

8

Order Odonata: the dragonflies and damselflies

49 species in 9 families

Despite being linked with the Ephemeroptera within the Palaeoptera, the Odonata have a very different appearance from the mayflies. The wings are long, narrow and parallel-sided, and the fore and hind wings are the same length. Details of the wing venation are widely used at the higher level classification. There are two distinct suborders of Odonata: the Zygoptera, or damselflies, and the Anisoptera, or dragonflies, although members of the whole order are often known colloquially as dragonflies. A third suborder was formerly recognized, the Anisozygoptera known from just two species in southeast Asia, but these are now considered as Anisoptera.

Adult Odonata are well known to most people; their bright colours, rapid flight and impressive behaviour during territorial defence, courtship and hunting prey always attract attention. In contrast to the Ephemeroptera, dragonflies are very strong and agile fliers and they are fierce and effective aerial predators. They have many morphological features that enhance this predatory role: the large compound eyes give them acute vision (Fig. 8.1); their spiny legs are held forward, basket-like, to catch prey on the wing; and to aid this function the thorax is skewed to bring the leg attachments forward. As a result, the wing attachments are towards the back of the thorax, which enables the wings to keep clear of the legs and the directly attached flight muscles allow the fore and hind wings to beat independently, greatly increasing manoeuvrability in the air (Fig. 8.2). Some adults chase their prey during patrolling flights; others dart out quickly from a favourite perch. These two kinds of flight are also

exhibited by the highly territorial males; these either regularly patrol their chosen site for a female to oviposit, or else wait on a perch and fly out quickly to repel competing males.

Some characteristics are concerned with reproduction, which is complex in this group. The first stage is for the male to grab the female's thorax with his legs, and then grasp her behind the head with his anal appendages (see Figs. 8.5 & 8.13). The pair can then continue flying in a straight line, the male in front, in the so-called tandem position. Next the male transfers sperm from the gonopore at the apex of the abdomen to his secondary intromittent organ (often loosely called the penis) on the ventral side of the second abdominal segment. The female then brings the tip of her abdomen round in a circle to pick up the sperm from the male, a position known as the copulatory wheel. The couple may remain united until the female is ready to oviposit, when



Fig. 8.1 Eyes of Southern hawk, *Aeshna cyanea* (Aeshnidae) (Photo: Roger Key)



Fig. 8.2 The independently beating wings of a dragonfly (Photo: Robin Williams)

they either revert to the tandem position (see Fig. 8.12) or else the male remains close by, guarding the female as she lays alone (see Fig. 8.4). This prolonged association obviously increases the male's chances of successfully breeding, and his intromittent organ can even displace sperm that the female has acquired from an earlier mating. The eggs are either laid into plant tissue using a piercing ovipositor, or else are dropped into the water where they often adhere to the outside of aquatic vegetation.

Odonata nymphs are found in a wide range of aquatic habitats, though they are usually restricted to still or slow water. The carnivorous nymphs feed on a wide variety of invertebrates, especially insect larvae, though the larger nymphs can capture small fish. The head has an extensible labium, known as the mask, which can shoot out at high speed to catch almost any prey within range. Most damselfly nymphs have a narrow cylindrical body with three plate-like caudal lamellae at the end of the abdomen; these are gills but can also help with locomotion. The larger dragonfly nymphs often have stouter bodies with five small spines at the abdominal apex; their gills are internal to the rectum and oxygen is extracted from water pumped in and out of the anus. A rapid contraction of the rectal muscles can propel the nymph rapidly by means of a jet of water. Identification of nymphs is not easy and a microscopic examination is needed in some groups. Only the larger nymphs or their exuviae can be identified, using books such as Cham (2007, 2009).

Although up to 50 species have been recorded from the British Isles, only 40 could be considered as resident. Two species (*Coenagrion armatum* and *Oxygastra curtisii*) have become extinct in England during the last half century, one species (*Coenagrion*

lunulatum) is known only from Ireland, and many others are regular migrants or vagrants. There is evidence that others have recently become established, so the accepted British total may rise again soon. Every British species has a common name, though some of these were recently contrived for the purpose of species-management plans. A guide to the Irish dragonflies (Nelson & Thompson, 2004) has introduced some entirely different names for some species, based on those appearing in some recent European books, though they have never been widely used in Britain.

