, Sandy Carpet, Slender Pug, Freyer's Pug, White-spotted Pug, Green Pug, Lesser Treble-bar, Yellow-barred Brindle, Brown Silver-line (a species which is making a come-back and extending its range), the Engrailed, Common Footman, Heart and Club, Ingrailed Clay, The Lychnis, Twin-spotted Quaker, Black Rustic (a species which was rare prior to 1950, presently extending its range northwards and eastwards), Large Ranunculus (previous recent records from Ealing and Barn Elms Reservoir 1994, Harrow 1996 and Parliament Hill 1997), Centre-barred Sallow, Dingy Shears, Dusky Brocade, Treble Lines and Scarce Silver-lines. The spectacular Hawk-moths were represented with both Lime and Poplar Hawk-moths being trapped. The record for Elephant Hawk-moth was provided by Mr C. Wood (date unknown). In the late 1960s I found wings of Red Underwing moths around Lombardy poplar trees growing near the Stables. These were remains after bat feeding sessions (probably brown long-eared bats which eat noctuids). Other attractive species include the Brindled and Oak Beauties.

Rare and unusual species included four category 3 species: Oak-tree Pug, Juniper Pug, White-line Dart and Autumnal Rustic. The Feathered Ranunculus was recorded from Penzance Street.

The **Oak-tree Pug** is very rare and local in London and north west London generally. In was recorded on at least two occasions, 29.4.98 and 19.5.98 and suspected on a few more (moths escaped from trap). One specimen was determined by Dr D. Agassiz at the NHM and the other by myself. I examined genitalia of the specimens (both ♂) confirming their identity. This species flies from the end of April to the start of June. Its closest recorded locality to HP was Wimbledon TQ27K (Plant, 1993 p. 74) Porter lists its hostplants as hawthorn and oak, possibly evergreen oak (1997).

The **Juniper Pug**. One ♀ was recorded on 16.7.98. I examined the genitalia. This is a widespread but very locally distributed species which flies between mid July and mid September. It is associated with the more well-to-do gardens where juniper, its hostplant, is frequently grown. The closest records to HP were Wimbledon TQ27K and Hampstead Heath TQ28T (Plant, 1993 p. 75)

The **White-line Dart** was recorded only once on 3.8.97. A very locally distributed resident, seldom seen in any numbers and flying in the latter part of July to the end of August. It was recorded twice at Barn Elms Reservoir in July 1994 (Plant, 1995). Two previous records which were close to HP were Wimbledon TQ27K and Parliament Hill TQ28S (Plant, 1993 p. 135). This species appears to be polyphagous.

The **Autumnal Rustic** was recorded twice, once on 4.9.97 (Ireton Lodge) and once on 22.9.98 (Parcel 12). A very local but locally common species in Surrey and western Middlesex flying from the second week of August to the end of September. Several were recorded at Barn Elms Reservoir and one at Parliament Hill in 1994 (Plant, 1995). Earlier records close to HP were Kensal Green Cemetery TQ28G and Fulham TQ27N (Plant, 1993 p. 143). I found that it was fairly abundant in Brompton Cemetery TQ27N (22 records in September 1997) (Freed, 1999a), so this species may be increasing in this part of London. The larva appears to be polyphagous; birch and sallow are included as hostplants (Porter, 1997).

The **Feathered Ranunculus**, described by Plant as a vagrant which has only been recorded five times in the London Area (1993 p. 178-179; 1995, p. 156), was taken in the Penzance Street trap on 8.9.97. The ♂ specimen was in perfect condition. Identification was confirmed by Dr P. Waring. There have been several more recent records near London since that date including specimens from north-west Kent and 4 from Surrey in 1998 (most northerly location was East Sheen) (Collins, 1999 p. 10). Collins concluded that the species is spreading along the course of the Thames.

4. DISCUSSION AND MANAGEMENT IMPLICATIONS

Holland Park contains one of the largest and most important areas of mature woodland in inner London. As such, it has considerable potential for Lepidoptera.

The park is not directly linked to significant green corridors and therefore cannot rely on regular influxes of any but the most mobile/migratory species e.g. Small White and Red Admiral. However, mature gardens and squares are close by, providing possible routes for movement. An impressive list of Lepidoptera has been obtained as a result of the survey although this should not be regarded as comprehensive for reasons given in section 2. Whilst some butterflies are common e.g. Speckled Wood, Holly Blue, Purple Hairstreak and Comma, others which were recorded only in low numbers, could increase with modifications to existing management. Certain actions could also increase the moth diversity.

Comments on important botanical components of **the most valuable sites and Parcels for butterflies and many moths** are given below, followed by suggestions for habitat management and planting:

IRETON LODGE - see page 5.

The north-easterly section of **PARCEL 8** (to the west of Azalea Walk and to the north and west of the water tanks), provides good habitat for Holly Blue, Purple Hairstreak, Speckled Wood and Meadow Brown. The presence of older, semi-improved grassland has further potential for Skippers and Browns with stands of cock's-foot and Yorkshire-fog grasses together with a few nectar sources e.g. bindweeds, black medick, creeping thistle and red campion. [Pignut and the previously unrecorded sweet vernal grass were also noted during the survey]. The area suffers from **overshading** and suckers of false acacia etc. also diminish the potential of the grassland. Some thinning/pruning of mature trees would let in more light and encourage forbs to establish and flower. Planting one or two butterfly bushes in sunny spots and encouraging a bramble hedge along the north edge of the older grassland would help to remedy the general paucity of nectar sources and afford more shelter. A large ♀ holly provides hostplant for first brood Holly Blues and several species of oak are being utilised by Purple Hairstreaks.

PARCEL 12 comprises one of the best sites for butterflies in HP with **11** species recorded. It is good for Large Skipper, Purple Hairstreak and Meadow Brown, and very good for Comma and Speckled Wood. It's success is primarily due to the existence of a **large area of older, semi-improved grassland** (especially in the southern half), which contains an

interesting variety of forbs. The following are very useful nectar sources for butterflies and other insects: bramble, common ragwort, creeping thistle, dandelion, greater bird's-foot-trefoil (a large patch was noted flowering in the south-westerly section on 23.7.98), meadow buttercup, meadow vetchling, red campion, red clover, spear thistle, tufted vetch and a large butterfly bush in the south western part. Common sorrel and common bird's-foot-trefoil (hostplants of Small Copper and Common Blue respectively) were recorded in the LEU survey. Hogweed, a valuable nectar source for Diptera (flies) and other insects, is common in parts. Especially in the southern half of the Parcel, there are extensive areas of Yorkshire-fog and creeping soft-grass as well as good stands of rough meadow-grass, cock's-foot and meadow foxtail; these are utilised by Skippers, Browns and many moths for hostplant. The presence of several substantial **bramble thickets with holly, nettle patches and quantities of dead wood** provide excellent **shelter, overwintering sites, hostplants and basking areas.** These should be kept and further encouraged. However, brambles and nettles should be checked so that they do not encroach excessively into the open grassland. The openness of the Parcel should also be maintained by **removing suckers and unwanted saplings** (e.g. false acacia in the north-eastern part) and possibly by selective pruning of trees to allow **allow more light in**, whilst taking care to retain its **sheltered** character. Ivy is largely absent from this Parcel and could be planted at the base of trees. This would benefit Holly Blues and many other species of fauna.

The grassland in **PARCEL 15** is another excellent site for butterflies comprising a recently created meadow (c1993). It occupies a much smaller area than Parcel 12 but has advantages in that the grassland is situated on a slope with a south-westerly aspect and for the mostpart, it is unshaded and sheltered by a surrounding screen of trees; however, many of these are elms which are dying/have died of Dutch elm disease. Emergent vegetation and several willow species have been planted around the two ponds within the Parcel adding to its attractiveness for Lepidoptera and other insects. 16 species of butterflies have been recorded here and it is the only site where Small and Essex Skippers, White-letter Hairstreak and Gatekeeper have been observed so far. The area immediately surrounding Parcel 15 is good and the immediate woodland are good for Purple Hairstreak, Holly Blue, Comma and Peacock. The 'meadow' and adjoining pathways contain stands of hostplant grasses e.g. Yorkshire-fog, creeping soft-grass, tufted hair-grass and cock's-foot, all of which are utilised by Skippers and Browns.

The current management of the 'meadow' is not maximising its potential for butterflies; suggested modifications are given below under **Grassland Management.** Nectar plants recorded here of particular value include black horehound, bristly oxtongue, cat's-ear, common bird's-foot-trefoil, common fleabane, common ragwort, creeping thistle, dandelion, forget-me-nots, hemp-agrimony, knapweeds, meadow vetchling, perennial sow-thistle, purple-loosestrife, spear thistle, tufted vetch, water mint and yarrow. Some of

these have been introduced in wildflower seed mixes (e.g. BTVC 'Hedgerow and Roadside' mix, S. Turner pers comm.); garlic mustard, which has successfully germinated outside the entrance to the Wildlife Area, is a hostplant for Large, Small and Green-veined Whites as well as the Orange-tip (should this species ever become established in HP). This plant and other crucifers such as hedge mustard, dame's-violet and honesty are utilised by Whites for hostplant and could be introduced to the damper/peripheral parts of Parcels 15 and 16 as well as along the woodland path edges in the vicinity of the Wildlife Area.

PARCEL 16 (which surrounds Parcel 15) contains good habitat for Speckled Wood, Holly Blue, Purple and possibly White-letter Hairstreak colonies. Stands of pathside grasses, dead wood and woodland flora such as bluebell, bramble, hedge woundwort, ivy and red campion are all important for Lepidoptera. The current coppicing of 10 m squares of woodland on a rotational basis is a good idea since it allows sunlight into densley shaded areas and encourages flora to flower. However, it is vital that elms which are possibly being used by breeding colonies of the White-letter Hairstreak, remain undisturbed (as yet, these trees have not been identified). Ivy should be left on trees (especially flowering growths in sunny locations). There is an abundance of holly in the eastern part, very little of which is useful for Holly Blues since it is heavily shaded.

WOODLAND PATHS, which include Chestnut Walk and Lime Tree Avenue, provide valuable open areas where sunlight and warmth can enter the woodlands. The sunny north sides of the pathways (south facing edges of the woodland enclosures) are the best for butterflies.

