

## ANT-LIONS, LACEWINGS, and ALLIES Order Neuroptera

Soft-bodied holometabolous insects with wingspans ranging from about 3mm to more than 100mm. Wings are membranous, usually with a dense network of cross-veins that gives the order its name: Neuroptera means nerve-winged. Except in the alder flies (p. 108), the veins usually fork prominently at the wing margins. Flight is weak in most species and the wings are generally held roofwise over the body at rest. Antennae usually thread-like: sometimes moniliform (composed of bead-like segments) and occasionally toothed or clubbed. Compound eyes large, sometimes accompanied by 3 ocelli. Tarsi 5-segmented. Largely carnivorous, feeding mainly on other small insects, although some eat pollen and some hardly feed at all. Larvae are carnivorous or parasitic, with several species living in water. More than 6000 species are known, of which about 300 occur in Europe. The snake flies and alder flies are sometimes placed in a separate order – the Megaloptera.

**ANT-LIONS Myrmeleonidae.** Dragonfly-like insects with long narrow body and narrow wings spanning up to about 100mm in European species. Antennae short and stout, and always clubbed in European species. Males have prominent claspers at the rear. Flight slow and fluttery: mostly nocturnal or crepuscular and often coming to artificial light. Nocturnal species often take flight when disturbed by day. Difficult to see when resting among vegetation with wings pulled tightly back along the body. Mostly carnivorous, plucking small insects from plants, but some also nibble pollen. All like warm, dry areas.

The larvae prey on a wide range of spiders and small insects, which are captured with large jaws. Some larvae roam in soil and leaf litter: others construct pitfall traps in sandy soil. The pit is conical and the larva buries itself at the bottom. Insects blundering into the pit slither to the bottom, often helped by sand grains hurled by the ant-lion, and are grabbed by the large jaws. Ants are among the commonest victims – hence the name. There are 41 European species, mainly in the Mediterranean region. Only one occurs in B.

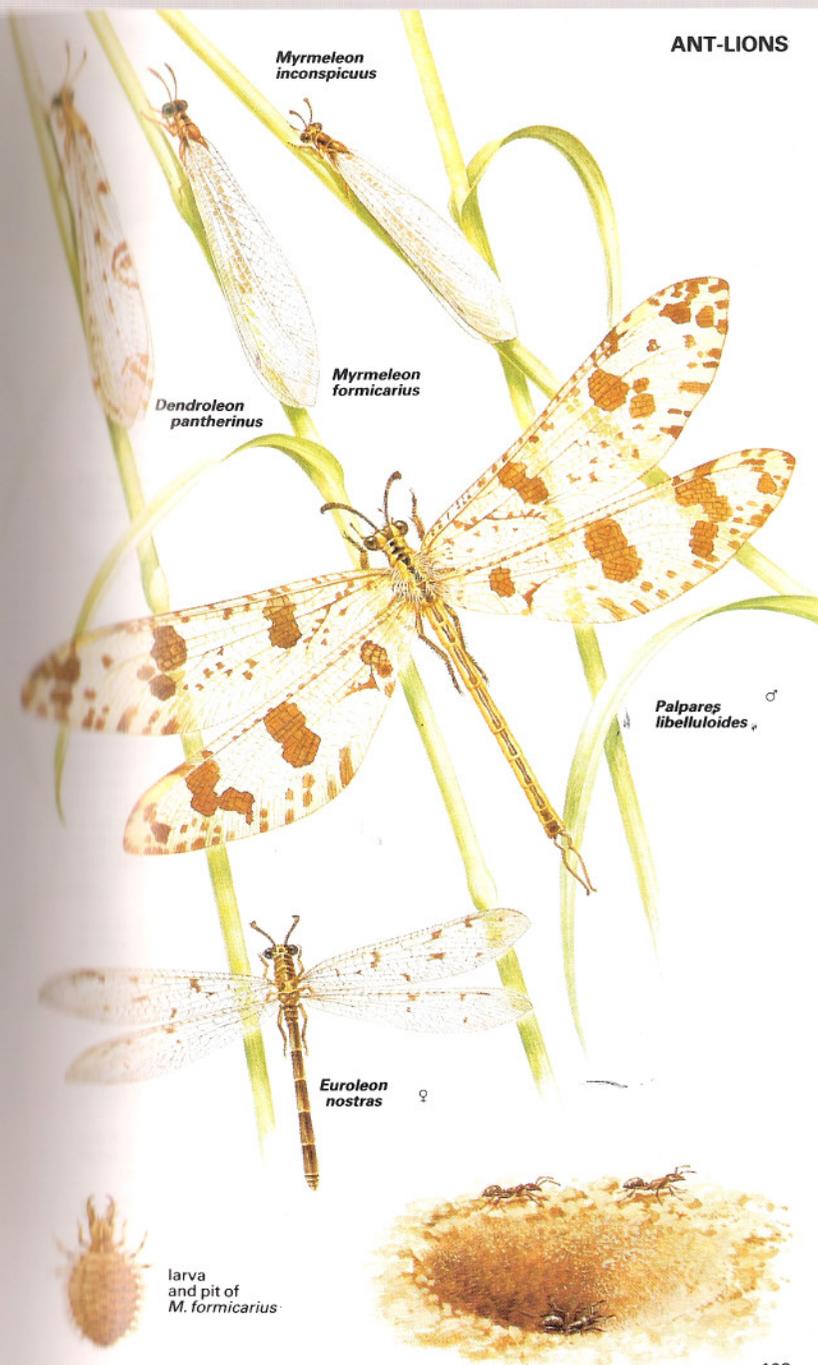
***Dendroleon pantherinus*.** Characteristic eye-spot on hind edge of forewing may be rather indistinct. Dry, open oakwoods with many old trees. 7-8. Larva lives in old leaf litter and makes no pit. S & C.

