

Subject	Insect Taxonomy
Lect. No.	9
Date	11 / 28/ 2023

## **ORDER: COLEOPTERA**

Synonym : Elytroptera

Etymology : Coleo - Sheath ; ptera-wing

Common names : Beetles, Weevils

Coleoptera, which is the largest insect order of them all containing over known 400,000 species. Beetles are found all over the world and live in almost every habitat imaginable (except for in the sea or polar regions)! They are easy to identify from the hardened forewings, or 'elytra', Beetles can be beneficial predators, like lady beetles or ground beetles that eat insect pests like aphids or caterpillars. However, some beetle species are themselves troubling insect pests, like the Colorado potato beetle or root weevils, that eat up agricultural crops. Charles Darwin was a famous beetle collector and frequently referred to them in his writings on natural selection and evolution.

## **Characters:**

1. They are minute to large sized insects.
2. Antenna is usually 11 segmented.
3. Mouthparts are chewing type.
4. Prothorax is large, distinct and mobile.
5. Mesothorax and metathorax are fused with the first abdominal segment.
6. 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.
7. Hindwings are membranous with few veins and are useful in flight.
8. Larva are often called grubs. And vary considerably in form in different families in most beetle larvae are campodeiform or scarabaeiform, and some elateriform and few are vermiform.
9. Pupae are usually exarate and rarely found in cocoons.

**Classification:** This order is divided into two suborders,

**A – Suborders: Adephaga**

**FAMILIES OF PREDATORS**

**1. Cicindelidae (Tiger beetles)**



*Cicindela asiatica* brulle

**2. Carabidae (Ground beetles)**

1-Adults are often black in colour and some are brightly spotted.

2-Some cannot fly because they have fused elytra and atrophied hindwings.

3-Legs are suited for running. They are nocturnal.

4-predators both as adults and larvae. They feed on soft bodied caterpillars and other insects.



Ground beetle : *Calosoma maderae* ( F. )

### **3.Dytiscidae: (True water beetles, Predaceous diving beetles)**

1-Body is long, oval, smooth and shiny.

2-Head, thorax and abdomen are compactly joined.

3-Antenna is filiform.

4-Hindlegs are flattened, fringed with hairs and suited for swimming.

5-Air is stored beneath the elytra.

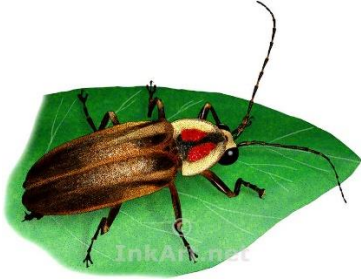
7-Adults and larvae are aquatic predators



*Cybister lateralimarginalis*

## **B. Suborder: Polyphaga (eaters of many things).**

### **1. Lampyridae (Fireflies, Glow worms)**



### **2-Coccinilidae: (Lady bird beetles)**

#### **Characters:**

1-They are hemispherical. The body is convex above and flat below..

2-Elytra is strongly convex, brightly colored and variously spotted.

3-Grubs are compodeiform and spiny.

Except the genus *Epilachna*, others are predators on aphids, scales, mites and whiteflies.

Lady beetle : *Coccinella septempunctata* L. Predator on Aphids



## FAMILIES OF SCAVENGERS

### 1. Scarabaeidae (Scarabs, Dung beetles)

*Rhizotrogus deserticola* Blarch.



### 2. Hydrophilidae (Water scavenger beetles)

Characters:

1-They are black or dull coloured.

2-Body is convex above and flattened below.

3-Maxillary palps are long and look like antennae.

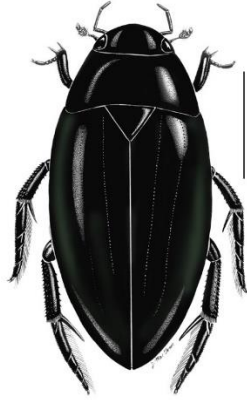
4-Middle legs are flattened and suited for swimming.

5- **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.

*Hydrophilus triangularis* Say

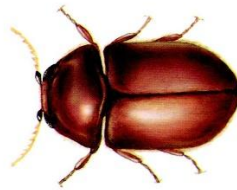


*Hydrophilus triangularis* Say

## **FAMILIES OF STORED PRODUCT PESTS**

### **1. Anobiidae (Wood worms, Wood borers)**

Cigarette beetle : *Lasioderma serricorne* is the most serious pest of tobacco in factories and cigar stores.



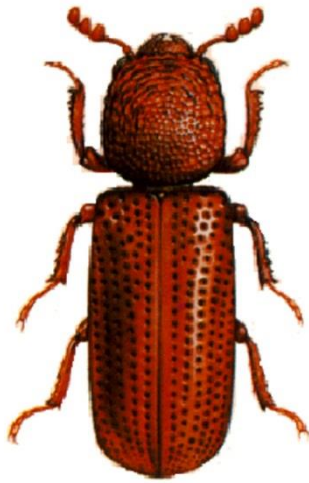
### **2-Bostrychidae; Characters:**

1-They are small, elongate and cylindrical beetles.

2-Head is concealed by the pronotum which is hood like.

3-Antenna is either smooth or sculptured.