9 species of butterflies including Large Skipper, Green-veined, Small and Large Whites, Holly Blue, Comma and Speckled Wood were recorded along pathways. **Grassy bays, especially along the pathway on the EAST side of the park are very important for Speckled Woods. Grass tussocks (e.g. cock's-foot and tufted hair-grass) and bramble growth here should ideally be retained and cut just once a year** (or possibly on a biennial basis).

Extensive areas of **nettlepatches interspersed with a variety of forbs and grasses** occur in places along pathways; valuable nectar sources for butterflies include: bristly oxtongue, butterfly bush, common mallow, common ragwort, creeping buttercup, creeping thistle, oxeye daisy, red campion, and spear and welted thistles. Nettle-leaved bellflower (one specimen noted on the south side of Lime Tree Avenue, 23.7.98), foxglove, green alkanet, hedge mustard and prickly sow-thistle were amongst others recorded but these are not important nectar sources for butterflies.

A great deal of **UNDERSTOREY PLANTING of mostly native trees and shrubs** has taken place in/is planned for Parcels and along woodland pathways. Species include ash, beech, blackthorn, crab apple, field maple, guelder rose, hawthorn, hazel, rowan, wild cherry and wild service-tree. Whilst this will benefit Lepidoptera, it is possible that pathways will become **shaded out** and become less suitable for sun-loving species e.g. Skippers, Whites and Nymphalids. **It is therefore desirable to maintain some open sunny areas along the woodland paths.** Additional or replacement plantings should include the following (in approximate order of importance for Lepidoptera with the most valuable listed first): **native oaks, birches, willows and sallows, hawthorn, blackthorn, apple, alder, poplars and aspens, hazel,** beech, hornbeam, ash, lime, rowan, elm. The planting of **alder buckthorn** Frangula alnus (as opposed to buckthorn Rhamnus cathartica which is distributed mainly on lime-based soils), in **sunny, sheltered locations**, will provide hostplant for the Brimstone butterfly. This attractive and popular species is not seen in the park due to the present scarcity of buckthorns. It is highly recommended that more **silver birch, grey willow, goat willow** (also known as 'pussy willow' or sallow) **and butterfly bush** are planted along the **sunny sides of woodland pathways**. Goat and grey willow catkins (both ♂ and ♀) are a valuable early spring nectar source for Lepidoptera and other insects emerging from hibernation and the foliage is hostplant for many larvae.

Inspite of the abundance of **holly** in HP, it appears that only a small percentage is being utilised by Holly Blues. This is mainly because much of it is growing in densely shaded situations. First brood females (which oviposit on flowerbuds of both ♂ and ♀ hollies between April and June) prefer trees growing in **sunny, sheltered** locations especially in the vicinity of **mature, flowering ivy** (second brood hostplant). It is recommended that a few more ♀ trees are planted in strategic locations. ♀ hollies growing in full sunshine will also produce more berries which are important for birds in the winter. The dense stands of holly bordering the pathway between Parcels 6 and 7 provide good Holly Blue habitat; mature ivy in the vicinity should be encouraged.

The present management recommends the removal of **snowberry**. Whist there are good reasons for this, it should be noted that **snowberry is a highly favoured nectar source for second brood Holly Blues and an alternative hostplant for its first brood.**

IVY is an extremely valuable plant for wildlife including Lepidoptera. A list of over 230 species of fauna which are directly associated with ivy has recently been compiled (Freed, 1997). This includes 89 species of Lepidoptera (14 of butterflies and 75 of moths) most of which feed on the sugar-rich nectar in September and October. Others use ivy as hostplant (e.g. Holly Blue, Yellow-barred Brindle, Old Lady and Angle Shades) and a few regularly hibernate amongst its foliage (e.g. Brimstone and Peacock). Whilst the evergreen

foliage in itself provides important refuge for invertebrates, it is the **mature, flowering form of ivy which is most useful for Lepidoptera and other insects including hoverflies.** Although flowers develop on ivy growing in light shade, maximum production occurs when it is in **full sunshine** (such as the growth climbing a tall poplar near the east end of Parcel 6). In such situations mature ivy should be encouraged (especially if hollies are nearby). It is well attested that ivy is not parasitic and does not cause undue damage to trees. If a tree is already sick or dying then ivy will take over but in virtually all cases on healthy trees, it will cause no harm.

The current management plan prescribes the clearance of the entire stump where the removal of undesirable trees is concerned (e.g. sycamores). **It is suggested that the main trunk could be left after the boughs and upper growth have been removed (applying herbicide to cut areas if desirable), and that ivy is then encouraged to grow up the stump/trunk.** This will provide breeding sites and food for birds and invertebrates.

In agreement with the current management plan, the retention of **dead wood** is considered very beneficial - c20% of British invertebrate fauna (including many species of Lepidoptera) is directly or indirectly dependent on dead/dying wood and associated fungi. The retention of as much **bramble** as possible is recommended wherever it exists - this is one of the most valuable shrubs for Lepidoptera and its flowers are especially favoured by many species.

GRASSLAND MANAGEMANT: a list of some of the most valuable butterfly nectar plants found in the Parcels and along woodland pathways is shown in **Appendix 2** (spring flowering species have been asterisked *). Of the 17 butterfly species recorded in the park in recent years c82% breed in grassland habitats: Skippers and Browns (6 species) have larvae which feed on grasses; Vanessids (5 species) have larvae which feed on nettles/thistles within grasslands; Whites (3 species) feed on cruciferous plants growing in and around grassland. The Small Copper and Common Blue (recorded 1982) are both grassland species. All butterflies recorded in HP visit flowers growing in grasslands although some prefer to feed on honeydew secretions on leaves.

The most important grasslands for butterflies occur in Parcels 12 and 15. Parcel 8 also has much potential. Parcels 8 and 12 are prescribed three cuts by flail-mower per year with all cuttings raked off. In practice they are presently being cut only once a year (end of July) and in 1998, Parcel 12 was not cut at all. This reduction is generally good for butterflies. The prescription for the 'meadow' in Parcel 15 is for one cut in September with cuttings removed, followed by winter/spring grazing with sheep. Grazing for 1998-9 appears to have been suspended. This alteration is good since it appeared that the area

was being overgrazed (development of rank thistle growth) resulting in the reduction of hostplant grasses. Grazing on such a small site also destroys Lepidoptera 'stock' (ova, larvae and pupae). A large area of nettles and thistles on the east side of Parcel 15 is cut on a biennial basis, with one half being alternatively left uncut through the winter. Woodland pathways are prescribed three cuts per year with all cuttings removed. However there appears to be a reduction in the number of cuts for these. Apparently some nettles growing along the pathways were sprayed in 1997. Generally there appears to be a flexibility to the frequency and timing of cutting. This is promising for possible future adjustments to the scheme.

Frequent cutting and removal of clippings reduces sward coarseness, removes mats of cut grass, favours botanical diversity and the development of less competitive forbs. However, some adjustments should be made to parts of or to whole areas of grassland in order to maximise their potential for Lepidoptera and other invertebrates. The following alterations are recommended: **avoid blanket-style cutting schemes. Instead, a mosaic-style structure should be created by cutting different areas at different times. Cutting should be carried out at a height of 10-15 cm above the ground in order to protect 'stock'**. With such relatively small areas of suitable grassland and nectar sources available in the park, and a lack of any major feeder sites close by, which might be a source of replenishment, it is important to retain as much 'stock' (ova, larvae and pupae) on site. This can be achieved by **reducing the number of cuts** (to one or two per year), by **leaving clippings unraked on the site** (these contain 'stock'), and by **leaving pre-determined areas of long grass uncut through the winter**; these can be cut biennially on a rotational basis so that less competitive forbs are not reduced and scrub does not develop. At the Royal Botanic Gardens, Kew over 20 different cutting regimes have been introduced in order to provide a broad variety sward structures for butterflies and wild flowers (Hall and Buckley, 1993); some areas which were managed biennially are now being cut triennially to favour species such as Skippers and the Gatekeeper which require long grass for successful ovipositing and overwintering (see section 3).

For areas where it is desirable to reduce coarse, competitive grasses e.g. false-oat grass, and promote an excellent wild flower display in July and August, one cut (by strimmer) in the third week of May can produce excellent results (Freed, 1997).

Whatever grassland management scheme is improvised, it is **important to monitor the effects on both butterfly and wild flower populations** and to make further adjustments as necessary.

The possibility of improving the grasslands by sowing a seed mix or diversifying existing dull grasslands by rotovating, oversowing, adding potted plants etc. is a complex and expensive business requiring a great deal of planning and aftercare. Previous projects have often had a high failure rate especially regarding the establishment of less competitive herbs (Gilbert and Anderson, 1998 pp. 54-91).

Concerning **NETTLES**, the hostplant of several Lepidoptera including the colourful Vanessids, **a varied structure to the patch should be sought by cutting different parts at different times.** Care should be taken to avoid cutting nettles which have larvae on them (usually silken nests of dark, spiny Vanessid larvae). A suggested management programme would entail cutting c½ a patch at the start of April, a second cut of c½ the patch in the third week of June, taking care to avoid the nests of jet black Peacock larvae (this can overlap part of the April cut) and a final cut of c¾ patch in December (leaving an uncut overwintering portion for other invertebrates at the rear if desirable). **Ovipositing Vanessids generally prefer fresh, young nettles growing in sunny locations which are sheltered from the north and east.** The nettle/thistle patch on the east side of Parcel 15 is quite heavily shaded on its south side; ovipositing here was only observed once (Comma) and no nests of Vanessid larvae were found on it during the survey. Ovipositing was observed on young nettles outside the entrance to the Wildlife Area (Red Admiral) and on the south-west side of Parcel 15 (Comma).