***Myrmeleon formicarius*.** Top of head black or brown. Wings clear. Dry, open places. 5-8. Larva makes pit in soil, rarely in leaf litter. One of the commonest European ant-lions, from southern Scandinavia southwards. ***M. inconspicuus*** has top of head yellow with brown spots. Wings clear, spanning 50-70mm. Veins dark with just a few clear spots (several similar species have pale veins with a few dark spots). Abdomen chequered. Open habitats, especially near the sea. 5-8. Larva makes pit in fine sand, especially on dunes and in stream banks. S & C.

***Palpares libelluloides*.** An unmistakable insect, flying mainly by day and often forming dense colonies on dunes, rough grassland, and rocky maquis (not too dense). Avoids the driest places. 5-9. Larva (p. 294) lives in soil and debris around vegetation but makes no pit: head protrudes from ground and larva rushes out to grab passing prey in its huge jaws. Mediterranean.

△s ***Euroleon nostras*.** Both wings spotted, but hindwing has just a few small spots in front half. Several cross-veins between radius and media in basal part of hindwing (see below). Open woodland, but avoids driest places: sometimes flies with *M. formicarius*. 6-9. Baltic islands southwards, but very local. Larva makes small pit in bare ground. The only ant-lion in B, found on sand-dunes of East Anglia.

## ANT-LIONS



The hind wing helps to identify the smaller ant-lions. *Myrmeleon* and *Euroleon* (left) have several cross-veins between radius and media in basal region: *Creoleon*, *Distoleon*, and *Macronemurus* (right) have just one such cross-vein.



*Creoleon lugdunensis*

*Distoleon tetragrammicus*

***Creoleon lugdunensis*.** Yellowish thorax with dark brown central stripe. Female abdomen does not extend beyond wings. Two branches of cubital vein in forewing run parallel to hind margin. Hindwing with just one cross-vein between radius and media in basal region (see p. 102). Common in rough grassland and rocky places 5-8. Larva in soil and debris, but makes no pit. SW, as far north as Loire Valley. *C. plumbeus* of SE is very similar.

***Distoleon tetragrammicus*.** Conspicuously spotted, similar to *Eurolean nostras* but with only 1 cross-vein between radius and media in basal part of hindwing (see p. 102). 6-8 in dry oak and pine woods: local but sometimes abundant. Larvae lies in dry leaf litter and makes no pit. S & C.

