13

The insects and other invertebrates of Alderley Edge

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Introduction

Dmitri V. Logunov

> Insects glistened in the sunshine,
> Insects skated on the water,
> Filled the drowsy air with buzzing.
> H. W. Longfellow (1856), *Hiawatha*, Pt 2, XVIII, The Death of Kwasind

From every point of view, 'bugs' – the insects and other invertebrates – represent the most diverse group of organisms both locally on Alderley Edge and nationally in the British Isles. The total number of bugs recorded from the Edge by the Alderley Edge Landscape Project (AELP) is 1,732 species: they are listed in Appendix 13.1. The total numbers of the eight groups of bugs recorded on the Edge is summarised in Table 13.1. The best-represented are the harvestmen, with their total accounting for 44 per cent of the British species; the least represented are the Hymenoptera, at 1.7 per cent. As a whole, the groups given in Table 13.1 make up about 7 per cent of the British list of invertebrate species. The total of 1,732 species for Alderley Edge is by no means exhaustive because for many practical reasons only selected groups were surveyed and identified. For instance, the soil fauna remains totally unknown. Given that over 2,135 species of insects and other invertebrates have been found in just a single ordinary suburban garden in Leicester (although collected

Table 13.1. Numbers of species in selected groups of invertebrates recorded on Alderley Edge and in the British Isles as a whole

Taxonomic group	*Alderley Edge*	*British Isles*	*% of British Isles*
True Bugs (Hemiptera)	134	*c.* 1,830	7.3
Beetles (Coleoptera)	363	4,034	9.0
Butterflies and moths (Lepidoptera)	616	2,717	23.0
True flies (Diptera)	216	7,035	3.1
Ants, wasps, bees (Hymenoptera)	128	7,517	1.7
Spiders (Araneae)	137	649	21.1
Harvestmen (Opiliones)	11	25	44.0
Centipedes and millipedes (Myriapoda)	17	156	10.9

Note. The term 'True Bugs' is in different contexts used to denote the entire order of Hemiptera but alternatively specifically the suborder Heteroptera.
Source: author generated; total counts of species of each order in the British fauna were taken from various sources.

over a period of thirty years: see Owen, 2010), the number of bugs from the Edge is indicative of how poorly their real diversity over the site is currently known: the figure should at least be trebled.

For instance, to date, the best-studied and therefore the richest insect fauna of Alderley Edge is that of the Lepidoptera (butterflies and moths), with 616 recorded species (Table 13.1). In the UK there are 2,717 recorded Lepidopteran species (see Kimber, 2014), accounting for 11 per cent of the entire British list of insects (*c.* 25,054 species). By extrapolating this proportion, as 616 species representing about 11 per cent of the entire insect diversity of the Edge, one could estimate its diversity as about 5,600 species of insects. An estimate of about 4,600 insect species can be calculated if one uses the spiders, which are relatively well studied on the Edge, as a proportional value. However, the real diversity of the entire fauna of invertebrates of Alderley Edge must be even greater.

Some readers might think that with a few exceptions creepy-crawlies, so often referred to as 'pests', are not worthy of all this attention and discussion. We all are rather happy with showy butterflies flapping around us or birds singing in the air and obviously doing it for our own pleasure. As T. Turpin (2009) remarked, 'one reason for insects is, no doubt, to give poets something to write about!' However, myriads of unnoticeable bugs are the cornerstones of all existing ecosystems, providing vital ecological services on which humans depend: they pollinate flowers and crops, recycle our wastes and do many other invisible jobs in our gardens. Insect pollinators such as honeybees, bumblebees, butterflies and hoverflies are thought to contribute to one in every three mouthfuls of the food that we eat. As Losey and Vaughan (2006) put it, 'love them or hate them, we need insects for global survival!', and therefore bugs

deserve our special attention. One can only agree with Jennifer Owen, the author of *The Ecology of a Garden* (1991), who argued that 'there are no pests, because everything in my garden is a source of interest and enjoyment'. Therefore let us talk a little about the interest and enjoyment that our diminutive neighbours can generate if we pay a little attention to them.

The brief essays that make up the rest of Chapter 13 are devoted to various groups of bugs and are written in a manner that will (we hope) make them interesting for non-entomologists; the intention is to arouse readers' enthusiasm rather than overloading them with technical details and terms. For this reason they are better used in conjunction with the more detailed and specialised literature devoted to each of the groups we discuss and which we mention in its context, and with the excellent account of the cultural stories of the British invertebrates called *Bugs Britannica*, by Marren and Mabey (2010). At the same time it is also our hope that these essays and especially the checklist in Appendix 13.1 will draw the attention of local entomological enthusiasts to the bug fauna of Alderley Edge and to the need for a thorough inventory. Further progress in the study of this fauna will certainly depend on those individual enthusiasts who are ready to take on this challenge.

To help the reader identify the insects mentioned in this chapter, the *Collins Pocket Guide to the Insects of Britain and Western Europe* by Chinery (1986, and subsequent editions) and the comprehensive field guide by Brock (2014) are recommended. Some of the more detailed guides to particular groups of British insects are mentioned in the relevant sections and in Appendix 13.1. For a comprehensive account of specialised literature on British insects and other invertebrates see Barnard (1999, 2011).

A. True Bugs (Hemiptera) and smaller orders of insect

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> Yet let me flap this bug with gilded wings,
> This painted child of dirt that stinks and stings.
> Alexander Pope (1735), 'Epistles to Several Persons: Epistle to Dr. Arbuthnot'

The Hemiptera, or True Bugs, constitute a diverse group of insects with incomplete metamorphosis in which the young bugs (nymphs) develop gradually, resemble miniature wingless adults and do not undergo a pupal stage. The word 'bug' is thought to derive from the Middle English word *bugge*, meaning a 'spirit' or 'ghost' (Schaefer, 2003): should one awake in the morning with small, red itching welts and swellings, these

marks were mistakenly attributed to a malevolent spirit called a *bugge*; yet the real culprit was in fact the Bedbug (*Cimex lectularius*). Thus the 'bad' habits of one creature gave its name to the whole group of its 'better' relatives. All True Bugs are characterised by piercing mouth parts (termed the rostrum), like a tiny hypodermic needle, which they use to suck up liquid food: juices from plants or body fluids from other insects, or even the blood of vertebrates (e.g. the already mentioned Bedbug, not yet formally recorded from the Edge). Some plant-feeding bugs such as Greenflies are all too familiar. A total of 134 species of the Hemiptera have been found on Alderley Edge, while some 1,830 species are known nationally (see Appendix 13.1; Table 13.1; Bantock and Botting, 2010).

Traditionally, the Hemiptera were subdivided in two suborders: the Heteroptera (True Bugs) defined by the forewings lying flat over the body and partially sclerotised (horny at the base and membranous at the apex); and the Homoptera (Froghoppers, Leafhoppers, Greenflies, etc.), in which both pairs of wings are membranous and uniform in texture and are held roof-like over the body. However, recent morphological studies and DNA analysis strongly suggest that the Homoptera is not a natural taxonomic unit and consists of at least four suborders (see Henry, 2009, for a discussion; Barnard, 2011). In the present section, the information is presented in the traditional way (Heteroptera and Homopteran bugs), whereas the checklist of recorded species in Appendix 13.1 is given according to the modern taxonomic classification. This section is best used in conjunction with the comprehensive synopsis on the British Heteroptera by Southwood and Leston (1959; see Nau, 2006, for the corrected bug names used in the latest books) and with the good introduction to the biology and ecology of the British Hemiptera with identification keys to families by Dolling (1991). Useful general information on the True Bugs can also be found in Schuh and Slater (1995); aquatic groups of bugs are briefly covered by Greenhalgh and Ovenden (2007); and an illustrative identification guide to the British Hemiptera with many impressive colour images has been assembled by Bantock and Botting (2010).

Although the known diversity of the Hemiptera of Alderley Edge may seem impressive (134 species), it is much less than the diversity yet to be discovered. One of the obvious reasons why the True Bugs are so diverse is that many of them (the Homopterans in particular) are food plant specific and therefore their diversity on the Edge should be equal to or more than that of the vascular plants (351 species; see Chapter 9). The diversity of bugs and their lifestyles can explain why insect enthusiasts find them so fascinating to study and observe. Even gardeners should learn more about their habits in order to see that not all of them are foes.

Heteroptera

The Heteroptera (True Bugs) represent the largest and wonderfully diverse group of bugs, with 563 species found in the UK (Nau, 2006) and some 42,350 species worldwide (Henry, 2009). The currently known fauna of True Bugs of Alderley Edge is modest, numbering eighty-nine species only (Appendix 13.1). Nevertheless, the fauna contains a number of species with interesting lifestyles. In the text that follows, the counts of British species in various Heteropteran families follow Nau (2006).

The most familiar and easily recognisable group of the True Bugs seem to be Shield Bugs of the families Acanthosomatidae (three species, five nationally) and Pentatomidae (two species, nineteen nationally). Usually, these are relatively large insects, often shield-shaped, exhibiting a great diversity in colouration. The majority of the Shield Bugs are plant feeders, with a distinct preference for immature fruits and seeds. For instance, the commonest of them, the Hawthorn Shieldbug (*Acanthosoma haemorrhoidale*; Plate 21) feeds on hawthorn, but can also be found on bramble and other fruiting shrubs (parcels 17 and 20b of the biological survey done as part of the Alderley Edge Landscape Project – see Chapter 8), from where one can occasionally pick it up together with berries and then be unpleasantly surprised by the reaction of the bug: when disturbed, Shield Bugs emit an unpleasant pungent scent, sometimes smelling mildly of almonds, hence their other vernacular name of Stinkbug. Interestingly, the stinky smell produced by the Shield Bugs seems to protect them not only from vertebrates but also from ants.

One of the striking biological features of Shield Bugs is their maternal care, which is sometimes even reflected in their names. For instance, the female of the Parent Bug (*Elasmucha grisea*), a common dweller in birch trees throughout the Edge, lays between thirty and forty eggs in a compact mass which is completely covered by her body, so that she can protect the eggs and newly hatched youngsters from predators and parasitoids (see section E for a discussion of parasitoids). A few species of Shield Bug are entirely carnivorous, for instance *Picromerus bidens*, which is found on low vegetation along woodland edges and marsh margins (parcel 17). This species can attack only slow-moving insects which are not equipped to defend themselves, such as moth caterpillars.

Compared with the clumsy carnivorous Shield Bugs, the Assassin Bugs (Reduviidae; one species on the Edge, seven nationally) are far more effective predators, capable of subduing a wide array of prey among other arthropods, which they actively seek out and seize. The only species of the so-called Thread-legged Assassin Bugs (*Empicoris vagabundus*) recorded from the Edge uses only the two hind pairs of its very long and delicate legs for walking. The first pair of legs is raptorial,

as in the Mantids, and is used to hold down its prey – various soft-bodied insects such as Booklice. This Assassin Bug is a cryptically coloured ambusher, commonly found on the trunks and branches of trees.

The small (about 4 mm long or less) and predatory Flower Bugs (Anthocoridae; four common species on the Edge, thirty-four nationally) can be found on almost any plant in parcels 3a, 5, 11d, 17, preferring lower vegetation. The commonest of them is *Anthocoris nemorum*. One of the Flower Bugs (*Tetraphleps bicuspis*) is more specific and is associated with the larch (parcels 4, 20b); adults of this species hide under the bark and the nymphs are normally seen in July and August. A striking biological peculiarity of the Flower Bugs is the so-called 'traumatic insemination', also known in the Bedbugs, that is, the mating practice in which the male pierces the female's abdomen with its sharp penis in order to deposit its semen. How that cruel 'love practice' could have evolved is a matter of debate, but some call it a sexual conflict.

An interesting group of predacious bugs, often flightless, are the Damsel Bugs (Nabidae; four species on the Edge, twelve nationally), of which all of the recorded species prefer a range of open habitats, including grassland, marshy places and ruderal communities (parcels 17, 18). Some species have shortened (in *Nabis flavomarginatus*) or very short (in *Nabis limbatus*) wings and look almost like ants. Even better ant-mimics are the females of the *Loricula* species (Microphysidae, or Minute Bugs; two species on Alderley Edge, eight nationally): these are tiny (1.5–2 mm long), virtually wingless creatures with a narrow orange anterior part of the body and a greatly broadened and rounded dark brown abdomen. *Loricula* species are also notable for their distinctive sexual dimorphism, for the males have normally developed wings. Both *Loricula* species found on the Edge live on the bark of various trees, mostly hiding in the crevices among the lichen on tree trunks, where they hunt Mites, Springtails and fly larvae. Another interesting and rarely encountered bug living beneath the bark of birch and oak trees and feeding on bracket fungi (*Polyporus*) is *Aradus depressus*, the only representative of Flat Bugs (or Bark Bugs) found on the Edge (Aradidae; seven nationally). These bugs have a very flattened body, shortened legs and, what is particularly striking, unlike other True Bugs, their mouth parts are very long and narrow and stored coiled within the head.

There are several medium-sized farmland ponds on Alderley Edge (parcels 11d, 20b, 22) which support a good variety of common water bugs (fifteen species; Appendix 13.1) and other insects (see below); for a general account of the Alderley Edge pondlife see Chapter 12. Most aquatic bugs are predators; perhaps the best-known are Pond Skaters (e.g. *Gerris lacustris*) and the Common Backswimmer (*Notonecta glauca*). The latter species is a highly evolved predator that can readily attack the fry of fish, tadpoles and aquatic insects, immobilising them with a toxic

bite. This bug will even stab a person's fingers painfully if handled. Even so, it is worth trying to grab the bug since the old wisdom teaches us that 'if you can catch a lucky bug out of water, you will have fine luck'. Due to its remarkable 'tail' (a respiratory siphon), the Water Scorpion (*Nepa cinerea*) is another easily recognisable bug of the Edge's ponds; it prefers shallow muddy waters at the margins. They are notable for having a set of three pairs of hydrostatic organs: these detectors of water pressure allow the bug to orient itself in relation to depth, and also give an indication of the deviation of its body from the horizontal. Two species of Water-cricket found on the Edge (*Microvelia reticulata* and *Velia caprai*) are daytime predators, snatching up insects or spiders that fall on the water surface, on which they can walk. Large prey is usually conveyed to the land for consumption. Unlike other water bugs, Water Boatmen (Corixidae; thirty-three species in the UK) are herbivorous, feeding on bottom algae. In order to gather algae they use the modified, spoon-shaped tarsi of their first legs. Another unusual biological feature of the corixids is a courting song produced by males of many species (e.g. *Corixa punctata*) by rubbing the special sound-pegs of their front femora against the resonant head margin, the process called stridulation (as in Grasshoppers). Water Boatmen 'sing' after dusk and their 'songs' can be heard from a few metres away.

An interesting group of bugs which can be collected from the margins of ponds, ditches and slow streams (parcels 17, 18, 20b) is the Shore Bugs (Saldidae; three species on the Edge, twenty-one nationally). Shore Bugs are active predators that have good visual acuity and detect their prey by sight. They are ovoid in outline and are notable for their agility through a combination of fast movements, jumping and flight. Some species (e.g. *Saldula saltatoria*) occur in saltmarshes or small temporarily flooded hollows, always on firm mud; others (e.g. *Chartoscirta cincta*) can be found among reeds and rushes. If truly terrestrial, like *Saldula orthochila*, they prefer acid grassland, sandy heaths and paths on sandy soil (parcel 17b).

Beautiful Lace Bugs (Tingidae; two species on the Edge, twenty-three nationally) are easily recognisable by their bizarre flat bodies and the lace-like reticulation of their pronotum and forewings. Both species found on Alderley Edge (parcels 17a, 18) feed on the underside of leaves of a single host plant or a group of closely related species: the common Gorse Lacebug (*Dictyonota strichnocera*) occurs on gorse and also on broom; *Tingis ampliata*, one of the most frequently encountered Lace Bugs, can be predominantly found on creeping thistle (*Cirsium arvense*).

Over a half of the True Bugs recorded on Alderley Edge belong to two large and diverse families of the Ground or Seed Bugs (Lygaeidae; eight species of eighty-two known nationally) and of the Capsid Bugs (Miridae; forty-five species of 216 known nationally). Most species of the

Lygaeidae are ground-living insects, feeding on mature seeds – hence their two common names. Two of the recorded species are uncommon in northern England: *Kleidocerys ericae*, a heather-feeding bug which is found mainly on heathland in England; and *Cymus claviculus*, a bug preferring drier open habitats such as sandy heaths and dry meadows, where it is associated with knotgrass and toad rush. The Birch Catkin Bug (*Kleidocerys resedae*) is a noisy and smelly bug that in June can swarm on catkins and seed heads of birches and alders (parcels 17, 20b). It can produce a sound by rubbing forewings and hindwings together, which can be heard by the human ear, especially if an insect is placed in a small vial and then shaken – who would not 'sing' when caged!

The Capsid Bugs (Miridae) constitute the largest family of True Bugs, containing nearly one-third of all the True Bugs, with some 10,400 species described worldwide (Henry, 2009). The family consists of soft, delicate-looking bugs of variable size and appearance: their varied colouration can blend well with the foliage, flowers or bark on which they rest or feed. Capsid Bugs easily shed their legs by muscular action if seized by a predator or trapped in a film of moisture (Dolling, 1991). Most Capsid Bugs are herbivorous, feeding largely on developing fruits and seeds and therefore some species may get into conflict with gardeners. For instance, the Potato Bug (*Closterotomus norvegicus*) can occasionally be a pest of crop and garden plants; the polyphagous *Lygocoris* species (e.g. the Common Green Capsids – *Lygocoris pabulinus*) can not only feed on various garden plants but also damage them by injecting their toxic saliva, which kills off tiny areas of plant tissue. A common sign of Capsid damage is distorted, crinkly leaves full of small, brown-ringed holes, while flower buds may never open. On apples they leave raised bumps and scabby patches. Some Capsid Bugs are partly (e.g. the *Phylus* species) or entirely (e.g. *Deraeocoris lutescens*) predacious. All the three *Phytocoris* species found on the Edge not only have a distinctive appearance, due to their long hind femora and very long first antennal segment, but are also predominantly carnivorous. They occur on the trunks and branches of a range of deciduous trees all over Alderley Edge, feeding on small insects and mites. Among predacious Capsid Bugs found on the Edge there are species with rather specialised feeding habits; for example, *Campyloneura virgula* feeds predominantly on Barklice of the family Psocidae.

Identification of the Capsid Bugs is difficult, not only because of their overwhelming diversity but also because many species are wing-polymorphic, in other words, individuals of the same species exist in distinct long-winged and short-winged forms. Such wing polymorphism is especially widespread in the bugs associated with grasses, and it is known in at least seventy-five British Heteroptera species (Waloff, 1983). This phenomenon is also well known in Pond Skaters (Gerridae).

Although factors underlying the wing polymorphism in True Bugs have not been fully understood, it is agreed that a complex hormonal regulation in combination with environmental factors such as density of population, host plant condition and temperature is involved. Of the species recorded from Alderley Edge, the Fern Bug (*Bryocoris pteridis*), occurring on various woodland ferns (parcel 3a), shows strong wing polymorphism in both males and females. The same holds true for *Dicyphus pallicornis*, a garden species commonly found on foxgloves.

Homoptera

Only forty-five Homopteran bugs have been recorded from Alderley Edge to date (Appendix 13.1). The majority of Homopterans are plant feeders that are usually restricted to a single host plant or to a few related plant species. However, there are exceptions: for example, the Common Froghopper (*Philaenus spumarius*), found on the Edge, with over 500 documented food plants, has the broadest known host range of any plant-feeding insect. It is one of the three Froghopper species (Aphrophoridae) found on the Edge (nine species in the UK: Bantock and Botting, 2010). Although most readers will probably not have seen adult Froghoppers, many (if not all) will be familiar with the frothy masses, commonly known as 'cuckoo spits', which can be seen on grassy plants around Alderley Edge in spring and early summer. The name 'cuckoo spit' seems to originate from antiquity, when Aristotle taught that instead of laying eggs like other birds cuckoos spat their young into the world, and the tiny being inside the spit was a baby cuckoo (see Marren and Mabey, 2010). Contrary to the opinion of the great Aristotle, we now know that the spits are actually produced by baby Froghoppers (nymphs), which sit inside them. This is why another common name of these creatures is Spittlebugs. If you are not sure of this, please visit the Edge in late spring and check for yourself! The frothy mass is created to protect nymphs from predators and desiccation and to insulate them from temperature extremes.

An interesting Homopteran group found on Alderley Edge (parcel 17) is the beautiful lace-winged Planthoppers (Cixiidae; two species on the Edge, twelve in the UK), which are distinguished by their transparent membranous forewings with well defined contrasting veins and often with reticulate brownish markings. Nymphs of some Planthoppers (e.g. *Tachycixius pilosus*) develop at the base of grasses in dry, sunny places and can be found in the litter layer throughout the winter. A group of small plant-sucking hoppers of the family Delphacidae (three species on the Edge, seventy-six in the UK) is characterised by the presence of a large movable spur at the apex of the hind tibia and by the well

expressed wing polymorphism in most species. The Delphacidae are slow-moving bugs, with the majority living and feeding exclusively on grasses, sedges or rushes, never trees or shrubs (e.g. *Conomelus anceps* feeds only on rushes).

The majority of the Homopterans found on Alderley Edge belong to the large family Cicadellidae commonly referred to as Leafhoppers (twenty-six species on the Edge of the 288 known in the UK; Bantock and Botting, 2010). The most familiar of them is the Green Leafhopper (*Cicadella viridis*), a bright green and eye-catching Leafhopper that can be found elsewhere on grasses and rushes in marshy places. In gardens it is common on emergent rushes and sedges at the margins of garden ponds. Most Leafhoppers have only a single food plant or a narrow range of them, and therefore are usually confined to a particular habitat. For instance, the very variably coloured Leafhopper *Oncopsis flavicollis* feeds only on birch; the heavily built green or brown Leafhopper *Iassus lanio* is usually found on oaks, although occasionally on other trees; and the very distinct *Ulopa reticulata*, with strongly convex and coarsely punctured forewings, can be found exclusively on heather (both *Erica* and *Calluna*), normally at the bases of the plants. It is worth mentioning that Leafhoppers and Planthoppers can cause damage to the structure of the food plant as they pierce it for feeding and, even more important, they can transmit viruses or bacterial pathogens from one plant to another; some countries go so far as to categorise them as agricultural pests.

A unique feature of the Leafhoppers among all insects is the production of a distinctive hydrophobic biomaterial, known as brochosomes (protein-lipid granules). Brochosomes constitute an excretory product that is expelled from the anus with the liquid faeces and used for covering Leafhoppers' bodies with a hydrophobic coating. This coating makes the body surface highly repellent to water and protects the creatures from wetting by water and their own liquid excreta (Rakitov, 2009).

Unfortunately, identification of Leafhoppers can be complex, depending on venation of both wings, detailed facial features and internal male genitalia, and requires extensive training because many species are very variable and also sexually dimorphic. Besides, about 16 per cent of the British Homopterans associated with grasses and forbs display wing-polymorphism, as mentioned above (see Waloff, 1983). Identification guides (e.g. Le Quesne and Payne, 1981) to the British Homopterans are still limited (see Barnard, 1999, for further references).

Several families of the Homopterans are commonly called Aphids, better known as Greenflies (suborder Sternorrhyncha; see Appendix 13.1). These are tiny, soft-bodied and pear-shaped insects of varying colours and shades, many of which are troublesome garden pests. Most

Aphid species are restricted to a few food plants: for example, *Aphis epilobii* feeds only on leaves or shoots of willowherbs (*Epilobium* spp.), while the Grey Pine Aphid (*Schizolachnus pineti*) feeds exclusively on pine needles. Consequently there may be almost as many species of aphids on Alderley Edge as there are native and cultivated vascular plants (351 species; see Chapter 9), yet only eight of them have been recorded to date (of some 600 aphid species known nationally and over 4,500 species described worldwide; Forero, 2008). Some Aphid species can subsist on several food plants, which are sometimes alternated during the season. For instance, as its name indicates, the Willow-carrot Aphid (*Cavariella aegopodii*) subsists on two kinds of food plants: its primary host is willow (*Salix* spp.), on which it feeds during the spring and autumn, and the secondary hosts are various umbellifers such as carrot, celeriac, parsnip and others, on which it feeds during the summer.

All British Aphids have several generations per year. Their life cycles are generally complex, and they reproduce both asexually and sexually. Another hallmark of the aphids is that they are often 'farmed' and guarded by ants for their sweet excrement, known as honeydew. About 25 per cent of British aphids are ant attended (Hopkins and Thacker, 1999) and both parties seem to benefit from the interaction. Ants not only 'milk' Aphids as dairy cows but also protect them, fighting off Ladybirds and other predators. Of the Aphid species recorded from the Edge, *Aphis epilobii*, as well as other species of *Aphis* which have not been formally recorded from the Edge (e.g. the Black Bean Aphid – *Aphis fabae*), are known to be associated with the Black Garden Ant (*Lasius niger*). The European Birch Aphid (*Euceraphis punctipennis*) is known to be tended by Wood Ants of the genus *Formica*. Since most Aphid species are quite polymorphic (i.e. they occur in several different forms and morphs), their identification is difficult and usually requires microscopic examination and extensive training. Furthermore, as a consequence of their specialised feeding habits, reliable identification of Aphids inevitably requires reasonable knowledge of their food plants. A good introduction to the British Aphids is the book by Blackman (1974); see also Barnard (1999, 2011) for further references.

Only two species of the Jumping Plant Lice (superfamily Psylloidea) of the eighty species known nationally (Barnard, 1999, 2011) have been found on the Edge to date. These are small plant-feeding insects resembling diminutive cicadas and ranging in length from 1.5 to 4.5 mm. Their common name reflects the ability of adults to jump backwards when disturbed. As with the Greenflies, the Jumping Plant Lice are host plant specific, being associated with just one or two host plant species; consequently their likely species number on the Edge is to be multiplied many times. The Jumping Plant Lice is one of the least studied groups of British Homopterans and the most difficult set of species

to identify (many species require dissection to distinguish them). For those who are interested in studying Psyllidae, the identification guide by Hodkinson and White (1979) and the online resource by Bantock and Botting (2010) can be recommended.

As an additional sign of the incompleteness of our knowledge of the Edge's Homopterans one can mention a total lack of records for the Whiteflies (Aleyrodoidea; nineteen species nationally; Kloet and Hinks, 1964) and especially for the Scale Insects (Coccoidea; 107 species nationally; Barnard, 1999). The Whiteflies are tiny insects with waxy white wings; they resemble minute moths. They usually feed on the underside of leaves and may be familiar to many gardeners, both in greenhouses and outdoors, because their adults often appear in hordes of hundreds flying away from the foliage of a favoured host plant. The Scale Insects constitute a large group of the Homopterans with a great variety of forms and lifestyles, that are usually small (less than 5 mm long) and often cryptic in habit. Although their reproduction is thought to be sexual, the males of many species, which look like tiny flies with a single pair of forewings, have not yet been found and described.

Smaller orders of insect

Insect groups presented in this section do not constitute a natural taxonomic grouping. Their common feature is a comparatively low number of recorded/known species on both a regional (Alderley Edge) and a national scale, and for this reason all such groups are briefly discussed together.

Some of the insect groups with only a few representatives found on the Edge simply remain under-recorded. For instance, virtually nothing is known about the soil-dwelling, primitive, wingless insects such as the Springtails (order Collembola; one species on the Edge, of the 304 known nationally; Kloet and Hinks, 1964) and the Two-pronged Bristletails (order Diplura; one species of the twelve native species). As with the soil mites and other soil invertebrates (see section G), these insect groups remain practically unstudied on Alderley Edge. Other groups, such as the Scorpion Flies (order Mecoptera; four species nationally), the Alder Flies (order Megaloptera; seven species nationally), the Green Lacewings (order Neuroptera; sixty species in the UK; Plate 22 shows a species photographed on the Edge), Grasshoppers (order Orthoptera; thirty-three known nationally; Plate 23 shows a species photographed on the Edge) and the Earwigs (order Dermaptera; four native species), are poorly represented overall in the UK and thus it not surprising that only one or two of the commonest species have been found on Alderley Edge.

Earwigs (Dermaptera) are almost too well known to require description: elongate insects with a pair of large terminal, pincer-like appendages. The only species found on the Edge is the Common Earwig (*Forficula auricularia*). This species is a harmless scavenger, although it can chew flower petals and thus cause a little damage in gardens. The word 'earwig' is of historical significance on account of the widespread belief that these creatures are liable to crawl into the human ear and wreak havoc. Yet how earwigs became associated with ears is uncertain – some blame Pliny the Elder, the Roman natural historian, for bringing this idea up: see Berenbaum (2009) for further details – and this notion is just a common misconception which has never been proven.

Four smaller orders represent semi-aquatic groups, whose larvae or nymphs live in water while adults are terrestrial (flying) forms. The most dazzling of these insects are of course the Dragonflies and Damselflies (order Odonata; Plate 24 shows a female Common Darter, *Sympetrum striolatum*, from the Edge), with nine species recorded from the Edge of the twenty-one known in north-west England (Bentley, 2008) and fifty nationally (see the website of the British Dragonfly Society, http://www.british-dragonflies.org.uk/). Those recorded locally include some spectacular species, such as the large Southern Hawker (*Aeshna cyanea*), which can be up to 70 mm long; the species is brightly coloured, with apple-green marks on a dark background, and can be seen swinging or darting to and fro over ponds around parcels 20b and 22. This species breeds in well vegetated small ponds, often those in gardens. The Brown Hawker (*Aeshna grandis*) can be distinguished by its golden-brown wings; interestingly, the record of this species is near its northern limit in the UK. The Broad-bodied Chaser (*Libellula depressa*; Plate 25) is another easily recognisable species of the Edge. It has a very broad, flattened abdomen, which is blue in males and golden brown in females. Out of four common Damselflies found on the Edge, it is worth mentioning the Large Red Damselfly (*Pyrrhosoma nymphula*; Plate 26), an active, deep-red damselfly with black legs, which can be found elsewhere near ponds or slow-moving water. The Odonata of Cheshire have been fully surveyed by Gabb and Kitching (1992). A very interesting account of Dragonflies and Damselflies and their cultural associations has been provided by Lucas (2002; see also Marren and Mabey, 2010).

Two other groups of semi-aquatic insects, the Stoneflies (Plecoptera; thirty-four British species) and the Mayflies (order Ephemeroptera; forty-seven British species) are represented on the Edge by a single species only (see Appendix 13.1). The main reason for this may be not an under-recording, as in the case of the soil-dwelling groups mentioned above, but rather the low water quality of the Edge's ponds and slow-moving streams. All species of Stoneflies are intolerant of water pollution. The same holds true for the Mayflies, which are routinely

used for monitoring water quality because their presence and, even more importantly, their species diversity can be valuable indicators of water quality. Incidentally, the nymphs of the only Mayfly species found on the Edge (*Cloeon dipterum*) are notable for their high resistance to a low level or a significant decrease of oxygen, which may be why this species is able to exist on the Edge. This Mayfly is also famous for its ovoviviparity (a unique feature among the European Mayflies), that is, a mode of reproduction in which embryos develop inside eggs that are retained within mother's body until they are ready to hatch.

Caddisflies (order Trichoptera) are superficially similar to moths and, unlike the aforementioned groups of semi-aquatic insects, they have a complete metamorphosis, and pass through a pupa stage. Caddisfly larvae are famous for constructing portable protective cases made of vegetable fragments or sand grains joined together by silk; the shape and structure of these cases are often species specific and can be used for identification. Only thirteen of the 198 British species of Caddisflies have been found on Alderley Edge (see Appendix 13.1), less than half of the species recorded from north-west England (fifty species; Bentley, 2008). Adults rarely feed; they can form mating swarms, are usually active at night and thus can be collected by light traps, as can moths. Identification of Caddisflies requires training, as it is based on examination of their genitalia under a microscope and of the fine venation of their wings (see Barnard, 1999, for references to useful identification guides).

A large number of good introductory books exist on British freshwater life, for instance a well illustrated guide by Greenhalgh and Ovenden (2007). A complete list of aquatic invertebrates in north-west England ponds has been provided by Bentley (2008).

An interesting group of the Barklice (order Psocoptera) is represented on the Edge by only five of about seventy known in the UK (New, 2005) and is certainly under-recorded here. For comparison one can mention that fourteen species of Psocoptera were found in just a single garden in Leicestershire by Owen (1991). Barklice are small to minute insects, often wingless, that occur on the foliage of trees, on and beneath bark or in leaf litter, where they graze on organic debris, algae or mildewed leaves. Some species occur indoors, where they feed on stored dried products and moulds on damp books, hence their second common name – Booklice. Because none of the Booklice can tolerate desiccation, a single session with the fan heater will easily solve the problem of domestic Booklice.

A limited number of parasitic insects have been recorded from Alderley Edge to date: seven species of the True Lice (order Phtiraptera; about 550 in the UK – see Barnard, 1999) and nine species of Fleas (order Siphonaptera; sixty-two in the UK – see Whitaker, 2007). The

real number of species of True Lice on the Edge must actually be many times greater than this.

Overall, the clear under-recording of some insect groups on the Edge mentioned above and a total absence of records of others, such as Bristletails (Thysanura; seven species in the UK) and Thrips (Thysanoptera; 160 species in the UK), are clear indications of how poorly the insect fauna of Alderley Edge has been studied so far. There is a lot of room for any enthusiasts who would like to conduct their own research on any of the insect groups mentioned here, or on those to be discussed in the following sections of this chapter.

B. Order Lepidoptera – micromoths and macromoths

Dmitri V. Logunov

> And here and younder a flaky butterfly
> Was doubting in the air, scarlet and blue.
> G. MacDonald (1893), 'A Manchester Poem'

Butterflies and moths are grouped in the order Lepidoptera ('scale wings'), also called Lepidopterans, an artificial, non-scientific division. They are the insects to which people are generally first attracted, undoubtedly because of their beautiful colouration and variable patterns. Poets have called them 'pretty genii of the flowers' or 'daughters of the air' (Faulkiner, 1931). However, such epithets are likely to have been inspired by a relatively low number of better-known and showy butterflies, which are culturally seen as joyful spirits: happy, frivolous and carefree (see Marren and Mabey, 2010). As with other insect groups, the majority of Lepidopterans are tiny and inconspicuous, difficult to observe and to catch.

A total of 616 species of Lepidoptera (259 micromoths and 357 macromoths – see below) has been recorded from Alderley Edge (see Table 13.1), accounting for 23 per cent of the British fauna (2,717 species; see Kimber, 2014). The status of the current knowledge of Lepidoptera could be considered reasonable, but still incomplete. The checklist in Appendix 13.1 contains no species of the 'bagworms' of the family Psychidae (twenty-one species in the UK). There is only one recorded species of the Clearwing Moths from Alderley Edge, the Currant Clearwing (*Synanthedon tipuliformis*, of the family Sesiidae; sixteen species in the UK), but adults of these moths are difficult to find except shortly after emerging. Only two species of the Eggars (Lasiocampidae; twelve species in the UK) have been recorded to date. Even such common species as the Drinker (*Euthrix potatoria*), the Small Eggar (*Eriogaster lanestris*) and the Fox Moth (*Macrothylacia rubi*) (and

others) have not been recorded yet, but all are likely to occur on the Edge. It is safe to assume that the recorded number of Lepidoptera species is around 80 per cent of the entire fauna.

Except for a limited number of butterflies (see section C) no specific bionomic data based on the local studies of the Lepidoptera of Alderley Edge are available. Therefore the listed species remain known to a large extent by name only, along with the data in the published literature on their larval preferred food plants and flying seasons. The following overview of the Lepidoptera of Alderley Edge is thus intended as a very general introduction and it is better used in conjunction with three recent field guides to the British Lepidoptera, by Manley (2009), Skinner (2009) and Waring and Towsend (2003), the classic two-volume synopsis by South (1973), and the comprehensive online resource on the UK moths by Kimber (2014). The last resource also contains the latest and most complete checklist of the British Lepidoptera.

Twenty butterfly species of the Hesperiidae (Skippers), the Lycaenidae (Gossamer-winged Butterflies), the Pieridae (Yellows and Whites) and the Nymphalidae ('Brush-footed' Butterflies) are considered in detail by Roger Dennis in section C (see also Anon., 2011) and are not included in the following overview. A complete list of the Lepidoptera recorded to date from Alderley Edge is given in Appendix 13.1. Lepidoptera have been conventionally subdivided in two large groups, micromoths and macromoths, depending on the size of their wingspan rather than on any scientific basis. Generally speaking, macromoths are larger than micromoths (but there are exceptions) and almost all of them have English common names, whereas most of the micromoths do not. The present overview follows this conventional subdivision.

Micromoths

Almost half the moths recorded from Alderley Edge (259 species out of 616) are small-sized, with a wingspan usually 3–20 mm, and are commonly known as micromoths. They rarely come to the attention of visitors to the Edge, who are more likely to notice their caterpillars, which may live communally and spin silken webs or mine leaves in a distinctive way. Micromoths are difficult to identify: close examination of their genitalia is often the only method, although sometimes the structure of larval leaf-mines is the primary basis (which in practice can be examined only if the moths are bred in captivity), as in the case of the Gracillaridae described below. Micromoths have a wide variety of feeding habits in both larval and adult life stages, and can be found in both terrestrial and freshwater aquatic habitats (some of the Pyralidae are a case in point, as described below).

Most peculiar are the Micropterigidae, the most archaic group of Lepidoptera, because they have normally developed mandibles (jaws), whereas all other Lepidopterans possess only a proboscis – a tube-like mouth-part used for feeding. Adults are diurnal and feed on pollen. Larvae of the Case-bearing Moths possess rather long antennae which are most unusual for the Lepidopterans; they live in mosses and lichens, feeding on fungal hyphae. Of the five species known in the UK only one, *Micropterix aruncella*, was recorded from the Edge.

Some micromoths are very distinctive in their general appearance. For instance, the luxuriously coloured Cosmopterigidae can be recognised by the lanceolate (pointed) forewings, often with a metallic pattern consisting of raised scale tufts. The Honeysuckle Moth (*Ypsolopha dentella*; Yponomeutidae) and other representatives of the genus *Ypsolopha* recorded from the Edge have tips of their forewings extended and raised up, hence their common name 'sickle-winged moths'. The Longhorns (Adelidae) are easily recognisable by their very long antennae, especially in males, reaching two and half or even three times their forewing length. Males of some Longhorns (e.g. *Adela reaumurella*) form small summer swarms in the same way as do Midges or Gnats (Garland, 1985); females are usually to be found resting on leaves nearby.

Two other unusual-looking moths of the Edge are both commonly called 'Plume Moths', despite being unrelated to each other. The Twenty-plume Moth (*Alucita hexadactyla*) is the only representative of the family Alucitidae in the UK; each of its wings is split into six plumes, whence the scientific name. The true Plume Moths (the family Pterophoridae) are represented on Alderley Edge by three species (*Amblyptilia acanthadactyla*, *Gillmeria pallidactyla* and *Emmelina monodactyla*), compared with forty-three species in the UK fauna as a whole. Its wings are deeply divided into several 'fingers', each of which is finely feathered, or plumed. Because of this wing structure the Plume Moths do not look like moths at all, for with a T-shaped body they can be confused with large Mosquitoes or Craneflies. None of the British Plume Moths is a pest.

Some species of micromoths are difficult to distinguish visually, but they can easily be recognised by their constructions. For instance, caterpillars of several species of the Yponomeutidae (known as Ermines because the adults resemble a stoat in its winter coat) are notable for living in large communal web-nests that are spun for protection from wasps and birds before they pupate. The famous Bird-cherry Ermine (*Yponomeuta evonymella*) can occur in pest numbers and if this happens its larvae can produce a huge web-nest completely covering a medium-sized bird-cherry tree and even a car parked nearby (see *Daily Mail*, 28 May 2009). However, such outbreaks of this species seem never to have been observed on Alderley Edge.

Many of the micromoths are leaf-miners. Their tiny larvae are usually flattened in the dorso-ventral direction and feed inside the leaves, mining cavities which appear as discoloured blotches and meandering lines where the internal tissues have been eaten away. The structure of such mines is an important or sometimes the only means of their identification. Nepticulidae is a family of the smallest leaf-mining moths, with a wingspan of approximately 3–6 mm, and characterised by scaly eyecaps over the eyes. Over 100 species are known from the UK, with twenty-eight of them having been found on the Edge. *Stigmella aurella*, recorded from the Edge, is one of the commonest British leaf-miners. Its larvae excavate serpentine-shaped tunnels just under the surface of bramble leaves. They spend the winter in their mines and then come out of the leaf to pupate. Some leaf-miners, such as members of the family Gracillariidae (thirty-four species in the Edge, almost a half of the British fauna), can seriously damage host plants by spoiling the external appearance of leaves. For instance, larvae of the Nut Leaf Blister Moth (*Phyllonorycter coryli*) mine blotches on hazel leaves, causing the leaf to contort. Their mines are very visible in late summer and autumn.

A very interesting group of micromoths of Alderley Edge is the family Coleophoridae, collectively known as Case-bearers or Case-bearing Moths. The common names of the Coleophoridae refer to the fact that their caterpillars live in portable protective cases made of silk, plant material and frass. Cases are discarded and built anew as caterpillars grow and moult, in the same way as the aquatic larvae of the caddisflies. Ten species of the case-bearers have been recorded from the Edge, of about 110 known in the UK. Moths of this group are tiny and similar in appearance, having pale, long and slender wings. Genitalia examination is usually required for a positive identification of these micromoths.

Only ten species of the large family Gelechiidae have been found on the Edge out of 150 in the UK and about 4,500 worldwide. These are usually very small moths with narrow, fringed wings, and with the front end of the body often being raised when at rest. Caterpillars feed on various parts of their host plants, sometimes causing galls. It is worth mentioning the larvae of the three *Bryotropha* species occurring on the Edge, which specialise in feeding on mosses growing on rocks or stony walls, of which the Edge has plenty. The larvae of one of these, *Bryotropha domestica*, live in silken galleries.

Moths of the family Oecophoridae are distinct in having wide and often brightly coloured forewings, which are folded flat when at rest. Many oecophorid species are the most colourful and attractive micromoths in the UK. Eleven of about ninety British species have been recorded from the Edge, all of them common. The majority of oecophorids overwinter as adults. Caterpillars show a great diversity of lifestyles and food preferences, and some are indoor pests: for instance, larvae of the Brown

House Moth (*Hofmannophila pseudospretella*), which was introduced from Asia to Europe in the 1840s, feed on detritus and other organic material, including old wool and leather. Overall, many species of the micromoths can cause severe damage to plants as well as to fabrics and other man-made goods or stored products. The best known of them is of course the clothes moth (*Tineola biselliella*), which, surprisingly, has not yet been formally recorded from the Edge, although its wild counterpart, *Tinea trinotella*, a common scavenger in birds' nests, does occur there. However, the majority of economically significant pests come from two families, Tortricidae and Pyralidae, both of them well represented at Alderley Edge.

The Tortricidae is the largest family of micromoths, with sixty-one species being recorded from the Edge, of some 350 species in the UK and almost 9,500 worldwide. These moths are commonly known as Leaf-rollers, because their caterpillars roll themselves up into the tips of leaves and flowers. They feed and pupate within the protective shelter of rolled-up leaves. Some of the Leaf-rollers can become pests, being unwelcome guests in gardens and orchards. One of these is the Light Brown Apple Moth (*Epiphyas postvittana*). In the 1930s this species was accidentally introduced into the southern part of the UK from Australia, where it causes serious damage to orchards, and it has spread quickly northwards. It is a polyphagous species, for its larvae can feed on about 2,000 different plants, and therefore the potential threat from this moth is high. As the name suggests, larvae of the Garden Rose Tortrix (*Acleris variegana*) feed on rose bushes, including cultivated kinds. The Cyclamen Tortrix (*Clepsis spectrana*) can damage such cultivated plants as cyclamen, strawberry, hops and brideworts. Sometimes larvae of the tortricid moths develop inside fruits; the best-known is the Codling Moth (*Cydia pomonella*), which is considered a pest because of the larval habit of feeding inside the fruits of apple, pear and other wild and cultivated fruits.

