COLEOPTERA - COCCINELLIDAE, CHRYSOMELIDAE, CERAMBYCIDAE, CURCULIONIDAE, BRUCHIDAE, SCARABAEIDAE

COLEOPTERA

Synonym : Elytroptera

Etymology : Coleo - Sheath ; ptera-wing

Common names : Beetles, Weevils

Characters

- ✓ They are minute to large sized insects.
- ✓ Antenna is usualy 11 segmented.
- ✓ Mouthparts are chewing type. Mandibles are short with blunt teeth at the mesal face in phytophagous group. In predators the mandibles are long, sharply pointed with blade like inner ridge. In pollen feeders teeth are absent and the mandibles are covered with stiff hairs.
- ✓ Prothorax is large, distinct and mobile.
- ✓ Mesothorax and metathorax are fused with the first abdominal segment.
- ✓ Forewings are heavily sclerotised, veinless and hardened. They are called elytra. Forewings do not overlap and meet mid-dorsally to form a mid-dorsal line. It is not used for flight. They serve as a pair of convex shields to cover the hindwings and delicate tergites of abdomen.
- ✓ Hindwings are membranous with few veins and are useful in flight. At rest they are folded transversely and kept beneath the elytra. In some weevils and ground beetles the forewings are fused and hindwings are atrophied.
- ✓ A small part of the mesothorax known as scutellum remains exposed as a little triangle between the bases of elytra.
- ✓ Cerci and a distinct ovipositor are absent.
- ✓ Metamorphosis is complete. Larva are often called grubs.

- ✓ Pupae are usually exarate and rarely found in cocoons.

Importance: It is the largest order. It includes predators, scavengers and many crop pests. They also damage stored products.

Classification: This order is divided into two suborders, viz., **Adephaga** (devourers) and **Polyphaga** (eaters of many things). Adephaga includes Cicindelidae, Carabidae and Dytiscidae. Other families listed out below come under Polyphaga.

FAMILIES OF PREDATORS

1. CICINDELIDAE (Tiger beetles)

- ✓ Head is usually wider than prothorax.
- ✓ Eyes are fairly larger and they have very keen vision.
- ✓ Mandibles are sharply pointed, sickle shaped and acutely toothed for capturing the prey.
- ✓ Legs are long and tarsi slender which enable to run fast.
- ✓ Elytra have spots and stripes.
- ✓ Larva excavates vertical pits for prey capture.
- ✓ Both grubs and adults are active predators.

2. CARABIDAE (Ground beetles)

- ✓ Adults are often black in colour and some brightly spotted.
- ✓ Some cannot fly because they have fused elytra and atrophied hindwings.
- ✓ Legs are suited for running.

- ✓ Larvae have caliper like mandibles, well developed legs and terminal cerci like structures called urogomphi.
- ✓ They are nocturnal. Ground beetles are voracious predators both as adults and larvae.
- ✓ They feed on soft bodied caterpillars and other insects.
- ✓ Six spotted carabid : *Anthia sexguttata*

3. DYTISCIDAE: (True water beetles, Predaceous diving beetles)

- ✓ Body is long, oval, smooth and shiny.
- ✓ Head, thorax and abdomen are compactly joined.
- ✓ Antenna is filiform.
- ✓ In some male beetles the foretarsi are provided with cup like suckers which are useful in clasping the mate.
- ✓ Hindlegs are flattened, fringed with hairs and suited for swimming.
- ✓ Air is stored beneath the elytra.
- ✓ Adults and larvae are aquatic predators

4. GYRINIDAE (Whirlinig beetles)

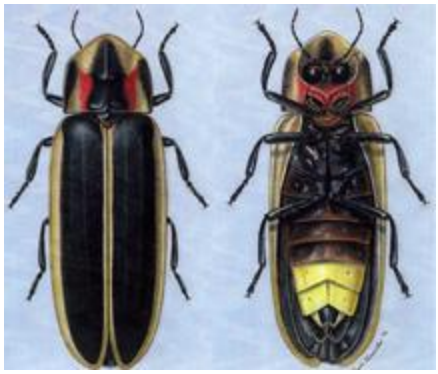
- ✓ They swim in erratic paths on water surface and exhibit gyrating moton.
- ✓ Compound eyes are completely divided by the front margin of the head into an upper and lower half so that the beetle appear to have two pairs of compound eyes. The dorsal pair is suited for aerial vision and the ventral pair is for aquatic vision.
- ✓ Forelegs are prehensile and long.
- ✓ Middle legs and hindlegs are **natatorial**.
- ✓ They are predators.

5. COCCINELLIDAE (Lady bird beetles)

- ✓ They are hemispherical. The body is convex above and flat below.
- ✓ Their body appearance resembles a split pea.
- ✓ Head is small, turned downward and received into a prominent notch of prothorax.
- ✓ Elytra is strongly convex, brightly coloured and variously spotted.
- ✓ Grubs are compodeiform and spiny.
- ✓ The last larval skin either cover the pupa or gets attached to the anal end of the pupa.
- ✓ Except the genus *Epilachna*, others are predators on aphids, scales, mites and whiteflies.