***Acanthaclisis baetica*.** One of our largest ant-lions. Wings virtually unspotted and with two rows of cells along front edge of forewing. 6-9, mostly on coastal dunes. Larva lives in sand but makes no pit. SW, as far north as Normandy.

***Macronemurus appendiculatus*.** Thorax yellow with 3 brown stripes on top. Abdomen yellow and brown, extending beyond wings in male, who has very long claspers. Often swarms over roadsides and waste land and also among cereals and other crops. Larva lives in soil but makes no pit. S.

**ASCALAPHIDS Ascalaphidae.** Fast-flying relatives of the ant-lions, generally shorter and stouter but with very long, clubbed antennae. Males have prominent claspers. Mostly diurnal, with fast undulating flight, commonly 2-3 metres above the ground. Capture flies and other small insects in flight. May bask on plants with wings open, as illustrated, in dull weather, but normally rest with wings folded roofwise over body. Larvae are like those of ant-lions, but make no pits. They live on the ground, among debris and under stones, often camouflaging their bodies with debris. Ascalaphids prefer warm, dry places and the 15 European species occur mainly in the south. None lives in B.

***Libelloides longicornis*.** Black area at base of hindwing stops well short of anal angle. Yellow veins run through dark area of forewing. General venation pale yellow to deep gold. 6-8 in sunny meadows. SW (including southern Switzerland).

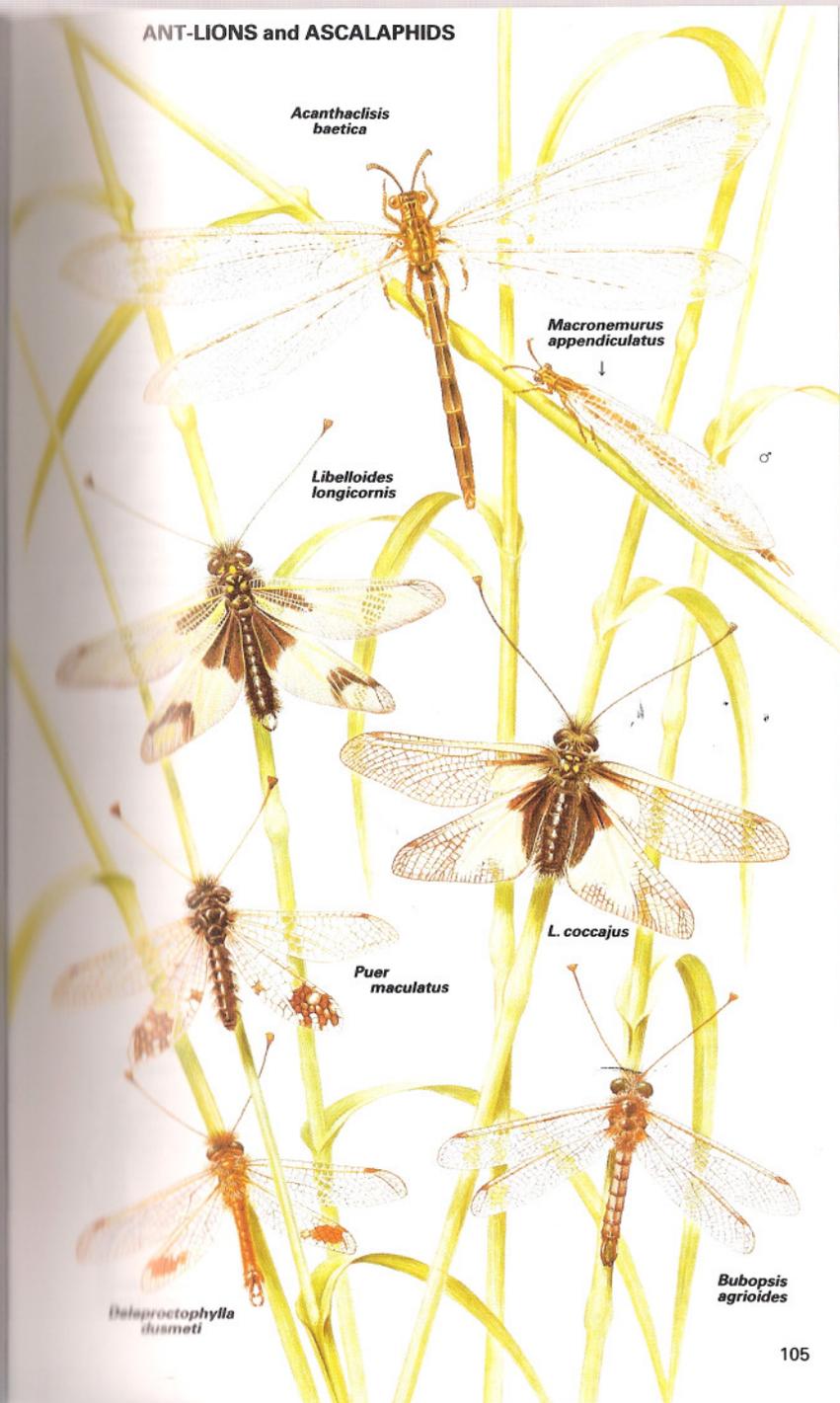
***L. macaronius*** of eastern Europe is similar but base of forewing is yellow and there is a dark bar in the centre of the wing. ***L. coccajus*** has black area at base of hindwing extending almost or quite to anal angle, and no yellow veins in dark areas of forewing. Pale patches white or yellow, often deep yellow in Iberia. Dry, open woods and grassy areas (rarely far from trees). 4-7. S & C.

