

SURVEY OF
THE DIPTERA (True Flies)
AND
COLEOPTERA (Beetles)
OF CHIGWELL ROW WOOD LNR

English Nature Grant No. – BGNT/202
Epping Forest District Council

Barbara Schulten and John W. Ismay

c/o Hope Entomological Collections
Oxford University Museum of Natural History
Parks Road
Oxford
OX1 3PW

Summary

Chigwell Row Wood LNR, Essex, is known to have been contiguous with Hainault Forest until around 1900. Hainault Forest received its status as a Site of Special Scientific Interest (SSSI) due to its fauna of dead wood dependent insects. The Diptera and Coleoptera of Chigwell Row Wood LNR were surveyed. The sampling methods used were aerial traps, pitfall traps, sweeping, beating and hand collecting. Three aerial traps were placed in the west side of the wood, the heath and veteran tree 0025. Five pitfall traps at each site were placed on the west side of the wood, the heath, the open area and around veteran tree 0027. Samples were collected from 14. May – 28. June and 7. September – 22. October 2002.

Samples were sorted into major taxonomic groups. In the true flies (Diptera) the fungus gnats (Mycetophiloidea), dance flies (Empidoidea), house flies (Muscidae and Fanniidae), hoverflies (Syrphidae) and Acalyptrata, and the beetles (Coleoptera) were identified to species level by experts in the groups.

A total of 391 species were recorded, i.e. 286 Diptera and 105 Coleoptera. Fifty-six species of conservation concern, i.e. RDB1 to Notable, were recorded, and a further 24 species, which are considered to be local. We also found two species, which were recently described as new to science. The latter are scarce, but not enough information is available yet to allocate conservation status. The species of conservation concern included one RDB1, five RDB2, four RDB3, one RDBK and 45 Notable. The fungus gnats included 98 species, almost 20% of the British Fauna, of which 16 had conservation status. In comparison the much larger Epping Forest, surveyed over several decades, had 50% of the British Fauna.

Thirty four percent of the Diptera and Coleoptera recorded are considered to be dependent as larvae on decaying wood or associated fungi and of these 29 % had conservation status or were local. Many further species are associated with woodland though they have not been reared; in fact only 11 species with conservation or local status had either no certain association or were associated with other habitats. The results show that the rarer species in Chigwell Row Wood LNR are predominantly associated with woodland.

If one takes the broadest interpretation into account, almost two thirds of the Diptera and half of the Coleoptera are dependent on woodland. Many of the insects recorded from Chigwell Row Wood LNR during this survey are known to be ancient woodland species. This illustrates the high quality of the woodland. Due to favourable management, i.e. pollarding, scrub clearance and scattering of dead wood, the scarcer species are spreading into the secondary woodland. The results show that dead wood is extremely important in Chigwell Row Wood LNR and many of the species recorded are scarce, i.e. have conservation status, or are local.

The survey demonstrated that the management of Chigwell Row Wood LNR has led to a sufficient supply of dead wood. However, we believe that the flies and beetles of the wood would benefit further from an improvement of adult food resources in form of nectar and pollen. This could be achieved by changing the management of the adjacent grassland and further restoration of the heath. Also, care should be taken that a constant supply of dead wood of all stages is ensured, i.e. age gaps are avoided, either by pollarding or coppicing some of the trees.

Chigwell Row Wood LNR is bordered on two sides by housing and on a third side by meadows, which could be developed. In addition to 50 plus veteran oak pollards and numerous ancient hornbeam pollards the wood has a rich fauna of dead wood insects, many of which have conservation status or are local. We strongly recommend that the existing Site of Special Scientific Interest (SSSI) covering Hainault Forest be extended to include Chigwell Row Wood LNR.

Contents

Summary	2
Contents	3
1. Introduction	4
2. Methods	5
2.1. Sampling.....	5
2.2. Trapping	5
2.3. Location of traps.....	5
2.3.1. West side Aerial	5
2.3.2. Heath Aerial	5
2.3.3. VT0025 Aerial.....	6
2.3.4. West side Pitfall	6
2.3.5. Open Area Pitfall.....	6
2.3.6. VT0027 Pitfall.....	6
2.3.7. Heath Pitfall.....	6
2.4. Data Analysis	6
3. Results	8
4. Discussion	10
5. Recommendations for Management	12
6. Notes on species	14
6.1. DIPTERA	14
6.1.1. Fungus gnats.....	16
6.2. COLEOPTERA	19
7. Acknowledgements	24
8. References	25
Appendix 1	27
Appendix 2	35

1. Introduction

This project was commissioned by Epping Forest District Council to survey the Diptera (True Flies) and Coleoptera (Beetles) of Chigwell Row Wood, Essex. It was funded by the Council and a grant from English Nature. The purpose was to compile an inventory of these orders and to assess the importance of the saproxylic fauna of this woodland site.

Chigwell Row Wood was once part of the ancient woodland of Hainault Forest, but became separated during development of the road network and the partial destruction of Hainault Forest between 1851 and 1900. Chigwell Row Wood still retains part of the ancient woodland flora. It is also known for its veteran oak and hornbeam pollards. In addition, the wood contains some secondary woodland and a small area of heath. The southeastern border is closest to the larger remnant of Hainault Forest. Chigwell Row Wood is a Local Nature Reserve, but is not a Site of Special Scientific Interest.

Current management of Chigwell Row Wood LNR is aimed towards preserving the ancient woodland elements of the site. The areas around the veteran trees, which had become overgrown by younger growth, including holly, have been cleared to allow more light to reach the trees. Some hornbeam pollards were recut in the early 1990s and some further restoration work has been done recently. Care was taken that the dead wood created by these operations was left on site in a suitable condition for colonisation by saproxylic organisms. Where diseased and damaged trees were treated this was completed with the minimum of intervention compatible with human safety, so that this important resource was retained for the benefit of the fauna. As a result of this management Chigwell Row Wood LNR retains a number of veteran trees in varying states of decrepitude and a large stock of hornbeam pollards. The network of paths through the site has been cleared and expanded providing more open areas, which are essential for some groups of animals. A special project has been the recreation of the small remnant of heath in the southeast of the site.

