

Note: Some insects like whiteflies (Fig. 9B), male scales and thrips are included in this type of metamorphosis, but actually they neither fit into hemimetabola nor into holometabola. The early instars of their young are without wings and called larvae. The later instars are with rudimentary wings and resemble with nymphs. The final instar is pupa-like and known as pseudopupa.

3. Holometabola (complex, indirect or complete metamorphosis) (Fig. 9A): Insects in which the young ones pass through complex or marked changes to become adults and have a pupal stage are said to be with complex metamorphosis, e.g., moths, butterflies, beetles, flies, bees, wasps, etc. These insects are either winged or secondarily wingless. The winged insects develop their wings internally (i.e. within the body of the young) and are thus known as Endopterygota. The young one is called larva which is entirely different from the adult. There are four stages in their life, viz., egg, larva, pupa and adult.

Note: Hypermetamorphosis is a type of complex metamorphosis in which all larval instars are not similar. That is, the shape of larva either goes on changing in all the instars, e.g., blister beetle (Fig. 12) or the first instar is only different from the remaining instars which are similar, e.g., hymenopterous parasites. It may be mentioned here that in case of complex metamorphosis all larval instars are usually similar.

TYPES OF EGGS

Some common types of eggs are as follows:

- 1. Spherical (Fig. 10A):** These are rounded eggs, e.g., lemon butterfly, citrus leaf miner, hawk moth, gram cutworm and red cotton bug.
- 2. Oval (Fig. 10B):** These are egg-like in shape, e.g., bean aphid, silverfish, rice bug, mango mealybug, maize borer, red pumpkin beetle and rice weevil.
- 3. Conical (Fig. 10C):** These are conical in shape and with longitudinal ridges, e.g., beet armyworm.
- 4. Elongate (Fig. 10D):** These are elongate, e.g., house fly, ak grasshopper, cotton jassid, fig borer, sand fly and bot fly.
- 5. Stalked (Fig. 10E, F):** These are with a pedicel or stalk, which may be short or long, e.g., whiteflies, green lacewing, parasitic wasps and citrus psylla.
- 6. With appendages (Fig. 10G, H):** These are with thread-like processes or appendages which come out from the upper side. Their number varies in different insects, e.g., water scorpions (*Ranatra and Nepa*) and stink bugs.
- 7. Sculptured (Fig. 10I, J):** These are with various designs or sculpturing, e.g., malarial mosquito, spotted boll-worm, cabbage butterfly, gram caterpillar and pink gramineous borer.



A. SPHERICAL
(LEMON BUTTERFLY)



B. OVAL
(BEAN APHID)



C. CONICAL
(BEET ARMYWORM)



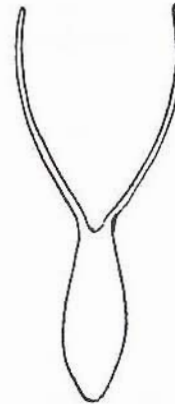
D. ELONGATE
(HOUSE FLY)



E. STALKED
(WHITEFLY)



F. STALKED
(GREEN LACEWING)



G. WITH APPENDAGES
(RANATRA)



H. WITH APPENDAGES
(NEPA)



I. SCULPTURED
(MALARIAL MOSQUITO)



J. SCULPTURED
(SPOTTED BOLL-WORM)

FIG.10. TYPES OF EGGS

TYPES OF LARVAE

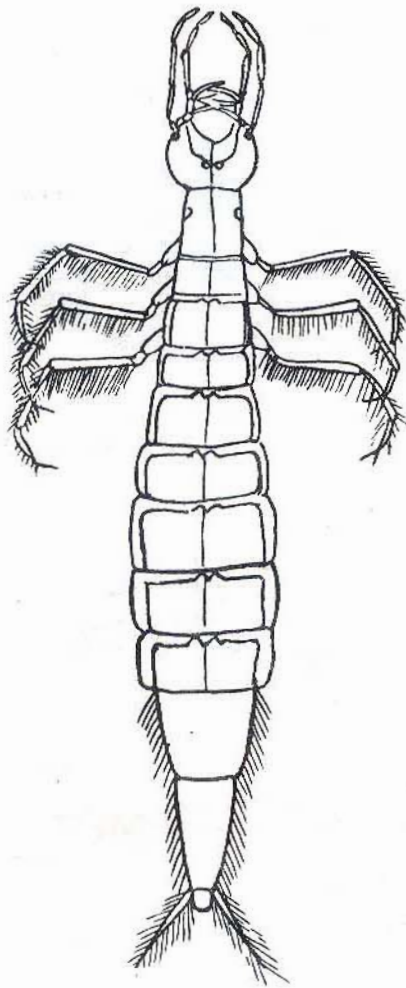
Some important types of larvae are as follows:

