Coleoptera

Beetles / Weevils

The name Coleoptera, derived from the Greek words *"koleos"* meaning sheath and *"ptera"* meaning wings, refers to the modified front wings which serve as protective covers for the membranous hind wings.

Classification & Distribution | Life History & Ecology | Physical Features | Economic Importance | Major Families | Bug Bytes

- ## Classification & Distribution

Holometabola

- complete development (egg, larva, pupa, adult)

Coleoptera is divided into four suborders but only two of these, Aedephaga and Polyphaga, include common families:

- **Aedephaga** - the first abdominal sternum is divided by the hind coxae
- **Polyphaga** - the first abdominal sternum is undivided

Distribution: Worldwide. This is the largest order of insects.

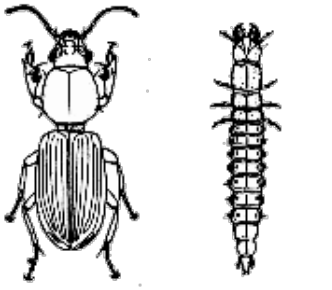
	North America	Worldwide
Number of Families	**112**	**166**
Number of Species	**23,592**	**>300,000**

- ## Life History & Ecology

Coleoptera (beetles and weevils) is the largest order in the class Insecta. As adults, most beetles have a hard, dense exoskeleton that covers and protects most of their body surface. The front wings, known as elytra, are just as hard as the rest of the exoskeleton. They fold down over the abdomen and serve as protective covers for the large, membranous hind wings. At rest, both elytra meet along the middle of the back, forming a straight line that is probably the most distinctive characteristics of the order. During flight, the elytra are held out to the sides of the body where they provide a certain amount of aerodynamic stability.

Both larvae and adults have strong mandibulate mouthparts. As a group, they feed on a wide variety of diets, inhabit all terrestrial and fresh-water environments, and exhibit a number of different life styles. Many species are herbivores -- variously adapted to feed on the roots, stems, leaves, or reproductive structures of their host plants. Some species live on fungi, others burrow into plant tissues, still others excavate tunnels in wood or under bark. Many beetles are predators. They live in the soil or on vegetation and attack a wide variety of invertebrate hosts. Some beetles are scavengers, feeding primarily on carrion, fecal material, decaying wood, or other dead organic matter. There are even a few parasitic beetles -- some are internal parasites of other insects, some invade the nests of ants or termites, and some are external parasites of mammals.

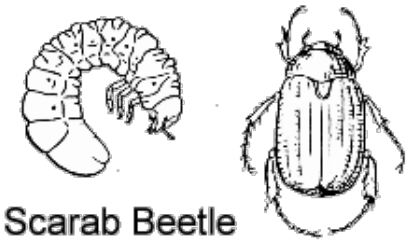
- ## Physical Features



Ground Beetle

Immatures:

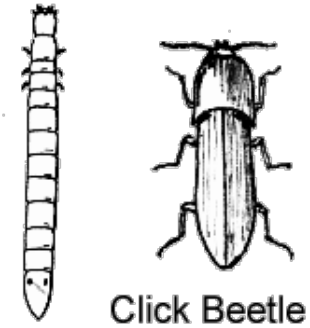
- Head well-developed with ocelli and chewing mouthparts.
- Three pairs of thoracic legs; no abdominal prolegs
- Body form:
- Campodeiform -- Slender, active crawlers
- Scarabaeiform -- Grub-like, fleshy, c-shaped body
- Elateriform -- Wireworms; elongate, cylindrical, with a hard exoskeleton and tiny legs



Scarab Beetle

Adults:

- Chewing mouthparts (sometimes located at the tip of a beak or snout)
- Front wings (elytra) are hard and serve as covers for the hind wings; meet in a line down the middle of the back
- Hind wings large, membranous, folded beneath the elytra
- Tarsi 2- to 5-segmented



Click Beetle

Economic Importance

Many beetles are regarded as major pests of agricultural plants and stored products. They attack all parts of living plants as well as processed fibers, grains, and wood products. Scavengers and wood boring beetles are useful as decomposers and recyclers of organic nutrients. Predatory species, such as lady beetles, are important biological control agents of aphids and scale insects.

