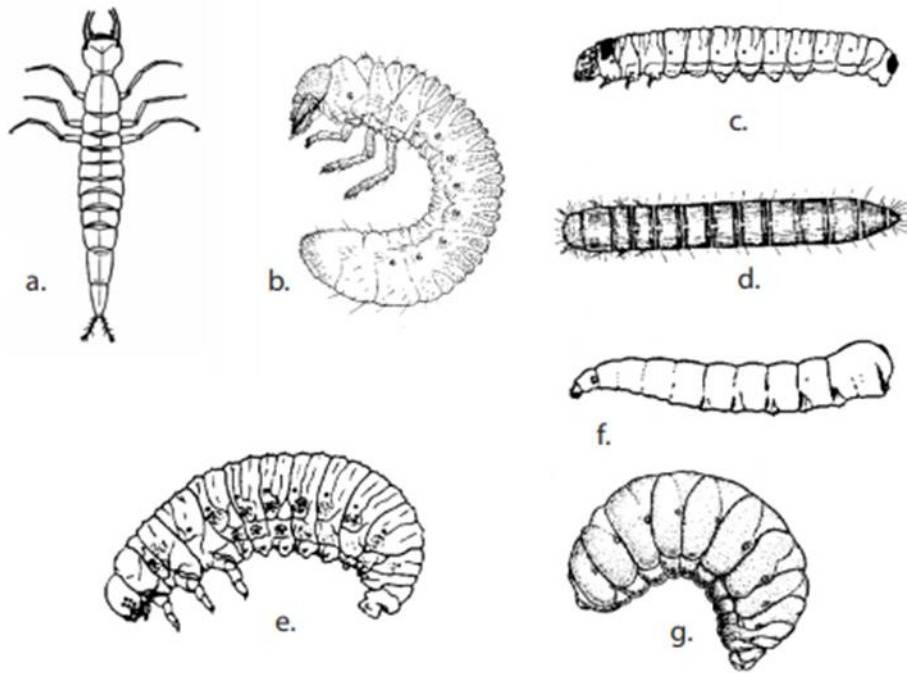


3) **Elateriform Larvae:** wireworm-like, e.g., family Elateridae

C) Polypod Or Eruciform Larvae: The body consists of an elongate trunk with large sclerotized head capsule. Head bears a pair of powerful mandibles. Two groups of single lensed eyes. The antenna is short. Three pairs of thoracic legs and up to five pairs of unjointed abdominal legs or prolegs are present. Thoracic legs are segmented and they end in claws which are useful in clinging to the exposed surface of vegetation and walking. Abdominal segments three to six and ten typically bear prolegs. Eg: **Caterpillar** (larvae of moths and butterflies).



Types of Larvae

III) Pupa: It is the resting and inactive stage in all holometabolous insects. During this stage, the insect is incapable of feeding and is quiescent. During this transitional stage, the larval characters are destroyed and new adult characters are created. There are three main types of pupae.

1) Obtect Pupa: Various appendages of the pupa viz., antennae, legs and wings pads are stuck to the body by a secretion produced during the last larval moult. Exposed surface of the appendages is more heavily sclerotised than those adjacent to body. e.g.: moth and Butterfly pupa.



2) Active Pupa: Pupa of mosquito is called tumbler. It is comma shaped with simple appendages. Breathing trumpets are present in the cephalic end and anal paddles are present at the end of the abdomen. Abdomen is capable of irregular movements which are produced by the anal paddles. The pupa is very active.



3) Exarate Pupa: Various appendages viz., antennae, legs and wing pads are not glued to the body. They are free. All oligopodous larvae will turn into exarate pupae. The pupa is soft and pale. e.g.: pupa of rhinoceros beetle. And Pupa of Honeybees



4) Coarctate Pupa: The pupal case is barrel shaped, smooth with no apparent appendages. The last larval skin is changed into a case containing the exarate pupa. The hardened dark brown pupal case is called puparium. Eg: Fly pupa.



Insect Classification:

Taxonomy is the process of identifying and classifying living organisms. Taxonomists study organisms and identify them based on their characteristics. These characteristics might be visible morphological characteristics or genetic differences. The binomial naming system is the system used to name species. Each species is given a name that consists of two parts. The first part is the Genus to which the species belongs and the second part is the species name.

For example, *Apis mellifera* (the honey bee). The honey bee belongs to the Genus *Apis* and has a scientific name of *Apis mellifera*. The binomial naming system was first uniformly used by Carl Linnaeus. Other names for (or types of) Binomial naming system include: □ Binominal nomenclature

Biological classification is the process by which scientists group living organisms. Organisms are classified based on how similar they are. Historically, similarity was determined by examining the physical characteristics of an organism but modern classification uses a variety of techniques including genetic analysis. Organisms are classified according to a system of seven ranks: For example, the honey bee (*Apis mellifera*) would be classified in the following way:

Kingdom = Animalia
Phylum = Arthropoda
Class = Insecta
Order = Hymenoptera
Family = Apidae
Genus = *Apis*
Species = *Apis mellifera*

Species names are always written including the Genus in either full or abbreviated, for example, *Apis mellifera* or *A. mellifera* respectively.

The Class *Insecta* is generally studied under a classification system with approximately 30 orders. Insects can be divided into two groups historically treated as Subclasses: wingless insects, known as **Apterygota**, and Subclasses winged insects, known as **Pterygota**.

➤ **Subclass Apterygota: Characterized as following:**

Traditionally, the groups included in the term “apterygota,” namely, the Collembola, Protura, Diplura, and Thysanura, were considered orders of primitively wingless insects and placed in the subclass Apterygota (Amatabolic insect). They show the following common features:

- 1- Wingless (apterous)
- 2-no metamorphosis
- 3- Immature individuals are called Youngs
- 4- Adults with one or more pregenital appendages
- 5- Mandibles usually articulate with head capsule at a single point.

Thysaneura → Example Silver fish

Collembola → Example spring tails

Diplura → Example Japygids

Protura → Example Telson tails or proturans

➤ **Subclass: Pterygota: Characterized as following:**

1. Winged insects or some have lost the wings as a secondary modification.
2. Metamorphosis of various types and rarely absent.
3. Adults without pregenital abdominal appendages
4. Mandibles if not highly modified, articulate with the head capsule at two points.

The 29 insect orders are numbered in an approximate series of evolutionary complexity, with the oldest and most primitive groups being listed first. The first four orders are known as the Apterygote orders because all the adults are wingless. Like the immature stages these have no metamorphosis and are the most primitive insects alive today. The other 25 orders are called the Pterygote orders.

- **Class: Insects**
 - **Subclass: Apterygota**
 - **O: Thysanura**
 - **O: Collembola**
 - **Subclass: Pterygota**
 - **Infraclass: Paleoptera**
 - **O: Ephemeroptera**
 - **O: Odonata**
 - **Infraclass: Neoptera**
 - **Division: Exopterygota**
 - **O: Orthoptera**
 - **O: Dictyoptera**
 - **O: Dermaptera**
 - **O: Embioptera**
 - **O: Isoptera**
 - **O: Homoptera**
 - **O: Hemiptera**
 - **O: Mallophagaga**
 - **O: Anoplura**
 - **O: Thysanoptera**
 - **Division: Endopterygota**
 - **O: Neuroptera**
 - **O: Lepidoptera**
 - **O: Coleoptera**
 - **O: Siphonaptera**
 - **O: Diptera**
 - **O: Hymenoptera**