There are many useful books on the British species but only a small selection of the very recent ones is included here (Askew, 2004; Brooks, 1997; Corbet & Brooks, 2008; Smallshire & Swash, 2010). As long as the book is up to date, choosing which one to use can be a matter of deciding whether photos or paintings are preferred as illustrations. Because many dragonflies can be recognized in the field, perhaps using binoculars, there is a greater emphasis on watching, rather than catching them although not every species can be identified in this way. This has led to a new approach, very similar to bird-watching, as exemplified by recent books such as Dudley, Dudley and Mackay (2007). This increase in dragonfly-watching, enhanced by their complex life-histories and photogenic appearance, has probably made the group second only to butterflies in insect popularity among amateur naturalists.

There are around 130 species in 11 families in Europe, and 5600 species in 33 families worldwide. A brief world overview of the Odonata is given by Tennessen (2009).

HIGHER CLASSIFICATION OF BRITISH ODONATA

- Suborder Anisoptera
 - Superfamily Aeshnoidea
 - Family Aeshnidae (4 genera, 11 species)
 - Family Gomphidae (1 genus, 1 species)
 - Superfamily Cordulegastroidea
 - Family Cordulegastridae (1 genus, 1 species)
 - Superfamily Libelluloidea
 - Family Corduliidae (3 genera, 4 species)
 - Family Libellulidae (5 genera, 14 species)
- Suborder Zygoptera
 - Superfamily Calopterygoidea
 - Family Calopterygidae (1 genus, 2 species)
 - Superfamily Coenagrionoidea
 - Family Coenagrionidae (6 genera, 13 species)
 - Family Platycnemididae (1 genus, 1 species)
 - Superfamily Lestoidea
 - Family Lestidae (1 genus, 2 species)

SPECIES OF CONSERVATION CONCERN

Two species of Odonata are listed on the Wildlife and Countryside Act 1981: *Aeshna isosceles* (Aeshnidae) and *Coenagrion mercuriale* (Coenagrionidae); both species are also on the UKBAP list. *Oxygastra curtisii* (Corduliidae) is listed on the Bern Convention.

The Families of British Odonata

SUBORDER ANISOPTERA

The dragonflies, in the narrow sense, are distinguished by rather different shapes in the fore and hind wings, the latter having a broader basal section forming an enlarged anal field. The head is about the same width as the thorax, with the eyes usually touching in the mid-line (except the Gomphidae).

SUPERFAMILY AESHNOIDEA

Family Aeshnidae (4 genera, 11 species)

The hawker dragonflies are large and spectacular, well-known for their powerful and almost continuous flight. Their nymphs are found in a wide range of still-water habitats from small ponds to large lakes and canals. None of the British species can be considered as common; *Aeshna juncea* (Common hawkler) is perhaps the most widespread, though it is not found everywhere and *A. cyanea* (Southern hawkler) is more common in southern England (Fig. 8.3), as is *Anax imperator* (Emperor), another large and striking species (Fig. 8.4). *Hemianax ephippiger* is included on the British list as an increasingly common migrant from north Africa and the Middle



Fig. 8.3 *Aeshna cyanea* in flight (Aeshnidae) (Photo: Robin Williams)

East. Other species of *Anax* and *Aeshna* are occasional migrants.

Aeshna isosceles (Norfolk hawkler) is listed on the Wildlife and Countryside Act 1981 and is also on the UKBAP list.

British genera: *Aeshna*, *Anax*, *Brachytron*, *Hemianax*

Family Gomphidae (1 genus, 1 species)

Like all the members of this family the Club-tailed dragonfly, *Gomphus vulgatissimus*, is easily distinguished from the other Anisoptera by the widely separated eyes, like those of the Zygoptera. The nymph lives in running water.