***Puer maculatus*.** Forewing clear; hindwing densely spotted and sometimes almost black in distal part. Garrigue and rough grassland in summer. Almost confined to southern France: uncommon.

***Deleproctophylla dusmeti*.** Forewing clear; hindwing with brown patch near tip. 6-8 in dry, grassy places. SW. (Insects found from Corsica eastwards have brown patch on all four wings and have recently been treated as a separate species - *D. australis*.)

***Bubopsis agrioides*.** Wings very narrow: first 2 long veins very dark and forming a prominent streak near front edge of all wings. Active at dusk and most often seen at artificial light. 5-8, mainly in and around open woodland, especially pinewoods. SW.

## ANT-LIONS and ASCALAPHIDS



*Acanthaclisis baetica*

*Macronemurus appendiculatus*

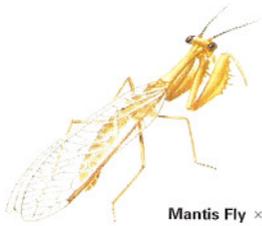
*Libelloides longicornis*

*L. coccajus*

*Puer maculatus*

*Deleproctophylla dusmeti*

*Bubopsis agrioides*



Mantis Fly × 2

**Mantis Fly** *Mantispa styriaca* Mantispidae. Resembles mantis but wings flimsy and insect more timid, feeding mainly on small flies. Active day and night in warm, dry places, especially light woodland with plenty of ground cover. 5-8. Larva enters egg cocoons of spiders, especially wolf spiders, and feeds on eggs. S & C. 4 other similar species in S.

**Nemoptera bipennis** Nemopteridae. Easily recognised by ribbon-like hindwings and lazy, up-and-down flight. Dry, stony and grassy hillsides and coastal pinewoods. 4-8. Larva has long neck and lives on ground. Iberia only. There are 2 similar species in SE, *N. sinuata* being powder-blue with black markings.

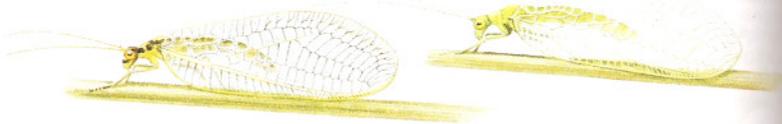
▲ **Conwentzia psociformis** Coniopterygidae. One of many very similar small insects clothed with mealy white powder. Resembles a whitefly (p. 96) but rests with wings steeply roofwise. Common in many habitats 4-11 and often comes to lights at night. Larva eats aphids on trees.

