

## **ORDER COLEOPTERA - BEETLES**

The front pair of wings of this group of insects are extremely sclerotized and have completely lost their flight functions and have transformed into wing-cases (elytra). During rest, they cover and protect the membranous hindwings, used for flying, fold once or twice underneath the elytra. This group includes some of the smallest insects (some species of the **Ptiliidae** family are only 0, 20 mm long), however there are some true giants in the tropics – up to 160 mm. The head is equipped with well-developed compound eyes. They can be partially reduced or even completely missing, only in the inhabitants of caves and soil cavities or under rocks, where they live in constant darkness. The mouthparts are of the gnawing and more seldom – of a licking type. The legs are adapted for walking or running, and more seldom for digging or jumping.

Beetles are insects, developing with a complete metamorphosis. In individual species, the larva stages may reach 15, but most often they amount to three.

Beetles are typically land insects, but members of some families have adjusted to an aquatic life, both in the larva stage, and as adults. Most beetles are herbivorous, but there are also predators and detritivores. Some species or their larvae are dangerous enemies to agricultural crops and trees, but many of the predators are beneficial.

They form an exceptionally diverse group, in terms of their morphology, vital strategies and habitats, affecting and having an impact on ecosystems in various manners. Their significance to people is also diverse: from being considered sacred (*Scarabaeus sacer* L. in Ancient Egypt), through objects of collecting and photography, to being the main “pests“ for agricultural crops and forests. In certain regions in Asia and Africa some beetles are even used as food. Moreover, beetles play another positive role, as predators and regulators of various pests, as a valuable indicator and tool for the evaluation of the changes and functions in the land and water ecosystems, as well as a key element, ensuring stability and a criterion for the environmental protection.

Compared to butterflies and dragon-flies, they are less involved in the cultural and tourist activities, but due to the diversity of morphological forms and life strategies, they can be successfully used in educational programmes. Beetles are of great significance to science, not only because of their role in the environment and the ecosystem services they provide, but also due to the fact that they are still understudied and there are real chances of discovering new species, and thus – ecosystem services, beneficial to mankind.

This order includes approximately 360 000 species. In Bulgaria, there are probably more than 10 000 species. The Kyustendil region is moderately studied, as over 2000 beetle species may be encountered there.

### **CICINDELIDAE - TIGER BEETLES**

Small predatory beetles with strong mandibles and a slender, often brightly-coloured body and long legs. They are easy to scare with quick reactions. They fly away immediately, long before one can approach them. These beetles attack and eat various insects, including some that may be larger than them. Their larvae, equipped with powerful mandibles, are also predators. They live in vertical holes in the ground, where they ambush their prey. In Bulgaria there are 11 species of this family.

### *Cicindela campestris*

12 - 15 mm, with grass-green elytra and a small round lighter spot on each elytron. It can be found in pastures with low grass in the oak and beech forest strips. If you find yourself in the appropriate habitats, you may see these beetles during the spring or in the beginning of the summer, flying short distances and running fast. They are easiest to see in the spring and the beginning of the summer, in open, sandy spaces, where they stop, while actively flying. Your chances of observing them increase if there are dirt-roads at or near the places of observation.

## **CARABIDAE**

Predominantly predators, more rarely herbivorous or omnivorous beetles. Most of them inhabit the soil. Some are good flyers, and others have reduced wings and cannot fly at all. Most often, these are the species, living in the ground and under rocks. Predatory species usually hunt at night. This family includes some serious pests in cereals (the *Zabrus* genus), and some of the predatory species are beneficial. There are approximately 25 000 species of the Carabidae. In Bulgaria, these amount to approximately 600.

### *Calosoma sycophanta* - **Forest Caterpillar Hunter**

Up to 30 mm, with golden-green elytra and indigo-blue scutellum. The legs and antennae are black. The imago lives for 1 - 3 years, wintering in the soil. It kills large caterpillars and cocoons of butterflies, harmful to trees. In one season this beetle kills approximately 400 caterpillars. It is distributed around the entire Palearctic realm. Due to its obvious benefits, the species have been transferred to the US for biological fight against pests. It can be observed from May to September mostly in the oak belt.

