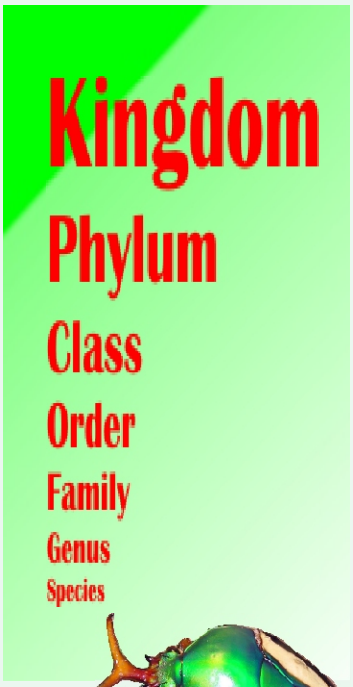
Hands On Learning
with Reading Museum Service

TROPICAL BEETLES Z170

Scientists organise living things into different levels - see the diagram on the right. Altogether there are seven major levels: ***Kingdom***, ***Phylum***, ***Class***, ***Order***, ***Family***, ***Genus***, ***Species***. The ***Kingdom*** is the largest grouping. Until recently only two kingdoms were recognised - animals and plants. At the other end of the scale comes the ***Species***, the smallest grouping. Each species is given a two-part Latin name. The beetle on the right, for example, is *Eudicella gralli* - in English it is called the striped love beetle.



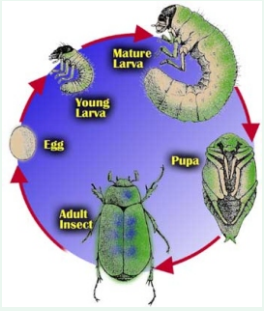


Beetles are placed in the ***Order*** *Coleoptera*, which means sheathed wing in Latin. All beetles are insects that have two pairs of wings that meet neatly down the centre, but the front ones are hard or leathery (and often colourful) and form a protective covering for the working wings underneath (left). To complicate matters, a few beetle species have evolved that have no wings at all! This order contains more named species than in any other order in the animal kingdom.



Eudicella gralli

The specimens in this box are organised into separate orders. The individual species are not known.



All the specimens in this box are adult beetles. However, most beetles have a four-stage life cycle (right). They begin life as an **egg**, which hatches to produce a **larva**, which is generally worm-like in form. The larval stage is often referred to as a caterpillar. The larva grows and eventually becomes a **pupa**, a stage sealed within a cocoon (chrysalis). In the pupal stage, the insect undergoes considerable change in form to emerge as an imago, or **adult**.

Many beetles only spend a short part of their lives as adults. The stag beetle, for example, spends four to six years as a larva, but only a few months as an adult. The purpose of the adult stage is to find a mate and breed. Once this is done, then in many cases the adult dies..

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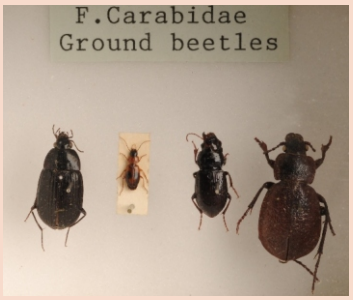
Carabidae



The *Carabidae* family are usually referred to in English as ground beetles. There are thought to be more than 40,000 species worldwide, with about 350 living in Britain.

Most species, both adults and larvae, are carnivorous. Adults can run swiftly to catch their prey. They are usually nocturnal and can be found hidden under the bark of trees, logs or rocks during the day.



Most are dark coloured, but many have beautiful metallic sheens. A photograph of a glossy *Carabus auratus*, or the golden ground beetle, taking a worm, can be seen on the left. Their wing cases (called elytra) normally have nine ridges. The shape of the body is fairly constant throughout the family and many can be recognised as such on sight.

Some members of the *Carabidae* family are known as bombardier beetles. They have evolved an ability to fire a mixture of chemicals from special glands in their posterior. The boiling, foul-smelling liquid is expelled with a loud popping sound. An example of a bombadier beetle can be seen on the right.





Left: Amara aulica, a typical dark-coloured member of the Carabidae family, which is found in the UK. This beetle is 11-14 mm long and lives under stones in grassland and waste ground. It is not a carnivore, but feeds on the seeds of plants such as thistles.

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Dytiscidae



The *Dytiscidae* name means 'able to dive'. In English they are referred to as predaceous diving beetles, water beetles and diving beetles. The family is estimated to include about 4,000 species, around 100 of which live in the UK.



Members of the *Dytiscidae* family have a characteristic appearance - a hard, smooth, oval body, with their hind legs flattened, with a fringe of hairs so that they can act like a paddle. In the water, *Dytiscidae* beetles swim by moving their hind legs simultaneously, like oars.

