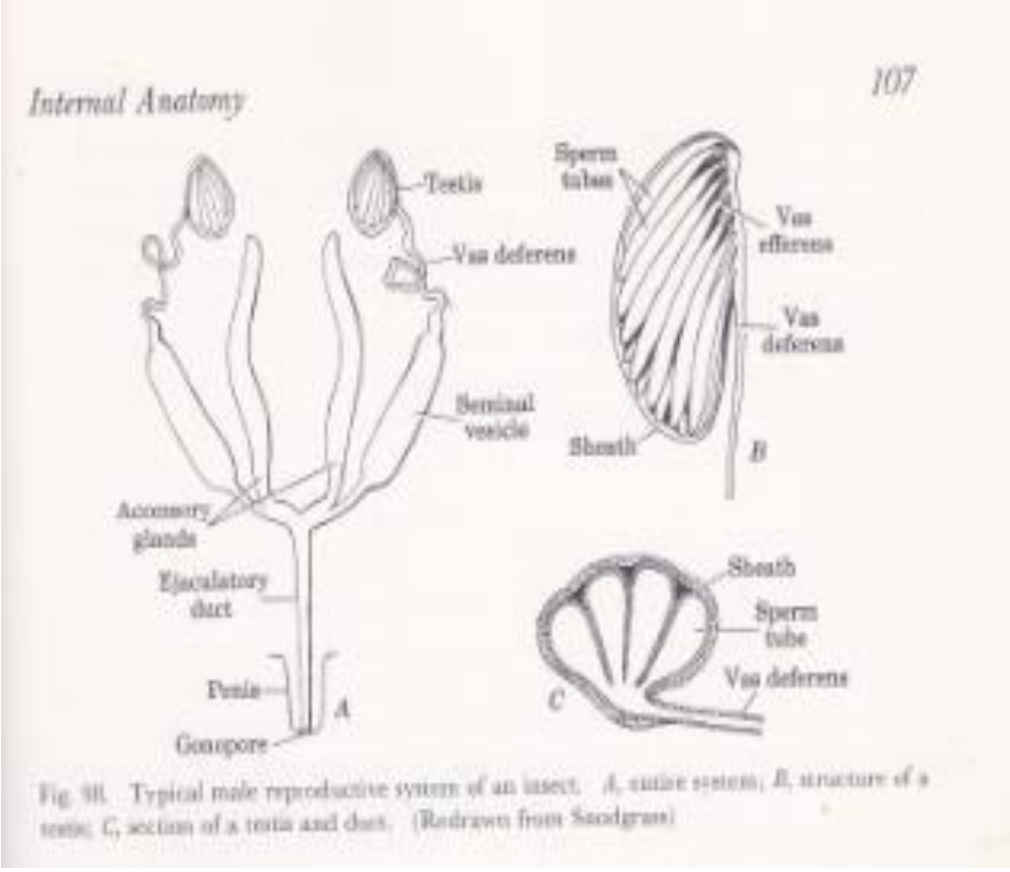


Fig. 98. Typical male reproductive system of an insect. *A*, entire system; *B*, structure of a testis; *C*, section of a testis and duct. (Redrawn from Snodgrass)

Reproduction:- **Reproduction in insects is nearly always Sexual and the sexes are separate . variation from the usual reproduction occur occasionally ; in the social insects , certain females (the workers) may be unable to reproduce , because their sex organs are undeveloped.**

Hemaphroditism:- **functional Hemaphroditism is extremely rare phenomenon in insects , such as in the scale insects Icerya purchasi .**

Parthenogenesis :- **in this type of Reproduction the egg undergo full development without having been fertilized , it is either :-**

a) ***Obligate :-*** **males very rare and non-functional .**

b) ***Facultative :-*** **when it co-exist with normal bisexual Reproduction.**

Four types of parthenogcensis are known :-

1- In honey bee , the female lay two kinds of eggs :-

a- Unfertilized (n) chromosome ⟶ males .

b- Fertilized eggs (2n) chromosome ⟶ females .

2- In some insects the female lays two kind of eggs :-

a- Fertilized ⟶ males + females .

b- un Fertilized eggs :- egg nucleus + 2nd polar body ⟶ females only .

3- In other insects : the eggs formed without

4- meiosis ⟶ female progeny .

Peadogenesis :- **this terms means the reproduction by juvenile stage .**

Polyembryony :- **means production of two or more embroys from a single egg .**

"Growth and development"

That can be divided into two stages :-

1- Embryonic development:- all the changes that occur to embryon within the egg.

2- Postembyonic development :- all the changes that occur to the small insects after hatching till it reaches adult stage , this is called metamorphosis .

According to the metamorphosis the insects can be divided into :-

1- Ametabola :

Egg ⟶ young ⟶ adult

ex :- Thysanura

2- Metabola : in these insect , the small insects differ in their shape few or large from the adult , for that the insects divided into :-

a- Gradual metamorphosis :

Egg ⟶ nymph ⟶ adult.

The nymph like the adult in : shape , habit and food .

And differ from the adult in : size , no wing and not mature : such as grasshopper .

b- Incomplete metamorphosis :

The naiad differ from the adult completely in : shape , habit , food and others - like : Odonata

Egg ⟶ naiad ⟶ adult .

c- Complete metamorphosis : in this case insect pass four stage to reach the adult stage :

Egg ⟶ larva ⟶ pupa ⟶ adult .

Hypermetamorphosis

In this case the larva may pass two or more different shapes before it change to pupal stage .

ex : oil beetles.

Types of larvae :-

1- Protopod larva :- ex- larva of parasitic wasps .