FORMAL AREAS (e.g. the Formal Gardens), can be enhanced by planting suitable butterfly attracting shrubs and herbaceous plants **(see Appendix 3)**. Spring-flowering species are asterisked * and shrubs are typed in **bold**. It is important to remember that even if a superb garden is created full of suitable nectar plants, few butterflies will visit it unless suitable breeding habitat exists or is created relatively close by. Migratory and highly mobile species like Red Admiral, Painted Lady, Small Tortoiseshell, Peacock, Holly Blue and Large and Small Whites would be likely visitors. **One suggestion is to transform all or part of the Azalea Walk into a Butterfly Garden. This combined with sympathetic grassland management in Parcels 8 and 12 (as outlined above) could be highly successful due to the proximity of these breeding sites.**

8. PROPOSALS FOR FURTHER SURVEY WORK

Moths: it would be useful to carry out further moth-trapping in the park, especially in other areas of the woodlands. The frequency of trapping has been very low and regular trapping throughout the year is bound to produce a larger species list.

Monitoring butterflies: it would be a good idea to set up a regular Butterfly Transect Walk in the park's woodlands in accordance with the national Butterfly Monitoring Scheme. This would entail a person counting butterflies along a set route on weekly walks between the first week in April and the last week in September. Walks and counts are made according to the Scheme's standardised conditions so that results can be compared annually as well as with other monitored sites. There is also a need to investigate the whereabouts and status of the White-letter Hairstreak in HP's woodlands. This would require intensive searching for adults in July and possibly, searching for larvae in April/May.

Biodiversity species: at the time of writing, the London Biodiversity Partnership is establishing species and habitat Action Plans for each London Borough. Suitable candidates for butterflies in Holland Park might include Small Skipper, White-letter Hairstreak, Holly Blue, Speckled Wood and Gatekeeper.

Small Skipper and Speckled Wood are 'indicator' species of grassland and semi-shaded woodland respectively. White-letter Hairstreak, though not rare nationally, is very unusual in inner London and is dependent on elm trees for hostplant. The Holly Blue has been selected as one of the main butterfly species for London due to its widespread distribution even in the most central areas. The Gatekeeper is of interest because of its present on-going spread into inner London. It is dependent on similar habitat to the Skippers - long grasses in sheltered herb-rich grassland.

Concerning moths, several geometrids and noctuids would warrant biodiversity status e.g. Oak-tree pug, Juniper Pug, White-line Dart and Autumnal Rustic which are all Category 3 species. Several others noted on page 25 under **interesting species** could also be appropriate candidates for selection.

Grassland cutting plans: following the botanical survey of the park which is being undertaken in 1999, detailed plans could be drawn up for important areas and Parcels.

ACKNOWLEDGEMENTS

I am greatly indebted to the following people who have enabled me to carry out this survey:

Dr Erica Constantine and Stuart Turner at the Ecology Centre for kindly providing maps, advice and information on management.

David Owen (Parks Manager) and Rosa Owen at Ireton Lodge for kindly allowing me unhindered access to Ireton Lodge and for providing much valuable information and friendly assistance throughout the survey.

Dr. David Agassiz and Mark Parsons at the Natural History Museum for kindly giving much time and invaluable help with micromoth identification, resulting in a considerable number of additions to the species list. Also to Kevin Tuck (NHM) for assistance with the article on Argyresthia cupressella.

Graham Vincent at the Park's Office for arranging the use of the generator and for providing information on the management of the grasslands and pathways.

Brian, Martin and Tim of Waterers nursery for generously supplying fuel for the generator.

Christopher Wood of the Friends of Holland Park for providing information on his observations of Lepidoptera in the park.

PC 107 Jack Shults, PC 104 Jan Caccione, PC 111 Paul Singleton, PC 112 Tony Curtis and PC 109 Alan Morgan of the RBK&C Parks Police for their invaluable assistance with arranging security and transport for the moth trapping sessions away from Ireton Lodge; this would have been impossible without their friendly help.

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TABLE 1. BUTTERFLIES RECORDED IN HOLLAND PARK and monad TQ2480. Please refer to pages 11 and 12 to assist interpretation

INDEX No	COMMON NAME	SCIENTIFIC NAME	1982	1995	1996	1997	1998
		HESPERIIDAE					
1526	Small Skipper	Thymelicus sylvestris			15.vii,2	8.vii,1	
1527	Essex Skipper	Thymelicus lineola			15-26.vii,2	4.viii,2	18.vii,1
1531	Large Skipper	Ochlodes venata			15-26.vii,5		18.vii,1
		PIERIDAE					
1549 *	Large White	Pieris brassicae	18.vii,1				12.v-5.viii,13
1550 *	Small White	Pieris rapae	8.vii-3.viii,7		15.vii,2	8.vii-21.viii,7	12.v-20.viii,2
1551 *	Green-veined White	Pieris napi	18.vii,1			8.vii-14.ix,8	27.iv-5.viii,6
		LYCAENIDAE					
1557	Purple Hairstreak	Quercusia quercus			26.vii,9		20.vii-6.viii,17
1558	White-letter Hairstreak	Satyrium w-album			15.vii,1		
1561 *	Small Copper	Lycaena phlaeas	3.viii,1				
1574 *	Common Blue	Polyommatus icarus	2.viii,3				
1580 *	Holly Blue	Celastrina argiolus	8.vii-3.viii,4		15-26.vii,7	8.vii,3	12.v-5.viii,3+10=13
		NYMPHALIDAE					
1590 *	Red Admiral	Vanessa atalanta	18-30.vii,2		15-26.vii,3	10.ix,2	18.vii-5.viii,5
1591 *	Painted Lady	Cynthia cardui			26.vii-26.viii,2		
1593 *	Small Tortoiseshell	Aglais urticae	18.vii-3.viii,5		15.vii,1		1.viii,1
1597 *	The Peacock	Inachis io	30.vii,1		26.vii,3		27.iv-5.viii,7
1598 *	The Comma	Polygonia c-album	18.vii-3.viii,2		15.vii,3	8.vii,3	12.v-1.viii,20
1614	Speckled Wood	Pararge aegeria		24.vii-13.viii,5	6.vi-26.viii,8	30.iii-14.ix,43	27.iv-5.viii,58
1625	The Gatekeeper	Pyronia tithonus					5.viii,1
1626	Meadow Brown	Maniola jurtina			15-26.vii,5		18-23.vii,16

TABLE 2. MICROMOTHS RECORDED IN HOLLAND PARK. Please refer to pages 11 and 12 to assist interpretation

INDEX No	COMMON NAME	SCIENTIFIC NAME	1998
		ERIOCRANIIDAE	
6		Eriocrania subpurpurella	30.iii-21.iv,4
		TISCHERIIDAE	
123		Tischeria ekebladella	6.vii,1
		INCURVARIIDAE	
148		Nemophora degeerella	29.v,c25 (early morning flight near Azalea Walk)
150		Adela reaumurella	15.v,1
		TINEIDAE	
227	Skin Moth	Monopis laevigella	16.vi,1
230		Monopis crocicapitella	15.v,1
231		Monopis imella	11.v,1
247		Tinea trinotella	11-19.v,2
		LYONETIIDAE	
263	Apple Leaf Miner	Lyonetia clerkella	3.vi-27.vii, many
		BUCCULATRICIDAE	
273		Bucculatrix thoracella	11-19.v,2
274		Bucculatrix ulmella	15.v,1
		GRACILLARIIDAE	
284		Caloptilia rufipennella	21.iv,1
286		Caloptilia alchimiella	16.vii,2
287		Caloptilia robustella	19.v,1; 27.vii,1
301		Parornix betulae	27.vii,1
321		Phyllonorycter messaniella	11-19.v, several
332a		Phyllonorcyter leucographella	15-19.v, a few
353		Phyllonorycter ulmifoliella	21.iv,1
		CHOREUTIDAE	
385		Anthophila fabriciana	27.iv, a few on nettle (Wildlife Area)

TABLE 2. MICROMOTHS RECORDED IN HOLLAND PARK and monad TQ2480. Please refer to pages 11 and 12 to assist interpretation

INDEX No	COMMON NAME	SCIENTIFIC NAME	1994	1997	1998
		YPONOMEUTIDAE			
c407a	Cypress Tip moth	Argyresthia cupressella			3.vi,1
411		Argyresthia goedartella		3-22.viii,2	
422		Argyresthia albistria		22.viii,1	
424	Bird-cherry Ermine	Yponomeuta evonymella	29.vi,1		
441		Paraswammerdamia lutarea			6-16.vii,2
447		Roeslerstammia erxlebella			15.v-27.vii, a few
449	Ash Bud Moth	Prays fraxinella			15-19.v,2
455		Ypsolopha scabrella			27.vii,2
458		Ypsolopha alpella			19.xi,1
462		Ypsolopha sequella			18-22.ix,3
464	Diamond-back Moth	Plutella xylostella		viii-ix	v-vii, several
469		Eidophasia messingiella			16.vi,1
476 P		Acrolepia autumnitella			26.iv,1
		OECOPHORIDAE			
640		Batia lunaris			16.vi,1
647	Brown House-moth	Hofmannophila pseudospretella			3.vi,1
658		Carcina quercana		3.viii,1	16.vi,1
663		Diurnea fagella			27.iii,2
		GELECHIIDAE			
767		Teleiodes decorella			16.vii,1
772		Teleiodes fugitivella			16.vi,1
774		Teleiodes luculella			16.vi-6.vii, a few
787		Bryotropha terrella			16.vii,1
801a		Gelechia senticella			27.vii,1
819		Scobipalpa costella			16.vi,1
870		Oegoconia quadripuncta			16.vii,1
871a		Oegoconia caradjai			27.vii,1
		BLASTOBASIDAE			
873		Blastobasis lignea		3.viii,1	27.vii,1; 24.ix,1
		MOMPHIDAE			
892		Mompha subbistrigella		3-16.vi,2	
		COSMOPTERIGIDAE			
905		Blastodacna hellerella		16.vii,1	

TABLE 2. MICROMOTHS RECORDED IN HOLLAND PARK and monad TQ2480. Please refer to pages 11 and 12 to assist interpretation