▲ **Osmylus fulvicephalus** Osmylidae. Identified by large size and spotted wings. Streamside vegetation, especially in woods. 4-8. Larva hunts in wet moss and debris. Most of Europe but absent from much of N.

**GREEN LACEWINGS Chrysopidae.** Long veins reduced, with one – the pseudomedia – almost straight and very prominent in centre of wing. Two zig-zag veins – the gradates – rise stair-like in outer part of wing. Generally green, but there are some brown species. Mainly nocturnal. Eggs on slender stalks (p. 294). Larvae (p. 294) mostly aphid-eating, some species camouflaging themselves with empty skins of victims.

▲ **Chrysopa perla** is bluish green, heavily marked with black. Deciduous woodland. 5-8. ▲ **C. pallens** is large and bright green with 7 tiny black spots on head. Woods, hedges, and gardens. 5-8. Larvae of both species naked.

▲ **Chrysoperla carnea** is pale green, becoming pinkish in autumn when it seeks hibernation sites in buildings. All kinds of well-vegetated habitats. Larva naked. There are several other pale green lacewings and accurate identification necessitates a detailed examination of the veins and the genitalia.



*Chrysopa perla* × 2

*Chrysoperla carnea* × 2

▲ **Nothochrysa fulviceps** is large and brown, with central yellow band on thorax. Pseudomedia runs into inner gradate vein. Oakwoods. 6-9. S & C, but very rare in B, where *N. capitata*, with no pale thoracic stripe, is more common.

**Italochrysa italica** resembles *Nothochrysa* but, as in most other chrysopids, pseudomedia runs into outer gradate. Yellow-brown thorax with red-brown side stripes. Dry, well-vegetated areas. 6-9. Larva feeds on grubs in nests of the ant *Crematogaster scutellaris* (p. 234). S.

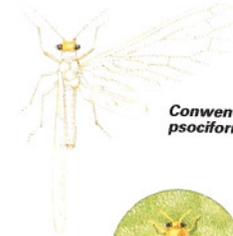
▲ **Sisyra fuscata** Sisyridae. The non-forking veins along front of wing distinguish this family from Hemerobiidae (p. 108). All-dark antennae separate *S. fuscata* from similar species. Streamside vegetation. 4-10. Larva feeds on sponges.

**Dilar meridionalis** Dilaridae. Recognised by pectinate antennae of male or long, slender ovipositor of female. Flies weakly at dusk. Lush vegetation, especially in woodland clearings. 6-9. Larvae live under bark. SW.

## LACEWINGS



*Nemoptera bipennis* × 1

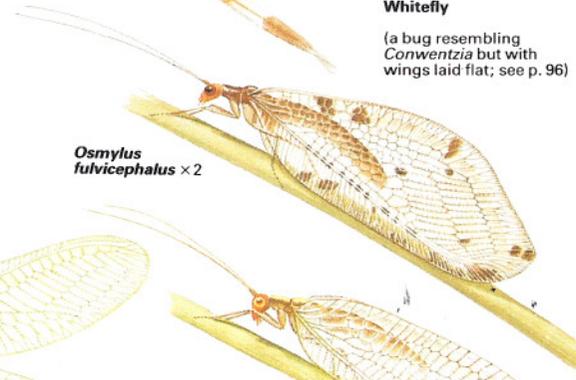


*Conwentzia psociformis* × 6



Whitefly

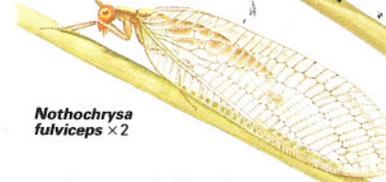
(a bug resembling *Conwentzia* but with wings laid flat; see p. 96)



*Osmylus fulvicephalus* × 2



*Chrysopa pallens* × 2



*Nothochrysa fulviceps* × 2



*Italochrysa italica* × 2



*Sisyra fuscata* × 2.5



*Dilar meridionalis* × 3 ♂

## LACEWINGS and SCORPION FLIES

**BROWN LACEWINGS Hemerobiidae.** A large family of mainly small greyish or brown insects. Distinguished from Chrysopidae by numerous long veins and from Sisyridae by the forked veins along front edge of wing. Larvae (p. 294) less bristly than chrysopids: mainly aphid-eating.