British genus: *Gomphus*

SUPERFAMILY CORDULEGASTROIDEA

Family Cordulegastridae (1 genus, 1 species)

This family was originally included within the Aeshnidae. *Cordulegaster* is the only genus in Europe, and the Golden-ringed dragonfly, *Cordulegaster boltonii*, is the sole British species (Fig. 8.5). This distinctive black and yellow species is most common in the north and west of Britain. The nymph is quite different from those of the Aeshnidae in that it breeds in fast-flowing water.

British genus: *Cordulegaster*



Fig. 8.4 Female Emperor dragonfly, *Anax imperator* (Aeshnidae) ovipositing (Photo: Robin Williams)



Fig. 8.5 Mating pair of Golden-ringed dragonfly, *Cordulegaster boltonii* (Cordulegasteridae) (Photo: Roger Key)



Fig. 8.6 Libellulid nymph (Photo: Roger Key)

SUPERFAMILY LIBELLULOIDEA

Family Corduliidae (3 genera, 4 species)

These metallic green Odonata are known as the emerald dragonflies. All are very local and at least two species are considered as threatened. The nymphs of this family all develop in still water such as canals, ponds and bogs.

Oxygastra curtisii (Orange-spotted emerald) is on the British list, but is now considered extinct in this country; it is listed on the Bern Convention.

British genera: *Cordulia*, *Oxygastra*, *Somatochlora*

Family Libellulidae (5 genera, 14 species)

This is the largest family of British dragonflies, and also includes many large-sized species and distinctive species (Figs. 8.6, 8.7 & 8.8). The species of *Libellula*, known as chasers, have broad, flattened



Fig. 8.7 Adult Four-spotted chaser, *Libellula quadrimaculata* (Libellulidae) emerging from nymphal skin (Photo: Roger Key)



Fig. 8.8 Exuvium of *Libellula quadrimaculata*, with remains of nymphal tracheae (Libellulidae) (Photo: Roger Key)

abdomens, and their nymphs live in still water. The two species of *Orthetrum*, called skimmers, are both rather local in Britain and as their name suggests they fly low over the water; their nymphs develop in either still or slow-flowing water. The status of the species of *Sympetrum*, known as darters



Fig. 8.9 Black darter, *Sympetrum danae* (Libellulidae) (Photo: Roger Key)

(Fig. 8.9) is not always clear. *S. striolatum* (Common darter) is the most widespread resident, but several other species are occasional migrants and some, such as *S. fonscolombi* (Red-veined darter) occasionally breed here. The species in this genus are not easy to separate, especially the females; their nymphs develop in still water. *Pantala flavescens* is included on the British list as a migrant; it is an almost cosmopolitan species known in America as the Globe skimmer, although not commonly seen in Europe.

British genera: *Leucorrhinia*, *Libellula*, *Orthetrum*, *Pantala*, *Sympetrum*

SUBORDER ZYGOPTERA

The damselflies are generally smaller and more delicate than dragonflies, with a weaker flight. The fore and hind wings are almost identical in shape, and the head is much wider than the thorax with the eyes widely separated.

SUPERFAMILY CALOPTERYGOIDEA

Family Calopterygidae (1 genus, 2 species)

A very distinct group, known as the 'demoiselles', with bright colours on the wings and metallic coloured bodies. The male of *Calopteryx splendens* (Banded demoiselle) has broad blue bands across the centre of each wing, while the females have entirely greenish wings (Fig. 8.10); in *C. virgo* (Beautiful demoiselle) most of the wing is bluish, while the female wings are purplish brown. *C. virgo*



Fig. 8.10 Female Banded demoiselle, *Calopteryx splendens* (Calopterygidae) (Photo: Roger Key)



Fig. 8.11 The aptly named Red-eyed damselfly, *Erythromma najas* (Coenagrionidae) (Photo: Roger Key)

nymphs are unusual in preferring fast-running water.