INDEX No	COMMON NAME	SCIENTIFIC NAME	1993	1994	1997	1998
		TORTRICIDAE				
969	Chequered Fruit-tree Tortrix	Pandemis corylana			22.viii,1	
970	Barred Fruit-tree Tortrix	Pandemis cerasana				16.vi,1
972	Dark Fruit-tree Tortrix	Pandemis heparana				16.vi,1
974		Argyrotaenia ljungiana				11.v,1
998	Light Brown Apple Moth	Epiphyas postvittana				26.iv-11.v; 23.ix, several
1001		Lozotaeniodes formosanus				6.vii,1
1007		Capua vulgana				19.v,1
1010	Red-barred Tortrix	Ditula angustiorana				vi-vii; ix, a few
1011		Pseudargyrotoza conwagana				19.v-16.vi, a few
1021	Flax Tortrix	Cnephasia asseciana				26.iv,1; 6.vii,1
1024	Light Grey Tortrix	Cnephasia incertana			3.viii,1	
1025		Tortricodes alternella				18.ii,3
1030		Eana incanana				6.vii,1
1032		Aleimma loeflingiana				16.vi,1
1033	Green Oak Tortrix	Tortrix viridana	22-29.vi,7	15.vi,1		3-16.vi,4
1041		Acleris sparsana				24.ix,1
1044		Acleris ferrugana				21.iv,1; 22.ix,1
1048	Garden Rose Tortrix	Acleris variegana			22.viii,1	
1050		Acleris boscana				19.v,1
1054		Acleris cristana				21.iv,2
1065		Celypha rufana				6.vii,4
1076		Olethreutes lacunana			22.viii,1	v,vi,vii,ix, several
1113		Eudemis profundana				27.vii,1
1133		Epinotia bilunana				16.vi,1
1150		Epinotia abbreviana				3.vi,1
1169		Gypsonoma dealbana			22.viii,1	16.vi,1
1200		Eucosma hohenwartiana				16.vi,1
1236		Pammene fasciana			3.viii,1	27.vii,1
		ALUCITIDAE				
1288	Twenty-plume Moth	Alucita hexadactyla				15.v,1
		PYRALIDAE				
1293		Chrysoteuchia culmella			3.viii,5	vii, many
1294		Crambus pascuella				6-16.vii,3
1305		Agriphila tristella			21.viii,1	
1309 P		Agriphila geniculea			30.viii,1	
1316		Catoptria falsella				16.vii,1
1334 g		Scoparia ambigualis				16-27.vii, several

TABLE 2. MICRO & MACROMOTHS RECORDED IN HOLLAND PARK and monad TQ2480. Please refer to pages 11 and 12 to assist interpretation

INDEX No	COMMON NAME	SCIENTIFIC NAME	CATEGORY	1993	1994	1997	1998
		PYRALIDAE (continued)					
1334a g		Scoparia basistrigalis					16-27.vii, a few
1340 g		Eudonia truncicolella					16.vii, a few
1342		Eudonia angustea					27.vii,1
1376	Small Magpie	Eurrhypara hortulata		24-29.vi,2			19.v-20.vi, a few
1378		Phyctaenia coronata					6.vii,1
1392		Udea olivalis					28.v,1
1398	Rush Veneer	Nomophila noctuella					15.v,1
1405	Mother of Pearl	Pleuroptya ruralis				3.viii,2	16-27.vii, several
1413	Gold Triangle	Hypsopygia costalis		22.vi,1			16.vii; 18.ix,2
1417	Meal Moth	Pyralis farinalis					6.vii,1
1424		Endotricha flammealis				3.viii,4	vii, many
1428	Bee Moth	Aphomia sociella					15.v,1
1439		Numonia advenella					16.vii, a few
1452		Phycita roborella					16-27.vii, several
1458	Thistle Ermine	Myelois cribrella					6.vii,1
1470		Euzophera pinguis				3-21.viii,2	6.vii,1
		PTEROPHORIDAE					
1524		Emmelina monodactyla				3.viii,1	17.iii,1; 6.vii,1
		DREPANIDAE					
1646	Oak Hook-tip	Drepana binaria	1B				v,vii,9
		THYATIRIDAE					
1654	Figure of Eighty	Tethea ocularis	1B		15-29.vi,2		19.v,1
		GEOMETRIDAE					
1663	March Moth	Alsophila aescularia	1B				18.ii-27.iii, a few
1669	Common Emerald	Hemithea aestivaria	1A	22.vi,1			6.vii,1
1680	Maiden's Blush	Cyclophora punctaria	2B				19.v,1
1699	Least Carpet	Idaea vulpinaria atrosignaria	2E				6.vii,1
1705	Dwarf Cream Wave	Idaea fuscovenosa	2B				6.vii,1
1707	Small Dusty Wave	Idaea seriata	2A				16.vii,1
1711	Treble Brown Spot	Idaea trigeminata	1B	24.vi,1	29.vi,1		3.vi,1
1713 *	Riband Wave	Idaea aversata	1A	24-29.vi,10	29.vi,1	3-21.viii,12	vi-vii,34
1728 *	Garden Carpet	Xanthorhoe fluctuata	1A		29.vi,1	21.viii,1	vii,ix,7
1742 P	Yellow Shell	Camptogramma bilineata	1B			8.ix,1	

TABLE 2. MACROMOTHS RECORDED IN HOLLAND PARK. Please refer to pages 11 and 12 to assist interpretation

INDEX No	COMMON NAME	SCIENTIFIC NAME	CATEGORY	1993	1994	1997	1998
		GEOMETRIDAE (continued)					
1764 *	Common Marbled Carpet	Chloroclysta truncata	1A	29.vi,4	15.vi,1		11.v-6.vii,8
1768	Grey Pine Carpet	Thera obeliscata	1B				15.v-22.ix,7
1803	Small Rivulet	Perizoma alchemillata	1B				27.vii,1
1808	Sandy Carpet	Perizoma flavofasciata	1C				11.v,1
1811 g	Slender Pug	Eupithecia tenuiata	2B				3.vi,1
1827 g	Freyer's Pug	Eupithecia intricata arceuthata	1B				3.vi,2
1834 g	Common Pug	Eupithecia vulgata	1A				15-19.v,2
1835	White-spotted Pug	Eupithecia tripunctaria	2A			3.viii,1	
1852 g	Brindled Pug	Eupithecia abbreviata	1B				27.iii-11.v, many
1853 g	Oak-tree Pug	Eupithecia dodoneata	3				29.iv,1; 19.v,1
1854 g	Juniper Pug	Eupithecia pusillata	3				16.vii,1
1860	Green Pug	Chloroclystis rectangulata	1A		23.vi,1		
1862	Double-striped Pug	Gymnoscelis rufifasciata	1A				30.iii-21.iv;18.ix, a few
1868	Lesser Treble-bar	Aplocera efformata	2B			3.viii,1	
1883	Yellow-barred Brindle	Acasis viretata	2B				15.v,1
1902	Brown Silver-line	Petrophora chlorosata	1C				16.vii,1
1906	Brimstone Moth	Opisthograptis luteolata	1A		15.vi,1		11-19.v,9
1921	Scalloped Oak	Crocallis elinguaria	1A				6-16.vii,6
1923	Feathered Thorn	Colotois pennaria	1C				found dead in shed
[1926 *	Pale Brindled Beauty	Apocheima pilosaria	2B]				
1927	Brindled Beauty	Lycia hirtaria	1B				30.iii-21.iv,6
1930	Oak Beauty	Biston strataria	1C				17-27.iii,2
1937	Willow Beauty	Peribatodes rhomboidaria	1A	29.vi,1		viii.ix,4	v-ix,31
1947	The Engrailed	Ectropis bistortata	1C			4.ix,1	
1961	Light Emerald	Campaea margaritata	1B	22-24.vi,2	15-23.vi,3	21.viii,2	19.v-16.vi,5
		SPHINGIDAE					
1979	Lime Hawk-moth	Mimas tiliae	1A				11.v-6.vii,6
1981	Poplar Hawk-moth	Laothoe populi	1B				15-19.v,3
1991 e	Elephant Hawk-moth	Deilephila elpenor	1A	[a singleton found by Mr C.Wood]			
		LYMANTRIIDAE					
2029	Brown tail	Euproctis chrysorrhoea	2C	29.vi,1	29.vi,1		6-16.vii,3
		ARCTIIDAE					
2050	Common Footman	Eilema lurideola	1C				27.vii,1
[2069 *	The Cinnabar	Tyria jacobaeae	1A]				

TABLE 2. MACROMOTHS RECORDED IN HOLLAND PARK and Monad TQ2480. Please refer to pages 11 and 12 to assist interpretation

INDEX No		COMMON NAME	SCIENTIFIC NAME	CATEGORY	1993	1994	1997	1998
			NOCTUIDAE					
2081		White-line Dart	Euxoa tritici	3			3.viii,1	
2087		Turnip Moth	Agrotis segetum	1A			21.viii,1	
2088		Heart and Club	Agrotis clavis	2B				6.vii,1
2089	*	Heart and Dart	Agrotis exclamationis	1A	22-29.vi,13	15-23.vi,12		3.vi-6.vii, 15
2091		Dark Sword-grass	Agrotis ipsilon	5			21.viii,1	6.vii,1
2092		Shuttle-shaped Dart	Agrotis puta	1A	24.vi,1		3-21.viii,8	
2107	*	Large Yellow Underwing	Noctua pronuba	1A	24.vi,1	29.vi,2	viii-ix,37	16.vii-23.ix,26
2109	*	Lesser Yellow Underwing	Noctua comes	1A			21.viii-23.ix,6	16.vii-23.ix,14
2110		Broad-bordered Yellow Underwing	Noctua fibriata	1A			3.viii-23.ix,3	18.ix,2
2111		Lesser Broad-bordered Yellow Underwing	Noctua janthina	1A		29.vi,1	3.viii-23.ix,17	15.v-18.ix,12
2117		Autumnal Rustic	Paradiarsia glareosa	3			4.ix,1	22.ix,1
2120		Ingrailed Clay	Diarsia mendica	1C		29.vi,2		3.vi,6
2126		Setaceous Hebrew Character	Xestia c-nigrum	1A	29.vi,1	15.vi,1	21.viii-4.ix,8	15.v-16.vi,3
2134		Square-spot Rustic	Xestia xanthographa	1A			21.viii-23.ix,5	18-23.ix,12
2154	e*	Cabbage Moth	Mamestra brassicae	1A	[17.viii.'75]			
2160	*	Bright-line Brown-eye	Lacanobia oleracea	1A	22.vi,1	15.vi,1		
2173		The Lychnis	Hadena bicruris	2A				16.vi,1
2182		Small Quaker	Orthosia cruda	1C				17-30.iii,5
2187		Common Quaker	Orthosia cerasi	1A				2.iii-29.iv,15
2188		Clouded Drab	Orthosia incerta	1A				17.iii-21.iv,11
2189		Twin-spotted Quaker	Orthosia munda	2B				17-30.iii,8
2190		Hebrew Character	Orthosia gothica	1A				17.iii-29.iv,21
2199		Common Wainscot	Mythimna pallens	1A			21.viii,1	
2232		Black Rustic	Aporophyla nigra	2E			24.ix,2	
2240	P	Blair's Shoulder-knot	Lithophane leautieri	1B			30.ix,1	
2243		Early Grey	Xylocampa areola	1A				27.iii-15.v,23
2252	P	Large Ranunculus	Polymixis flavicincta	2E			3.x,1	
2255	P	Feathered Ranunculus	Eumichtis lichenea	6			8.ix,1	
2258		The Chestnut	Conistra vaccinii	1C				18.ii-2.iii,2
2266		Brown-spot Pinion	Agrochola litura	1B			4.ix,2	
2269		Centre-barred Sallow	Atethmia centrago	2B			4.ix,1	
2270	P	Lunar Underwing	Omphalooscelis lunosa	1B			30.ix,1	
2271		Orange Sallow	Xanthia citrago	2B			4-23.ix,7	18.ix,1