The survey commenced in May 2002 and samples were collected during 2002 in early summer and early autumn. The sampling methods were designed to record species in the most important habitats of the wood, principally species associated with dead wood or with the heath. Due to Diptera occurring later than usual in 2002 we delayed the second sampling period, which enabled us to catch some autumn species and some Mycetophilidae, which occurred in large numbers after heavy rainfall during the second half of the 2nd sampling period. Subsequently, the samples were sorted into major groups and identified by specialists. The following groups were identified to species level:

- Diptera
 - Mycetophiloidea sensu latu – P.J. Chandler
 - Empidoidea – R. Crossley
 - Muscidae and Fanniidae – A.C. Pont
 - Syrphidae – J.W. Ismay
 - Acalyptrata – J.W. Ismay and B. Schulten
- Coleoptera
 - Carabidae – J.E. Hogan
 - Remaining Coleoptera – D.J. Mann

2. Methods

The survey was conducted by using various sampling and trapping methods and was conducted twice weekly during two 6 week periods (14th May – 28th June 2002 and 7th September – 22nd October 2002). The samples from aerial and pitfall traps were usually collected every three to four days, washed and preserved in 70% ethanol.

2.1. Sampling

The sampling methods used were sweeping, beating and hand collecting of specimens, as weather permitted, during the trapping programme. Material from beating and sweeping was preserved dry in tubes or pinned.

2.2. Trapping

The trapping programme was conducted using standard pitfall traps and aerial flight interception traps.

Three aerial interception traps, consisting of 4 perspex vanes at 90° above a plastic bowl containing at least 50% antifreeze, were used. These traps were of a new design and were designed by Darren Mann, Oxford University Museum of Natural History, and made by Curt Lamberth of Oxford Environmental Solutions. The traps were raised by Country Care staff to about 7-10m up veteran oak trees.

Twenty pitfall traps, unbaited, with dilute detergent in water, were placed in sets of five at four sites. These were standard round plastic picnic cups (200 ml) sunk into the ground.

These traps were placed in seven areas of the wood which are referred to as follows, in which VT refers to the veteran tree numbers:

- West side (pitfall and aerial traps placed approximately 50m apart)
- Open area (pitfall only)
- VT0025 (aerial only)
- VT0027 (pitfall only)
- Heath (pitfall and aerial traps placed approximately 30m apart)

2.3. Location of traps

2.3.1. West side Aerial

The trap was raised approximately 10m high on veteran oak, VT 0037 (TQ 4612 9281). This tree was about 5m inside the western border of Chigwell Row Wood with the adjacent meadow and was surrounded by rather open growing trees with scrub as undergrowth. Its stem was covered in ivy.

2.3.2. Heath Aerial

This trap was raised approximately 10m high on veteran oak, VT 0036 (TQ 4646 9299), which was located about 8m west of the heathland, which itself is in the southeast corner of the site. This tree was obscured by holly scrub and had neighbouring veteran and younger trees and scrub growing rather densely to the west.

2.3.3. VT0025 Aerial

This trap was raised approximately 10m high on veteran oak, VT0025 (TQ 4635 9305), which was located about 20m inside the northern boundary of the wood towards the recreation ground. The trap was close to a large rot hole. The tree was surrounded by a rather high density of other veteran oaks and is within the ancient part of the forest. Rather older deadwood was in the close vicinity, while the base of the tree was covered with bramble extending approximately 5m from the trunk. The wood to the south of this tree consisted of rather dense secondary growth.

2.3.4. West side Pitfall

These pitfall traps were located approximately 50m south of VT 0037, which was the location of the west side aerial trap, scattered around a path. It had recent and old deadwood in the form of large trunks, bramble and bare ground in the close vicinity. The aspect was open with partial sunlight.

2.3.5. Open Area Pitfall

These pitfall traps were approximately 50-70 m north of the southern border of Chigwell Row Wood. They were placed about 10-20 m east of the main North-South path in a recently cleared area with a large proportion of bare ground in May, which was starting to be recovered by bramble in autumn. This site had recent and old deadwood present. The grid reference for this site is TQ 462 928.

2.3.6. VT0027 Pitfall

These pitfall traps were placed around the veteran oak VT0027 (TQ4633 9312) in partially open ground with old decayed leaf litter and lying recent and old dead wood. A number of sycamore trees had been cleared from this area two weeks before the first trapping session commenced. This site was about 20m from the northern edge of the wood.

2.3.7. Heath Pitfall

These pitfall traps were scattered in the most open part of the heath, which is situated in the southeastern corner of the site. The area included young aspen and birch growth, *Calluna* and *Juncus*, but also some *Deschampsia* tussocks, bramble and a large pile of old decaying birch wood. The grid reference is TQ 4646 9299.

2.4. **Data Analysis**

For ease of identification the samples were combined resulting in six date classes for the early summer samples and six date classes for the pitfall traps in autumn, but five date classes for the aerial traps in autumn.

The conservation statuses for Diptera were assessed using Falk (1991). Newer reviews of these statuses (Falk & Chandler, Falk & Crosskey, Falk & Ismay, Falk & Pont) have been prepared already and are awaiting publication by JNCC. Therefore, the changes in statuses based on these drafts are shown in the table for Diptera. However, for the purpose of this report the statuses based on Falk (1991) are used. The conservation statuses for Coleoptera were assessed using Recorder 2002, which is based on Hyman & Parsons (1992, 1994). We used the old conservation categories, Notable, RDB etc. in this report, because the newer categories based on threat are not published at the time of this report. In Coleoptera the Notable category has been divided into Notable A and Notable B, but in Diptera it is not split.

The nomenclature for Diptera follows the British Checklist for Diptera (Chandler 1998) and subsequent corrections and additions (Chandler 2000, 2001, 2002), while the nomenclature for

Coleoptera follows the British Checklist for Coleoptera as found in Recorder 2002 (JNCC 2002) with the exception of the nomenclature of the family Carabidae, which follows Luff & Duff (2004).

The identification of species as being saproxylic (= dependent on decaying timber), as well as the categories for the larval habitat is taken from Alexander (2002). This work notes that recording insects taking part in wood decay is not straightforward. Some insects feed directly on dead or decaying wood, others feed on fungi involved in the wood decay process, while others feed on fungi, which are not associated with wood decay. However, Alexander (2002) only included insect species, where wood decay fungi are a significant proportion of the fungi used. In the appendices of Diptera and Coleoptera five categories of larval habitat are included. These were based on Alexander (2002), but for the purposes of discussion these larval habitats have been combined and are referred to as dependent on decaying wood / timber.