6. LAMPYRIDAE (Fireflies, Glow worms)

- ✓ They show sexual dimorphism.
- ✓ **Male** : head is concealed by the semicircular pronotum.
- ✓ Eyes are well developed and contiguous.
- ✓ Forewings are soft and flexible. They do not fully cover the abdomen.
- ✓ Photogenic organ is found in sixth and seventh abdominal segments.
- ✓ **Female** : Head is hidden by pronotum.
- ✓ Eyes are very much reduced.
- ✓ Wings are absent and is larviform.
- ✓ Photogenic organ is present in seventh abdominal segment.
- ✓ Larvae are with sickle like mandibles. They are carnivorous and feed on snails. Extra intestinal digestion is common in larvae.
- ✓ All life stages are luminous to varying degree. The luminescence is produced by the oxidation of a substance luciferin in the presence of an enzyme luciferase. The function of luminescence is to bring the sexes together.



FAMILIES OF SCAVENGERS

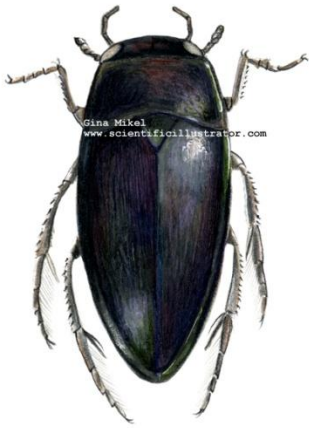
1. SCARABAEIDAE (Scarabs, Dung beetles)

- ✓ Head is broad and flat.
- ✓ Mandibles are membranous and incapable of chewing.

- ✓ Many have spines and horns on head and prothorax.
- ✓ Forelegs are **fossorial**.
- ✓ Middle legs are widely separated
- ✓ Adults and larvae are scavengers. They feed upon the droppings of animals and human excreta. They role on the dung into balls and bury them in underground chambers. They use their head and forelegs for handling dung and digging pits in the soil. Head is used as an excavator and fore-tibia as shovel. They show remarkable parental care.
- ✓ Common Indian dung beetle : *Heliocopris bucephalus*

2. HYDROPHILIDAE (Water scavenger beetles)

- ✓ They are black or dull coloured.
- ✓ Body is convex above and flattened below.
- ✓ Antenna is clubbed and kept beneath the prothorax.
- ✓ Maxillary palps are long and look like antennae.
- ✓ Legs are evenly placed in the anterior part of the body.
- ✓ Middle legs are flattened and suited for swimming.
- ✓ **Metasternum** is produced into a spine posteriorly.
- ✓ Air is stored beneath the elytra and over the undersurface of the body.
- ✓ Adults and larvae feed on decomposing vegetable matter.



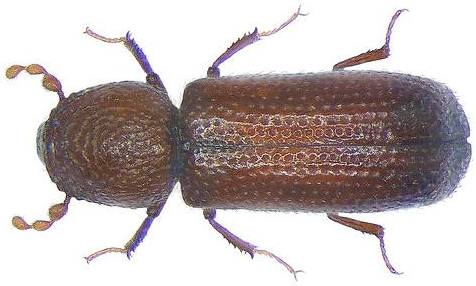
FAMILIES OF STORED PRODUCT PESTS

1. ANOBIIDAE (Wood worms, Wood borers)

- ✓ Body is oval shaped or cylindrical.
- ✓ Head is concealed by pronotum which is helmet like.
- ✓ Grub is fleshy with larger abdominal segments.
- ✓ Cigarette beetle : *Lasioderma serricorne* is the most serious pest of tobacco in factories and cigar stores.

2.BOSTRYCHIDAE

- ✓ They are small, elongate and cylindrical beetles.
- ✓ Head is concealed by the pronotum which is hood like.
- ✓ Antenna is either smooth or sculptured.
- ✓ Lesser grain borer : *Rhizopertha dominica* larvae bore in to the stored grains and eat the inner contents completely.



3. BRUCHIDAE (Pulse beetles, Seed beetles)

- ✓ They are small, short beetles.
- ✓ Head is small and the snout is blunt.
- ✓ Antenna is serrate.
- ✓ Hind femur is thick.
- ✓ Elytra are short and do not cover the abdomen fully.
- ✓ Eggs are whitish, scale like and glued to the pods or seeds by a glutinous secretion. Grubs feed exclusively on seed legumes. Pupation occurs within the seed. Adult emerges by cutting a circular exit hole. Development is similar to hypermetamorphosis. Pulse beetle : *Callosobruchus chinensis*. It is a serious pest on stored pulses.

4. TENEBRIONIDAE(Meal worms)

- ✓ Body is flat and elongate.
- ✓ Elytra is often sculptured.
- ✓ Legs are heteromerous with a tarsal formula of 5-5-4.
- ✓ Larvae are called meal worms.

- ✓ Red flour beetle : *Tribolium castaneum*. It is an important pest of milled products.

