Insect classification and biodiversity
ENT-304

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COLEOPTERA (Sheath wings)

The insects are commonly **called beetles and weevils**, which bear a hard pair of fore wings known as **elytra**

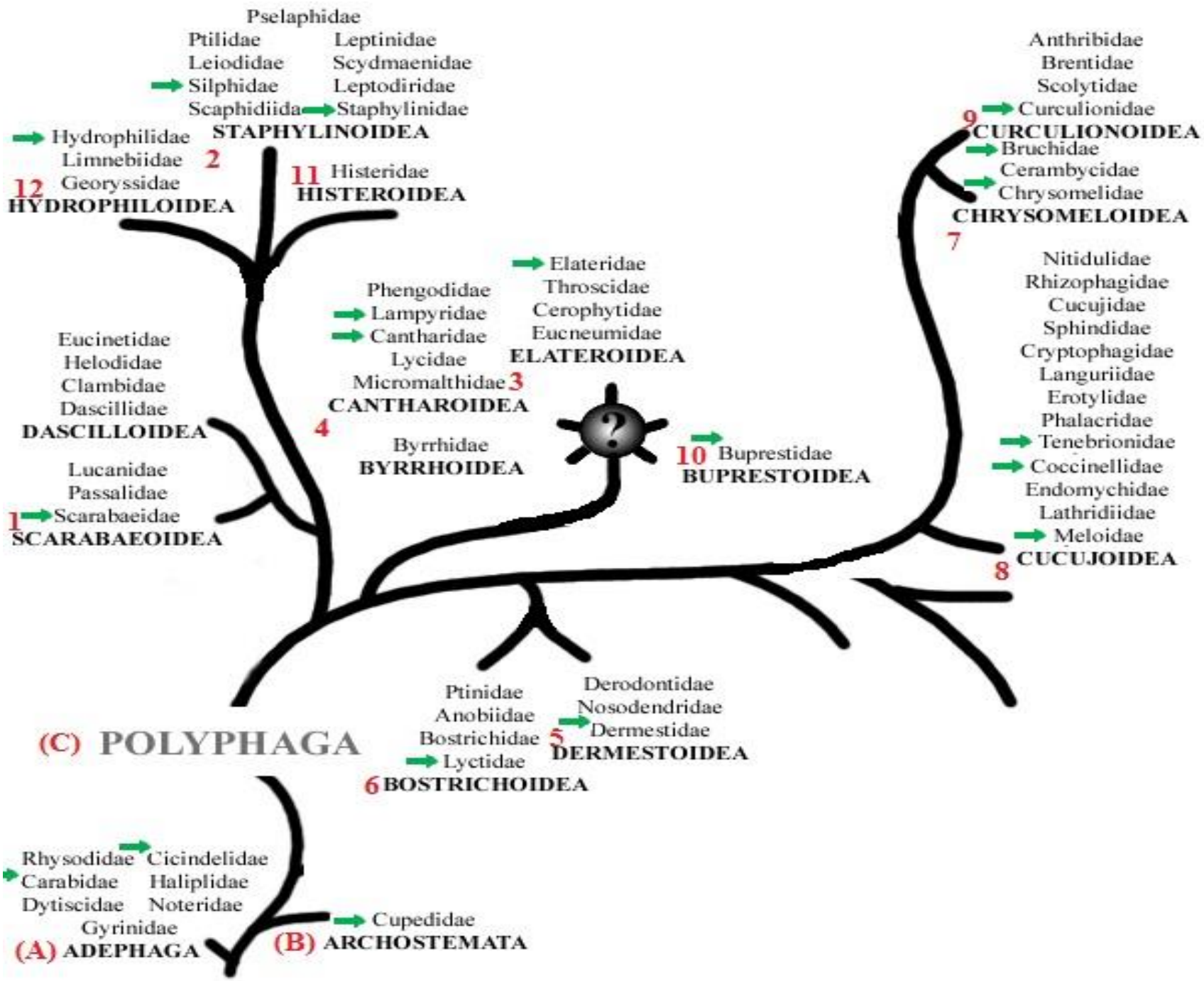
Characters

Head

- Antennae are varied types
- Mouthparts are chewing type

Thorax:

- Fore wings are Elytra
- Hind wings are membranous


Pselaphidae
Ptilidae
Leptinidae
Leiodidae
Scydmaenidae
Silphidae
Leptodiridae
Scaphidiida
Staphylinidae
STAPHYLINOIDEA
Hydrophilidae
Limnebiidae
2
12
Georyssidae
HYDROPHILOIDEA
11 Histeridae
HISTEROIDEA
Anthribidae
Brentidae
Scolytidae
9 Curculionidae
CURCULIONOIDEA
Bruchidae
Cerambycidae
Chrysomelidae
CHRYSOMELOIDEA
7
Elateridae
Throscidae
Phengodidae
Cerophytidae
Lampyridae
Eucneumidae
Cantharidae
ELATEROIDEA
Lycidae
Micromalthidae
3
CANTHAROIDEA
4
Eucinetidae
Helodidae
Clambidae
Dascillidae
DASCILLOIDEA
Byrrhidae
BYRRHOIDEA
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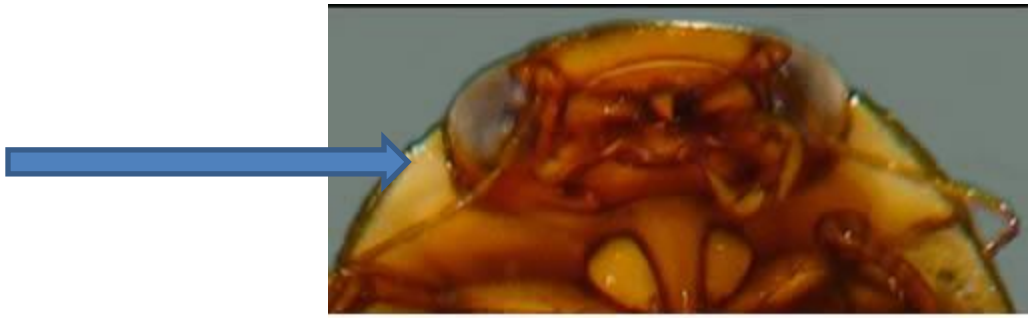
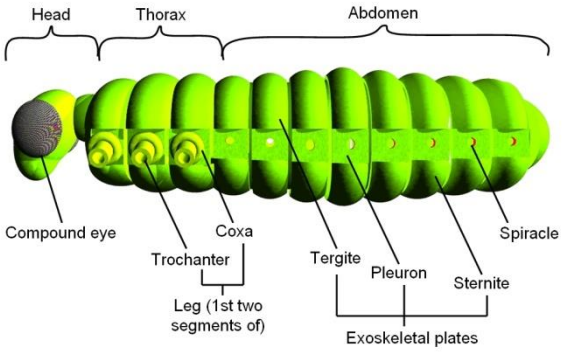
10 Buprestidae
BUPRESTOIDEA
Nitidulidae
Rhizophagidae
Cucujidae
Sphindidae
Cryptophagidae
Languriidae
Erotylidae
Phalacridae
Tenebrionidae
Coccinellidae
Endomychidae
Lathridiidae
Meloidae
CUCUJOIDEA
8
Lucanidae
Passalidae
1 Scarabaeidae
SCARABAEOIDEA
Ptinidae
Derodontidae
Anobiidae
Nosodendridae
Dermestidae
Bostrichidae
5
Lyctidae
DERMESTOIDEA
6 BOSTRICHOIDEA
(C) POLYPHAGA
Rhysodidae
Cicindelidae
Carabidae
Haliplidae
Dytiscidae
Noteridae
Gyrinidae
(A) ADEPHAGA
Cupedidae
(B) ARCHOSTEMATA

- **Sclerites** = Hardened body wall plates
- **Suture** = A groove between sclerites where two separate plates meet.

- **Tergum** = the dorsal portion of an arthropod segment
- **Notum** = tergum or dorsal exoskeleton of the thorax
- **Sternum** = thickened ventral plate on each segment of the body of an arthropod
- **Pleuron** is a lateral sclerite of an insect between the tergum and the sternum
- The **notopleuron** is a thoracic pleurite (a sclerite on the pleuron)



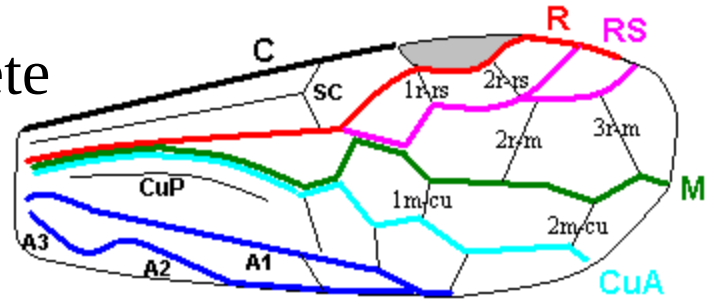


Classification

This order is divided into 3 suborders:

1. Suborder Polyphaga

- Notopleural suture is absent or incomplete
- Wings are without 2 m-cu cross veins



2. Suborder Adephaga

- Notopleural suture is present in prothorax
- Wings are usually with 2m-cu cross veins

3. Suborder Archostemata

- Notopleural suture is present in prothorax
- Wings are usually with 2m-cu cross veins

Superfamilies of suborder Polyphaga

It includes 12 super-families

1. SUPERFAMILY SCARABAEOIDEA

Antennae are usually 10-segmented, with 3-7 apical segments produced on one side to form lamellate club.