### *Carabus intricatus* - **Blue ground beetle**

24 - 36 mm, dark-blue. A daytime predator, also eating fluids of herbal origin - rotting fruit, mushrooms etc. Usually walks on the ground, but sometimes also climbs trees. It can be observed from May to September in all forest belts.

*Brachynus bombardus* - **Bombardier Beetle** – a relatively small member of the ground beetles family. With an orange-red head and thorax and metallic blueish elytra. One of the most well-known insects due to its interesting defence mechanism. If attacked, this beetle mixes chemical substances with water and enzymes in a special chamber in the back of its abdomen. This causes a reaction, accompanied by a fast discharge of heat. This liquid, heated almost up to one hundred degrees Celsius is ejected from the back of the abdomen. Apart from the thermal shock, the attacker is also subjected to the repulsive smell and corrosive action of this secretion.

### *Myas (Myas) chalybaeus* - **Purple Relict Ground Beetle**

One of the rare members of this family. A carnivore, inhabiting old forests. A relict, existing for more than 3 million years in the region of Bulgaria, survivor of the ice ages.

## **DYTISCIDAE - DIVING BEETLES**

Aquatic beetles with oval flattened body. Hind legs are adapted for swimming. The front legs of the males of some species are equipped with suction cups, helping the male hold to the smooth body of the female, during mating. Both adults and larvae are carnivorous, eating various water invertebrates, but they also attack small fish. Approximately 5000 species of this family are known to science. In Bulgaria there are about 120 species.

#### *Dytiscus marginalis*

27 - 35 mm, olive-green, the thoracic shield and elytra have a light outline. The female is yellow-brown, the anterior 2/3 of the elytra with a number of longitudinal furrows, but there are also specimens with smooth elytra. Both species swim and fly well. Predators, sometimes also attacking small fish. The female lays its eggs in the stems of aquatic plants, one egg per stem. It inhabits still waters, most often with abundant aquatic plants in all parts of the mountain.

### **SILPHIDAE - CARRION BEETLES**

Adults and larvae of most species live at the expense of the corpses of birds and mammals, but some individual species are herbivorous. The family includes approximately 300 species. In Bulgaria there are probably around 30 species.

#### *Necrophorus vespilloides* – (Bulgarian name – *Osobodoben marshoyad/Wasp-like scavenger*/)

12- 22 mm the first and up to 30 mm – the second type, black with two orange strips on the elytra giving it its name (wasp-like). In Bulgaria there are several species of the same genus, with similar colouration, except for two entirely black species (such as the German scavenger). Both species, bury the carcasses of small mammals on the ground, by means of undermining. In the so formed “crypt” the female remains for a long time, digging a small gallery, where it lays its eggs. She takes care of the feeding of the hatched caterpillar-like larvae, which develop for about a week. The larvae start feeding independently when they grow older, but the female actively protects them against other insects, which may penetrate the “crypt”.

### **STAPHYLINIDAE - ROVE BEETLES**

Small to medium-sized beetles with short elytra. Adults and larvae are often predators, but some of them are pollinivorous, eating mushrooms or co-inhabiting ants' nests. Most often observed in humid areas, under rocks, on the humid banks of lakes and rivers or under the barks of old trees. Approximately 25 000 species of this family are currently known. More than 1000 species inhabit Bulgaria.

#### *Staphylinus caesareus*

17 - 22 mm. Unlike most species in the family, which are entirely black, this one has bright red-brown elytra and golden hairs on both sides of the abdomen. Can be seen in early spring, near roads and under rocks in oak and beech belts. The larvae also are predators, eating the larvae of various other insects. They sometimes hunt the larvae of flies or dung-beetles near old cattle faeces or in the tunnels of the dung-beetles.