The family Pyralidae is an impressively diverse group of micromoths, with thirty-two species being recorded from the Edge, of some 200 in the UK and over 6,200 worldwide. The pyralid moths come in a wide range of sizes, with some species such as the Mother of Pearl (*Pleuroptya ruralis*) having a wingspan up to 40 mm, reaching the point when they can hardly be called micromoths anymore. The feeding habits of Pyralidae vary significantly, from the Bee Moth (*Aphomia sociella*), which attacks the honeycomb inside bee and wasp nests, to the Meal Moth (*Pyralis farinalis*), found in grain products stored in barns and warehouses. At least thirty resident pyralid species which are now indoor pests of stored products have been imported into the UK with plant material. Some pyralid species such as the Garden Pebble (*Evergestis forficalis*) can be a pest in gardens and allotments, feeding on cultivated crucifers.

Particularly interesting are (semi-)aquatic pyralid moths. For example, larvae of the Small China-mark (*Cataclysta lemnata*) are semi-aquatic, building floating cases made of fragments of the duckweed on which they feed. They acquired their common name because of a supposed resemblance to the potter's marks on antique porcelain. The caterpillars of the Water Veneer (*Acentria ephemerella*) are fully aquatic, feeding on submerged freshwater plants such as pondweeds and Canadian waterweed. Furthermore, there are two forms of the Water Veneer's female, winged and wingless, of which the wingless ones remain under water after emergence, mating at the surface with fully winged males.

Macromoths

Several groups of macromoths are absolutely unmistakable if encountered on Alderley Edge or elsewhere. Easiest to recognise are the Tiger Moths (Erebidae; ten species in the Edge, of thirty-eight in the UK; they are alternatively called Ermines, but that term is also used to denote a group of micromoths, as above). True Tigers have fluffy and brightly coloured bodies and wings, either monochrome, as in the case of the Ruby Tiger (*Phragmatobia fuliginosa*; Plate 27), or with numerous dark spots on a red, yellow or white background, as in the White Ermine (*Spilosoma lubricipeda*). The Hook-tips (family Drepanidae) also cannot be confused with other moths, as the majority have hooked tips to the forewings. Nine species of the Hook-tips of the sixteen recorded in the UK have been found on the Edge; of these, the Pebble Hook-tip (*Drepana falcataria*) closely resembles a dead leaf when resting. The Leopard Moth (*Zeuzera pyrina*; family Cossidae) has a fluffy white body and pale wings with a span of about 5 cm, covered with numerous black or dark-blue spots (whence the common name). This spectacular moth is the only representative of the Cossidae recorded on the Edge, of three found in the UK. The moth is associated with woodland, gardens and orchards. Its larvae bore into the stems of trees and cause damage by eating the heartwood. A fully grown larva can reach a length of 5 cm and is white, fleshy and apparently tasty, like the edible larvae of several Australian relatives of the Leopard Moth known as witchetty grubs. But who in this country would dare to taste them?

The Hawk Moths (Sphingidae; eight species from the Edge, of the twenty-six recorded in the UK) are easy to recognise by their streamlined appearance. These medium to large moths are powerful fliers, capable of hovering in front of flowers and sipping the nectar with their long proboscis, looking like humming birds. Indeed, the best-known is the Humming-bird Hawk-moth (*Macroglossum stellatarum*), a common visitor in gardens and parks all over Britain. Many species of Hawk

Moths actively migrate to the UK from as far as North Africa and the Canary Islands. For instance, the Convolvulus Hawk-moth (*Agrius convolvuli*) regularly migrates from southern Europe in late summer and autumn, and at dusk can be seen feeding on garden flowers, especially those of the tobacco plant. A much scarcer visitor from North Africa is the Silver-striped Hawk-moth (*Hippotion celerio*), also recorded from the Edge. This species usually arrives in autumn and can be seen as far north as Scotland.

The majority of macromoth species found on Alderley Edge belong to two families, Geometridae (148) and Noctuidae (169), accounting for 51 per cent of the entire Lepidopteran fauna of the site. It is hardly surprising as both groups represent the two largest moth families in the world and in the UK: the Geometridae number 21,093 species worldwide, with over 300 in the UK, and the Noctuidae 42,030 species worldwide, over 400 of them in the UK.

Moths of the family Geometridae, commonly known as the Geometers, have broad butterfly-like wings that are large relative to their slender bodies. The wings are flat and outstretched when at rest, with the hindwings visible, having a radial wavy pattern consisting of contrasting lines or bands coming across both pairs of wings and the body. Moths usually rest on a similar-looking substrate and so tend to blend into the background. However, many species are quite spectacular, which is reflected in their poetic and wonderfully picturesque names, for instance the Feathered Thorn (*Colotois pennaria*), a rich reddish-brown moth whose males have feathery antennae; the Lilac Beauty (*Apeira syringaria*), a moth of a crumpled leaf-like appearance; and the Small Phoenix (*Ecliptopera silaceata*), which has a wing colour pattern resembling a rare kind of marble. The name Geometridae means 'earth-measurer': they are so named because of the walking pattern of their caterpillars, which do not have legs in the middle portion of the body and move by arching and then straightening their bodies, creating the impression of measuring their journey. This is why the caterpillars are called 'measuring worms' or 'loopers'.

The majority of the Geometers recorded from the Edge are common, although some are mainly distributed in the southern half of England, becoming gradually scarcer or absent further north and in Scotland – for instance, the attractive greenish Blotched Emerald (*Comibaena bajularia*), the Small Yellow Wave (*Hydrelia flammeolaria*) and the Blood-vein (*Timandra comae*). However, a few species are indeed rare. For instance, the Cloaked Pug (*Eupithecia abietaria*) is included in the *British Red Data Book* (Shirt, 1987) under category 3 (rare species). This scarce species is a suspected migrant that was once resident in a range of scattered locations throughout Britain but became almost extinct at the beginning of the twentieth century. Since then it has been

rediscovered in parts of England, Wales and Scotland. Its larvae feed internally on the cones of Norway spruce, Sitka spruce and noble fir, of which none has been recorded within the surveyed territory (see Chapter 10). It is possible, however, that the food plants of the Cloaked Pug occur in some private gardens on Alderley Edge.

Many species of the Geometers are polyphagous, that is, capable of feeding on many kinds of plants. Of the species recorded from the Edge, the most famous one of this kind is the Peppered Moth (*Biston betularia*; Plate 28), which can feed even on the poisonous leaves of oleander. This species has been the subject of numerous genetic studies investigating the problem of industrial melanism, where all-dark individuals became the dominant form in industrial and polluted regions of northern England. Nowadays the melanic form is declining again in these areas due to changes in the ecological situation. Other Geometrid groups are specialised feeders. For instance, larvae of *Eupithecia* species (twenty-three on the Edge), commonly known as Pugs, feed on the flowers and seeds of their food plants rather than the foliage. Many of them demonstrate a particular specialisation: for example, the larvae of the Foxglove Pug (*Eupithecia pulchellata*) feed inside the flowers of foxglove, while those of the Larch Pug (*Eupithecia lariciata*) specialise on the needles of larch. Some Geometer species are considered garden pests because of their feeding habits, such as the Magpie (*Abraxas grossulariata*; Plate 29, from the Edge) and the Phoenix (*Eulithis prunata*), whose caterpillars can swarm over currant and gooseberry bushes and damage them. See Owen (1983) for a useful popular overview of moth pests in British gardens.

The family Noctuidae, or the Noctuids, is an extensive assemblage of moths characterised by an incredible diversity of feeding preferences and lifestyles, from those living on rotten or withered leaves like the Fan-foot (*Zanclognatha tarsipennalis*) to classical foliage feeders such as the Gothic (*Naenia typica*). Most Noctuids are plain-looking moths usually with brownish forewings, which have given them the common name of Owlet Moths. The colour pattern of their forewings is simple, usually consisting of a spot shaped like a kidney bean and a further spot nearby. However, the relative size, colour and arrangement of these spots are important diagnostic characters that help to distinguish similar species. Hindwings of some noctuid moths such as the Red Underwing (*Catocala nupta*) or the *Noctua* species are brightly coloured: red, orange or yellow, with a wide brown band. Some species are quite peculiar: the Spectacle (*Abrostola tripartita*) possesses raised tufts of scales on its thorax which resemble a pair of spectacles when viewed from the front. Some of the noctuid species recorded from the Edge are common migrants, for instance the Silver Y (*Autographa gamma*) and the Scarce Bordered Straw (*Helicoverpa armigera*). It is worth mentioning one of

the classic invasive species recorded from the Edge, the Golden Plusia (*Polychrysia moneta*). This moth was first recorded in Britain in 1890, since when it has spread rapidly north-westwards thanks to plentiful supply of such garden food plants as delphiniums and monkshood.

With a few exceptions, the noctuid moths fly only at night and in order to capture them one has to use a light trap (see Martin, 1977, for details). During the day their larvae usually hide on the ground (Plate 30, photographed on the Edge), among low herbage or in spun-together leaves, and generally leave their retreats only at night, to feed. Nonetheless, larvae of some noctuid species like the Flounced Rustic (*Luperina testacea*) feed underground in the bases of grass stems and among the roots. The food preferences of some Noctuids are very specific. For instance, larvae of the Beautiful Yellow Underwing (*Anarta myrtilli*) and the Neglected Rustic (*Xestia castanea*) feed mainly on heather and heath, and therefore both species have a very scattered distribution over most of Britain, chiefly occurring on heaths and moors.

Many Noctuids are important agricultural and garden pests. Caterpillars of some species, such as those of the Heart and Dart Moth (*Agrotis exclamationis*; Plate 31, photographed on the Edge) and of the Large Yellow Underwing (*Noctua pronuba*), are known as 'cutworms' and feed on virtually all types of grasses, including cereal crops. They emerge at night, cut off seedlings at ground level and then devour them. Larvae of the aptly named Cabbage Moth (*Mamestra brassicae*), as well as those of the geometrid Garden Carpet (*Xanthorhoe fluctuata*) and the tiny Diamond-back Moth (*Plutella xylostella*), are pests on cabbage and related crops. One species, the Angle Shades (*Phlogophora meticulosa*), is rather special, for its green caterpillars can be found feeding on house plants such as pelargoniums that have been brought inside for the winter after female moths laid their eggs on them during the autumn (Garland, 1985).

In this brief section it is impossible to discuss all the recorded species of Lepidoptera of Alderley Edge, even the most interesting ones, but see South (1973) and Kimber (2014) for details. Although the majority of these species are common, each can be seen more clearly through the magnifying lens of your own curiosity. This alone can turn a diminutive and dull micromoth into a spectacular creature of many wonders. People like to watch birds in nature and bird-watching a very popular hobby. But so is butterfly-watching! However, just as in a sport, the more you know about the game the more enjoyable it is to watch. Look round and you can see 'daughters of the air' flapping above flowers or resting in secluded corners. With a little patience you can discover that many of them are distinctive and can be identified by the way they look.

Finally, there is no need to go to your nearest butterfly-house to watch and interact with the Lepidopterans. This can be done on Alderley Edge

free of charge and with no time limits; it can even be done at night. Many moths can be attracted by lamp-light and can be observed in your own garden (see Owen, 1983, for useful hints). Possibly one of the more unusual techniques is to use so-called 'sugar baits' that attract many night-flying moths (see Garland, 1985). A mixture of black treacle, sugar and stale beer is painted onto the vertical surface of trees and then these sites are searched by torchlight during the night. 'Sugar baits' and light traps are best used in combination because certain moths rarely come to lights but are common on sugar, and vice versa. Sugaring is certainly an ingenious method used by moth hunters who do not intend to kill the moths but want to watch them: fun, and easy!

C. Order Lepidoptera – butterflies

Roger L. H. Dennis

In memory of the late Charles Ian Rutherford, 1919–2008, Alderley Edge's lepidopterist

Introduction: butterflies on Alderley Edge – resources, habitats and changes

Compared with other arthropods, the butterfly fauna of Britain is small, comprising some sixty species that breed in the islands or are regular immigrants from the Continent (Thomas, 2007). The fraction on Alderley Edge is smaller still, with only twenty breeding species recorded (Dennis, 2000a); Appendix 13.2 describes the detailed survey results. Even so, the interest they generate far exceeds their number; colourful, easily recognisable, aesthetically pleasing creatures, they form valuable indicators of landscape – and thus human – health and of environmental changes, especially those associated with climate and biotope fragmentation. This section provides a brief overview of research done on Alderley Edge butterflies, a guide to where particular species may be observed on the escarpment and the conditions that influence their presence.

Surveys

Four sets of butterfly survey have been undertaken on Alderley Edge since the mid-1990s, though not as part of the AELP. The purpose of three of these was largely scientific, to explore vagrancy (occurrence of

individuals at sites lacking their host plants) and the use of resources outside 'habitats' in the so-called 'matrix'; even so, they reveal important aspects of butterfly geography on the escarpment. Work on Alderley Edge butterflies has been instrumental in refining the notion of 'habitat' from its traditional usage as a biotope (vegetation unit) to that of the 'resource-based habitat'. The resource-based habitat is broadly defined as the conjunction of a number of distinct resources and conditions (e.g. light, temperature) essential for the survival, reproduction and the development of individuals – in butterflies during their different stages as eggs, larvae, pupae and imagos (adults) – and thus for the persistence of a population (Dennis, 2010).

The 1996–99 survey of squares

Butterfly records were obtained from thirty 1 ha units in the Alderley Edge Site of Special Scientific Interest (SSSI), the corners of which had been pegged for topographic survey. The squares, located north-east to south-west over the escarpment from base to summit, were evenly distributed over woodland and open ground (mean wood cover 81.6 per cent and 22.1 per cent respectively). Data were collected from thirty-eight three-hourly visits using a fixed transect covering each square over four seasons. Data were independently collected on biotopes and two butterfly resources (larval host plants, nectar flowers used by adults) (Dennis, 2000a).

Parcel survey

A broad survey in September 1999 was conducted of all parcels for butterfly larval host plants (Appendix 13.2). No attempt was made to distinguish use or condition of the host plants, the data merely indicating potential for habitat restoration with suitable management. Records obtained on butterfly early stages and adults from casual observation over several years, and dedicated surveys, are added to this record, providing the basis for information on butterfly distributions on the escarpment.

2003 and 2004 transect surveys

Two surveys were conducted by the author in consecutive years of resource use over different substrates and biotopes. The first was on the satyrines (browns), the Meadow Brown (*Maniola jurtina*), Gatekeeper (*Pyronia tithonus*) and Speckled Wood (*Pararge aegeria*), the second on the pierines (whites), the Large White (*Pieris brassicae*), Small White (*Pieris rapae*) and the Green-veined White (*Pieris napi*). The first followed

a fixed transect south-west of the Macclesfield Road in parcels 11b, 11c, 17, 18a, 20b, 21c and the track and path bisecting the fields towards unit 20b from Whitebarn Farm. The second applied random transects over much of the escarpment. The spontaneous behaviour of each individual was recorded in relation to substrate, biotope and weather conditions (Dennis, 2004; Dennis and Hardy, 2007).

2006 nettle patch surveys

Larval host-plant suitability for the Peacock (*Aglais io*; Plate 32) and Small Tortoiseshell (*Aglais urticae*) butterflies were assessed using two surveys in 2006 on the Alderley escarpment (Dennis, 2008). The first involved sampling ninety-three nettle patches within a 5 m box of a 5 km transect route over the escarpment, evenly located over wood and open ground. The second survey, conducted immediately after the first, focused on a random sample of 24 ha stratified for woodland and open biotopes. Nettle patch dimensions, butterfly larval batches and environmental conditions were recorded.

Comparison of two basic biotopes

Two surveys (1996–99, 2006) on Alderley Edge reveal sharp contrasts between woodland and open biotopes (100 m squares) for butterflies (see Figure 13.1). British woodlands can be especially rich biotopes, despite the fact that most British butterfly species (83 per cent) feed on herbaceous host plants (Greatorex-Davies *et al.*, 1993; Fox and Waring, 1999; Kemp *et al.*, 2008). However, this is not the case for Alderley Edge. The Alderley woods contain significantly fewer host plants and nectar sources for butterflies than the surrounding open ground, particularly the Sandhills, the unimproved pasture and Saddlebole Quarry. More than twice the number of butterfly species is recorded for squares with open biotopes than woodland biotopes (means: 14.6 versus 6.5 respectively after thirty-eight visits). Over 1 ha squares, there is a loss rate of one species for every 7.8 per cent increase in woodland cover (one breeding species for every 6.7 per cent increase). This pattern is also reflected in the number of butterfly individuals encountered (Dennis, 2000a). Of the eighteen species for which sufficient data were available for testing differences, only two were observed to be more abundant in woodland than in open biotopes, Speckled Wood and Red Admiral (*Vanessa atalanta*). Regression analyses on each species separately demonstrated that contrasting abundances for specific host plants and nectar sources accounted respectively for the incidence of fifteen and seventeen of the eighteen species in squares. The only species lacking a

(a)

(b)

Figure 13.1. Open biotopes (foreground) and wood biotopes (background) on Alderley Edge. (a) The west end of Engine Vein. Since fenced off and seeded, this open area has become one of the butterfly hot spots in the wood. (b) The field adjoining the car park (parcel 24). With increasing conversion to unimproved pasture, this area is becoming a valuable butterfly biotope with a wide range of flowering plants and mixed grasses.

Photographs Roger L. H. Dennis.

significant association with either its host plant or nectar sources is the Red Admiral, a butterfly which is most evident when it uses landscape high points and woodland sunspots for locating mates (Dennis and Dennis, 2008). The Speckled Wood defends territories in the woodland and has long been known to do this by occupying sunspots on the

woodland floor (Davies, 1978). More recently, this butterfly has been found exploiting territories higher in the canopy on Alderley Edge (Dennis *et al.*, 2009); the females adopt a possum-like behaviour when harassed (Dennis, 2003b; Shreeve *et al.*, 2006).

Apart from the Speckled Wood and Red Admiral, three other butterflies have host plant sources in the woods. The Purple Hairstreak (*Favonius quercus*) uses oak; it has not been seen in the main woodland but has been observed on the Sandhills oaks. There is now plentiful holly and ivy for the Holly Blue (*Celastrina argiolus*) in the woodland, but much of it inappropriately under shade, and the butterfly has only been seen in open biotopes and ecotones (wood edges) on Alderley Edge, although during 2012 ivy was cut off many trees and substantially reduced (indeed, the vegetation on the Edge has undergone some substantial changes since the surveys described elsewhere in Part III of the book). The Green-veined White feeds on small and immature crucifers (Dennis, 1985); it is seen flying through the woods and can use hairy bitter-cress (*Cardamine hirsuta*) in dappled shade, which occurs sparingly along the paths, and Jack-by-the-hedge (*Alliaria petiolata*) along wooded sections of Macclesfield Road and Artists Lane (parcel 11) and the track from Thieves Hollow to the Goldenstone (parcel 10a).

A further interesting contrast between woodland and open biotopes is found in the occurrence of breeding and vagrant butterfly species. Inevitably, the cumulative distribution of new species for squares increases with the number of visits; this tends to flatten out for the thirty squares on Alderley Edge after twenty visits. However, the number of vagrant species is significantly higher in woodland than in squares with open biotopes and, interestingly, vagrant species increase at a faster rate in woodland squares. The reason is not difficult to find. There is a marked contrast between species in butterflies' capacity to migrate between habitat patches. Woodland squares, lacking habitat patches, have a larger pool of vagrant species to draw on over time; eventually, even the most sedentary of species crosses into woodland squares in seeking out new habitats (e.g. in 2009, the Gatekeeper was observed in the Armada Beacon hilltop opening in the woodland). In an ancillary study it was shown that degree of vagrancy identified in this way (individuals of species occurring in squares lacking host plants) corresponded with other independent measures of butterfly migration capacity (Cook *et al.*, 2001).

In 2006, a separate study concentrated on the exploitation of nettle patches by the nettle-feeding nymphalids, the Small Tortoiseshell and Peacock (Dennis, 2008), two species which are capable of migrating over large distances and are seen both in the woods and on open ground. Although sufficiently large nettle patches used by these butterflies, which lay their eggs in batches, are found in most squares over Alderley Edge

in both woodland and open biotopes, only one larval batch was found within the woodland and a further seventeen on nettle patches outside the woods or wood/open space ecotone. Egg batches are laid only on large, dense nettle patches (typically having a diameter over 200 cm) in sunlight, and patches in shade are ignored; the nettle patch used in the woods had a south-facing aspect at the wood edge.

Resources and habitats

The comparison of woodland and non-woodland areas on Alderley Edge suggests a dichotomy of the landscape: the woodland would be considered as non-habitat or 'matrix' by ecologists, as it is the open spaces (habitat) that are butterfly rich and the woodland as butterfly impoverished. This view of habitat and matrix emerges largely owing to a preoccupation by ecologists with a limited set of resources for organisms (Dennis *et al.*, 2008). Studies in 2003 and 2006, on three 'browns' and three 'whites', indicate that resource use is much more complex among butterflies. For instance, they require sites for roosts, basking, resting, finding mates, escaping enemies, pupation and hibernation among other more specialised conditions of heat, light and moisture. It has long been known, however, that butterflies are picky and exploit a fraction of the available substrates for a particular resource. In some cases the reasons are obvious, as in the case of the nettle-feeding nymphalids discussed above. The later studies disclosed that butterflies often use fragmentary, tiny resource units in the so-called matrix (Dennis, 2004); a nice example was a larval batch of Large Whites on Jack-by-the-hedge on the neatly mown margin of the National Trust car park (Dennis and Hardy, 2006b), an attractive butterfly better known for infesting cabbage patches. The 'whites' search for resources in biotopes, for instance roosts and mates in the wood canopy, where no resources were previously thought to exist (Dennis and Hardy, 2007). Inevitably some butterflies search for resources (host plants) in examples of biotopes where they are expected to exist even when they do not; a classic example was a Comma (*Polygonia c-album*) female searching for the host plants, nettle or elm, within woodland parcel 10a. For this reason, visitors to the Edge should not be surprised to find butterfly species in unexpected situations doing unusual things; delightful surprises have been a non-territorial Painted Lady (*Vanessa cardui*) in a woodland clearing surrounded by bilberry basking on a dead log, Red Admirals vigorously defending a territory on a dying birch trunk near the memorial stone, Holly Blues well away from their holly and ivy host plants, feeding on heather at Stormy Point, and two Peacocks diving into the same rabbit run at the base of a gorse bush for shelter during a rain storm (Dennis, 2005b).

A resource-based definition of a butterfly habitat (Dennis, 2010) draws attention to significant parcels on Alderley Edge where species are found but in very small populations, scattered at low density. The classic cases are the unimproved pastures (parcels 20b and 22); here, Meadow Browns, Orange-tips (*Anthocharis cardamines*) (Plate 33) and Green-veined Whites, Small Coppers (*Lycaena phlaeas*) (Plate 34), Common Blues (*Polyommatus icarus*) and other species all breed, but are few in number. These areas, vital for plants and insects, have in the past been too heavily grazed or grazed at the wrong time of the year and also have received occasional herbicide treatment (e.g. 21 May 2007; Dennis, personal observation). In effect, resources are available but are being suppressed or eradicated, as in the case of a nettle patch which had a Peacock larval batch treated with herbicide in parcel 20b in May 2007. Other nymphalid larval batches have been destroyed in parcel 24 near the car park by cutting in 2007 (for hay) and 2008 (accidentally during an archaeology experiment). Contrasts in the size and density of butterfly populations are not evident in Appendix 13.2 but the differences can be marked, as for instance between parcels 20b and 18a; in the latter, the population density of several butterfly species is high, as it is (but decreasingly) on marginal land outside farming in parcel 17 of the Sandhills. As parcel 18a comes under more intensive use its butterfly population is decreasing.

Changes over time

A prominent feature of observations on butterflies at Alderley Edge has been the changes in butterfly populations and turnover of species over time. These are probably associated with three main factors: climate, vegetation succession and land-use practices.

Significant fluctuations in the butterfly populations are expected from year to year relating to changes in fecundity and survival (Warren, 1992); climate is a key agent (Dennis, 1993). Regular visitors to the Edge will be aware of large fluctuations in numbers of migrants from the Continent (e.g. Painted Lady, Red Admiral); this feature was most evident in the surveys of the thirty 1 ha squares between 1996 and 1999, and 2009 was a year for Painted Lady butterflies. But seasonal weather can have more subtle influences, affecting for instance the interaction of butterflies with their resources and providing further insight into the specialist demands of butterfly species. In the cool spring weather of 2005 Orange-tips loaded many eggs onto few shoots of cuckoo flower. Usually, because the larvae are cannibalistic, females lay one egg per shoot and avoid plants that have already received eggs; as the larvae feed on the flower heads the adults pick large shoots with more buds. In 2005,

emergence of the butterfly and growth of the plant were poorly synchronised, and because conditions were too cold and cloudy for longer flights in areas lacking shelter, fewer females left the Sandhills to exploit other hosts (e.g. Jack-by-the-hedge) along the roadsides. Some plants became overloaded with eggs, one receiving eight, seven of which were consumed after the first larva appeared (Dennis and Hardy, 2006a).

Since the mid-1990s there have been some notable changes in species, associated with a warming climate (Dennis, 1993; Hill *et al.*, 2002). The Wall Brown (*Lasiommata megera*), once abundant on the Sandhills, as over Cheshire generally, has become very scarce (Dennis and Dennis, 2006); the Speckled Wood (Plate 35), Gatekeeper and Small Skipper (*Thymelicus sylvestris*), not recorded on the Edge in the early 1980s, became abundant components of the fauna in the early 1990s (Hardy *et al.*, 1993; Hardy and Dennis, 1997) and remain so. The Ringlet (*Aphantopus hyperantus*) was found by the author in the Goyt Valley to the east of Alderley Edge in 2008, in Macclesfield Forest in 2011 (Dennis *et al.*, 2011) and on the Edge itself (but outside the National Trust property) in 2015. The Meadow Brown increasingly invaded the woods, even laying eggs on tree trunks (Dennis, 2003a), and long-distance migrants that hitherto survived only at the coastal fringe, over-wintering as adults, have started to survive deeper into the British countryside; evidence of this was a record of a Red Admiral (Plate 36) on Alderley Edge in February 2000 (Dennis, 2000b). Woodland shade may also be important for nectar sources (e.g. bramble flowers) during hot summers; woodland butterflies like the Speckled Wood can use other food, such as cuckoo spit (Dennis, 2005a).

One noticeable change has been the decline of the Common Blue. This was found throughout the Sandhills (parcel 17) in the 1980s. However, vegetation succession has moved on apace, scrub, saplings and tall dense herbs crowding out the bird's foot trefoil (*Lotus corniculatus*) and lesser bird's foot trefoil (*Lotus pedunculatus*), and the population of the butterfly in consequence has been reduced to single figures throughout the current century. The biotopes at the Sandhills have shifted from being most suitable for Wall Browns, Common Blues and Small Coppers to ones that favour Meadow Browns and Small Skippers, ultimately providing habitats for Gatekeepers and Speckled Woods. A similar process has affected Saddlebole Quarry. Some recent clearance of scrub such as broom has reversed conditions on the higher slopes.

Managing future butterfly resources

From the various surveys of butterflies, indications have emerged of what can be achieved for the National Trust area; instigating change is

of huge importance for the Edge and its farming and urban surrounds. Currently, butterfly populations on the Edge are small and some species that could occur are missing, reflecting a lack of habitat for them. Yet for butterflies Alderley Edge functions as a refuge or source for the multiplicity of tiny resource patches dotted over the surrounding Cheshire countryside. From the viewing points on the Edge, Cheshire looks green and lush, but from a butterfly standpoint the largest part of it is in fact a green desert, intensively farmed. Essentially, large areas on the Edge can be enhanced for butterflies and other wildlife, rapidly and at low cost. The proviso is that evidence-based ecology, the science that underlies any suggestions (Pullin and Knight, 2001), is currently poorly developed; consequently, experimental approaches need careful advance planning and monitoring of changes since land use, National Trust revenue and other aspects of the flora and fauna may be affected. This is particularly the case for grazing regimes; evidence regarding interactions between grazing intensity and livestock type is distinctly lacking, frustrating prediction regarding the impacts of different types of livestock at given stocking intensities (Stewart and Pullin, 2008). A well established system, the Butterfly Monitoring Scheme (Pollard and Yates, 1993), applied to over 100 sites now for over thirty years and extended recently to many hundreds more, provides a foundation for monitoring changes in management; ideally, monitoring needs to be put into action before any large-scale changes are made.

Most butterflies on the Edge require open conditions but also a range of substrates, from bare ground to short and tall herb-rich grassland and patchy scrub. The conditions required for any species are both varied and dynamic (Asher *et al.*, 2001; Dennis *et al.*, 2003); key biotopes in the successional sequence of vegetation types are only too short-lived (less than five years). The fenced-off area around Engine Vein produced a valuable herb biotope for several butterflies in 2009 (e.g. Green-veined White, Small Copper, Meadow Brown, Gatekeeper), but this could easily be lost to birch scrub development without management, and during 2012 scrub was removed here. In the present state of knowledge, management is best conducted for a mosaic in biotopes (Oates, 1993), including a focus on dry sandy ground used by the Common Blue and Small Copper and on wetlands such as the marlpits valuable for Orange-tips and Green-veined Whites. Currently, the key areas on the Edge with the greatest potential for housing butterfly populations, the unimproved and semi-improved grassland parcels (parcels 20b, 22, 23, 24 and 30), are overgrazed and receive excessive nutrients. Intermittent ground disturbance is vital for producing conditions for a number of species (e.g. Common Blue, Small Copper) but is adverse when continuously applied. Moves towards selecting appropriate grazing animals, smaller herds and a greater bias towards winter as opposed to summer

grazing should restore much of the plant and insect diversity in the grassland regimes that are being planned (Oates, 1993 – but see Stewart and Pullin, 2008; C. Widger, personal communication). Where this is not possible, dividing up the ground into sectors in which land use is cycled will help to generate a biotope mosaic.

Management of the woodlands for butterflies is a difficult matter; it can take centuries to produce mature deciduous woodland (Merryweather, 2007) and many open spaces on the Edge, like the viewing spots such as Stormy Point, are intensively used by visitors and thus suffer from erosion. Even so, important steps are being taken to improve conditions for arthropods dependent on mature and dead timber and to open up some woodland (C. Widger, personal communication). Valuable steps that can be undertaken are relatively simple: increasing exposure of holly and ivy at sunny edges to light; renewing coppice cycles where feasible; and planting tree and shrub host plants. Stripping of ivy (as was done during 2012) is beneficial for the trees but it has implications for birds as well as insects. Elm (*Ulmus* sp.) is scarce on the Edge and planting it in opportune locations along field boundaries will in years to come support the White-letter Hairstreak (*Satyrium w-album*), which has been observed near Wilmslow. Planting up sunlit wood edges and clearings as well as hedges with alder buckthorn (*Frangula alnus*), already started by the National Trust staff, will reap more immediate benefits. This is the host plant for the Brimstone Butterfly (*Gonepteryx rhamni*) (Plate 37), which lays its eggs on young as well as mature plants, but essentially on those in sunlight. There is little difficulty in butterflies finding these new resources; vagrants fly into the National Trust area from considerable distances. Even sedentary butterflies, such as the Green Hairstreak (*Callophrys rubi*) and the Small Heath (*Coenonympha pamphilus*), species reminiscent of a time before 1800 when the Edge was under heath, may find their way to the Edge from the Pennine foothills (however, these records are not from the present surveys and so do not appear in Appendix 13.2). In the 1980s, a Green Hairstreak was observed in a garden off Macclesfield Road (C. Rutherford, personal communication) and a Small Heath was seen by the author in what was then a barley field (parcel 25a). Reminders of earlier times are still apparent, such as the ling at Stormy Point and the bilberry in Bradford Lodge Wood (parcel 12b), the latter of which, if extended, may be a large enough patch to sustain populations of Green Hairstreaks.

Some important contributions are easily made. Crucially, use of herbicide should be restricted. In one survey 45.2 per cent of areas studied outside the National Trust area and 4.7 per cent of unimproved pastures and verges within it had been recently treated with herbicide (Dennis, 2000a). Herbicide drift in the top field (parcel 29b) has caused dieback of marginal trees and kills off host plants for the Orange-tip

and Green-veined White in the roadside hedgerow such as Jack-by-the-hedge. More care over mowing during the period April to August, especially leaving nettle patches in direct sunlight, will also benefit our nymphalid butterflies.

Conclusions

Alderley Edge provides habitats for some twenty butterfly species and acts as a refuge for butterflies in the surrounding countryside. Currently, butterfly populations tend to be small but can be greatly improved with changes in management, at the same time providing an increasing source of interest for visitors to the Edge. With these visitors in mind, the National Trust has produced a colour brochure illustrating nearly all the butterflies found there, which is normally available in the main car park.

D. True Flies (Diptera)

Dmitri V. Logunov

> A fly, Sir, may sting a stately horse and make him wince; but one is but an insect, and the other is a horse still.
> J. Boswell, *Life of Samuel Johnson* (1791)

True Flies are members of the order Diptera (= two-winged) and are a familiar group of insects which includes Mosquitoes, Midges, Hoverflies, Fruit Flies and many others. It is the second-largest order of the British insects, with 7,035 species known nationally (Chandler, 2010) and over 150,000 species worldwide (Courtney *et al.*, 2009). To date, only 216 species of true flies have been recorded from Alderley Edge (see Table 13.1 and Appendix 13.1), which beyond doubt represent just a fraction of their real diversity over the site. For instance, only a single species of the Gall Midges (Cecidomyiidae; 652 species nationally), three species of the Black Fungus Gnats (Sciaridae; 266 species nationally) and no species of Agromyzidae (a group of specialised leaf-miners; 392 species nationally) have been recorded from the Edge to date. Here and elsewhere in the following report, the counts of British species in various Diptera families are given on the basis of the 2010 edition of *A Dipterist's Handbook* (Chandler, 2010), which is the most up-to-date and comprehensive account of information and specialised literature on British flies. The following brief report is best used in conjunction with this *Handbook*, and with the checklist by Chandler (1998) and the excellent, classical account by Colyer and Hammond (1951).

Traditionally, the Diptera are subdivided in two groups (suborders): Lower Diptera (formerly called Nematocera), recognised by filamentous, multi-segmented antennae which may be plumose in males, and Brachycera, recognised by shorter antennae, usually no longer than the head.

Lower Diptera (= Nematocera)

The Nematocera, collectively termed Threadhorns, are a group of flies that includes Mosquitoes, Midges, Gnats, Craneflies and some others. The majority of them develop in water. Their free-living larvae can dwell on the water surface (e.g. Meniscus Midges – Dixidae), swim (e.g. Mosquitoes – Culicidae), crawl on the bottom (e.g. Non-biting Midges – Chironomidae) or even tunnel actively in muddy sediments (e.g. Craneflies – Ptychopteridae and some Tipulidae). A common feature of the lower Diptera, particularly of Phantom Midges and Non-biting Midges, is the formation of dense mating swarms, generally composed of males that dance up and down to attract females. The swarms are formed in areas of moist vegetation or over dark areas of damp earth, and can be observed all around Alderley Edge on warm and quiet spring or summer days. When a female enters the swarm, coupling quickly takes place. Once the female is fertilised, she is no longer receptive to the males and will fly away to lay eggs.

Six nematocerous families are loosely called Craneflies (twenty-seven species recorded from Alderley Edge and about 435 nationally). Craneflies, with their rather leggy appearance, are probably familiar to most people as Daddy-long-legs (in fact few Cranefly species have English common names). Typical Daddy-long-legs (*Tipula*-type) can be encountered on the Edge from April (e.g. *Tipula vittata*; a dweller of shaded and open situations in woodland) to autumn (e.g. *Tipula staegeri*; a species widespread in wet and damp woodland). Some species are fairly common and widespread (e.g. *Tipula oleracea*) and can come into houses on warm summer evenings, being attracted to light. Despite all Daddy-long-legs being non-venomous, non-biting and unable to harm humans in any way, a common urban myth is that these creatures have poisonous fangs and could be the most poisonous animals of all (Marren and Mabey, 2010). In fact Craneflies barely eat as adults. Their larvae are usually scavengers of decaying matter, occurring on wet pastures and water margins, often under water. Nevertheless, some species, such as *Nephrotoma appendiculata* (Spotted Cranefly), *Tipula oleracea* and *Tipula paludosa* (the commonest Cranefly, not yet formally recorded from the Edge) are deemed to be horticultural and agricultural pests. Their larvae – tough-skinned grubs – feed on grass roots and are known

to gardeners and farmers as 'Leatherjackets'. It is worth remembering that both larvae and adults of most if not all Craneflies constitute the major food source for bats and birds.

Of the Cranefly species found on the Edge, *Dolichopeza albipes* of the family of Long-palped Craneflies (Tipulidae) is known as the White Footed Ghost (see Boardman, 2007). It is an entirely black Cranefly, except with shining white ends to its legs. The creature prefers densely shaded places under fallen trees or rocks along streams (e.g. parcel 11d). When disturbed it flies out of the darkness, displaying its white leg segments to confuse predators. Its larvae live in patches of liverwort along densely shaded stream banks.

The group of Short-palped Craneflies (Limoniidae) comprises quite small and elegant flies, representing the most numerous and diverse group of Craneflies, with twelve species on the Edge and some 215 nationally. Some of the species recorded from the Edge (e.g. *Cheilotrichia cinerascens* and *Ormosia hederae*) have two generations per year and fly in early spring and again in late summer/autumn. Many species (e.g. *Dicranomyia modesta* and *Erioconopa trivialis*) occur virtually anywhere that presents wet soil. However, some dwell in rather unexpected habitats: for instance, *Limonia duplicata* breeds in dung, and so is common in cattle-rearing areas (parcels 20b or 22), and *Limonia nubeculosa* is abundant in sand dunes and sand heaths (parcel 17b), with its larvae living in leaf litter. Some species (e.g. *Rhypholophus varius*) prefer acid substrates such as carr and seepages.

Winter Gnats of the family Trichoceridae, with three common species found on the Edge, are abundant throughout the year, but more so in late autumn and winter, and this is why they acquired their common name. All the recorded species of Winter Gnats are potentially ubiquitous; the males can be seen swarming in sheltered spots in gardens, woodland clearings or along footpaths. The Fold-winged Craneflies (family Ptychopteridae) are represented on the Edge by two common species (*Ptychoptera albimana* and *P. contaminata*; Plate 38). Both are small attractive flies with spotted wings and the abdomen visibly constricted in its middle part. Larvae burrow into soft sediment or live among dead leaves at the bottom of ponds and streams, and breathe through long tubes. According to Stubbs (1993), ptychopterid species are good indicators of the quality of aquatic habitats.

Of other nematocerous flies found on the Edge it is worth mentioning Window Gnats (Anisopodidae). One of the two recorded species, *Sylvicola fenestralis*, breeds in a variety of decaying wood or vegetation, animal manure, mud and fermenting sap. Its larvae have even been reported as being capable of causing damage to honeycombs, cider and homemade wines. However, the fly enters houses accidentally, especially in springtime, being attracted to light, and can be found near windows

(hence its English common name). This species is one of a number of True Flies collectively known as 'Filter Flies' (Hickin, 1964). They breed in sewage filters, preventing the fungal mat (on which the larvae feed) becoming too dense and clogging the filter beds in sewage works.

If you are a mushroom hunter, you know how disappointing it can be to pick up a wild mushroom that is full of wormholes and white 'worms'. In fact these 'worms' are the larvae of various True Flies that develop in fungi known as fungicolous flies. Two groups of flies found on the Edge are definitely in this league, the Fungus Gnats of the families Mycetophilidae (twenty-nine species on the Edge, 471 nationally) and Bolitophilidae (four on the Edge, seventeen nationally). Many groups of the Mycetophilidae are oligophagous and develop only in a particular kind of mushroom, such as *Mycetophila formosa*, which develops only in the Wrinkle Crust (*Phlebia radiata*). Larvae of others are less choosy and can develop in various mushrooms. For instance, *Allodia lugens* and *Mycetophila fungorum* inhabit living agarics, boletes, Pezizales and some other kinds. All four *Bolitophila* species recorded on the Edge develop in agarics, the most common group of mushrooms. Their larvae are gregarious and develop internally in soft fungi. Larvae of the Black Fungus Gnats (Sciaridae; three species on the Edge) develop in decaying detritus, but some, such as *Lycoriella ingenua*, also in agarics and polypores, such as bracket fungi, which are often found on Alderley Edge on rotting logs. As a whole, the world of flies associated with fungi is quite diverse and is likely to exceed 800 species in the UK alone. A detailed account of which British Diptera species occur in fungi and how to collect and to study them is given by Chandler (2010).

While walking over wet meadows on Alderley Edge (parcels 17a–17c) on a warm spring day it is difficult to avoid black, slow-moving and absolutely harmless St Mark's Flies (Bibionidae; two species on the Edge, eighteen nationally), so named because they often appear close to St Mark's Day (25 April). Some species (e.g. the Fever-fly, *Dilophus febrilis*; Plate 39) can swarm on flowers, where flies will be seen doubled up during copulation, the habit that resulted in another country name, 'Love Bugs'. These flies breed in soil and rotting vegetation. Another easily recognisable family is the Moth-flies (Psychodidae; ninety-nine species nationally), small flies with short, hairy bodies and wings giving them a 'fluffy' appearance. They develop in moss and damp vegetable matter. Unfortunately, the fauna of Moth-flies of Alderley Edge remains practically unknown, with a single finding of aquatic larva of an undetermined *Psychoda* species.

The only group of blood-sucking Lower Diptera recorded from the Edge to date is the Mosquitoes (Culicidae) (three species locally, thirty-four nationally). Females of two species (*Aedes punctor* and *Culex pipiens*) feed on a range of mammals, including humans, and bite readily, while

those of *Culiseta morsitans* mostly feed on birds (see Snow, 1990). The *molestus* form of *Culex pipiens* is famous because its larvae occur underground, for example in flooded cellars or in the underground railway systems of large cities.

Brachycera

The suborder Brachycera, collectively termed 'Shorthorns', contains various groups that we think of as typical flies, such as Hoverflies, Houseflies and Bluebottles. Hoverflies (the family Syrphidae; twenty-one species on the Edge and 276 nationally) are among the best-known Diptera and almost universally liked by the general public because of their bright colour and effortless hovering around garden flowers (Plate 40 shows two species recorded on the Edge). Hovering by males seems to be a strategy for attracting females. For this reason males tend to hold small territories in loose swarms and chase off rivals.

Adults of the majority of Hoverflies feed on nectar and pollen in different proportions when visiting flowers. Many of them look like bees and wasps, including a similarity in colour, morphology and even behaviour. For instance, the Dronefly *Eristalis pertinax* and the Hoverfly *Cheilosia illustrata* resemble the Honeybee; the black and white Hoverflies *Syrphus vitripennis* and *Myathropa florea* resemble social wasps (*Vespula vulgaris* and related species); the furry black and yellow and white Hoverfly *Eristalis intricarius* looks very much like a Bumblebee; the orange and black hoverfly *Xylota segnis* resembles an Ichneumon wasp. Such similarity, known as mimicry, protects Hoverflies from predators (birds in particular) that are deceived into mistaking the harmless fly for a noxious insect and do not attack it (see Edmunds, 2008). Some Hoverflies not only look like social wasps and bees, but their larvae also live in wasps' nests, usually as scavengers. For instance, *Volucella pellucens*, of which adults can be seen hovering above the ground in woodland clearings on Alderley Edge, lays its eggs in the nests of social wasps in early autumn, when the wasp colony is about to die out; the Hoverfly larvae then feed on nest debris until next spring.

The larvae of many Hoverflies (e.g. *Epistrophe grossulariae*, *Melanostoma scalare* and *Platycheirus albimanus*) feed on Aphids and thus are friends to the gardener, alongside such predatory groups of insects as Lacewings, Ladybirds and Ground Beetles (see section F). Larvae of others (e.g. *Cheilosia illustrata* and other members of the same genus) are herbivorous, mining in the stems and roots of plants, and are associated with large umbellifers such as hogweed, on which the adults are typically seen. Larvae of *Eristalis* species are of the rat-tailed maggot type and occur in drains and ponds rich in the decaying organic matter

on which they subsist. Larvae of *Xylota sylvarum* feed on dead rotting wood and occur under rotten bark.

Many other flies are also convincing mimics of other Hymenoptera, for instance of the Ichneumon wasps. Adults of the only species of Awl-flies recorded from the Edge (*Xylophagus ater*; Xylophagidae) are delicate-looking flies which can be found by examining standing, freshly dead broad-leaved timber or fallen logs, on which eggs are laid, mainly in May and June. Males move and look very much like an Ichneumon wasp. Larvae of *Xylophagus ater* live in dead wood, sub-cortically (between the bark and the dead sapwood), but are carnivorous, preying on other larvae. Another mimic of the Ichneumon wasp is *Loxocera albiseta* (Psilidae; twenty-six species in the UK), an elongate red and black fly that lays eggs into plants on which the larvae feed.