Families

Family Scarabaeoidae (Dung beetle)

- Antennae 8-10 segmented.
- Some abdominal spiracles are lying in the sternites

Family Hydrophiloidae (Water scavenger)

Large numbers are truly aquatic

2. Superfamily Staphylinoidea

a. Antennae with last 3 segmented rarely forming club shape
b. Exoskeleton is rarely very hard and shining
c. Elytra truncate and usually leaving more than 2 abdominal segments exposed.

FAMILIES

1. Family Silphidae: (e.g. Carrion beetle and Bunging beetle)

a. Elytra long, usually leaving at least 1 segment exposed or not leaving abdominal segments exposed (see next slide)
b. Abdomen is not usually mobile.

2. Family Staphylinidae: (Rove beetle)

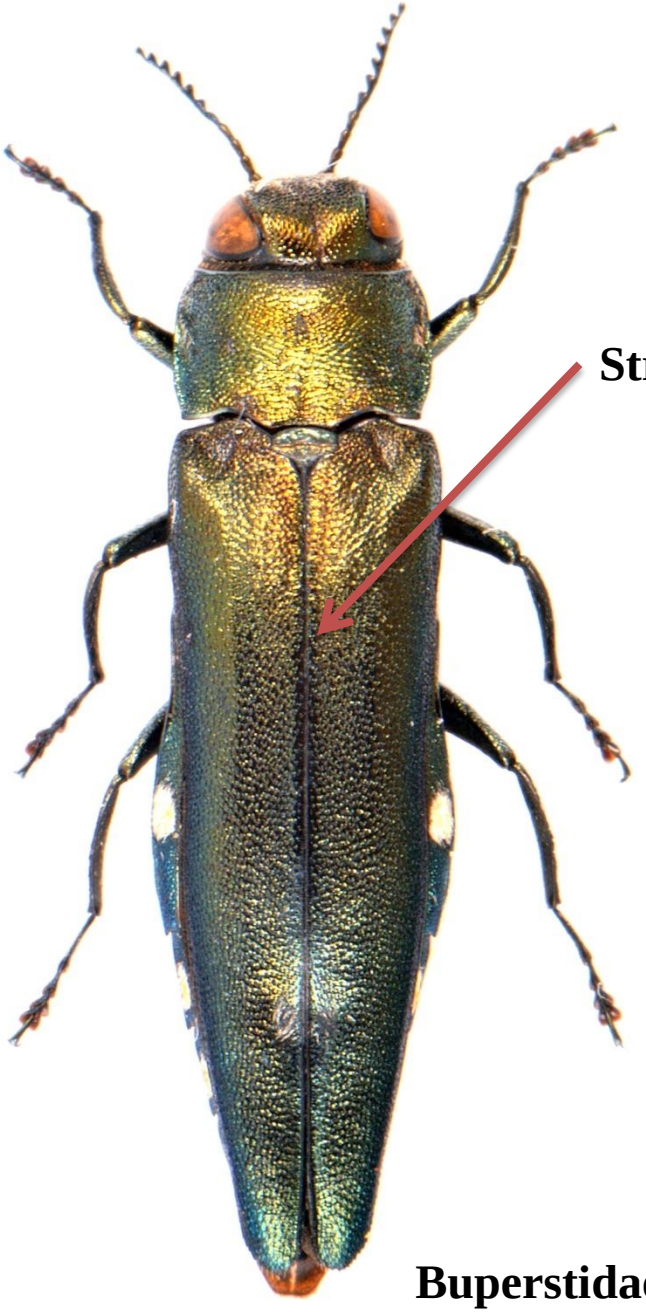
a. Elytra are very short, usually leaving many abdominal segments exposed (see next slide)
b. Abdomen usually mobile.

3. Family Buperstidae: (Cotton borer)

a. Adults have a striae on the elytra, the well-marked transverse suture on the metasternum (see next slide)

Truncate = cut off squarely at the tip
Striae (singular - stria) = the longitudinal grooves running from the base to the apex of the elytra;
Metasternum Noun. (plural metasterna) (anatomy) The most posterior element of the sternum

Silphidae



Buperstidae

3. Superfamily Elateroidea:

a. Antennae are filiform

b. Tarsi are rarely with more than one segment with adhesive lobes beneath.

c. Abdominal tergites are weakly sclerotized.

