Field Guide to

INSECTS

of Britain and Northern Europe

Bob Gibbons

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Back cover photographs: Male Banded Agrion, *Calopteryx splendens* (upper); a solitary bee, *Anthidium manicatum* (lower).
Title page photograph: Meadow Brown butterflies mating, *Maniola jurtina*.

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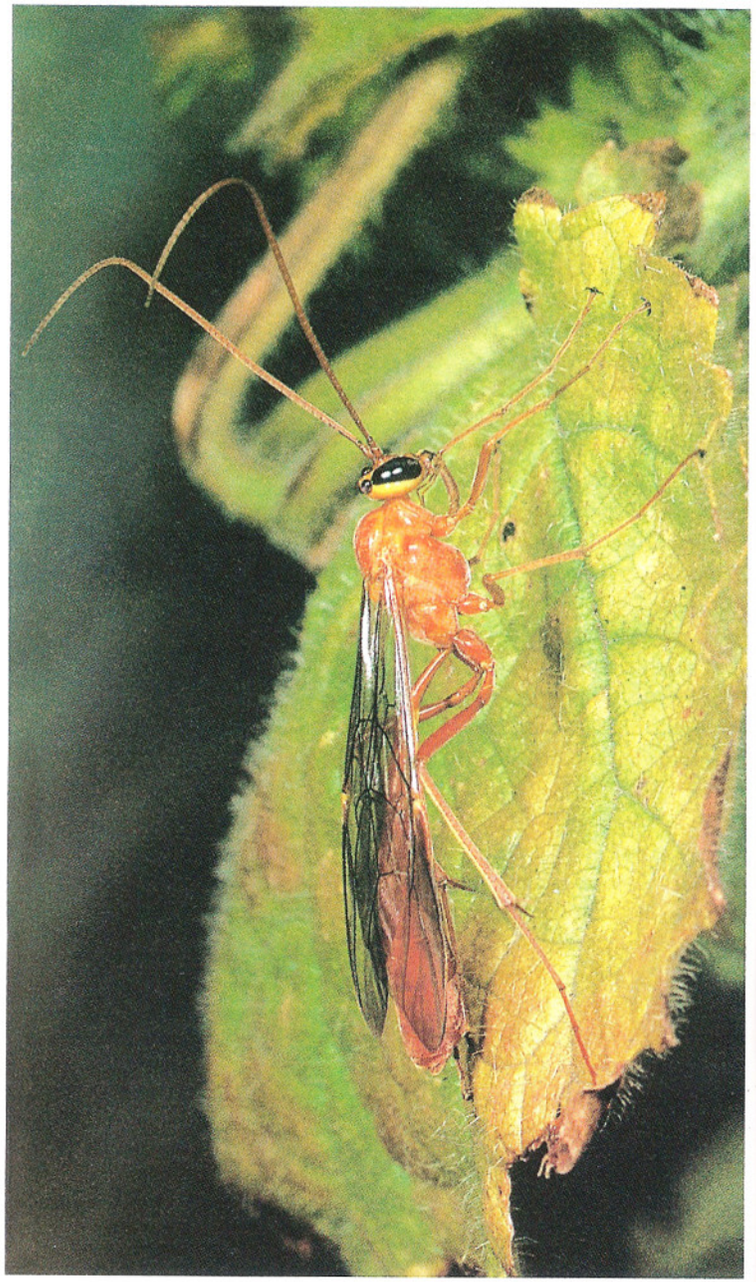
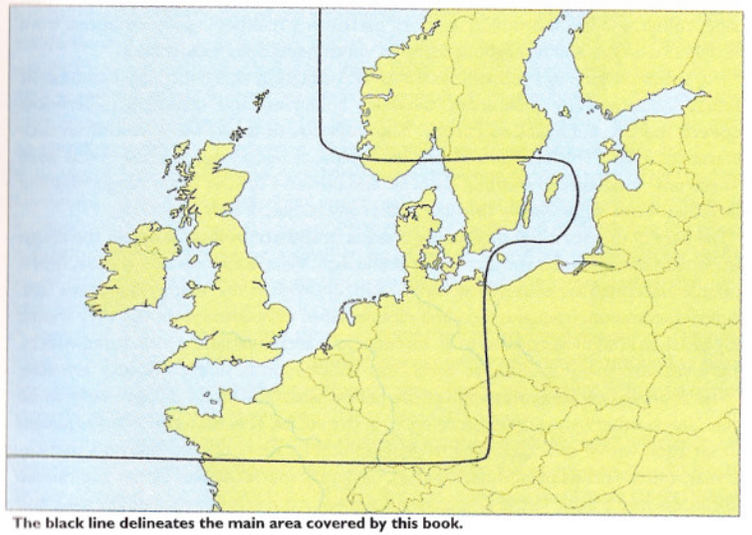


A common ichneumon wasp, the Yellow Ophion.