Many flies, such as *Acidia cognata*, the sole representative of the Picture-winged Flies (Tephritidae) found on the Edge (seventy-six species in the UK), have delicately patterned wings. The wings are used in courtship, but also provide a form of camouflage. Larvae of *Acidia cognata* are leaf-miners of the coltsfoot (*Tussilago farfara*), cutting semicircular slits under the leaf epidermis. It is worth noticing that the fly leaf-miners and stem-miners of Alderley Edge remain virtually unstudied, though there are over 350 native British species (Pitkin *et al.*, 2015). For instance, only two species of the Opomyzidae (sixteen nationally), whose larvae bore grass stems, and two species of the Shore-flies (Ephydridae; 151 in the UK), whose larvae mine leaves or stems of aquatic plants, have been found on Alderley Edge.

Our remoter forebears were right in assuming that flies could be generated from decaying organic matter (but not spontaneously as they thought). Two important groups of the kind are the Blowflies (Calliphoridae; two species on the Edge) and the Flesh-flies (Sarcophagidae; three species on the Edge). Larvae (i.e. maggots) of certain species (e.g. *Calliphora vicina*) feed on decaying animal material, being the dominant group of insects that decompose large carcasses. Maggots can occur in huge numbers, as each female lays about 300 eggs, and hatched maggots complete their development in less than two weeks. If fly maggots are present, 90 per cent of the available soft tissue on the carcass is gone within approximately six days. *Calliphora vicina* seems to be one of the most important fly species in the field of forensic entomology because of its consistent time of arrival and colonisation of the corpse, which it finds by odour. However, maggots of other species, known as Bird Blowflies (e.g. *Protocalliphora azurea*), are obligate external parasites of birds; they are found in the nests of birds and suck the blood of nestlings. Furthermore, some Sarcophagidae species (e.g. *Metopia argyrocephala*) are associated with nests of solitary bees (Apidae) and wasps (Sphecidae and Pompilidae), where fly larvae subsist on the food

store intended for the owner's offspring. Adults can be found in dry sandy places such as sand heath (parcel 17b), where their hosts nest.

Many Diptera species are associated with dung and play an important role in its recycling. In the UK at least 201 fly species develop in cow dung (P. Skidmore, in Chandler, 2010), forming an important part of what is collectively termed as the 'cow-dung community' (see also section F). These flies are well represented on the Edge because of the availability of permanent pastures (parcels 20b, 22). Some of them are exclusively dung-breeders, for instance the family Sphaeroceridae or Lesser Dung-flies, with eight species found on the Edge of the 137 known in the UK. These black and usually small flies are most often found in samples of cow dung. Most unusual is that the flies can penetrate below the dung surface, using the tunnels made by larger insects (Skidmore, 1991). Many species (e.g. *Copromyza atra*, *Crumomyia nigra* and *Sphaerocera curvipes*) can also utilise horse, pig and sheep dung, and are common in farmyard dung or compost heaps. Far more interesting, though, are the Scathophagidae, a group of exclusively dung-breeders loosely called the Yellow Dung-flies (fifty-four species nationally), with two common species found on Alderley Edge (Plate 41). Both of them belong to the genus *Scatophaga*, meaning 'dung-eater'. These bright yellow and orange furry flies are highly predacious and can attack much larger insects, including the Craneflies. In springtime, males of *Scatophaga* species can be seen on the Edge (parcels 5, 11d, 22) crowding on pats of cow dung. Males are territorial and try to defend their own space on the dung against rivals. The winner of a particular dung space, usually the largest male, is visited by a female that mates with him and then deposits her eggs.

The dung of poultry is also populated by flies, for instance by *Sepsis violacea*, a small bright black fly – a representative of the small family of Black Scavenger Flies (Sepsidae; four species on the Edge and twenty-nine nationally). Other species of the Sepsidae (e.g. *Sepsis fulgens*) are notable because they can form large swarms of adults, especially in the late winter.

However, in its association with human concerns the most famous group of dung-breeding flies is the family Muscidae (Houseflies). Because of the strong association of these flies with dung and decaying matter, many people assume that *all* flies feed on and develop in excrement of some sort. The main public accusation of the Housefly was brilliantly articulated by T. Crew in his 'The Song of the Fly' (1931):

> Straight from the rubbish heap I come,
> I never wash my feet,
> And every single chance I get
> I walk on what you eat.

It is an unfortunate but well known fact that, for instance, the Common Housefly (*Musca domestica*), which has not yet been formally recorded from the Edge, is not only an obnoxious home pest but can also be a mechanical vector of human diseases such as typhoid, dysentery, summer diarrhoea and others (Hickin, 1964). A comprehensive account of the Common Housefly and anti-housefly campaigns in the UK, where it was once called 'one of man's greatest enemies', was provided by Clark (2009).

For the sake of accuracy, it is worth stressing that larvae of many muscids (e.g. of *Hydrotaea cyrtoneurina*, *H. irritans* and *Polietes lardarius*), even if they occur in dung, are predators feeding on other fly larvae. Many muscids are indeed dung-breeders, for instance *Coenosia tigrina*, *Hebecnema umbratica* and *Mesembrina meridiana*, which are typically found around cattle pastures (parcels 11, 17, 20). Of these, *Mesembrina meridiana* is rather showy and can be identified in the field: it is a large shiny black fly with conspicuous orange-yellow bases to its wings. Adults can be seen sunbathing on logs, fences or bare sunny ground; this is why it is sometimes named the Noon Fly. Other muscid flies (e.g. *Thricops semicinerea* and *Phaonia basalis*) are frequent visitors to flowers, especially hogweed. Many species of the Muscidae such as *Phaonia subventa* are widespread and common, and can be found on the Edge from March until it freezes. Others are common visitors to our houses. For instance, the shiny green fly *Eudasyphora cyanella* sometimes overwinters indoors and is among those flies which are collectively known as 'Cluster Flies'. This fly is one of the first to appear each year, and individuals can be seen sunning themselves outside on walls.

Two species of Housefly recorded from Alderley Edge are particularly notorious. One of them is known as the Sheep Headfly or Sweat Fly (*Hydrotaea irritans*). It is a typical cattle-nuisance fly which bothers farm animals by swarming around their heads, feeding on saliva and mucous secretion, with a preference for blood. In Scotland, the fly can cause economic damage and it has been suggested that it is a vector for summer mastitis, a bovine bacterial infection. Another obnoxious species of the Edge is the Stablefly or Biting Housefly (*Stomoxys calcitrans*; Plate 42). It appears to be closely connected with horses and therefore can be found near stables, whence its common name. The fly resembles the Common Housefly, but it is a blood-sucker. It mainly attacks horses and cattle, choosing the lower part of the legs as the spot to feed, but (what a surprise!) it can also attack people. It is almost embarrassing to think that if methods for their total eradication are discovered we shall show no mercy towards Stableflies, nor towards the other Houseflies that commonly enter houses. But my personal heresy is that really we should not fight against nature, even if it comes to us in the appearance of a fly. Despite our deep animosity towards flies, it

is worth remembering a bit of popular wisdom that 'if you kill a fly, two more will come to its funeral'; we shall never win!

There are many other Diptera groups which can be found indoors at Alderley Edge, for they are likely to be attracted to light. Many are difficult for non-specialists to distinguish, for instance the small and dull-coloured *Heleomyza serrata* (Heleomyzidae) and *Palloptera ustulata* (Pallopteridae) and *Opomyza germinationis* (Opomyzidae) – a small yellowish fly with strongly marked wings. The latter species is abundant in grassy habitats, for its larvae are stem-borers in grasses. Some species of the Lauxaniidae (e.g. *Lyciella rorida*, a small yellow fly with orange eyes) can also be found indoors. Larvae in this family develop in decaying vegetable matter, including compost heaps, whereas adults prefer shady situations and this is why they may enter houses. Even some Soldier-flies (Stratiomyidae; five species on the Edge of forty-eight known in the UK) such as the Twin-spot Centurion (*Sargus bipunctatus*) may enter houses. The latter is an autumn species and a typical garden-dweller which can be seen from August to early November; its larvae breed in dung. Adults of the Soldier-flies are usually associated with wetlands (parcels 17a, 18c, 20b) and can be collected by sweeping waterside vegetation, on which they congregate and rest. Their common name is due to their bright (often metallic green or vivid yellow) body coloration, which is thought to be reminiscent of the soldiers' uniforms of long ago.

Many flies are parasitoids (i.e. parasites that kill their host; see also section E). The most diverse of such flies are the Tachinidae or Parasite Flies, with eight species found on the Edge (261 in the UK). These are usually medium-sized, dull-coloured flies, often resembling the Houseflies but more bristly. Tachinid larvae are almost without exception solitary internal parasitoids of other insects, especially of Lepidoptera and Coleoptera (Askew, 1971). For instance, larvae of *Dexiosoma caninum* parasitise larvae of the Cockchafer (*Melolontha* spp.), and those of *Eriothrix rufomaculata* and *Tachina fera* develop inside caterpillars of Arctiidae and Noctuidae. The host usually does not die until the larval development of the parasite is complete. Compared with the parasitoid Hymenoptera, larvae of the parasite flies are less specific and some of them can attack many hosts. The Thick-headed Flies (Conopidae; four species recorded from the Edge, twenty-three nationally) are another family that is exclusively parasitic. They attack adult bees or wasps: *Conops quadrifasciatus* is a parasitoid of the White-Tailed Bumble Bee (*Bombus lucorum*) and *Physocephala rufipes* is a bee-killing fly, its larvae being parasitoids of adult bees. Adults of the Thick-headed Flies are nice-looking creatures, with a wasp-like or bee-like appearance (often striped black and yellow), typically found in woodland glades and edges, meadows and sand heath (e.g. parcels 17a, 17c), visiting flowers, especially umbels and composites, where their hosts are likely to be

found. The family of Big-headed Flies (Pipunculidae; two species on the Edge and ninety-five nationally) includes small, dull-coloured flies that earn their common name from their disproportionately large heads, which are composed mostly of the enormous eyes. Another hallmark of the family is that they are exquisite fliers, capable of hovering just like the true Hoverflies (see above). Larvae of the Big-headed Flies are internal parasitoids of Homoptera, especially of Leafhoppers (Cicadellidae) and Froghoppers (Cercopidae) (discussed in section A).

Most unusual are the Keds or Louse Flies (Hippoboscidae; one species on the Edge of fourteen known in the UK), whose adults are external blood-sucking parasites of birds and mammals other than bats. These flies have flattened bodies and are often wingless. Instead of laying eggs, a female produces a fully grown larva, which pupates immediately. Only one larva is carried at a time, and one female can produce ten to twelve larvae during its life (Askew, 1971). The only species recorded from the Edge is *Stenepteryx hirundinis*, taken from the house martin, but the fauna of Hippoboscidae should include more species, for instance the Forest Fly (*Hippobosca equina*), a parasite of horses and cattle, and *Ornithomyia avicularia*, a parasite of a wide range of woodland birds, and others.

Some of the Edge's flies, notably the Dance-flies of the families Empididae and Hybotidae, can surprise an attentive spectator by their elaborate courtship rituals. At first glance everything seems ordinary: on a sunny spring or summer day, elegant small to medium-sized flies, non-metallic and rather bristly, form aerial mating swarms, in a similar manner to the Non-biting Midges (see above). However, the males exhibit unique mating behaviour. Each male carries some prey (usually other flies), which is given to the female during courting as a 'nuptial gift'. Sometimes males prey on rival males of their own species and use them as gifts. In the swarms, males advertise their gifts by a rapid side-to-side 'dance', as if swaying on a pendulum, which explains their common name of Dance-flies. Females seem to choose the male with the most enticing offering. Mating does not take place until the female accepts the fly and feeds on it (a kind of a parental investment from the male); see Preston-Mafham and Preston-Mafham (1993) for more details of sexual rituals in the Dance-flies. Similar courtship ritual is described for the Nursery-web Spider (*Pisaura mirabilis*), but there it is performed for a different reason (see section G).

The fauna of the Dance-flies of Alderley Edge remain poorly studied, with only nine species of the Empididae (208 nationally), six species of the Hybotidae (178 nationally) and one species of the Brachystomatidae (four nationally) recorded to date. Nevertheless, one of the recorded species (*Rhamphomyia caliginosa*; Empididae) is nationally scarce, and two others (*Empis hyalipennis* and *Hilara monedula*; both Empididae)

are rare in northern England. Despite the unusual courtship ritual of Dance-flies, many aspects of their biology remain to be explored. Even in some common species recorded from the Edge, such as *Empis punctata*, *Hybos culiciformis* and *Platypalpus pallidiventris*, the larval biology is still unknown, and in others (e.g. *Trichopeza longicornis*) even habitat requirements have not been established. All Dance-flies are predators, having a conspicuous down-pointing proboscis, which is used for piercing the prey: other flies, Caddisflies, Mayflies and Moths. This is why another common name for the Empididae is Dagger-flies.

Of the Diptera groups occurring on Alderley Edge, one cannot omit the large family of Long-legged Flies (Dolichopodidae), close relatives of the Dance-flies, with ten species found on the Edge and 296 nationally. Members of the family are easy to recognise: all are medium to small slender flies with green or copper metallic-coloured bodies and long legs. However, identification of individual species is very difficult, because many are similar. Long-legged Flies have a short proboscis and prey on other small insects. Males demonstrate the elaborate courtship behaviour, which involves visual communication between sexes. Males show dynamic flight manoeuvres and/or display their leg modifications (called 'badgers' in scientific jargon) by waving them in front of the female. Adults of the common Long-legged Flies found on the Edge (e.g. *Dolichopus trivialis*, *D. ungulates*, *Hercostomus aerosus*, *H. cupreus*) prefer damp situations and wetlands; the carnivorous larvae develop in damp soil or mud.

It is worth mentioning a few more of the remaining groups of flies on Alderley Edge. The Common Clegg (*Haematopota pluvialis*) is the sole representative of the Horseflies (Tabanidae; thirty species nationally) found on the Edge. It is a greyish biting fly that is associated with marshes and damp woodlands, like other local species of Horseflies. Females bite mammals, including humans (especially around parcels 17b, 20b and 22), and the bites hurt. Certain representatives of the predatory Snipe-flies (Rhagionidae), such as *Rhagio scolopacea*, can be recognised by their habit of perching head-downward on tree trunks, from whence they make short flights at passing prey (other soft-bodied insects). This is the reason for their other common name – 'Downlookers'. Some of the Brachycera flies are associated with fungi, for example *Suillia bicolor* (Heleomyzidae; eight species on the Edge, fifty-six nationally), whose larvae inhabit agarics and boletes. Larvae of the Snail-killing Flies (Sciomyzidae; one species on the Edge, seventy nationally) are specialist predators of snails and slugs.

Although it is possible to continue telling more interesting stories and facts about what could be seen by some as the all-too-common flies occurring on Alderley Edge, this brief report cannot cover all of them. Therefore why don't you just choose a warm, sunny spring or

summer day and visit the Edge yourself? Myriads of flying minibeasts of which little or nothing is known are still there to be looked at and studied. For observation nothing is required but patience, a pocket lens and goodwill. Whether you are a nature-lover or a rigorous scientist, you might be the one who will discover something unusual about our neighbourhood flies or challenge what seems to be a well known fact about them.

E. Wasps, ants, bees and allies (Hymenoptera)

Dmitri V. Logunov

> The roving bee proclaims aloud
> Her flight by vocal wings.
> W. Wordsworth (1888), 'Gold and Silver Fishes in a Vase'

The order Hymenoptera is the third largest group of insects after the Coleoptera (beetles) and Lepidoptera (butterflies and moths), numbering over 145,000 species described worldwide (Huber, 2009). In the UK it is the largest insect order, with 7,517 species (G. Broad, personal communication). The group gets its name from the Greek words *hymen* and *pteron*, and means 'membrane-winged'. Hymenoptera are characterised by usually having two pairs of membranous wings. However, fore- and hindwings are tightly interlocked by a line of small hooks and hence during flight the pair of wings on each side acts as a single membrane. There are two main taxonomic groups of Hymenoptera: the Symphyta (sawflies and wood wasps), which are broad-waisted, and the Apocrita, which usually have a pinched waist and include all the remaining Hymenoptera, themselves traditionally considered in two groups: the Parasitica (parasitoid wasps) and the Aculeata (those groups that can sting: bees, wasps and ants).

The most widely recognised hymenopterans – bees, ants and wasps – have long been part of art, ritual, folklore and literature worldwide – to take just one unforgettable comment by A. A. Milne's Winnie-the-Pooh: 'The only reason for being a bee that I know of is making honey … and the only reason for making honey is so I can eat it'. Whatever the reasons for 'being a bee' might be according to Winnie-the-Pooh, many hymenopterans do indeed provide themselves and especially their offspring with nutritious food, either animal-based (paralysed insects) as in the case of wasps, or plant-based (seeds, pollen, honey, etc.), as do the ants and bees. In the latter case, a poorer food resource such as nectar is usually modified into a better one such as honey.

The regional fauna of the Hymenoptera of Alderley Edge remain poorly known, with only 128 species being recorded to date (see

Appendix 13.1, Table 13.1). This number is even less than the number of collected species of flies (216) or spiders (137). It is mainly due to the notably low number of recorded parasitoid wasps, the most diverse and the least-known group of the Hymenoptera. These wasps are called 'parasitoids' because, technically speaking, they are not 'parasites'. True parasites, like helminths, subsist at the expense of their host and rarely or never kill it, whereas young parasitoids develop inside the host, consuming it entirely apart from the skin, and always kill it. Nearly 10 per cent of described insect species are parasitoids, but they are in fact likely to represent 20–25 per cent of all insect species (Mills, 2003); yet most of them belong to poorly known groups such as parasitoid wasps (over 64,000 known species worldwide).

Only twenty-two of the parasitoid wasp species (Braconidae, Ichneumonidae and Proctotrupidae) out of over 5,500 known in the UK have been recorded from the Edge, mainly on the basis of the old card index of faunistic records of insects of Lancashire and Cheshire compiled in 1920–54 by the famous British entomologist Harry Britten and held in Manchester Museum. Yet the parasitoid wasps are likely to be one of the most abundant flying insects in British gardens, far more numerous than moths or even flies (Thompson, 2006), and thus it is hardly an exaggeration to say that the fauna of parasitoid Hymenoptera of Alderley Edge still remain practically unexplored.

Of the Parasitica recorded from the Edge, it is worth mentioning the huge family of Ichneumon Wasps (Ichneumonidae), the parasitoids of butterfly and moth caterpillars or pupae in which they lay their eggs. For instance, the large, Black Ichneumon *Amblyjoppa proteus* is reared in caterpillars of the Elephant Hawk-moth, a common species of the Edge. Although the great majority of the Ichneumon Wasps have fully developed wings and are very active in flight, females of some species, particularly of the genus *Gelis* (three species of which have been found on the Edge), are wingless, looking like elegant ants. They can attack spider cocoons. Some parasitoid wasps develop inside aphids. For instance, *Ephedrus plagiator* (Braconidae) attacks the Black Bean Aphid (*Aphis fabae*; see Askew, 1971), which forms large colonies on many host plants. Surprisingly enough this aphid species has not yet been formally recorded from the Edge – another sign of how incomplete is our current knowledge of the insects of Alderley Edge.

Only a single species of the gall wasps (*Andricus kollari*, Cynipidae) has been recorded from Alderley Edge. A gall is an abnormal swelling of plant tissues induced by various organisms, including the grub-like larvae of gall wasps. Gall provides nourishment and shelter for the gall maker. *Andricus kollari* is well known for developing spherical and woody Oak Marble Galls, which were used as dye-source for cloth and ink until 1860. This is why this gall wasp, which is a native of the Middle East,

was introduced to Devon during the 1830s and by 1860 had spread as far northwards as Scotland (see Redfern and Askew, 1992). Herbalists also used gall extract as remedy to cure rheums, dysentery and other fluxes.

The Sawflies and Wood Wasps (Symphyta) of Alderley Edge remain poorly known and include only eleven of the 470 species recorded in the UK (Archer, 2002). They are more familiar as grubs, for the caterpillar-like larvae, some of which attack certain garden plants such as currants and roses, are often gregarious (Owen, 1983, 1991). Sawflies get their name from the saw-like ovipositor used by females for cutting plant tissues and laying eggs. Sawflies are most numerous in woodlands. The most spectacular and largest British species is the Birch Sawfly (*Cimbex femoratus*; up to 25 mm long), of which spectacular fast-flying adults can be collected from May to August; its greenish, solitary grubs feed on birch. Only slightly smaller (15–20 mm long) is *Trichosoma lucorum*, which at first glance could be easily mistaken for a bee; its grubs also subsist on birch leaves. Representatives of the large family Tenthredinidae (nine species on the Edge) are much smaller and often difficult to identify; their grubs are usually gregarious.

Alderley Edge is regionally important for the Aculeata (about 570 species in the UK; see Archer, 2002), primarily due to the easy availability of open habitats, such as sandy heaths, grasslands, heathlands and exposed soil along the edges of paths (parcels 3b, 12b, 17, 20b, 22, etc.), whose soil provides suitable nesting sites for solitary bees and wasps, such as Andrenidae, Halictidae, Pompilidae and some Sphecidae. Many of these groups are strongly habitat-associated and therefore local, with a very patchy distribution. Two species, the Hairy Sand Wasp (*Podalonia hirsuta*, Sphecidae) and the Spider-hunting Wasp (*Priocnemis schioedtei*, Pompilidae), are nationally scarce. One species, *Nomada lathburiana* (Anthophoridae), is listed in the *British Red Data Book* (Shirt, 1987) as a rare species (category 3), which means the species is extremely localised within the UK and seems to be at risk of extinction. It is a Cuckoo Bee that resembles a wasp (striped in yellow, black and red), being a nest parasite of the Grey Mining Bee (*Andrena cineraria*). The female enters the open cell of the host and lays its egg. When it emerges the larva kills the egg or young larva of the host and feeds on the stock of pollen that forms its stored provisions.

Of the solitary bees, two groups are best-represented at the Edge: the Mining Bees (Andrenidae; thirteen species) and the Sweat Bees (Halictidae; thirteen species) (nationally thirty-two and fifty-seven species respectively). The Mining Bees are small to large subterranean-nesting bees, brown or blackish in colour, and look superficially like honey bees. As with all solitary bees, it is the female Mining Bees that dig and provision the nest. Generally a nest consists of an entrance

leading to a main burrow with shorter lateral burrows, each ending in a cell or cluster of cells lined with a wax-like substance. All the recorded species are common and widespread, but some, such as *Andrena fucata* and *A. barbilabris* (Plate 43), are local in distribution, being restricted to places with exposures of sand or light sandy soils, including landslips and sandy heaths (parcel 17). Other species are strongly associated with a particular plant, for instance *Andrena lapponica* with the bilberry (*Vaccinnium* spp.; parcels 3b, 12b), from which the females collect pollen. The nests of all *Andrena* species are sometimes taken over by Cuckoo Bees of the family Anthophoridae (five species on the Edge, nationally thirty-two). Female Cuckoo Bees resemble wasps, do not construct their own nests, and lay their eggs in the nests of Mining Bees, as described above for *Nomada lathburiana*, behaviour reminiscent of cuckoo birds. In professional jargon, Cuckoo Bees are named cleptoparasites.

The Sweat Bees (Halictidae) are small to medium-size subterranean-nesting bees, usually dark-coloured and often metallic in appearance (e.g. the metallic bronzy-green *Halictus tumulorum*). These bees may be solitary (as are all the *Lasioglossum* species recorded from the Edge) or primitively eusocial (*Halictus tumulorum*). In the latter case, the female that has established a nest becomes the queen. She rears a first brood, some of which remain in the nest when they become adults, as workers helping the queen to take care of the second brood. All species of *Sphecodes* (four on the Edge) are cleptoparasites of either *Halictus* or *Lasioglossum* bees, usually with no particular specialisation. They can even attack the Mining Bees. For instance, the black and red *Sphecodes pellucidus* is known to parasitise the nests of *Andrena barbilabris*.

Solitary bees of the Edge also include Leaf-cutting Bees (Megachilidae). One of the two species recorded from the Edge (*Megachile willughbiella*) is notorious for making neat, semi-circular holes in rose leaves, which are cut from the leaf margins by the female bees and used to create nest walls. On the other hand, Leaf-cutting Bees are important as pollinators.

All groups of bees are efficient pollinators of fruit crops and garden flowers, and are capable of enhancing a garden (see Owen, 1983). Crops such as apples, pears and berries are entirely dependent on pollinators for fruit production. Various measures such as bee nesting boxes, bamboo canes and the like can be used to attract the bees to gardens and orchards (see Thompson, 2006). The most famous of the pollinators are social bees (Apidae), Bumblebees (*Bombus* spp.) and the Honey Bee, with organised societies and elaborate honeycombs. It is about them that the early seventeenth-century English proverb says that 'where bees are, there is honey'. Eight species of Apidae have been found on the Edge out of the twenty-five British species (250 worldwide: Huber, 2009). All British Bumblebees live socially in colonies throughout their lives. They nest underground, often in old mouse or vole nests, and can have

from 30–50 up to 150–200 bees in the colony (e.g. *Bombus terrestris*). Bumblebees forage on a wide range of plants, feeding on pollen and nectar and rearing their grubs on the same diet. Bumblebee colonies are annual affairs: they die out each autumn, leaving only young mated queens to survive the winter and start new colonies each spring. Many British bumblebee species are in serious decline, causing what is known as 'pollination deficit', and a number of measures need to be taken to conserve and protect them (see Marren and Mabey, 2010). Two of the Apidae species recorded on the Edge are Cuckoo Bees, which belong to the subgenus *Psithyrus* of the genus *Bombus* (Plate 44 shows one of these two) and which may take over a substantial part of the colonies of other *Bombus* species, giving them their common name (see Prŷs-Jones and Corbet, 1987). The *Psithyrus* female crawls into a bumblebee nest, often kills the host queen and starts laying her eggs in the host nest. As a result, its larvae are reared by workers of the host bumblebee species. One of these Cuckoo Bees (*Bombus vestalis*) is regionally notable in northern England, and otherwise common.

Of the solitary wasps recorded from Alderley Edge, it is worth mentioning Spider-hunting Wasps (Pompilidae; seven species) and Digger Wasps (Sphecidae; twenty-four species) (44 and 120 British species respectively). A common feature is that the female wasps make individual nests, dug in sandy soil or excavated in plant stems, and then provision them with paralysed prey such as spiders, caterpillars or other insects as food for their offspring. Several dozen insects or spiders can be collected for each larva: see Yeo and Corbet (1983) for a useful account on the general biology of and identification key to the British solitary wasps. All the Spider-hunting Wasps recorded on the Edge are common but local in distribution. As the name suggests, these wasps usually prey on spiders, particularly on ground-dwelling Wolf Spiders (Lycosidae), and are commonly seen running erratically on sand and bare earth. Some groups such as the *Priocnemis* species excavate multi-celled burrows, often in natural cavities; others like *Anoplius nigerrimus* (Plate 45) make their nest cells in deserted burrows, including those of other Aculeata, or sometimes even in snail shells. There are even nest parasites among the Pompilidae. For instance, *Evagetes crassicornis* is a brood parasite on other subterranean nesting species of the family such as *Arachnospila anceps* and *Anoplius nigerrimus*; the latter was recorded from the Edge.

The Digger Wasps represent a rather diverse group (731 species worldwide; Huber, 2009), with a wide array of habits and prey used for their larvae. For instance, the large yellow and black Slender-bodied Digger Wasp (*Crabro cribrarius*; Plate 46) as well as other *Crabro* and also *Crossocerus* species provision their young with flies of various families (Asilidae, Empididae, Muscidae, Syrphidae, Therevidae, etc.); species of the genus *Psen* stock their nests with cicadellid leaf-hoppers;

the *Pemphredon* species, commonly nesting in rotten wood or in broken plant stems, prey on Aphids; females of the nationally scarce species *Podalonia hirsuta* provision their nest with caterpillars. A few sphecid species such as *Passaloecus corniger* have adopted a parasitic lifestyle, stealing aphid prey of other *Passaloecus* species and from *Psenulus pallipes*, which is most unusual for Digger Wasps.

As a stock of paralysed insects represents a valuable food source, all solitary wasps have their own cleptoparasites, which lay their eggs in the host's nest cells and their larvae then eat the rightful brood, like the Cuckoo Bees (see above). For instance, the Cuckoo Wasp *Elampus panzeri* (Chrysididae; Plate 47) recorded on the Edge parasitises Digger Wasps of the genus *Psen* (Sphecidae). The adults of this and other species of Chrysididae are bright, metallic-coloured insects (hence their second English common name – Ruby-tailed Wasps), which feed on nectar and pollen, often on garden flowers.

However, the most familiar to everyone are the Social Wasps (Vespidae), with five species reported from Alderley Edge of the nine known in the UK (4,918 worldwide; Huber, 2009). In various regions of Britain, these wasps are known as Apple-bees, Sow-wasps, Jaspers, Yellow Jackets, etc. (see Marren and Mabey, 2010); the last name is due to their black and yellow banded bodies. All Social Wasps build complex nests made of chewed wood pulp, a kind of papier mâché, which is obtained from dead trees, fences, etc. Nests are usually suspended in enclosed spaces such as bird boxes, hollow trees, roof spaces or cavity walls, as in the case of the *Dolichovespula* species, or the wasps form colonies underground, as does the Common Wasp (*Vespula vulgaris*). Young are reared on meat of other insects or scraps of carrion. The adults feed on nectar, fruits and honeydew or steal honey from colonies of Bumblebees.

Seven species of Ants have been found on the Edge, out of some fifty British species (see Skinner and Allen, 1996). Ants are best known for living in well organised eusocial colonies. In children's popular literature Ants are frequently affirmed to be the cleverest, most organised and hardest-working creatures, living in kingdoms at their own disposal. As the Book of Proverbs suggests (vi.6), 'Go to the ant, thou sluggard; consider her ways, and be wise'. The majority of Ants are omnivorous, although many of them tend their own colonies of Greenflies and regularly 'milk' them for honeydew. For instance, the Black Garden Ant (*Lasius niger*), the commonest species of the Edge, farms Greenflies on garden plants and also eats ripe fruit, causing problems for gardeners. It is abundant everywhere, under pavements and garden paths, and frequently builds its nests in the insulation layers of houses; colonies average 5,500 individuals. Because Ants are the evolutionary cousins of bees and wasps, some of them are vicious stingers. Four species of the

kind have been found on Alderley Edge, all from the genus *Myrmica*. Their generic name originated from the Greek word *myrmex*, meaning 'ant', which the ancients thought had the same root as the Myrmidons, the followers of the hero Achilles who moved in battle as one mass like soldier ants (see Sleigh, 2003). The commonest of the stingers is the Red Ant (*Myrmica rubra*), which may be found in gardens and woodlands and nesting in colonies under stones and in rotting wood. This ant is a generalist predator and scavenger. The uncommon *Myrmica lobicornis* can be found occasionally, restricted to warm and dry isolated sites.

Although overall the Hymenoptera fauna of Alderley Edge may appear rather ordinary (see Appendix 13.1), it contains a great number of species, particularly of the more charismatic solitary wasps and bees, whose behaviour and natural history still conceal many surprises and unknown facts. Whether you are a child or an interested adult, few things can be more fascinating than observing how a Mason Wasp (Eumenidae) is constructing its jug-like nest out of clay, how a Spider-hunting Wasp (Pompilidae) is hauling off a paralysed spider to its nest, or how Yellow Jackets (Vespidae) are making their own papier mâché. Such curious observations and discoveries are very educational and can easily be made on Alderley Edge. There is no end to discovering and learning of new facts about wasps, bees or ants, if you take the time to visit the site and to observe them carefully.

F. Beetles (order Coleoptera)

Dmitri V. Logunov

> There ought to be a moral in Beetles but I haven't found it.
> (G. Taylor, 1948: 30)

Beetles (Coleoptera, 'sheath-wings'), with approximately 357,000 species described worldwide (Bouchard *et al.*, 2009), are the largest group of animals in the world, representing one-fifth of all known living organisms and about a quarter of all named species in the plant and animal kingdoms. As the famous British scholar J. B. Haldane exclaimed, 'the Creator, if he exists, must have an inordinate fondness for beetles' (see Marren and Mabey, 2010: 331). Beetles are easily recognised by their forewings, which have modified into hardened wing cases (elytra), covering and protecting the second pair of membranous flight wings. Some groups of beetles have no hindwings and are therefore flightless. Most beetles have mouthparts clearly adapted for chewing, with four main types of feeding: on plant tissues, on fungi, on decaying animal/plant matter, and as predators. The following brief overview of the beetles of Alderley Edge is intended for a general reader and is better used

in conjunction with *A Coleopterist's Handbook* by Cooter and Barclay (2006), the field guide by Harde (1999) and the checklist of British beetles by Duff (2008). The latter checklist is also available online on the website of *The Coleopterist* journal, http://www.coleopterist.org.uk. For general reading on the biology of beetles the book by Evans (1975) remains one of the best.

With 4,034 species recorded to date (see Duff, 2008), the beetle diversity of the British Isles comes third, being surpassed by Diptera (true flies, 7,035 species; Chandler, 2010) and Hymenoptera (bees, wasps, ants, sawflies, 7,517 species; G. Broad, personal communication; and see sections B and D, as well as Table 13.1). On Alderley Edge a total of 363 beetle species has been recorded to date (see Appendix 13.1, Table 13.1). This number constitutes only about 9.0 per cent of the entire British fauna and is by no means complete. The lack of some beetle groups which are restricted to the south of the country, such as Jewel Beetles (Buprestidae) or Thick-legged Flower Beetles (Oedemeridae), can partly be explained by the unsuitable conditions of the Atlantic climate of the Edge (high rainfall and cool summers) and partly by a secondary character of the site's woody vegetation, which is basically an old plantation. Nonetheless, the low diversity of such groups as Leaf Beetles (Chrysomelidae), Seed Weevils (Apionidae) or True Weevils (Curculionidae) is definitely due to under-collecting (see p. 276). No representative of the Tortoise Beetles (*Cassida* spp.) has been found (fourteen species nationally). Even common garden species, such as the Violet Ground Beetle (*Carabus violaceus*; Carabidae), are absent from the current checklist. A conservative estimate is that at least the same number as has already been recorded from the Edge is still awaiting discovery.

Of the beetles recorded, the Ground Beetles (Carabidae) are one of the most popular research subjects for both amateur and professional coleopterists. They occur in all terrestrial habitats and demonstrate diverse modes of life. Although some Ground Beetles are vegetarians (e.g. *Pterostichus melanariu*s, which occasionally attacks soft fruits such as strawberries), the majority are ground-living predators or scavengers. As many carabids are easy to collect in pitfall traps, they are commonly used by researchers as sensitive bio-indicators of various environmental conditions and processes, including pollution by heavy metals and the like. The distinctively coloured Green Tiger Beetle (*Cicindela campestris*; Plate 48) is undoubtedly one of most remarkable Ground Beetles of the Edge. It occurs in sandy heath conditions such as the Sandhills at Alderley (parcel 17) and is a diurnal predator that hunts by sight, being active and fast in sunny conditions and always flying away promptly when disturbed. Its larvae live in burrows and wait for prey passing close to the entrances of their burrows. The shining jet-black

Black Clock (*Pterostichus madidus*) is very common where the land has been disturbed and in areas associated with people, such as gardens (parcels 2c, 17). More interestingly, the beetle is noted for its 'forecasting capabilities'. According to children's folklore, stepping on a Black Clock brings rain. However, this species, like *Nebria brevicollis*, has been reported to be an important predator of caterpillars and even slugs in gardens or agricultural crops. A kind of 'green snail killer', not one you can buy in a garden centre, is the Snail Hunter (*Cychrus caraboides*). This very distinctive beetle has a pear-shaped body with an elongated head designed for entering snail shells, especially those of the small *Oxychilis* snails (Zonitidae), to eat their flesh. Widespread throughout the British Isles, it is usually found under logs or bark where it is damp. Some ground beetles such as the shiny bronze *Notiophilus biguttatus* or the metallic-coloured *Elaphrus cupreus* prefer damp situations and on the Edge can be collected in wet meadows from under stones and tussocks of rush (parcels 1, 5). The former is a sun-loving beetle, with large, very conspicuous bulbous eyes used in hunting small-sized insects on the ground, especially Springtails. There is one riparian species (*Nebria rufescens*), which can primarily be collected under streamside stones (parcels 4, 5). In wood litter and under tree bark (parcels 2c, 11d, 14) various species of the large genera *Bembidion* and *Leistus* can be found. Common species of the British ground beetles can be identified by means of the guide by Forsythe (1987).

There are at least two ponds (parcels 11ab, 20b, 22) and a stream (parcel 5) on the Edge, together with some damp areas with slowly running water (parcels 17, 18c, 19). These habitats harbour a number of aquatic beetles, of which the Diving Beetles (Dytiscidae) and the Scavenger Water Beetles (Hydrophilidae) are most diverse, with thirty and nineteen species respectively. These figures account for about a half of the recorded diversity of Diving and Scavenger Water Beetles in north-west England (seventy and forty-seven species respectively; Bentley, 2008). The Diving Beetles are much modified for life in water, with their streamlined bodies and oar-shaped hind legs. Most can be found throughout the year. Both adults and larvae are carnivorous. Some species (e.g. *Agabus bipustulatus*, common in Britain) are remarkable for their abilities to colonise all forms of aquatic habitat. Small diving beetles of the genus *Hydroporus* are very common in all kinds of still water, but prefer shallow bog habitats. The Scavenger Water Beetles contain both aquatic (subfamily Hydrophylinae) and terrestrial (subfamily Sphaeridiinae) species. The former group includes poor swimmers that are usually omnivorous scavengers (Plate 49 shows the hydrophyline *Anacaena globulus*, found on the Edge). The latter includes species associated with dung (*Sphaeridium* and *Cercyon* spp., Sphaeridiinae found in parcels 15, 18a).

Some water beetles are unusual in their lifestyle. For instance, pupation of the Burrowing Water Beetle (*Noterus clavicornis*; Noteridae) takes place in cocoons attached to the roots of aquatic plants. Even more peculiar adaptation to aquatic life is demonstrated by the Reed Beetle *Donacia vulgaris* (Chrysomelidae). Its soft and grub-like larvae feed on the roots of aquatic plants, but they have no gills. They inhale air by means of two hollow spine-like tubes that pierce air reservoirs in the roots. Pupae are attached to aquatic plants in the same way. A single species of the Whirligig Beetles (*Gyrinus substriatus*) was found in the Edge, of the twelve known in the UK (Duff, 2008). These are small, shiny black beetles that live in small groups on the surface of the water. When disturbed, the Whirligigs quickly scud over the water's surface, leaving circular ripples; this is the reason for their common name. The beetles can see both above and below water, and subsist on dead or dying insects that have fallen on the water. For a general account of the pondlife of the Edge see Chapter 12. A well illustrated introduction to the freshwater life of Britain was produced by Greenhalgh and Ovenden (2007). A very useful identification key to aquatic beetles is that by Friday (1988).

Some common but notable beetles have been found on Alderley Edge. The Rhinoceros Beetle (*Sinodenron cylindricum*; Lucanidae) is the only Stag Beetle found there (parcel 18a), out of the four species recorded in the UK. It is known to breed in rotting stumps, especially of beech, the second commonest tree species on the Edge (see Chapter 10, pp. 154–6). The species gets its name from the pointed projection on the front of the head of the males, which gives it a rhinoceros-like appearance. The Cockchafer (*Melolontha melolontha*; Scarabaeidae) is most familiar as a night-flier that often comes crashing into lighted windows on warm dusks in early summer. Its larvae feed on the roots of a number of plants, especially of grasses and cereals. The Garden Chafer (*Phyllopertha horticola*) is the smaller relative of the Cockchafer, which can be found throughout the UK in June and July. Both chafers are related to a distinct group of beetles that make their lives from utilising dung. A total of 275 insect species has been reported to occur in the dung of cattle in Britain (Skidmore, 1991). The majority of dung beetles are Scarabs and Dor Beetles, which feed directly on dung, but on the Edge their diversity is low. For instance, only five species of *Aphodius* (Scarabaeidae), the most diverse genus in the UK (forty-two species), have been recorded to date (parcel 18a). The main reason for this is likely to be current agricultural practice elsewhere in the UK, such as the treatment of livestock with persistent anti-helminthic drugs. Residues of these drugs can persist in the dung and are lethal to the beetles. The Dumble-dor, otherwise known as 'Lousy Watchman' (*Geotrupes stercorarius*; Geotrupidae), is common on grazing pastures, where a pair of beetles dig out a nesting tunnel under suitable dung and furnish it with dung for the larvae to

feed on. Despite a clumsy manner of walking, Dumble-dors are good fliers. Having taken off, they fly with a low rasping droning buzz that can be heard several metres away ('dor' was an old word for 'drone' – the beetle's buzzing flight): hence the name dor beetles. The nickname 'Lousy Watchman' was earned because in a close-up view one can see that these beetles carry lots of tiny copper-coloured mites on their ventral sides. In 1959 the entomologist Hyatt recorded 488 mites on a single Dor Beetle, belonging to seven different species. The majority are predatory mites (predators of other mites and small invertebrates) that are simply using the beetles as a common means of dispersal, the phenomenon known as phoresy. A similar association with mites is also known for the Burying Beetles (Silphidae), which feed on carcasses of small dead animals and birds, performing the very important role of sanitary officers of the fields. However, the only species of Silphidae found in the Edge, the Beet Carrion Beetle (*Aclypea opaca*), is known to be a vegetarian, reported as a pest of beet and turnip crops.

The Rove Beetles (Staphylinidae), or 'staphs' in coleopterists' jargon, form the largest and most diverse beetle family in the UK, with 1,087 recorded species (over 50,000 species worldwide). Rove Beetles are usually small and slim. They are characterised by having greatly shortened wing cases, leaving most of the abdomen exposed, with their flying wings much folded underneath the elytra. This gives 'staphs' narrow flexible bodies that allow them to chase their prey rapidly through complex narrow spaces such as densely matted grass or leaf litter. Most species fly well. The most common and best-known of the staphs is the large and black Devil's Coach-horse (*Ocypus olens*), especially in Ireland, where it was believed to have magic power and to be able to kill merely by a look. On the other hand the beetle's power could be turned to advantage: if the beetle was imprisoned within the handles of someone's scythe, their skill would improve (see Marren and Mabey, 2010).

Although many 'staphs' are scavengers, the majority are ground-living predators, feeding on small invertebrates. Some, like the *Tachyporus* species, specialise in feeding on Aphids. To date, ninety species of 'staphs' have been found on Alderley Edge (all over the site), collected from leaf litter, decaying fungi/detritus, under the bark of dead trees and dung. As with the money spiders (see pp. 279–80), the sieving of leaf or moss litter and detritus and using special extracting equipment such as Berlese extraction funnels or Winkler selectors are the best methods of collecting 'staphs' (see Martin, 1977; Cooter and Barclay, 2006). With some exceptions the identification of Rove Beetles requires the dissection of their genitalia and extensive training.

A few of the beetles that frequent flowers or that can be collected by sweeping from blossoming shrubs and grasses can be mentioned here. *Malachius bipustulatus* is 'the only representative collected from the Edge

(parcel 15) of the small family of Soft-wing Flower Beetles (Malachiidae; sixteen species in the UK), one of the most common species of the family known from the UK and Europe. It is metallic green with a bright scarlet spot at the end of each wing case. The beetle feeds on the pollen of grasses and flowers, but its larvae feed on other insect larvae such as caterpillars and maggots living under the loose bark of trees. Of the forty-one species of the Soldier Beetles (Cantharidae) registered in the UK, ten have been found on Alderley Edge (parcels 4, 11b, 15). They are called Soldier Beetles because of their slender and straight bodies coloured red, black or yellow, reminiscent of military uniforms. The adult beetles sit on flower heads, waiting for other flower-visiting insects, on which they prey, but also feeding on nectar themselves. Some of the Soldier Beetles, such as the Common Red Soldier Beetle (*Rhagonycha fulva*; Plate 50) (parcel 2c), have acquired a bad reputation, presumably because of their reddish colour: many people mistakenly believe that these beetles are bloodsuckers, though they are quite harmless. Large groups of small, elongate yellowish-brown beetles with variable black markings can be seen on hawthorn or elder blossoms in June (parcels 3c, 4, 10a, 15, 18a). These are Tumbling Flower Beetles (Scraptiidae), which feed on pollen. When disturbed they promptly drop down to the ground to confuse predators. Some species of Nitidulidae, including the commonest, Rape Blossom Beetle (*Meligethes aeneus*) and *Epuraea melanocephala*, can be found feeding as larvae and adults on the unopened buds and flowers of many plants (parcels 1a, 11b, 15, 18a, 29a). They are important pollinators. But others, such as *Carpophilus marginellus* and *Epuraea biguttata* (parcel 4), are known to be associated with tree sap. Due to this duality of food preferences, the family is called Pollen or Sap Beetles.