2- Polypod larvae (eruciform larva): the body of the larva is cylindrical with true leg and abdominal legs (pseudo pods) .

Ex :- Lepidoptera larva .

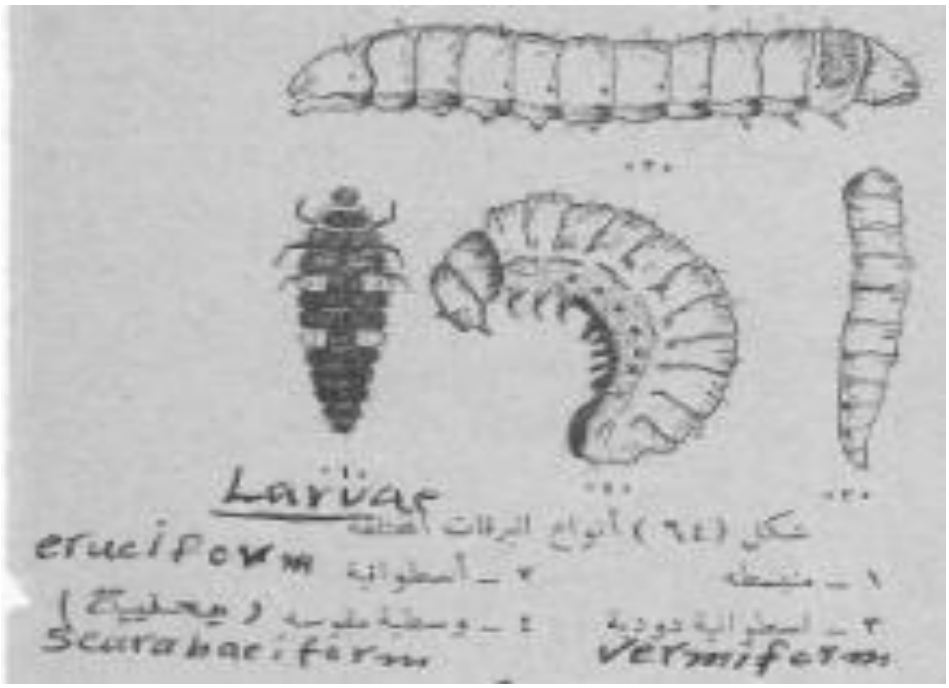
3- Oligopod larva with three pairs of leg .

- **a- compodeiform larva the larva is flattend .**
- **b- Scarabaeiform larva : the larva C shaped with short , weak legs .**

Ex : larva of scarobaeidae.

c-Elateriform larva .

d-Apodous larva(vermiform),with out legs .



Types of pupa :-

1- **Exarate pupa**
   Ex : pupa of wasp .
2- **Obtect pupa**
   Ex : pupa of Lepidoptera .
3- **Coarctate pupa**
   Ex : pupa of house fly .

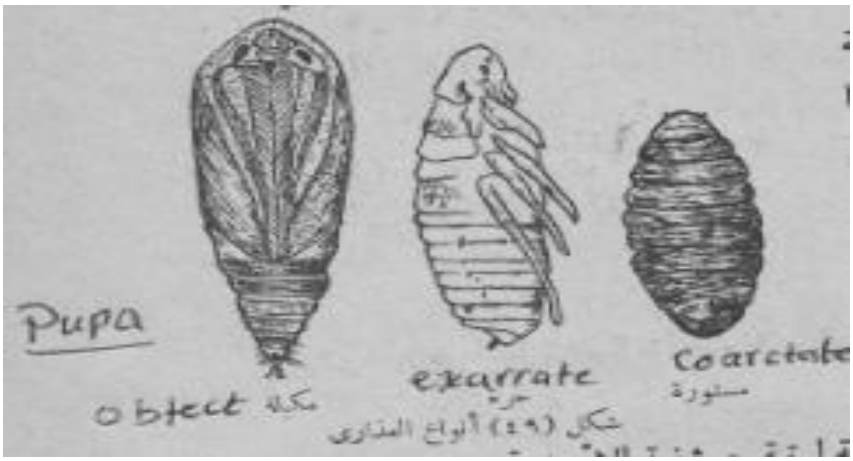


Table 1. Classification Outline of Insect Orders

Subclass Apterygota—wingless insects:
- Order Diplura—campodeans and japygids.
- Protura—proturans.
- Collembola—springtails.
- Microcoryphia—bristletails.
- Thysanura—silverfish.

Subclass Pterygota—winged insects:
- Series Paleoptera—ancient winged insects:
  - Order Ephemeroptera—mayflies
  - Odonata—dragonflies.
- Series Neoptera—modern or folding-wing insects:
  - Order Cursoria—cockroaches, walkingsticks.
  - Isoptera—termites.
  - Orthoptera—grasshoppers, crickets.
  - Dermaptera—earwigs.
  - Embioptera—embiids.
  - Plecoptera—stoneflies.
  - Zoraptera—zorapterans.
  - Corrodentia—psocids, booklice.
  - Phthiraptera—chewing and sucking lice.
  - Thysanoptera—thrips.
  - Hemiptera—bugs (Heteroptera and Homoptera).
  - Megaloptera—dobsonflies.
  - Neuroptera—lacewings.
  - Raphidiodca—snakeflies.
  - Hymenoptera—bees, ants, wasps.
  - Coleoptera—beetles.
  - Mecoptera—scorpionflies.
  - Trichoptera—caddisflies.
  - Lepidoptera—moths, butterflies.
  - Diptera—two-winged flies.
  - Siphonaptera—fleas.