1. **Campodeiform** (Fig. 11A): It has an elongate and flattened body, long thoracic legs and usually cerci on the end of abdomen, e.g., diving beetles, rove beetles, caddisflies and nerve-winged insects.
2. **Carabiform** (Fig. 11B): This is a modified form of the campodeiform larva. It has flattened body, shorter legs and no cerci, e.g., ground beetles, leaf beetles and fireflies.
3. **Eruciform** (Fig. 11C): The body is cylindrical with both thoracic and abdominal legs, e.g., butterflies, moths and scorpionflies.
- 5 4. **Scarabaeiform** (Fig. 11D): The body is cylindrical and C-shaped with usually thoracic but no abdominal legs, e.g., scarab beetles and pulse beetles.
- 4 5. **Elateriform** (Fig. 11E): The body is thin, elongate, cylindrical with short thoracic legs, e.g., click beetles and darkling beetles.
6. **Platyform** (Fig. 11F): The body is very broad with short or no legs, e.g., some syrphid flies.
7. **Vermiform** (Fig. 11G): The body is cylindrical, elongate, narrowing anteriorly and without legs, e.g., flies, fleas and parasitic wasps.

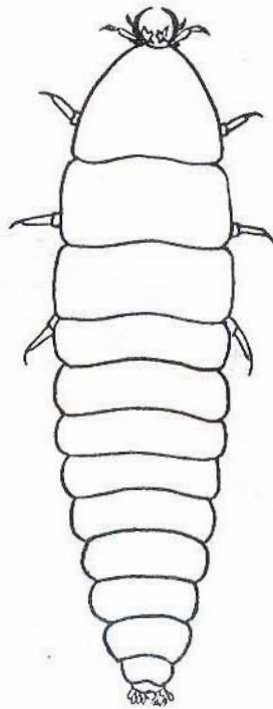
TYPES OF PUPAE

There are three types of pupae:

1. **Obtect** (Fig. 13A): The appendages (antennae, legs and wing pads) are firmly glued to the body, e.g., butterflies, moths and many beetles. The obtect pupa of a butterfly is also called chrysalis.
2. **Exarate** (Fig. 13B): The appendages are free and not glued to the body, e.g., most wasps and bees, beetles, caddisflies and nerve-winged insects.
3. **Coarctate** (Fig. 13C): It is like an exarate pupa covered in a loose hardened case which is called puparium. This puparium is formed from the last larval skin which is not shed but retained as a body covering, e.g., most flies.



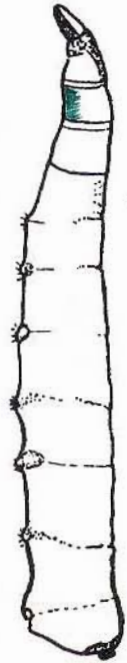
A. CAMPTODEIFORM (DIVING BEETLE)



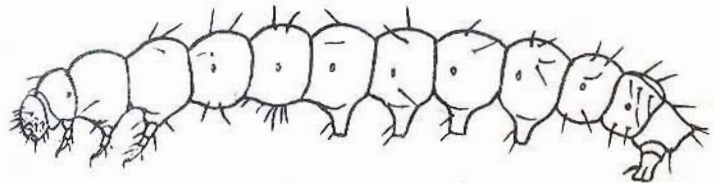
B. CARABIFORM (GROUND BEETLE)



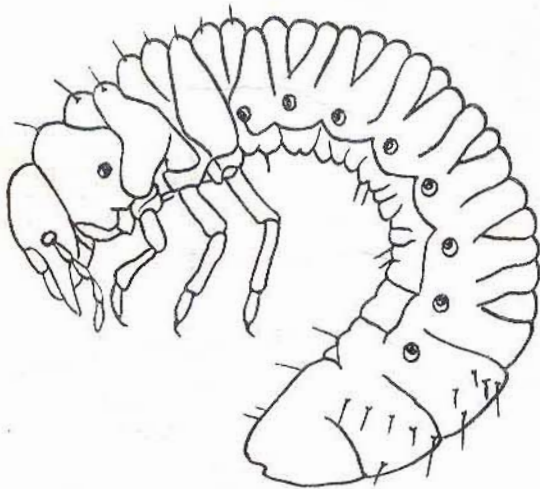
E. ELATERIFORM
(CLICK BEETLE)