Although it is impossible to mention all the groups of beetles and other insects visiting flowers for feeding or for preying upon other visitors to the flowers, there is one group that cannot be neglected. It is the Ladybirds (Coccinellidae), familiar to and beloved by most people. What about the simple little saying: 'My dear, have you heard of that nice Lady Bird who yet is no lady, and yet is no bird?' (for some, perhaps, a reminiscence of their own, hopefully happy, childhood). Ladybirds were once called 'England's true guardian angels', because of their effective work in ridding garden plants of Aphids and Greenflies (Owen, 1983). However, scholars are confident that the Ladybird was in fact named after and dedicated to Our Lady (the Virgin Mary) (see Kritsky and Cherry, 2000). This is why Ladybirds are regarded as bringers of good fortune, particularly to the person on whom they alight. Fifteen of the fifty-three species of Ladybirds in the British Isles have been found on the Edge, including the common Two-spotted Ladybird (*Adalia bipunctata*; Plate 51).

Some beetle families demonstrate a clear disparity between their general high diversity worldwide and in the UK and the surprisingly low number of species recorded on Alderley Edge: this is a clear sign of the incompleteness of our knowledge of the Edge's beetles. The Click Beetles (Elateridae) have yielded five species on the Edge (seventy-three in the UK and over 7,000 worldwide). These beetles get their common name from the distinctive click that they make as they flip themselves upwards when disturbed, employing a special mechanism that uses powerful muscles in the thorax. The larvae of Click Beetles have a long thin body and are collectively called 'wireworms'. Some of them, such as the larvae of the *Agriotes* and *Athous* species, are pests of cereals like wheat, barley and oats and of root crops, as they damage the plant roots on which they feed. The adults are omnivorous, the larvae strictly vegetarian. Only four species of the Long-horn Beetles (Cerambycidae) have been encountered on the Edge, of sixty-five in the British list (the world total is well over 20,000 species). Of these, the Wasp Beetle (*Clytus arietis*) is the only representative of the Long-horn Beetles commonly occurring on flowers, particularly on umbellifers. The beetle is a perfect wasp mimic, dark brown to black, with bright yellow transverse stripes resembling the colour pattern in jacket wasps. This species can also be seen scuttling over tree trunks, especially of beeches, in whose wood its larvae develop. The Leaf Beetles (Chrysomelidae) are represented by twelve species on Alderley Edge, of the 271 species recognised in the UK and over 35,000 worldwide; almost all are leaf-eaters. Approximately half of the British fauna of Leaf Beetles belongs to the Flea Beetles, which are small and difficult both to catch and to identify. Some Leaf Beetles can be recognised by the characteristic damage they cause to the leaves on which they feed; for instance, the *Oulema* species cut short longitudinal strips in parallel lines 1 mm wide, completely perforating the leaf blade.

To date, a single species of the Seed Weevils (*Exapion ulicis*, Apionidae) has been collected from the Edge (parcel 17), yet there are eighty-eight species on the British list (some 900 species in the Palaearctic region), many of which are quite common and widespread. The majority of Seed Weevils are closely associated with particular host plants, sometimes with just a few or even one, on which they feed and breed. For instance, *Taeniapion urticarum* feeds only on the common stinging nettle. As 351 species of vascular plants were recorded in the survey of the Edge described in Chapter 9, one can expect the number of the Edge Seed Weevils to be multiplied many times (at least a dozen species can be expected). The same holds true for the True Weevils (Curculionidae), of which only twenty-five species have been found on Alderley Edge. This number reflects only a small proportion of their real diversity here. Of these, the Clay-coloured Weevil (*Otiorhynchus singularis*)

specialises in the needles of pine trees, but its adults can also be seen on hawthorn blossoms (parcels 7, 27). It is worth mentioning that there are more species of the True Weevil in the UK (476 in total) than of birds, mammals, reptiles and amphibians combined (336 species). Their world diversity is over 60,000 described species (Bouchard *et al.*, 2009). For those who want to study weevils, a reasonable working knowledge of botany, particularly of the names of their host plants, will be of great help. A useful starting guide to the weevils is that by Morris (1991).

Members of the family of Pill Beetles (Byrrhidae; thirteen British species) are hard-bodied, convex and black. When disturbed, they retract their legs and antennae into ventral recesses, forming a compact 'pill', hence the common name. Adults and larvae feed on plants, sometimes on tender hair roots. *Simplocaria semistriata* is the most widespread, and the only species of Pill Beetles recorded from the Edge (parcel 4). This species occurs elsewhere in large numbers. The single finding of Museum Beetle (*Anthrenus museorum*; Dermestidae) picked up from a *Heracleum* flower (parcel 10a) is of some interest. This species is more evident indoors, where it is a serious pest, damaging materials containing chitin and keratin, but adults also feed on pollen. As its common name implies, museum zoological collections are always under threat. It is the main concern of any entomology curator.

Fungi provide a very attractive habitat for many groups of beetles that feed on the fungi themselves or prey upon other invertebrate inhabitants, as some Rove Beetles do. On Alderley Edge, a number of such fungus-dwellers have been collected. For instance, the metallic blue and red *Tetratoma fulgorum* can be found in fungal fruiting bodies, especially when they are in advanced stages of decay (parcels 1b, 8). Representatives of the Minute Tree-fungus Beetles (Ciidae), such as the tiny *Cis boletus* (and other *Cis* species), can commonly be found tunnelling into old dry birch bracket fungi (*Piptoporus betulinus*) (parcels 1, 5, 6, 11d; see Plate 17). Many more species feed on the parts of fungi not usually seen. A typical example is the black orange-spotted *Mycetophagus quadripustulatus* and other species of the Hairy Fungus Beetles, which feed on the hyphae or fungal root structures penetrating the bark and the wood of old trees (parcels 2a, 6).

Many beetles are associated with nests of animals and birds. They either scavenge the nest or prey on Fleas and their larvae which are usually present. To date, only three nest-dwelling beetles have been found on Alderley Edge. The tiny *Gnathoncus rotundatus*, the only representative of the Clown Beetles (Histeridae; fifty British species) recorded from the Edge, was collected from under a great tit nest (parcel 15). One species of the Feather-winged Beetles (*Ptenidium laevigatum*; Ptiliidae) was found in an old hedgehog nest. The Rove Beetle *Haploglossa nidicola* was collected from a sand martin nest. A great diversity of beetles of

various families are associated with ants' nests (Wood Ants in particular), but none of them has yet been collected from Alderley Edge.

Some small beetles live quietly and usually unseen unless special methods of collecting are used or a collector knows exactly where to search for them. For instance, the Silken Fungus Beetles (Cryptophagidae; 113 British species) are usually small, inconspicuous (black/brown) and difficult to identify. Some of these (e.g. *Atomaria* spp.) can be found in grass tussocks, leaf litter and compost, where they feed on decaying plant material and fungi. Others, such as the *Cryptophagus* species, are dwellers in birds' nests, squirrel dreys and even the nests of ground-dwelling bees and wasps. Representatives of the small family of Root-eating Beetles (Monotomidae; twenty-three British species) can be found all over Alderley Edge, under the sappy bark of dead and dying trees, sometimes two or three species together (parcels 1a, 3c, 5, 7, 10a, etc.). The large family of Feather-winged Beetles (Ptiliidae; seventy-five species in the UK) consists of tiny beetles, none of them longer than 1 mm. These beetles feed on fungal hyphae and spores and can be collected from a variety of habitats, including rotting vegetation and wood, under bark, and dung. As with the 'staphs', in order to collect all these small beetles, special equipment needs to be used, such as a sifter (like a kitchen sieve but with collecting bags attached to it), baited pitfall traps or special laboratory extractors such as Berlese extraction funnels or Winkler selectors (see Martin, 1977, for further details).

Although the recorded beetle fauna of Alderley Edge (listed in Appendix 13.1) may seem to some to be quite ordinary, particularly in terms of notable species or rarities, it does not mean that the site does not have its potential. The majority of recorded beetles on Alderley Edge, leaving on one side those which are yet to be found there, are still known to a large extent by name only. At best, we are more or less aware of how common they are, where they have been recorded in the UK and what their preferred habitats are. Yet few or no details of their general biology, feeding or mating habits, life cycles, interactions with other insects or with plants have been recorded. One cannot say better than Shakespeare that 'in Nature's infinite book of secrecy / a little I can read' (*Antony and Cleopatra*, act 1, scene 2). Believe it or not, there is no need to go to the tropics to be a true discoverer. The wonderful world of beetles and other insects, with all its wonders and surprises, is awaiting you on Alderley Edge.

G. Invertebrates other than insects

Dmitri V. Logunov

Spiders (Araneae)

With spiders I had friendship made
And watch'd them in their sullen trade.
Byron, *The Prisoner of Chillon*, XIV, 16–17

In total, 137 spider species from Alderley Edge have been recorded to date (see Table 13.1 and Appendix 13.1), which account for 21 per cent of the 649 species that comprise the entire spider fauna of the British mainland. It is hardly a bad score when one takes into account the relatively small size of the Edge and the secondary character of its vegetation – as described in Chapters 9 and 29, it is secondary woodland, planted in the middle of the eighteenth century and now largely replacing the earlier heathland. However, as with all the animal groups but particularly with invertebrates, there is still a lot of surveying to be done. A clear indication of the incompleteness of our knowledge of the spiders of the Edge is the absence from the final checklist of certain groups which are nevertheless highly likely to occur here, such as Pirate Spiders (Mimetidae), common species of *Hahnia* (Hahniidae), Goblin Spiders (Oonopidae), more species of the Funnel-web Spiders (Agelenidae), and many others. The fact that only one member of the Hackled-web Spiders (*Dictyna arundinacea*, Dictynidae) has been collected from the Edge is another indication that its spider diversity is still incompletely known. It is safe to assume that the recorded number of spider species (137) is around 70 per cent of the entire spider fauna. A complete checklist of the British spider fauna is available in the *Member's Handbook* of the British Arachnological Society (Russell-Smith, 2008) and also online on the Society's website, at http://www.britishspiders.org.uk/html/bas.php. Distribution maps and notes on habitat preferences for all British spider species are given in the *Provisional Atlas of British Spiders* by Harvey *et al.* (2002). The following overview is intended for the general reader, and is better used in conjunction with these two books and also with the field guide to British spiders by Roberts (1995).

Sixty per cent (eighty-three species) of the spiders recorded from Alderley Edge belong to the family Linyphiidae (Money Spiders), the second-largest spider family in the world. In the UK, these spiders are so called because of the superstition that if you see such a spider running over you it means financial good fortune. The high proportion of Linyphiidae on the Edge is not surprising: in all local spider faunas of the temperate zone of the northern hemisphere, Money Spiders account

for roughly half the registered species. The commonest of all the Edge's Money Spiders is *Microneta viaria*, found in nearly every sample of leaf litter taken from the Edge. The species is widespread throughout the British Isles. Most species of Money Spiders are very small, less than 3 mm long, and cannot be identified in the field: identification is based on a study of their genitalia under a microscope and requires special skills and training. Money Spiders make small catching sheet-webs in leaf litter, grass or on bushes, and usually live unnoticed by people. The best time for non-specialists to encounter them seems to be late summer or early autumn, when the tiny creatures can be seen ballooning on fine silk threads (gossamer) in warm and dry weather. Such a spider landing on your clothes is absolutely harmless and it seems appropriate to recall the famous saying that 'if you wish to live and thrive, let a spider run alive': this is about Money Spiders – and let it be so! For those who would like to collect and study Money Spiders, one of the best methods of collecting them is sieving foliage, leaf litter or rotting wood, using a special device called a sifter (see Martin, 1977, for further details).

Although most of the spider species of the Edge are fairly common, some records are worthy of special attention. The finding of *Entelecara congenera* and *Crustulina guttata* represents their most northerly records in the UK. The former is a tiny Money Spider, collected by shaking them off the twigs of gorse bushes (parcel 17a). This species' status is currently recognised as nationally scarce, but it is likely that it has been simply under-recorded. The latter belongs to a very distinctive genus of the Comb-footed Spiders (Theridiidae), which is characterised by tiny warty granulations on the carapace and sternum. This species occurs in grass tussocks and detritus, and is widespread but generally scarce.

The most diverse and interesting spider habitats are the heathers that represent the remains of the original vegetation of the Edge. Originally, the Edge was covered with sparse woodland whose clearings were dominated by heather and bracken. Nowadays the heather habitats occur in at least two variants: heather–stony slope (parcel 3a) and the moss–heather–bilberry heath in birch coppice (parcel 12b), both impacted by human activity. A total of forty-eight spider species has been recorded from the heathland, sixteen of which were not collected outside it. As usual, Money Spiders (Linyphiidae) predominate in the heather habitats, with some records being of especial interest. For instance, *Minyriolus pusillus* is a common species in Scotland but scattered elsewhere in Britain, and *Saaristoa firma* is a very local and scarce species. The heath in birch coppice was the only site from which two interesting litter dwellers were collected. One is *Neon reticulatus*, a tiny Jumping Spider (Salticidae) with very large anterior eyes and recognisable reticulate brown colouration of the body; another is *Zora spinimana*, the only representative of Spiny-leg Spiders (Zoridae) found

on the Edge. The latter species is easily recognised by the long spines on the ventral surfaces of its leg tibia and the contrasting stripes on the carapace. Though common on the Edge, elsewhere both species have only scattered populations.

The second most diverse habitat on Alderley Edge is the damp meadows with rush and moss (parcels 18c, 20b), which almost certainly belong to one of the original vegetation types. This habitat is occupied by forty-two spider species, of which twenty-six (or 62 per cent) are Money Spiders. Notable is the fact that six of the eight species of Long-jawed Spiders (Tetragnathidae) recorded from the Edge occur in damp meadows. Most species are long-legged and thin-bodied. The feature shared by them all is that the males have disproportionately elongated and divergent chelicerae (the fang-like mouthparts found in spiders and their relatives) which they use for locking up the chelicerae of the female during mating, thereby avoiding being bitten. Such a 'love bite' would be fatal, for if a female spider bites the male he will be poisoned and paralysed or killed. Representatives of the genera *Tetragnatha* and *Metellina* spin delicate orb-webs, which are often inhabited by male and female together. By contrast, adult *Pachygnatha* species are ground dwellers and free hunters.

One species of the Long-jawed Spider, *Metellina merianae*, is a common dweller at the entrances of old mines (e.g. parcel 10b), where it makes its orb-webs at the ceilings of tunnels (Plate 52). This fact recalls the famous Scottish legend about Robert the Bruce, king of Scots, who took courage from watching a spider. During the Scottish wars of independence, Bruce was hiding in a cave on Rathlin Island. There he watched a spider trying again and again to place a web across a space in the roof. After six failed attempts, the spider finally succeeded. At the time Robert the Bruce had lost six battles against the English but this incident inspired him and his supporters to continue the campaign for an independent Scotland. The only spider suspect that could occur in that cave and could have been seen by Robert the Bruce is *Metellina merianae*. On the Edge one can easily observe *Metellina* at the entrances of old mines with the aid of torchlight. Go and see the spider that impressed the king with its resilience and persistence (for more details of this legend and its possible relation to the biblical story of David and Saul, see Marren and Mabey, 2010: 98).

The Sandhills region (parcel 17b) is composed of bare sandy soil covered with patchy low grassy vegetation. It is quite different from the rest the Edge, and it is not surprising that its spider fauna turned up some rarities, such as the cryptic Wolf Spider *Arctosa perita* (Lycosidae): 'cryptic' here means similar to the background, camouflaged (Plate 53). This species is strongly associated with sandy coasts; inland it is widespread but local, confined to old sand pits and sparsely vegetated

mine spoils. The species builds a burrow in which it hides, emerging to catch prey during daytime. One can easily recognise it by its bright and variegated colouration, consisting of white to yellow spots over the greyish background of the body, camouflaging the species on the sandy soil. Adults can be collected from mid-June. If one is prepared to bend down and take a close look at the low grassy vegetation of the Sandhills, some species of Money Spider can be found that are generally infrequent and scattered elsewhere, among them *Walckenaeria vigilax*, occurring in wet moss and grass, and *Pelecopsis parallela*, which is usually common in calcareous and acid grasslands. The Sandhills is bordered on one of its sides by a dry sand ditch; here one can find funnel webs of the Giant House Spider, *Tegenaria gigantea* (Agelenidae) (Plate 54), a relative of the Hairy House Spider. Males of several *Tegenaria* species often enter houses in search of females in late August–September. All are absolutely harmless and do not, as some mistakenly believe, turn up in the bath from sewer pipes.

Waterfall Wood (parcel 5) is considered by botanists to be an example of relatively undisturbed Cheshire woodland (see Chapter 9). The survey of the fauna here yielded only seventeen species, mostly common species of spiders and harvestmen, a figure that hardly describes its real diversity. The reason for the low spider diversity reported in Waterfall Wood seems to be that only sieving and hand-collecting were used in the fieldwork; for a full account of collecting methods of spiders see Martin (1977) and Roberts (1995). Nevertheless, there were some interesting finds. For instance, *Cryphoeca silvicola* is a relatively common species in northern England and Scotland, but is absent from most of east and south-east England. It is a representative of the Funnel-weavers (Agelenidae).

The interesting habitats of the Edge's woodland are: rocks, where spiders can be collected from under dry ferns and grass clumps, leaf litter, moss and lichen (parcels 5, 10b, 11d); and standing dead trees or fallen logs, where they can be found under loose bark. Both habitats are characterised by a small but rather specialised fauna, of which the most common is surely *Amaurobius fenestralis*, a dark brown spider with a prominent pale oval ring marking (Plate 55). It belongs to the family of Window Spiders (Amaurobiidae), so called because they frequently build retreats in the crevices around doors and windows. In nature they construct retreats within holes in rocks and under tree bark, where the spiders spend the daytime. It is believed that the spider can be attracted from its retreat by holding a sounding tuning fork against its web, presumably resembling the sound of a trapped insect. The rare Sac-spider *Clubiona corticalis* (Clubionidae) was collected from under the loose bark of dead standing trees, which is indeed its common habitat. This find lies at the northernmost limits of the species' distribution in the

UK. The species can also be found in birds' nests and squirrel dreys. The common European Money Spider *Labulla thoracica* (Linyphiidae) has been collected only from rocks. The species has a very distinctive appearance, with a group of white spots easily seen on the underside of the abdomen, just in front of the spinnerets.

The spider fauna of stone field and house walls is related to the one just described, as some species (e.g. *Amaurobius fenestralis*) can also be collected there, and it contains a number of really peculiar spiders. One of them is the Six-eyed Tunnel Spider *Segestria senoculata* (Segestriidae), which makes its tubular retreat within holes in walls and bark, each with a silken collar at the rim and a number of short straight lines of silk radiating out from the entrance. These solitary spiders normally sit near the entrance, waiting for their prey. Another interesting species is the Jumping Spider *Salticus scenicus* (Salticidae), better known as the Zebra Spider, remarkable for the black and white stripy pattern of its body (Plate 56). It is common in southern Britain but becoming scarce in Scotland. The species can often be observed on the sunny walls of buildings. As with all Jumping Spiders, the Zebra Spider has excellent binocular vision and it can jump, either when pouncing on its prey or when escaping its own enemies.

Grassland habitats are best represented in parcels 17a and c, but also occur patchily elsewhere on the Edge. Thirty-four spider species have been found there. Half of the nationally recorded Orb-weavers (Araneidae) have been found in the Alderley grasslands, including the commonest, the Garden Cross Spider (*Araneus diadematus*). Most of these species mature in late summer, when one can see large females sitting in the centre of their orbicular aerial webs, or hiding with their egg cocoons in silk retreats at some distance from the web, as with *Larinioides cornutus*. Spiders react to the tensing and vibration of threads in the web when prey is caught. The Long-jawed Spiders (Tetragnathidae) are also common in grassland, especially in the wetter parts. A number of larger species of Linyphiidae, such as *Linyphia triangularis*, *Microlinyphia pusilla* and *Neriene montana*, can be encountered in the grasslands in late summer. The creatures make their sheet-webs on grasses and bushes, hanging upside down below them. Compared with other Money Spiders, these species are distinguishable by their distinct black-and-white dorsal pattern, even making it possible to identify them in the field with a magnifying lens. On drier parts of the grassland one can see females of the common Wolf Spider *Pardosa pullata* carrying their globular egg sacs attached to their spinnerets. By carrying the cocoons or newly hatched spiderlings on their backs, female Wolf Spiders protect their brood and help the youngsters in distribution. Another example of brood-care behaviour is demonstrated by the Nursery-web Spider (*Pisaura mirabilis*), a relatively large spider

(up to 15 mm long) which can be found in grassland in late June–July. The female carries the very large egg sac in her chelicerae underneath the body for about four weeks. Before the spiderlings emerge she weaves a tent-shaped nursery-web, where the youngsters stay for some time, guarded by their mother (Plate 57). It is worth mentioning another hallmark of the Nursery-web Spider, which is its elaborate courtship ritual. A courting male offers a female a 'nuptial gift', which is an insect prey caught by the male and wrapped up in silk. Mating does not begin until the female has accepted the gift. It has been suggested that the role of the 'nuptial gift' is protection for the male spider from being eaten by a hungry female during courtship and mating. Several groups of True Flies, such as Dance-flies (Empididae), are also known to offer 'nuptial gifts' to the females during a ritual courting (see section D, pp. 262–3).

An even more sophisticated example of brood-care behaviour is displayed by two Comb-footed Spiders (Theridiidae), namely *Phylloneta impressa* and *Phylloneta sisyphia*. Both are common and widespread throughout Britain, being easily recognisable in the field by their body colour pattern, consisting of white stripes and two sub-parallel interrupted brown bands. Yet to separate these species one has to examine their genitalia under a microscope. Each species constructs inverted a cup-shaped retreat covered with plant debris and below it the tangled catching web typical of all the Comb-footed Spiders. *P. sisyphia* inhabits bushes, especially gorse, whereas *P. impressa* prefers lower vegetation. The blue-green egg sac is attached to the retreat from beneath and is protected by the female. Later, she feeds the emergent spiderlings orally by regurgitation and even shares large prey with them. When the mother dies, her body is effectively sucked out by the spiderlings; this kind of 'parental investment' is known in several groups of spiders. In general terms, the behaviour of these *Phylloneta* species is called 'periodic social', referring to the fact that the spiders live in small family groups for some time. Some tropical Comb-footed Spiders are famous for their more advanced social behaviour, when a large group of spiders of various ages and generations live and prey together in very large tent-shaped webs. However, none of the British Theridiidae has reached such high levels of social behaviour.

Because of their irregular three-dimensional webs, the Theridiidae are sometimes called 'Cobweb Weavers', and their web a 'cobweb'. This name calls to mind the *Critical Essay upon the Faculties of the Mind* by Jonathan Swift, who wrote that 'laws are like cobwebs, which may catch small flies, but let wasps and hornets break through'. One can only guess why it is that spiders usually provoke such negative associations in humans: most likely it is because we do not know them well enough and therefore fear them. For the sake of scientific accuracy, one can add that the cobweb of Theridiidae is strong enough to allow spiders to catch

prey almost twice their own size and weight. I cannot help myself but to quote once more from Shakespeare, where in *A Midsummer Night's Dream* Bottom the Weaver says 'I shall desire you of more acquaintance, good Master Cobweb' (act III, scene I).

A story of the Edge's spiders cannot be limited to these brief notes. Should you be interested in the spiders of Alderley Edge, one of the finest natural history monuments of Britain, just pick up your wellies and go. The amazing world of spiders and other creepy-crawlies awaits you there.

Harvestmen (Opiliones) and False-scorpions (Pseudoscorpiones)

Harvestmen and False-scorpions are related to spiders but are much less diverse groups. The British fauna of Harvestmen numbers only twenty-five species (see Hillyard, 2005), while False-scorpions run to twenty-seven species (see Legg and Jones, 1988), compared with the 649 registered spider species. The Harvestmen (Opiliones) are non-venomous arachnids with a small rounded body and very long thin legs, of which the 'Harvest Spider' – also known rather confusingly as Daddy-long-legs, a name also given to Craneflies and one group of spiders (Pholcidae) – is archetypical and the most familiar to the majority of people. Harvestmen are omnivorous, either preying upon small insects or feeding on various plant materials, fungi or even dead organisms and dung. The False-scorpions (Pseudoscorpiones) are small arachnids (2–3 mm long) resembling a tailless scorpion. Most of them are dwellers of litter and under-bark or under-stone spaces, but some can be found even in libraries among old papers and are therefore called Book Scorpions. These False-scorpions feed on tiny invertebrates like springtails or bristletails and are absolutely harmless to humans.

A total of eleven Harvestman and one False-scorpion species have been recorded from Alderley Edge (see Appendix 13.1 and Table 13.1); seventeen species of Harvestman were recorded in Cheshire and Lancashire by Mackie (1968). The commonest Harvestman has been *Nemastoma bimaculatum*, which occurs in most ground habitats studied throughout the country. This tiny species is easily recognised in the field by its dark brown or black body with a pair of prominent silvery white spots. This is the reason for its Latin species name, stemming from *bis*, meaning 'twice', and *macula*, meaning 'spot', in other words 'two-spotted'. Adults of this species occur all year round. This is also true for *Mitostoma chrysomelas* (see Hillyard, 2005), a very tiny and delicate species with long legs, which was collected once from the heather–stony slope of Alderley Edge (parcel 3a). Adults of most of

the Edge's Harvestmen appear in late summer, but the exception is *Platybunus triangularis*, whose season of maturity is unusually early, from April to July.

An interesting dweller in rocks (among lichen) and fallen and standing trees (on or under bark) is the harvestman *Megabunus diadema* (Phalangiidae) (Plate 58). It is a common but narrowly distributed species, which is remarkable for the two rows of exceptionally long spines situated above its eyes on the ocular tubercle and looking like a crown. This feature is flagged up in the name of the species, as the Latin word *diadema* means 'royal fillet or crown'.

The only False-scorpion found on the Edge is *Neobisium muscorum*, the commonest and most widespread species in the UK, which was collected by sieving from leaf litter and from the moss–heather–bilberry heath (parcels 10b, 13a). It is clear that other common British species of False-scorpions such as *Chtonius ischnocheles* will also be found on Alderley Edge in the future.

Ticks and Mites (Acarina)

As with many other groups of invertebrates, the Ticks and Mites (Acarina) of Alderley Edge remain poorly studied, with only twenty species recorded to date (see Appendix 13.1). Many groups of Acarina, even common species of the Velvet Mites (Trombidiidae) which definitely occur on the Edge, remain to be formally recorded.

Ticks (suborder Ixodida), known in Scotland as 'keds' or 'taigs', are all blood-feeding ectoparasites of vertebrates and can survive only by sucking the blood of their hosts. Twenty-six species of Ticks are known from the British Isles (Hillyard, 1996), five of which have been recorded in Lancashire and Cheshire (Thompson, 1972), but only one, the Hedgehog Tick (*Ixodes hexagonus*), has been found on the Edge. This Tick is very common on hedgehogs and in their nests, but can frequently be picked up by many other animals, including dogs. It can even bite humans and is known to be capable of transmitting pathogens of several diseases such as human babesiosis, Lyme disease and even tick-borne encephalitis.

The most important group of soil Mites are the Oribatida, known also as Beetle Mites. They are the world's most numerous arthropods living in soil, and are abundant everywhere, including the soil of our back gardens, yet only one of them (*Hermannia scabra*) has been recorded from the Edge to date. The abundance and diversity of Oribatida in a particular soil serve as a good indicator of its 'health'.

A useful general account of the British fauna of Ticks and Mites, but with out-of-date nomenclature, remains the synopsis by Turk (1953).

Other litter/soil invertebrates

Twenty-seven species of litter-dwelling invertebrates have been found on Alderley Edge: nine species of Millipedes (Diplopoda), eight species of Centipedes (Chilopoda), three species of Woodlice (Isopoda) and ten species of land snails and slugs (Pulmonata). For a checklist of these species see Appendix 13.1.

The Millipede *Proteroiulus fuscus* was present in large numbers. It is the sixth commonest millipede of the British Isles (Blower, 1985), found typically under the bark of fallen logs and stumps of both coniferous and deciduous trees. Another common species was the White-legged Snake Millipede (*Tachypodoiulus niger*), which is easily recognised by its narrow black cylindrical body with contrasting white legs (around 100, not the huge number that many people assume). It is a common and widespread species, found in gardens, woodlands and anywhere with rocks or rotting trees under which it can hide. This species subsists on encrusting algae as well as on decaying detritus. *Polydesmus angustus* is the most frequently seen of the Flat-backed Millipedes: this is a flattened, brownish Millipede, with off-white legs with heavy mottling and sculpturing on its back. This species, as well as other Millipedes, normally feeds on dead leaves and other rotting plant material. Unlike other Millipedes, the Pill Millipede (*Glomeris marginata*) is capable of rolling itself up into a ball, just like a pill-bug. It is a common European species, with short body, either dark brown or black. This Millipede occurs in leaf litter, and is often active on bright, sunny days. On the Edge it was found in parcels 3a and 5.

Geophilomorpha are known as the Earth Centipedes, because they usually occur in the soil or in leaf matter. These are slender and very long Centipedes, 2–6 cm long. All of them, like the common Luminous Centipede (*Geophilus carpophagus*) found on the Edge, can easily be recognised by their habit of repeatedly knotting and unknotting their slender bodies. Earth Centipedes are predators, feeding on soil invertebrates, in particular small earthworms. In contrast to the Earth Centipedes, Lithobiomorpha are surface-active feeders and therefore called Stone Centipedes. They are voracious predators, feeding on ground-dwelling invertebrates, including creatures larger than themselves. All species recorded on the Edge are widespread, especially in woodland; a good example is the Variegated Centipede (*Lithobius variegates*). This species is red-brown but its legs are conspicuously banded with brown or purple rings.

Only nine species of land molluscs of the 140 recorded in Cheshire and Lancashire (Pettitt, 1975) have been found on the Edge. Of these the Discus Snail (*Discus rotundatus*) is rather beautiful when seen under magnification. It is fairly small, with a lens-shaped, tightly coiled and

densely ribbed shell. The species is very common, occurring in almost any type of cover provided by leaf litter, stones, logs and the like. It feeds on detritus and fungus. The rather large Yellow Slug *Limax flavus* is beautifully coloured, usually yellow overlaid with greyish mottling and with pale blue tentacles. It is Mediterranean in origin and therefore in Britain it is synanthropic, that is, it is strongly associated with human habitation, such as gardens, out-houses and damp cellars. On Alderley Edge, it has been collected several times in rotting wood and litter (parcels 3a and 3b) near private houses. Fairly common slugs of the Edge are the Southern Garden Slug (*Arion hortensis*) and related forms, usually found under the loose bark of fallen logs and in litter. Nonetheless, a proper identification of all these forms requires dissection and special skills. Commonest of all slugs is the Great Black Slug (*Arion ater*; Plate 59). As its name suggests, the slug is generally black, but in nature its colouration varies; this slug can even be orange or white. It is an omnivorous species, eating carrion and dung as well as vegetable matter. The Great Black Slug prefers rotting vegetation to living plants and therefore rarely does much harm in the garden. Of the pest species recorded from the Edge, it is worth mentioning the Dusky Slug (*Arion subfuscus*), the species that can cause some damage to garden flowers. Really pestilential species, such as the Netted Slug (*Deroceras reticulatum*) and the Keeled Slugs (*Milax budapestensis* or *M. sowerbyi*), have not yet been formally recorded from Alderley Edge, but may well occur there. The best field guide to slugs and land snails is the book by Kerney and Cameron (1979).

Of the thirty-five woodlouse species recorded in the UK (Hopkin, 1991), only three common ones have been found in the Edge to date. Woodlice are not insects but crustaceans, related to crabs and shrimps. They form the suborder Oniscidea, within the order Isopoda. Woodlice typically inhabit damp soil and leaf litter in woodland but can also be found in nearly every other temperate habitat, including grasslands, sparsely vegetated fields, spaces under the bark of fallen logs or even basements of buildings. In different parts of the UK woodlice are referred to by a surprising variety of local names – at least sixty-five have been recorded, from 'Sink-lice' in Lancashire, 'Bible bugs' in Stafford to 'Cod-worms' in Shropshire. This last name came about because of the local belief that woodlice, if thrust down the throat of a cow, can be beneficial in promoting the restoration of rumination and cudding in a sick cow (Cloudsley-Thompson, 1958: 5). Various woodlouse remedies (for example using them against such disorders as jaundice or kidney stones) are mentioned by Marren and Mabey (2010). On Alderley Edge, the commonest woodlouse is *Porcellio scaber*, otherwise known as the Common Rough Woodlouse or the Potato Bug, which can be found particularly beneath the dry loose bark of vertical trunks of living or dead

trees. It can be recognised by the transverse rows of small tubercles that cover the back of the head and body. The Common Pygmy Woodlouse (*Trichoniscus pusillus*) can be extracted from the topsoil and litter of beech woodland, particularly from moist sites with the decaying leaf litter on which it feeds. It is abundant elsewhere, although the animals can be overlooked owing to their small size and dark colouration. This species normally produces two distinct generations per year, breeding taking place between May and September; an interesting fact is that in Britain the species usually occurs in parthenogenetic populations, that is, those composed almost entirely of females.

Unfortunately, nothing is yet known about the soil animals of Alderley Edge, such as the Earthworms, Potworms (Enchytraeidae) and Nematoda, of which many are small enough to be easily overlooked. However, it is known that the top 15 cm of soil beneath 1 m^2 of permanent grassland can contain hundreds of Earthworms, over 100,000 Mites and up to 200,000 Potworms, not to mention also millions of Nematoda (see Owen, 1983). Some soil organisms are true herbivores, because they feed directly on the roots of living plants, or are carnivorous or parasites, but most subsist upon detritus, microbes, fungi and algae associated with dead plant matter, or a combination of these. As such, soil organisms play a vital role in the breakdown and recycling of organic matter. For instance, Aristotle – who understood the role of Earthworms in the decomposition of organic matter – called them 'the intestines of the earth'. Earthworms are also of prime importance for maintenance of soil texture, ploughing and aerating the soil. Thirty-seven species of the Earthworms are known from the UK (Sims and Gerard, 1999), but none has so far been formally recorded from Alderley Edge. For those who might be interested in reading about soil animals or surveying them on Alderley Edge, the first book to read might be *Fundamentals of Soil Ecology* by Coleman *et al.* (2004).

Aquatic invertebrates

Several medium-sized farmland ponds of Alderley Edge (parcels 11d, 20b, 22) support a variety of common aquatic invertebrates, of which Leeches (class Hirudinea) and freshwater Molluscs are best represented and known (see Appendix 13.1); for a general account of the Alderley Edge pondlife see section F for the water beetles and also Chapter 12.

Of the sixteen British species of leeches (Elliott and Mann, 1979), seven have been found at the Edge, which is almost equal to the total number of Leeches recorded from ponds across north-west England (nine species; Bentley, 2008). In Old English, 'leech' is a word for cure or healing (see Marren and Mabey, 2010): so someone skilled in healing

was called a leech. The name was shared with a bloodsucking worm known now as the Medicinal Leech (*Hirudo medicinalis*), a species which has not yet been formally recorded from the Edge (but search in the nearest pharmacy where you may indeed find them because they are coming back into fashion as a therapeutic aid, as are maggots for cleaning infected wounds).

Leeches are closely related to Earthworms and Potworms but, unlike those groups, which subsist on decaying organic matter, the majority of them are voracious predators (such as the Horse Leech – *Haemopis sanguisuga*; see Plate 59), feeding on insect larvae, various worms, including other Leeches of smaller size, and even molluscs; smaller prey is usually swallowed whole. Some predacious Leeches (e.g. *Erpobdella octoculata*) can also feed on moribund or dead animals and even on plants. Leeches devour their prey using three toothed jaws situated around the mouth, but some (e.g. all representatives of the family Glossiphoniidae) lack jaws and instead have an eversible proboscis that is used to penetrate the tissues of their prey or host. Some Leeches of the latter group became bloodsucking ectoparasites of tadpoles and fish (the Fish Leech, *Hemiclepsis marginata*) or water birds (the Duck Leech, *Theromyzon tessulatum*, a small, matchstick-sized leech which usually enters the bird's nostrils).

Sixteen species of freshwater molluscs have been recorded at Alderley Edge, rather fewer than the total recorded in north-west England (forty-five species; Bentley, 2008). It is interesting to note that the fauna of the Edge's molluscs includes both the so-called hard-water species, those that prefer water with a high concentration of calcium (e.g. *Anisus vortex*, *Lymnaea stagnalis*, *Planorbis carinatus*), and those which can occur both in hard and in soft waters (e.g. *Bathyomphalus contortus* and *Gyraulus* species) (see Macan, 1977, for further explanations). This fact seems to be rather surprising, as the site of Alderley Edge is known to be formed on the sandstones (see Chapters 4 and 5), which seems to mean that the water is low in dissolved salts and is therefore soft. Yet the presence of the Lake Limpet (*Acroloxus lacustris*), for instance, which prefers the ponds and lakes on chalk or limestone, seems to contradict this assumption. The latter species is a small and inconspicuous snail with a low cone-shaped shell (about 2 mm in height), which can be found attached to vegetation such as the stems of the common reed (*Phragmites*).

Of the relatively large and showy freshwater snails of the Edge, it is worth mentioning two: the Great Pond Snail (*Lymnaea stagnalis*), the largest species (35–50 mm high, 18–25 mm wide); and the Great Ramshorn (*Planorbarius corneus corneus*), a large snail (up to 12 mm in diameter) that is common in garden ponds.

Some Pond Snails (family Lymnaeidae) can be found not only in water but also in damp places in fields. One such species, the Dwarf

Pond Snail (*Galba truncatula*), is even regarded as not truly aquatic (see Macan, 1977). Apparently as a consequence of such habitat preferences, the Dwarf Pond Snail became involved in the life cycle of a dangerous parasitic worm known as the Common Liver Fluke (*Fasciola hepatica*). The Snail is the intermediate host in which the parasite's larvae, called *cercariae*, develop. In the UK, the Fluke can be found in a variety of mammals, including humans, frequently causing the disease known as fascioliasis, which leads to the destruction of the host's liver tissue and bile ducts. Farm livestock (cattle and sheep) become infected by grazing in low-lying, marshy pastures, where the Snail occurs.

An interesting group of freshwater molluscs is the Pea Mussels (family Sphaeriidae), of which five species have been found in the Edge. These molluscs are often abundant, but can be overlooked because they normally remain buried in the pond mud or sandy bottoms (Greenhalgh and Ovenden, 2007). However, these bivalves can spin slime threads, which are attached to the leaves of water plants, and the molluscs can be seen climbing up and down these threads. Most interesting is that many of these molluscs, such as the Horny Orb Mussel (*Sphaerium corneum*), are ovoviviparous species: that is, their eggs develop inside the gills, in special brood-pouches, and the young (usually between six and thirty of them) when extruded are completely developed and look like miniatures of the adult mussels (Ellis, 1978).

Although currently pond Snails and Leeches seem to maintain a rather low profile among naturalists, many aspects of their biology and interactions with other freshwater organisms remain poorly understood – something to look into for those who have a garden pond or a freshwater aquarium.

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Bibliography

Chapter 13 covers a somewhat specialised topic and thus its bibliographic references are also specialised and are linked more closely to the discussion in the text than elsewhere in this book. For that reason they appear here rather than with the main list of references at the end of the volume. Books for general reading on invertebrates are also mentioned in the text of each section.

Abbreviations used in this list:

FBA Freshwater Biological Association
FSC Field Studies Council
LCES Lancashire and Cheshire Entomological Society
LCFS Lancashire and Cheshire Fauna Society
RES Royal Entomological Society

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Plates

(**a**)

Plate 1. (a) Aerial view over Alderley Edge looking west, taken in May 1996. Edge House Farm is in the foreground, the National Trust car park and the Wizard are on the left with Artists Lane and Brynlow immediately beyond. Engine Vein shows as a scar in the centre, with Windmill Wood behind and a spur of woodland running down to the Sandhills in the middle distance. Alderley Edge village with its railway is in the background. (b, *over page*) Aerial view over Alderley Edge looking north-west, taken in May 1996. Dickens Wood and Glaze Hill are on the left, the erosion at Stormy Point is in the centre, with Saddlebole to its right and the Hough beyond, and Findlow Bower Farm is just visible on the right. The spire of St Philip's Church in Alderley Edge village can be seen in the background.

Photographs Barri Jones.

(**b**)

Plate 2. Cupriferous sandstones in the largely aeolian Wilmslow Sandstone Formation above Pillar Mine. Exposures like these first attracted Bronze Age and perhaps earlier miners to this site. The porous sandstones lying in between and beneath the less permeable red and green mudstones have become the sites of secondary mineral deposition.

Photograph Simon Timberlake.

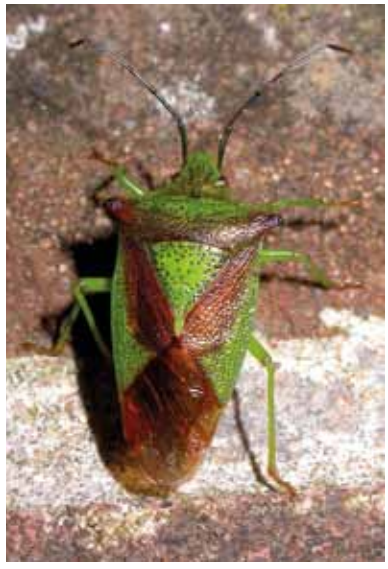

Plate 21. Hawthorn Shieldbug (*Acanthosoma haemorrhoidale*), widespread and common across Britain in wooded areas.

Photograph David I. Green.

Plate 22. Common Green Lacewing (*Chrysoperla carnea*). Its larvae are fierce predators of greenflies, whiteflies and other garden pests.

Photograph David I. Green.

Plate 23. Field Grasshopper (*Chorthippus brunneus*), a medium-sized grasshopper widespread throughout much of the British Isles.

Photograph David I. Green.

Plate 24. Common Darter (*Sympetrum striolatum*; female).

Photograph David I. Green.

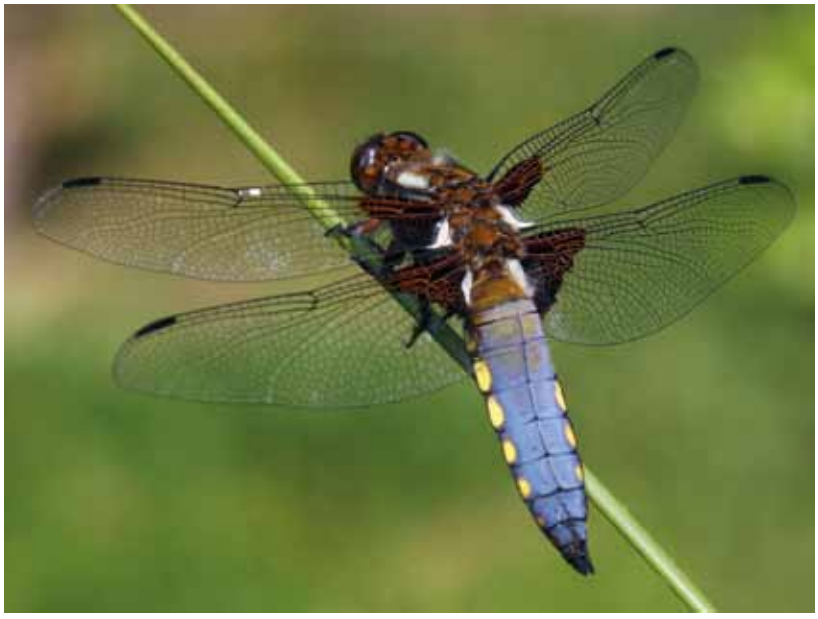

Plate 25. Broad-bodied Chaser (*Libellula depressa*; male), widespread in Cheshire but rare at the Edge.