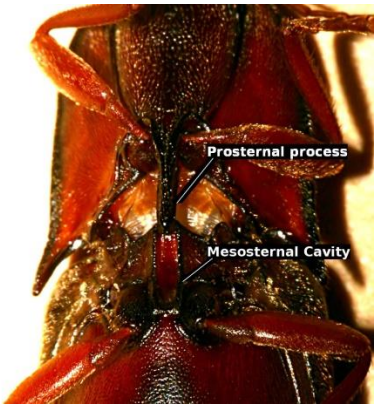
d. Hind coxae are almost always with complete femoral plates.

FAMILY ELATERIDAE: (the most common species known as Click beetles).

a. Antennal sockets are close to eyes.

b. Femoral plates of hind coxae are broad throughout

c. Prosternal spine works as “click” mec



L**obes** or padds that are located between the **tarsal** claws of many **insects**. The pads have **adhesive** properties, including the use of an **adhesive** fluid, and this helps the **insect** stick to the surface on which it is standing.

4. Superfamily Cantharoidea

- Antennae are filiform.
- Hind coxae are with femoral plate very narrow, incomplete or absent.
- 6 or 7 abdominal sternites are visible.

FAMILIES OF SUPERFAMILY CANTHARODEA:

1. **Family Lampyridae: (e.g. Firefly, Glow-worm)**

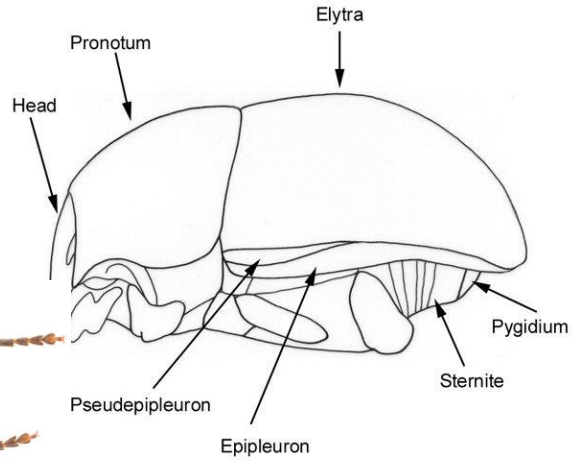
a. Laminous organ is usually present in one sex (male).

b. Elytra are usually with epipleura anteriorly broad.

2. **Family Cantharidae: (e.g. Soldier beetles).**

a. Luminous organ is absent.

b. Elytra are narrow or without epipleura.



Epipleuron (pl. epipleura) = the reflexed/curved lateral edge of the elytron

5. Superfamily Dermestoidea

a. Antennae are not filiform

b. 5 abdominal sternites are visible

c. Tarsi are 5 segmented.

d. Prothorax is not hood like.

1. **FAMILY DERMESTIDAE: (e.g. Dermestid, Khapra).**

- Dermestids have a variety of habits; most genera are scavengers that feed on dry animal or plant material, such as skin or pollen, animal hair, feathers, dead insects and natural fibers.

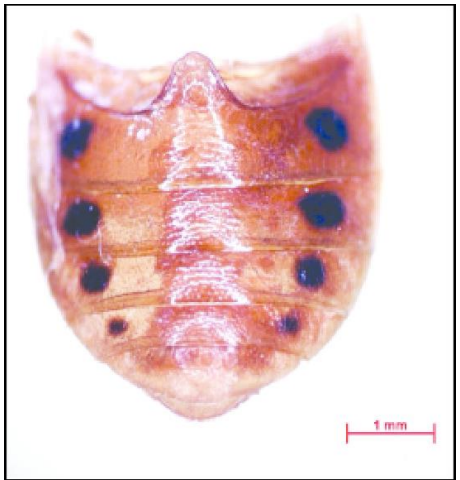


Figure 1. Dorsal view of adult male black larder beetle, Dermestes ater DeGeer. Photograph by: Andreas Herrmann, http://www.dermestidae.com/ Used with permission.

The underside of the abdomen is light brown with dark brown patches in the middle and on the sides (Mound 1989). This characteristic distinguishes *D. ater* from *D. lardarius* (larder beetle), which has an underside lighter in color (Hedges and Lacey 1996).

Figure 2. Ventral view of abdomen of an adult black larder beetle, Dermestes ater DeGeer. Notice dark brown patches in the middle and on the sides. Also note that on both the third and fourth segment of the abdominal sternites (counting from the top), the adult male has a small stout bristle surrounded by golden-colored bristles, which the female lacks. Photograph by: Andreas Herrmann, http://www.dermestidae.com/ Used with permission.