- ▲ *Wesmaelius quadrifasciatus* flies in dry, warm habitats, especially among conifers. 5-9. ▲ *Micromus variegatus* prefers low-growing vegetation and is common in gardens and hedgerows. 4-9. ▲ *Drepanopteryx phalaenoides* is immediately identified by its pointed and hooked wing-tips, but easily passed over as a dead leaf. It flies in light woodland with well-vegetated clearings. 4-10. N & C.
- ▲ *Hemerobius humulinus* is one of several very similar species. Forewing pattern varies. Abundant in hedgerows and deciduous woods 3-11.

- ▲ **Alder Fly *Sialis lutaria* Sialidae.** One of 6 very similar species in N & C. Veins not forked at margins. Flies near water, but spends much time resting on vegetation. 4-8. Eggs laid in batches on reeds and other waterside objects. Larva (p. 296) aquatic.

**SNAKE FLIES Raphidiidae.** Named for the long 'neck', on which the head can be raised way above the body. Mainly woodland insects and largely aphid-eating. Female with long ovipositor. Larvae (p. 294) eat various insects under bark and in dead wood. Several very similar species in Europe, differing in detailed wing venation and also in shape of head.

- ▲ *Phaeostigma notata* is associated mainly with oaks. Usually 2 cross-veins in pterostigma. 4-8. Larva in stumps of various trees, but mainly oak. N & C.
- ▲ *Subilla confinis* is smaller (c. 20mm wingspan), with only 1 cross-vein in pterostigma. Associated with pines. 5-7. S & C. ▲ *Atlantoraphidia maculicollis*, one of the commonest species, is confined to conifers. About the same size as *S. confinis*, but with narrower head. 1 cross-vein in pterostigma. 5-7. S & C: mainly western.

*Inocellia crassicornis* resembles the above but has no ocelli and no veins crossing pterostigma. Associated with conifers. 5-7. N & C.



*Phaeostigma* wing



*Inocellia* wing

## SCORPION FLIES Order Mecoptera

Named because male abdomen is often up-turned, but main diagnostic feature is downward extension of the head to form a stout beak. There are some 400 known species and about 30 – mostly *Panorpa* species – live in Europe. These fly weakly in shady places, eating mainly dead animal matter and fruit. They fly mainly 5-8, but there are two or more broods in S and may fly all year in Mediterranean area. Larvae (p. 294) are caterpillar-like. The species are often difficult to separate, especially the females.

- ▲ *Panorpa communis* is a typical species with fairly heavy spotting on wings.
- ▲ *P. germanica* is similar but spotting may be lighter, and absent altogether in N. Distinguished from *communis* by the parallel appendages on male abdomen (caliper-shaped in *communis*). ▲ *P. cognata* is slightly smaller and usually paler: 6th abdominal segment in male is square and appendages divergent. *P. alpina* of S & C has almost spotless wings but is best identified by the short subcostal vein. *P. rufostigma* of SE has a red pterostigma. *P. meridionalis* is a heavily spotted species from Iberia and southern France.

*Bittacus italicus* Bittacidae. clings to vegetation with front legs and grabs small insects with its long back legs. Male has no up-turned tail. All four wings long and narrow. Shady places in spring and summer. S.

- ▲ **Snow Flea *Boreus hyemalis*** is flightless, with much reduced wings and no up-turned tail. Lives among mosses. 10-4: often seen hopping over snow.