3. Results

During this survey a total of 391 species were recorded, comprising 286 Diptera species and 105 Coleoptera species. The Diptera species identified belonged to 33 families, while species from 39 Coleoptera families were recorded. In total 56 species with conservation status and 24 local species were found. The 33 Diptera species included 25 Notable, 4 RDB3, 3 RDB2 and one RDB1 species, while the 23 Coleoptera species comprised 14 Notable b, 5 Notable a, one Notable, one RDBK and 2 RDB2 species. A summary of the results is shown in Table 1, while the detailed results for the Diptera and Coleoptera can be found in Appendix 1 and 2 of this report.

Table 1: **Diptera / Coleoptera from Chigwell Row Wood, summary**

order	Diptera	Coleptera	total
no. of species	286	105	391
no. of species with conservation status or local			
RDB1	1	0	1
RDB2	3	2	5
RDB3	4	0	4
RDBK	0	1	1
N	25	1	26
Na	0	5	5
Nb	0	14	14
total	33	23	56
local	10	14	24
total	43	37	80
recently described	2	0	2

In both orders the highest number of species were recorded from the traps in the ancient part of Chigwell Row Wood LNR, which were placed at respectively around the two veteran trees (VT0025 and VT0027) at the northern edge of the wood. 30 of the local Diptera or those with conservation status were recorded from these sites, while only 8 were found close to the heath. The proportion of Coleoptera species with conservation status or being local is almost equally distributed between these two areas, with 16 from the heath traps and 17 from the two veteran tree traps. The Diptera samples contained a large number of Fungus Gnat (Mycetophilidae) species (98), which comprise almost 20% of the British Fauna. Almost all of these including Red Data Book species were again found in the traps close to the veteran trees 25 and 27.

The three Red Data Book beetles *Agrilus pannonicus* (RDB2), *Uleiota planata* (RDB2) and *Mordellistena humeralis* (RDBK) and the eight Red Data Book flies *Empis woodi* (RDB3), *Brachypeza armata* (RDB2), *Exechia cincta* (RDB3), *Exechia dizona* (RDB1), *Mycetophila autumnalis* (RDB3), *Mycetophila caudata* (RDB2), *Mycomya insignis* (RDB2) and *Odinia maculata* (RDB3) were recorded during the survey. We also found the two recently described species *Systemus mallochi* and *Mycetophila eppingensis*, which are thought to be very scarce, but have not been allocated status until their distribution is better known. Further information on these and other species can be found in section 6 'Notes on species'.

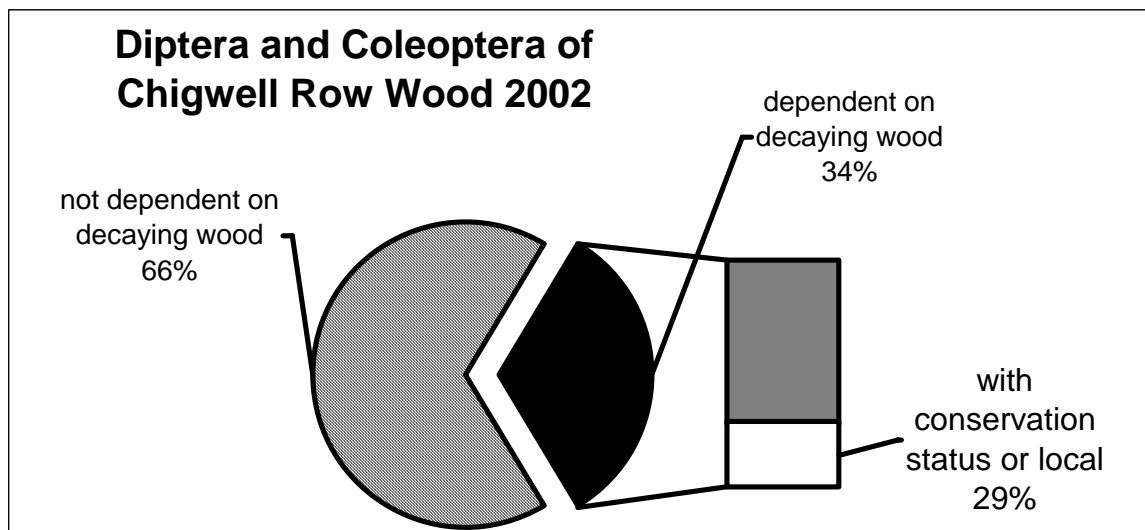


Fig. 1: Proportion of Diptera and Coleoptera in Chigwell Row Wood dependent as larval habitat on decaying wood or associated fungi, based on the data displayed in appendix 1 and 2

Figure 1 shows that 34%, i.e. 133 species of Diptera and Coleoptera, recorded during the survey are dependent on decaying timber or associated fungi. This classification was based on Alexander (2002) and relies on the larval habitat. We have only included species of which larvae were definitely found in the relevant habitat, which was either fungi in woodland (on trees or terrestrial (category 'fungus feeder')), dead or living wood (often on rotting wood or under bark), rot holes (in trees) or sap runs. Twenty nine per cent, i.e. 38 species, of these had conservation status (26 species) or were local (12 species) and one (*Mycetophila eppingensis*) was described in 2001 as new to science from Epping Forest (Chandler 2001).

Ninety two species of Diptera, i.e. a third of those recorded, are dependent on wood in all stages of decay, which include 15 species with conservation status including three Red Data Book species. It is known that *Exechia cincta* (RDB3) and *Exechia dizona* (RDB1) are woodland species, but the larvae have not been found in Britain so far. According to Alexander (2002) 484 species of all British Diptera utilise deadwood or fungi in woodland as their larval habitat. However, not all of these groups were identified and, therefore, only 342 species within the groups identified have decaying timber as their larval habitat. Twenty seven per cent of these, i.e. 92 species, were recorded during this survey. Forty species, i.e. 38%, of all Coleoptera species recorded during this survey depend on decaying wood, 15 of these by feeding as larvae on fungi growing on dead or diseased timber. If one takes the habitat requirements of all life stages into account, the great majority (25) of the species of conservation concern or local status of Coleoptera were associated with woodland; seven species had either no certain association or were associated with other habitats. The comparable figures for the Diptera are extremely similar, 33 woodland species and 4 others. This shows that the rarer species in Chigwell Row Wood LNR are predominantly associated with woodland. A further 19 species of Coleoptera and 19 species of Diptera are certainly associated with woodland, though the larval habitat is unclear.

Of the 98 Mycetophilidae, 16 species had conservation status in Falk (1991), although four of these are recommended for downgrading from this in the Review by Falk & Chandler (in preparation). One species *Mycetophila eppingensis* had been described as new to science since the Review was first drafted and records are still too scarce to assess its status. This and *Exechiopsis crucigera* were in good numbers in the material and can therefore be regarded as established at the site. For further details of the results see appendix 1 and 2.