6. Superfamily Bostrychoidea

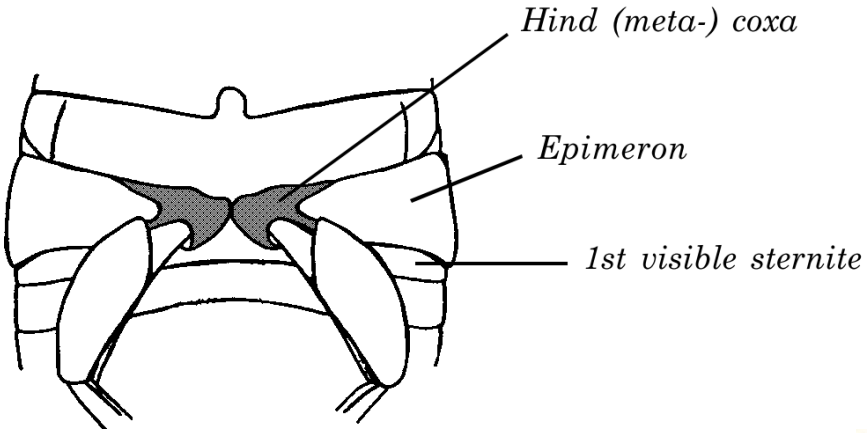
a. Prothorax is hood like.

b. Ocelli are absent.

1. FAMILY LYCTIDAE: (Powder post beetle)

a. Antennae are usually less then 11-segmented, with club shape

b. Hind coxae are separated.



7. Superfamily Chrysomeloidea

a. Ocelli are present

b. Head is not rostrate

c. Gular suture (see next slide) is distinct.

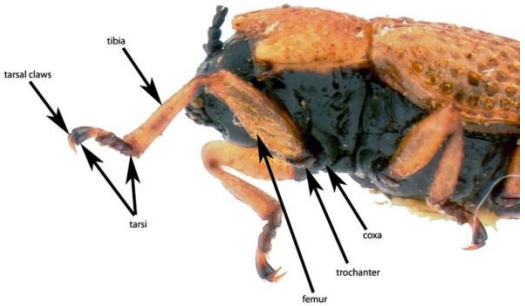
d. Antennae are not received into a groove

Rostrum in Curculionidae

1. **FAMIY BRUCHIDAE: (e.g. Dhora, Seed beetle, Pulse beetle, etc).**

a. Antennae are usually shorter.

b. Claws (see next slide) are often split.

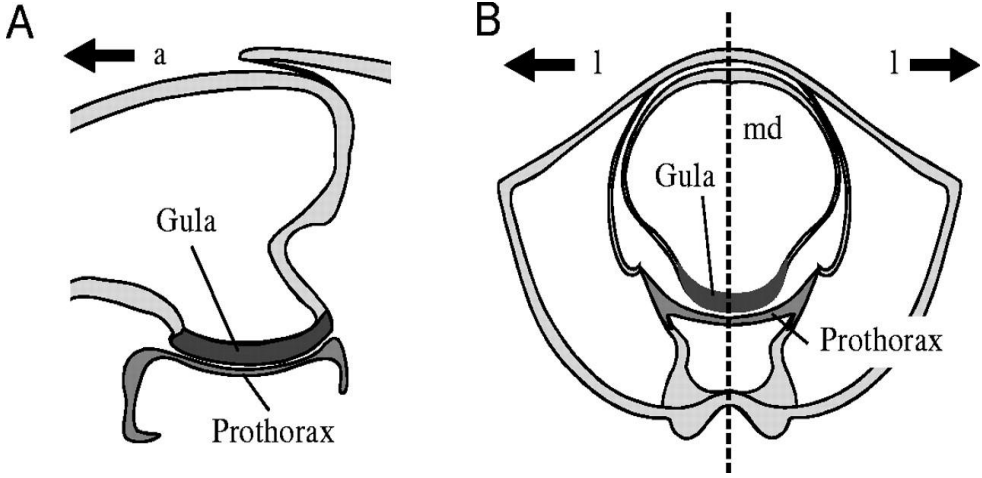


2. **FAMILY CHRYSOMELIDAE: (e.g. Leaf beetle, Potato beetle, Red pumpkin beetle)**

a. Antennae are filiform and fairly long.