Photograph David Kitching.

Plate 26. Large Red Damselfly (*Pyrrhosoma nymphula*; female): can be seen in spring and can be found on almost any habitat near water.

Photograph David I. Green.

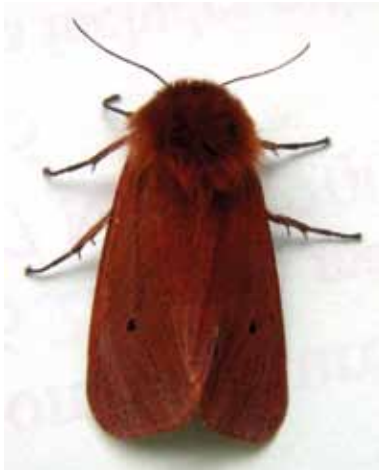

Plate 27. Ruby Tiger Moth (*Phragmatobia fuliginosa*), a common species throughout Britain.

Photograph Michael Dockery.

Plate 28. Peppered Moth (*Biston betularia*; typical form), a favourite of geneticists investigating the problem of industrial melanism.

Photograph Michael Dockery.

Plate 29. Magpie Moth (*Abraxas grossulariata*), a common garden species whose caterpillars can damage currant and gooseberry bushes.

Photograph Roy Leverton.

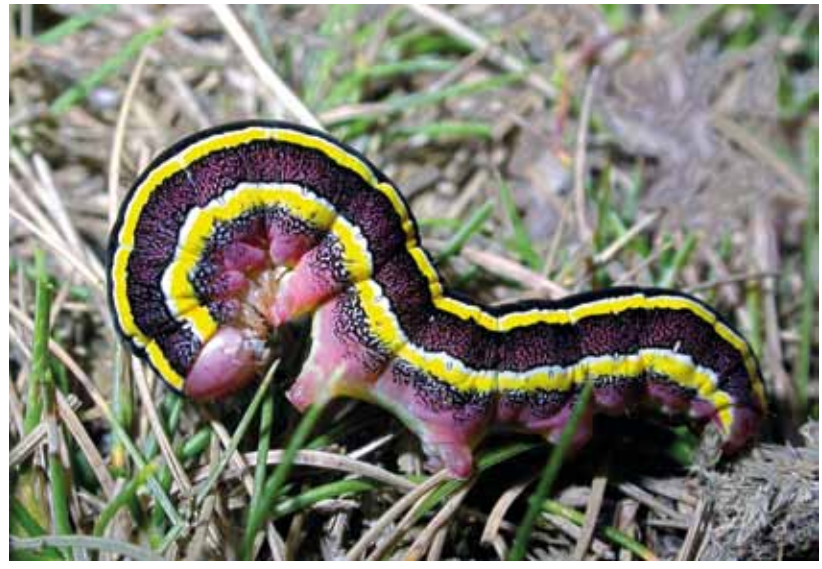

Plate 30. Broom Moth caterpillar (*Melanchra pisi*): can be seen in a wide range of habitats, including gardens.

Photograph David I. Green.

Plate 31. Heart and Dart Moth (*Agrotis exclamationis*), a common species throughout most of Britain.

Photograph Michael Dockery.

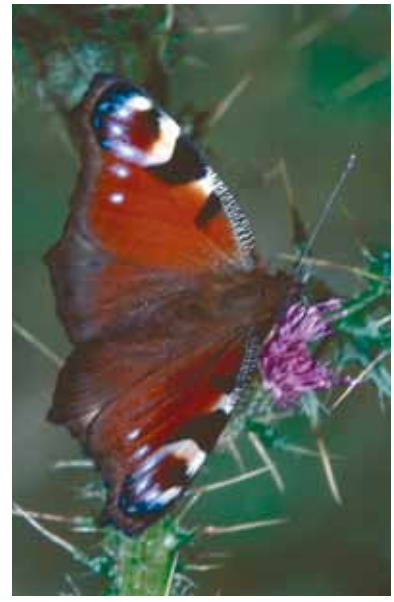

Plate 32. Peacock Butterfly (*Aglais io*), a common resident on the Edge.

Photograph Roger Dennis.

Plate 33. Orange-tip Butterfly (*Anthocharis cardamines*; male), another common resident on the Edge.

Photograph Peter B. Hardy.

Plate 34. Small Copper Butterfly (*Lycaena phlaeas*), an uncommon resident on the Edge.

Photograph Peter B. Hardy.

Plate 35. Speckled Wood Butterfly (*Pararge aegeria*; male), a species that has recently colonised the Edge.

Photograph Peter B. Hardy.

Plate 36. Red Admiral Butterfly (*Vanessa atalanta*), a migrant from the Continent.

Photograph Peter B. Hardy.

Plate 37. Brimstone Butterfly (*Gonepteryx rhamni*; male), another uncommon resident on the Edge.

Photograph Peter B. Hardy.

Plate 38. A mating pair of the Fold-winged Cranefly (*Ptychoptera contaminata*): the female is the larger.

Photograph Steven Falk.

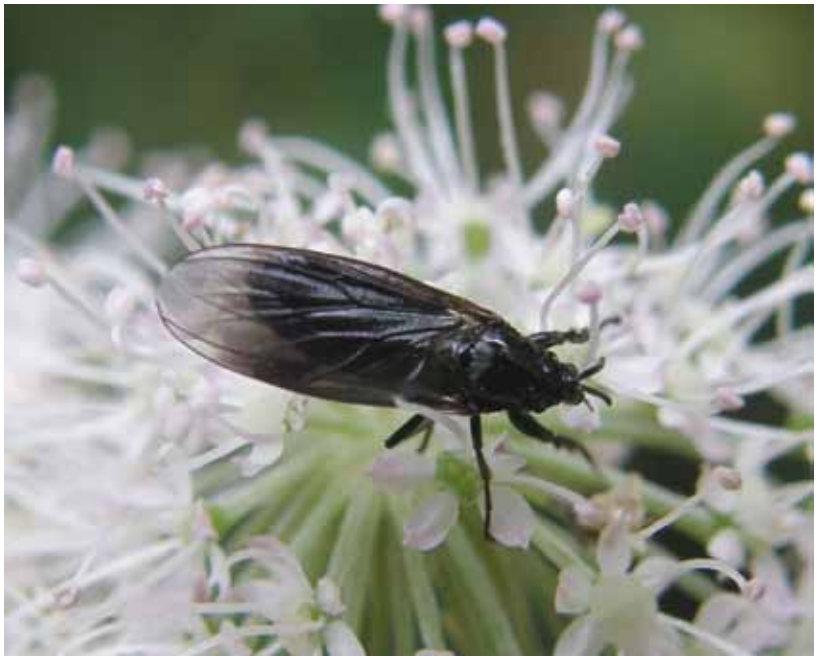

Plate 39. Fever-fly (*Dilophus febrilis*; female). Common and widespread around low vegetation in April and May.

Photograph Steven Falk.

Plate 40. Hoverflies *Eristalis tenax* (Dronefly, larger) and *Episyrphus balteatus* (smaller), two species which can commonly be seen in British gardens.

Photograph Yvonne Golding.

Plate 41. Yellow Dung-fly (*Scathophaga stercoraria*): can be seen on the Edge crowding on pats of cow or horse dung.

Photograph Steven Falk.

Plate 42. Stablefly (*Stomoxys calcitrans*), an obnoxious blood-sucking species that can be seen around open pastures on the Edge and can inflict painful bites.

Photograph Steven Falk.

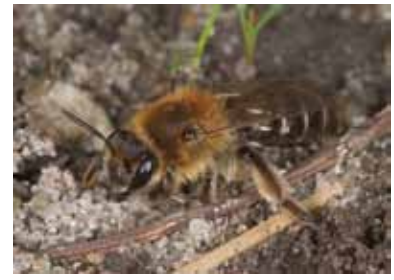

Plate 43. Mining Bee (*Andrena barbirabris*; female), a common species restricted to places with exposures of sand.

Photograph Mike Edwards.

Plate 44. Four-coloured Cuckoo Bee (*Bombus (Psithyrus) sylvestris*), known to aggressively attack colonies of other bumblebees.

Photograph Mike Edwards.

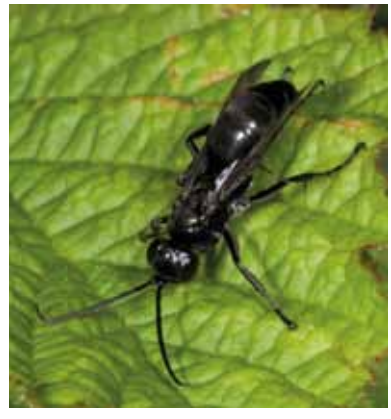

Plate 45. Spider-Hunting Wasp (*Anoplius nigerrimus*), found in a wide range of habitats and reported to prey on Wolf and Nursery-Web Spiders.

Photograph Mike Edwards.

Plate 46. Slender-Bodied Digger Wasp (*Crabro cribrarius*), a large solitary wasp which nests in sandy soil and stocks its burrows with flies.

Photograph Mike Edwards.

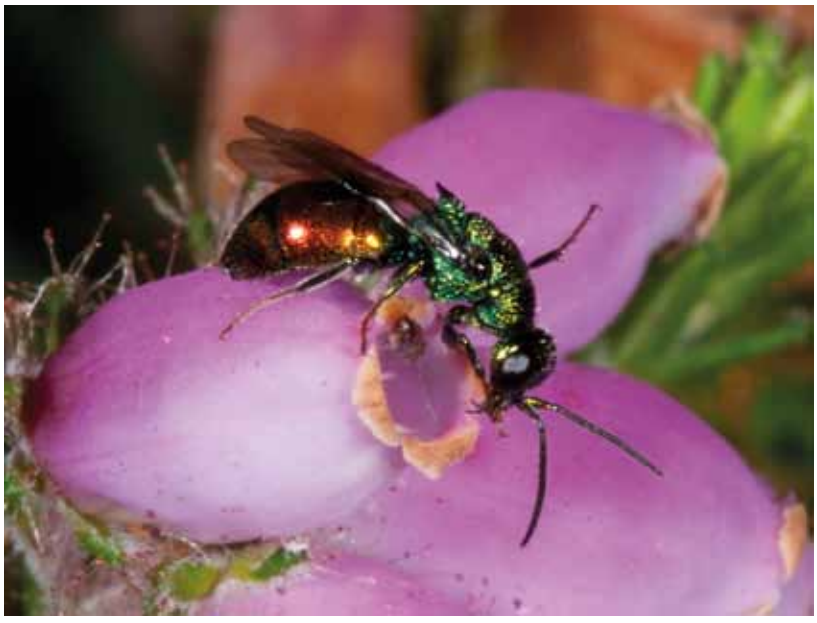

Plate 47. Ruby-tailed Wasp (*Elampus panzeri*), a brood parasite of digger wasps (*Sphecidae*).

Photograph Mike Edwards.

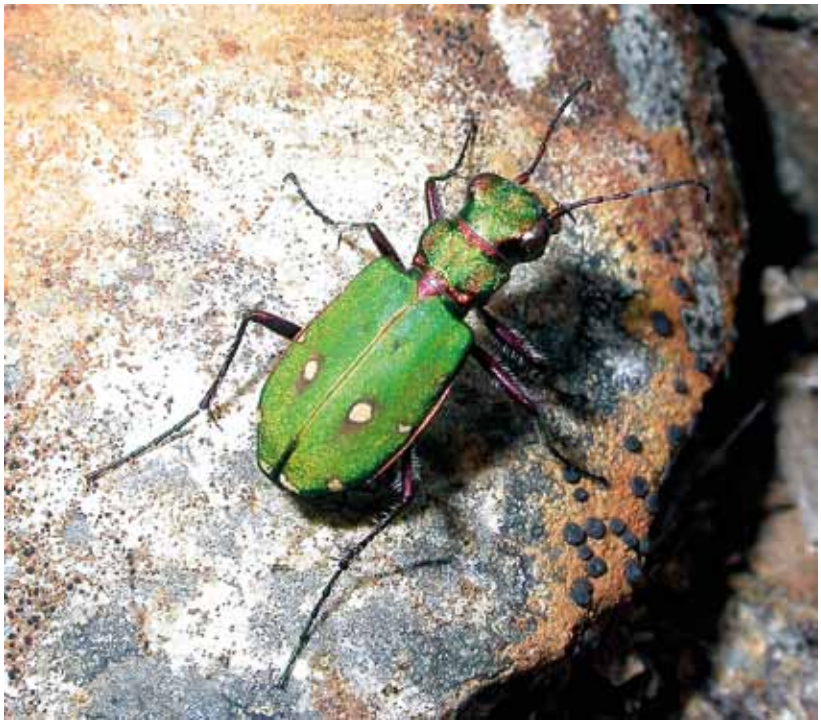

Plate 48. Green Tiger Beetle (*Cicindela campestris*), an active predator, usually seen in early summer on heaths, dunes and sandy places

Photograph David I. Green.

Plate 49. A museum specimen of *Anacaena globulus*, a common representative of the Scavenger Water Beetles, which can be found in rich mud at pond edges

Photograph Katherine Child.

Plate 50. Common Red Soldier Beetle (*Rhagonycha fulva*), a frequent visitor to open-structured flowers such as members of the carrot family.

Photograph David I. Green.

Plate 51. Two-spotted Ladybird (*Adalia bipunctata*), a fairly common species and one of 'England's true guardian angels' (see text, p. 275).

Photograph David I. Green.

Plate 52. Long-jawed Spider (*Metellina merianae*, colour variety *celata*; female), a common dweller in entrances to old mines.

Photograph Martin Askins.

Plate 53. Cryptic Wolf Spider (*Arctosa perita*; female), dwelling in the Sandhills region.

Photograph Martin Askins.

Plate 54. The Giant House Spider (*Tegenaria gigantea*) occurs in houses and out-buildings as well as outside.

Photograph Peter Nicholson.

Plate 55. Window Spider (*Amaurobius fenestralis*: female), which builds retreats in holes in rocks and under tree bark.

Photograph Martin Askins.

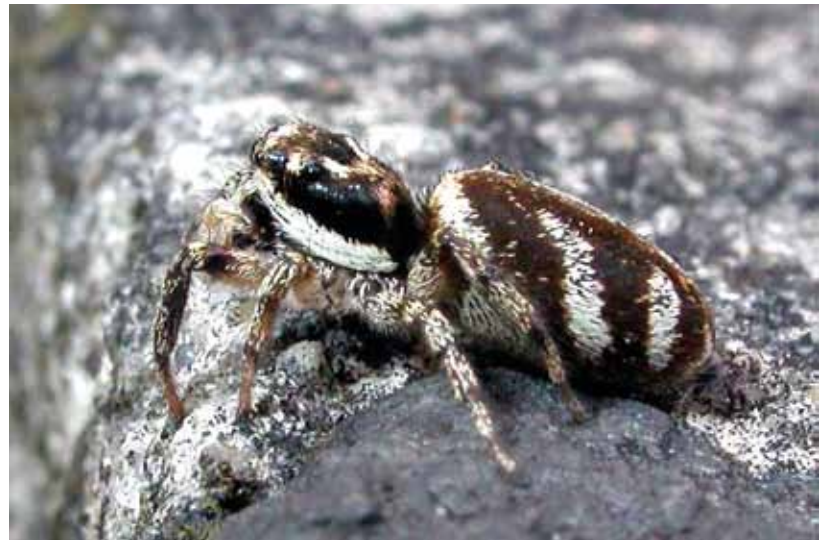

Plate 56. Zebra Spider (*Salticus scenicus*), a common dweller of stony walls and rocks.

Photograph David I. Green.

Plate 57. Nursery-web Spider (*Pisaura mirabilis*; female) with egg sac inside its nursery web.

Photograph Martin Askins.

Plate 58. The tiny harvestman *Megabunus diadema* can be found on rocks.

Photograph Martin Askins.

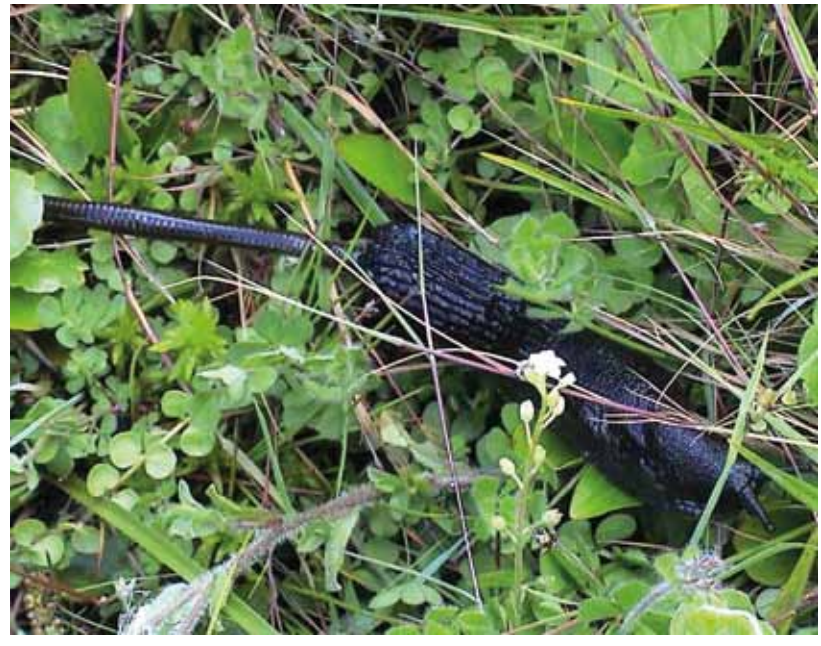

Plate 59. Horse Leech (*Haemopis sanguisuga*, left) attacking a Great Black Slug (*Arion ater*, right).

Photograph John Walters.

Appendix 13.1

A checklist of the invertebrates of Alderley Edge

Dmitri V. Logunov

The checklist of 1,732 species of invertebrates found on Alderley Edge provided below has been compiled on the basis of several unpublished reports, the data released at our request by a number of organisations and county recorders, the collections and card indexes of Manchester Museum, and a number of publications. The names of colleagues or institutions whose data have been used are mentioned at the beginning of each section. Although this checklist is by no means complete (see also the Introduction to Chapter 13), it is the first ever to have been compiled for Alderley Edge. Further progress in extending it will depend on conducting a number of special and detailed inventories of the separate invertebrate groups listed below.

A note on scientific names

The checklist contains both scientific and common English names (if they exist). Biologists have divided the living world into groups of organisms, or taxa, which are usually arranged according to a series of levels known as a *taxonomic hierarchy*. The *species* is the basal element in this hierarchy, having typically the lowest taxonomic rank. However, some species include even lower taxonomic ranks, called *subspecies*. Related species are grouped into a *genus*, related genera into a *family*, families into an *order*, orders into a *class*, classes into a *phylum*. Families can be further subdivided into subfamilies, and genera into subgenera. Scientific names are assigned or reassigned according to the sets of

rules called *codes of nomenclatures*, conventional among specialists. The *International Code of Zoological Nomenclature* (ICZN) is the one followed by the zoological disciplines. In the present checklist, the following taxonomic hierarchy is used (from bottom to top): subspecies – species – subgenus – genus – tribes – subfamily – family – order – class – subphylum – phylum. However, subspecies, subgenera and subfamilies are included only if it is thought appropriate. For some groups these names are not available, as their classification is still poorly developed. The publications mentioned at the beginning of each section will provide the complete classification of every large group in the present checklist (i.e. the order or class) and the detailed nomenclature of the taxa involved. Note that the references themselves are listed at the end of Chapter 13 itself (pp. 293–9).

Scientific species names are always Latinised, and each typically consists of four essential parts: *Genus*, *Species*, *Author's name* and *Date*. For instance, the scientific name of the Great Diving Beetle is *Dytiscus marginalis* Linnaeus, 1758. This shows that the species *marginalis* was described in the genus *Dytiscus* by Linnaeus in 1758. The author and date can be bracketed or not, depending on the original combination of a species name given by its author. If a species name was described in a particular genus and still remains in that genus, the author and date are given without brackets. If the species name has been transferred to another genus since its original description, the author and date are enclosed in curved brackets.

Genus and species names constitute a unique two-word (*binomial*) combination of a scientific name for every species. If a subgenus name is included, the combination will be *trinomial*. The current checklist contains both bi- and trinomial names, depending on availability and practicalities. The family names can be recognised by the standard ending '*-idae*'. Nomenclature of all listed groups is given in accordance with most up-to-date relevant catalogues, if available; all references are provided. It is beyond the scope of these brief notes to describe all existing nomenclatural rules. A brief account of the taxonomic nomenclature can be found in Cooter and Barclay (2006); one of the best and most comprehensive accounts of the practical taxonomy is a book by J. E. Winston, *Describing Species: Practical Taxonomic Procedure for Biologists* (1999).

Common English names have been provided for the majority of macro-Lepidoptera and for those groups where such names exist. For a fairly comprehensive synopsis of common English names of insects, as well of those from nine other European languages, see 'the Pherobase', online at http://www.pherobase.com/database/commonname/common-names-atoz-index.php. The meanings of the scientific names of the British butterflies and moths, as well as a brief history of the scientific

nomenclature, were discussed by Emmet (1991). The scientific names of the British spiders and harvestmen were covered by Parker (1982, 1993).

If a species has remained undetermined, it is listed below as 'sp.', which means 'species'. In this case, the name of the most similar species is given followed by the word 'complex' (both in parentheses).

For simplicity, all taxa are arranged alphabetically within their parent group.

Phylum Arthropoda (Jointed-foot invertebrates: insects, arachnids, crustaceans, etc.) Subphylum Mandibulata

Class Insecta (Insects)

Order Coleoptera (Beetles; 363 species)

The checklist presented below includes 363 species and is mainly based on the unpublished report on terrestrial beetles prepared by Colin Johnson (Manchester). This report includes data on 264 species taken both from fieldwork on Alderley Edge which he carried out over a number of years and from the Lancashire and Cheshire Card Index by Harry Britten in Manchester Museum (extracted by Lai Mei Li, Wigan). The list of aquatic beetles of the families Dytiscidae, Haliplidae, Hydraenidae, Hydrophilidae, Gyrinidae, Paelobiidae, Scirtidae, Chrysomelidae, Coccinellidae and Noteridae (sixty-one species) is based on the unpublished reports of two aquatic invertebrate surveys undertaken by Ian Wallace from Liverpool Museum in 1996 and by Jonathan Guest in 1998 (the latter forms the basis for our Chapter 12 on the Alderley Edge pondlife). Thirty-eight additional species from the families Cantharidae, Carabidae, Cerambycidae, Chrysomelidae, Coccinellidae, Leiodidae, Rhynchitidae, Scarabaeidae and Staphylinidae were added from the 2002 unpublished report by Dmitri Logunov (Manchester Museum), the data released at our request by rECOrd, the Biodiversity Information System for Cheshire (courtesy of Tom Hunt) and by Don Stenhouse (Bolton Museum), the Cheshire County recorder for Coleoptera, and from the unpublished report on the National Trust Biological Survey by Jackson and Alexander in 1998.

Nomenclature is arranged in accordance with the latest checklist of beetles of the British Isles edited by Duff (2008), with tribes omitted.

Suborder Adephaga

Family CARABIDAE (41) – Ground Beetles

Subfamily Carabinae

Abax (*Abax*) *parallelepipedus* (Piller and Mitterpacher, 1783)
Agonum (*Agonum*) *muelleri* (Herbst, 1784)
Agonum (*Europhilus*) *fuliginosum* (Panzer, 1809)
Agonum (*Europhilus*) *thoreyi* Dejean, 1828
Amara (*Zezea*) *plebeja* (Gyllenhal, 1810)
Anchomenus dorsalis (Pontoppidan, 1763)
Bembidion (*Metallina*) *lampros* (Herbst, 1784)
Bembidion (*Peryphus*) *tetracolum* Say, 1823
Calathus (*Amphyginus*) *rotundicollis* Dejean, 1828
Calathus (*Calathus*) *fuscipes* (Goeze, 1777)
Calathus (*Calathus*) *melanocephalus* (Linnaeus, 1758)
Carabus (Archicarabus) nemoralis Müller, 1764
Carabus (*Carabus*) *granulatus* Linnaeus, 1758
Carabus (*Mesocarabus*) *problematicus harcyniae* Sturm, 1815
Clivina fossor (Linnaeus, 1758)
Cychrus caraboides (Linnaeus, 1758)
Dromius (*Dromius*) *quadrimaculatus* (Linnaeus, 1758)
Elaphrus (*Neoelaphrus*) *cupreus* Duftschmid, 1812
Leistus (*Leistus*) *fulvibarbis* Dejean, 1826
Leistus (*Leistus*) *terminatus* (Panzer, 1793)
Leistus (*Pogonophorus*) *spinibarbis* (Fabricius, 1775)
Loricera (*Leistus*) *pilicornis* (Fabricius, 1775)
Nebria (*Boreonebria*) *rufescens* (Strøm, 1768)
Nebria (*Nebria*) *brevicollis* (Fabricius, 1792)
Nebria (*Nebria*) *salina* Fairmaire and Laboulbène, 1854
Notiophilus aestuans Dejean, 1826
Notiophilus biguttatus (Fabricius, 1779)
Notiophilus rufipes Curtis, 1829
Ocys harpaloides (Audinet-Serville, 1821)
Paranchus albipes (Fabricius, 1796)
Patrobus atrorufus (Strøm, 1768)
Platynus (*Platynus*) *assimilis* (Paykull, 1790)
Pterostichus (*Bothriopterus*) *quadrifoveolatus* Letzner, 1852
Pterostichus (*Morphosoma*) *melanarius* (Illiger, 1798)
Pterostichus (Lagarus) vernalis (Panzer, 1795)
Pterostichus (*Platysma*) *niger* (Schaller, 1783)
Pterostichus (*Phonias*) *diligens* (Sturm, 1824)
Pterostichus (*Phonias*) *strenuus* (Panzer, 1796)
Pterostichus (*Steropus*) *madidus* (Fabricius, 1775) – 'Black Clock' in Surrey
Pterostichus sp. (*nigrita* complex)

Subfamily Cicindelinae

Cicindela (s.str.) *campestris* Linnaeus, 1758

Family DYTISCIDAE (30) – Diving Beetles

Acilius (*Acilius*) *sulcatus* (Linnaeus, 1758)
Agabus (*Acatodes*) *sturmi* (Gyllenhal in Schönherr, 1808)
Agabus (*Gaurodytes*) *affinis* (Paykull, 1798)
Agabus (*Gaurodytes*) *bipustulatus* (Linnaeus, 1767)
Agabus (*Gaurodytes*) *guttatus* (Paykull, 1798)
Agabus (*Gaurodytes*) *nebulosus* (Forster, 1771)
Colymbetes fuscus (Linnaeus, 1758)
Dytiscus marginalis Linnaeus, 1758 – Great Diving Beetle
Hydroporus angustatus Sturm, 1835
Hydroporus erythrocephalus (Linnaeus, 1758)
Hydroporus incognitus Sharp, 1869
Hydroporus gyllenhalii Schiødte, 1841
Hydroporus memnonius Nicolai, 1822
Hydroporus neglectus Schaum, 1845
Hydroporus nigrita (Fabricius, 1792)
Hydroporus obscurus Sturm, 1835
Hydroporus palustris (Linnaeus, 1761)

Hydroporus planus (Fabricius, 1781)
Hydroporus pubescens (Gyllenhal, 1808)
Hydroporus striola (Gyllenhall, 1862)
Hydroporus tessellates (Drapiez, 1819)
Hydroporus tristis (Paykull, 1798)
Hygrotus (*Coelambus*) *impressopunctatus* (Schaller, 1783)
Hygrotus (*Hygrotus*) *inaequalis* (Fabricius, 1777)
Hyphydrus ovatus (Linnaeus, 1761)
Ilybius ater (DeGeer, 1774)
Ilybius fuliginosus (Fabricius, 1792)
Ilybius quadriguttatus (Lacordaire, 1835)
Laccophilus minutus (Linnaeus, 1758)
Suphrodytes dorsalis (Fabricius, 1787)

Family HALIPLIDAE (3) – Crawling Water Beetles
Haliplus (*Haliplinus*) *immaculatus* Gerhardt, 1877
Haliplus (*Haliplinus*) *ruficollis* (DeGeer, 1774)
Haliplus (*Haliplinus*) *sibiricus* Motschulsky, 1860

Family GYRINIDAE (1) – Whirligig Beetles
Gyrinus substriatus Stephens, 1828

Family NOTERIDAE (1) – Burrowing Water Beetles
Noterus clavicornis (DeGeer, 1774)

Family PAELOBIIDAE (1) – Screech Beetles
Hygrobia hermanni (Fabricius, 1775)

Suborder Polyphaga

Family ANOBIIDAE (3) – Woodworm and Spider Beetles
Dryophilus pusillus (Gyllenhal, 1808)
Niptus hololeucus (Faldermann, 1835) – Golden Spider Beetle
Ptilinus pectinicornis (Linnaeus, 1758) – Fan-bearing Wood-borer

Family APIONIDAE (1) – Seed Weevils
Exapion (*Ulapion*) *ulicis* (Forster, 1771)

Family BYRRHIDAE (1) – Pill Beetles
Simplocaria semistriata (Fabricius, 1794)

Family BYTURIDAE (1) – Raspberry Beetles
Byturus tomentosus (DeGeer, 1774) – Raspberry Beetle

Family CANTHARIDAE (10) – Soldier Beetles
Cantharis decipiens Baudi, 1871
Cantharis nigra (DeGeer, 1774)
Cantharis nigricans (Müller, 1776)
Malthinus frontalis (Marsham, 1802)
Malthodes fuscus (Waltl, 1838)
Malthodes mysticus Kiesenwetter, 1852
Rhagonycha fulva (Scopoli, 1763) – Common Red Soldier Beetle
Rhagonycha lignosa (Müller, 1764)
Rhagonycha limbata (Thomson, 1864)
Rhagonycha testacea (Linnaeus, 1758)

Family CERAMBYCIDAE (4) – Long-horn Beetles

Clytus arietis (Linnaeus, 1758) – Wasp Beetle
Phymatodes testaceus (Linnaeus, 1758)
Tetropium gabrieli Weise, 1905
Saperda scalaris (Linnaeus, 1758)

Family CERYLONIDAE (2)

Cerylon ferrugineum Stephens, 1830
Cerylon histeroides (Fabricius, 1792)

Family CHRYSOMELIDAE (12) – Leaf and Flea Beetles

Altica lythri Aubé, 1843 – Willowherb Flea Beetle
Chaetocnema sp. (*concinna* complex)
Crepidodera fulvicornis (Fabricius, 1793)
Donacia vulgaris Zschach, 1788 – Reed Beetle
Hydrothassa marginella (Linnaeus, 1758)
Lochmaea caprea (Linnaeus, 1758)
Lochmaea crataegi (Forster, 1771)
Oulema sp. (*melanopus* complex)
Phaedon tumidulus (Germar, 1824) – Celery Leaf Beetle
Phratora laticollis (Suffrian, 1851)
Phyllotreta undulata Kutschera, 1860 – Lesser or Small Striped Flea Beetle
Prasocuris phellandrii (Linnaeus, 1758)

Family CIIDAE (5) – Minute Tree Fungus Beetles

Octotemnus glabriculus (Gyllenhal, 1827)
Cis bidentatus (Olivier, 1790)
Cis bilamellatus Wood, 1884
Cis boleti (Scopoli, 1763)
Cis fagi Waltl, 1839

Family COCCINELLIDAE (15) – Ladybirds

Adalia bipunctata (Linnaeus, 1758) – Two-spot Ladybird
Adalia decempunctata (Linnaeus, 1758) – Ten-spot Ladybird
Anatis ocellata (Linnaeus, 1758) – Eyed Ladybird
Anisosticta novemdecimpunctata (Linnaeus, 1758) – Nineteen-Spot Ladybird
Aphidecta obliterata (Linnaeus, 1758) – Larch Ladybird
Calvia quattuordecimguttata (Linnaeus, 1758) – Cream-spot Ladybird
Coccidula rufa (Herbst, 1783)
Coccinella septempunctata Linnaeus, 1758 – Seven-spot Ladybird
Coccinella undecimpunctata Linnaeus, 1758 – Eleven-spot Ladybird
Halyzia sedecimguttata (Linnaeus, 1758) – Sixteen-spot Ladybird
Myrrha octodecimguttata (Linnaeus, 1758) – Eighteen-spot Ladybird
Myzia oblongoguttata (Linnaeus, 1758) – Striped Ladybird
Propylea quattuordecimpunctata (Linnaeus, 1758)
Psyllobora vigintiduopunctata (Linnaeus, 1758) – Twenty-two-spot Ladybird
Scymnus (*Pullus*) *auritus* Thunberg, 1795

Family CRYPTOPHAGIDAE (8) – Silken Fungus Beetles

Atomaria (*Anchicera*) *lewisi* Reitter, 1877
Atomaria (*Anchicera*) *rubella* Heer, 1841
Cryptophagus dentatus (Herbst, 1793)
Cryptophagus denticulatus Heer, 1841
Cryptophagus lycoperdi (Scopoli, 1763)
Cryptophagus punctipennis Brisout de Barneville, 1863
Micrambe ulicis (Stephens, 1830)
Ootypus globosus (Waltl, 1838)

Family CURCULIONIDAE (25) – True Weevils and Bark Beetles

Subfamily Ceuthorhynchinae

Nedyus quadrimaculatus (Linnaeus, 1758)
Parethelcus pollinarius (Forster, 1771)
Sirocalodes mixtus (Mulsant and Rey, 1858)

Subfamily Cossoninae

Euophryum confine (Broun, 1881)

Subfamily Curculioninae

Archarius pyrrhoceras (Marsham, 1802)
Dorytomus rufatus (Bedel, 1888)
Orchestes (*Salius*) *fagi* (Linnaeus, 1758)

Subfamily Entiminae

Otiorhynchus singularis (Linnaeus, 1767) – Clay-coloured Weevil
Phyllobius (*Dieletus*) *argentatus* (Linnaeus, 1758)
Phyllobius (*Metaphyllobius*) *glaucus* (Scopoli, 1763)
Phyllobius (*Phyllobius*) *pyri* (Linnaeus, 1758) – Common Leaf Weevil
Polydrusus (*Neoeustolus*) *cervinus* (Linnaeus, 1758)
Sitona puncticollis Stephens, 1831
Sitona regensteinensis (Herbst, 1797)
Strophosoma capitatum (DeGeer, 1775)
Strophosoma melanogrammum (Forster, 1771)

Subfamily Scolytinae

Dryocoetinus villosus (Fabricius, 1792)
Hylurgops palliatus (Gyllenhal, 1813)
Hylastes ater (Paykull, 1792)
Hylastes opacus Erichson, 1836
Hylesinus sp. (*varius* complex)
Scolytus intricatus (Ratzeburg, 1837) – Oak Bark Beetle
Trypodendron domesticum (Linnaeus, 1758) – Ambrosia Beetle
Trypodendron lineatum (Olivier, 1795)
Trypodendron signatum (Fabricius, 1792)

Family DERMESTIDAE (1) – Skin, Carpet or Larder Beetles

Anthrenus (*Florilinus*) *museorum* (Linnaeus, 1761) – Museum Beetle

Family ELATERIDAE (5) – Click Beetles

Agriotes pallidulus (Illiger, 1807)
Athous (*Athous*) *haemorrhoidalis* (Fabricius, 1801)
Dalopius marginatus (Linnaeus, 1758)
Denticollis linearis (Linnaeus, 1758)
Melanotus sp. (*villosus* complex)

Family EROTYLIDAE (1) – Pleasing Fungus Beetles

Triplax aenea (Schaller, 1783)

Family GEOTRUPIDAE (3) – Dor Beetles

Anoplotrupes stercorosus (Scriba, 1791)
Geotrupes spiniger (Marsham, 1802)
Geotrupes stercorarius (Linnaeus, 1758) – Dumble-dor or Lousy Watchman

Family HELOPHORIDAE (4)

Helophorus (*Atracthelophorus*) *brevipalpis* Bedel, 1881
Helophorus (*Helophorus*) *minutus* Fabricius, 1775
Helophorus (*Helophorus*) *obscurus* Mulsant, 1844
Helophorus (*Megahelophorus*) *grandis* Illiger, 1798

Family HISTERIDAE (1) – Clown or Hister Beetles

Gnathoncus rotundatus (Kugelann, 1792)

Family HYDRAENIDAE (4)

Hydraena riparia Kugelann, 1794
Hydraena testacea Curtis, 1830
Limnebius truncatellus (Thunberg, 1794)
Ochthebius minimus (Fabricius, 1792)

Family HYDROPHILIDAE (19) – Scavenger Water Beetles

Subfamily Hydrophylinae

Anacaena globulus (Paykull, 1798)
Anacaena limbata (Fabricius, 1792)
Anacaena lutescens (Stephens, 1829)
Cymbiodyta marginellus (Fabricius, 1792)
Enochrus coarctatus (Gredler, 1863)
Enochrus testaceus (Fabricius, 1801)
Helochares lividus (Forster, 1771)
Hydrobius fuscipes (Linnaeus, 1758)
Laccobius bipunctatus (Fabricius, 1775)

Subfamily Sphaeridiinae

Cercyon (*Cercyon*) *convexiusculus* Stephens, 1829
Cercyon (*Cercyon*) *impressus* (Sturm, 1807)
Cercyon (*Cercyon*) *melanocephalus* (Linnaeus, 1758)
Cercyon (*Cercyon*) *pygmaeus* (Illiger, 1801)
Coelostoma orbiculare (Fabricius, 1775)
Cryptopleurum minutum (Fabricius, 1775)
Megasternum concinnum (Marsham, 1802)
Megasternum obscurum (Marsham, 1802)
Sphaeridium scarabaeoides (Linnaeus, 1758)
Sphaeridium sp. (*bipustulatum* complex)

Family KATERETIDAE (1) – Pollen Beetles

Brachypterus urticae (Fabricius, 1792)

Family LATRIDIIDAE (7) – Plaster Beetles

Cartodere (*Aridius*) *bifasciata* (Reitter, 1877)
Cartodere (*Aridius*) *nodifer* (Westwood, 1839)
Cortinicara gibbosa (Herbst, 1793)
Enicmus testaceus (Stephens, 1830)
Enicmus transversus (Olivier, 1790)
Latridius porcatus Herbst, 1793
Stephostethus lardarius (DeGeer, 1775)

Family LEIODIDAE (6) – Round Fungus Beetles

Agathidium (*Neoceble*) *nigripenne* (Fabricius, 1792)
Agathidium (*Neoceble*) *rotundatum* (Gyllenhal, 1827)
Anisotoma humeralis (Fabricius, 1792)
Leptinus testaceus Müller, 1817
Nargus (*Nargus*) *velox* (Spence, 1813)
Nargus (*Nargus*) *wilkini* (Spence, 1813)

Family LUCANIDAE (1) – Stag Beetles

Sinodendron cylindricum (Linnaeus, 1758) – Rhinoceros beetle

Family LYMEXYLIDAE (1) – Ship-timber Beetles

Hylecoetus dermestoides (Linnaeus, 1761)

Family MALACHIIDAE (1) – Soft-wing Flower Beetles

Malachius bipustulatus (Linnaeus, 1758)

Family MELANDRYIDAE (2) – False Darkling Beetles

Melandrya caraboides (Linnaeus, 1761)
Orchesia undulata Kraatz, 1853

Family MONOTOMIDAE (4) – Root-eating Beetles

Rhizophagus (*Eurhizophagus*) *depressus* (Fabricius, 1792)
Rhizophagus (*Rhizophagus*) *bipustulatus* (Fabricius, 1792)
Rhizophagus (*Rhizophagus*) *dispar* (Paykull, 1800)
Rhizophagus (*Rhizophagus*) *nitidulus* (Fabricius, 1798)

Family MYCETOPHAGIDAE (3) – Hairy Fungus Beetles

Litargus connexus (Geoffroy in Fourcroy, 1785)
Mycetophagus atomarius (Fabricius, 1787)
Mycetophagus quadripustulatus (Linnaeus, 1761)

Family NITIDULIDAE (7) – Pollen or Sap Beetles

Carpophilus marginellus Motschulsky, 1858
Cryptarcha strigata (Fabricius, 1787)
Epuraea (*Epuraea*) *pallescens* (Stephens, 1835)
Epuraea (*Epuraea*) *biguttata* (Thunberg, 1784)
Epuraea (*Micruria*) *melanocephala* (Marsham, 1802)
Glischrochilus (*Glischrochilus*) *quadriguttatus* (Fabricius, 1777)
Meligethes aeneus (Fabricius, 1775) – Bronzed Blossom, Blossom or Rape Blossom Beetles

Family PTILIIDAE (13) – Feather-winged Beetles

Acrotrichis (*Acrotrichis*) *atomaria* (DeGeer, 1774)
Acrotrichis (*Acrotrichis*) *cognata* (Matthews, 1877)
Acrotrichis (*Acrotrichis*) *danica* Sundt, 1958
Acrotrichis (*Acrotrichis*) *fascicularis* (Herbst, 1793)
Acrotrichis (*Acrotrichis*) *henrici* (Matthews, 1872)
Acrotrichis (*Acrotrichis*) *intermedia* (Gillmeister, 1845)
Ptenidium (*Gillmeisterium*) *nitidum* (Heer, 1841)
Ptenidium (*Matthewsium*) *laevigatum* Erichson, 1845
Ptenidium (*Ptenidium*) *formicetorum* Kraatz, 1851
Ptiliolum (*Ptenidium*) *fuscum* (Erichson, 1845)
Ptinella cavelli (Broun, 1893)
Ptinella denticollis (Fairmaire, 1858)
Ptinella errabunda Johnson, 1975

Family RHYNCHITIDAE (1)

Deporaus (*Deporaus*) *betulae* (Linnaeus, 1758)

Family SALPINGIDAE (2) – Narrow-waisted Bark Beetles

Salpingus planirostris (Fabricius, 1787)
Salpingus ruficollis (Linnaeus, 1761)

Family SCRAPTIIDAE (5)

Anaspis (*Anaspis*) *fasciata* (Forster, 1771)
Anaspis (*Anaspis*) *frontalis* (Linnaeus, 1758)
Anaspis (*Anaspis*) *maculata* Fourcroy, 1785 – Tumbling Flower Beetle
Anaspis (*Anaspis*) *regimbarti* Schilsky, 1895
Anaspis (*Nassipa*) *rufilabris* (Gyllenhal, 1827)

Family SCARABAEIDAE (7) – Dung Beetles and Chafers

Aphodius (*Agrilinus*) *ater* (DeGeer, 1774)
Aphodius (*Melinopterus*) *prodromus* (Brahm, 1790)
Aphodius (*Melinopterus*) *sphacelatus* (Panzer, 1798)
Aphodius (*Teuchestes*) *fossor* (Linnaeus, 1758)
Aphodius sp. (*fimetarius* complex)
Melolontha melolontha (Linnaeus, 1758) – Common Cockchafer or 'Maybug'
Phyllopertha horticola (Linnaeus, 1758) – Garden Chafer or Bracken-clock

Family SCIRTIDAE (3) – Marsh beetles

Cyphon coarctatus Paykull, 1799
Cyphon hilaris Nyholm, 1844
Scirtes hemisphaericus (Linnaeus, 1758)

Family SCYDMAENIDAE (2) – Ant-like Stone Beetles

Neuraphes (*Neuraphes*) *elongatulus* (Müller and Kunze, 1822)
Stenichnus collaris (Müller and Kunze, 1822)

Family SILPHIDAE (1) – Sexton and Carrion Beetles

Aclypea opaca (Linnaeus, 1758) – Beet Carrion Beetle

Family SPHINDIDAE (1) – Dry Fungus Beetles

Aspidiphorus orbiculatus (Gyllenhal, 1808)

Family STAPHYLINIDAE (90) – Rove Beetles

Subfamily Aleocharinae

Acrotona obfuscata (Gravenhorst, 1802)
Alaobia taxiceroides (Munster, 1932)
Aleochara (*Xenochara*) *lanuginosa* Gravenhorst, 1802
Aloconota (*Aloconota*) *gregaria* (Erichson, 1839)
Amischa analis (Gravenhorst, 1802)
Anomognathus cuspidatus (Erichson, 1839)
Atheta aquatica (Thomson, 1852)
Atheta aquatilis (Thomson, 1867)
Atheta britanniae (Bernhauer and Scheerpeltz, 1926)
Atheta castanoptera (Mannerheim, 1830)
Atheta crassicornis (Fabricius, 1792)
Atheta harwoodi Williams, 1930
Atheta vaga (Heer, 1839)
Atheta xanthopus (Thomson, 1856)
Autalia sp. (*impressa* complex)
Autalia rivularis (Gravenhorst, 1802)
Bolitochara obliqua Erichson, 1837
Cypha laeviuscula (Manerheim, 1830)
Datomicra celata (Erichson, 1837)
Datomicra dadopora (Thomson, 1867)
Dimetrota cinnamoptera (Thomson, 1856)
Dimetrota ischnocera (Thomson, 1870)
Dimetrota laevana (Mulsant and Rey, 1852)
Dimetrota marcida (Erichson, 1837)
Encephalus complicans Stephens, 1832
Haploglossa nidicola (Fairmaire, 1852)
Ischnoglossa prolixa (Gravenhorst, 1802)
Ischnoglossa turcica Wunderle, 1902
Geostiba circellaris (Gravenhorst, 1806)
Leptusa fumida Kraatz, 1856
Leptusa pulchella (Mannerheim, 1830)
Liogluta granigera (Kiesenwetter, 1850)
Mocyta amplicollis (Mulsant and Rey, 1873)
Mocyta fungi (Gravenhorst, 1806)
Mocyta sp. (*fungi* complex)
Oxypoda alternans (Gravenhorst, 1802)
Oxypoda brevicornis (Stephens, 1832)
Oxypoda elongatula Aubé, 1850
Philhygra palustris (Kiesenwetter, 1844)
Phloeopora corticalis (Gravenhorst, 1802)
Phloeopora testacea (Mannerheim, 1830)
Placusa depressa Mäklin, 1845
Placusa pumilio (Gravenhorst, 1802)

Subfamily Omaliinae

Anthobium atrocephalum (Gyllenhal, 1827)

Anthobium unicolor (Marsham, 1802)
Dropephylla vilis (Erichson, 1840)
Hapalaraea pygmaea (Paykull, 1800)
Lesteva longoelytrata (Goeze, 1777)
Olophrum piceum (Gyllenhal, 1810)
Omalium italicum Bernhauer, 1902
Omalium rivulare (Paykull, 1789)
Phloeonomus punctipennis Thomson, 1867

Subfamily Oxytelinae

Anotylus sculpturatus (Gravenhorst, 1806)
Anotylus tetracarinatus (Block, 1799)
Oxytelus laqueatus (Marsham, 1802)
Platystethus (*Platystethus*) *arenarius* (Fourcroy, 1785)
Syntomium aeneum (Müller, 1821)

Subfamily Pederinae

Lathrobium brunnipes (Fabricius, 1792)

Subfamily Proteininae

Proteinus ovalis Stephens, 1834

Subfamily Pselaphinae

Bibloporus bicolor (Denny, 1825)
Tychus niger (Paykull, 1800)

Subfamily Staphylininae

Bisnus fimetarius (Gravenhorst, 1802)
Dinothenarus pubescens (DeGeer, 1774)
Gabrius splendidulus (Gravenhorst, 1802)
Gyrohypnus fracticornis (Müller, 1776)
Nudobius lentus (Gravenhorst, 1806)
Ocypus (*Ocypus*) *olens* (Müller, 1764) – Devil's Coach-horse
Ontholestes tesellatus (Fourcroy, 1785)
Othius subuliformis Stephens, 1833
Philonthus cognatus Stephens, 1832
Philonthus nigrita (Gravenhorst, 1806)
Philonthus tenuicornis Mulsant and Rey, 1853
Philonthus varians (Paykull, 1783)
Philonthus varius (Gyllenhal, 1810)
Quedius (*Microsaurus*) *cruentus* (Olivier, 1795)
Quedius (*Microsaurus*) *lateralis* (Gravenhorst, 1802)
Quedius (*Microsaurus*) *xanthopus* Erichson, 1839
Quedius (*Raphirus*) *fumatus* (Stephens, 1833)
Quedius (*Raphirus*) *maurorufus* (Gravenhorst, 1806)

Subfamily Steninae

Stenus (*Hemistenus*) *impressus* Germar, 1824
Stenus (*Metastenus*) *bifoveolatus* Gyllenhal, 1827
Stenus (*Metastenus*) *nitidiusculus* Stephens, 1833

Subfamily Tachyporinae

Lordithon trinotatus (Erichson, 1839)
Tachinus humeralis Gravenhorst, 1802
Tachinus marginellus (Fabricius, 1781)
Tachinus proximus Kraatz, 1855
Tachinus rufipes (Linnaeus, 1758)
Tachyporus nitidulus (Fabricius, 1781)
Tachyporus obtusus (Linnaeus, 1767)
Tachyporus sp. (*chrysomelinus* complex)

Family TENEBRIONIDAE (1) – Darkling Beetles

Eledona agricola (Herbst, 1783)

Family TETRATOMIDAE (1)

Tetratoma fungorum Fabricius, 1790

Order Collembola (Springtails; 1 species)

The record is based on the slide collection of Collembola held in the Manchester Museum (courtesy of Phillip Rispin). Nomenclature follows Kloet and Hinks (1964).