### **SCARABAEOIDEA SUPERFAMILY**

The imago of the species in this family differ from the members of the other beetle families, mainly for the structure of their antennae. Their last 4 - 7 members are leaf-shaped and gathered in paddles, but may be opened in a fan-like manner. The imago and larvae of most species eat animal manure, and the others – fresh or decaying leaves or wood. The opinions, regarding the systematics of this family vary. Generally it includes 14 sub-families, many of which are considered by some contemporary scientists to be separate families.

#### *Lucanus cervus* - **Stag beetle**

Males - 35- 75 mm, females - 30- 45 mm. The Bulgarian name of the species (elenov rogach – stag beetle), is derived by the over-developed mandibles of the male, resembling the horns of a stag. This is the largest member of the stag-beetle family (Lucanidae) and generally of the beetles (Coleoptera) order in Bulgaria. The most characteristic feature of their external morphology is the extremely well developed upper mandibles. The body of the largest specimen reaches 5.5 cm, and together with the mandibles – up to 7.5 cm. The stag beetle is also characteristic for the clearly expressed variability and sexual dimorphism. The variability concerns the total dimensions and the degree of development of the mandibles. It is a reflection of the differences in the environment (thermal regime, food abundance etc.), in which the individual development of the larva has taken place.

There are also significant differences between the representatives of the two sexes (sexual dimorphism). Females are generally shorter (2.5 – 4.5 cm), with much smaller upper mandibles. Males have militant disposition. They often fight fiercely among each other for the female (much like the male stags) or for food. This is the sole use of their massive mandibles. Adults usually fly in June - August, most often in oak forests. The larva has a long life – up to 5 years. It inhabits rotting wood, which it eats.

It is distributed all around Bulgaria at 0 to 1400 meters of altitude.

**The stag beetle is a protected species in Bulgaria and Europe.**

#### *Geotrupes vernalis* - **Spring dor beetle**

14 - 20 mm with a bulky round body, metallic blue or metallic green. The male and the female dig a funnel-shaped opening under a pile of horse or cattle manure. A 5-cm long vertical tunnel starts from the bottom of that funnel, connecting it to a vast chamber. Animal manure is stored in lateral tunnels, which is used as food for the beetles, and in the chamber they form an 8 - 10 cm long manure “sausage”, at one end of which the female lays the eggs. She remains in the chamber, until the hatched larvae grow and go into their pupa stage. The beetles appear in early spring, near animal manure, in the pastures and meadows in the oak and beech belts, together with other species of the same genus.

#### *Scarabaeus pius* – **Dung beetle**

This beetle is one of the most interesting insects in Bulgaria. Apart from South Europe, it also inhabits North Africa and Middle Asia. In Bulgaria the scarab winters buried into the soil and usually comes out in April. It is active during the day, mostly in warm and sunny weather. As an adult and larva it feeds on dung. It is able to find food, due to its excellent sense of smell. This insect senses the smell of fresh cattle or horse manure from a long distance. Using the front of its head and the two foremost legs, the scarabs separate small particles from the fresh faeces they have found, and roll them into balls. When it is time to lay eggs, the female scarabs make separate

dung balls. They roll them at some distance, and then bury them into the soil. While doing that, the ball becomes pear-shaped. Then the female scarab lays an egg in the narrower part of the ball. With this, scarab's instincts to care for the offspring are exhausted. The hatched larva starts eating the dung, without damaging the walls of its refuge. This food is sufficient for the entire development of the larva and it turns into a pupa in the "pear". Several months later, an adult beetle emerges from the pupa.

#### *Oryctes nasicornis* - **European rhinoceros beetle**

25- 40 mm, red-brown, shiny. The male has characteristic protrusions on the scutellum and slightly back-turned horn on its head (a secondary sex characteristic). The female has no horn or only a very small one. Depending on the environmental conditions, the development of the larva, which usually lives in woody debris, has a varying duration (up to several years). After reaching a length of 120 mm, it turns into a pupa. It remains in this stage for 1-2 months.