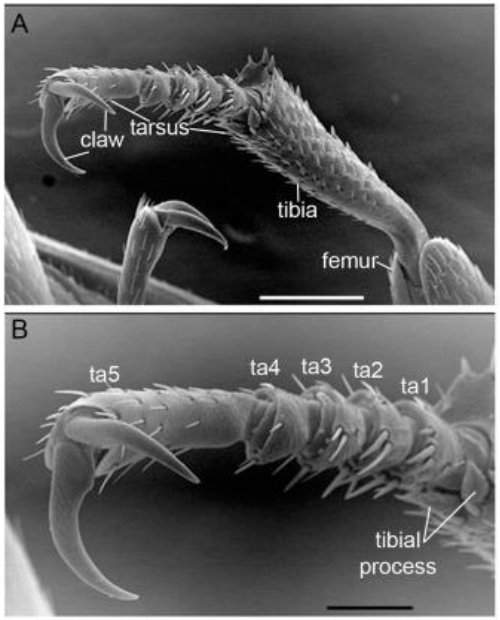
b. Tarsi are four segmented; the 3rd segment is enlarged to form a large kidney shaped pad (For grip and attachment)

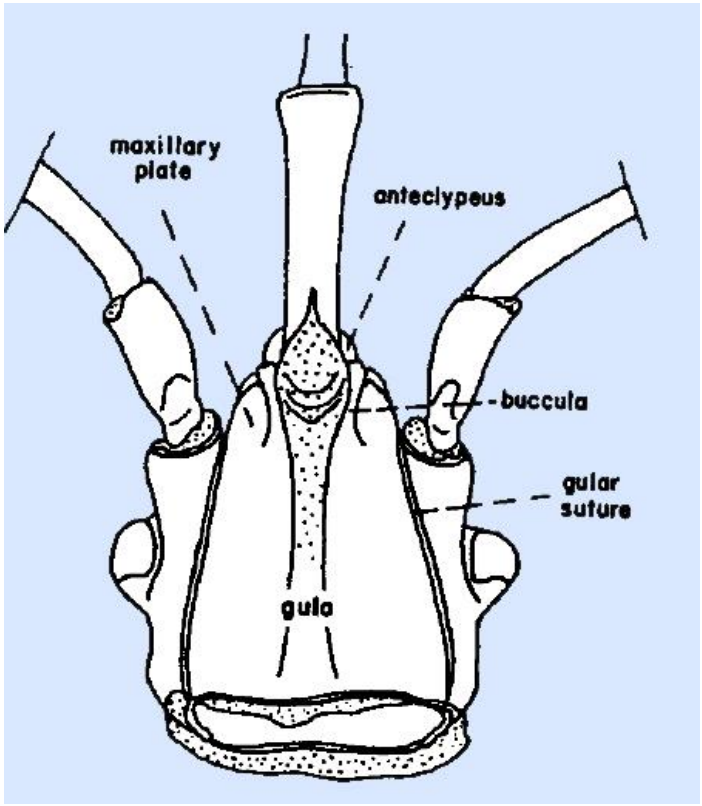
The **rostrum** is a beak-like projection from the heads of some insects, **Weevils** often possess a large rostrum and their mouth parts are located at the very tip. These insects use their **rostrum** to pierce the body of their prey.



Gula (middle piece of the throat) is a median ventral plate of the head

Gular suture: Longitudinal sutures on each side of the gula





8. Superfamily Cucujoidea

a. Head is not rostrate
b. Antennae are filiform or clubbed
c. Abdomen with 5 visible sternites

FAMILY COCCINELLIDAE: (e.g. Lady bird beeetle)

a. Head is partly concealed by pronotum
b. Tarsi are 4-segmented, 3rd segment concealed in the bilobed second segment.

FAMILY TENEBRIONIDAE: (e.g. Darkling beetle, Red flour beetle)

a. First 3 visible abdominal sternites are connate (Fused together or immovably united.)
b. Fore coxae are not projecting

FAMILY MELOIDAE: (e.g. Blister beetle)

a. Head is strongly deflexed, neck narrow.
b. Tarsi claw is split and usually serrate

9. Superfamily Curculionoidea

a. Head is more or less produced into a rostrum.

b. Gular suture is nearly always confluent (merging)

c. Antennae are usually geniculate the clubbed, 1st segment into a groove

FAMILY CURCULIONOIDAE: (weevils: Rice weevil, Date palm weevils etc.)

a. Head is forming a snout.

b. Antennae nearly always geniculate.

c. Trochanter very rarely long.

Families of the suborder Adephaga

FAMILY CICINDELIDAE: (Tiger beetle) large sized terrestrial beetle

a. Clypeus is extended laterally in front of antennal insertion.