Family ENTOMOBRYIDAE (1)
Entomobrya albocincta (Templeton, 1835) [ex Hedge Sparrow's nest]

Order Dermaptera (Earwigs; 1 species)

The record is taken from the unpublished report prepared by the Liverpool Museum staff and associates resulting from the Alderley Edge Invertebrate Survey undertaken by their team in 1996 (courtesy of Steve Judd, Liverpool). Nomenclature and common English names follow Marshall and Haes (1988).

Family FORFICULIDAE (1)
Forficula auricularia Linnaeus, 1758 – Common Earwig

Order Diplura (Two-pronged Bristletails; 1 species)

The record is taken from the Lancashire and Cheshire Card Index held in the Manchester Museum (courtesy of Phillip Rispin). Nomenclature follows Kloet and Hinks (1964).

Family CAMPODEIDAE (1)
Campodea plusiocheta Silvestri, 1912 [ex Robin's nest]

Order Diptera (True Flies; 216 species)

The checklist presented below includes 216 species and is mainly based on the unpublished report prepared by the Liverpool Museum staff and associates resulting from the Alderley Edge Invertebrate Survey undertaken by their team in 1996 (courtesy of Steve Judd, Liverpool). Diptera were collected by T. H. Mawdsley and identified by L. Clemons. Sixty-one additional records were taken from three publications (Britten, 1947; Kidd and Brindle, 1959; Chandler, 1991) and from the data extracted from the Lancashire and Cheshire Card Index of Harry Britten in the Manchester Museum (courtesy of Phillip Rispin). Seven species of Bolitophilidae and Mycetophilidae from Alderley Edge were kindly added by Peter Chandler (Melksham, UK), based on his examination of H. Britten's Diptera collection retained in the Manchester Museum. Two records of Conopidae were taken from the

data released at our request by rECOrd, the Biodiversity Information System for Cheshire (courtesy of Tom Hunt), and five additional records from the unpublished report on the National Trust Biological Survey by Jackson and Alexander in 1998. The list of aquatic groups is mostly based on the unpublished reports of two aquatic invertebrate surveys undertaken by Ian Wallace from the Liverpool Museum in 1996 and by Jonathan Guest in 1998 (see Chapter 12). Nomenclature follows the checklist by Chandler (1998) and subsequent updates in *Dipterists Digest* (courtesy of Peter Chandler), with subfamilies and tribes omitted. A useful and fairly complete source of information about the British true flies, including the latest checklist of Diptera of the British Isles, is the Dipterist Forum, online at http://www.dipteristsforum.org.uk; the latest counts of the British Diptera fauna and much useful information on how to collect and study true flies can be found in the second edition of *A Dipterist's Handbook* (Chandler, 2010).

Suborder Lower Diptera (= Nematocera)

Family ANISOPODIDAE (2) – Window Gnats
Sylvicola cinctus (Fabricius, 1787)
Sylvicola fenestralis (Scopoli, 1763)

Family BIBIONIDAE (2) – St Mark's Flies
Bibio johannis (Linnaeus, 1767)
Dilophus febrilis (Linnaeus, 1758) – Fever-fly

Family BOLITOPHILIDAE (4) – Fungus Gnats
Bolitophila (*Bolitophila*) *basicornis* (Mayer, 1951)
Bolitophila (*Bolitophila*) *cinerea* Meigen, 1818
Bolitophila (*Bolitophila*) *saundersii* (Curtis, 1836)
Bolitophila (*Cliopisa*) *hybrida* (Meigen, 1818)

Family CECIDOMYIIDAE (1) – Gall Midges
Dasineura urticae (Perris, 1840)

Family CHAOBORIDAE (1) – Phantom Midges
Chaoborus sp.

Family CHIRONOMIDAE (1) – Non-biting Midges
Orthocladius (*Eudactylocladius*) *fuscimanus* (Kieffer in Kieffer and Thienemann, 1908)

Family CULICIDAE (3) – Mosquitoes
Culex (*Culex*) *pipiens* Linnaeus, 1758
Culiseta (*Culiseta*) *morsitans* (Theobald, 1901)
Ochlerotatus punctor (Kirby in Richardson, 1837)

Family DIXIDAE (3) – Meniscus Midges
Dixa maculata Meigen, 1818
Dixa nebulosa Meigen, 1830
Dixella aestivalis (Meigen, 1818)

Family KEROPLATIDAE (1) – Fungus Gnats

Macrocera phalerata Meigen, 1818

Family LIMONIIDAE (12) – Short-palped Craneflies

Austrolimnophila ochracea (Meigen, 1804)
Cheilotrichia (*Empeda*) *cinerascens* (Meigen, 1804)
Crypteria limnophiloides Bergroth, 1913
Dicranomyia (*Dicranomyia*) *modesta* (Meigen, 1881)
Dicranomyia (*Numantia*) *fusca* (Meigen, 1804)
Erioconopa trivialis (Meigen, 1881)
Erioptera (*Erioptera*) *lutea* Meigen, 1804
Limonia nubeculosa Meigen, 1804
Molophilus appendiculatus (Staeger, 1840)
Ormosia hederae (Curtis, 1935)
Rhipidia maculata Meigen, 1818
Rhypholophus varius (Meigen, 1818)

Family MYCETOPHILIDAE (29) – Fungus Gnats

Allodia (*Allodia*) *lugens* (Wiedemann, 1817)
Allodia (*Allodia*) *truncata* Edwards, 1921
Allodia zaitzevi Kurina, 1998
Boletina gripha Dziedzicki, 1885
Coelophthinia thoracica (Winnertz, 1863)
Cordyla brevicornis (Staeger, 1840)
Exechia contaminata Winnertz, 1863
Exechia dorsalis (Staeger, 1840)
Exechia fusca (Meigen, 1804)
Exechia parva Lundström, 1909
Exechia spinuligera Lundström, 1912
Exechiopsis hammi (Edwards, 1925)
Mycetophila finlandica Edwards, 1913
Mycetophila formosa Lundström, 1911
Mycetophila fraterna Winnertz, 1863
Mycetophila fungorum (De Geer, 1776)
Mycetophila ichneumonea Say, 1823
Mycetophila luctuosa Meigen, 1830
Mycetophila marginata Winnertz, 1863
Mycetophila ocellus Walker, 1848
Mycetophila signatoides Dziedzicki, 1884
Mycetophila vittipes Zetterstedt, 1852
Mycomya (*Mycomya*) *annulata* (Meigen, 1818)
Phronia cinerascens Winnertz, 1863
Phronia coritanica Chandler, 1992
Phronia nigricornis (Zetterstedt, 1852)
Platurocypta testata (Edwards, 1924)
Rymosia virens Dziedzicki, 1910
Tarnania fenestralis (Meigen, 1818)

Family PSYCHODIDAE (1) – Moth-flies

Psychoda sp.

Family PTYCHOPTERIDAE (2) – Fold-winged Craneflies

Ptychoptera albimana (Fabricius, 1787)
Ptychoptera contaminata (Linnaeus, 1758)

Family SCIARIDAE (3) – Black Fungus Gnats

Leptosciarella (*Leptosciarella*) *rejecta* (Winnertz, 1867)
Lycoriella (*Hemineurina*) *modesta* (Staeger, 1840)
Lycoriella (*Lycoriella*) *ingenua* (Dufour, 1839)

Family TIPULIDAE (10) – Long-palped Craneflies

Dolichopeza albipes (Stroem, 1768)
Nephrotoma appendiculata (Pierre, 1919)
Tipula (*Acutipula*) *fulvipennis* Degeer, 1776
Tipula (*Acutipula*) *vittata* Meigen, 1804
Tipula (*Lunatipula*) *fascipennis* Meigen, 1818
Tipula (*Lunatipula*) *vernalis* Meigen, 1804
Tipula (*Savtshenkia*) *rufina* Meigen, 1818
Tipula (*Savtshenkia*) *staegeri* Nielsen, 1922
Tipula (*Tipula*) *oleracea* Linnaeus, 1758
Tipula (*Vestiplex*) *scripta* Meigen, 1830

Family TRICHOCERIDAE (3) – Winter Gnats

Trichocera maculipennis Meigen, 1818
Trichocera regelationis (Linnaeus, 1758)
Trichocera saltator (Harris, 1776)

Suborder Brachycera

Family ANTHOMYIIDAE (4)

Chirosia flavipennis (Fallén, 1823)
Hydrophoria ruralis (Meigen, 1826)
Hylemya vagans (Panzer, 1798)
Lasiomma picipes (Migen, 1826)

Family BRACHYSTOMATIDAE (1)

Trichopeza longicornis (Meigen, 1822)

Family CALLIPHORIDAE (2) – Blowflies

Calliphora vicina Robineau-Desvoidy, 1830 – Bluebottle
Protocalliphora azurea (Fallén, 1817)

Family CHLOROPIDAE (1) – Grass Flies

Oscinella maura (Fallén, 1820)

Family CONOPIDAE (4) – Thick-headed Flies

Conops flavipes Linnaeus, 1758
Conops quadrifasciatus DeGeer, 1776
Leopoldius signatus (Wiedemann in Meigen, 1824)
Physocephala rufipes (Fabricius, 1781)

Family DOLICHOPODIDAE (10) – Long-legged Flies

Campsicnemus curvipes (Fallén, 1823)
Campsicnemus loripes (Haliday, 1832)
Campsicnemus scambus (Fallén, 1823)
Dolichopus trivialis Haliday, 1832
Dolichopus ungulatus (Linnaeus, 1758)
Gymnopternus aerosus (Fallén, 1823)
Gymnopternus cupreus (Fallén, 1823)
Gymnopternus metallicus (Stannius, 1831)
Rhaphium appendiculatum (Zetterstedt, 1849)
Sciapus platypterus (Fabricius, 1805)

Family DROSOPHILIDAE (1) – Fruit-flies

Scaptomyza (*Parascaptomyza*) *pallida* (Zetterstedt, 1847)

Family DRYOMYZIDAE (1)
Neuroctena anilis Fallén, 1820

Family EMPIDIDAE (9) – Dance or Dagger-flies
Chelifera precatoria (Fallén, 1816)
Empis (*Coptophlebia*) *hyalipennis* Fallén, 1816
Empis (*Empis*) *nuntia* Meigen, 1838
Empis (*Euempis*) *tessellata* Fabricius, 1794
Empis (*Xanthempis*) *punctata* Meigen, 1804
Empis (*Xanthempis*) *stercorea* Linnaeus, 1761
Hilara longifurca Strobl, 1892
Rhamphomyia (*Amydroneura*) *erythrophthalma* Meigen, 1830
Rhamphomyia (*Holoclera*) *caliginosa* Collin, 1902

Family EPHYDRIDAE (2) – Shore-flies
Hydrellia maura Meigen, 1839
Limnellia quadrata (Fallén, 1813)

Family FANNIIDAE (1) – Lesser Houseflies
Fannia aequilineata Ringdahl, 1945

Family HELEOMYZIDAE (8)
Heleomyza borealis Boheman, 1865
Heleomyza serrata (Linnaeus, 1758)
Suillia atricornis (Meigen, 1830)
Suillia bicolor (Zetterstedt, 1838)
Suilla fuscicornis (Zetterstedt, 1838)
Suilla laevifrons (Loew, 1862)
Suilla ustulata (Meigen, 1830)
Tephrochlamys rufiventris (Meigen, 1830)

Family HIPPOBOSCIDAE (1) – Keds or Louse Flies
Stenepteryx hirundinis (Linnaeus, 1758) [ex House Martin] – Swallow Ked

Family HYBOTIDAE (6) – Dance-flies
Hybos culiciformis (Fabricius, 1775)
Ocydromia glabricula (Fallén, 1816)
Platypalpus longiseta (Zetterstedt, 1842)
Platypalpus pallidiventris (Meigen, 1822)
Tachypeza nubila (Meigen, 1804)
Trichinomyia flavipes (Meigen, 1830)

Family LAUXANIIDAE (4)
Calliopum simillimum (Collin, 1933)
Meiosimyza rorida (Fallén, 1820)
Minettia (*Frendelia*) *longipennis* (Fabricius, 1794)
Minettia (*Minettia*) *inusta* (Meigen, 1826)

Family LONCHOPTERIDAE (2) – Lance-flies
Lonchoptera lutea Panzer, 1809
Lonchoptera tristis Meigen, 1824

Family MICROPEZIDAE (1) – Stilt Flies
Micropeza lateralis Meigen, 1826

Family MUSCIDAE (15) – Houseflies and allies

Coenosia tigrina (Fabricius, 1775)
Eudasyphora cyanella (Meigen, 1826)
Graphomya maculata (Scopoli, 1763)
Hebecnema nigricolor (Fallén, 1825)
Hebecnema umbratica (Meigen, 1826)
Hydrotaea cyrtoneurina (Zetterstedt, 1845)
Hydrotaea irritans (Fallén, 1823) – Sheep Headfly
Mesembrina meridiana (Linnaeus, 1758) – Noon Fly
Phaonia basalis (Zetterstedt, 1838)
Phaonia errans (Meigen, 1826)
Phaonia palpata (Stein, 1897)
Phaonia subventa (Harris, 1780)
Polietes lardarius (Fabricius, 1781)
Stomoxys calcitrans (Linnaeus, 1758) – Stablefly
Thricops semicinereus (Wiedeman, 1817)

Family OPOMYZIDAE (2)

Geomyza sp. (*hackmani* complex)
Opomyza germinationis (Linnaeus, 1758)

Family PALLOPTERIDAE (1) – Flutter-wing Flies

Palloptera ustulata Fallén, 1820

Family PIPUNCULIDAE (2) – Big-headed Flies

Chalarus spurius (Fallén, 1816)
Verrallia aucta (Fallén, 1817)

Family PSILIDAE (1) – Carrot Flies

Loxocera albiseta (Schrank, 1803)

Family RHAGIONIDAE (3) – Snipeflies

Chrysopilus cristatus (Fabricius, 1775)
Rhagio lineola Fabricius, 1794
Rhagio scolopaceus (Linnaeus, 1758)

Family SARCOPHAGIDAE (3) – Flesh-flies

Metopia argyrocephala (Meigen, 1824)
Sarcophaga (*Sarcophaga*) *carnaria* (Linnaeus, 1758)
Sarcophaga (*Sarcophaga*) *subvicina* Rohdendorf, 1937

Family SCATHOPHAGIDAE (2) – Yellow Dung-flies

Scathophaga stercoraria (Linnaeus, 1758)
Scathophaga inquinata Meigen, 1826

Family SCIOMYZIDAE (1) – Snail-killing Flies

Tetanocera elata (Fabricius, 1781)

Family SEPSIDAE (4) – Black Scavenger Flies

Sepsis fulgens Meigen, 1826
Sepsis cynipsea (Linnaeus, 1758)
Sepsis punctum (Fabricius, 1794)
Sepsis violacea Meigen, 1826

Family SPHAEROCERIDAE (8) – Lesser Dung-flies

Lotophila atra (Meigen, 1830)
Crumomyia nigra (Meigen, 1830)
Crumomyia nitida (Meigen, 1830)
Crumomyia notabilis (Collin, 1902)
Limosina silvatica (Meigen, 1830)
Spelobia (*Spelobia*) *clunipes* (Meigen, 1830)
Spelobia (*Spelobia*) *manicata* (Richards, 1927)
Sphaerocera curvipes Latreille, 1804

Family STRATIOMYIDAE (5) – Soldier-flies

Beris chalybata (Forster, 1771)
Beris fuscipes Meigen, 1820
Chloromyia formosa (Scopoli, 1763)
Sargus bipunctatus (Scopoli, 1763) - Twin-spot Centurion
Sargus iridatus (Scopoli, 1763)

Family SYRPHIDAE (21) – Hoverflies

Baccha elongata (Fabricius, 1775)
Brachypalpoides lentus (Meigen, 1822)
Cheilosia illustrata (Harris, 1780)
Episyrphus balteatus (DeGeer, 1776)
Epistrophe grossulariae (Meigen, 1822)
Eristalis nemorum (Linnaeus, 1758)
Eristalis intricaria (Linnaeus, 1758)
Eristalis pertinax (Scopoli, 1763)
Eupeodes corollae (Fabricius, 1794)
Eupeodes latifasciatus (Macquart, 1829)
Helophilus pendulus (Linnaeus, 1758)
Leucozona lucorum (Linnaeus, 1758)
Melanostoma scalare (Fabricius, 1794)
Myathropa florea (Linnaeus, 1758)
Platycheirus albimanus (Fabricius, 1781)
Scaeva pyrastri (Linnaeus, 1758)
Syrphus vitripennis Meigen, 1822
Syritta pipiens (Linnaeus, 1758)
Volucella pellucens (Linnaeus, 1758)
Xylota segnis (Linnaeus, 1758)
Xylota sylvarum (Linnaeus, 1758)

Family TABANIDAE (1) – Horseflies

Haematopota pluvialis (Linnaeus, 1758) – Common Clegg

Family TACHINIDAE (8) – Parasite Flies

Carcelia (*Carcelia*) *gnava* (Meigen, 1824)
Dexiosoma caninum (Fabricius, 1781)
Eriothrix rufomaculata (DeGeer, 1776)
Gymnocheta viridis (Fallén, 1810)
Pelatachina tibialis (Fallén, 1810)
Phebellia glauca (Meigen, 1824)
Siphona sp.
Tachina fera (Linnaeus, 1761)

Family TEPHRITIDAE (2) – Picture-winged Flies or Fruitflies

Acidia cognata (Wiedemann, 1817)
Trypeta sp.

Family XYLOPHAGIDAE (1) – Awl-flies

Xylophagus ater Meigen, 1804

Order Ephemeroptera (Mayflies; 1 species)

The record is taken from the unpublished report prepared by the Liverpool Museum staff and associates resulting from the Alderley Edge Invertebrate Survey undertaken by their team in 1996 (courtesy of Ian Wallace, Liverpool). Nomenclature follows Kloet and Hinks (1964).

Family BAETIDAE (1)
Cloeon dipterum (Linnaeus, 1761)

Order Hemiptera (Bugs; 126 species)

Based on the unpublished report prepared by the Liverpool Museum staff and associates resulting from the Alderley Edge Invertebrate Survey undertaken by their team in 1996 (courtesy of Steve Judd, Liverpool), on the paper by Judd (2012), and on the data extracted from the Lancashire and Cheshire Card Index of Harry Britten in the Manchester Museum, with sixteen additional species (courtesy of Phillip Rispin). Hemiptera were collected by S. Judd and C. Felton and identified by S. Judd; one species (*Aradus depressus*) was collected by C. Johnson (Manchester). The collection of voucher specimens is kept in the National Museums Liverpool. The list of aquatic groups is based on the unpublished reports of two aquatic invertebrate surveys undertaken by Ian Wallace from the Liverpool Museum in 1996 and by Jonathan Guest in 1998 (see Chapter 12). The list of Aphids (families Aphididae, Callaphididae, Lachnidae and Pemphigidae) is based in the data extracted from the corresponding slide collection and the Lancashire and Cheshire Card Index of H. Britten. Nomenclature of the suborders of Hemiptera follows Forero (2008; see also Dolling, 1991). The Heteroptera follow the revised checklist of British species by Nau (2006), but tribal names are omitted; the British Auchenorhyncha follow the updated checklist by Le Quesne and Payne (1981), but subfamily names are omitted and the Aphrophoridae is here considered a family rank, following Bantock and Botting (2010); families included in the suborder Sternorrhyncha are given given according to Kloet and Hinks (1964).

Suborder Auchenorrhyncha

Family APHROPHORIDAE (3) – Froghoppers or Spittlebugs
Aphrophora alni (Fallén, 1805)
Neophilaenus lineatus (Linnaeus, 1758)
Philaenus spumarius (Linnaeus, 1758) – Common Froghopper

Family CICADELLIDAE (26) – Leafhoppers
Adarrus ocellaris (Fallén, 1806)
Allygus mixtus (Fabricius, 1794)

Aphrodes albifrons (Linnaeus, 1758)
Cicadella viridis (Linnaeus, 1758) – Green Leafhopper
Cicadula quadrinotata (Fabricius, 1794)
Conosanus obsoletus (Kirschbaum, 1858)
Deltocephalus pulicaris (Fallén, 1806)
Elymana sulphurella (Zetterstedt, 1828)
Eupelix cuspidata (Fabricius, 1775)
Eupteryx aurata (Linnaeus, 1758)
Eupteryx urticae (Fabricius, 1803)
Eurhadina concinna (Germar, 1831)
Eurhadina pulchella (Fallén, 1806)
Euscelis lineolatus Brullé, 1832
Fagocyba carri (Edwards, 1914)
Fagocyba cruenta (Herrich-Schaeffer, 1838)
Iassus lanio (Linnaeus, 1761)
Jassargus distinguendus (Flor, 1861)
Linnavuoriana decempunctata (Fallén, 1806)
Linnavuoriana sexmaculata (Hardy, 1850)
Oncopsis flavicollis (Linnaeus, 1761)
Ribautiana scalaris (Ribaut, 1931)
Speudotettix subfusculus (Fallén, 1806)
Streptanus marginatus (Kirschbaum, 1858)
Streptanus sordidus (Zetterstedt, 1828)
Ulopa reticulata (Fabricius, 1794)

Family CIXIIDAE (2) – Planthoppers
Cixius nervosus (Linnaeus, 1758)
Tachycixius pilosus (Olivier, 1791)

Family DELPHACIDAE (3) – Planthoppers
Conomelus anceps (Germar, 1802)
Dicranotropis hamata (Boheman, 1849)
Hyledelphax elegantulus (Boheman, 1847)

Suborder Heteroptera – True Bugs

Family ACANTHOSOMATIDAE (3) – Shield Bugs
Acanthosoma haemorrhoidale (Linnaeus, 1758) – Hawthorn Shieldbug
Elasmostethus interstinctus (Linnaeus, 1758) – Birch Shieldbug
Elasmucha grisea (Linnaeus, 1758) – Parent Bug

Family ANTHOCORIDAE (4) – Flower or Minute Pirate Bugs
Anthocoris confusus Reuter, 1884
Anthocoris nemoralis (Fabricius, 1794)
Anthocoris nemorum (Linnaeus, 1761)
Tetraphleps bicuspis (Herrich-Schäffer, 1835)

Family ARADIDAE (1) – Flat or Bark Bugs
Aradus depressus (Fabricius, 1794)

Family CORIXIDAE (9)
Callicorixa praeusta (Fieber, 1860)
Corixa punctata (Illinger, 1807) – Common Water Boatman
Hesperocorixa sahlbergi (Fieber, 1848) – Lesser Water Boatman
Sigara distincta (Fieber, 1848)
Sigara dorsalis (Leach, 1817)
Sigara falleni (Fieber, 1848)
Sigara lateralis (Leach, 1817)
Sigara limitata (Fieber, 1848)
Sigara nigrolineata (Fieber, 1848)

Family GERRIDAE (1)

Gerris lacustris (Linnaeus, 1758) – Common Pond Skater

Family LYGAEIDAE (8) – Ground or Seed Bugs

Cymus claviculus (Fallén, 1807)
Drymus brunneus (Sahlberg, 1848)
Drymus sylvaticus (Fabricius, 1775)
Kleidocerys ericae (Horváth, 1910)
Kleidocerys resedae (Panzer, 1797) – Birch Catkin Bug
Scolopostethus decoratus (Hahn, 1833)
Stygnocoris sabulosus (Schilling, 1829)
Trapezonotus desertus Seidenstücker, 1951

Family MICROPHYSIDAE (2) – Minute Bugs

Loricula elegantula (Bärensprung, 1853)
Loricula pselaphifromis Curtis, 1833

Family MIRIDAE (45) – Capsid Bugs

Apolygus spinolae (Meyer-Dür, 1841)
Asciodema obsoleta (Fieber, 1864)
Atractotomus magnicornis (Fallén, 1807)
Blepharidopterus angulatus (Fallén, 1807) – Black-kneed Capsid
Bryocoris pteridis (Fallén, 1807) – Fern Bug
Calocoris alpestris (Meyer-Dür, 1843)
Campyloneura virgula (Herrich-Schäffer, 1836)
Closterotomus norvegicus (Gmelin, 1788) – Potato Caspid
Cyllecoris histrionicus (Linnaeus, 1767)
Cyrtorhinus caricis (Fallén, 1807)
Deraeocoris lutescens (Schilling, 1837)
Dicyphus pallicornis (Meyer-Dür in Fieber, 1861)
Dryophilocoris flavoquadrimacula (DeGeer, 1773)
Grypocoris stysi (Wagner, 1968)
Heterocordylus tibialis (Hahn, 1833)
Heterotoma planicornis (Pallas, 1772)
Leptopterna dolabrata (Linnaeus, 1758) – Meadow Plant Bug
Leptopterna ferrugata (Fallén, 1807)
Lygocoris pabulinus (Linnaeus, 1761) – Common Green Capsid
Lygocoris rugicollis (Fallén, 1829)
Liocoris tripustulatus (Fabricius, 1781)
Monalocoris filicis (Linnaeus, 1767) – Bracken Bug
Neolygus contaminatus (Fallén, 1807)
Notostira elongata (Geoffroy in Fourcroy, 1785)
Orthotylus ericetorum (Fallén, 1807)
Orthotylus marginalis Reuter, 1883
Orthotylus virescens (Douglas in Scott, 1865)
Phylus melanocephalus (Linnaeus, 1758)
Phylus palliceps Fieber, 1861
Phytocoris longipennis Flor, 1861
Phytocoris tiliae (Fabricius, 1776)
Phytocoris ulmi (Linnaeus, 1758)
Plagiognathus arbustorum (Fabricius, 1794)
Plagiognathus chrysanthemi (Wolff, 1804)
Psallus flavellus Stichel, 1933
Psallus haematodes (Gmelin, 1788)
Psallus mollis (Mulsant et Rey, 1852)
Psallus varians (Herrich-Schäffer, 1836)
Psallus wagneri Ossianilson, 1953
Rhabdomiris striatellus (Fabricius, 1794)
Stenodema calcarata (Fallén, 1807)
Stenodema holsata (Fabricius, 1787)
Stenodema laevigata (Linnaeus, 1758)
Stenotus binotatus (Fabricius, 1794)
Trigonotylus ruficornis (Geoffroy in Fourcroy, 1785)

Family NABIDAE (4) – Damsel Bugs
Himacerus major (Costa, 1842)
Nabis ferus (Linnaeus, 1758) – Field Damsel Bug
Nabis flavomarginatus Scholtz, 1847 – Broad Damsel Bug
Nabis limbatus Dahlbom 1851 – Marsh Damsel Bug

Family NAUCORIDAE (1)
Ilyocoris cimicoides (Linnaeus, 1758) – Saucer Bug

Family NEPIDAE (1) – Water Scorpions
Nepa cinerea Linnaeus, 1758 – Water Scorpion

Family NOTONECTIDAE (1) – Water Boatmen
Notonecta glauca Linnaeus, 1758 – Common Backswimmer

Family PENTATOMIDAE (2) – Shield Bugs
Piezodorus lituratus (Fabricius, 1794) – Gorse Shieldbug
Picromerus bidens (Linnaeus, 1758)

Family REDUVIIDAE (1) – Assassin Bugs
Empicoris vagabundus (Linnaeus, 1758)

Family SALDIDAE (3) – Shore Bugs
Chartoscirta cincta (Herrich-Schäffer, 1842)
Saldula orthochila (Fieber, 1859)
Saldula saltatoria (Linnaeus, 1758) – Common Shore Bug

Family TINGIDAE (2) – Lace Bugs
Dictyonota strichnocera Fieber, 1844 – Gorse Lacebug
Tingis ampliata (Herrich-Schäffer, 1838)

Family VELIIDAE (2)
Microvelia reticulata (Burmeister, 1835) – Lesser Water Cricket
Velia caprai Tamanini, 1947 – Water Cricket

Suborder Sternorrhyncha

Family APHIDIDAE (3)
Amphorophora ampullata Buckton, 1876
Aphis epilobii Kaltenbach, 1843
Cavariella aegopodii (Scopoli, 1763) – Willow-carrot Aphid

Family CALLAPHIDIDAE (2)
Euceraphis punctipennis (Zetterstedt, 1828) – European Birch Aphid
Myzocallis (*Agrioaphis*) *castanicola* Baker, 1917 – Oak Aphid

Family LACHNIDAE (2)
Protolachnus agilis (Kaltenbach, 1843)
Schizolachnus pineti (Fabricius, 1781) – Grey Pine Aphid

Family PEMPHIGIDAE (1) – Galling Aphids
Pemphigus sp.

Family PSYLLIDAE (2) – Jumping Plant Lice
Aphalara exilis (Weber and Mohr, 1804)
Psylla sorbi (Linnaeus, 1758)

Order Hymenoptera (wasps, bees and allies; 128 species)

The species list contains 128 species and is based on the unpublished report prepared by the Liverpool Museum staff and associates resulting from the Alderley Edge Invertebrate Survey undertaken by their team in 1996 (courtesy of Steve Judd, Liverpool). The Aculeata Hymenoptera were collected and identified by C. Clee and the Symphyta by T. Green. The collection of voucher specimens is kept in the National Museums Liverpool. Four additional species of the families Tenthredinidae and Cynipidae were added from the data released at our request by rECOrd, the Biodiversity Information System for Cheshire (courtesy of Tom Hunt), two species of Ichneumonidae and one of Pompilidae have been taken from Britten (1950) and Askew (1981), and thirty-three additonal records (mostly of the parasitic Hymenoptera, but also of the Andrenidae, Chrysididae, Cimbicidae, Halictidae and Tenthredinidae) were extracted from the Lancashire and Cheshire Card Index of H. Britten held in the Manchester Museum (courtesy of Phillip Rispin).

Nomenclature follows Fitton *et al.* (1978), but that of the Ichneumonidae is in accordance with Broad (in prep.).

Suborder Symphyta – Sawflies

Family CIMBICIDAE (2)

Cimbex femoratus (Linnaeus, 1758)
Trichosoma lucorum (Linnaeus, 1758)

Family TENTHREDINIDAE (9)

Aglaostigma aucupariae (Klug, 1814)
Ametastegia equiseti (Fallén, 1808)
Ametastegia glabrata (Fallén, 1808)
Dolerus ferrugatus Lepeletier, 1823
Dolerus nitens Zaddach, 1859
Eutomostethus luteiventris (Klug, 1814)
Loderus vestigialis (Klug, 1814)
Tenthredo arcuata Forster, 1771
Tenthredopsis nassata (Linnaeus, 1767)

Suborder Apocrita – Wasps, ants and bees

Family ANDRENIDAE (13) – Mining Bees

Andrena (*Andrena*) *clarkella* (Kirby, 1802)
Andrena (*Andrena*) *fucata* Smith, 1847
Andrena (*Andrena*) *fulva* (Müller in Allioni, 1766) – Tawny Mining Bee
Andrena (*Andrena*) *lapponica* Zetterestedt, 1838
Andrena (*Euandrena*) *bicolor* Fabricius, 1775 – Gwynne's Mining Bee
Andrena (*Hoplandrena*) *jacobi* Perkins, 1921
Andrena (*Hoplandrena*) *scotica* Perkins, 1921
Andrena (*Leucandrena*) *barbilabris* (Kirby, 1802)
Andrena (*Melandrena*) *cineraria* (Linnaeus, 1758) – Grey Mining Bee
Andrena (*Melandrena*) *nigroaenea* (Kirby, 1802)
Andrena (*Micrandrena*) *subopaca* Nylander, 1848
Andrena (*Notandrena*) *chrysosceles* (Kirby, 1802)
Andrena (*Trachandrena*) *haemorrhoa* (Fabricius, 1781) – Early Mining Bee

Family ANTHOPHORIDAE (5)

Nomada flava Panzer, 1798
Nomada goodeniana (Kirby, 1802) – Gooden's Nomad Bee
Nomada lathburiana (Kirby, 1802)
Nomada leucophthalma (Kirby, 1802)
Nomada panzeri Lepeletier, 1841

Family APIDAE (8) – Social Bees

Bombus (*Bombus*) *hortorum* (Linnaeus, 1761) – Small Garden Bumble Bee
Bombus (*Bombus*) *lapidarius* (Linnaeus, 1758) – Large Red-tailed Bumble Bee
Bombus (*Bombus*) *lucorum* (Linnaeus, 1761) – White-tailed Bumble Bee
Bombus (*Bombus*) *pascuorum* (Scopoli, 1763) – Common Carder Bee
Bombus (*Bombus*) *pratorum* (Linnaeus, 1761) – Early Bumble Bee
Bombus (*Bombus*) *terrestris* (Linnaeus, 1758) – Buff-tailed Bumble Bee
Bombus (*Psithyrus*) *sylvestris* Lepeletier, 1841 – Four-coloured Cuckoo Bee
Bombus (*Psithyrus*) *vestalis* (Geoffroy in Foucroy, 1785) – Vestal Cuckoo Bee

Family BRACONIDAE (3)

Aleiodes circumscriptus (Nees, 1834)
Ephedrus plagiator (Nees, 1811)
Macrocentrus infirmus (Nees, 1834)

Family CHRYSIDIDAE (3) – Ruby-tailed or Cuckoo Wasps

Chrysis (*Chrysis*) *ignita* (Linnaeus, 1758)
Elampus panzeri (Fabricius, 1804)
Omalus (*Notozus*) *panzeri* (Fabricius, 1804)

Family COLLETIDAE (2)

Hylaeus (*Hylaeus*) *communis* Nylander, 1852
Hylaeus (*Spatulariella*) *hyalinatus* Smith, 1803

Family CYNIPIDAE (1) – Gall Wasps

Andricus kollari (Hartig, 1843) – Oak Marble Gall

Family FORMICIDAE (7) – Ants

Formica fusca Linnaeus, 1758 – Negro Ant
Formica lemani Bondroit, 1917
Lasius niger (Linnaeus, 1758) – Black Garden Ant
Myrmica lobicornis Nylander, 1846
Myrmica rubra (Linnaeus, 1758) – Red Ant
Myrmica ruginodis Nylander, 1846
Myrmica scabrinodis Nylander, 1846

Family EUMENIDAE (2) – Potter and Mason Wasps

Ancistrocerus gazella (Panzer, 1798)
Ancistrocerus trifasciatus (Müller, 1776)

Family HALICTIDAE (13)

Halictus tumulorum (Linnaeus, 1758)
Lasioglossum (*Dialictus*) *leucopum* (Kirby, 1802)
Lasioglossum (*Dialictus*) *morio* (Fabricius, 1793)
Lasioglossum (*Dialictus*) *smeathmanellum* (Kirby, 1802)
Lasioglossum (*Evylaeus*) *albipes* (Fabricius, 1781)
Lasioglossum (*Evylaeus*) *calceatum* (Scopoli, 1763) – Slender Mining Bee
Lasioglossum (*Evylaeus*) *fratellum* (Pérez, 1903)
Lasioglossum (*Evylaeus*) *rufitarse* (Zetterstedt, 1838)
Lasioglossum (*Evylaeus*) *villosulum* (Kirby, 1802) – Shaggy Mining Bee
Sphecodes fasciatus von Hagens, 1882

Sphecodes gibbus (Linnaeus, 1758)
Sphecodes monilicornis (Kirby, 1802)
Sphecodes pellucidus Smith, 1845

Family ICHNEUMONIDAE (16) – Ichneumon or Scorpion Wasps

Agrypon clandestinum (Gravenhorst, 1829)
Amblyjoppa proteus (Christ, 1791) [ex Elephant Hawk-moth]
Campoplex difformis (Gmelin, 1790)
Cryptus titubator (Thunberg, 1824)
Diplazon laetatorius (Fabricius, 1781)
Epitomus infuscatus (Gravenhorst, 1829)
Gelis anthracinus (Förster, 1850)
Gelis areator (Panzer, 1804)
Gelis rufogaster Thunberg, 1827
Gregopimpla inquisitor (Scopoli, 1763)
Netelia (*Bessobates*) *cristata* (Thomson, 1888)
Phygadeuon troglodytes Gravenhorst, 1829
Rhembobius quadrispinus (Gravenhorst, 1829)
Scambus (*Scambus*) *sagax* (Harting, 1838)
Syrphoctonus pictus (Gravenhorst, 1829)
Xorides brachylabis (Kriechbaumer, 1889)

Family MEGACHILIDAE (2) – Leaf-cutting and Mason Bees

Megachile centuncularis (Linnaeus, 1758) – Patchwork Leaf-cutter Bee
Megachile willughbiella (Kirby, 1802) – Willughby's Leaf-cutter Bee

Family PLATYGASTRIDAE (1)

Metaclisis areolata (Haliday in Walker, 1835)

Family POMPILIDAE (7) – Spider-hunting Wasps

Anoplius (*Anoplius*) *concinnus* (Dahlbom, 1845)
Anoplius (*Anoplius*) *nigerrimus* (Scopoli, 1763)
Arachnospila spissa (Schiødte, 1837)
Dipogon variegatus (Linnaeus, 1758)
Evagetes crassicornis (Shuckard, 1837)
Priocnemis (*Priocnemis*) *schioedtei* Haupt, 1927
Priocnemis (*Umbripennis*) *perturbator* (Harris, 1780)

Family PROCTOTRUPIDAE (2)

Codrus confusus (Nixon, 1938)
Phaenoserphus calcar (Haliday, 1839)

Family PTEROMALIDAE (2)

Nasonia vitripennis (Walker, 1836)
Stenomalina gracilis (Walker, 1834)

Family SAPYGIDAE (1)

Sapyga quinquepunctata (Fabricius, 1781)

Family SPHECIDAE (24) – Digger Wasps

Argogorytes mystaceus (Linnaeus, 1761) – Field Digger Wasp
Crabro cribrarius (Linnaeus, 1758) – Slender-bodied Digger Wasp
Crabro peltarius (Schreber, 1784)
Crossocerus (*Blepharipus*) *cetratus* (Shuckard, 1837)
Crossocerus (*Blepharipus*) *megacephalus* (Rossius, 1790)
Crossocerus (*Crossocerus*) *elongatulus* (Vander Linder, 1829) – Slender Digger Wasp
Crossocerus (*Crossocerus*) *pusillus* Lepeletier et Brullé, 1834
Crossocerus (*Crossocerus*) *tarsatus* (Shuckard, 1837)

Crossocerus (*Crossocerus*) *varus* Lepeletier et Brullé, 1835
Crossocerus (*Crossocerus*) *wesmaeli* (Vander Linden, 1829) – Wesmael's Digger Wasp
Crossocerus (*Hoplocrabro*) *quadrimaculatus* (Fabricius, 1793) – Four-spotted Digger Wasp
Ectemnius cavifrons (Thomson, 1870)
Ectemnius cephalotes (Olivier, 1791)
Mellinus arvensis (Linnaeus, 1758) – Field Digger Wasp
Nysso spinosus (Forster, 1771) – Large Spurred Digger Wasp
Oxybelus uniglumis (Linnaeus, 1758) – Common Spiny Digger Wasp
Passaloecus corniger Shuckard, 1837 – Horned Black Wasp
Pemphredon (*Cemonus*) *inornatus* Say, 1824 – Shuckard's Wasp
Pemphredon (*Pemphredon*) *lugubris* (Fabricius, 1793) – Mournful Wasp
Podalonia hirsuta (Scopoli, 1763) – Hairy Sand Wasp
Psen (*Mimesa*) *equestris* (Fabricius, 1804)
Psen (*Mimesa*) *lutarius* (Fabricius, 1804)
Rhopalum (*Rhopalum*) *clavipes* (Linnaeus, 1758)
Trypoxylon attenuatum Smith, 1851 – Slender Wood Borer Wasp

Family TIPHIIDAE (1)

Myrmosa atra Panzer, 1801 – Black Headed Velvet Ant

Family VESPIDAE (5)

Dolichovespula norwegica (Fabricius, 1781) – Norwegian Wasp
Dolichovespula sylvestris (Scopoli, 1763) – Tree Wasp
Vespula (*Paravespula*) *germanica* (Fabricius, 1793) – German Wasp
Vespula (*Paravespula*) *vulgaris* (Linnaeus, 1758) – Common Wasp
Vespula (*Vespula*) *rufa* (Linnaeus, 1758) – Red Wasp

Order Lepidoptera (butterflies and moths; 616 species)

The species list given below is mainly based on the data provided by Shane Farrell, the Data Officer of the Cheshire Moth Group (http://www.consult-eco.ndirect.co.uk/lrc/cmg/cmg.htm), Steve Hind, the Cheshire (VC58) county micromoth recorder, and by Mr Kevin McCabe (Alderley Edge, UK), plus additional data taken from the published account by Ellis (1940), but with updated nomenclature, and from the data released at our request by rECOrd, the Biodiversity Information System for Cheshire (courtesy of Tom Hunt) and one additional record (*Odezia atrata*) from the unpublished report on the National Trust Biological Survey by Jackson and Alexander (1998). The list of the four butterfly families (Hesperidae, Lycaenidae, Nymphalidae and Pieriae) is based on the report by Roger Dennis (Wilmslow, UK) published as section C of Chapter 13 and on the data released by rECOrd.