TABLE 2. MACROMOTHS RECORDED IN HOLLAND PARK. Please refer to pages 11 and 12 to assist interpretation

INDEX No	COMMON NAME	SCIENTIFIC NAME	CATEGORY	1993	1994	1997	1998
		NOCTUIDAE (continued)					
2278	Poplar Grey	Acronicta megacephala	1A		29.vi,1		3.vi,1 6.vii,2
2279	The Sycamore	Acronicta aceris	1A	22.vi,1	29.vi,1		3.vi-16.vii,3
2284 g	Grey Dagger	Acronicta psi	1B			3.viii,1	6-16.vii,2
2293 *	Marbled Beauty	Cryphia domestica	1A			21.viii,3	16.vii-18.ix,3
2297	Copper Underwing	Amphipyra pyramidae	1A			21.viii-23.ix,15	18-23.ix,22
2298	Svensson's Copper Underwing	Amphipyra berbera	1A			4.ix,2	
2300 P	Old Lady	Mormo maura	1A			4.v,1	
2303	Straw Underwing	Thalpophila matura	1A			3.viii,1	
2306	Angle Shades	Phlogophora meticulosa	1A		29.vi,1	21.viii-4.ix,3	15-28.v,7;18.ix,1
2314	Dingy Shears	Parastichtis ypsillon	2A				6.vii,1
2318	The Dun-bar	Cosmia trapezina	1A	29.vi,1	29.vi,2	3.viii,6	6-27.vi,16
2321	Dark Arches	Apamea monoglypha	1A	24-29.vi,3		3.viii,1	16.vi-27.vii,13
2330	Dusky Brocade	Apamea remissa	1A	29.vi,1			
2337 g	Marbled Minor	Oligia strigilis	1A	22-24.vi,9	29.vi,1		16.vi,4
2339 g	Tawny Marbled Minor	Oligia latruncula	1A				28.v-16.vi,4
2341 g	Cloaked Minor	Mesoligia furuncula	1A			3.viii,1	
2343 g	Common Rustic	Mesapamea secalis	1A				
2343a g	Lesser Common Rustic	Mesapamea didyma	1A				
2353	Flounced Rustic	Luperina testacea	1A			21.viii-4.ix,2	
2380	Treble Lines	Charanyca trigrammica	2A				28.v,1
2381 g	The Uncertain	Hoplodrina alsines	1A	24-29.vi,5	29.vi,1		16.vii,7
2384	Vine's Rustic	Hoplodrina ambigua	1A			21.viii,1	3.vi,2; 23.ix,1
2389 *	Pale Mottled Willow	Caradrina clavipalpis	1A	29.vi,1		3.viii-23.ix,3	11.v-18.ix,36
2421	Scarce Silver-lines	Bena prasinana	2B	29.vi,1			
2423	Oak Nycteoline	Nycteola revayana	2B				27.iii,1
2441 *	Silver Y	Autographa gamma	5		29.vi,1		11-28.v,4
2450	The Spectacle	Abrostola triplasia	1A				19.v,1
2452 e	Red Underwing	Catocala nupta	1A	[1960s and '70s wings found near stableyard]			
2469	The Herald	Scoliopteryx libatrix	1A				27.iii,1; 15-19.v,2
2477	The Snout	Hypena proboscidalis	1B	24-29.vi,1			16.vi-16.vii,6; 18-23.ix,3

APPENDIX 1

LARVAL HOSTPLANTS AND DATES OF LARVAL OCCURRENCE

The plants in this appendix are the main hostplants of the Lepidoptera listed in Tables 1 and 2; the same numerical index is used here (after Emmet and Heath, 1991), so that the numbers can be cross-referenced, e.g. Butterflies occur between 1526 - 1626. Only the main hostplants are given. Where 'spp.' follows the generic name of a plant, only specific species of that genus may be accepted by the larva.

The usual dates for the larval stage(s) are shown on the right. A number of species are multivoltine, occurring in larval form more than once per year. Others may be found in the larval form throughout the year. Many species overwinter in the larval state. Larvae live either solitarily or gregariously and most feed nocturnally. Larvae exist in various ways on or within the hostplant: many live openly on leaves and twigs but some bore into stems and wood. Others make silken tubes or spinnings, burrow underground, dwell in movable cases, galls, or form mines within the foliage.

INDEX No	SCIENTIFIC NAME OF PLANT(S)	LARVAL OCCURRENCE
6	Quercus spp.	May - July
123	Quercus spp., Castanea	Sept - Apr
148	Unknown for early stage but later on dead leaves	Aug - Apr
150	"	Jul - Feb
227	Birds' nests, dead animals, stored animal products	Mar - Feb
230	Refuse of animal or vegetable origin	?
231	Refuse of animal origin	?
247	" and birds' nests	Jun - Apr
263	Crataegus, Malus, Pyrus, Prunus, Betula	May; Jul; Sep-Oct
273	Tilia	Jul - Aug
274	Quercus spp.	Jul; Sep-Oct
284	Acer pseudoplatanus, A. campestre	Jun-Jul; Sep
286	Quercus spp.	Jul - Oct
287	Quercus spp.	May-Jul; Sep-Oct
301	Betula	Jun; Sep-Oct
321	Quercus spp., Carpinus, Castanea	Jul; Oct; Dec-Apr
332a	Pyracantha	Jun-Sep; Nov-Mar
353	Betula spp.	Jul; Sep-Oct
385	Urtica, Parietaria	All year
c407a	Cupressus, Juniperus, Chamaecyparis	Most of the year
411	Betula spp., Alnus glutinosa; shoot and catkin	Nov - Apr
422	Prunus spinosa	Nov - May
424	Prunus padus	Oct - Jun
441	Crataegus, Sorbus aucuparia	Sep - May
447	Tilia, Betula	Jul; Sep-Oct
449	Fraxinus	Oct - May
455	Malus, Crataegus, Cotoneaster	May - Jun
458	Quercus spp.	May
462	Acer campestre, occasionally A. pseudoplatanus	May - Jun
464	Cruciferae	Jun - Sep
469	Cardamine amara, Cardaria	Apr - May
476	Solanum dulcamara, Atropa belladonna	Jun; Sep
640	Under dead bark, in mite galls	Oct - Apr
647	Dry material of animal and plant origin	All year
658	Polyphagous on deciduous trees and bushes	Sep - Jun
663	"	Jun - Oct
767	Quercus, Cornus	May - Jun
772	Ulmus spp.	May

INDEX No	SCIENTIFIC NAME OF PLANT(S)	LARVAL OCCURRENCE
774	Quercus spp.	Sep
787	Gramineae	Mar - Apr
801a	Juniperus spp.	?
819	Solanum dulcamara	May; Aug-Sep
870	Leaf-litter	May - Jun
871a	"	May - Jun
873	Fresh or decaying vegetable matter	Sep - Jun
892	Epilobium montanum	Jul - Aug
905	Crataegus	Sep - Oct
969	Polyphagous on deciduous trees and shrubs	May - Jun
970	"	Sep - May
972	"	All year
974	" mainly on Erica	Jun; Sep
998	Polyphagous, especially on Euonymus japonicus	All year
1001	Pinus sylvestris	Sep - Jun
1007	Polyphagous on trees and bushes	Jul - Apr
1010	"	Aug - May
1011	Ligustrum, Fraxinus	Jul - Oct
1021	Polyphagous especially on herbaceous plants	Sep - Jun
1024	"	Sep - Jun
1025	Polyphagous on trees and bushes especially Quercus	May - Jun
1030	Endymion, Leucanthemum	Apr - May
1032	Quercus, Carpinus, Acer	May
1033	Quercus spp. and other deciduous trees	May - Jun
1041	Fagus, Carpinus, Acer spp.	Jun - Aug
1044	Quercus spp. Salix spp	May - Jun; Aug
1048	Polyphagous	May - Jul
1050	Ulmus spp.	May-Jun; Aug-Sep
1054	Rosaceae trees	Apr - Jul
1065	Tanacetum vulgare, Artemisia vulgaris	Sep - May
1076	Polyphagous mainly on herbaceous plants	Aug - Jun
1113	Quercus spp.	Jun
1133	Betula spp.	Sep - Apr
1150	Ulmus, Acer campestre	Apr - Jun
1169	Crataegus, Quercus, Corylus, Populus, Salix spp.	Sep - Jun
1200	Centaurea spp., Serratula	Aug - May
1236	Quercus spp., Castanea	Aug - May
1288	Lonicera periclymenum	Jun - Jul
1293	Gramineae	Sep - Apr
1294	"	?
1305	Deschampsia cespitosa and other Gramineae	Sep - Jun
1309	Gramineae	Sep - Jun
1316	Mosses especially Tortula muralis	Feb - May
1334	Mosses?	?
1334a	?	?
1340	Mosses on ground	Jun - Sep
1342	Mosses especially Tortula muralis and Barbula revoluta	May - Sep
1376	Urtica and occasionally others	Aug - May
1378	Sambucus nigra, Viburnum, Syringa, Ligustrum	Aug - May
1392	Polyphagous	Sep - May
1398	Trifolium spp., Polygonum aviculare, Gramineae	Aug - Oct
1405	Urtica dioica	Sep - Jun
1413	Dry vegetable matter	Sep - Jul
1417	Stored cereals	Aug - May
1424	Polyphagous on trees and herbaceous plants	Aug - May
1428	Comb in nest of Hymenoptera spp.	Aug - Apr
1439	Crataegus occasionally Sorbus aucuparia	May - Jun
1452	Quercus spp., occasionally Pyrus, Malus	Sep - May