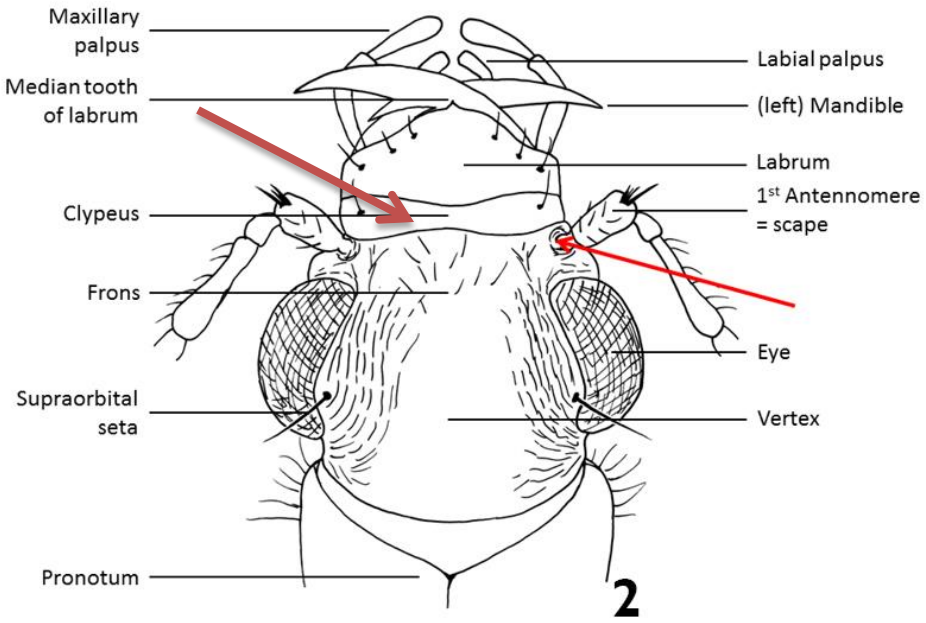
b. Elytra are not regularly striate

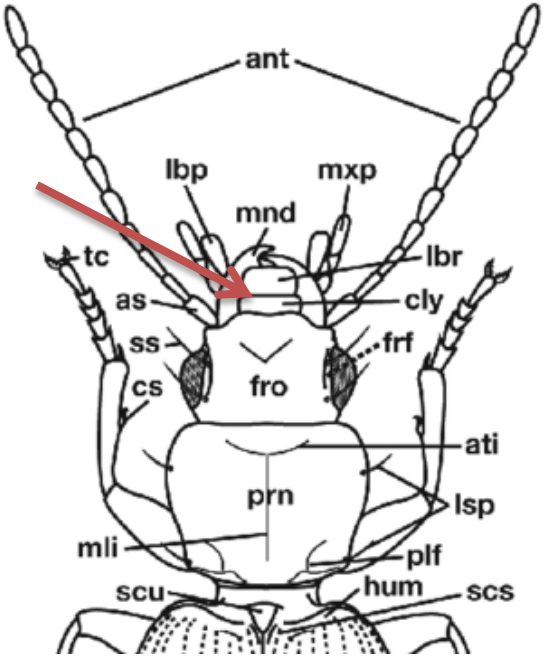
FAMILY CARABIDAE: (Carabid beetle, Ground beetle)

a. Clypeus is not extended laterally in front of antennal insertion.

b. Elytra with striation.

c. Terrertrial small sized beetle


Maxillary palpus
Median tooth of labrum
Clypeus
Frons
Supraorbital seta
Pronotum
Labial palpus
(left) Mandible
Labrum
1st Antennomere = scape
Eye
Vertex
2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Families of the Suborder Archostemata

Two important families i.e., Cupedidae and Micromalthidae only recorded form the central United States also introduced in Hawaii and South Africa.

Collection

Beetles and weevils can be collected from their specific habitats, which are mentioned in their respective families. Generally they can be collected through light traps, by sweeping net in the aquatic sources, from stored materials and grains, under the bark of trees etc

STREPSIPTERA (Twist Wings)

These are small and endo-parasitic insects having twisted wings and commonly called **stylopids** or twisted winged insects.

Characters:

Head:

- Antennae are flabellate and conspicuous.
- Mouthparts are biting type but degenerated

Thorax:

- Forewing is reduced to small club like called pseudo-haltere.
- Hind wing large and fan shaped
- Female is like a larval form and degenerate its body appendages

Classification

FAMILY STYLOPIDAE: (Parasitic bees and wasps)

a. Antennae are 4-6 segmented.

b. Tarsi are 4 segmented.

FAMILY HELITOPHAGIDAE: (Parasitic leaf hoppers, grasshoppers, plant hoppers, treehoppers)

a. Antennae are 7 segmented.

b. Tarsi are 3 segmented.

Collection:

These insects can be collected from their hosts in which they live. The parasitized hoppers, bees and wasps can be brought from crops fields and adult stylopids emerge out after a few days.