How to Use this Book

This book is intended as an introduction to the marvellous range of insects to be found in Britain and adjacent parts of north Europe (see map for area of coverage). No single portable volume can possibly cover the full range of insects that occur within this area, and this book is highly selective in the insects that it includes. Although the whole range of insect orders is covered, within this framework I have selected examples that have one or more of the following features:

- They are readily noticed by the average naturalist, either singly or *en masse*. This includes species that may be noticeable by some aspect other than simply their visible adult stage. For example, some larvae are especially noticeable (even though their adult phase may be drab or inconspicuous); some insect products are especially noticeable, such as the froth, known as 'cuckoo spit' produced by froghopper nymphs; and occasionally insects may be more noticeable by their sound than by their appearance, such as house crickets. As far as possible, it is the conspicuous feature that has been illustrated, since this is what people notice most.
- They are reasonably frequent and widespread. There are a few exceptions to this, where particularly distinctive insects are involved; or within the key groups of Odonata (dragonflies and damselflies), butterflies, and Orthoptera (grasshoppers and crickets), where we have aimed to include all UK species, and most NW European species, whether they are common or rare.
- They are identifiable in the field. In practice, this is not as simple as it sounds, since many apparently distinctive species have a number of close relatives that differ only in minor characteristics. In these cases, it is the group of species that is distinctive and identifiable, and this is usually made clear in the text. Apart from the main groups of larger insects, most groups of insects require specialized texts and detailed study for their certain identification. Some of the more appropriate specialized guides are listed in the Bibliography.



The black line delineates the main area covered by this book.

IDENTIFYING INSECTS

When using the book to try to identify an insect, ideally you should have the book there at the time; it is designed to be portable, and used in the field. It is surprisingly easy to see an insect that appears to be highly distinctive at the time and to find, on later examination of illustrations, that there are several similar-looking species. It can then be very difficult to recall which key features 'your' insect possessed!

If you already know which order the insect belongs to, it is a quick process to flick through the pictures to see if there is anything like it. If so, check the timing and distribution to see if its occurrence is likely, then read the 'similar species' to see if anything fits better. If you are uncertain where the insect fits into the scheme of things, you can use the illustrated key to the main groups of adult insects. For this, you need to be able to see the details clearly; it can be helpful to catch the insect and examine it in a clear container, releasing it afterwards. Alternatively, you can scan through the photographs in the whole book, leaving aside groups to which the insect obviously *does not* belong. For example, if you had a stonefly, it would be readily obvious that it was not a butterfly, dragonfly, grasshopper or cricket, even though you had no idea what it actually was. Once narrowed down, the procedure is the same as above.

LAYOUT OF SPECIES DESCRIPTIONS

The layout of each species description follows a roughly constant pattern, though this is necessarily altered at times, according to the type of insect.

- If the whole description is preceded by the symbol * , this denotes that the insect does not normally occur in the UK. This speeds up the process of checking through possibilities if you are working within the UK.
- This is followed by the English name, where there is one. Many insects are not well enough known to have an English name, and in such cases the description starts with the scientific name, in italics. In a few instances, where the name has been changed recently and the old one was familiar, alternative scientific names have been given.
- Next comes a description of the insect, beginning with a general indication of size, shape, colour and key anatomical features, particularly mentioning any variations from the illustrated type and highlighting features which need close examination.
- The section beginning **Habitat** describes the habitats in which the insect commonly occurs, indicating any differences between countries, and especially differences between the UK and mainland Europe, if appropriate. (It is surprising how often such differences exist.) This section can only be a guide, as many insects occur in too wide a spectrum of habitats to mention them all, and others – such as larger dragonflies and butterflies – can range widely through almost any habitat, if only in passing.
- The part of the description beginning **Status and distribution** indicates the rough distribution of the insect, and its relative abundance. Where appropriate, the UK distribution is described separately. The terms used, in order of decreasing abundance, are: abundant, common, frequent, local and rare, qualified as necessary, though they should only be taken as a guide, and there can be enormous annual variations with some insects. There are also many species for which this information is simply not fully available.
- The abbreviation **Season** indicates the period when the insect is most likely to be seen. Unless otherwise qualified, it refers to active adults. There is a good deal of potential variation within this, according to geographical location, the weather in a particular year, and the habits of individual species. Generally species appear earlier and survive later in warmer places: in the UK, coastal south-western areas are especially mild, and on the Continent, the W coast of France, and southern areas in general, are the warmest. A mild frost-free autumn may extend the flight period of many summer insects well into November. Some insects, especially aquatic ones, may remain adult all year, but they become less active, or totally inactive, in cold weather; in these cases, only the period during which they are most likely to be seen are given.
- A subsection headed 'Similar species' may follow the general description. This describes closely related or very similar species that are not usually illustrated. In many cases there are large numbers of similar species, and it is not possible to describe them all. Occasionally, where one insect may be confused with another that is described elsewhere in the book, this section may draw attention to this possible source of confusion.