It inhabits lower parts – generally the oak forest belt. This beetle is sometimes attracted to light and may come at night near the light of an electric bulb.

#### *Polyphylla fullo* – **"Marble" beetle**

25 - 38 mm, black-brown with white dots, formed by tiny white scales. Males possess an enlarged antennal "fan", consisting of 7 well-developed leaf-shaped members, as the "fans" of the female consist of 5 members. It lays its eggs in the soil. The larvae feed on roots of various grasses and winter 3 to 4 times. The pupa is formed, when the larva reaches a length of 80 mm. The imago gnaws on the needles of pine trees. It flies in June and July during the first half of the night.

#### *Cetonia aurata* - **Rose chafer**

14 - 20 mm, solid green, shiny, with several short and thin white lines marks along the wing-case. It flies from April to October, visiting the flowers of Rosales and Sambucus. The larvae develop in rotting plant debris. In Stara Planina Mountain it inhabits all forest belts. It can be easily observed on the flowers of the Sambucus or other plants. Feeding on pollen, the beetles sometimes damage the flowers.

#### *Osmoderma barnabita* – **Hermit Beetle**

*Osmoderma barnabita* is a large beetle, the largest of its family (Fig. 7). Size 2.8-3.2 cm. Its body is large, stocky, dark black with a slight metallic glint.

It inhabits old deciduous forests, often preferring habitats at the outskirts of forests and river banks. Micro-habitat – exclusively rotting and decaying old trees with hollows. When choosing its habitats, it prefers oaks the most, followed by lime-tree, willow, beech, plane-tree, it is even encountered in old orchards. Females lay their eggs in the decaying wood of tree hollows, where the larvae develop. The development of the larvae continues for 2-3 years. Adult insects may be seen from May to the beginning of September, but are most often observed in June and July. They feed on the sap of the trees. This beetle's flight can be observed during warm and sunny afternoons and evenings. In the autumn adults die. They have very poor distribution capabilities and rarely go further than 1-2 km, from the hollow, where they have developed, spending most of their lives in the same hollow.

## **BUPRESTIDAE - JEWEL BEETLES**

Beetles with a long body, which often has glossy iridescent colours. The imago alights on the tree trunks or flower stems, and the larvae dig tunnels in the wood of various trees. They are distinguished for the much wider three or four segments of their bodies. The family includes some 15 000 species, most of them inhabiting the tropics, where they are much larger and with more beautiful colours. Approximately 170 species can be observed in Bulgaria.

### *Capnodis tenebrionis* – **Black rose chafer**

26 - 30 mm, black with white dots, due to the white scales, covering concavities on the surface of the body. The larva gnaws its way through the main trunk of fruit trees of the **Rosaceae** family, causing their decay. In the spring and summer adult insects may be observed on the cut surfaces of tree trunks or on the tree bark.

## **LAMPYRIDAE - FIREFLIES**

Medium-sized beetles with a relatively soft chitin shell. Both adults and larvae, as well as the eggs emit light. Males have well developed wings and can fly. They emit pulsating light. Females have reduced wings and resemble larvae. They crawl on the ground and bushes, emitting constant light. The imago does not eat. The larvae are predators, feeding on snails and slugs. The family includes some 1900 species, mainly inhabiting the tropics. Very few species can be found in Bulgaria.

### *Lampyrus noctiluca* - **Common glow-worm**

The male is 10- 12 mm long, brown. Flies after dusk. The female - 15- 20 mm, wingless. This species can be encountered in the oak belt from June to September. The number of fireflies declines in various parts of Europe, as the main reason for that is considered to be the changes in their habitats, the urbanization and light pollution. There are no studies of this phenomena in Bulgaria.