This family generally prefer slow moving or stagnant water, such as ponds, lakes, dams, and pools at the edges of streams. They need to go to the surface to breath. They store air in a chamber underneath their wing covers. Larvae lack this ability, but many species use a siphon of long filaments at the end of the abdomen to take in air.

Both adults and larvae are fiercely carnivorous. Most larvae do not have a mouth opening, but have long, sickle like jaws which enable them to suck fluids out of their prey items. The larvae will attack animals much larger than themselves, and have been known to feed on other insects, crustaceans, worms, leeches, molluscs, tadpoles and small fish. *Dytiscidae* beetles should not be kept in a tank with such creatures!

Despite their watery lifestyle, adult *Dytiscidae* beetles are capable of flight and often travel some distance to find new habitats. They generally fly in the evening or at night and they use reflected light from a water surface as a method of finding a new pond. They can be confused by artificial reflected surfaces (such as glass) or lights and are often attracted to these sources rather than water.



Above: The great diving beetle, Dytiscus marginalis, which is widespread in the UK.

Buprestidae



Buprestidae is a family of beetles that are usually called jewel beetles or metallic wood-boring beetles because of their beautiful glossy colours. The family is among the largest of the beetles, with some 15,000 species known. They are mainly found in the tropics. Only 12 species are present in the UK, none of them common.

Buprestidae beetles can reach 10 cm in length, although most species are under 2 cm. Their head is usually sunk into the middle section (thorax) of the body. The eyes are often quite large and many *Buprestidae* beetles are active during the daytime.

The *Buprestidae* are perhaps the most brightly coloured of all beetle families. Some examples are shown below. Their bright colours are probably related to their ability to see. Most beetles usually prefer to use other senses rather than sight to find their way around. *Buprestidae*, on the other hand, find food or a mate using the sense of smell to locate the general area, but then they use their eyes to identify the right target. Bright colours are used to distinguish one species from another and males from females.



The plain coloured larvae (left) bore through roots, logs, stems and leaves of various types of plants. The wood boring types generally favour dying or dead branches on otherwise-healthy trees. Some of these are serious pests capable of killing trees and causing major economic damage. Some records suggest that the larvae of some species can live for nearly 30 years before changing into adults.



Lucanidae



The are about 1,200 known species in the Lucanidae family, but only three of them are present in the UK. The males and females are usually very different from each other, with the males possessing large antler-like jaws. Despite their fearsome appearance, these antlers are useless for biting and are used to wrestle other males. If a male can lift his opponent then he will gain control of a favoured mating site. The smaller female looks less threatening, but it can inflict a sharper nip than the male!



The large specimen in the middle of the box is clearly a male. It may be *Odontolabis cuvera*, a native to southeast Asia (left - two males and a female). Although only three species are present in the UK, one of these - *Lucanus cervus* - can grow to over 5 cm and is our largest beetle. Photographs of a male and female can be seen at the bottom of the page



The large adult stag beetle represents only a very small part of an extremely long life cycle. Females lay their eggs in decaying wood. Stag beetle larvae, which are blind and shaped like a letter C, feed on rotting wood. The larvae go through several developmental stages, taking 4 to 6 years before they become pupae. The pupae live in the soil for about 3 months, then emerge in summer to awkwardly fly off to mate. They survive as adults for only a few months at best.

Stag beetle numbers are falling across the whole of Europe. There are, though, more stag beetles in Britain than in other European countries. Increasingly they are finding sanctuary in urban areas, particularly Greater London, rather than in the countryside.





Scarabaeidae

This family is one of the largest of all insect families. *Scarabaeidae* beetles have special antennae with fans on their tips that can be compressed into a ball or fanned out like leaves to sense smells. There are perhaps 30,000 species worldwide, with about 80 species present in the UK. There are three cases of *Scarabaeidae* in this box, each of them representing a different sub-family.

Dynastinae



The *Dynastinae* sub-family occurs all over the world. About 1,400 species of dynastines are known. They are most famous for their size and their horns which, as with stag beetles, are used by the males of some species to defend breeding territory.

Dynastinae are sometimes referred to as rhinoceros beetles because of these horns. The smallish beetle in the centre of the case has a typical 'rhinocerous beetle' horn.

The beetle on the left of the case is a *Goliathus* species - a Goliath beetle. Goliath beetles are found in many of Africa's tropical forests, where they feed primarily on tree sap and fruit. They measure from 511 cm (2 to 4-1/3 inches) in length as adults, and can reach weights of up to 80-100 grams (3 to 3-1/2 oz) in the larval stage, though the adults are only about half this weight. The heavily armoured adults are so large that when flying, they produce a sound akin to a toy helicopter in flight. The females range from a dark brown to silky white, but the males are normally brown/white/black or black/white. In recent years Goliath beetles have been moved from *Dynastinae* to the sub-family *Cetoniiae*.