FAMILIES OF CROP PESTS

1. APIONIDAE:

- ✓ Head is produced into a snout
- ✓ Antenna is not elbowed.
- ✓ Grubs are apodous.
- ✓ Sweet potato weevil : *Cylas formicarius*. It attacks sweet potato both in fields and in storage.

2. BUPRESTIDAE (Jewel beetles, Metallic wood borers)

- ✓ They are often elongate hard bodied insects.
- ✓ Body regions have a metaliic lusture
- ✓ Antenna is serrate.

- ✓ Larvae are called flat headed borers. Larval head is small and is entirely withdrawn into thorax. Prothorax is greatly expanded. Legs are absent. They tunnel beneath the bark or bore into stems or roots.
- ✓ Groundnut stem borer : *Sphenoptera perotetti*. The larva tunnels into the main root and kills the plants.



4. CASSIDIDAE (Tortoise beetles)

- ✓ Adults look like a small tortoise
- ✓ Head is concealed under the prothorax.
- ✓ Head is inferior in position.
- ✓ Prothorax and elytra are convex, wider and form a shell.
- ✓ Leg tips alone are exposed outside the shell.
- ✓ Larva is dorsally spiny to which excreta and exuviae are attached forming a faecal shield.
- ✓ Sweet potato beetle : *Aspidiomorpha miliaris*. They primarily feed on sweet potato.

5. CERAMBYCIDAE (Longicorn beetles)

- ✓ Body is cylindrical.

- ✓ Compound eyes are notched.
- ✓ Antenna is as long or longer than the beetle itself. Antenna can be flexed backwards. It is surrounded at the base by compound eye.
- ✓ Pronotum is with one to three laterally located spines.
- ✓ Grubs are called round headed borers. They are apodous but have psuedopods both on dorsal and ventral side. They are wood borers. They develop beneath the bark and tunnel into the branches or main stem. Mango stem borer : *Batocera rufomaculata*

6. CURCULIONIDAE (Weevils, snout beetles)

- ✓ Minute to large sized insects.
- ✓ Frons and vertex of the head are produced into snout. It is cylindrical and in some species larger than the beetle itself.
- ✓ Mouthparts (Mandibles and maxillae) are present at the tip of the snout. It is useful to feed on internal tissues of the plant and provide a place for egg laying.
- ✓ Antenna is geniculate and found usually in the middle of the snout.
- ✓ Grubs are apodous and eucephalous.
- ✓ Weevils are important crop pests occuring both in field and storage.
- ✓ Coconut red palm weevil: *Rhynchophorus ferrugineus*.

7. DYNASTIDAE (Unicorn beetles, Rhinoceros beetles)

- ✓ Mandibles are bent, expanded, leaf like and visible from above.
- ✓ Horns are usually present in male in the head and thorax.
- ✓ Coconut rhinoceros beetle: *Oryctes rhinoceros*. Cephalic horns are found in both the sexes. In male the horn is longer and recurved. In female it is shorter and straight. Adults are injurious to coconut and grubs are found in dying palms and manure pits.

8. ELATERIDAE(Click beetles, Wire worms)

- ✓ Body is elongate and cylindrical.
- ✓ Pronotum is rounded anteriorly and its posterior corners are sharply pointed.
- ✓ Adult is able to jump and land upon its feet while lying on its back. Each jump is accompanied by an audible clicking sound. Movement of prothorax makes the prosternal spine to slip into the mesosternal cavity. This causes the elytra to press against the surface and propel the beetle into air.
- ✓ Eggs are laid in soil.Grubs are long,

cylindrical and tough skinned and called wireworms. They feed on roots.

9. GALERUCIDAE(Pumpkin beetles)

- ✓ Antennae are closely approximated.
- ✓ Third tarsomere is deeply bilobed.
- ✓ Larvae are root feeders.
- ✓ Adults bite holes on leaves.
- ✓ Red pumpkin beetles : *Raphidopalpa foveicollis*.

10. MELOIDAE(Blister beetles, Oil beetles)

- ✓ They are cylindrical, soft bodied beetles.
- ✓ Head is connected to thorax by a distinct neck.
- ✓ Legs are heteromerous with a tarsal formula of 5-5-4.
- ✓ Claws show longitudinal splitting.
- ✓ Forewings are soft and leathery.
- ✓ They give off a fluid containing the oily principle **catharidin**, when disturbed which causes blisters.
- ✓ Development involves **hypermetamorphosis**. Eggs hatch into active triungulin larvae which may feed on eggs of grasshoppers.
- ✓ Adults feed on foliage and flowers.

Banded blister beetle : *Mylabris pustulata*

11. MELOLONTHIDAE (Chafer beetles, June beetles, White grubs)

- ✓ They are stout beetles with glossy surface.
- ✓ Head is small.
- ✓ Labrum is well sclerotised.
- ✓ Adults are attracted to light. They feed on tree foliage during night and hide in soil during day time.
- ✓ Larvae are scarabaeiform and root feeders.
- ✓ Groundnut white grub: *Holotrichia consanguinea*. It is a serious pest on groundnut under rainfed condition.