General Entomology

Lecture (11)

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Lecture Topics

- **Metamorphosis in Insects**
  - **No Metamorphosis**
  - **Incomplete metamorphosis**
  - **Complete metamorphosis**
  - **Types of larvae**
  - **Types of pupa**

Metamorphosis

- Humans grow gradually. You began life as a baby and grow a little at a time until you're an adult. While you're growing, the basic plan of your body doesn't change. You have the same body your whole life.
- For many insects, the stages are so different from one another that you might not recognize them as the same animal.

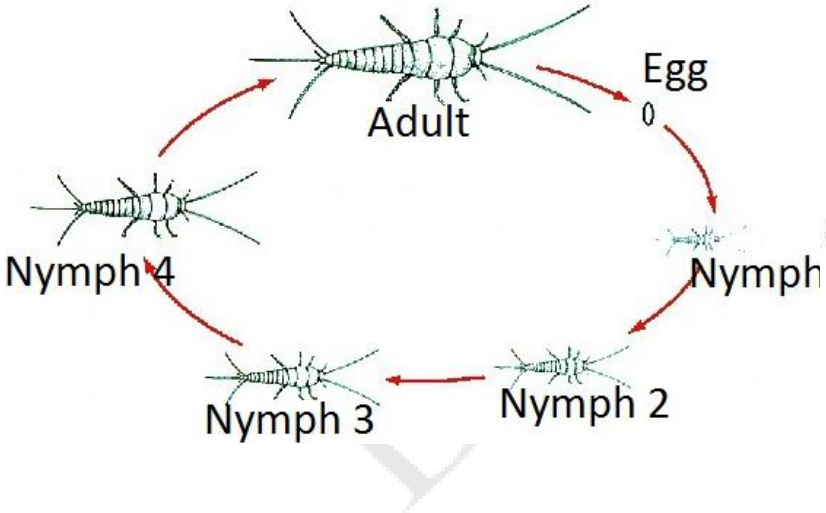
Metamorphosis

- Insects grow in stages and the cycle of stages is metamorphosis.
- The word “metamorphosis” comes from the Greek which means to transform.
- *Metamorphosis* is the process of transformation of an immature larval individual into sexually mature reproducing adult.
- The transformed adult is completely different from larvae in form, structure and habit. It is the way insects grow and mature.
- There are three types of metamorphosis in insects.

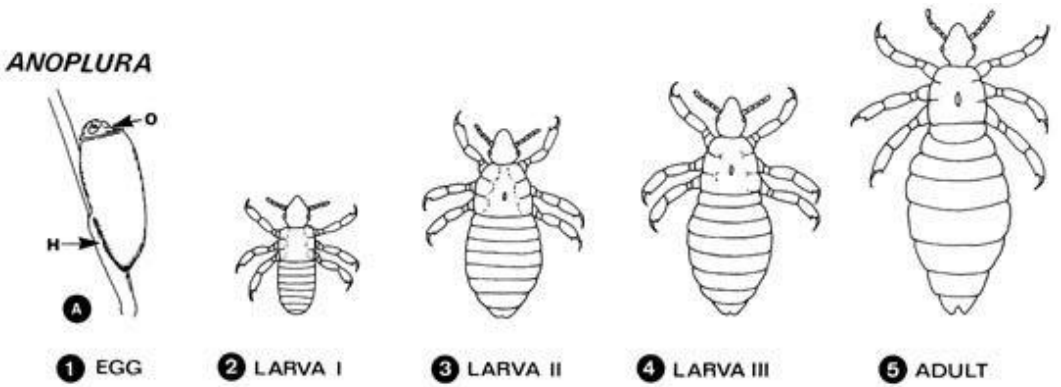
Types of Metamorphosis

1. No Metamorphosis

- Also known as ametabolous development.
- In this type, the newly hatched creature looks like an adult except smaller in size and immature.
- E.g., Silverfish, Order: Collembola , Sucking lice, Or: Anoplura.