MECOPTERA (Long wings)

Long is referred to length of wings and a beak

The wings are very long in these insects, which are commonly called **Scorpionflies**

Characters:

Head:

Antennae are very long and filiform.

Mouthparts are chewing type

Head is greatly prolonged to anterior side to form a long beak like structure This is not a sucking proboscis, but at the end of beak small mandibles are present which cut and chew the things.

Thorax:

Wings are long, narrow and similar.

Abdomen

- In many male members of this order, the end of abdomen is raised up in air just like the pattern of scorpion sting.
- This is why they are called scorpionfly.
- They have no sting at the end.
- Abdomen ends in two short cerci

FAMILY PANORPIDAE: (e.g, *Panorpa* sp)

Collection

These insects are found at high altitude in the mountainous area.

SIPHONAPTERA (Tube wingless)

Commonly called **fleas** which are ecto-parasites bears a sucking mouth tube and without wings, feed as adult on the blood of birds and mammals

Characters:

Head:

Antennae are short; lie in grooves in the head.

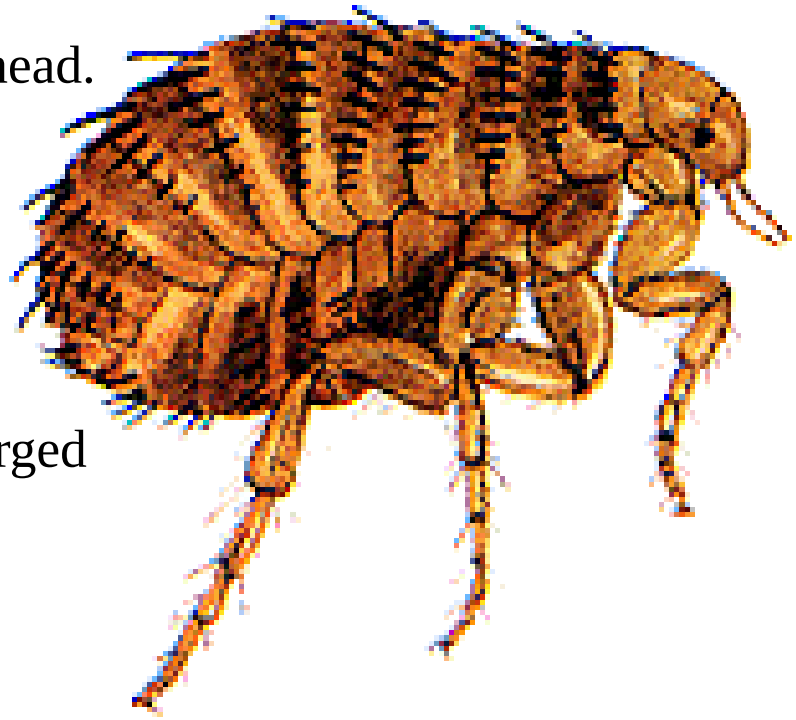
Mouthparts are sucking.

Eyes may be present or absent.

Thorax:

Wings are absent

Legs are long with coxae are greatly enlarged



Classification

FAMILY PULICIDAE: e.g. Oriental rat fleas, *Pulex xenopsylla*

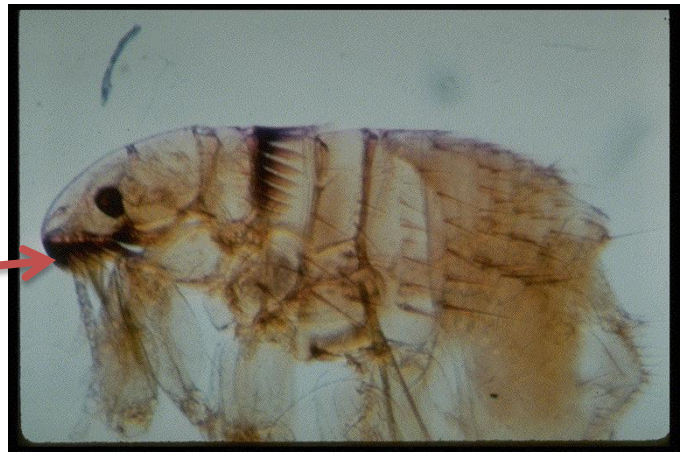
a. Eyes are present and well developed

b. Genal comb is present, or absent

FAMILY DOLICHOPSYLLIDAE: (Rat flea, *Nosoprsyllus fasciatus)*

a. Eyes are absent.

b. Genal comb is absent.



Comb: Hairs present on Genal part of head

Collection:

These insects are ectoparasites and mostly found on rats; also be found on other mammal