INDEX No	SCIENTIFIC NAME OF PLANT(S)	LARVAL OCCURRENCE
1458	Cirsium, Carduus, Onopordum, Arctium spp.	Aug - May
1470	Fraxinus, under bark (especially pollarded trees)	Oct - Jul
1524	Convolvulus, Calystegia	Jul - Sep
1526	Holcus lanatus (and some other Gramineae)	Sep - May
1527	Dactylis glomerata, Holcus mollis	Sep - May
1531	Dactylis glomerata	Jul - May
1549	Cruciferae especially Brassica	May - Oct
1550	Cruciferae especially Alliaria petiolata, Sinapis arvensis	May - Oct
1551	Cruciferae especially Cardamine pratensis, Alliaria petiolata	Apr - Oct
1557	Quercus spp.	Sep - Jun
1558	Ulmus spp. especially U. glabra	Mar - Jun
1561	Rumex spp. especially R. acetosa and R. acetosella	Aug - Apr
1574	Lotus corniculatus and other Leguminosae	Jun - Apr
1580	Flowerbuds of Ilex spp. for 1st brood; flowerbuds of Hedera spp. for 2nd brood	May-Jun; Aug-Sep
1590	Urtica spp.	Jun - Sep
1591	Cirsium spp.; occasionally Urtica dioica	Jun - Sep
1593	Urtica spp.	May - Aug
1597	Urtica dioica, occasionally Humulus lupulus	May - Jul
1598	" and occasionally Ribes, Salix, Ulmus	May - Aug
1614	Brachypodium sylvaticum, Dactylis glomerata, Holcus lanatus	All year
1625	Gramineae especially Festuca and Agrostis spp.	Sep - Jun
1626	Gramineae especially Poa, Agrostis, Lolium spp. etc.	Jan - Dec
1646	Quercus spp., occasionally Betula pendula	Jun - Sep
1654	Populus spp. especially P. tremula	Jul - Aug
1663	Polyphagous on deciduous trees; (female wingless)	May - Jun
1669	Polyphagous on deciduous trees	Aug - Apr
1680	Quercus spp.	Jul; Sep
1699	Hedera, Clematis, Alyssum saxatile	Aug - May
1705	Taraxacum	Aug - May
1707	Polyphagous on herbaceous plants especially Hedera	Aug - Jun
1711	Polyphagous on herbaceous plants especially Hedera	Aug - May
1713	Polyphagous especially on Galium, Stellaria, Polygonum	Sep - May
1728	Cruciferae	Apr - Sep
1742	Polyphagous especially on Stellaria media, Rumex	Sep - May
1764	Polyphagous on deciduous trees, bushes, etc.	Oct-May; Jul
1768	Pinus sylvestris, Picea abies, Pseudotsuga menziesii	Oct - May
1803	Galeopsis spp.	Aug - Sep
1808	Silene spp.	Jul - Sep
1811	Salix spp. catkins	Mar - Apr
1827	Cupressus, Chamaecyparis spp.	Aug - Sep
1834	Polyphagous on herbaceous plants especially Salix, Crataegus	Jun-Jul; Sep-Oct
1835	Sambucus nigra, Angelica sylvestris, Heracleum sphondylium	Jun-Jul; Sep-Oct
1852	Quercus, Crataegus spp.	May - Jul
1853	Crataegus, Quercus	Jun - Aug
1854	Juniperus, Thuja, Chamaecyparis	Apr - Jun
1860	Malus, Pyrus, Prunus spp.	Mar - May
1862	Polyphagous especially Ulex, Ilex, Calluna	May-Jun; Sep-Oct
1868	Hypericum spp.	Jul-Aug; Oct-Apr
1883	Ilex, Hedera, Ligustrum, Cornus, Viburnum opulus	Jun - Jul
1902	Pteridium aquilinum	Jul - Sep
1906	Polyphagous on trees especially Rosaceae	Jan - Dec
1921	Polyphagous on deciduous trees and shrubs	Apr - Jul
1923	"	Apr - Jun
[1926	"	Apr - Jun]
1927	Polyphagous on deciduous trees and shrubs	May - Jul
1930	Polyphagous on deciduous trees and shrubs	May - Jul
1937	Polyphagous on deciduous trees and Hedera, Taxus, Clematis	Oct - May

INDEX No	SCIENTIFIC NAME OF PLANT(S)	LARVAL OCCURRENCE
1947	Polyphagous on deciduous trees and shrubs	May-Jun; Aug-Sep
1961	Polyphagous on deciduous trees	Sep - May
1979	Tilia spp., Ulmus, Alnus glutinosa, occasionally others	Jul - Sep
1981	Populus, Salix spp.	Jul - Sep
1991	Epilobium spp., Galium, Fuchsia, Impatiens	Jul - Aug
2029	Polyphagous on trees and shrubs especially Rosaceae	Sep - May
2050	Lichens	Sep - Jun
[2069	Senecio spp.	Jul - Aug]
2081	Polyphagous on herbaceous plants	Oct - Jun
2087	Roots of hebaceous plants	Oct-Mar; Jun-Jul
2088	Herbaceous plants; leaves and roots	Aug - May
2089	Herbaceous and cultivated plants	Aug - Mar
2091	Polyphagous on herbaceous plants	Aug - Sep
2092	Polyphagous on herbaceous plants	May - Mar
2107	Polyphagous on herbaceous plants and grasses	Oct - Apr
2109	Polyphagous on trees, shrubs and deciduous plants	Sep - Apr
2110	Polyphagous on shrubs and herbaceous plants	Sep - Apr
2111	Polyphagous on shrubs and herbaceous plants	Sep - Apr
2117	Polyphagous on herbaceous plants and grasses	Oct - May
2120	Polyphagous on shrubs and herbaceous plants	Sep - Apr
2126	Polyphagous on herbaceous plants especially Urtica	Oct-Apr; Jul-Aug
2134	Polyphagous; Gramineae, herbaceous plants, trees	Sep - May
2154	Polyphagous esp. Brassica spp.	Jun - Apr
2160	Polyphagous on herbaceous plants	Jul - Sep
2173	Silene spp., Dianthus spp., Lychnis spp.	Jul - Sep
2182	Polyphagous on deciduous trees and shrubs	May - Jun
2187	Quercus, Salix spp. and other trees	May - Jun
2188	Polyphagous on deciduous trees and shrubs	May - Jun
2189	Polyphagous on deciduous trees - Salix, Ulmus, Quercus	May - Jun
2190	Polyphagous on deciduous trees and shrubs	May - Jun
2199	Gramineae	Jan - Dec
2232	Polyphagous on herbaceous plants	Oct - May
2240	Cupressus macrocarpa, Chamaecparis lawsoniana, Cupressocyparis leylandii	Apr - Jun
2243	Lonicera spp.	Apr - Jun
2252	Polyphagous on deciduous shrubs and herbaceous plants	Apr - Jul
2255	Polyphagous on herbaceous plants	Nov - Apr
2258	Polyphagous on deciduous plants	May - Jul
2266	Poyphagous on herbaceous plants	Apr - Jul
2269	Fraxinus	Apr - Jun
2270	Gramineae	Oct - May
2271	Tilia spp.	Mar - Jul
2278	Populus and Salix spp.	Jul - Sep
2279	Aesculus hippocastanum, Acer pseudoplatanus etc.	Aug - Sep
2284	Polyphagous on deciduous trees and bushes	Aug - Oct
2293	Lichens especially Lecidea confluens	Sep - May
2297	Quercus spp. and other deciduous trees and shrubs	Apr - May
2298	Quercus spp., Carpinus, Syringa vulgaris etc.	Apr - May
2300	Herbaceous plants, deciduous trees and shrubs	Sep - Jun
2303	Gramineae	Sep - May
2306	Polyphagous mainly on herbaceous plants	Jan - Dec
2314	Salix spp., occasionally Populus nigra	Apr - Jun
2318	Polyphagous on deciduous trees	Apr - May
2321	Gramineae	Aug - May
2330	Gramineae, esp. Phalaris arundinacea	Aug - Apr
2337	Gramineae, esp. Dactylis glomerata, Elymus repens	Aug - Apr
2339	"	Aug - Apr

INDEX No	SCIENTIFIC NAME OF PLANT(S)	LARVAL OCCURRENCE
2341	Deschampsia cespitosa, Arrhenatherum elatius, Festuca arundinacea and other Gramineae stems	Oct - Jun
2343	Gramineae, Luzula pilosa	Sep - May
2343a	"	Sep - May
2353	Gramineae, stem-bases and roots	Sep - Jun
2380	Plantago major	Jun - Apr
2381	Polyphagous on herbaceous plants	Sep - Apr
2384	Polyphagous on herbaceous plants	Oct-Apr; Jul
2389	Gramineae	Sep - May
2421	Quercus spp.	Aug - May
2423	Quercus spp.	Jun - Jul
2441	Polyphagous on herbaceous plants	Jan - Dec
2450	Urtica dioica	Jul - Sep
2452	Salix and Populus spp.	May - Jul
2469	"	Jun - Aug
2477	Urtica dioica	Jul - May

APPENDIX 2

IMPORTANT LEPIDOPTERA NECTAR PLANTS RECORDED IN HOLLAND PARK'S GRASSLANDS AND WOODLAND PATHWAYS

Refer to individual butterfly accounts (pp. 13-24) for the nectar plant preferences of each species. Many of the following plants are also used as hostplant by Lepidoptera (see **Appendix 1**). Spring-flowering plants have been asterisked *.