4. Discussion

The survey revealed a high number of species, i.e. 391 species (286 Diptera and 105 Coleoptera) despite problems with some pitfall traps and non ideal weather conditions. This statement takes into account the relatively short sampling period and the restriction in sampling techniques, but also the fact that due to limited resources Diptera from only four major groups were identified.

The aerial traps were a new design and functioned extremely well. They were almost undisturbed and produced a small amount of material of high quality and interest. Some problems were experienced with the pitfall traps, which were disturbed by humans or dogs in the earlier sampling period and suffered more serious damage in the later period, probably by grey squirrels seeking water during a drought. Due to the very dry summer we delayed the autumn sampling by two weeks. Luckily this ensured some rain during the sampling period, which led to the emergence of many Mycetophilidae, many of which are autumnal species and often feed on fungi. The aerial traps proved to be an excellent tool for recording these species. Almost 20% of all Mycetophilidae species known from Britain could be recorded from Chigwell Row Wood, 13 of these had not even been found in Epping Forest, which contains approximately 50% of the British Fauna.

Approximately one third of the species recorded are dependent on dead wood or fungi and an even higher proportion are typical woodland species. Of these 80 species of conservation status or local species were caught during this survey, which included 43 Diptera species. Of the latter 15 species of conservation concern and 6 local species are known to be dependent on decaying timber or fungi in woodland as their larval habitat. However a further 9 notable species, one local species and the recently described *Mycetophila eppingensis* are all found in woodland, two of these are even indicator's of primary woodland (*Eumerus ornatus* (strong indicator) and *Chalcosyrphus nemorum* (good indicator)) according to Stubbs (1982). This shows that 31 Diptera species, which are local or have conservation status, are associated with woodland. If one takes into account the further species of Diptera or Coleoptera which are probably associated with woodland (although they may also occur in other habitats) almost two thirds of the Diptera and over half of the Coleoptera are associated with woodland. The high proportion of woodland species, many of which are thought to be established, illustrate the good quality of the woodland. The area of ancient woodland in Chigwell Row Woods seems to support the highest number of species, but also the secondary woodland and the heath supported fair amounts of flies and beetles. This indicates that constant deadwood supply seems to be ensured.

Thirteen species of Mycetophilidae, marked with an asterisk in Appendix 1, have not been recorded at Epping Forest, including 4 species with status. Among these 13 species were one male and one female of *Leptomorphus walkeri*, a large conspicuous species which develops on wood encrusting fungi, usually found in low numbers and local but widespread throughout Britain. Of interest are also the records of *Mycetophila caudata*, which is a mainly Scottish species in Britain but was recorded from Epping Forest and is otherwise known in England from King's Forest, Suffolk. This last site is known to be important for rare Diptera.

The results from this survey need to be placed in a larger context. Chigwell Row Wood is ancient woodland with much dead and decayed wood. It was not possible to compare Chigwell Row Wood with Hainault Forest because data from this site was not available. Data is available for Diptera from Epping Forest, Essex and Burnham Beeches NNR Buckinghamshire (Ismay, 2001). The present study records 286 species of Diptera from Chigwell Row Wood, while in 2001 the list for Epping Forest was 1586 and that for Burnham Beeches was 1372 species. However, the Epping and Burnham surveys were much larger projects over many years and were backed by earlier records. Both sites are much larger and contain a greater variety of habitats.

The surveys used more specialists in the field and several years of Malaise trap results. The Chigwell Row Wood survey was a much smaller project, concentrating on many fewer insect groups and with no earlier records. A larger study including further groups of Diptera would certainly greatly increase the list. Some further material is being examined at present and it is hoped to provide lists for Tipuloidea and Sciaridae in the near future. What is more important is that all three sites had a high proportion of species associated with dead wood, many with conservation status, as one would expect from an ancient forest. Thus, while Chigwell Row Wood may not be as important as Epping or Burnham it has been shown to have an important saproxylic fauna. The insect fauna also contains many species, which are dependent on ancient woodland, thus reflecting the ancient woodland flora. The current management of the site, with a few small changes, should ensure continuity of the saproxylic and ancient woodland fauna.

Chigwell Row Wood is a Local Nature Reserve and should thus be protected from development. However, it is already bordered by houses on its south side and its northwest corner. The meadows to the west, which are a possible food source for saproxylic invertebrates, are owned by a property developer. The results of this study show that Chigwell Row Wood LNR is an important site for saproxylic and ancient woodland insects. It is shown to be ecologically and geographically linked with Hainault Forest. We strongly recommend that the existing Site of Special Scientific Interest at Hainault Forest be extended to cover Chigwell Row Wood, to offer further protection to this important site.

Further studies of this important site could include identification of other groups from the samples taken during the study. Some of the insects recorded seem to have some association with the Goat Moth (*Cossus cossus*) and a moth survey would be beneficial.

5. Recommendations for Management

Chigwell Row Wood is currently well managed, but some problems still remain due to lack of management in earlier years. This resulted in extensive scrub growth, which covered the heath and surrounded the veteran trees, reducing available light. Food sources for adult insects, such as flower-rich ride margins and flowering bushes like hawthorn, became scarce. Here we comment on current management and offer some suggestions to improve the management for Coleoptera and Diptera. We understand that these suggestions need to be included in a broader framework for nature conservation and amenity use.

It is necessary to maintain a mosaic of habitats in the wood, with dense shade and more open areas to allow different species to maintain populations. Some dense scrub will be required for birds, and this is also good for invertebrates. A number of the species of Diptera and Coleoptera recorded may live in bird or mammal's nests. This is largely achieved already, as management resources have been available. However, clearing some areas of the forest so that herbal growth is encouraged would be beneficial to increase the number of food plants such as umbellifers.

The study showed that dead wood and associated microhabitats of fungi etc. are important in Chigwell Row Wood LNR. Old and diseased trees have been retained as far as possible and we agree with this management. The problem with saproxylic insect faunas is that they require a continuous supply of dead wood, recently dead in the case of saproxylic Diptera and some Coleoptera. Some of this supply is natural, as trees die or lose branches. Some dead wood has been supplied by management, by cutting undergrowth or clearing paths. Two points would improve current management. The dead wood produced by cutting has tended to be left near the site of work, but some could be moved around the wood into areas that have not been cut. Also, instead of leaving all logs lying on their side, a proportion should be cut into short pieces and left standing on end. This facilitates the entry of certain species of saproxylic beetles into the log, which then feed in the heartwood.