ORDER OF SPECIES

The order of species follows the generally accepted order of families, progressing from the most primitive to the most advanced. Species are all grouped taxonomically, with related species placed together. There is one exception to this: all the galls have been collected together at the end of the book in a special section. Galls are a fascinating study in themselves, and the larger ones readily attract attention. However, it is not possible to classify the insect that caused the gall simply by looking at the gall, and the insects themselves are rarely seen, so it is more useful to group all these insects together. Most such insects come from the orders Hymenoptera or Diptera, though a few other groups are involved, and there are also a number of non-insect gall-formers. Common examples of non-insect galls, such as those caused by mites, are included. Where the gall-forming insect is also likely to be noticed in its adult stage, it appears under the normal taxonomic grouping as well.

What is an Insect?

The term 'insect' refers to a vast group of animals, belonging to over 30 different orders, with a wide variation in structure and behaviour, so it is difficult to describe common characteristics which apply to all of them. The insects are one group of the huge biological tribe (phylum) known as the arthropods, which also includes spiders, crustaceans, millipedes and many other groups, whose primary characteristics include a hard external shell or skeleton, and soft flexible joints at appropriate places which allow the animals to move. These are collectively known generally as 'invertebrates' (i.e. animals that have no backbone). Insects are most likely to be confused with other arthropods such as woodlice, spiders or centipedes. Their main distinguishing characteristics are:

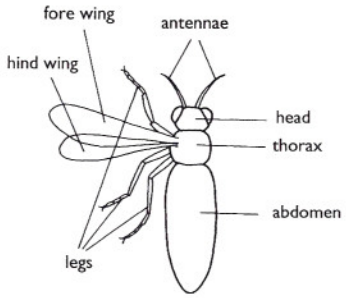
- Insects have six legs, in three pairs. Many insects have one or more pairs of legs missing, modified or reduced, but virtually all insects have six legs at some point in their life-cycle.
- Most insects have wings at some point in their life-cycle. If an invertebrate has wings, it *must* be an insect. However, a small group of insects (the Apterygota, see pp.38–41) never have wings, and there are species scattered through the insect orders that have lost their wings through specialization; e.g. the fleas.
- Insect bodies are divided into three sections: head, thorax and abdomen. The head usually bears one pair of antennae (though these may be very small); the thorax bears the legs and wings, if present; the abdomen never bears legs, though it may have outgrowths associated with mating or other processes.

Immature stages of insects, such as caterpillars, are often much more difficult to categorize, and smaller examples could easily be mistaken for some non-insect invertebrates. There is no guaranteed way of identifying an immature stage as an insect, though many larvae and most nymphs retain the characteristic three pairs of legs.

The Structure of Insects

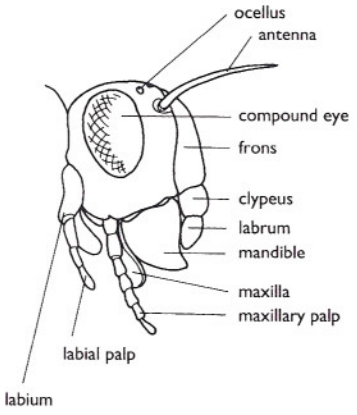
Nowadays, with good reason, most of the interest in insects centres on their ecology, behaviour and economic or conservation significance. However, in order to identify them, it may be necessary to understand their general anatomy, and their role in nature can be better understood if some aspects of their structure and biology are known.

As already described, the insect body is divided into three main parts: **head**, **thorax** and **abdomen**. There are basically 20 segments in an insect body, with six in the head, three in the thorax, and 11 in the abdomen. By no means all of these are usually distinguishable, as they have become fused together without visible joins. The segments are protected by hard plates, known as sclerites, composed mainly of chitin, which protect the internal contents. Between these plates, there are flexible joints, which may or may not correspond to the divisions between segments.