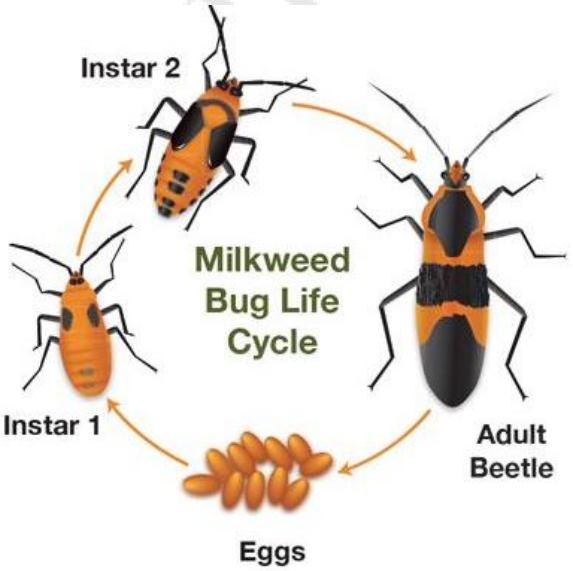


Silverfish: Collembola

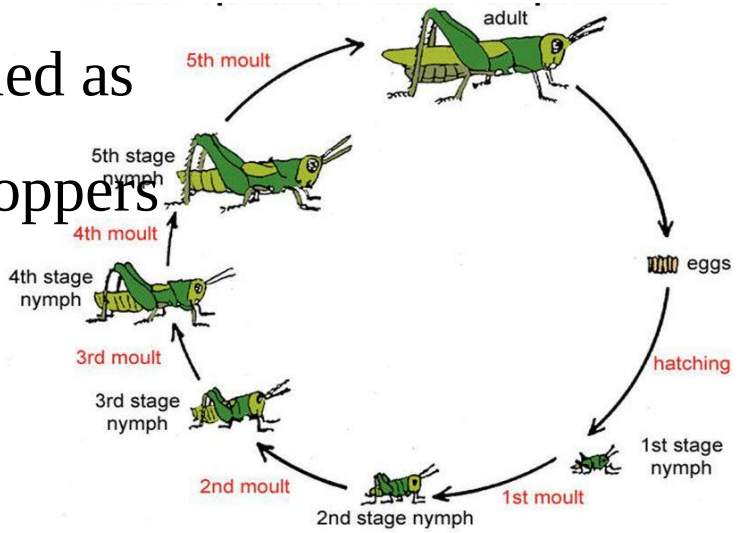


Types of Metamorphosis

2. Incomplete metamorphosis

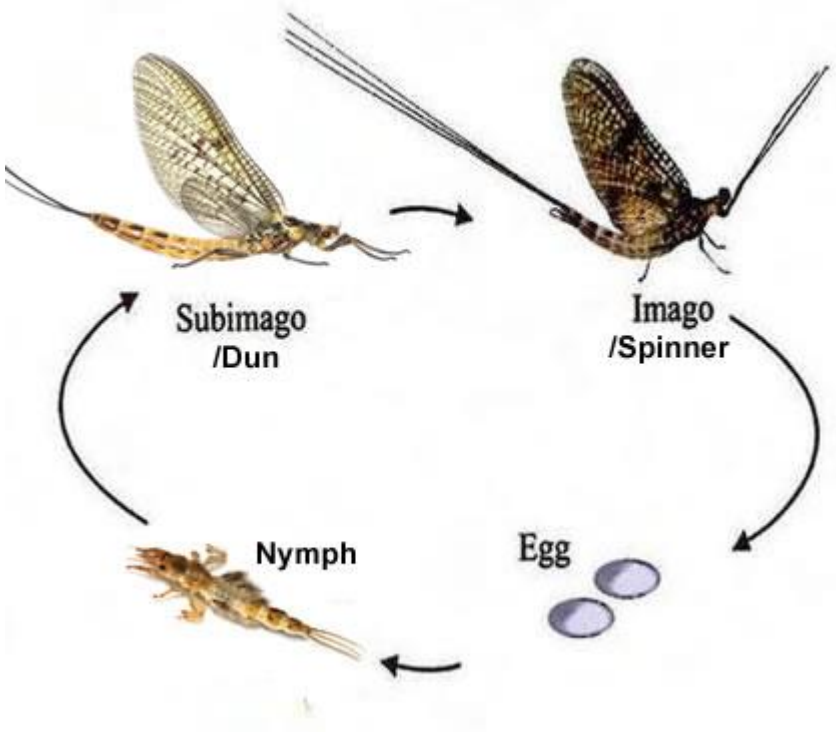


- Also known as hemimetabolous development.
- The general form is constant until the final molt, when the young undergoes substantial changes in body form to become a winged adult with fully developed genitalia.
- In this type, the immature stages are called as *nymphs* in terrestrial insects e.g., grasshoppers (Orthoptera), true bugs (Heteroptera), and aphids (homoptera).