British genus: *Calopteryx*

SUPERFAMILY COENAGRIONOIDEA

Family Coenagrionidae (6 genera, 13 species)

The largest family of damselflies in Britain, containing all the common blue or red species (Figs. 8.11 & 8.12). *Pyrrhosoma nymphula* (Large red damselfly),



Fig. 8.12 Pair of *Erythromma najas* ovipositing (Coenagrionidae) (Photo: Roger Key)



Fig. 8.13 Mating pair of Azure damselfly, *Coenagrion puella* (Coenagrionidae) (Photo: Roger Key)

Ischnura elegans (Blue-tailed damselfly), *Coenagrion puella* (Azure damselfly, Fig. 8.13) and *Enallagma cyathigerum* (Common blue damselfly, Fig. 8.14) are among the most frequently seen and widespread Odonata in the country. Their nymphs are usually in still or slow water, amongst vegetation. *Coenagrion armatum* has become extinct in Britain; *C. scitulum* (Dainty damselfly) was thought to have suffered the same fate though it seems to be surviving in the Thames estuary, but other species are threatened. On a more positive note, *Erythromma viridulum* (Small red-eyed damselfly) now seems to have become established in this country.

Coenagrion mercuriale (Southern damselfly) is listed on the Wildlife and Countryside Act 1981 and is also on the UKBAP list.

British genera: *Ceriagrion*, *Coenagrion*, *Enallagma*, *Erythromma*, *Ischnura*, *Pyrrhosoma*



Fig. 8.14 Common blue damselfly, *Enallagma cyathigerum* (Coenagrionidae) (Photo: Peter Barnard)



Fig. 8.15 White-legged damselfly, *Platycnemis pennipes* (Platycnemididae) (Photo: Robin Williams)

Family Platycnemididae (1 genus, 1 species)

The only British species is *Platycnemis pennipes* (White-legged damselfly, Fig. 8.15), a whitish or very pale blue species, whose nymphs live in well-vegetated water bodies.

British genus: *Platycnemis*

SUPERFAMILY LESTOIDEA

Family Lestidae (1 genus, 2 species)

The two British species of *Lestes* are metallic green in colour, giving them the common name of Emerald damselflies and their nymphs prefer still, often

stagnant, water. *L. dryas* (Scarce emerald damselfly) was thought to have become extinct in Britain, but a few surviving colonies are now known. *Sympetma fusca* is an occasional migrant from continental Europe and it was originally thought that *Lestes viridis* (Willow emerald damselfly) and *L. barbarus* (Southern emerald damselfly) had the same status, but these may now be breeding in parts of south and eastern England.

British genus: *Lestes*

REFERENCES

- ASKEW, R.R. 2004. *The dragonflies of Europe* (2nd edn.). Harley Books, Colchester.
- BROOKS, S.J. 1997. *Field guide to the dragonflies and damselflies of Great Britain and Ireland* (revised edn.). British Wildlife Publishing, Milton on Stour.
- CHAM, S. 2007, 2009. *Field guide to the larvae and exuviae of British dragonflies*, 2 vols. British Dragonfly Society, Whittlesey.

- CORBET, P.S. & BROOKS, S.J. 2008. *Dragonflies*. HarperCollins, London.
- DUDLEY, S., DUDLEY, C. & MACKAY, A. 2007. *Watching British dragonflies*. Subbuteo Natural History Books, Upton Magna.
- NELSON, B. & THOMPSON, R. 2004. *The natural history of Ireland's dragonflies*. Ulster Museum, Belfast.
- SMALLSHIRE, D. & SWASH, A. 2010. *Britain's dragonflies: a field guide to the damselflies and dragonflies of Britain and Ireland* (2nd edn.). WildGuides, Maidenhead.
- TENNESSEN, K.J. 2009. Odonata. In: Resh, V.H. & Cardé, R.T. (eds.) *Encyclopedia of insects* (2nd edn.) Academic Press/Elsevier, San Diego & London, pp. 721–8.

WEBSITES

<http://www.dragonflysoc.org.uk>

The British Dragonfly Society website is the starting point for information about the British species, latest sightings, recommended books and so on, as well as useful links to other sites worldwide. It also has downloads on creating and managing habitats for dragonflies.