Nomenclature and English common names are given according to the checklist by Bradley (2000); family composition follows Agassiz *et al.* (2013). Numbers in square brackets following the author name and year of description refer to the 'code numbers' given in Bradley (2000). Using this code, one can easily consult the information on feeding plants and biology of the corresponding species in the checklist by Bradley (2000).

Family ADELIDAE (3)
Adela reaumurella (Linnaeus, 1758) [150]
Nematopogon schwarziellus (Zeller, 1839) [141]
Nematopogon swammerdammella (Linnaeus, 1758) [140]

Family ALUCITIDAE (1)
Alucita hexadactyla Linnaeus, 1758 [1288] – Twenty-plume Moth

Family ARGYRESTHIIDAE (1)
Argyresthia trifasciata Staudinger, 1871 [409a]

Family BLASTOBASIDAE (2)
Blastobasis adustella Walsingham, 1894 [873]
Blastobasis lacticolella Rebel, 1940 [874]

Family BUCCULATRICIDAE (1)
Bucculatrix cidarella Zeller, 1839 [272]

Family CHOREUTIDAE (1)
Anthophila fabriciana (Linnaeus, 1767) [385] – Nettle-tap

Family COLEOPHORIDAE (10)
Coleophora albicosta (Haworth, 1828) [544]
Coleophora albidella (Denis et Schiffermüller, 1775) [532]
Coleophora alticolella Zeller, 1849 [584]
Coleophora caespititiella Zeller, 1839 [587]
Coleophora laricella (Hübner, 1817) [526] – Larch Case-bearer
Coleophora orbitella Zeller, 1849 [511]
Coleophora paripennella Zeller, 1839 [560]
Coleophora serratella (Linnaeus, 1761) [493]
Coleophora taeniipennella Herrich-Schäffer, 1855 [581]
Coleophora trifolii (Curtis, 1832) [516] – Large Clover Case-bearer

Family COSMOPTERIGIDAE (1)
Blastodacna hellerella (Duponchel, 1838) [905]

Family COSSIDAE (1)
Zeuzera pyrina (Linnaeus, 1761) [161] – Leopard Moth

Family CRAMBIDAE (3)
Catoptria falsella (Denis et Schiffermüller, 1775) [1316]
Dipleurina lacustrata (Panzer, 1804) [1338]
Scoparia pyralella (Denis et Schiffermüller, 1775) [1333]

Family DREPANIDAE (9)
Achlya flavicornis (Linnaeus, 1758) [1659] – Yellow Horned
Cilix glaucata (Scopoli, 1763) [1651] – Chinese Character
Falcaria lacertinaria (Linnaeus, 1758) [1645] – Scalloped Hook-tip
Drepana falcataria (Linnaeus, 1758) [1648] – Pebble Hook-tip
Habrosyne pyritoides (Hufnagel, 1766) [1653] – Buff Arches
Ochropacha duplaris (Linnaeus, 1761) [1657] – Common Lutestring
Tethea ocularis (Linnaeus, 1767) [1654] – Figure of Eighty
Thyatira batis (Linnaeus, 1758) [1652] – Peach Blossom
Watsonalla binaria (Hufnagel, 1767) [1646] – Oak Hook-tip

Family ELACHISTIDAE (6)

Cosmiotes freyerella (Hübner, 1825) [631]
Elachista albifrontella (Hübner, 1817) [601]
Elachista argentella (Clerck, 1759) [610]
Elachista canapennella (Hübner, 1813) [607]
Elachista humilis Zeller, 1850 [606]
Elachista rufocinerea (Haworth, 1828) [608]

Family EPERMENIIDAE (1)

Epermenia chaerophyllella (Goeze, 1783) [483]

Family EREBIDAE (10)

Arctia caja (Linnaeus, 1758) [2057] – Garden Tiger
Diaphora mendica (Clerck, 1759) [2063] – Muslin Moth
Eilema depressa (Esper, 1787) [2049] – Buff Footman
Eilema lurideola (Zincken, 1817) [2050] – Common Footman
Nudaria mundana (Linnaeus, 1761) [2038] – Muslin Footman
Orgyia antique (Linnaeus, 1758) [2026] – Vapourer
Phragmatobia fuliginosa (Linnaeus, 1758) [2064] – Ruby Tiger
Spilosoma lubricipeda (Linnaeus, 1758) [2060] – White Ermine
Spilosoma luteum (Hufnagel, 1766) [2061] – Buff Ermine
Tyria jacobaeae (Linnaeus, 1758) [2069] – Cinnabar

Family ERIOCRANIIDAE (3)

Eriocrania salopiella (Stainton, 1854) [10]
Eriocrania semipurpurella (Stephens, 1835) [13]
Eriocrania subpurpurella (Haworth, 1828) [6]

Family GELECHIIDAE (10)

Athrips mouffetella (Linnaeus, 1758) [762]
Brachmia blandella (Fabricius, 1798) [866]
Bryotropha affinis (Haworth, 1828) [779]
Bryotropha domestica (Haworth, 1828) [789]
Bryotropha terrella (Denis et Schiffermüller, 1775) [787]
Carpatolechia alburnella (Zeller, 1839) [771]
Carpatolechia fugitivella (Zeller, 1839) [772]
Helcystogramma rufescens (Haworth, 1828) [868]
Gelechia rhombella (Denis et Schiffermüller, 1775) [800]
Monochroa tenebrella (Hübner, 1817) [735]

Family GEOMETRIDAE (148)

Abraxas grossulariata (Linnaeus, 1758) [1884] – Magpie
Abraxas sylvata (Scopoli, 1763) [1885] – Clouded Magpie
Acasis viretata (Hübner, 1799) [1883] – Yellow-barred Brindle
Aethalura punctulata (Denis et Schiffermüller, 1775) [1951] – Grey Birch
Agriopis aurantiaria (Hübner, 1799) [1933] – Scarse Umber
Agriopis leucophaearia (Denis et Schiffermüller, 1775) [1932] – Spring Usher
Agriopis marginaria (Fabricius, 1777) [1934] – Dotted Border
Alcis repandata repandata (Linnaeus, 1758) [1941] – Mottled Beauty
Archiearis parthenias (Linnaeus, 1761) [1661] – Orange Underwing
Alsophila aescularia (Denis et Schiffermüller, 1775) [1663] – March Moth
Anticlea badiata (Denis et Schiffermüller, 1775) [1746] – Shoulder Stripe
Anticlea derivata (Denis et Schiffermüller, 1775) [1747] – Streamer
Apeira syringaria (Linnaeus, 1758) [1910] – Lilac Beauty
Aplocera plagiata (Linnaeus, 1758) [1867] – Treble-bar
Biston betularia (Linnaeus, 1758) [1931] – Peppered Moth
Biston strataria (Hufnagel, 1767) [1930] – Oak Beauty
Bupalus piniaria (Linnaeus, 1758) [1954] – Bordered White
Cabera exanthemata (Scopoli, 1763) [1956] – Common Wave
Cabera pusaria (Linnaeus, 1758) [1955] – Common White Wave
Campaea margaritata (Linnaeus, 1767) [1960] – Light Emerald

Camptogramma bilineata bilineata (Linnaeus, 1758) [1742] – Yellow Shell
Chesias legatella (Denis et Schiffermüller, 1775) [1864] – Streak
Chesias rufata (Fabricius, 1775) [1865] – Broom-tip
Chiasmia clathrata (Linnaeus, 1758) [1894] – Latticed Heath
Chloroclysta siterata (Hufnagel, 1767) [1760] – Red-green Carpet
Chloroclysta truncata (Hufnagel, 1767) [1764] – Common Marbled Carpet
Chloroclystis v-ata (Haworth, 1809) [1858] – V-Pug
Cidaria fulvata (Forster, 1771) [1765] – Barred Yellow
Colostygia multistrigaria (Haworth, 1809) [1775] – Mottled Grey
Colostygia pectinataria (Knoch, 1781) [1776] – Green Carpet
Colotois pennaria (Linnaeus, 1761) [1923] – Feathered Thorn
Comibaena bajularia (Denis et Schiffermüller, 1775) [1667] – Blotched Emerald
Cosmorhoe ocellata (Linnaeus, 1758) [1752] – Purple Bar
Crocallis elinguaria (Linnaeus, 1758) [1921] – Scalloped Oak
Cyclophora albipunctata (Hufnagel, 1767) [1677] – Birch Mocha
Cyclophora linearia (Hübner, 1799) [1681] – Clay Triple-lines
Dysstroma citrata (Linnaeus, 1761) [1762] – Dark Marbled Carpet
Ecliptopera silaceata (Denis et Schiffermüller, 1775) [1759] – Small Phoenix
Ectropis bistortata (Goeze, 1781) [1947] – Engrailed
Ectropis crepuscularia (Denis et Schiffermüller, 1775) [1948] – Small Engrailed
Electrophaes corylata (Thunberg, 1792) [1773] – Broken-barred Carpet
Ennomos alniaria (Linnaeus, 1758) [1913] – Canary-shouldered Thorn
Ennomos erosaria (Denis et Schiffermüller, 1775) [1915] – September Thorn
Ennomos fuscantaria (Haworth, 1809) [1914] – Dusky Thorn
Ennomos quercinaria (Hufnagel, 1767) [1912] – August Thorn
Epirrita autumnata (Borkhausen, 1794) [1797] – Autumnal Moth
Epirrita dilutata (Denis et Schiffermüller, 1775) [1795] – November Moth
Epirrita filigrammaria (Herrich-Schäffer, 1846) [1798] – Small Autumnal Moth
Euchoeca nebulata (Scopoli, 1763) [1874] – Dingy Shell
Eulithis mellinata (Fabricius, 1787) [1757] – Spinach
Eulithis testata (Linnaeus, 1761) [1755] – Chevron
Eupithecia abbreviata Stephens, 1831 [1852] – Brindled Pug
Eupithecia abietaria (Goeze, 1781) [1815] – Cloaked Pug
Eupithecia absinthiata (Clerck, 1759) [1830] – Wormwood Pug
Eupithecia assimilata Doubleday, 1856 [1832] – Currant Pug
Eupithecia centaureata (Denis et Schiffermüller, 1775) [1825] – Lime-speck Pug
Eupithecia dodoneata Guenée, 1858 [1853] – Oak-tree Pug
Eupithecia exiguata (Hübner, 1813) [1819] – Mottled Pug
Eupithecia icterata icterata (Villers, 1789) [1838] – Tawny Speckled Pug
Eupithecia indigata (Hübner, 1813) [1844] – Ochreous Pug
Eupithecia innotata (Hufnagel, 1767) [1848] – Angle-barred Pug
Eupithecia intricata (Zetterstedt, 1839) [1827] – Freyer's Pug
Eupithecia lariciata (Freyer, 1842) [1856] – Larch Pug
Eupithecia nanata (Hübner, 1813) [1846] – Narrow-winged Pug
Eupithecia pulchellata pulchellata Stephens, 1831 [1817] – Foxglove Pug
Eupithecia pusillata (Denis et Schiffermüller, 1775) [1854] – Juniper Pug
Eupithecia tantillaria Boisduval, 1840 [1857] – Dwarf Pug
Eupithecia tenuiata (Hübner, 1813) [1811] – Slender Pug
Eupithecia satyrata satyrata (Hübner, 1813) [1828] – Satyr Pug
Eupithecia subfuscata (Haworth, 1809) [1837] – Grey Pug
Eupithecia succenturiata (Linnaeus, 1758) [1839] – Bordered Pug
Eupithecia tripunctaria Herrich-Schäffer, 1852 [1835] – White-spotted Pug
Eupithecia virgaureata Doubleday, 1861 [1851] – Golden-rod Pug
Eupithecia vulgata (Haworth, 1809) [1834] – Common Pug
Entephria caesiata (Denis et Schiffermüller, 1775) [1744] – Grey Mountain Carpet
Epione repandaria (Hufnagel, 1767) [1907] – Bordered Beauty
Epirrhoe alternata alternata (Müller, 1764) [1738] – Common Carpet
Epirrhoe galiata (Denis et Schiffermüller, 1775) [1740] – Galium Carpet
Epirrita autumnata (Borkhausen, 1794) [1797] – Autumnal Moth
Epirrita dilutata (Denis et Schiffermüller, 1775) [1795] – November Moth
Epirrita filigrammaria (Herrich-Schäffer, 1846) [1798] – Small Autumnal Moth
Erannis defoliaria (Clerck, 1759) [1935] – Mottled Umber
Eulithis populata (Linnaeus, 1758) [1756] – Northern Spinach
Eulithis prunata (Linnaeus, 1758) [1754] – Phoenix
Eulithis pyraliata (Denis et Schiffermüller, 1775) [1758] – Barred Straw
Geometra papilionaria (Linnaeus, 1758) [1666] – Large Emerald
Gymnoscelis rufifasciata (Haworth, 1809) [1862] – Double-striped Pug
Hemithea aestivaria (Hübner, 1799) [1669] – Common Emerald

Hydrelia flammeolaria (Hufnagel, 1767) [1876] – Small Yellow Wave
Hydria cervinalis (Scopoli, 1763) [1788] – Scarce Tissue
Hydria undulata (Linnaeus, 1758) [1789] – Scallop Shell
Hydriomena furcata (Thunberg, 1784) [1777] – July Highflyer
Hydriomena impluviata (Denis et Schiffermüller, 1775) [1778] – May Highflyer
Hylaea fasciaria (Linnaeus, 1758) [1962] – Barred Red
Idaea aversata (Linnaeus, 1758) [1713] – Riband Wave
Idaea biselata (Hufnagel, 1767) [1702] – Small Fan-footed Wave
Idaea dimidiate (Hufnagel, 1767) [1708] – Single-dotted Wave
Idaea fuscovenosa (Goeze, 1781) [1705] – Dwarf Cream Wave
Idaea seriata (Schrank, 1802) [1707] – Small Dusty Wave
Jodis lactearia (Linnaeus, 1758) [1674] – Little Emerald
Lampropteryx suffumata (Denis et Schiffermüller, 1775) [1750] – Water Carpet
Lobophora halterata (Hufnagel, 1767) [1879] –Seraphim
Lomaspilis marginata (Linnaeus, 1758) [1887] – Clouded Border
Lomographa bimaculata (Fabricius, 1775) [1957] – White-pinion Spotted
Lomographa temerata (Denis et Schiffermüller, 1775) [1958] – Clouded Silver
Macaria liturata (Clerck, 1759) [1893] – Tawny-barred Angle
Macaria notata (Linnaeus, 1758) [1889] – Peacock Moth
Macaria wauaria (Linnaeus, 1758) [1897] – V-Moth
Menophra abruptaria (Thunberg, 1792) [1936] – Waved Umber
Mesoleuca albicillata (Linnaeus, 1758) [1748] – Beautiful Carpet
Mesotype didymata (Linnaeus, 1758) [1809] – Twin-spot Carpet
Odezia atrata (Linnaeus, 1758) – Chimney Sweeper
Odontopera bidentata (Clerck, 1759) [1920] – Scalloped Hazel
Operophtera brumata (Linnaeus, 1758) [1799] – Winter Moth
Operophtera fagata (Scharfenberg, 1805) [1800] – Northern Winter Moth
Opisthograptis luteolata (Linnaeus, 1758) [1906] – Brimstone Moth
Ourapteryx sambucaria (Linnaeus, 1758) [1922] – Swallow-tailed Moth
Pasiphila rectangulata (Linnaeus, 1758) [1860] – Green Pug
Pelurga comitata (Linnaeus, 1758) [1749] – Dark Spinach
Pennithera firmata (Hübner, 1822) [1767] – Pine Carpet
Peribatodes rhomboidaria (Denis et Schiffermüller, 1775) [1937] – Willow Beauty
Perizoma affinitata (Stephens, 1831) [1802] – Rivulet
Perizoma albulata (Denis et Schiffermüller, 1775) [1807] – Grass Rivulet
Perizoma alchemillata (Linnaeus, 1758) [1803] – Small Rivulet
Perizoma flavofasciata (Thunberg, 1792) [1808] – Sandy Carpet
Petrophora chlorosata (Scopoli, 1763) [1902] – Brown Silver-line
Phigalia pilosaria (Denis et Schiffermüller, 1775) [1926] – Pale Brindled Beauty
Plagodis dolabraria (Linnaeus, 1767) [1904] – Scorched Wing
Plemyria rubiginata (Denis et Schiffermüller, 1775) [1766] – Blue-bordered Carpet
Pseudoterpna pruinata (Walker, 1863) [1665] – Grass Emerald
Rheumaptera hastata (Linnaeus, 1758) [1787] – Argent and Sable
Rhodometra sacraria (Linnaeus, 1767) [1716] – The Vestal
Scopula floslactata (Haworth, 1809) [1693] – Cream Wave
Scotopteryx chenopodiata (Linnaeus, 1758) [1732] – Shaded Broad-bar
Scotopteryx mucronata (Heydemann, 1925) [1733] – Lead Belle
Selenia dentaria (Fabricius, 1775) [1917] – Early Thorn
Selenia lunularia (Hübner, 1788) [1918] – Lunar Thorn
Selenia tetralunaria (Hufnagel, 1767) [1919] – Purple Thorn
Thera britannica (Turner, 1925) [1769] – Spruce Carpet
Thera juniperata (Linnaeus, 1758) [1771] – Juniper Carpet
Thera obeliscata (Hübner, 1787) [1768] – Grey Pine Carpet
Theria primaria (Haworth, 1809) [1960] – Early Moth
Timandra comae (Schmidt, 1931) [1682] – Blood-vein
Trichopteryx carpinata (Borkhausen, 1794) [1881] – Early Tooth-striped
Triphosa dubitata (Linnaeus, 1758) [1790] – Tissue
Xanthorhoe designata (Hufnagel, 1767) [1722] – Flame Carpet
Xanthorhoe ferrugata (Clerck, 1759) [1725] – Dark-barred Twin-spot Carpet
Xanthorhoe fluctuata fluctuata (Linnaeus, 1758) [1728] – Garden Carpet
Xanthorhoe montanata montanata (Denis et Schiffermüller, 1775) [1727] – Silver-ground Carpet
Xanthorhoe spadicearia (Denis et Schiffermüller, 1775) [1724] – Red Twin-spot Carpet

Family GLYPHIPTERIGIDAE (2)

Glyphipteryx simpliciella (Stephens, 1834) [391] – Cocksfoot Moth
Glyphipterix thrasonella (Scopoli, 1763) [397]

Family GRACILLARIIDAE (34)

Aspilapteryx tringipennella (Zeller, 1839) [294]
Callisto denticulella (Thunberg, 1794) [310]
Caloptilia alchimiella (Scopoli, 1763) [286]
Caloptilia betulicola (Hering, 1927) [283]
Caloptilia elongella (Linnaeus, 1761) [282]
Caloptilia rufipennella (Hübner, 1796) [284]
Caloptilia stigmatella (Fabricius, 1781) [288]
Caloptilia syringella (Fabricius, 1794) [293]
Cameraria ohridella Deschka et Dimić, 1986 [366a] – Horse Chestnut Leaf-miner
Parornix anglicella (Stainton, 1850) [303]
Parornix betulae (Stainton, 1854) [301]
Parornix devoniella (Stainton, 1850) [304]
Phyllonorycter coryli (Nicelli, 1851) [342] – Nut Leaf Blister Moth
Phyllonorycter emberizaepenella (Bouché, 1834) [354]
Phyllonorycter froelichiella (Zeller, 1839) [358]
Phyllonorycter geniculella (Ragonot, 1874) [364]
Phyllonorycter harrisella (Linnaeus, 1761) [315]
Phyllonorycter hilarella (Zetterstedt, 1839) [337]
Phyllonorycter lautella (Zeller, 1846) [351]
Phyllonorycter leucographella (Zeller, 1850) [332a] – Firethorn Leaf Miner
Phyllonorycter maestingella (Müller, 1764) [341]
Phyllonorycter messaniella (Zeller, 1846) [321]
Phyllonorycter oxyacanthae (Frey, 1856) [323]
Phyllonorycter platani (Staudinger, 1870) [321a]
Phyllonorycter platanoidella (Joannis, 1920) [363]
Phyllonorycter quercifoliella (Zeller, 1839) [320]
Phyllonorycter quinnata (Geoffroy, 1785) [343]
Phyllonorycter rajella (Linnaeus, 1758) [345]
Phyllonorycter salictella viminiella (Sircom, 1848) [333]
Phyllonorycter sorbi (Frey, 1855) [324]
Phyllonorycter strigulatella (Lienig et Zeller, 1846) [344]
Phyllonorycter trifasciella (Haworth, 1828) [361]
Phyllonorycter tristrigella (Haworth, 1828) [356]
Phyllonorycter ulmifoliella (Hübner, 1817) [353]

Family HELIOZELIDAE (2)

Heliozela hammoniella Sorhagen, 1885 [157]
Heliozela sericiella (Haworth, 1828) [154]

Family HEPIALIDAE (5)

Hepialus humuli humuli (Linnaeus, 1758) [14] – Common Ghost Moth
Hepialus (*Korscheltellus*) *lupulinus* (Linnaeus, 1758) [17] – Common Swift
Hepialus (*Pharmacis*) *fusconebulosa* (DeGeer, 1778) [18] – Map-winged Swift
Hepialus (*Triodia*) *sylvina* (Linnaeus, 1761) [15] – Orange Swift
Phymatopus hecta (Linnaeus, 1758) [16] – Gold Swift

Family HESPERIIDAE (2)

Thymelicus sylvestris (Poda, 1761) [1526] – Small Skipper
Ochlodes faunus (Turani, 1905) [1531] – Large Skipper

Family LASIOCAMPIDAE (2)

Poecilocampa populi (Linnaeus, 1758) [1631] – December Moth
Saturnia pavonia (Linnaeus, 1758) [1643] – Emperor Moth

Family LYCAENIDAE (4)

Lycaena phlaeas eleus (Fabricius, 1798) [1561] – Small Copper
Neozephyrus quercus (Linnaeus, 1758) [1557] – Purple Hairstreak
Polyommatus icarus icarus (Rottemburg, 1775) [1574] – Common Blue
Celastrina argiolus brittanna (Verity, 1919) [1580] – Holly Blue

Family LYMANTRIIDAE (3)
Calliteara pudibunda (Linnaeus, 1758) [2028] – Pale Tussock
Euproctis similis (Fuessly, 1775) [2030] – Yellow-tail
Leucoma salicis (Linnaeus, 1758) [2031] – White Satin

Family LYONETIIDAE (3)
Leucoptera laburnella (Stainton, 1851) [254] – Laburnum Leaf Miner
Leucoptera spartifoliella (Hübner, 1813) [256]
Lyonetia clerkella (Linnaeus, 1758) [263] – Apple Leaf Miner

Family MICROPTERIGIDAE (1)
Micropterix aruncella (Scopoli, 1763) [4]

Family MOMPHIDAE (3)
Mompha epilobiella (Denis et Schiffermüller, 1775) [893]
Mompha raschkiella (Zeller, 1839) [883]
Mompha subbistrigella (Haworth, 1828) [892]

Family NEPTICULIDAE (28)
Bohemannia pulverosella (Stainton, 1849) [40]
Ectoedemia (*Etainia*) *albifasciella* (Heinemann, 1871) [37]
Ectoedemia (*Etainia*) *angulifasciella* (Stainton, 1849) [28]
Ectoedemia (*Etainia*) *atricollis* (Stainton, 1857) [29]
Ectoedemia (*Etainia*) *intimella* (Zeller, 1848) [25]
Ectoedemia (*Etainia*) *minimella* (Zetterstedt, 1839) [35]
Ectoedemia (*Etainia*) *occultella* (Linnaeus, 1767) [34]
Ectoedemia (*Etainia*) *subbimaculella* (Haworth, 1828) [38]
Ectoedemia (*Fomoria*) *septembrella* (Stainton, 1849) [42]
Stigmella anomalella (Goeze, 1783) [92] – Rose Leaf Miner
Stigmella aurella (Fabricius, 1775) [50]
Stigmella confusella (Wood, 1894) [117]
Stigmella floslactella (Haworth, 1828) [75]
Stigmella hemargyrella (Kollar, 1832) [81]
Stigmella hybnerella (Hübner, 1796) [99]
Stigmella lapponica (Wocke, 1862) [116]
Stigmella lemniscella (Zeller, 1839) [63]
Stigmella luteella (Stainton, 1857) [112]
Stigmella microtheriella (Stainton, 1854) [111]
Stigmella nylandriella (Tengsdtröm, 1848) [103]
Stigmella obliquella (Heinemann, 1862) [70]
Stigmella oxyacanthella (Stainton, 1854) [100]
Stigmella perpygmaeella (Doubleday, 1859) [79]
Stigmella ruficapitella (Haworth, 1828) [84]
Stigmella salicis (Stainton, 1854) [68]
Stigmella samiatella (Zeller, 1839) [88]
Stigmella sorbi (Stainton, 1861) [66]
Stigmella tityrella (Stainton, 1854) [77]

Family NOCTUIDAE (169)
Abrostola tripartita (Hufnagel, 1766) [2450] – Spectacle
Abrostola triplasia (Linnaeus, 1758) [2449] – Dark Spectacle
Acronicta alni (Linnaeus, 1767) [2281] – Alder Moth
Acronicta leporina (Linnaeus, 1758) [2280] – Miller
Acronicta rumicis (Linnaeus, 1758) [2289] – Knot Grass
Acronicta tridens (Denis et Schiffermüller, 1775) [2283] – Dark Dagger
Acronicta megacephala (Denis et Schiffermüller, 1775) [2278] – Poplar Grey
Acronicta psi (Linnaeus, 1758) [2284] – Grey Dagger
Agrochola circellaris (Hufnagel, 1766) [2262] – Brick
Agrochola helvola (Linnaeus, 1758) [2265] – Flounced Chestnut
Agrochola litura (Linnaeus, 1761) [2266] – Brown-spot Pinion
Agrochola lota (Clerck, 1759) [2263] – Red-line Quaker

Agrochola lychnidis (Denis et Schiffermüller, 1775) [2267] – Beaded Chestnut
Agrochola macilenta (Hübner, 1809) [2264] – Yellow-line Quaker
Agrotis exclamationis (Linnaeus, 1758) [2089] – Heart and Dart
Agrotis ipsilon (Hufnagel, 1766) [2091] – Dark Sword-grass
Agrotis segetum (Denis et Schiffermüller, 1775) [2087] – Turnip Moth
Agrotis trux trux Stephens, 1829 [2090] – Crescent Dart
Agrotis puta (Hübner, 1803) [2092] – Shuttle-shaped Dart
Allophyes oxyacanthae (Linnaeus, 1758) [2245] – Green-brindled Crescent
Amphipoea lucens (Freyer, 1845) [2357] – Large Ear
Amphipoea oculea (Linnaeus, 1761) [2360] – Ear Moth
Amphipyra berbera svenssoni Fletcher, 1968 [2298] – Svensson's Copper Underwing
Amphipyra pyramidea (Linnaeus, 1758) [2297] – Copper Underwing
Amphipyra tragopoginis (Clerck, 1759) [2299] – Mouse Moth
Anaplectoides prasina (Denis et Schiffermüller, 1775) [2138] – Green Arches
Anarta myrtilli (Linnaeus, 1761) [2142] – Beautiful Yellow Underwing
Anarta trifolii (Hufnagel, 1766) [2145] – Nutmeg
Anorthoa munda (Denis et Schiffermüller, 1775) [2189] – Twin-spotted Quaker
Antitype chi (Linnaeus, 1758) [2254] – Grey Chi
Apamea anceps (Denis et Schiffermüller, 1775) [2333] – Large Nutmeg
Apamea epomidion (Haworth, 1809) [2327] – Clouded Brindle
Apamea crenata (Hufnagel, 1766) [2326] – Clouded-bordered Brindle
Apamea lithoxylaea (Denis et Schiffermüller, 1775) [2322] – Light Arches
Apamea monoglypha (Hufnagel, 1766) [2321] – Dark Arches
Apamea remissa (Hübner, 1809) [2330] – Dusky Brocade
Apamea scolopacina (Esper, 1788) [2335] – Slender Brindle
Apamea sordens (Hufnagel, 1766) [2334] – Rustic Shoulder-knot
Apamea unanimis (Hübner, 1813) [2331] – Small Clouded Brindle
Atethmia centrago (Haworth, 1809) [2269] – Centre-barred Sallow
Aporophyla lutulenta (Denis et Schiffermüller, 1775) [2231] – Deep-brown Dart
Aporophyla nigra (Haworth, 1809) [2232] – Black Rustic
Autographa bractea (Denis et Schiffermüller, 1775) [2444] – Gold Spangle
Autographa gamma (Linnaeus, 1758) [2441] – Silver Y
Autographa jota (Linnaeus, 1758) [2443] – Plain Golden Y
Autographa pulchrina (Haworth, 1809) [2442] – Beautiful Golden Y
Axylia putris (Linnaeus, 1761) [2098] – Flame
Bena bicolorana (Linnaeus, 1758) [2421] – Scarce Silver-lines
Brachylomia viminalis (Fabricius, 1777) [2225] – Minor Shoulder-knot
Caradrina clavipalpis (Scopoli, 1763) [2389] – Pale Mottled Willow
Caradrina morpheus (Hufnagel, 1766) [2387] – Mottled Rustic
Catocala nupta (Linnaeus, 1767) [2452] – Red Underwing
Celaena haworthii (Curtis, 1829) [2367] – Haworth's Minor
Cerapteryx graminis (Linnaeus, 1758) [2176] – Antler Moth
Cerastis rubricosa (Denis et Schiffermüller, 1775) [2139] – Red Chestnut
Charanyca trigrammica (Hufnagel, 1766) [2380] – Treble Lines
Chortodes pygmina (Haworth, 1809) [2350] – Small Wainscot
Cirrhia gilvago (Denis et Schiffermüller, 1775) [2275] – Dusky-lemon Sallow
Coenobia rufa (Haworth, 1809) [2379] – Small Rufous
Conistra ligula (Esper, 1791) [2259] – Dark Chestnut
Conistra vaccinii (Linnaeus, 1761) [2258] – Chestnut
Cosmia affinis (Linnaeus, 1767) [2316] – Lesser-spotted Pinion
Cosmia trapezina (Linnaeus, 1758) [2318] – Dun-bar
Cryphia domestica (Hufnagel, 1766) [2293] – Marbled Beauty
Cucullia chamomillae (Denis et Schiffermüller, 1775) [2214] – Chamomile Shark
Cucullia umbratica (Linnaeus, 1758) [2216] - Shark
Diachrysia chrysitis (Linnaeus, 1758) [2434] – Burnished Brass
Diarsia brunnea (Denis et Schiffermüller, 1775) [2122] – Purple Clay
Diarsia dahlia (Hübner, 1813) [2121] – Barred Chestnut
Diarsia florida (Schmidt, 1859) [2124] – Fen Square-spot
Diarsia mendica mendica (Fabricius, 1775) [2120] – Ingrailed Clay
Diarsia rubi (Vieweg, 1790) [2123] – Small Square-spot
Dryobotodes eremita (Fabricius, 1775) [2248] – Brindled Green
Dypterygia scabriuscula (Linnaeus, 1758) [2301] – Bird's Wing
Enargia paleacea (Esper, 1788) [2313] – Angle-striped Sallow
Eugnorisma glareosa (Esper, 1788) [2117] – Autumnal Rustic
Euxoa tritici (Linnaeus, 1761) [2081] – White-line Dart
Euplexia lucipara (Linnaeus, 1758) [2305] – Small Angle Shades
Eupsilia transversa (Hufnagel, 1766) [2256] – Satellite
Euxoa nigricans (Linnaeus, 1761) [2082] – Garden Dart

Gortyna flavago (Denis et Schiffermüller, 1775) [2364] – Frosted Orange
Graphiphora augur (Fabricius, 1775) [2114] – Double Dart
Griposia aprilina (Linnaeus, 1758) [2247] – Merveille du Jour
Hada plebeja (Linnaeus, 1761) [2147] – Shears
Hadena bicruris (Hufnagel, 1766) [2173] – Lychnis
Hadena confusa (Hufnagel, 1766) [2171] – Marbled Coronet
Hadena perplexa (Denis et Schiffermüller, 1775) [2167] – Tawny Shears
Hecatera bicolorata (Hufnagel, 1766) [2164] – Broad-barred White
Helicoverpa armigera (Hübner, 1808) [2400] – Scarce Bordered Straw
Heliothis peltigera (Denis et Schiffermüller, 1775) [2403] – Bordered Straw
Herminia grisealis (Denis et Schiffermüller, 1775) [2492] – Small Fan-foot
Hoplodrina alsines (Brahm, 1791) [2381] – Uncertain
Hoplodrina blanda (Denis et Schiffermüller, 1775) [2382] – Rustic
Hydraecia micacea (Esper, 1789) [2361] – Rosy Rustic
Hypena proboscidalis (Linnaeus, 1758) [2477] – Snout
Ipimorpha subtusa (Denis et Schiffermüller, 1775) [2312] – Olive
Lacanobia oleracea (Linnaeus, 1758) [2160] – Bright-line Brown-eye
Lacanobia thalassina (Hufnagel, 1766) [2158] – Pale-shouldered Brocade
Lateroligia ophiogramma (Esper, 1794) [2336] – Double Lobed
Lithophane leautieri hesperica Boursin, 1957 [2240] – Blair's Shoulder-knot
Lithophane social (Hufnagel, 1766) [2236] – Pale Pinion
Luperina testacea (Denis et Schiffermüller, 1775) [2353] – Flounced Rustic
Lycophotia porphyrea (Denis et Schiffermüller, 1775) [2118] – True Lover's Knot
Mamestra brassicae (Linnaeus, 1758) [2154] – Cabbage Moth
Melanchra persicariae (Linnaeus, 1761) [2155] – Dot Moth
Melanchra pisi (Linnaeus, 1758) [2163] – Broom Moth
Mesapamea didyma (Esper, 1788) [2343a] – Lesser Common Rustic
Mesapamea secalis (Linnaeus, 1758) [2343] – Common Rustic
Mesoligia furuncula (Denis et Schiffermüller, 1775) [2341] – Cloaked Minor
Mesoligia literosa (Haworth, 1809) [2342] – Rosy Minor
Mniotype adusta (Esper, 1790) [2250] – Dark Brocade
Mythimna comma (Linnaeus, 1761) [2205] – Shoulder-striped Wainscot
Mythimna conigera (Denis et Schiffermüller, 1775) [2192] – Brown-line Bright-eye
Mythimna farrago (Fabricius, 1787) [2193] – Clay
Mythimna impura (Hübner, 1808) [2198] – Smoky Wainscot
Mythimna pallens (Linnaeus, 1758) [2199] – Common Wainscot
Naenia typica (Linnaeus, 1758) [2136] – Gothic
Noctua comes Hübner, 1813 [2109] – Lesser Yellow Underwing
Noctua fimbriata (Schreber, 1759) [2110] – Broad-bordered Yellow Underwing
Noctua interjecta caliginosa (Schawerda, 1919) [2112] – Least Yellow Underwing
Noctua janthe Borkhausen, 1792 [2111] – Lesser Broad-bordered Yellow Underwing
Noctua pronuba Linnaeus, 1758 [2107] – Large Yellow Underwing
Nonagria typhae (Thunberg, 1784) [2369] – Bulrush Wainscot
Ochropleura plecta (Linnaeus, 1761) [2102] – Flame Shoulder
Oligia fasciuncula (Haworth, 1809) [2340] – Middle-barred Minor
Oligia latruncula (Denis et Schiffermüller, 1775) [2339] – Tawny Marbled Minor
Oligia strigilis (Linnaeus, 1758) [2337] – Marbled Minor
Oligia versicolor (Borkhausen, 1792) [2338] – Rufous Minor
Omphaloscelis lunosa (Haworth, 1809) [2270] – Lunar Underwing
Orthosia cerasi (Fabricius, 1775) [2187] – Common Quaker
Orthosia cruda (Denis et Schiffermüller, 1775) [2182] – Small Quaker
Orthosia gothica (Linnaeus, 1758) [2190] – Hebrew Character
Orthosia gracilis (Denis et Schiffermüller, 1775) [2186] – Powdered Quaker
Orthosia incerta (Hufnagel, 1766) [2188] – Clouded Drab
Orthosia populeti (Fabricius, 1781) [2185] – Lead-coloured Drab
Panolis flammea (Denis et Schiffermüller, 1775) [2179] – Pine Beauty
Papestra biren (Goeze, 1781) [2162] – Glaucous Shears
Parastichtis suspecta (Hübner, 1817) [2268] – Suspected
Parastichtis ypsillon (Denis et Schiffermüller, 1775) [2314] – Dingy Shears
Peridroma saucia (Hübner, 1808) [2119] – Pearly Underwing
Phlogophora meticulosa (Linnaeus, 1758) [2306] – Angle Shades
Photedes minima (Haworth, 1809) [2345] – Small Dotted Buff
Plusia festucae (Linnaeus, 1758) [2439] – Gold Spot
Polia nebulosa (Hufnagel, 1766) [2150] – Grey Archer
Polychrysia moneta (Fabricius, 1787) [2437] – Golden Plusia
Pseudoips prasinana (Linnaeus, 1758) [2422] – Green Silver-lines
Rhizedra lutosa (Hübner, 1803) [2375] – Large Wainscot
Rhyacia simulans (Hufnagel, 1766) [2105] – Dotted Rustic

Rivula sericealis (Scopoli, 1763) [2474] – Straw Dot
Rusina ferruginea (Esper, 1785) [2302] – Brown Rustic
Scoliopteryx libatrix (Linnaeus, 1758) [2469] – Herald
Sideridis rivularis (Fabricius, 1775) [2166] – Campion
Thalpophila matura (Hufnagel, 1766) [2303] – Straw Underwing
Tholera cespitis (Denis et Schiffermüller, 1775) [2177] – Hedge Rustic
Tholera decimalis (Poda, 1761) [2178] – Feathered Gothic
Tiliacea citrago (Linnaeus, 1758) [2271] – Orange Sallow
Xanthia aurago (Denis et Schiffermüller, 1775) [2272] – Barred Sallow
Xanthia icteritia (Hufnagel, 1766) [2274] – Sallow
Xanthia togata (Esper, 1788) [2273] – Pink-barred Sallow
Xestia baja (Denis et Schiffermüller, 1775) [2130] – Dotted Clay
Xestia castanea (Esper, 1798) [2132] – Neglected Rustic
Xestia c-nigrum (Linnaeus, 1758) [2126] – Setaceous Hebrew Character
Xestia ditrapezium (Denis et Schiffermüller, 1775) [2127] – Triple-spotted Clay
Xestia sexstrigata (Haworth, 1809) [2133] – Six-striped Rustic
Xestia triangulum (Hufnagel, 1766) [2128] – Double Square-spot
Xestia xanthographa (Denis et Schiffermüller, 1775) [2134] – Square-spot Rustic
Xylena solidaginis (Hübner, 1803) [2233] – Golden-rod Brindle
Xylocampa areola (Esper, 1789) [2243] – Early Grey
Zanclognatha tarsipennalis (Treitschke, 1835) [2489] – Fan-foot

Family Nolidae (2)

Nola cucullatella (Linnaeus, 1758) [2077] – Short-cloaked Moth
Nycteola revayana (Scopoli, 1772) [2423] – Oak Nycteoline

Family Notodontidae (12)

Cerura vinula (Linnaeus, 1758) [1995] – Puss Moth
Diloba caeruleocephala (Linnaeus, 1758) [2020] – Figure of Eight
Drymonia ruficornis (Hufnagel, 1766) [2015] – Lunar Marbled Brown
Furcula bicuspis (Borkhausen, 1790) [1996] – Alder Kitten
Furcula bifida (Brahm, 1787) [1998] – Poplar Kitten
Notodonta dromedarius (Linnaeus, 1767) [2000] – Iron Prominent
Notodonta ziczac (Linnaeus, 1758) [2003] – Pebble Prominent
Phalera bucephala (Linnaeus, 1758) [1994] – Buff-tip
Pheosia gnoma (Fabricius, 1777) [2006] – Lesser Swallow Prominent
Pheosia tremula (Clerck, 1759) [2007] – Swallow Prominent
Pterostoma palpina (Clerck, 1759) [2011] – Pale Prominent
Ptilodon capucina (Linnaeus, 1758) [2008] – Coxcomb Prominent

Family Nymphalidae (10)

Aglais io (Linnaeus, 1758) [1597] – Peacock
Aglais urticae (Linnaeus, 1758) [1593] – Small Tortoiseshell
Coenonympha pamphilus pamphilus (Linnaeus, 1758) [1627] – Small Heath
Lasiommata megera (Linnaeus, 1758) [1615] – Wall
Maniola jurtina insularis Thomson, 1969 [1626] – Meadow Brown
Pararge aegeria tircis (Godart, 1821) [1614] – Speckled Wood
Polygonia c-album (Linnaeus, 1758) [1598] – Comma
Pyronia tithonus brittaniae (Verity, 1915) [1625] – Hedge Brown or Gatekeeper
Vanessa atalanta (Linnaeus, 1758) [1590] – Red Admiral
Vanessa cardui (Linnaeus, 1758) [1591] – Painted Lady

Family OECOPHORIDAE (11)

Agonopterix ciliella (Stainton, 1849) [689]
Agonopterix nervosa (Haworth, 1811) [706]
Batia unitella (Hübner, 1796) [642] – Golden-brown Tubic
Carcina quercana (Fabricius, 1775) [658]
Depressaria pastinacella (Duponchel, 1838) [672] – Parsnip Moth
Diurnea fagella (Denis et Schiffermüller, 1775) [663]
Diurnea lipsiella (Hübner, 1796) [664]
Endrosis sarcitrella (Linnaeus, 1758) [648] – White-shouldered House-moth
Hofmannophila pseudospretella (Stainton, 1849) [647] – Brown House Moth
Tachystola acroxantha (Meyrick, 1885) [656]

Semioscopis steinkellneriana (Denis et Schiffermüller, 1775) [667]

Family OPOSTEGIDAE (1)
Opostega salaciella (Treitschke, 1833) [119]

Family PARAMETRIOTIDAE (1)
Spuleria flavicaput (Haworth, 1828) [904]

Family PIERIDAE (6)
Anthocharis cardamines britannica Verity, 1908 [1553] – Orange-tip
Colias croceus (Geoffroy, 1785) [1545] – Clouded Yellow
Pieris brassicae (Linnaeus, 1758) [1549] – Large White
Pieris napi sabellicae Stephens, 1827 [1551] – Green-veined white
Pieris rapae (Linnaeus, 1758) [1550] – Small White
Gonepteryx rhamni rhamni (Linnaeus, 1758) [1546] – Brimstone