Photographs: Goliathus goliatus, which may well be the species in this box.

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Dung Beetles



Dung beetles feed partly or exclusively on dung. Some species also feed on mushrooms and decaying leaves and fruits, but for most, dung provides all the necessary nutrients. The larvae feeds on the undigested plant fibre in the dung, while the adults suck up the delicious liquid. Without dung beetles the world would be a much messier place. In the UK each cow produces about 7 tons of dung per year!

There are three main types of dung beetles - the dwellers, the tunnellers and the rollers.



The dwellers live in manure, laying their eggs directly into it. They are usually small and have a longer body than the other two types. The most common but least seen dung beetles in Britain are in the genus *Aphodius*, which contains over 1,000 species world-wide, with about 50 species in the UK. All species of *Aphodius* are dwellers. They lay their eggs straight into the dung and the larvae eat their way through it. The photograph on the left shows *Aphodius rufipes*, which is widespread in the UK.



The tunnellers make tunnels below the dung. The common dor beetle, *Geotrupes stercorarius* (right), is a tunneller. Once a pair have mated they dig a tunnel beneath the cow pat and drag as much dung as they can down into it. The females normally stay in the burrow, using their long broad legs to build side tunnels in the soil. The males provide dung pellets for the female, who places them in each of the side tunnels and an egg is laid in it. The dung gives the young grub nourishment.



Rollers take their dung to their preferred nest site. They usually meet in the dung pat. The male offers the female a giant-sized brood ball which, if accepted, they roll away together. During this time, other beetles often attempt to steal the ball. They bury the ball before mating. The male then leaves to find further partners. The female of this species makes a brood 'pear' or 'pears' and lays a single egg in each. Unusual in insects, the female stays with the ball and her grub, cleaning it and removing its faeces, fungi and bacteria. The photo shows two *Scarabaeus laticollis*, which are found all around the Mediterranean, rolling their brood ball.

Chafers



Chafers are distinguished from the other members of the *Scarabaeidae* family by the exposed tip of their abdomen. They have a characteristic shape with short powerful legs and are commonly between 3 and 36 mm in length.

While dung beetles are usually useful, chafers are generally regarded as more harmful creatures. Adult chafers eat the leaves and flowers of many deciduous trees, shrubs and other plants, but rarely cause any serious damage in the UK. However, their fat, white grubs live in the soil and feed on plant roots, especially those of grasses and cereals. Plants growing in rows are often attacked in succession as the grubs move along from one plant to the next. Chafer grubs feed below ground for 3-4 years before changing into adult beetles.

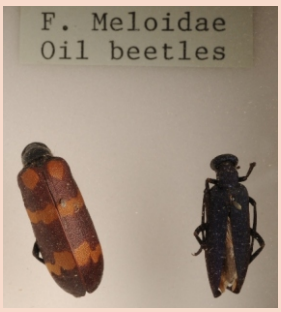


The commonest chafer in the UK is the cockchafer (*Melolontha melolontha*). The adult beetle (left - and on page 1) is a night-flier. It has a buzzing flight and often comes crashing into lighted windows on warm evenings in early summer. They are sometimes called May bugs because that is the month they normally appear. Adults live only for about five to seven weeks. After about two weeks, the female begins laying eggs in the earth.



The larvae (right) hatch after four to six weeks and soon get to work eating plant roots. The grubs develop underground for some three to four years, before they pupate in early autumn and develop into a cockchafer in some six weeks. If you pick a cockchafer larva up it will make a squeaking sound by rubbing a row of pegs on its hind legs against its middle legs. The larvae are sometimes called rookworms because rooks are said to have a taste for them.

Meloidae



Beetles in the *Meloidae* family are commonly known as blister beetles. There are approximately 2,500 known species worldwide. Only three of the nine *Meloidae* beetle species native to Britain remain and the number of sites supporting these species has declined drastically. They are known as blister beetles because they can squirt a poisonous chemical that can cause blistering of the skin and painful swelling.

Blister beetles have very complex life-cycles. In most parts of the world the young stages are parasites of grasshoppers, but the British species are all parasites of solitary bees.



One of the surviving British species is *Meloe proscarabaeus* (left), a bluish black beetle with a long swollen abdomen, which is particularly pronounced in females when they are producing eggs. Females are usually much bigger than males. Towards the end of spring, females dig burrows in the ground close to colonies of host bees, into which they lay around 1000 eggs. These eggs usually hatch the following year.