Black Horehound	Ballota nigra
Black Medick	Medicago lupulina
Bluebell *	Hyacinthoides non-scripta
Bramble	Rubus fruticosus agg.
Bristly Oxtongue	Picris echioides
Butterfly bush	Buddleja davidii 'Black Knight'
Cat's-ear	Hypochaeris radicata
Common Bird's-foot-trefoil	Lotus corniculatus
Common Fleabane	Pulicaria dysenterica
Common Knapweed	Centaurea nigrum
Creeping Buttercup	Ranunculus repens
Creeping Thistle	Cirsium arvense
Dandelion *	Taraxum officinale agg.
Forget-me-nots *	Myosotis spp.
Garlic Mustard *	Alliaria petiolata
Goat Willow (Pussy Willow)*	Salix caprea
Greater Bird's-foot-trefoil	Lotus pedunculatus
Greater Knapweed	Centaurea scabiosa
Hawk's-beards	Crepis spp.
Hemp-agrimony	Eupatorium cannabinum
Honesty *	Lunaria annua
Ivy	Hedera helix
Large Bindweed	Calystegia silvatica
Meadow Buttercup *	Ranunculus acris
Meadow Vetchling	Lathyrus pratensis
Oxeye Daisy	Leucanthemum vulgare
Perennial Sow-thistle	Sonchus arvensis
Privets	Ligustrum spp.
Purple-loosestrife	Lythrum salicaria
Ragworts	Senecio spp.
Red Campion *	Silene dioica
Red Clover	Trifolium pratense
Snowberry	Symphoricarpos albus
Spear Thistle	Cirsium vulgare
Tufted Vetch	Vicia cracca
Water Mint	Mentha aquatica
Welted Thistle	Carduus crispus
Wild Teasel	Dipsacus fallonum
Yarrow	Achillea millefolium

APPENDIX 3

LEPIDOPTERA ATTRACTING NECTAR SHRUBS AND HERBACEOUS PLANTS FOR FORMAL AREAS IN HOLLAND PARK

Shrubs are in bold type. Pure stock species are generally better nectar sources than modern cultivars/double-flowered sports. Species not listed in Stace (1995) are named as cited in *Shrubs* (Phillips and Rix, 1989) or *Reader's Digest Encyclopaedia of Garden Plants and Flowers* (RDA, 1973). Spring-flowering plants have been asterisked *.

Aubretia *	Aubretia deltoidea
Beauty-Bush	Kolwitzia amabilis
Bramble	Rubus fruticosus agg.
Broad-leaved Everlasting Pea	Lathyrus latifolius
Butterfly Bush	Buddleja davidii 'Black Knight';
"	B. x weyeriana 'Golden Glow', 'Sungold'
Butterfly Stonecrop (Ice Plant)	Sedum spectabile
Candytufts	Iberis spp.
Dame's-violet (Sweet Rocket)	Hesperis matronalis
Erigerons	Erigeron speciosus 'Darkest of All'
Escallonia	Escallonia macrantha
Evergreen Spindle	Euonymus japonicus
French Marigold	Tagetes patula
Garden cat-mint *	Nepeta x faassenii
Garden Privet	Ligustrum ovalifolium
Heathers *	Erica spp.
Hedge Veronicas	Hebe spp.
Hemp-agrimony	Eupatorium cannabinum
Holly *	Ilex aquifolium
Honesty *	Lunaria annua
Honeysuckles	Lonicera spp.
Ivies	Hedera spp.
Japanese Spiraea	Spiraea japonica 'Anthony Waterer'
Lantana	Lantana camara
Lavenders	Lavandula x intermedia 'Munstead'
Marjoram	Origanum spp.
Michaelmas-daises (Asters)	Aster spp.
Mints	Mentha spp.
Orange-ball-tree *	Buddleja globosa
Pieris *	Pieris japonica
Phlox	Phlox paniculata
Red Valerian	Centranthus ruber
Reflexed Stonecrop	Sedum reflexum
Scabious	Scabiosa caucasica
Shrub ragwort	Brachyglottis 'Sunshine'
Sneezeweed	Helenium x hybrida 'Magnificum'
Thymes	Thymus spp.
Wallflowers *	Erysimum spp.

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——— 1986. Anmärkningsvärda fynd av Microlepidoptera i Sverige 1985. *Ent. Tidskr.* 107: 71–79.
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APPENDIX 4

1999, *Entomologist's Gazette* 50: 11–16

The Cypress Tip moth *Argyresthia cupressella* Walsingham, 1890 (Lepidoptera: Yponomeutidae) new to Britain

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On 23 June 1997 Mr Philip Peecock sent a letter to The Natural Histor Museum, London, enclosing some mined sprigs of Leyland cypress and liv moths that had recently been taken at Ufford, Suffolk. The moths wer identified by KRT and Dr G. S. Robinson as *Argyresthia cupressella* Walsingham a species not previously recorded from Europe.

Armed with this information DJLA journeyed to Suffolk on 28 June obtained a series of the moth from Ufford and then began recording the moth i nearby localities extending inland as far as Stowupland. On 2 July DJL returned accompanied by Lt.-Col. A. M. Emmet and made further records to th south of the original locality, finding the moth especially common in Ipswich Moths varied in condition from good to very worn. Information about the lif history was obtained from Mr R. W. Duncan, Canadian Forestry Service, Britis Columbia.

Description of adult (Fig. 1)

Wingspan 8–9 mm. Head and scape whitish to ochreous; labial palpus ochreous; antenna ringed dark brown and ochreous white. Thorax and tegulae pale gold. Forewing chequered ochreous white and gold; a small black apical spot. Cilia gold around termen, becoming ochreous white from tornus dorsally. Hindwing whitish. Abdomen pale ochreous white, sometimes gold-tinged. Legs whitish ochreous, tarsal joints dark brown.

Male genitalia (Fig. 2). Aedeagus with a cluster of about four cornuti. Plate attached to eighth sternite Y-shaped, weak. Remainder of genitalia poorly sclerotized and of little diagnostic value at species level.

Female genitalia (Fig. 3). Signum comprising a strong basal plate with two scobinate prongs. Remainder of genitalia poorly sclerotized and of little diagnostic value at species level.

Systematic position. Veins R_4 and R_5 of the forewing are stalked mid way between disc and termen, indicating that the species belongs to the subgenus *Blastotere* Ratzeburg. It is closely related to such species as *A. dilectella* Zeller.

Life history

The following descriptions are from western North America (Duncan, 1996). The biology in England may differ on account of differences in climate.

Egg. Light yellow, oblong-ovoid, about 0.32 mm long and 0.25 mm broad.

Laid in a crevice between the scale leaves or in a twig axil; hatching in about three weeks.

Larva. When full-fed pale green, head and prothoracic plate pale brown, 5.2–7.0 mm long; early instars pale greenish yellow. At first the larva bores into a nearby scale; after eating out the scale leaf it moves into another, in this way affecting 9–12 scale leaves by autumn, but this damage is easily overlooked. It overwinters normally in the fourth instar, feeding only during mild weather. In the spring it bores into a shoot 0.3–2.0 cm from the tip and tunnels down 0.5–2.5 cm, occasionally using a lateral shoot. Four to six shoots may be attacked in this way; affected shoots die and become brown when vacated. In April or May the larva vacates its feeding place and pupates in a cocoon.

Pupa. 3.4–4.0 mm long, 0.78–0.88 mm in diameter; green with darker head and appendages. Enclosed within a white spindle-shaped cocoon. The pupal stage lasts about two weeks.

Adult. In western Canada the moth is on the wing in May and June. In Britain adults were recorded in June and early July, but there has not yet been an opportunity to note the date of emergence. Moths can be made to fly from the foodplant by tapping the branches, or else they may be seen at rest on the leaves.

Host plants

Mr Peecock recorded larval damage in Suffolk to *Cupressocyparis leylandii, C. leylandii* 'Castlewellan gold', *Chamaecyparis lawsoniana* 'Minima' and *Juniperus scopulorum* 'Skyrocket'. Duncan (1996) states that the species feeds on a wide variety of cupressaceous trees, most notably Lawson cypress, Leyland cypress, Monterey cypress, Italian cypress, Oriental cedar and some species of juniper having scale-like leaves.

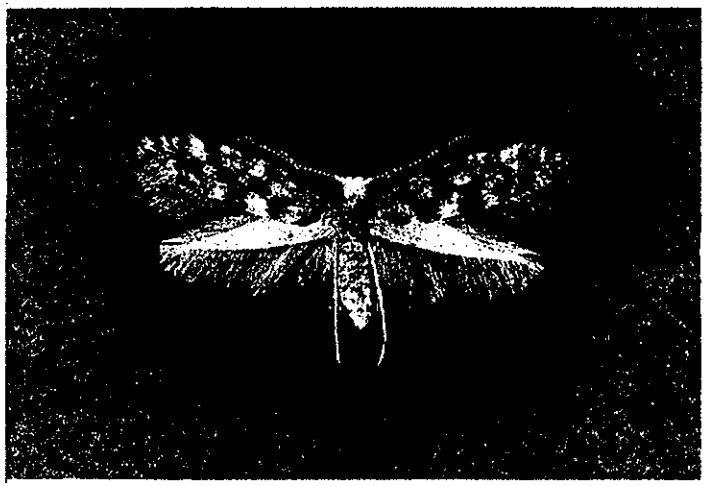

Fig. 1. Adult specimen of *Argyresthia cupressella* Walsingham.

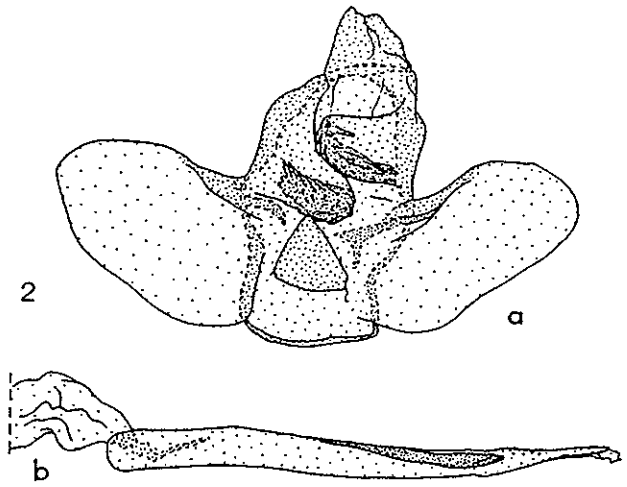

Fig. 2. *Argyresthia cupressella* Walsingham. Male genitalia: (a) armature; (b) aedeagus.