Standing dead trees should be left in situ if possible, given constraints of public safety. Diseased trees with rot holes and sap runs are especially important since they form a small proportion of the trees at any site. A number of species recorded here are known to favour trees damaged by the Goat Moth (*Cossus cossus*), but this species was not seen on site. It is possible to remove a dangerous branch from a dead or live tree and leave the remainder of the tree standing – this attracts a different fauna to that of lying dead wood. This point seems to have been accepted by the Council already. Very old dead standing trees are important nesting sites for aculeate Hymenoptera (bees and wasps), which were not covered in this survey.

The policy of clearing the area around veteran trees of scrub is an excellent one and should be given high priority. Similarly, old pollards have been recut and some new ones created. Care should be taken that age gaps are avoided so that constant dead wood supply is ensured. This could be done by encouraging regrowth of trees where necessary or by pollarding or coppicing. When clearing scrub, it is beneficial to leave some ivy where it will receive full sunlight. This encourages the ivy to flower, offering a good pollen and nectar source at a difficult time of the year for invertebrates.

Saproxylic insects have complex requirements beyond a supply of dead wood. Many adults need a pollen or nectar source if they are to breed successfully. Because Chigwell Row Wood LNR has been neglected in the past, there are few suitable areas for adult feeding. Such sources are provided by the opening of paths, open areas in the wood created by clearance (or arson!) and clearance around old trees. The heath restoration project is also important and should continue to

have priority. This could also support a slightly changed fauna since some grassland species were already recorded from there.

A further suggestion to create food sources, but also encourage some grassland species, is that management of the recreation area on the north side and the grass strip along the road on the east side of the site is changed to allow some areas alongside the wood to develop into flower-rich grassland by reducing cutting to a 2-3 year rotation. Similarly, sympathetic management of the field to the west of the wood might help increase pollen and nectar sources. Such management would also provide breeding sites for some important grassland species, which might well be in the meadows around Hainault Forest.

6. Notes on species

The species accounts given below are intended to give an indication of the importance of the species for conservation, the main habitat requirements and any special management requirements, which need to be considered. The great majority of species are associated with dead wood and management is considered in that section. Only species with conservation status for which further information was available are included.

6.1. DIPTERA

Lucilia ampullacea (Calliphoridae) L

This green bottle fly is local in the southern half of England. The larvae of this genus live in carrion or wounds on animals. This species has been recorded as an internal parasite of a toad, but probably more typically lives in carrion.

Elachiptera austriaca (Chloropidae) N

This fly is definitely associated with wetlands and frequently with *Phragmites* beds. It is recorded from a wide area of England and Wales, but is extremely local. The life-history is unknown, but related species are saprophagous, usually in decaying plant-tissue.

Lasiamba brevibucca (Chloropidae) N

A fly of old woodland and parkland with records widely scattered in southern England, the Midlands and East Anglia. The larvae develop in rotting wood and sap runs and have been associated with damaged oak trees.

Clusiodes ruficollis (Clusiidae) L

An uncommon species from southeast England and some northern Scottish localities. Larvae and puparia have been found under the bark of a recently felled hornbeam. It was formerly recorded under the name *C. fascialis* Collin.

Chrysotimus flaviventris (Dolichopodidae) N

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. It is uncommon in the southern half of England.

Systemus mallochi (Dolichopodidae) **recently described**

This species was described as new to science in 1997 and is only known from two localities in Suffolk, one in Yorkshire, one in Scotland and this record from Essex. It is confined to broad-leaved woodland. Recent work has shown that *Systemus* breeds in sap exudations on broad-leaved trees or rot holes in trees and is difficult to sample unless rot holes are specially targeted. Future work may therefore show that the species is more widespread. The larvae are predacious on other fly larvae in exudations or rot holes. The species has no current status, but will probably be given the equivalent of RDB status when its distribution is better known.

Systemus scholtzii (Dolichopodidae) N

The species is recorded from widely scattered localities in southern England. Most records are from ancient broad-leaved woodland and parkland. Recent work has shown that *Systemus* breeds

in sap exudations on broad-leaved trees or rot holes in trees and is difficult to sample unless rot holes are specially targeted. The larvae are predacious on other fly larvae in exudations or rot holes.

Thrypticus pollinosus (Dolichopodidae) **N**

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. It is widespread but scarce. The larvae are stem miners in monocotyledons.

Empis woodi (Empididae) **N**

This species has been widely recorded from the south of England. Its habitat is open chalk downland, ancient broad-leaved woods and parkland. The early stages are unknown.

Fannia aequilineata (Fanniidae) **N**

This species has been recorded from the southern half of England. Its habitat is ancient broad-leaved woodland. The fly has been bred from wood detritus and the fungus *Polyporus dryadeus*. The adult has been found attracted to sap runs, especially on trees infested by the Goat Moth (*Cossus cossus*).

Oedalea tibialis (Hybotidae) **N**

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. It is associated with ancient broad-leaved woodland. The larvae live in dead wood and are probably predatory on other invertebrates.

Oedalea zetterstedti (Hybotidae) **N**

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. It is associated with ancient broad-leaved woodland. The larvae live in dead wood and are probably predatory on other invertebrates.

Keroplatus testaceus (Keroplatidae) **N**

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. It appears to be increasing in frequency. It is found in old broadleaved woodland with abundant dead wood and bracket fungi. The larvae have been found in silken webs on the underside of polypore fungi on dead wood and are thought to feed on fungal spores.

Lonchoptera tristis (Lonchopteridae) **L**

This is an uncommon species usually associated with streams in ancient woodland. The larval stages are probably scavengers under stones and leaves on stream margins.

Helina abdominalis (Muscidae) **N**

This species occurs sparsely throughout England and South Wales. It occurs in broad-leaved woodland of a variety of types. The biology is unknown.

Helina pertusa (Muscidae) L

This is an uncommon species found in England north to Yorkshire. It is a characteristic species of dead wood habitats. The larvae are found in rot holes and under bark of dead trees.

Phaonia cincta (Muscidae) N

The species is recorded from England as far north as York and South Wales. It is found in ancient broad-leaved woodland and old parkland. Larvae have been found in sap runs on elm and horse chestnut.

Phaonia mediterranea (Muscidae) N

The species is widespread in southern England and South Wales and although there are few records, the species has been added to the British List relatively recently. It is found in broad-leaved woodland and parkland. The early stages are unknown.