The larvae are very active, and climb up onto flowers such as dandelions where they wait for a host bee. They attach themselves to the bee using well-developed claws and are flown to the host's burrow, where they turn into a grub-like larva and feed on the pollen stores and eggs of the host. The larva pupates and the resulting adult beetle spends the winter inside the host's burrow before emerging the following spring to begin the cycle all over again.

Far right: A black blister beetle, Epicauta pannsylvanica, from the USA. Right: A blister beetle from India.





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Tenebrionidae



Beetles in the Tenebrionidae family are called darkling beetles, a name which reflects their nocturnal habits and general colour. There are about 15,000 species worldwide, but only about 35 are found in the UK.



Darkling beetles eat both fresh and decaying vegetation. They are often a pest in granaries and warehouses. The mealworm beetle, *Tenebrio molitor* (left), is a species of darkling beetle. Their larvae are produced in huge numbers commercially as a food for pets, wild birds and as fishing bait.

Chrysomelidae



This is a huge family, with over 35,000 species, about 250 of which live in the UK. Adult and larval leaf beetles feed on all sorts of plant tissue. Many are serious pests of agriculture, for example the Colorado potato beetle (*Leptinotarsa decemlineata* - below right) and various flea beetles. In many leaf beetles the wing cases are fused together and they are actually flightless.



One of the commonest members of the *Chrysomelidae* family in Britain is the bloody-nosed beetle (*Timarcha tenebricosa* - left). It gets its English name because it exudes a foul-tasting bright red fluid from its mouth and from various other joints when it is alarmed. The bright red colour of this liquid warns off the insect's attackers.



The bloody-nosed beetle is the largest UK leaf beetle and can often be found in spring and early summer, walking slowly over grassy areas. Average specimens are quite squat, being about 2 cm long, and about half that wide. They are black to bluish or purplish black in colour. When looked at from above, the line down the centre of its back gives the appearance of wing casings, but in fact it is a flightless beetle.

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Cerambycidae



The *Cerambycidae* are commonly known as longhorn beetles. As their name suggests, their distinguishing feature is extremely long antennae, which are often as long as or longer than the beetle's body. The family is large, with over 20,000 species described. About 70 species live in the UK.



Most members of the family feed on wood in their larval stage. Because of this they can be a pest in commercial plantations. Some species prefer seasoned timber. The old-house borer beetle (*Hylotrupes bajulus* - left), for example, loves to eat pine planks. Larvae take two or three or more years to mature, depending on the moisture content of the wood. Full grown larvae can be heard boring in the wood, making a rhythmic ticking or rasping sound much like the sound of a mouse gnawing. When fully grown and transformed into an adult it cuts holes to exit the wood.



The titan beetle (*Titanus giganteus* - right), another member of the *Cerambycidae* family, is one of the largest insects in the world. Adults can grow up to 16.7 cm in length (21 cm including antennae). The larvae have never been found, but are thought to feed inside wood and may take several years to reach full size before they pupate. Boreholes thought to be created by titan beetle larvae seem to fit a grub over two inches wide and perhaps as much as one foot long. The adults defend themselves by hissing in warning and have sharp spines as well as strong jaws. It is said that their jaws can snap pencils in half and cut into human flesh. Adult titan beetles do not feed, but spend all their time flying around to find mates. They are attracted to bright lights after dark.

Curculionidae



The *Curculionidae* is a vast family - over 60,000 species have been described worldwide - and includes weevils and bark beetles. About 500 species live in the UK. The characteristic feature of weevils is their long snout or rostrum, to give it its official name. The snout has jaws at its tip and a pair of elbowed (bent) antennae half way along it. This feature can be clearly seen in the photograph of the acorn weevil on the left. The acorn weevil can use its rostrum to drill through the shell of an acorn. After a tasty meal eggs are then laid inside.





Weevils are almost entirely plant feeders and most species are associated with a narrow range of hosts, in many cases only living on a single species. Many of them are serious crop pests. The grain or wheat weevil (*Sitophilus granarius*) damages stored grain. The boll weevil (*Anthonomus grandis*) attacks cotton crops. It lays its eggs inside unripe cotton bolls, and the young weevils eat their way out.



The longest weevil is the giraffe weevil, *Lasiorhynchus barbicornis* (left), which is up to 8 cm long. At the other end of the scale there are weevils such as *Myrtonymus zelandicus* which is only 0.7-0.8 mm long. Another giraffe weevil (*Trachelophorus giraffa* - below) lives in Madagascar. In this species the total body length of the males is just under an 2.5 cm and it uses its long snout for nest building. The male rolls and secures a leaf and the female lays an egg within the tube.