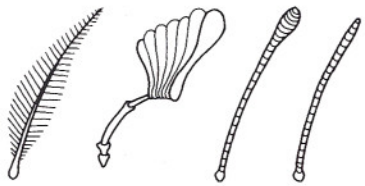
THE HEAD

The head varies enormously in shape from one insect to another. The six structural segments that form it are welded together to form a tough capsule, and usually the segmental divisions are not visible. The head bears the antennae or 'feelers', the mouthparts (which vary widely in structure), and the eyes. Parts of the head are given specific names, as shown in the accompanying diagram of a grasshopper head.



The **antennae** are organs of smell and touch, and virtually all insects possess them, even in their younger stages. There is one pair only, and they vary enormously in structure from being virtually absent to being much longer than the body. Their size and structure relates to their function, and a number of different types can be recognized. For example, male moths use their antennae to detect the presence of female moths, and they are receptive to just a few molecules of scent produced by a female that could be a considerable distance away. This ultra-sensitive detection of scent is made possible by the finely divided nature of the antennae, producing a much greater surface area for molecules to land on. By contrast dragonflies, which have highly developed eyes which they use for finding prey, have very reduced antennae. Some common types of antennae are shown in the diagram. The number of segments varies enormously, from just one or two (for example in some beetles) to over 100 (for example in bush-crickets).

Antennae types

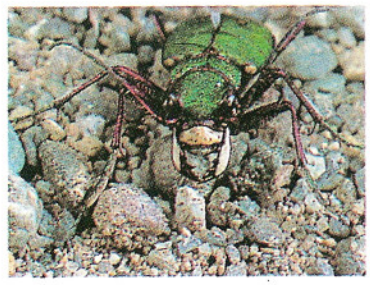


Antennae of a male Convolvulus Hawk-moth.

Insects can possess **eyes** of two types: simple eyes known as ocelli, and compound eyes. The compound eyes are the structures usually referred to as the eyes of an insect, as prominent paired structures on the top or side of the head. Each compound eye is composed of a number of separate units known as ommatidia, each of which has its own lens at the surface of the eye. An insect's eye may be composed of just a few ommatidia, or up to tens of thousands (for example in dragonflies), and generally speaking, the more ommatidia there are, the better the insect's vision will be. The ommatidia are visible on close examination (including in good magnified photographs of insects) as facets on the surface of the eye. Each ommatidium transmits the signal for an image to the brain of the insect, which is then turned into a composite picture. Obviously, more ommatidia allow greater detail to be resolved, and it also follows that insects are particularly good at detecting movement as an object moves from one ommatidium to another.

Virtually all adult insects have compound eyes, with very few exceptions (for example some scale insects), but no larvae do. Simple eyes, or ocelli, are present in larvae and in scale insects, but they are also present in insects that have compound eyes, though they are often very inconspicuous. They have no focusing mechanism and can detect no detail, but they are sensitive to light levels. Their function in adult insects is uncertain, and may be more or less obsolete, though they are more prominent in some groups such as the Hymenoptera. They are usually placed somewhere near the top of the head.

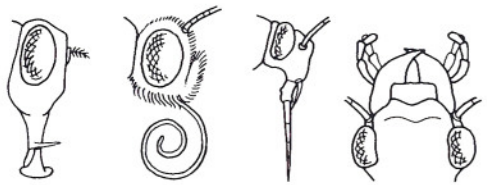
Insect **mouthparts** could be the subject of a whole book in themselves. They are highly variable in structure and function, and different components of the mouthparts may be greatly modified and enlarged or reduced according to requirements. Insects like cockroaches or some beetles demonstrate the basic mouthpart pattern, from which other types have evolved.



The ferocious biting mouthparts of the Green Tiger Beetle.

There is no internal jaw in insects, as there is in mammals, so any preparation of food for ingestion is performed by the external mouthparts. The mouthparts are located at the front of the head, and made up essentially of four parts. The top is formed by the hardened upper lip (labrum), which is actually part of the

Various insect mouthparts



sponge-like (fly) | proboscis (butterfly) | piercing (bug) | crushing (beetle)

head capsule. Below this lie the paired mandibles, or upper jaws, which are heavily sclerotized and provided with powerful muscles; it is the mandibles that equate most closely with the idea of 'jaws' and they may be toothed, pointed and very strong. The mandibles move in towards each other from the sides, and are concerned with crushing and cutting the food.