Phaonia pratensis (Muscidae) N

The species is recorded from England as far north as Northumberland and South Wales. It is found in ancient broad-leaved woodland, particularly those with old and damaged trees, including those infested with the Goat Moth, *Cossus cossus*. The larvae are found in rot holes and sap runs.

6.1.1. Fungus gnats

Fungus gnats (Mycetophilidae) are associated with fungi. About 75% of the species are associated with fungal fruiting bodies and about 20% with dead wood. They are characteristic of woodland sites with a high diversity of fungi. Chigwell Row Wood has an outstanding list of fungus gnats considering the size of the wood and the survey effort expended.

Anatella lenis (Mycetophilidae) N

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. However, it is still very local and known from old broad-leaved woodland in southern England. This species has been reared from the wood-decay fungus *Exidia glandulosa* (Alexander, 2002).

Boletina nitida (Mycetophilidae) N

This fungus gnat, which has been recorded from both broad-leaved and coniferous woodland, is widespread in the south. Its biology is unknown.

Boletina pallidula (Mycetophilidae) N

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. This fungus gnat, which is known from Gloucestershire to Suffolk and Norfolk and from Wales, is a widespread but local woodland species in the south.

Brachypeza armata (Mycetophilidae) **RDB3**

This species is listed as Notable in Falk (1991) but will be reduced in status to Notable in a forthcoming Review. It has been reared from *Pleurotus* species and also terrestrial fungi. This fungus gnat can be found in broad-leaved woodland including ancient woodlands. In Windsor Forest adults were recorded around *Pleurotus cornucopiae* on decaying beech.

Brachypeza bisignata (Mycetophilidae) **N**

This species has been reared from *Pleurotus ostreatus*, the adults were found around *Pleurotus* species on decayed beech in Windsor Forest. This fungus gnat has been recorded from ancient broad-leaved woodland. It is a widespread but very local species, which occurs most frequently in North Wales.

Exechia cincta (Mycetophilidae) **RDB3**

This species is listed as Notable in Falk (1991) but will be reduced in status to Notable in a forthcoming Review. This fungus gnat was found in southern England and South Wales, and one Scottish locality. It is known from about 20 sites. Some records were from near to woodland streams. The larvae of this species develop in soft fungi.

Exechia dizona (Mycetophilidae) **RDB1**

This species is known from only four other British records, from Hereford, Cumberland, Pembrokeshire and an older record from Dorset. This fungus gnat was not found in Epping Forest. In Russia it is known to develop in gill fungi (*Russula*, *Stropharia* and *Mycena*).

Exechiopsis crucigera (Mycetophilidae) **N**

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. This fungus gnat is found in woods and gardens. The biology of this species is unknown, but related species develop in soft fungi. It is widespread but local and has been recorded from Wales and England as far north as Durham.

Leptomorphus walkeri (Mycetophilidae) **L**

This is a large conspicuous species, usually found in low numbers but widespread throughout Britain. It develops on the wood encrusting fungi, *Xylodon versipora*.

Mycetophila autumnalis (Mycetophilidae) **RDB3**

This species is listed as Notable in Falk (1991) but will be reduced in status to Notable in a forthcoming Review.

Mycetophila caudata (Mycetophilidae) **RDB2**

This species is listed as Notable in Falk (1991) but will be reduced in status to Notable in a forthcoming Review. This is a mainly Scottish species in Britain but is also known from Epping Forest. The habitat in Scotland is Caledonian pine forest and the larvae probably develop in lignicolous fungi.

Mycetophila eppingensis (Mycetophilidae) **recently described**

This species was described after the family had been assessed for species with conservation concern. It is uncommon but occurs in several counties in southern England (P.J. Chandler, pers. comm.).

Mycomya flavicollis (Mycetophilidae) **N**

Most records for this species are from the south of England, with one from Lancashire. This fungus gnat is found in dry broad-leaved woodland, especially on calcareous soils. The biology of this species is unknown but larvae of this genus have been reared from fungi.

Mycomya insignis (Mycetophilidae) **RDB2**

This species is listed as Notable in Falk (1991) but will be reduced in status to Notable in a forthcoming Review. It has been found on the fungus *Xylodon*. The biology of this species is unknown but larvae of this genus have been reared from fungi or associated with fungi on dead wood. It is not known from Epping Forest.

Phronia disgrega (Mycetophilidae) **N**

This species is listed as Notable in Falk (1991) but will be reduced in status in a forthcoming Review. This fungus gnat is widespread, but infrequently recorded.

Rymosia signatipes (Mycetophilidae) **N**

This uncommon fungus gnat has a widely scattered distribution in southern England and Wales and is known to occur in damp broad-leaved woodland.

Trichonta clavigera (Mycetophilidae) **N**

This species is distributed throughout Britain, and is mainly known from ancient broad-leaved woodland. The biology of this fungus gnat is unknown, but species in this genus usually develop on the surface of fungi encrusting dead wood.

Odinia maculata (Odiniidae) **RDB3**

This species is known only from very few records, scattered across southern England. It is associated with ancient woodland and parkland. The larvae have been associated with beetle borings in trees and oaks attacked by the goat moth (*Cossus cossus*).

Palloptera scutellata (Pallopteridae) **L**

This species is local in southern England. It is found in a variety of habitats, including the edges of wetlands and heaths. The early stages are unknown, but there is no association with old woodland. Related species include plant and dead wood feeding species.

Pherbellia annulipes (Sciomyzidae) **N**

Records of this species are scattered in southern England and Wales. It is associated with old broad-leaved woodland. The early stages are predatory on snails, probably on dead wood as the adults are usually found on dead wood.

Chalcosyrphus nemorum (Syrphidae) **L**

The species is widespread in England, Wales and Scotland but local everywhere. The habitat is wet woodland. It is associated with the early stages of decay of waterlogged wood, either decaying sap or moist decaying bark and sapwood (Alexander, 2002). Stubbs (1982) selected this species as a good primary woodland indicator.

Eumerus ornatus (Syrphidae) **N**

The species is found in England and the south of Scotland. It is particularly recorded from old woodlands. Although the early stages are unknown, other species in the genus feed in bulbs as larvae. Stubbs (1982) selected this species as a strong primary woodland indicator. From Essex it is known from only two recent records according to the Essex RDB and listed as Essex scarce with the threat status Essex threatened.

Pipizella virens (Syrphidae) **N**

This species is recorded as far north as Yorkshire and seems to have a preference for dry grassland and woodland rides and margins. The larvae reportedly feed on aphids on the roots of umbelliferous plants. This species is known in Essex from the Thames Terraces and only from post-industrial sites according to the Essex RDB. It is listed as Essex scarce with regional importance.