G. VERMIFORM (HOUSE FLY)



C. ERUCIFORM (BUTTERFLY)



D. SCARABAEIFORM (SCARAB BEETLE)



F. PLATYFORM (SYRPHID FLY)

FIG. 11. TYPES OF LARVAE

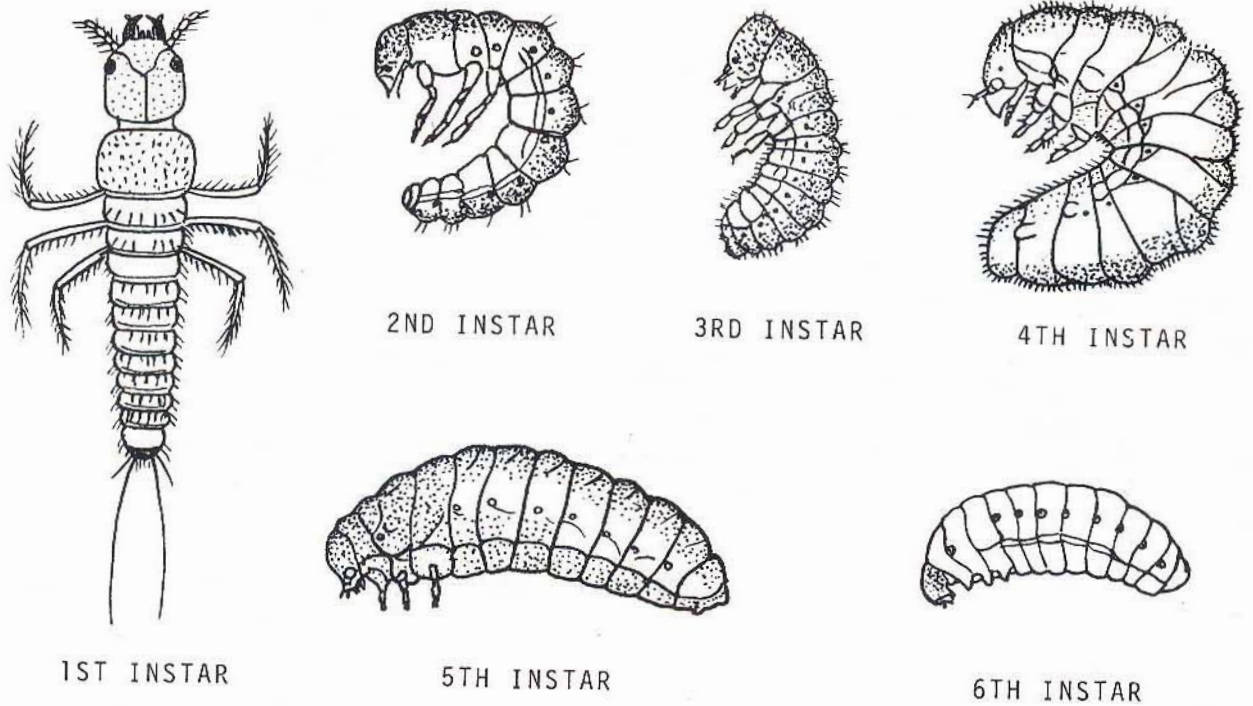


FIG.12. HYPERMETAMORPHOSIS
(LARVAL INSTARS OF A BLISTER BEETLE)

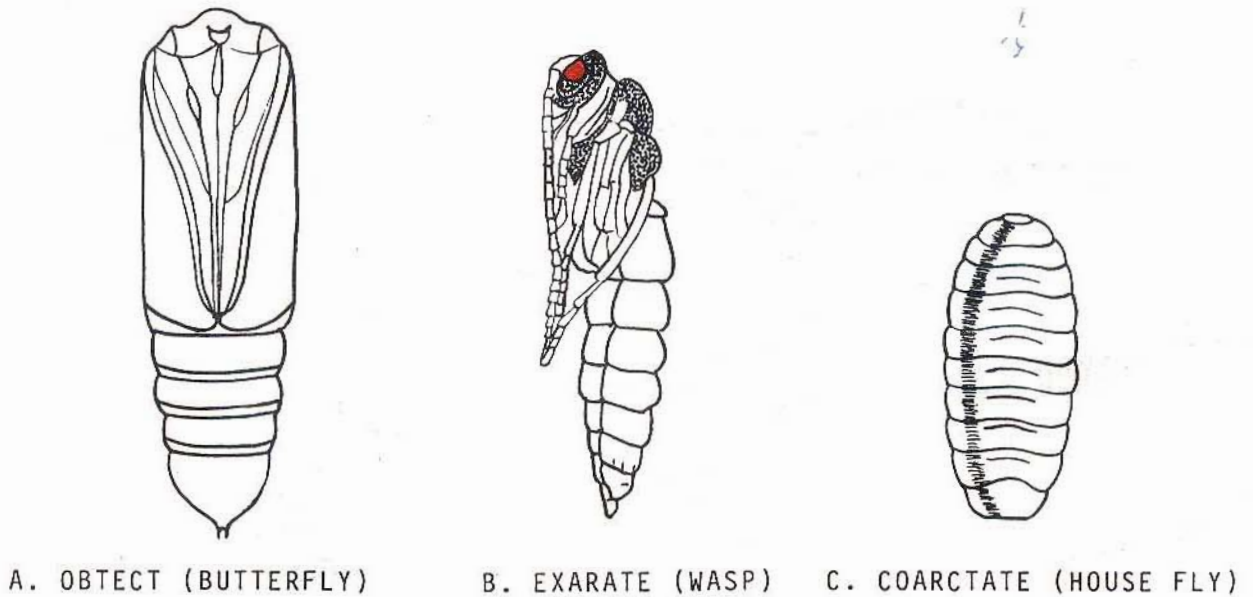


FIG.13. TYPES OF PUPAE