Lesser grain borer : *Rhizopertha dominica* larvae bore in to the stored grains and eat the inner contents completely.



*Rhizopertha dominica*

### **3. Bruchidae (Pulse beetles, Seed beetles): Characters**

1-They are small, short beetles.

2-Head is small and the snout is blunt.

3-Antenna is serrate.

4-Hind femur is thick.

Elytra are short and do not cover the abdomen fully.

Pulse beetle : *Callosobruchus chinensis*. It is a serious pest on stored pulses.





*Callosobruchus chinensis*

#### **4. Tenebrionidae (Meal worms): Characters**

1-Body is flat and elongate.

2-Elytra is often sculptured.

3- tarsal formula of 5-5-4.

4-Larvae are called meal worms.

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



*Tribolium castaneum*.

## **FAMILIES OF CROP PESTS**

**1. Apionidae:**

**.2. Cassididae (Tortoise beetles)**



**3. Dynastidae (Unicorn beetles, Rhinoceros beetles)**



**4. Galerucidae (Pumpkin beetles)**



5. Melolonthidae (Chafer beetles, June beetles, White grubs)



6. Cerambycidae (Longicorn beetles)

**Characters:**

1-Body is cylindrical.

2-Compound eyes are notched.

3-Antenna is as long or longer than the beetle itself..

4-Pronotum is with one to three laterally located spines.

5-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*



## 7. Meloidae (Blister beetles, Oil beetles)

### Characters:

- 1-They are cylindrical, soft bodied beetles.
- 2-Head is connected to thorax by a distinct neck.
- 3- Tarsal formula of 5-5-4.
- 4-Claws show longitudinal splitting.
- 5-They give off a fluid containing the oily principle **catharidin**, when disturbed which causes blisters.

Eg. banded blister beetle *Mylabris pustulata*.



## 8. Curculionidae (Weevils, snout beetles)

### Characters;

- 1-Minute to large sized insects.
- 2-Frons and vertex of the head are produced into snout. It is cylindrical and in some species larger than the beetle itself.

3-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.

4-Antenna is geniculate and found usually in the middle of the snout.

Grubs are apodous.

Weevils are important crop pests occurring both in field and storage.

Coconut red palm weevil: *Rhynchophorus ferrugineus*.



**Taxonomic Keys:** A tabulation of diagnostic characters of Species ( Or genera , Families , etc. )

Kinds of Keys:

1-Bracket Key

2-Indented Key

3-Serial key

4- 4-Branched key.

5-Circular key

6-Pictorial key

7-Box key

**Are required in the key taxonomic**

1. Definition: The characters may be clear and easy to distinguish.
2. Enough: would be helpful if key contains several characters
3. The morphological differences: It is preferable that the key contains the different characters of both sex

**Sentence format Bracket Key for Adult Insects in all Orders:**

- 1a. With wings..... 5
- 1b. Without wings.....2
- 2a. Antlike body..... 3
- 2b. Not an Antlike body..... 4
- 3a. Ant-like body with a narrow waist(ants)..... Hymenoptera
- 3b. Ant-like with a wide waist (termites) .....Isoptera
- 4a. With an 2 antennae-like appendages located at the end of the abdomen which is used .as a (springtails).....Collembola

- 4b. Has 3 pair of legs, but no wings, and no springy legs.....Immature insect
- 5a. With only a single pair of wings; the second pair of wings modified into a pair of knob-like organs known as halteres (flies) .....Diptera
- 5b. With two pair of wings ..... 6
- 5c. With piercing, sucking mouthparts (like a straw).....7
- 5d. Forewings leathery, but not hard; hindwings membranous and folded under the forewings.....8
- 6a. The wings are equal in size with a long slender abdomen..... (dragonflies and damselflies)..... Odonata
- 6b. The first pair of wings much larger than second and held straight up over the body; with two or three long, antennae-like appendages at the end of the abdomen(mayflies) .....Ephemeroptera
- 7a. Forewings half leathery, half membranous, while hindwings entirely membranous; wings makes an “X” when folded on the back (true bugs) .....Hemiptera
- 7b. Forewings either entirely membranous or entirely leathery; held rooflike over the body (aphids, scales, leafhoppers, and cicadas) .....Homoptera
- 8a. Chewing mouthparts; hind legs often enlarged, adapted for jumping..... (grasshoppers, katydids, and crickets).....Orthoptera
- 8b. Hind legs are not enlarged and adapted for jumping.....9

9a. Front legs have many spines and are held in front of them in a bent “prayer like” position; with large eyes (praying mantids)  
.....Mantode

**q/Construction identification key for the following orders?**

**Coleptera, Diptera, Protura, Ephemeroptera, Orthoptera**

**1a** With wings..... **2a**

**1b** Without wings..... **Protura**

**2a** Two pairs of wings.....**3a**

**2b** One pairs of wings..... **Diptera**

**3a** Forewings and hindwings membranous ..... **Ephemeroptera.**

**3b** Forewings hard, hindwings membranous.....**4a**

**4a** Forewings tegma, Antennae filiform. Hind Legs saltatorial, (modified for jumping)..... **Orthoptera.**

**4b** Forewings elytra, Antennae multiforms. legs are cursorial (i.e. adapted for walking)..... **Coleptera.**