Family PTEROPHORIDAE (3)
Amblyptilia acanthadactyla (Hübner, 1813) [1497]
Gillmeria pallidactyla (Haworth, 1811) [1504]
Emmelina monodactyla (Linnaeus, 1758) [1524]

Family PYRALIDAE (32)
Acentria ephemerella (Denis et Schiffermüller, 1775) [1331] – Water Veneer
Agriphila straminella (Denis et Schiffermüller, 1775) [1304]
Agriphila tristella (Denis et Schiffermüller, 1775) [1305]
Aphomia sociella (Linnaeus, 1758) [1428] – Bee Moth
Cataclysta lemnata (Linnaeus, 1758) [1354] – Small China-mark
Catoptria pinella (Linnaeus, 1758) [1313]
Chrysoteuchia culmella (Linnaeus, 1758) [1293] – Garden Grass-veneer
Crambus lathoniellus (Zincken, 1817) [1301]
Crambus pascuella (Linnaeus, 1758) [1294]
Crambus perlella (Scopoli, 1763) [1302]
Dioryctria abietella (Denis et Schiffermüller, 1775) [1454]
Elophila nymphaeata (Linnaeus, 1758) [1345] – Brown China-mark
Eudonia angustea (Curtis, 1827) [1342]
Eudonia mercurella (Linnaeus, 1758) [1344]
Eudonia truncicolella (Stainton, 1849) [1340]
Eurrhypara hortulata (Linnaeus, 1758) [1376] – Small Magpie
Evergestis forficalis (Linnaeus, 1758) [1356] – Garden Pebble
Homoeosoma sinuella (Fabricius, 1794) [1481]
Hypsopygia costalis (Fabricius, 1775) [1413] – Gold Triangle
Nomophila noctuella (Denis et Schiffermüller, 1775) [1398] – Rush Veneer
Ortholepis betulae (Goeze, 1778) [1450]
Orthopygia glaucinalis (Linnaeus, 1758) [1415]
Pempelia palumbella (Denis et Schiffermüller, 1775) [1442]
Phycita roborella (Denis et Schiffermüller, 1775) [1452]
Pleuroptya ruralis (Scopoli, 1763) [1405] – Mother of Pearl
Pyla fusca (Haworth, 1811) [1451]
Pyralis farinalis (Linnaeus, 1758) [1417] – Meal Moth
Scoparia ambigualis (Treitschke, 1829) [1334]
Trachycera advenella (Zincken, 1818) [1439]
Udea ferrugalis (Hübner, 1796) [1395] – Rusty-dot Pearl
Udea lutealis (Hübner, 1809) [1388]
Udea prunalis (Denis et Schiffermüller, 1775) [1390]

Family SESIIDAE (1)
Synanthedon tipuliformis (Clerck, 1759) [373] – Currant Clearwing

Family SPHINGIDAE (8)
Agrius convolvuli (Linnaeus, 1758) [1972] – Convolvulus Hawk-moth

Deilephila elpenor (Linnaeus, 1758) [1991] – Elephant Hawk-moth
Deilephila porcellus (Linnaeus, 1758) [1992] – Small Elephant Hawk-moth
Hippotion celerio (Linnaeus, 1758) [1993] – Silver-striped Hawk-moth
Laothoe populi (Linnaeus, 1758) [1981] – Poplar Hawk-moth
Macroglossum stellatarum (Linnaeus, 1758) [1984] – Humming-bird Hawk-moth
Mimas tiliae (Linnaeus, 1758) [1979] – Lime Hawk-moth
Smerinthus ocellata (Linnaeus, 1758) [1980] – Eyed Hawk-moth

Family TINEIDAE (2)

Nemapogon cloacella (Haworth, 1828) [216] – Cork Moth
Tinea trinotella Thunberg, 1794 [247]

Family TISCHERIIDAE (2)

Emmetia marginea (Haworth, 1828) [125]
Tischeria ekebladella (Bjerkander, 1795) [123]

Family TORTRICIDAE (61)

Acleris ferrugana (Denis et Schiffermüller, 1775) [1044]
Acleris forsskaleana (Linnaeus, 1758) [1036]
Acleris holmiana (Linnaeus, 1758) [1037]
Acleris laterana (Fabricius, 1794) [1038]
Acleris rhombana (Denis et Schiffermüller, 1775) [1042] – Rhomboid Tortrix
Acleris sparsana (Denis et Schiffermüller, 1775) [1041]
Acleris variegana (Denis et Schiffermüller, 1775) [1048] – Garden Rose Tortrix
Aethes rubigana (Treitschke, 1830) [946]
Agapeta hamana (Linnaeus, 1758) [937]
Aleimma loeflingiana (Linnaeus, 1758) [1032]
Ancylis achatana (Denis et Schiffermüller, 1775) [1115]
Ancylis badiana (Denis et Schiffermüller, 1775) [1126]
Ancylis mitterbacheriana (Denis et Schiffermüller, 1775) [1120]
Apotomis betuletana (Haworth, 1811) [1093]
Apotomis turbidana (Hübner, 1825) [1092]
Archips podana (Scopoli, 1763) [977] – Large Fruit-tree Tortrix
Bactra lancealana (Hübner, 1799) [1111]
Celypha lacunana (Denis et Schiffermüller, 1775) [1076]
Clepsis consimilana (Hübner, 1817) [994]
Clepsis spectrana (Treitschke, 1830) [993] – Cyclamen Tortrix
Cnephasia asseclana (Denis et Schiffermüller, 1775) [1021] – Flax Tortrix
Cnephasia stephensiana (Doubleday, 1849) [1020] – Grey Tortrix
Cochylis nana (Haworth, 1811) [968]
Cydia pomonella (Linnaeus, 1758) [1261] – Codling Moth
Cydia splendana (Hübner, 1799) [1260]
Cydia ulicetana (Haworth, 1811) [1255]
Ditula angustiorana (Haworth, 1811) [1010] – Red-barred Tortrix
Epiblema cynosbatella (Linnaeus, 1758) [1174]
Epiblema uddmanniana (Linnaeus, 1758) [1175] – Bramble Shoot Moth
Epinotia abbreviana (Fabricius, 1794) [1150]
Epinotia bilunana (Haworth, 1811) [1133]
Epinotia brunnichana (Linnaeus, 1767) [1155]
Epinotia cruciana (Linnaeus, 1761) [1147] – Willow Tortrix
Epinotia tenerana (Denis et Schiffermüller, 1775) [1139] – Nut Bud Moth
Epiphyas postvittana (Walker, 1863) [998] – Light Brown Apple Moth
Eucosma cana (Denis et Schiffermüller, 1775) [1201]
Eucosma hohenwartiana (Denis et Schiffermüller, 1775) [1200]
Eulia ministrana (Linnaeus, 1758) [1015]
Gypsonoma dealbana (Frölich, 1828) [1069]
Hedya nubiferana (Haworth, 1811) [1083] – Marbled Orchard Tortrix
Lobesia littoralis (Humphreys and Westwood, 1845) [1109]
Lobesia reliquana (Hübner, 1825) [1106]
Lozotaenia forsterana (Fabricius, 1781) [1002]
Lozotaeniodes formosanus (Geyer, 1830) [1001]
Metendothenia atropunctana (Zetterstedt, 1840) [1085]
Orthotaenia undulana (Denis et Schiffermüller, 1775) [1087]
Pandemis cerasana (Hübner, 1786) [970] – Barred Fruit-tree Tortrix
Pandemis corylana (Fabricius, 1794) [969] – Chequered Fruit-tree Tortrix

Pandemis heparana (Denis et Schiffermüller, 1775) [972] – Dark Fruit-tree Tortrix
Pammene argyrana (Hübner, 1799) [1228]
Pammene fasciana (Linnaeus, 1761) [1236]
Pammene giganteana (Peyerimhoff, 1863) [1227]
Pammene rhediella (Clerck, 1759) [1239] – Fruitlet Mining Tortrix
Pammene splendidulana (Guenée, 1845) [1223]
Pseudargyrotoza conwagana (Fabricius, 1775) [1011]
Ptycholomoides aeriferana (Herrich-Schäffer, 1851) [987]
Rhopobota naevana (Hübner, 1817) [1159] – Holly Tortrix
Rhyacionia pinivorana (Lienig et Zeller, 1846) [1212] – Spotted Shoot Moth
Spilonota ocellana (Denis et Schiffermüller, 1775) [1205] – Bud Moth
Tortrix viridana Linnaeus, 1758 [1033] – Green Oak Tortrix
Zeiraphera isertana (Fabricius, 1794) [1165]

Family YPONOMEUTIDAE (19)

Argyresthia bonnetella (Linnaeus, 1758) [421]
Argyresthia brockeella (Hübner, 1813) [410]
Argyresthia conjugella Zeller, 1839 [418] – Apple Fruit Moth
Argyresthia goedartella (Linnaeus, 1758) [411]
Argyresthia pygmaeella (Denis et Schiffermüller, 1775) [412]
Argyresthia retinella Zeller, 1839 [415]
Argyresthia semitestacella (Curtis, 1833) [423]
Paraswammerdamia nebulella (Goeze, 1783) [441]
Plutella xylostella (Linnaeus, 1758) [464] – Diamond-back Moth
Prays fraxinella (Bjerkander, 1784) [449] – Ash Bud Moth
Swammerdamia caesiella (Hübner, 1796) [437]
Yponomeuta evonymella (Linnaeus, 1758) [424] – Bird-cherry Ermine
Yponomeuta padella (Linnaeus, 1758) [425] – Orchard Ermine
Ypsolopha nemorella (Linnaeus, 1758) [452]
Ypsolopha dentella (Fabricius, 1775) [453] – Honeysuckle Moth
Ypsolopha scabrella (Linnaeus, 1761) [455]
Ypsolopha parenthesella (Linnaeus, 1761) [460]
Ypsolopha ustella (Clerck, 1759) [461]
Ypsolopha vittella (Linnaeus, 1758) [463]

Family ZYGAENIDAE (2)

Zygaena filipendulae (Linnaeus, 1758) [169] – Six-spot Burnet
Zygaena lonicerae (Scheven, 1777) [171] – Narrow-bordered Five-spot Burnet

Order Mecoptera (Scorpion flies; 1 species)

The record is based on the data extracted from the Lancashire and Cheshire Card Index of H. Britten in the Manchester Museum (courtesy of Phillip Rispin). Nomenclature follows Kloet and Hinks (1964).

Family BOREIDAE (1) – Snow Scorpion-flies or Snow Fleas

Boreus hyemalis (Linnaeus, 1767)

Order Megaloptera (Alder flies and allies; 1 species)

The record is based on the data released at our request by rECOrd, the Biodiversity Information System for Cheshire (courtesy of Tom Hunt). Nomenclature follows Kloet and Hinks (1964).

Family SIALIDAE (1)
Sialis lutaria (Linnaeus, 1758)

Order Neuroptera (lacewings and allies; 1 species)

The record is based on the unpublished report prepared by the Liverpool Museum staff and associates resulting from the Alderley Edge Invertebrate Survey undertaken by their team in 1996 (courtesy of Ian Wallace, Liverpool). Nomenclature follows Kloet and Hinks (1964).

Family CHRYSOPIDAE (1) – Green Lacewings
Chrysoperla sp. (*carnea* group)

Order Odonata (Dragonflies and Damselflies; 9 species)

The list is based on the data released at our request by David Kitching, the Cheshire County recorder for Odonata, and also taken from the unpublished aquatic invertebrate survey undertaken by by Jonathan Guest in 1998 (see Chapter 12). Nomenclature and English common names follow Miller (1987). Complete information on the Dragonflies and Damselflies of Cheshire can be found in Gabb and Kitching (1992); a full checklist of the British Odonata and information about their biology and conservation are given on the website of the British Dragonfly Society (http://www.british-dragonflies.org.uk).

Family AESHNIDAE (2)
Aeshna cyanea (Müller, 1764) – Southern Hawker
Aeshna grandis (Linnaeus, 1758) – Brown Hawker

Family COENAGRIIDAE (4)
Coenagrion puella (Linnaeus, 1758) – Azure Damselfly
Enallagma cyathigerum (Charpentier, 1840) – Common Blue Damselfly
Ischnura elegans (van der Linden, 1820) – Blue-tailed Damselfly
Pyrrhosoma nymphula (Sulzer, 1776) – Large Red Damselfly

Family LIBELLULIDAE (3)
Libellula depressa Linnaeus, 1758 – Broad-bodied Chaser
Libellula quadrimaculata Linnaeus, 1758 – Four-spotted Chaser
Sympetrum (?) *striolatum* (Charpentier, 1840) – Common Darter

Order Orthoptera (Grasshoppers and Crickets; 2 species)

The list is based on the paper by Brindle (1971) and the data extracted from the Lancashire and Cheshire Card Index of H. Britten in the Manchester Museum (courtesy of Phillip Rispin). Nomenclature and common English names follow Marshall and Haes (1988).

Family ACRIDIDAE (2) – Grasshoppers
Chorthippus (*Glyptobothrus*) *brunneus brunneus* (Thunberg, 1815) – Field Grasshopper
Myrmeleotettix maculatus maculatus (Thunberg, 1815) – Mottled Grasshopper

Order Phthiraptera (True Lice; 7 species)

The list is based on the data extracted from the collection of British lice and from the Lancashire and Cheshire Card Index of H. Britten in the Manchester Museum (courtesy of Phillip Rispin). All recorded louse species belong to the chewing lice, sometimes called Mallophaga. Nomenclature follows Price *et al.* (2003).

Suborder Amblicera

Family MENOPONIDAE (2) – Chicken body lice
Kurodaia subpachygaster (Piaget, 1880) [ex Barn Owl]
Pseudomenopon pilosum (Scopoli, 1763) [ex Moorhen]

Suborder Ischnocera

Family PHILOPTERIDAE (4)
Brueellia domestica (Kellogg and Chapman, 1899) [ex House Martin]
Degeeriella fusca (Denny, 1842) [ex Hobby]
Philopterus atratus Nitzsch, 1818 [ex Barn Owl]
Strigiphilus rostratus (Burmeister, 1838) [ex Barn Owl]

Family TRICHODECTIDAE (1)
Stachiella mustelae (Schrank, 1803) [ex Stoat]

Order Plecoptera (Stoneflies; 1 species)

The record is taken from the unpublished aquatic invertebrate survey undertaken by by Jonathan Guest in 1998 (see Chapter 12). Nomenclature follows Kloet and Hinks (1964).

Family NEMOURIDAE (1)
Nemoura cinerea (Retzius, 1783)

Order Psocoptera (Barklice and Booklice; 5 species)

The list is based on the data extracted from the Lancashire and Cheshire Card Index of H. Britten in the Manchester Museum (courtesy of Phillip Rispin). Nomenclature follows New (2005). A complete checklist of the British Psocoptera (sixty-eight species) accounts for all the recorded species and much supporting information can be obtained from the website of National Barkfly Recording Scheme (http://www.brc.ac.uk/schemes/barkfly/homepage.htm).

Family CAECILIUSIDAE (1)
Enderleinella obsoleta (Stephens, 1836)

Family ECTOPSOCIDAE (1)
Ectopsocus briggsi McLachlan, 1899

Family ELIPSOCIDAE (1)
Elipsocus pumilis (Hagen, 1861)

Family PSOCIDAE (1)
Loensia fasciata (Fabricius, 1787)

Family STENOPSOCIDAE (1)
Graphopsocus cruciatus (Linnaeus, 1768)

Order Siphonaptera (Fleas; 9 species)

The list is based on the data released from the collection of British fleas held in the Manchester Museum (courtesy of Phillip Rispin). Nomenclature follows Whitaker (2007), but subfamilies and subgenera are omitted.

Family CERATOPHYLLIDAE (7)
Amalaraeus penicilliger mustelae (Dale, 1878) [ex Robin nest]
Ceratophyllus farreni farreni Rothschild, 1905 [ex House Martin nest]
Ceratophyllus fringillae (Walker, 1856) [ex Hedge Sparrow nest]
Ceratophyllus gallinae (Schrank, 1803) [ex Hedge Sparrow nest]
Ceratophyllus hirundinis (Curtis, 1826) [ex House Martin nest]
Ceratophyllus styx jordani Smit, 1955 [ex Sand Martin nest]
Dasypsyllus gallinulae gallinulae (Dale, 1878) [ex Snipes nest]

Family ISCHNOPSYLLIDAE (2)
Ischnopsyllus octactenus (Kolenati, 1856) [ex Whiskered Bat]
Ischnopsyllus simplex simplex Rothschild, 1906 [ex Whiskered Bat]

Order Trichoptera (Caddisflies; 13 species)

The record is taken from the unpublished report prepared by the Liverpool Museum staff and associates which resulted from the Alderley Edge Invertebrate Survey undertaken by their team in 1996 (courtesy of Ian Wallace, Liverpool), and from the unpublished aquatic invertebrate survey undertaken by by Jonathan Guest in 1998 (see Chapter 12). Nomenclature follows Kloet and Hinks (1964).

Family BERAEIDAE (1)
Beraea pullata (Curtis, 1834)

Family HYDROPTILIDAE (2)
Athripsodes aterrimus (Stephens, 1836)
Triaenodes bicolor (Curtis, 1834)

Family LEPTOCERIDAE (1)
Agraylea multipunctata Curtis, 1834

Family LIMNEPHILIDAE (9)
Anabolia nervosa (Curtis, 1834)
Glyphotaelius pellucidus (Retzius, 1783)
Limnephilus centralis Curtis, 1834
Limnephilus flavicornis (Fabricius, 1787)
Limnephilus lunatus Curtis, 1834
Limnephilus vittatus (Fabricius, 1798)
Limnephilus sp. (*flavicornis* or *marmoratus*)
Micropterna lateralis (Stephens, 1837)
Micropterna sequax (McLachlan, 1875)

Subphylum Chelicerata
Class Arachnida (Spiders, Harvestmen and allies; 164 species)
Subclass Acarina or Acari (Mites and Ticks)

The list of mites and ticks (Acarina) is based on the data extracted from the collections of the Manchester Museum. Composition of families is given in accordance with the *Biology Catalog* of J. Hallan (2008; at http://bug.tamu.edu/research/collection/hallan). The higher classification of the Acarina is still a matter of controversy and debate: we follow the review by Dunlop and Alberti (2008) and consider mites and ticks in two orders. However, many specialists place the Acarina at the rank of subclass within the class Arachnida, with seven orders recognised. For instance, suborders given in the present checklist are accepted as orders in Hallan (2008).

Order Actinotrichida (Mites; 15 species)

Suborder Actinedida (or Prostigmata)

Family CHEYLETIDAE (1)
Neocheyletiella microrhynchus (Berlese and Trouessart, 1889) [ex House Martin]

Family BDELLIDAE (1)
Bdella longicornis (Linneaus, 1758) [ex Greenfinch nest with Cuckoo]

Family MYOBIIDAE (1)
Acanthophtirius mystacinalis (Radford 1953) [ex Whiskered bat]

Family TETRANYCHIDAE (1)
Bryobia praetiosa Koch, 1836 [ex Thrushes nest] – Clover Mite

Family TROMBICULIDAE (1)
Neotrombicula autumnalis (Shaw, 1790) [ex Stoat] – Harvest Mite

Suborder Astigmata

Family ACARIDAE (2)
Acarus siro Linnaeus, 1758 [ex Brown Rat]
Tyrophagus longior (Gervais, 1844) (= *Coelognathus dimidiatus*) [ex Hedgesparrow nest]

Family ANALGIDAE (1)
Protalges attennatus (Buchholz, 1869) [ex Barn Owl]

Family AVENZOARIIDAE (1)
Pteronyssoides obscurus (Berlese, 1884) [ex House Martin]

Family GLYCYPHAGIDAE (2)
Glycyphagus domesticus (DeGeer, 1778) [ex Thrush's nest] – Grocer's Itch Mite or House Mite
Ctenoglyphus canestrinii Armanelli 1887 [ex hay detritus]

Family PSOROPTOIDIDAE (2)
Pandalura strigis-oti (Buchholz, 1869) [ex Barn Owl]
Pandalura subintegra (Berlese, 1883) [ex House Martin]

Family PTILOXENIDAE (1)
Ptiloxenus vanelli (Canestrini, 1878) [ex Peewit]

Family PYROGLYPHIDAE (1)
Hirstia chelidonis Hull, 1901 [ex Dead House Martin]

Suborder Oribatida – Beetle Mites

Family HERMANNIIDAE (1)
Hermannia scabra (Koch, 1879) [ex Moss]

Order Anactinotrichida (mites and ticks; 5 species)

Suborder Ixodida

Family IXODIDAE (1) – Hard Ticks
Ixodes (*Pholeoixodes*) *hexagonus* Leach, 1815 [ex Hedgehog nest] – Hedgehog Tick

Suborder Mesostigmata

Family CELAENOPSIDAE (1)
Celaenopsis cuspidata (Kramer, 1876) [ex Greenfinch nest with Cuckoo]

Family DERMANYSSIDAE (1)
Dermanyssus gallinae (DeGeer, 1778) [ex Dead House Martin] – Red Poultry Mite

Family PARASITIDAE (2)
Pergamasus crassipes (Linnaeus, 1758) [ex Redshank nest]
Phorytocarpais fimetorum (Berlese, 1903) [ex Peewit nest]

Order Araneae (spiders; 137 species)

The list of Spiders, Harvestmen and False-scorpions of Alderley Edge is primarily based on the list published by Logunov (2003), plus twenty-two additional spider species from the unpublished report prepared by the Liverpool Museum staff and associates resulting from the Alderley Edge Invertebrate Survey in 1996 (courtesy of S. Judd and C. Felton). Two more species (*Agroeca proxima* and *Walckenaeria unicornis*) were found in D. W. Mackie and H. W. Freston's spider reference collection held by the Manchester Museum. One species, *Agyneta jacksoni*, reported by Logunov (2003), is a misidentification and this record should in fact be assigned to *Meioneta rurestris*. Voucher specimens of the listed spider and opilionid species are kept in the National Museums Liverpool (UK), Manchester Museum (UK) and the Zoological Museum of the Moscow State University (Russia). A total of 137 spider, eleven Harvestman and one False-scorpion species has been recorded from Alderley Edge to date. In the list given below, the numbers in square brackets following names refer to the habitats surveyed: [1] in crevices of sandy gorges; [2] under bark of standing trees or of logs; [3] rocks (under dry ferns and grass clumps, in litter, moss and lichen); [4] secondary grasslands; [5] gorse shrubs (shaken off twigs); [6] damp meadow with rush; [7] heather–stony slope; [8] broad-leaved (holly–oak–beech) wood (in litter and on ferns); [9] moss–heather–bilberry heath in birch coppice (in litter); [10] open sandy heath (with sparse grassy vegetation); [11] pine forest (in litter and on ferns); [12] damp birch forest (under rotten logs and in litter).

Family AGELENIDAE (3) – Funnel Weavers

Cryphoeca silvicola (C. L. Koch, 1834) [3, 8, 11]
Tegenaria gigantea Chamberlin et Ivie, 1935 [1, 2]
Tegenaria silvestris L. Koch, 1872 [no data]

Family AMAUROBIIDAE (2) – Window Spiders

Amaurobius fenestralis (Stroem, 1768) [2, 3]
Amaurobius similis (Blackwall, 1861) [2]

Family ARANEIDAE (9) – Orb Weavers

Araneus diadematus Clerk, 1757 [4, 5] – Garden Cross Spider
Araneus marmoreus Clerk, 1757 [4] – Marbled Orb Weaver
Araneus quadratus Clerk, 1757 [4] – 4-spot Orb Weaver
Araniella cucurbitina (Clerck, 1757) [4] – Cucumber Green Spider
Cyclosa conica (Pallas, 1772) [6]
Larinioides cornutus (Clerck, 1757) [4]
Nuctenea umbratica (Clerck, 1757) [2] – Walnut Orb-weaver Spider
Zygiella atrica (C. L. Koch, 1845) [5]
Zygiella x-notata (Clerck, 1757) [6]

Family CLUBIONIDAE (8) – Sac Spiders

Clubiona brevipes Blackwall, 1841 [no data]
Clubiona compta C. L. Koch, 1839 [7, 8]
Clubiona corticalis (Walckenaer, 1802) [2]
Clubiona diversa O. Pickard-Cambridge, 1862 [9, 10]
Clubiona lutescens Westring, 1851 [3, 4, 5, 6, 8]
Clubiona neglecta O. Pickard-Cambridge, 1862 [no data]
Clubiona reclusa O. Pickard-Cambridge, 1863 [6]
Clubiona terrestris Westring, 1851 [no data]

Family DICTYNIDAE (1) – Hackled-web Spiders

Dictyna arundinacea (Linnaeus, 1758) [4]

Family DYSDERIDAE (1) – Sixeyed Spiders

Harpactea hombergi (Scopoli, 1763) [no data]

Family HAHNIIDAE (1) – One-row Spiders

Antistea elegans (Blackwall, 1841) [6]

Family LINYPHIIDAE (83) – Money Spiders and allies

Agyneta conigera (O. Pickard-Cambridge, 1863) [8]
Agyneta decora (O. Pickard-Cambridge, 1871) [no data]
Bathyphantes approximates (O. Pickard-Cambridge, 1871) [6]
Bathyphantes gracilis (Blackwall, 1841) [3, 4, 5, 6, 8, 9, 10]
Bathyphantes nigrinus (Westring, 1851) [6, 12]
Bolyphantes alticeps (Sundevall, 1833) [8]
Centromerita bicolour (Blackwall, 1833) [no data]
Centromerita concinna (Thorell, 1875) [8]
Centromerus dilutus (O. Pickard-Cambridge, 1875) [9]
Centromerus sylvaticus (Blackwall, 1841) [6, 9]
Ceratinella brevipes (Westring, 1851) [7, 9]
Ceratinella brevis (Wider, 1834) [6, 7, 8]
Ceratinella scabrosa (O. Pickard-Cambridge, 1871) [8]
Cnephalocotes obscurus (Blackwall, 1834) [7, 9]
Collinsia inerrans (O. Pickard-Cambridge, 1885) [4]
Dicymbium nigrum (Blackwall, 1834) [6]
Dicymbium tibiale (Blackwall, 1836) [no data]
Diplocephalus cristatus (Blackwall, 1833) [8]
Diplocephalus latifrons (O. Pickard-Cambridge, 1863) [6, 8, 12]
Diplocephalus picinus (Blackwall, 1841) [8]

Diplostyla concolor (Wider, 1834) [8, 11]
Dismodicus bifrons (Blackwall, 1841) [4, 6]
Entelecara congenera (O. Pickard-Cambridge, 1879) [5]
Erigone atra Blackwall, 1833: [3, 4, 5, 6, 8, 9, 10]
Erigone dentipalpis (Wider, 1834) [3, 4, 5, 8, 9, 10]
Erigone promiscua (O. Pickard-Cambridge, 1872) [10]
Erigonella hiemalis (Blackwall, 1841) [7, 9, 12]
Floronia bucculenta (Cleck, 1757) [6]
Gnathonarium dentatum (Wider, 1834) [6]
Gonatium rubens (Blackwall, 1833) [7]
Gongylidiellum vivum (O. Pickard-Cambridge, 1875) [4, 9, 12]
Gongylidium rufipes (Linnaeus, 1758) [9]
Helophora insignis (Blackwall, 1841) [8]
Hilaira excisa (O.Pickard-Cambridge, 1871) [11]
Hypomma bituberculatum (Wider, 1834) [6]
Kaestneria pullata (O. Pickard-Cambridge, 1863) [4]
Labulla thoracica (Wider, 1834) [3]
Lepthyphantes minutus (Blackwall, 1833) [3, 8]
Lessertia dentichelis (Simon, 1884) [no data]
Linyphia hortensis Sundevall, 1829 [9, 11]
Linyphia triangularis (Clerck, 1757) [4, 5, 6]
Lophomma punctatum (Blackwall, 1841) [6]
Maso sundevalli (Westring, 1851) [8, 9]
Meioneta rurestris (C.L. Koch, 1836) [9]
Meioneta saxatilis (Blackwall, 1844) [5, 6, 9]
Micrargus herbigradus (Blackwall, 1854) [4, 5, 7, 11]
Microlinyphia pusilla (Sundevall, 1830) [4, 9, 10]
Microneta viaria (Blackwall, 1841) [8]
Minyriolus pusillus (Wider, 1834) [7]
Monocephalus fuscipes (Blackwall, 1836) [6, 7, 8, 9, 11, 12]
Neriene clathrata (Sundevall, 1830) [4, 6, 9]
Neriene montana (Clerck, 1757) [4]
Neriene peltata (Wider, 1834) [8, 9]
Obscuriphantes obscurus (Blackwall, 1841) [5, 9]
Oedothorax fuscus (Blackwall, 1834) [4, 5, 6, 9, 10]
Oedothorax gibbosus (Blackwall, 1841) (including *O. g.* form *tuberosus*) [6]
Oedothorax retusus (Westring, 1851) [6, 10]
Palliduphantes ericaeus (Blackwall, 1853) [7]
Palliduphantes pallidus (O. Pickard-Cambridge, 1871) [9]
Pocadicnemis pumila (Blackwall, 1841) [6, 9, 12]
Poeciloneta variegata (Blackwall, 1841) [5]
Pelecopsis parallela (Wider, 1834) [10]
Saaristoa abnormis (Blackwall, 1841) [9]
Saaristoa firma (O. Pickard-Cambridge, 1905) [9]
Savignia frontata Blackwall, 1833: [3, 8]
Silometopus elegans (O. Pickard-Cambridge, 1872) [10]
Stemonyphantes lineatus (Linnaeus, 1758) [no data]
Tapinocyba pallens (O. Pickard-Cambridge, 1872) [7, 11]
Tenuiphantes alacris (Blackwall, 1853) [8, 9, 11]
Tenuiphantes cristatus (Menge, 1866) [6, 8, 9]
Tenuiphantes flavipes (Blackwall, 1854) [3, 6, 8]
Tenuiphantes mengei (Kulczyński, 1887) [6]
Tenuiphantes tenebricola (Wider, 1834) [8, 9]
Tenuiphantes tenuis (Blackwall, 1852) [4, 5, 8, 9, 10]
Tenuiphantes zimmermanni (Bertkau, 1890) [3, 6, 8, 9, 11, 12]
Thyreosthenius parasiticus (Westring, 1851) [12]
Tiso vagans (Blackwall, 1834) [6]
Walckenaeria acuminata Blackwall, 1833 [9]
Walckenaeria cucullata (C. L. Koch, 1836) [8, 11]
Walckenaeria cuspidata Blackwall, 1833 [3]
Walckenaeria nudipalpis (Westring, 1851) [9]
Walckenaeria unicornis O. Pickard-Cambridge, 1861 [no data]
Walckenaeria vigilax (Blackwall, 1853) [10]

Family LIOCRANIDAE (2) – Field or Foliage-running Spiders

Agroeca proxima (O. Pickard-Cambridge, 1871) [no data]
Scotina celans (Blackwall, 1841) [7]

Family LYCOSIDAE (7) – Wolf Spiders

Alopecosa pulverulenta (Clerck, 1757) [6]
Arctosa perita (Latreille, 1799) [10]
Pardosa amentata (Clerck, 1757) [6, 10]
Pardosa palustris (Linnaeus, 1758) [6, 10]
Pardosa pullata (Clerck, 1757) [4, 8, 9]
Pirata piraticus (Clerck, 1757) [6]
Trochosa terricola Thorell, 1856: [8, 9]

Family PISAURIDAE (1) – Nursery Web Spiders

Pisaura mirabilis (Clerck, 1757) [4]

Family PHILODROMIDAE (3) – Rapid-running Crab Spiders

Philodromus aureolus (Clerck, 1757) [5, 9]
Philodromus cespitum (Walckenaer, 1802) [5]
Tibellus oblongus (Walckenaer, 1802) [4]

Family SALTICIDAE (3) – Jumping Spiders

Euophrys frontalis (Walckenaer, 1802) [3, 4, 9, 10]
Neon reticulatus (Blackwall, 1853) [9]
Salticus scenicus (Clerck, 1757) outer house walls – Zebra Spider

Family SEGESTRIIDAE (1) – Six-eyed Tunnel Spiders

Segestria senoculata (Linnaeus, 1758) [2]

Family TETRAGNATHIDAE (8) – Long-jawed and Thick-jawed Spiders

Metellina mengei (Blackwall, 1869) [3, 5, 6, 8, 10, 12]
Metellina merianae (Scopoli, 1763) [2, 3, in mines (close to entrances)]
Metellina segmentata (Clerk, 1757) [4, 5, 6, 8]
Pachygnatha clercki Sundevall, 1823 [4, 6]
Pachygnatha degeeri Sundevall, 1830 [6, 10]
Tetragnatha extensa (Linnaeus, 1758) [4, 6]
Tetragnatha montana Simon, 1874 [9]
Tetragnatha obtusa C.L. Koch, 1837 [4, 6]

Family THERIDIIDAE (11) – Comb-footed Spiders

Anelosimus vittatus (C. L. Koch, 1836) [4]
Enoplognatha ovata (Clerck, 1757) [4, 5, 6, 8, 9]
Crustulina guttata (Wider, 1834) [no data]
Neottiura bimaculata (Linnaeus, 1767) [6]
Paidiscura pallens (Blackwall, 1834) [6, 7, 8, 9]
Phylloneta impressa L. Koch, 1881 [4]
Phylloneta sisyphia (Clerck, 1757) [4, 5, 9]
Platnickina tincta (Walckenaer, 1802) [5]
Steatoda bipunctata (Linnaeus, 1758) [around houses] – Rabbit Hutch Spider
Theridion mystaceum L. Koch, 1870 [3]
Theridion varians Hahn, 1833: [5]

Family THOMISIDAE (1) – Crab Spiders

Xysticus cristatus (Clerck, 1757) [4, 5, 10]

Family ZORIDAE (1) – Wandering or Spiny-leg Spiders

Zora spinimana (Sundevall, 1833) [9]

Order Opiliones (Harvestmen; 11 species)

Family LEIOBUNIDAE (1)
Leiobunum rotundum (Latreille, 1798) [3, 5]

Family NEMASTOMATIDAE (2)
Mitostoma chrysomelas (Hermann, 1804) [7]
Nemastoma bimaculatum (Fabricius, 1885) [4, 6, 8, 9, 12]

Family PHALANGIIDAE (8)
Lacinius ephippiatus (C. L. Koch, 1835) [4]
Megabunus diadema (Fabricius, 1779) [1, 3]
Mitopus morio (Fabricius, 1799) [3, 4, 5, 8, 9]
Oligolophus hanseni (Kraepelin, 1896) [5, 8]
Oligolophus tridens (L. Koch, 1836) [6]
Paroligolophus agrestis (Meade, 1855) [3, 5, 8]
Phalangium opilio Linnaeus, 1758 [5]
Platybunus triangularis (Herbst, 1799) [3, 6, 8, 9, 11]

Order Pseudoscorpiones (False-scorpions; 1 species)

Family NEOBISIIDAE (1)
Neobisium (*Neobisium*) *muscorum* (Leach, 1817) [8, 9]

Subphylum Crustacea

The list of woodlice (Onicsidea) is based on the 1996 unpublished report by a Manchester biology student, Alison Deen. The list of aquatic groups is based on the unpublished reports of two aquatic invertebrate surveys undertaken by Ian Wallace from the Liverpool Museum in 1996 and by Jonathan Guest in 1998 (see Chapter 12). Nomenclature of Isopoda follows the world checklist by Schotte *et al.* (1995 onwards). A checklist of all the freshwater Crustacea of north-west England ponds is given by Bentley (2008). All the British freshwater Malacostraca are considered by Glendhill *et al.* (1993).

Class Malacostraca (Woodlice, Shrimps, Crabs and allies; 10 species)

Order Amphipoda – Freshwater Shrimps and Sand Hoppers

Family CRANGONYCTIDAE (1)
Crangonyx pseudogracilis Bousfield, 1958 – American Freshwater Shrimp

Family GAMMARIDAE (1)
Gammarus pulex (Linnaeus, 1758) – Common Freshwater Shrimp

Order Isopoda – Woodlice and allies

Suborder Asellota

Family ASELLIDAE (2)
Asellus aquaticus (Linnaeus, 1758) – Common Hog-louse
Asellus meridianus Racovitza, 1919 – Lesser Hog-louse

Suborder Oniscidea – Woodlice

Family PORCELLIONIDAE (1) – Sow Bugs
Porcellio scaber Latreille, 1804 – Common Rough Woodlouse

Family PHILOSCIIDAE (1)
Philoscia muscorum (Scopoli 1763) – Common Striped Woodlouse

Family TRICHONISCIDAE (1)
Trichoniscus pusillus Brandt 1833 – Common Pygmy Woodlouse

Class Brachiopoda

Order Cladocera

Family CHYDORIDAE (1)
Erycercus lamellatus (Müller, 1776)

Family DAPHNIIDAE (2) – Water-Fleas and allies
Daphnia pulex Leydig, 1860
Simocephalus vetulus (Müller, 1776)

Subphylum Myriapoda

The species list is based on the Myriapoda collection made by Dmitri Logunov (Manchester Museum) in 2002, which has been identified by Graham Proudlove (Manchester Museum). The collection is kept in the Manchester Museum (UK). Nomenclature of Diplopoda follows the checklist by Lee (2006). Nomenclature and common English names of Chilopoda follow the latest systematic list of British Chilopoda by Barber (2008). A complete list of the Myriapoda of Lancashire and Cheshire is provided by Blower (1987).

Class Diplopoda (Millipedes; 9 species)

Order Glomerida

Family GLOMERIDAE (1) – Pill Millipedes
Glomeris marginata (Villers, 1789)

Order Julida

Family JULIDAE (4)
Cylindroiulus punctatus (Leach, 1815) – Blunt-tailed Snake Millipede
Julus scandinavius Latzel, 1884
Ophyiulus pilosus (Newport, 1843)
Tachypodoiulus niger (Leach, 1815) – White-legged Snake Millipede

Family BLANIULIDAE (1)
Proteroiulus fuscus (Am Stein, 1857)

Family NEMASOMATIDAE (1)
Nemasoma varicorne C.L. Koch, 1847

Order Polydesmida

Family POLYDESMIDAE (2)
Brachydesmus supesus Latzel, 1884
Polydesmus angustus Latzel, 1884 – Flat-backed Millipede

Class Chilopoda (Centipedes; 8 species)

Order Geophilomorpha – Earth Centipedes

Family GEOPHILIDAE (3)
Geophilus carpophagus Leach, 1814 – Luminous Centipede
Geophilus insculptus (Attems 1895) – Common Geophilus
Geophilus truncorum (Bergsoë and Meinert, 1886) – Small Geophilus

Family HIMANTARIIDAE (1)
Stigmatogaster subterranea (Shaw, 1789) – Western Yellow Centipede

Family LINTOTAENIIDAE (1)
Strigamia acuminata (Leach, 1814) – Shorter Red Centipede

Order Lithobiomorpha – Stone Centipedes

Family LITHOBIIDAE (3)
Lithobius crassipes L. Koch, 1862 – Thick-legged Lithobius
Lithobius forficatus (Linnaeus, 1758) – Common Lithobius or Brown Centipede
Lithobius variegates Leach, 1814 – Variegated Centipede

Phylum Mollusca

The list of terrestrial groups is based on unpublished data collected from Alderley Edge by a Manchester biology student, Alison Deen, who sampled soil invertebrates in October 1996 and February 1997, and by Dmitri Logunov (Manchester Museum), who sampled litter-dwelling invertebrates between March and October 2002. The list of aquatic groups is based on the unpublished reports of two aquatic invertebrate surveys undertaken by Ian Wallace from the Liverpool Museum in 1996 and by Jonathan Guest in 1998 (see Chapter 12).

Nomenclature follows the checklist of British non-marine Mollusca by Anderson (2011). A checklist of all the non-marine Mollusca of Cheshire can be found in Pettitt (1975); the list of aquatic molluscs of north-west England ponds is given by Bentley (2008). A useful resource for understanding and identifying all the British terrestrial, freshwater and marine molluscs is the website of Conchological Society of Great Britain and Ireland (http://www.conchsoc.org/index.php).

Class Gastropoda (Snails and slugs; 26 species)

Order Pulmonata

Family ACROLOXIDAE (1) – River Limpets
Acroloxus lacustris (Linnaeus, 1758) – Lake Limpet

Family AGRIOLIMACIDAE (1)
Deroceras laeve (Müller, 1774) – Meadow Slug

Family ARIONIDAE (4)
Arion (*Arion*) *ater* (Linnaeus, 1758) – Great Black Slug
Arion (*Kobeltia*) *intermedius* Normand, 1852 – Hedgehog Slug
Arion (*Kobeltia*) *hortensis* Férussac, 1819 – Southern Garden Slug
Arion (*Mesarion*) *subfuscus* (Draparnaud, 1805) – Dusky Slug

Family CLAUSILIIDAE (1) – Door Snails
Clausilia (*Clausilia*) *bidentata bidentata* (Ström, 1765) – Two-toothed Door Snail

Family EUCONULIDAE (1)
Euconulus (*Euconulus*) *fulvus* (Müller, 1774)

Family DISCIDAE (1)
Discus (*Gonyodiscus*) *rotundatus rotundatus* (Müller, 1774) – Discus Snail

Family LIMACIDAE (1) – Keelback Slugs
Limacus flavus Linnaeus, 1758 – Yellow Slug

Family LYMNAEIDAE (3) – Pond Snails
Galba (*Galba*) *truncatula* (Müller 1774) – Dwarf Pond Snail
Lymnaea (*Lymnaea*) *stagnalis* (Linnaeus, 1758) – Great Pond Snail
Radix balthica (Linnaeus, 1758) – Wandering Pond Snail

Family OXYCHILIDAE (1)
Oxychilus (*Oxychilus*) *alliarus* (Miller, 1822) – Garlic Snail

Family PLANORBIDAE (7) – Ramshorns
Anisus (*Disculifer*) *vortex* (Linnaeus 1758) – Whirlpool Ramshorn
Bathyomphalus contortus (Linnaeus, 1758) – Twisted Ramshorn
Hippeutis complanatus (Linnaeus 1758) – Flat Ramshorn
Gyraulus (*Armiger*) *crista* (Linnaeus, 1758) – Nautilus Ramshorn
Gyraulus (*Gyraulus*) *albus* (Müller, 1774) – White Ramshorn
Planorbarius corneus corneus (Linnaeus, 1758) – Great Ramshorn
Planorbis carinatus Müller, 1774 – Keeled Ramshorn

Class bivalvia (Oysters, clams and allies; 5 species)

Order Veneroida

Family SPHAERIIDAE (5) – Pea Mussels or Peaclams
Musculium lacustre (Müller, 1774) – Lake Orb Mussel
Pisidium milium Held, 1836 – Quadrangular Pillclam
Pisidium personatum Malm, 1855 – Red-crusted Pea Mussel
Pisidium sp. (not *milium*)
Sphaerium corneum (Linnaeus, 1758) – Horny Orb Mussel

Phylum Annelida (Earthworms, Leeches and allies; 7 species)

The list is based on the 1996 unpublished reports by Ian Wallace from the Liverpool Museum, by Jonathan Guest in 1998 (see Chapter 12) and on the data released at our request by rECOrd, the Biodiversity Information System for Cheshire (courtesy of Tom Hunt). Nomenclature follows Elliott and Mann (1979); the latter authors provided a complete account on the sixteen leech species known to occur in Britain.

Class Hirudinea (Leeches; 7 species)

Order Gnathobdellae

Family HIRUDINIDAE (1)
Haemopis sanguisuga (Linnaeus, 1758) – Horse Leech

Order Rhynchobdellae

Family GLOSSIPHONIIDAE (5)
Glossiphonia complanata (Linnaeus, 1758)
Glossiphonia heteroclita (Linnaeus, 1761)
Helobdella stagnalis (Linnaeus, 1758)
Hemiclepsis marginata (Müller, 1774) – Fish Leech
Theromyzon tessulatum (Müller, 1774) – Duck Leech

Order Pharyngobdellae

Family ERPOBDELLIDAE (1)
Erpobdella octoculata (Linnaeus, 1758)

Phylum Platyhelminthes (Flatworms; 1 species)

The record is taken from the 1996 unpublished report by Ian Wallace from the Liverpool Museum. A complete checklist and key for the freshwater triclads in Britain and Ireland (twelve species altogether) can be found in Reynoldson and Young (2000).

Class Turbellaria (1 species)

Order Tricladida – Flatworms

Family PLANARIIDAE (1)
Polycelis sp. (*nigra* or *tenuis*)