Ctenophora pectinicornis (Tipulidae) **N**

The species is widespread in southern Britain. It is found in broad-leaved woodland and the larvae live in rot holes and dead wood of large broad-leaved trees.

Dictenidia bimaculata (Tipulidae) **L**

This species is widespread but local in England, but there appears to be only two other Essex records. It is well established in Chigwell Row Wood and females were seen investigating hornbeam pollards. The larvae develop in well-rotted timber of several species of broad-leaved trees. This species is genuinely scarce in Essex and has so far only been recorded from Epping Forest and Hainault Forest (<http://www.essexfieldclub.org.uk/ERDlist/ERDB.htm>).

6.2. COLEOPTERA

Rhynchites interpunctatus (Attelabidae) **Nb**

This small shining blue leaf-rolling weevil is widespread but local in southern England and Wales in broad-leaved woodland. It is phytophagous and has been found on oak and hawthorn.

Diplocoelus fagi (Biphyllidae) **Nb**

This small dark reddish beetle is associated with beech and is particularly found under the bark of dead wood. It is local in southern and central England (Hyman & Parsons, 1992). Its habitat is ancient broad-leaved woodland and pasture-woodland.

Agrilus pannonicus (Buprestidae) **RDB2**

The Oak Jewel Beetle is known from southern England as far north as Sherwood Forest. It is confined to ancient woodland with oaks. The larvae develop in and under oak bark and seem to attack old, dying and dead trees. The lack of recent records from some older sites seems to indicate that some of its former strongholds may have become unsuitable for the species.

Notiophilus rufipes (Carabidae) **L**

This is a small bronze ground beetle with red legs. It is predatory, diurnal and lives in damp open conditions, sometimes among leaf litter. It is local in southern England and rare in the north.

Platyderus ruficollis (Carabidae) **Nb**

This ground beetle is known from England and North Wales. It is recorded from a variety of open habitats including heathland and is found amongst leaves, moss and other vegetation, and under stones. It is predatory.

Leptura scutellata (Cerambycidae) **Na**

This moderately-sized longhorn beetle can be found in old broad-leaved forests with many ancient trees (Alexander, 2002). The larvae develop deep in dead wood, particularly in sun-exposed stumps, trunks or larger pieces of beech, but also in oak, birch, hornbeam and sycamore. This species is confined to southern England, as far north as Nottinghamshire. Adults can occasionally be found visiting flowers such as umbellifers, bramble, rose and hawthorn.

Cerylon histeroides (Cerylonidae) **L**

This small beetle is found under the dead bark of broad-leaved trees in old woodland and wood pastures. It is widespread in Britain, but most frequent in lowland England. The family is known to feed in fungal hyphae and spores.

Notolaemus unifasciatus (Cucujidae) **Na**

This flat bark beetle is known only from southern England and is very local. It is recorded from ancient broad-leaved woodland and pasture-woodland. It has been found under the bark of dead beech, and also associated with oak and hornbeam.

Uleiota planata (Cucujidae) **RDB2**

This small dark brown beetle lives under the bark of various tree species, most commonly beech, but has also been recorded from wych elm, oak, silver birch, sweet chestnut and sycamore. This species is associated with ancient broad-leaved woodland and is very rare, known from very few sites in the Hants, Berks, London area to Lancashire and South Wales. The larvae are found under bark and probably eat fungi.

Coeliodes dryados (Curculionidae) **L**

This small reddish weevil is known to be widespread but local. It lives on the foliage of oak.

Coeliodes erythroleucos (Curculionidae) **Nb**

This small red weevil is known from England, Scotland and Wales. It is found in broad-leaved woodland, oak scrub and wooded heathland. The larva feeds on the female flowers of oak.

Curculio villosus (Curculionidae) **Nb**

This large 'nut' weevil is a local species, but becomes rarer in the north (Hyman & Parsons, 1992). Its habitat is broad-leaved woodland. It is phytophagous, feeding on oak. The larvae develop as inquilines in 'oak-apple' galls induced by *Biorhiza pallida* (Hymenoptera), and very occasionally as inquilines of bedeguar galls on rose, induced by *Diplolepis rosae* (Hymenoptera).

Melasis buprestoides (Eucnemidae) **Nb**

This false click beetle is recorded from England and Wales; it is widespread but local (Hyman & Parsons, 1992). The habitat is broad-leaved woodland and pasture woodland. It has been associated with oak and birch, among other deciduous trees. The larvae develop in hard dead wood of standing trunks, stumps and both fallen branches and those remaining on the tree.

Nemadus colonoides (Leiodidae) **L**

This is a very small pitchy coloured beetle recorded as far north as Yorkshire, but is very local. It lives in rotting wood under bird's nests in hollow trees.

Conopalpus testaceus (Melandryidae) **Nb**

This false darkling beetle is restricted to England and Wales in Britain. It is known from ancient woodland, wooded bogs and other habitats. There is also an association with ancient wood-pastures. It can be found under the bark of dead branches, including those of oak. The larval food appears to be unknown.

Aplocnemus pini (Melyridae) **Nb**

This small dark brown beetle has been recorded from under the bark of deciduous trees, including oak and hawthorn. The habitat is ancient broad-leaved woodland and pasture-woodland. It is recorded from England and Scotland. The larvae of this family of beetles are predatory, though some may be associated with dead wood because of their hosts (e.g. scolytid beetles).

Mordellistena humeralis (Mordellidae) **RDBK**

This beetle is known from two vice-counties in England. It is recorded from broad-leaved woodland. Larvae develop in either dead wood or plant stems.

Mordellochroa abdominalis (Mordellidae) **L**

This medium-sized red and black beetle is found as an adult on flowers, particularly umbellifers. Its habitat is broad-leaved woodland. The larvae are thought to develop in rotting wood or plant stems. It is a southern species and is local.

Cryptarcha strigata (Nitidulidae) **Nb**

This is a small yellow spotted black beetle, widely distributed in England and Wales but very local. It is found in broad-leaved woodland and pasture-woodland. There is an association with sap runs on trees, particularly those caused by the larva of the goat moth (*Cossus cossus*). The goat moth is now very local. Trees damaged by this moth should therefore be retained wherever possible.

Cryptarcha undata (Nitidulidae) **Nb**

This species is widespread but local in England. It is found in broad-leaved woodland and pasture-woodland. It is found on sap runs on oak, under bark and there is also an association with the larval burrows of the goat moth (*Cossus cossus*). The goat moth is now very local. Trees damaged by this moth should therefore be retained wherever possible.