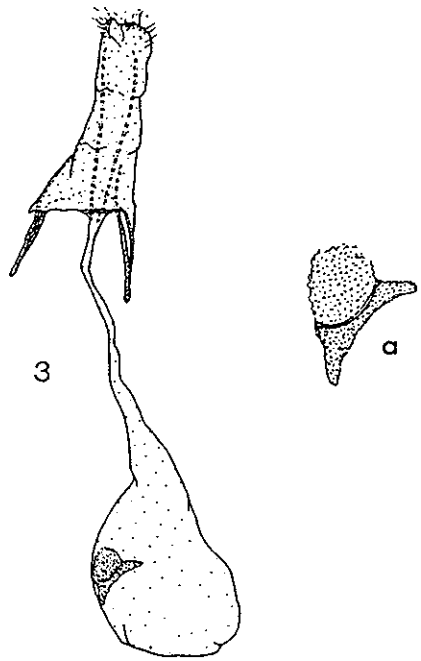

Fig. 3. *Argyresthia cupressella* Walsingham. Female genitalia: (a) detail of signum, enlarged.

54

Distribution

The species is known from the west coast of North America, from southern California northwards to southern British Columbia. In Britain it has been recorded from East Suffolk and near Harwich, Essex. The map (Fig. 4) shows the occurrence in 10 km squares surveyed during 1997; dark circles indicate a density causing damage estimated at over 1% of leaf area, grey circles indicate a density of 1% of leaf area or less. The squares to the south and west of the infestation were surveyed, but those to the north were not, consequently it is not yet known how far northwards the range extends.

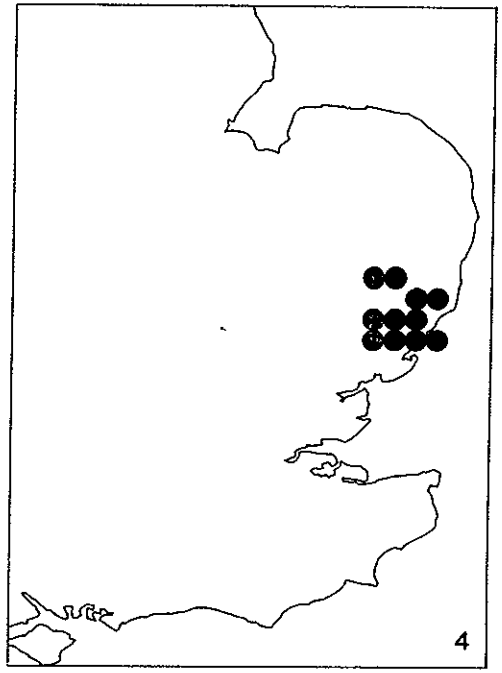

Fig. 4. Map showing known distribution of *Argyresthia cupressella* Walsingham in England in 1997. Solid circles represent high density, >1% of leaf area affected, grey circles represent low density, <1% of leaf area affected. 10 km squares to the north of those shown were not surveyed.

Possible confusion with other species

There are now four species of *Argyresthia* known to feed on ornamental trees of the family Cupressaceae in Europe: *A. cupressella* and *A. thuiella* Packard described originally from North America (Frankenhuyzen, 1974), *A. trifasciata* Staudinger described originally from the Alps (Stigter & Frankenhuyzen, 1992), and *A. dilectella*, a native species whose primary host-plant is juniper (*Juniperus communis*). All have larvae mining the shoots in the spring and the differences between them may not be sufficient to ascertain the species before the moths emerge.

Pest potential

Whether or not an insect is regarded as a pest depends on one's point of view. Lepidopterists may be pleased to have an additional quarry, while conservationists may be delighted that here is an insect which devours introduced conifers! The garden centre trade will surely regard this insect as a pest, since it can seriously affect the appearance of trees, even though it is most likely that this trade has been responsible for its introduction to Europe. *Argyresthia cupressella* is sufficiently well established in Britain that its eradication is impossible. Application of insecticides may reduce the incidence of attack, but is sure to be followed by recolonisation from nearby trees in infected areas. For those with cypress hedges, the population will be kept to minimal levels by regular trimming which will remove most of the eggs or larvae.

Anticipated spread

Several species associated with ornamental trees or shrubs have been introduced into countries beyond their established range in recent years (Agassiz, 1996). In urban areas there is often a large amount of such host-plants facilitating the spread of insects that attack them. Studies on *Phyllonorycter leucographella* (Zeller) and *P. platani* (Staudinger) demonstrated that these species moved radially outwards from the founding populations at 10.3 and 8.6 km per year respectively (Nash *et al.*, 1995). It is likely that *A. cupressella* may achieve a similar rate of spread although if other centres are established from which the moth population can expand the effective rate will be much greater. We are not aware of studies on the recruitment of parasitoids to *Argyresthia* spp. but with *Phyllonorycter* spp. it was rapid yet it still did not control the population in the early years (Godfray *et al.*, 1995). Since *A. cupressella* is from a different continent it is possible that the rate of recruitment of natural enemies may be slower, resulting in a greater rate of spread.

Acknowledgements

We are very grateful to Mr Peecock for bringing this introduction to our attention at an early stage, and to Mr Bob Duncan for much helpful information.

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Addendum

A visit to Suffolk on 5 May 1998 made it possible to check the life history in Britain. At that date most of the larvae had pupated, but a single example was observed and the description agreed with that quoted above. Most interesting was the discovery of a number of white cocoons spun amongst the cypress foliage, especially where it had been possible for the larvae to descend from the higher branches. Other *Argyresthia* species normally pupate on the ground where the cocoons are difficult to locate; on the branches they are much more easily found. Adults began to emerge indoors on 25 May and continued to do so for two weeks.

NOTES AND OBSERVATIONS

Argyresthia cupressella Walsingham (Lepidoptera: Yponomeutidae) reaches Middlesex

One adult of this species was taken on 3 June 1998 in a Robinson m.v. light-trap in a private garden within the woodland section of Holland Park, Kensington (TQ248802). The moth was identified by Mark Parsons and Kevin Tuck at The Natural History Museum, London, and compared with the primary type and with specimens from Suffolk.

A possible means of introduction of this species to Holland Park was considered to be the horticultural trade. Subsequent enquiries established that the park had received plants from a nursery at Woodbridge, Suffolk, in 1998 and in previous years, although no species of *Cupressus, Chamaecyparis* or *Juniperus* were known to be involved but only *Rhododendron*. However, it is still conceivable that the appearance of *A. cupressella* in the park resulted from carriage of plants from the nursery. It is hoped that a subsequent search for larval mines will produce more information.

Many thanks to Mark Parsons for the initial identification and for drawing my attention to the current interest in this species; to Kevin Tuck for confirming the identification and for further information on its distribution; and to David Owen, Parks Manager, for additional assistance.

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1999, *Entomologist's Gazette* 50: 17–27

Genetics of British *Zygaena* Fabricius, 1775 (Lepidoptera: Zygaenidae). VI. The confluent form of *Zygaena (Zygaena) filipendulae* (Linnaeus, 1758)

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Extreme confluent forms of *Zygaena (Zygaena) filipendulae* (Linnaeus, 1758) (The Six-spot Burnet) are of two kinds: in one the forewing spots coalesce longitudinally to form an irregularly shaped blotch (Tremewan, 1985: 108, pl. 4, fig. 16); in the other (Tremewan, 1985: 109, pl. 4, fig. 17), the forewing spots are connected by a variable amount of red scaling which, in extreme examples, is suffused over much of the dark ground colour. Although such forms are extremely rare in the wild, breeding experiments have shown that both are dominant to the wild type or normal form. The genetics of the longitudinally confluent form illustrated by Tremewan (1985: pl. 4, fig. 16) are described below; the suffused confluent form will be dealt with in a subsequent paper (Tremewan, in prep.).

The description of the infrasubspecific nominal taxon *confluens* Oberthür (1896: 45, pl. 8, fig. 132) was based on a specimen collected in England and purchased by Oberthür at the sale of the Howard Vaughan collection held at the famous Stevens auction rooms in London on 22–23 April 1890 (Tremewan, 1961: 284, pl. 54, fig. 21). The descriptions of the infrasubspecific nominal taxa *proconfluens* Tutt (1899: 512), *quinquejuncta* Tutt (1899: 512) and *conjuncta* Tutt (1899: 510) were based on confluent specimens reared by W. H. B. Fletcher during 1896 and 1897 from parents captured at Deal, Kent (Tutt, 1899: 512). According to Tutt, the majority of the progeny were more or less blotched after two years inbreeding; unfortunately no records appear to have been kept as to the exact numbers of confluent and wild type specimens in the F_1 and F_2 generations. However, it would appear that the results obtained by Fletcher were similar to those described below, showing that all the above-mentioned nominal taxa are the variable expression of a single gene. Consequently, the names *proconfluens* Tutt, 1899, *quinquejuncta* Tutt, 1899, and *conjuncta* Tutt, 1899, are here considered to be junior subjective synonyms of *confluens* Oberthür, 1896. Many of the specimens reared by Fletcher, and all but one of the types of the nominal taxa mentioned above, are now preserved in The Natural History Museum, London (BMNH) (Tremewan, 1961: 284–285, pl. 54, figs 21–23).

Breeding experiments

A red confluent male (Fig. 1) of *Z. (Z.) filipendulae* captured at Ranmore Common, Surrey, on 20 July 1989 was paired with a wild type[1], virgin female (Fig. 2) which emerged on 21 July 1989 from a cocoon collected from the same

[1] i.e. red and with a normal spot pattern; the specimen has a slightly deformed right forewing, a defect that has neither been reflected in its progeny nor in subsequent cultures.