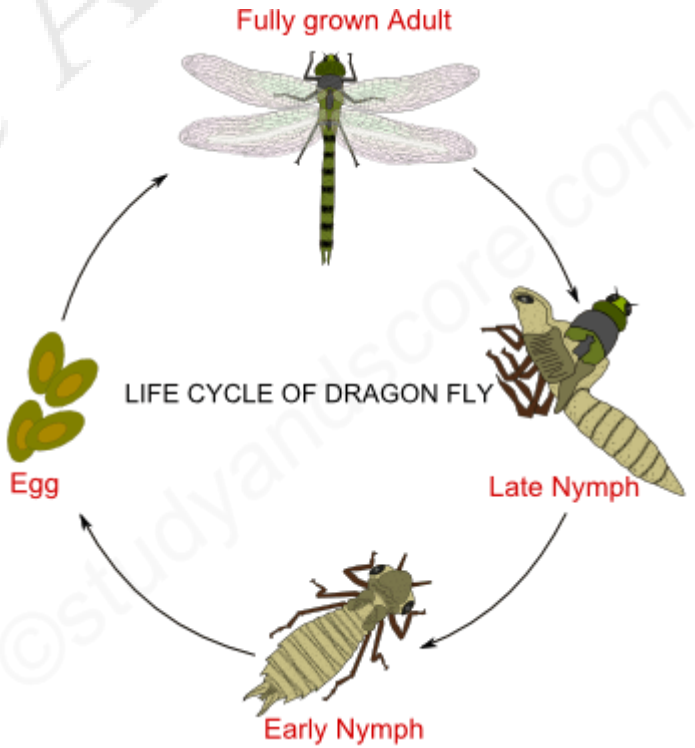


Types of Metamorphosis

- Nymphs of aquatic insects, as in the Odonata (Dragonflies), Ephemeroptera (mayflies), and Plecoptera (Stoneflies), are also called *naiads*, and they respire with the help of tracheal gills.