## **COCCINELLIDAE - LADYBUGS**

Small beetles with a characteristic semi-spherical upper and flat bottom surface of the body, predominantly predatory species, but there are also some herbivorous species, such as the *Subcoccinella vigintiquatuorpunctata*, the adults and larvae of which eat alfalfa, clover and other crops, sometimes causing significant damage. This family includes the well-known seven-spot ladybug *Coccinella septempunctata*. A characteristic feature of most ladybugs is that in case of danger, they pretend to be dead and lie on the ground. If taken in hand, they excrete a yellow fluid from openings at the joint between the upper and lower parts of their legs. This is haemolymph (a bodily fluid of insects, which, unlike the blood of vertebrates, does not distribute oxygen throughout the body), it contains Cantharidin, which probably acts as repellent to insectivorous birds. 4300 species of this family are known. Approximately 80 species inhabit Bulgaria.

*Coccinella septempunctata* - **Seven-spot ladybug** – 5-7 mm. This is the seven-spot ladybug everybody knows from their childhood – the hero of numerous fairy tales and proverbs. The larvae and adults are carnivorous, successfully feeding on aphids, destroying enormous quantities of them. If they find a plant, attacked by aphids,

ladybugs lay their eggs on the lower side of the leaves. The newly hatched larvae crawl around, searching for aphids. This ladybug can give offspring twice a year, as the adults gather at the high parts of the mountains to spend the winter there. Sometimes dozens of thousands of ladybugs can gather at the same place.

#### *Harmonia axyridis* - **Harlequin**

It was given its name due to the highly variable colouring. The harlequin originates from Eastern Asia. In Europe, numerous attempts have been made to artificially breed this insect, in order to be used as a biological insecticide against vegetable pests. With time, it has adapted to the local conditions and started distribution in wildlife environments. This is how it became an invader species in Europe and since 2010 it is also part of the Bulgarian fauna. As an invader, it has started replacing the local ladybug species, and in some cases even causes their complete disappearance from certain areas. For its wintering, the Harlequin ladybugs gather in people's homes, near window edges and in the room corners, sometimes in thousands. Although harmless to human health, it causes certain inconveniences.

#### **MELOIDAE – BLISTER BEETLE**

Beetles with long bodies and soft chitin shell. Wings are usually well developed, but in some species the elytra are very short and there are no membranous wings. Their larvae parasite other insects. Their lifecycle consists of three stages, completely different from one another. The family includes 2700 species. Just a few members of this family inhabit Bulgaria.

#### *Meloe violaceus* - **Violet oil beetle**

The members of the *Meloe* genus are large, lumbering beetles, 4-5 cm long, with a cone-shaped abdomen. They are black or black-blue, with a bronze tint. Their elytra are very short, underdeveloped, usually 1/3 of the body length and only cover the main part of the abdomen. Unlike many other insects they have no second pair of wings and cannot fly. They mainly feed on leaves, nectar and pollen. If agitated, they excrete abundant quantities of the poisonous substance Cantharidin, causing painful swelling and blisters on human skin. Several of these species inhabit Bulgaria. The Maloe beetles mate in spring. The female lays between 2 and 3 thousand cylindrical eggs in holes in the ground with a diameter of several centimetres. The larva hatches in about a month. In its first stage of development it is small, agile and is referred to as Planidium. Within 4 days of hatching, it goes to the surface, climbs up various plants and remains on their flowers. When a bee or another insect visits such flowers, the planidium grabs its body with its well-developed claws. In most cases the bee is used for transport, but the planidiums of some species pierce through the semi-chitin membrane between the members and feed on the haemolymph of the insect. When the insect, carrying the parasite, returns to the nest, the transfers to the cells in the nest and start eating eggs. In the second stage of development it pines, transforming into a fat, worm-like larva with tine legs and it eats honey. In the process of development it forms a false pupa, producing a legless and non-eating larva. After a short period of time it once again turns into a pupa, but this time proper. The metamorphosis ends by the pupa transforming into a young beetle.