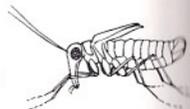
*P. alpina*



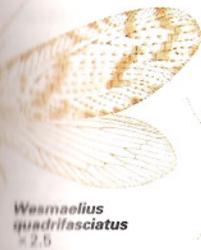
*P. rufostigma*



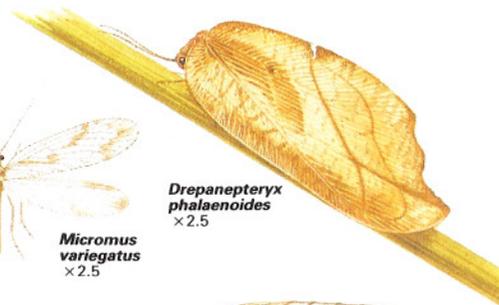
*P. meridionalis*



Snow Flea



*Wesmaelius quadrifasciatus*  
× 2.5



*Drepanopteryx phalaenoides*  
× 2.5



*Micromus variegatus*  
× 2.5



*Hemerobius humulinus*  
× 3



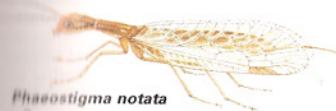
*P. notata*



*A. maculicollis*



*S. confinis*



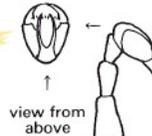
*Phaeostigma notata*  
× 2



*Panorpa communis* × 2



*Bittacus italicus*  
× 1.5

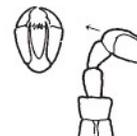


view from above

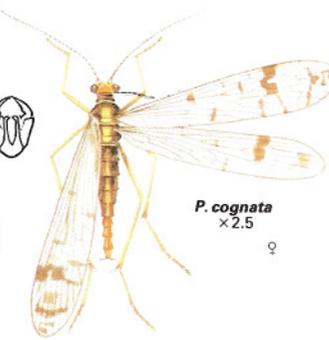
*P. communis*



*P. germanica*



*P. cognata*



*P. cognata*  
× 2.5

## BUTTERFLIES and MOTHS Order Lepidoptera

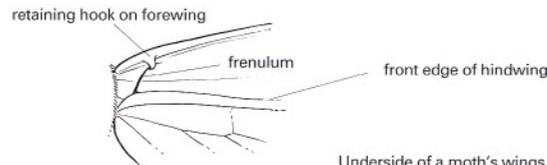
A very large order, with some 150,000 known species. About 5000 species occur in Europe and about half of these live in Britain. A few moths have wingless females, but the insects generally have two pairs of membranous wings clothed with minute scales. The scales provide the wing colour and pattern, but they are easily detached: touch the wings and you will find scales on your fingers. Insects that have been flying around for several weeks often look dull and worn as a result of losing many of their scales. Lepidopterans show little variation in general structure and are easily recognised as such, but they do exhibit a remarkable range of sizes. European species have wingspans ranging from 3mm to 150mm, and some tropical species exceed 300mm.

Adult **mouth-parts** are almost always in the form of a slender tube called the proboscis. They use this to drink nectar from flowers, and sometimes to suck up other fluids. When not in use, the proboscis is coiled neatly under the head. Many moths lack a functional proboscis and take no food in the adult state. Some of the more primitive moths, including the *Micropterix* species (p. 124) have retained biting jaws and feed on pollen.

The simple division of the order into **butterflies** and **moths** is an artificial split, based on simple observations and having no real scientific basis. There are about 25,000 known butterfly species and over 120,000 moths. No one feature separates all the butterflies from all the moths, and moth groups differ from each other just as much as they do from butterflies. Nevertheless, the butterfly/moth distinction is well established in the English language and unlikely to be abandoned.

Butterflies are day-flying insects, usually brightly coloured, generally resting with their wings brought together vertically above the body, and with clubbed antennae. Moths are generally nocturnal, rather dull in colour, hold their wings either flat or roofwise over the body at rest, and seldom have clubbed antennae. But there are exceptions: in Europe, the burnet moths (p. 134) are colourful and diurnal and have clubbed antennae – while some butterflies are quite drab. Most moth antennae are either hair-like or feathery, those of the male being more feathery than those of the female because the greater surface area helps him to pick up the female's scent more easily during courtship.