Mayfly

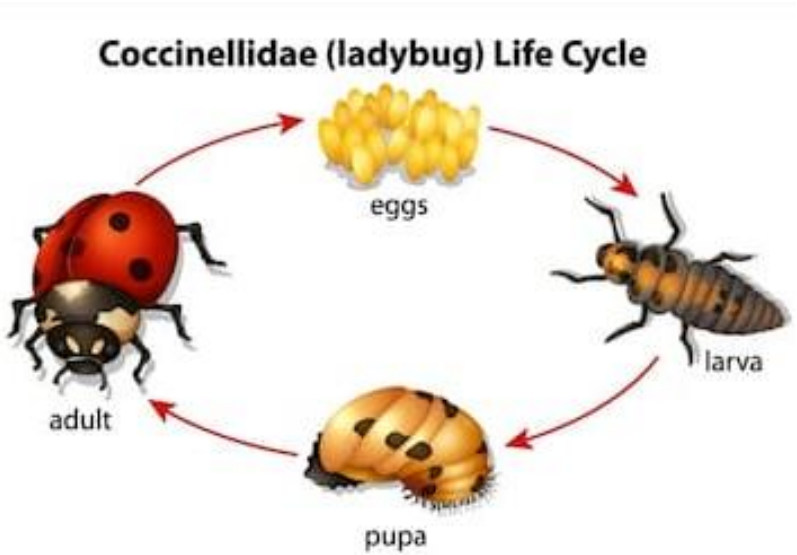


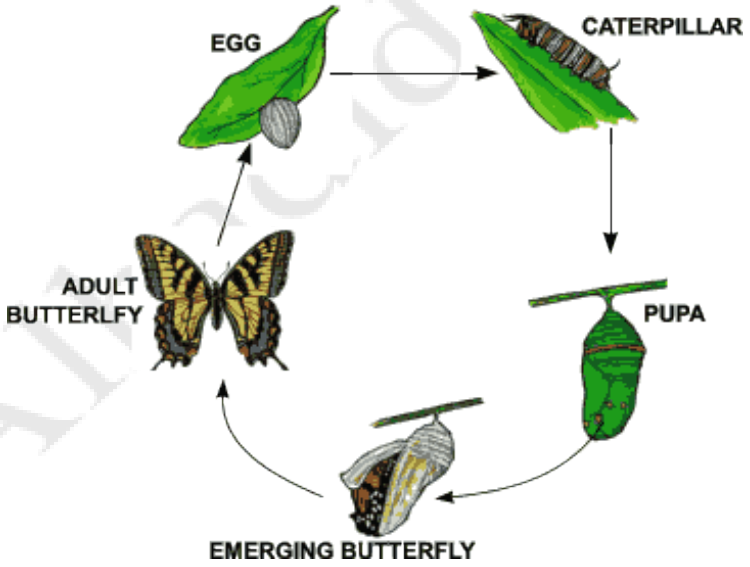
Types of Metamorphosis

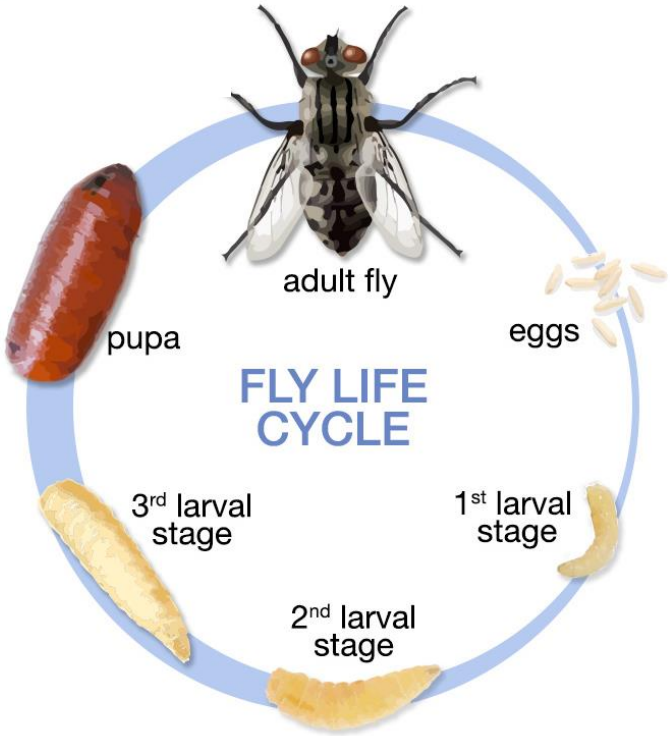
3. Complete metamorphosis

- Also known as holometabolous development.
- In this type, four metamorphic stages are included namely **egg**, **larva**, **pupa** and **adult**.
- After hatching larva moults several times to become fully grown one. It later becomes a pupa within a secreted case called as puparium.
- Inside the puparium, the pupa differentiates into adult and then breaks open the case to emerge out.
- E.g., the high orders of insects, including Lepidoptera (butterflies and moths), Coleoptera (beetles), Hymenoptera (ants, wasps, and bees), Diptera (true flies), and several others.

Types of Metamorphosis







Types of larvae

There are three main types of insect larvae.

1. Apodus: They are larvae without appendages for locomotion. Based on the degree of development and sclerotization of head capsule there are three subtypes.

larva of mosquito

a. Eucephalous: Larva with well developed head capsule with functional mandibles and maxillae. Mandibles act transversely. e.g. wriggler (larva of mosquito) and grub of red palm weevil.

grub of red palm weevil

Types of larvae

b. Hemicephalous: Head capsule is reduced and can be withdrawn into thorax. Mandibles act vertically. e.g., Larva of horse fly and robber fly.

Larva of horse fly

c. Acephalous: Head capsule is absent. Mouthparts consist of a pair of protrusible curved mouth hooks. They are also called vermiform larvae. e.g. Maggot (larva of house fly).

larva of house fly

Types of larvae

2. Oligopod: Thoracic legs are well developed. Abdominal legs are absent. There are two subtypes.

a. Campodeiform: called to the dipluran genus *Campodea*.

Body is elongate, depressed dorsoventrally and well sclerotised. Head is prognathous. Thoracic legs are long. A pair of abdominal cerci or caudal processes is usually present. Larvae are generally predators and are very active. e.g. grub of antlion or grub of ladybird beetle.

grub of ladybird beetle

grub of antlion

Types of larvae

b. Scarabaeiform:

Body is `C' shaped, stout and subcylindrical. Head is well developed.

Thoracic legs are short. Larva is sluggish, burrowing into wood or soil.

Caudal processes are absent. e.g. grub of rhinoceros beetle.

grub of rhinoceros beetle

Types of larvae

3. Polypod: The body consists of an elongate trunk with large head capsule. Head bears a pair of powerful mandibles which tear up vegetation. The antenna is short. Three pairs of thoracic legs and up to five pairs of unjointed abdominal legs are present. Thoracic legs are segmented, e.g. Caterpillar (larvae of moths and butterflies).

Types of pupa

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 the transitional stage, the larval characters are destroyed and new adult characters are created.
- There are three main types of pupae.

1. Obtect : Various appendages of the pupa viz., antennae, legs and wing pads are glued to the body by a secretion produced during the last larval moult e.g., pupa of butterfly.

pupa of butterfly

Types of pupa

2. Exarate: Various appendages e.g., antennae, legs and wing pads are not glued to the body (they are free). All oligopod larvae will turn into exarate pupae. The pupa is soft and pale e.g. Pupa of rhinoceros beetle.

Pupa of rhinoceros beetle

3.Coarctate: The pupal case is barrel shaped, smooth with no apparent appendages. The last larval skin is changed into case containing the exarate pupa. e.g. pupa of fly.

Fly pupa

Usfel websites

https://www.studyandscore.com/studymaterial-detail/phylum-arthropoda-metamorphosis-in-insects

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https://www.amnh.org/learn-teach/curriculum-collections/biodiversity-counts/arthropod-identification/arthropod-morphology/metamorphosis-in-arthropods

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Thanks for
listening