➢ Subclass Apterygota:

Order Collembola:

1. Mouth parts for biting and chewing.
2. delicate insects with six or fewer abdominal segments. Under side of abdomen has a sucker, and a pair or more or less fused appendages, for jumping (furculum).

Order Thysanura:

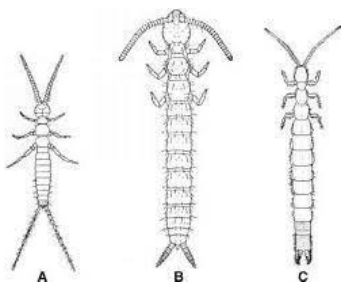
1. Very delicate insects, flattened body often covered with scales.
2. chewing mouthparts
3. Anal cerci present, nearly as long as median caudal filament.
4. Compound eyes separated small or absent.
5. Has 11 abdominal segments
6. (Silverfish, bristle tails).

Order Protura:

1- Elongated and very small, less than 2 mm long
2- Distributed throughout the world in soil and leaf litter,
3- Antennae absent- front legs serve role of antennae.
4- Abdomen with 12 segments
5- Eyeless and cerci absent

Order Diplura:

1- Elongated with long slender antennae, and less than 10 mm in length.
2- Their two tail filaments can be long and thin, short and thick, or in the form of pincers.
3- Eyeless (blind).



➢ Subclass: Pterygota:

Subclass Pterygota can be divided into two groups Infraclass Paleoptera and Infraclass Neoptera

Pterygota (winged insects) have been divided on the basis of the ability to flex the wings horizontally over the body when at rest. In to the **Paleoptera** which are the orders Ephemeroptera and Odonata whose members do not possess a wing-folding mechanism.

The second group is **Neoptera** whose members are able to fold their wings over the body

❖ Infraclass: Paleoptera

the **Paleoptera**: "old-winged" insects. These were unable to fold their wings back against their abdomens because they lacked certain specializations of the wing-thorax articulation area. Only two orders of **Paleoptera** continue today.

Order **Ephemeroptera** includes the mayflies, characterized by aquatic Naiad (immature) stages and very short-lived adults; including possession of a median caudal filament.

And Order **Odonata** includes damselflies and dragonflies, which are highly efficient predatory insects with aquatic Naiad stages like the mayflies.

Order Ephemeroptera: (Mayflies**)**

Mayflies are

1- medium-sized soft-bodied insects.

2- They are common near aquatic environments, where the immatures develop.

3- The adults have membranous wings, with the front wings being large and somewhat triangular while the hind wings are typically smaller and rounded. Unable to fold their wings over their back, they belong to the Paleoptera infraclass.

4- The adults have one pair of small bristlelike antennae.

5- The adults do not feed and have vestigial mouthparts.

6- Some mayflies have only a pair of cerci, others have a pair of cerci and a median caudal filament.

Order Odonata: (Dragonflies & Damselflies)

The Odonata are **relatively large** insects. As immatures, they live in aquatic habitats and often remain near water as adults. They are predaceous as both immatures (naiads) adults. Like other aquatic insects, they are often used as ecological indicators. Both suborders are Long slender insects with long and narrow wings, have **large compound eyes, three ocelli, short bristlelike antennae, chewing mouthparts, and membranous wings**. The variations among these characteristics often separates the two suborders.

- **Suborder Anisoptera*:* (dragonflies)**

The dragonflies have hind wings that are wider than the front wings, especially at the base. Also, the wings are held horizontally at rest. Typically, the compound eyes of dragonflies are touching at the top of the head.

1-Family: Aeschnidae

2-Family: Libellulidae

F. Aeschnidae

F.: Libellulidae

- **Suborder Zygoptera:**

Damselflies are usually more slender and smaller than dragonflies. Their eyes are separated at the top of the head and their wings, which are of equal size and narrow at the base, are held vertically when at rest.

1-Family: Agrionidae

2-Family: Coenagrionidae

F. Coenagrionidae

F. Agrionidae

Infraclass: Neoptera:

I) Division: Exopterygota

This division characterized as following:

- Wings develop externally.
- Metamorphosis simple or slight. **Paurometabola**: (**Gradual metamorphosis**)
- Immature stages generally nymphs which resemble adults in structures and habits.

The Exopterygota could be arranged into two groups:

Orthopteroid Orders:
Order: Plecoptera
Order: Grylloblattodea
Order: Orthoptera
Order: Phasmatodea
Order: Dermaptera
Order: Embioptera.
Order: Dictyoptera
Order: Isoptera

Hemipteroid Orders:
Order: Psocoptera
Order: Mallophaga
Order: Anopleura
Order: Hemiptera
Order: Homoptera
Order:Thysanoptera

Hemipteroid Orders characterized as following:	Orthopteroid Orders characterized as following:
▶ usually suctorial, mouthparts ▶ wing venation reduced. ▶ small anal lobe in hind wing ▶ Anal cerci Absent. ▶ few Malpighian tubules. ▶ generalized nervous system with few discrete abdominal ganglia.	▶ generalized biting mouthparts ▶ wing venation usually well developed with numerous cross veins. ▶ Large anal lobe in hind wing ▶ Anal cerci present. ▶ many Malpighian tubules. ▶ generalized nervous system with several discrete abdominal ganglia.

Orthopteroid Orders:

Order: Orthoptera: (Grasshoppers, Crickets and Mole Crickets)

1. Winged or brachypterous or rarely apterous.
2- Antenna is filiform.
3. Month parts biting and chewing type (Mandibulate type)
4- Prothorax is large. Pronotum is curved, ventrally covering the pleural region
5. Hind leg usually enlarged and modified for jumping.
6. Two pair's wings, sometimes absent or vestigial, following straight, thickened called Tegmina, hind pair of wings membranous.
7. Gradual metamorphosis, the nymphs resemble the adults in all essential features and habits.
8. A pair of unsegmented short cerci is present.

- **Family: Gryllidae (Field crickets)**

Antenna is long.

1. Antenna is long
2. Tarsus is four segmented.
3. Ovipositor is slender and needle like.
4. Forewings are abruptly bent down to cover the sides of the body
5. Hindwings are acuminate. They are produced into a pair of long processes which project beyond the abdomen.
6. Cerci are long and unsegmented
7. Auditory organs and stridulatory organs are similar to long horned grasshopper. Males
8. stridulate during night. They produce a shrill chirping noise.
9. ***Gryllus*** sp. It is household pest.

- **Family: Acrididae (Locustidae) (Locusts grasshopper)**

1. Antenna is short
2. Tarsus is three segmented
3. Ovipositor is short and horny
4. Tympanum is located one on either side of the first abdominal segment.
5. Sound is produced by femoro-alary mechanism. A row of peg like projections found on the inner side of each hind femur is rubbed against the hard-radial vein of the closed tegmen