#### **CERAMBYCIDAE - LONGHORN BEETLES**

Beetles with a long body and very long antennae, which may even exceed significantly the length of the insect itself, in some species. If caught in one's hand, they make a noise, by rubbing the prothorax to the mesothorax. Their larvae dig holes in the wood of various trees and bushes, healthy, ill or cut trees. 27000 species are known. Over 200 species inhabit Bulgaria.

#### *Cerambyx cerdo* - **Great capricorn beetle**

24 - 53 mm. The largest of the Bulgarian beetles, black with black-brown elytra. One of the largest European beetles, reaching a length of 5.5 cm. The antennae of the males may sometimes be twice as long as the body, and in females – the same length as the body.

It inhabits mainly old oak and more rarely other deciduous trees: beech, hornbeam, elm-tree, walnut. The female lays its eggs in the cracks and under the bark of young and old trees. The hatched larvae eat through the wood wide, oval tunnels in various directions, with a maximum length of 1 meter. On the fourth year of its development the larva forms a chamber in the wood, where it forms a pupa. The beetle that appears in August remains in the wood throughout the winter. It leaves the tree in May and can be encountered until the end of July.

In Bulgaria it is mainly encountered in the lower areas, at an altitude of 0 to 800 m. It flies during the first half of the night.

**A protected species, according to the Bulgarian and European legislation. The main threats to this species include the loss of natural habitats, cutting of all trees etc.**

#### *Rosalia alpina* - **Rosalia longicorn**

15 - 38 mm, light grey-blue with 3 dark strips on each wing-cases. Its long grey-blue antennae have black thick areas between the different members. Its larvae develop in the death wood of beech and ash trees. The development last for 3 and more years. It is encountered in the spring and summer in the beech belt. It is easy to be seen just before or around noon, when adult beetles sometimes gather sun's rays on the trunks of the beech trees.

**A protected species, according to the Bulgarian and European legislation.**

#### *Morimus asper*

32 - 36 mm, the elytra are grey with two black spots each. The chitin shell of the body is extremely hard. The elytra are fused, and the flight wings are reduced and the beetle cannot fly, but just crawls on the ground. It is encountered during spring and summer in the beech belt, but is less bound to these areas than the *Rosalia longicorn*. It is easy to be seen on tree trunks or leaves of the beech trees. When it moves, its movements can be heard.

**A protected species, according to the Bulgarian and European legislation.**

### **CURCULIONIDAE - TRUE WEEVILS**

Beetles, whose head extends into a long snout, with the mouth at the end. The antennae are attached to the side of the snout. Their solid, most often egg-shaped bodies, in some species, is covered with tiny scales or hairs, and is smooth in others. The elytra of some species are fused, and the hindwings wings - reduced and they do not fly. All species, as well as their larvae, are herbivorous. This family includes



approximately 60 000 species. Over 1000 of these species are encountered in Bulgaria.

*Larinus latus*

7 - 10 mm, grey-brown to grey-black with shapes, formed by the scales on its wings. The imago and larvae feed on thistle. Adults can easily be observed on the flowers and stems of flowering plants, during most of summer and into the beginning of September.

**TENEBRIONIDAE - DARKLING BEETLE**

Small to medium-sized beetles, most often with dark colouration and a very hard chitin shell of the body. They feed on plant and animal debris. Some species are synanthropic. The family includes about 20 000 species, but very few of them are encountered in Bulgaria.

*Gnaptor spinimanus* – A large entirely black beetle, approximately 35 mm long. Very common at low altitudes during spring. Adult insects are often seen, crawling on the surface in grassy habitats with sandy soil and low vegetation. The larvae live in the soil and among various plant debris, which they use for food. The lower parts of the front legs have a long and sharp spike at the end. This makes it easily distinguishable from the other members of its family, with similar colours and appearance.



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