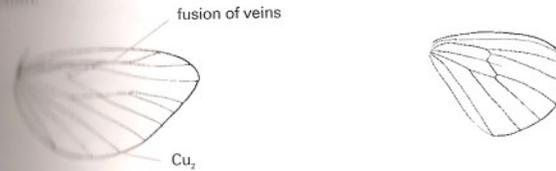
Many moths, including the burnets, also have a **frenulum** on the underside of the hindwing. This is a bristle springing from the 'shoulder' of the wing and running forward to be held in a small catch on the underside of the forewing. Its function is to link the wings together in flight. Only one butterfly – an Australian skipper – is known to have a frenulum. Butterflies generally link their wings together simply by means of a large overlap, and the same is true of those moths without frenula.



Underside of a moth's wings, showing how the frenulum connects them

The Lepidoptera are arranged in numerous **families**, based largely on wing-venation. This can sometimes be seen through the covering of scales, and one can usually make out a prominent cell (called the discal cell, or simply the cell) near the centre of the wing. But venation is of little use with living insects and one must rely on general appearance to assign them to their families. With a little practice, this is not difficult. Colour alone may be enough with the butterflies: predominantly white or yellow species belong to the *Pieridae* (p. 114), blue ones to the *Lycaenidae* (p. 122), and brown ones with eye-spots to the *Satyridae* (p. 120). Moths are a little more difficult, but many families have characteristic

features. The *Noctuidae* (p. 156) are generally rather stout-bodied with drab or grey wings laid flat or held roof-like over the body at rest. The *Pieridae* (p. 148) are similar but have a slightly different forewing venation. The *Geometridae* (p. 170) are rather flimsy and generally rest with their wings flat. Some members of the *Pyralidae* (p. 128) look like them but are distinguished by the hindwing venation. The presence or absence of tympanal 'ears' may also be used to distinguish certain families. These membranes, when present, occur at the rear of the thorax or at the front of the abdomen. At least some moths are known to be able to pick up bats' echolocation signals and to take avoiding



Venation of hindwing of pyralid (left) and (right) geometrid moths

**Life Histories** Among the butterflies the sexes are usually brought together mainly by visual signals emanating during flight, although scent signals come into play during the later stages of courtship. Most moths rely entirely on scent, and this is why it is much easier to breed moths in captivity than butterflies, which need plenty of flying space. **Eggs** are usually laid on the appropriate food-plant, and a lens will reveal that many are exquisitely sculptured. Some species pass the winter in the egg stage, but most eggs hatch within a couple of weeks or so and the **larvae** or **caterpillars** start to feed. Almost all lepidopteran larvae are vegetarian, feeding on or in almost every kind of terrestrial plant and attacking every part from the root to the flower and seed, although most species feed on the leaves. Many are serious agricultural pests. A few, such as the wool-eating clothes moth larvae, feed on animal matter. Their natural habitats are the nests of birds and mammals, where they find plenty of fur or hair to eat.

The typical caterpillar has three pairs of true legs at the front and five pairs of stumpy or fleshy prolegs at the back. The last pair are known as claspers. All the prolegs are furnished with numerous minute hooks, with which the caterpillar keeps a firm hold on its food-plant. Some species have fewer than five pairs of prolegs. Geometrid larvae have only two pairs, including the claspers. They move by stretching out along a twig and taking a grip with the front legs, and then bringing the claspers right up behind them. In doing so, the body is arched up (see p. 176), and these caterpillars are commonly known as loopers.

After three or four moults the caterpillar is ready to turn into a **pupa** or **chrysalis**. Many moth larvae spin silken cocoons in which to pupate – usually among the leaves of the food-plants. Others burrow into the soil and make silk-lined chambers. Most butterfly larvae pupate naked on the food-plants, either hanging from the tail-end or held upright against a stem by a silken girdle. Many butterfly and moth species pass the winter in the chrysalis stage. Others overwinter as larvae, either completely quiescent (hibernating) or remaining active and feeding when conditions allow. A few species hibernate as adults.



Butterfly pupae: suspended (left) and (right) upright or succinct



A typical moth pupa