Biblopectus pusillus (Pselaphidae) **N**

This tiny brown beetle is usually found in grass tussocks or thick damp moss. It is recorded from England, Wales and southern Scotland and has a wide distribution but is very local. The adult may be predatory on mites. The record was from the Heath site and management recommendations for this species include the retention of a high water table, but also safeguarding of the *Deschampsia* tussocks.

Euplectus sanguineus (Pselaphidae) **L**

This tiny reddish short-winged mould beetle lives under bark. It is widespread but local. Beetles of this family are predatory, particularly on mites.

Ptinus sexpunctatus (Ptinidae) **Nb**

This spider beetle is known from England and southern Scotland. The ecology of the species is not understood, but the species may be associated with dead wood. It has been recorded from the nests of bees and house martins.

Rhizophagus parallelocolis (Rhizophagidae) **L**

This species is commonly known as the Graveyard Beetle since it is able to colonise human corpses in fairly deep graves. It is also found under bark and in rotting fungus and carrion. It is widespread but local.

Prionocyphon serricornis (Scirtidae) **Nb**

This species is known from very few sites in England, Wales and Scotland. The habitat is ancient broad-leaved woodland and pasture-woodland. There is an association with wet or water filled rot-holes in trees and the larva is probably predatory.

Dryocoetinus villosus (Scolytidae) **L**

This is a local 'bark' beetle. The larvae bore into the wood of oak, beech and chestnut.

Xyleborus dispar (Scolytidae) **Nb**

This bark beetle is found in England in broad-leaved woodland. The larvae live under the bark of a wide variety of trees and the adults carry a fungus that lines the brood channels and forms the food of the larvae.

Xyleborus saxeseni (Scolytidae) **L**

This very local bark beetle is associated with the hard dead wood of broad-leaved and coniferous trees in lowland England.

Anaspis thoracica (Scraptiidae) **Na**

The species is recorded from England and southern Scotland. It is found in woodland and woodland margins and the larvae probably develop in dead wood. Adults may be found on flowers.

Mycetochara humeralis (Tenebrionidae) **Na**

This darkling beetle is recorded from southern England. It is associated with ancient broad-leaved woodland and is found in dead wood and under bark. The larvae develop in rotten wood and are recorded from several species of tree including oak.

Tetratoma desmaresti (Tetratomidae) **Na**

This is a small metallic beetle that is recorded from England and southern Scotland, but there are only five recent vice-county records and the species is now very local. It is found in old woodlands and pasture woodland. The larva has been found in a fungus on oak.

7. Acknowledgements

We thank the Curator, Professor S.J. Simpson, Hope Entomological Collections, Oxford University Museum of Natural History (= OUM) for facilities during this survey. Ms Stella Brecknell of the OUM Library kindly provided literature, which was of great assistance to us. This project depended on the cooperation of experts in identifying specimens, particularly Darren Mann, OUM (Coleoptera), James Hogan, OUM (Carabidae), Adrian Pont (Muscidae and Fanniidae), Peter Chandler (Mycetophilidae), Roy Crossley (Empidoidea) and David Gibbs (Pipunculidae), to whom we are very grateful. We also wish to thank Darren Mann, OUM for his information and comments regarding the life history of the Coleoptera. We are indebted to Martin McCleary (Epping) who assisted with sampling. We are grateful to Paul Hewitt and the staff of Countrycare, Epping Forest District Council who suggested and organised the project, placed the aerial traps in trees and supported in many other ways. We thank Epping Forest District Council and English Nature for financial support.

8. References

- Alexander, K.N.A. 2002. The invertebrates of living and decaying timber in Britain & Ireland – a provisional annotated checklist. *English Nature Research Reports* No. 467: pp. 1-142.
- Chandler, P.J. 1998. Checklists of insects of the British Isles (New Series) Part 1: Diptera. *Handbooks for the identification of British Insects* **12**.
- Chandler, P.J. 2000. Corrections and changes to the Diptera Checklist (4) – Editor. *Dipterists Digest*(2) **7**(2):81-82.
- Chandler, P.J. 2001. Corrections and changes to the Diptera Checklist (5) – Editor. *Dipterists Digest*(2) **8**(1):67-70.
- Chandler, P.J. 2001. Fungus gnats (Diptera, Sciaroidea) new to Britain. *British Journal of Entomology and Natural History* **13**: 215-243.
- Chandler, P.J. 2002. Corrections and changes to the Diptera Checklist (8) – Editor. *Dipterists Digest*(2) **9**(2):150-152.
- Falk, S. 1991. A review of the scarce and threatened flies of Great Britain. (part 1). *Research and survey in nature conservation* 39: pp.194
- Falk, S. & Chandler, P.J. In Preparation. A review of the scarce and threatened flies of Great Britain. (Nematocera and Aschiza). *Research and survey in nature conservation*.
- Falk, S. & Crossley, R. In Preparation. A review of the scarce and threatened flies of Great Britain. (Empidoidea). *Research and survey in nature conservation*.
- Falk, S. & Ismay, J.W. In Preparation. A review of the scarce and threatened flies of Great Britain. (Acalyptrata). *Research and survey in nature conservation*.
- Falk, S. & Pont, A.C. In Preparation. A review of the scarce and threatened flies of Great Britain. (Calypttrata). *Research and survey in nature conservation*.
- Hyman & Parsons - 1992, A review of the scarce and threatened Coleoptera of Great Britain. Part 1. UK Nature Conservation No. 3.
- Hyman & Parsons - 1994, A review of the scarce and threatened Coleoptera of Great Britain. Part 2. UK Nature Conservation No. 12.
- Ismay, J.W. 2001. The flies (Diptera) of Epping Forest. *The Essex Naturalist* (New Series) **18**: 105-112.
- Ismay, J.W. and Schulten, B. 2003. Development of Understanding of Habitat Requirements of Invertebrates on Priority Habitats: Diptera, Acalyptrata – *Buglife (unpublished report)*: 1-165.
- Luff, M. & Duff, A.G. 2004. Carabidae In: *Checklist of Beetles of the British Isles*. Revised 18th February 2004. www.coleopterist.org.uk.
- Recorder 2002, Version 2.3.1.0, JNCC 2002.

Stubbs, A.E. 1982. Hoverflies as primary woodland indicators with reference to Wharncliffe Woods. *Sorby Record*. **20**: 62-67.

Appendix 1

Appendix 2