Below the mandibles lie the paired maxillae, or lower jaws, to which are attached some segmented antenna-like appendages known as the maxillary palps. The maxillae themselves help to hold the food, while the palps have a sensory function, detecting taste and acceptability as food. The lowest part of the mouthparts is made up by the labium, or lower lip, which may carry appendages known as the labial palps.

Mouthparts such as those described above are of the biting type. However, some insects have sucking and piercing mouthparts, or various modifications and combinations of these. For example, butterflies and moths have long probosces, curled when not in use, which are used to suck either nectar from flowers or nutrient-rich liquids from other sources. Bugs, and some 'biting' flies like mosquitoes, have piercing mouthparts for taking in sap or blood, both of which flow out under pressure, obviating the need for a sucking capability. Many flies, such as hoverflies, have 'suction pads', with which they soak up liquids.

THE THORAX

Behind the head lies the thorax, usually clearly separated by a 'neck' or joint. The thorax is made up of three underlying segments, named (starting from the head end) as the prothorax, the mesothorax and the metathorax. Each of these segments carries a pair of legs, if all three pairs are present. Wings are borne on the mesothorax and metathorax. The shape and size of the segments varies considerably, depending to some extent on the tasks they perform. For example in flies, whose hindwings are reduced virtually to nothing, the metathorax is very small. The shape and markings of the various segments may be useful for identification.

The hardened plates, or sclerites, of the thorax all have names, though only two need concern us here. Grasshoppers (p.66) have a strongly developed pronotum, which forms a sort of shield over the thorax, extending down the sides and back to the abdomen. In the groundhoppers (p.74), the pronotum is extended back over the abdomen, or beyond it in some species and its shape is a useful aid to identification. In some bugs, especially shieldbugs (p.87), a protective plate over the mesothorax, known as the scutellum, is enlarged, forming the triangular patch between the wings, and even extending to the tip of the abdomen in some species, such as the European Tortoise Bug, *Eurygaster maura*.

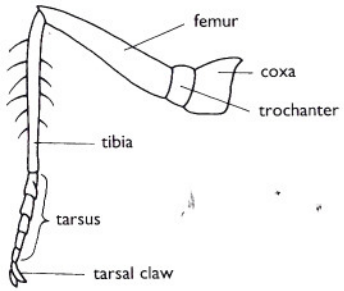
THE ABDOMEN

The abdomen forms the remainder of the insect body. It is basically made up of 11 segments, but segment 11 is usually small or absent, and segment one is often much reduced. In many species, the other segments are clearly visible as divisions, though in some groups they are combined to form fewer divisions. Segments 8 and 9 usually bear the genitalia, which may be either inconspicuous or readily visible. In some groups, such as bush-crickets or ichneumons, there is an ovipositor, shaped according to the egg-laying requirements.

The abdomen may also possess projections from the terminal segment known as cerci. These may take the form of slender 'tails', as in mayflies (see p.42) or stoneflies (see p.64), or be short and more robust, as in grasshoppers, or be modified into 'pincers', as in some dragonflies and damselflies, or earwigs (see p.84). Their function seems to be mainly sensory, rather like antennae. In a few groups, the dorsal sclerite is projected backwards as an additional tail between the two cerci; this is especially noticeable in the three-tailed bristletails (see p.38) and some mayflies (see p.42).

THE LEGS

The legs of insects are borne on the thorax, in three pairs. This is one of the distinguishing characteristics of insects as a group. As with other insect parts, there is great variation in leg structure, and some or all of the legs may be absent in some species or groups (though there are never more than three pairs). The simple basic structure, as seen in fast-running species, such as cockroaches or ground beetles, is as shown in the diagram. Some typical variations include the enlargement of the hind femora in grasshoppers and bush-crickets, for jumping; or the enlarged and powerful front legs of the Mole Cricket, used for digging. Grasshoppers use their legs as part of the system for producing their characteristic calls.



THE WINGS

More important, from several points of view, are the wings. The possession of wings is one of the features that distinguishes insects from other invertebrates, and one of the key factors in their success (see p.14). They are also a useful aid to identification, especially in groups like the Lepidoptera, where the pattern and colour of the wings is all-important.

Structurally, wings are not limbs, but outgrowths of the thorax. Most insects, such as Lepidoptera, Hymenoptera, and Hemiptera habitually have two pairs of wings, though they are not necessarily both conspicuous nor equal in size and

A Cardinal Beetle about to take off, giving a clear view of the difference between its forewings and hindwings.