Major Families

The following ten families include about 70% of the North American beetle fauna:

- **Staphylinidae** (rove beetles) -- scavengers and herbivores; elytra are characteristically shorter than the abdomen
- **Curculionidae** (weevils, snout beetles) -- herbivores; many species are pests of agricultural crops and stored grains. Chewing mouthparts are at the tip of a proboscis
- **Carabidae** (ground beetles) -- predators; many beneficial species including the fiery hunter, *Calosoma calidum*
- **Chrysomelidae** (leaf beetles) -- herbivores; includes many pests of agricultural crops. Most species have distinctive shapes or color patterns (e.g., Colorado potato beetle, *Leptinotarsa decemlineata*).
- **Scarabaeidae** (lamellicorn beetles, June beetles, scarab beetles) -- herbivores; robust beetles with heavy spines on femur and tibia. Distinctive lamellate antennae. Usually live in the soil as larvae and feed on plant roots. Includes many pest species, including the Japanese beetle, *Popillia japonica*.
- **Tenebrionidae** (darkling beetles) -- herbivores; found in flowers, rotting wood, and occasionally as pests of stored grain. Most abundant in arid climates.
- **Cerambycidae** (longhorned beetles) -- herbivores; all larvae are wood borers. Adults have distinctively long antennae. A few species are pests of wood and wood products.
- **Elateridae** (click beetles) -- herbivores; larvae are known as wireworms. Some species feed destructively on the roots of crop plants. When adults are turned on their back, they can snap (click) the head and abdomen against the substrate to right themselves.
- **Buprestidae** (metallic wood borers) -- herbivores; larvae are known as flat-headed wood borers. Some species are forestry pests.
- **Coccinellidae** (lady beetles) -- most adults and larvae are predators of aphids and scale insects, but a few species are pests of agricultural crops (e.g., Mexican bean beetle, *Epilachna varivestis*).

Other noteworthy families include:

- **Cicindellidae** (tiger beetles) -- predators
- **Dytiscidae** (predaceous diving beetles) -- large aquatic predators

- **Gyrinidae** (whirligig beetles) -- aquatic predators
- **Hydrophilidae** (water scavenger beetles) --- scavengers and predators
- **Silphidae** (carrion beetles) -- scavengers
- **Lampryidae** (fireflies) -- herbivores
- **Dermestidae** (carpet beetles) -- scavengers and herbivores
- **Nitidulidae** (sap beetles) -- scavengers and herbivores
- **Meloidae** (blister beetles) -- larval parasites, adult herbivores
- **Scolytidae** (bark beetles) -- herbivores
- **Passalidae** (wood-boring beetles) -- herbivores
- **Cantharidae** (soldier beetles) -- herbivores and predators

Bug Bytes

- Coleoptera is the largest order in the animal kingdom. It includes 40% of all insects and nearly 30% of all animal species.
- The smallest beetle is the fringed ant beetle, *Nanosella fungi* (family Ptiliidae). At 0.25 mm in length it is some 16 million times smaller in volume than the largest beetle, *Goliathus giganteus* (family Scarabaeidae), which may have a body length up to 10 cm.
- Two families of Coleoptera are bioluminescent (able to produce light). Fireflies (family Lampyridae) and glowworms (family Phengodidae) have light-producing organs in the abdomen. In some species, the females are wingless and larviform.
- Ancient Egyptians believed that a scarab beetle rolled the sun across the sky each day. The scarab icon became associated with Ra, the sun god, and scarab beetles, *Scarabaeus sacer*, were worshiped as a symbol of immortality.
- Over 1000 beetle species are known to live as predators, parasites or commensals in the nests of ants. They gain entrance to the nest by mimicking the odor and behavior of the ants.
- Bombardier beetles, *Brachinus* spp. (family Carabidae), have the ability to discharge a defensive spray of hot quinones. Two chemical reactants are stored in adjacent compartments of an abdominal gland and combine explosively when the insect is disturbed.
- Males of many stag beetles (family Lucanidae) and scarab beetles (family Scarabaeidae) have enlarged mandibles or protruding horns which are used in courtship and in ritualized fights with other males.
- The Spanish fly, *Lytta vesicatoria* (family Meloidae), is a source of cantharadin. This chemical, once thought to be an aphrodesiac, is now used as a mating stimulant when breeding cattle and in the treatment of certain urogenital diseases.

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