ENTOMOLOGY

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ENTOMOLOGY

Entomology = Entoma + logos .

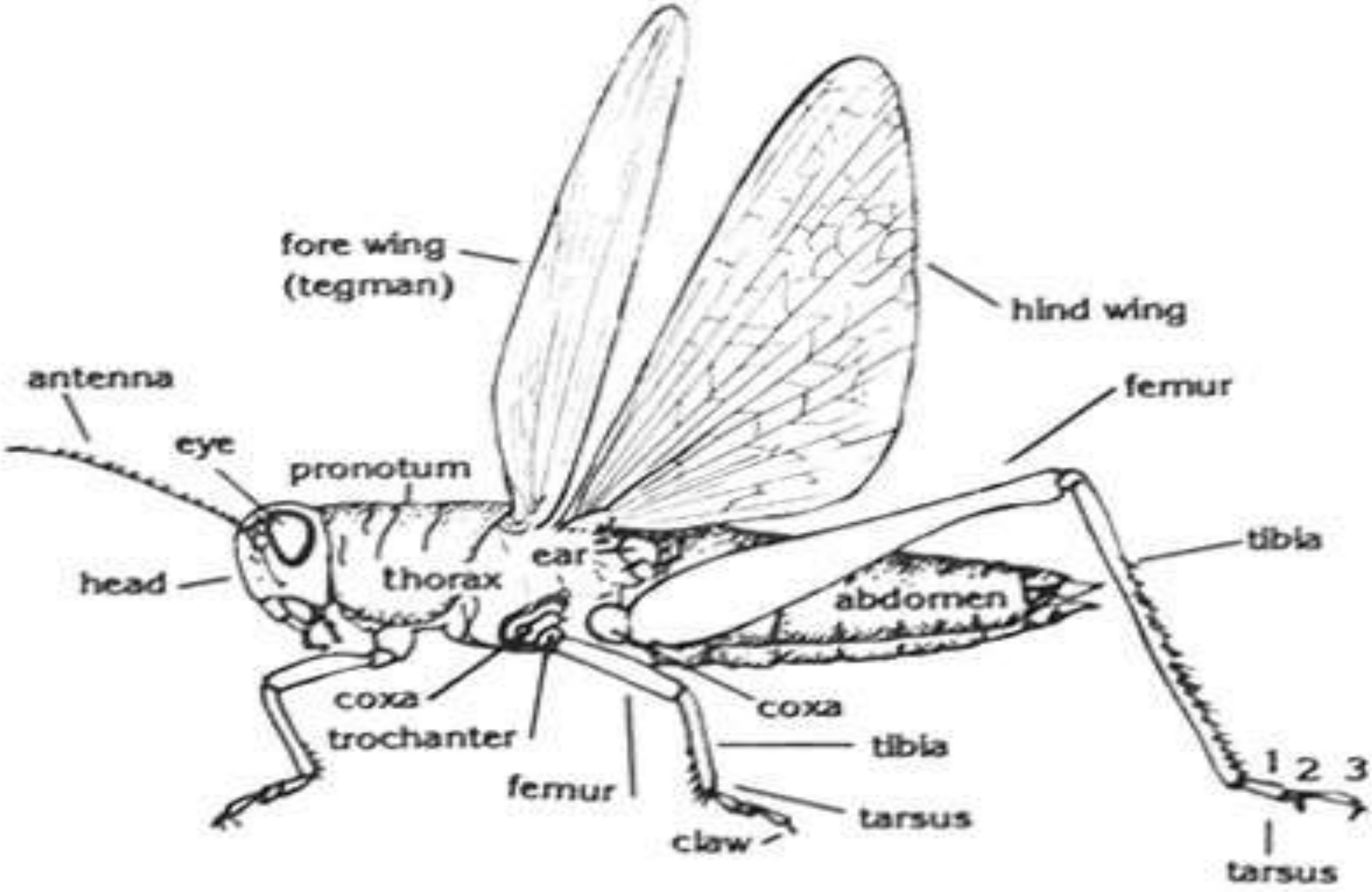
Science of insects Insects + Science

All kinds of Arthropods of phylum Arthropoda

Arthros = Jointed . Podos = Foot.

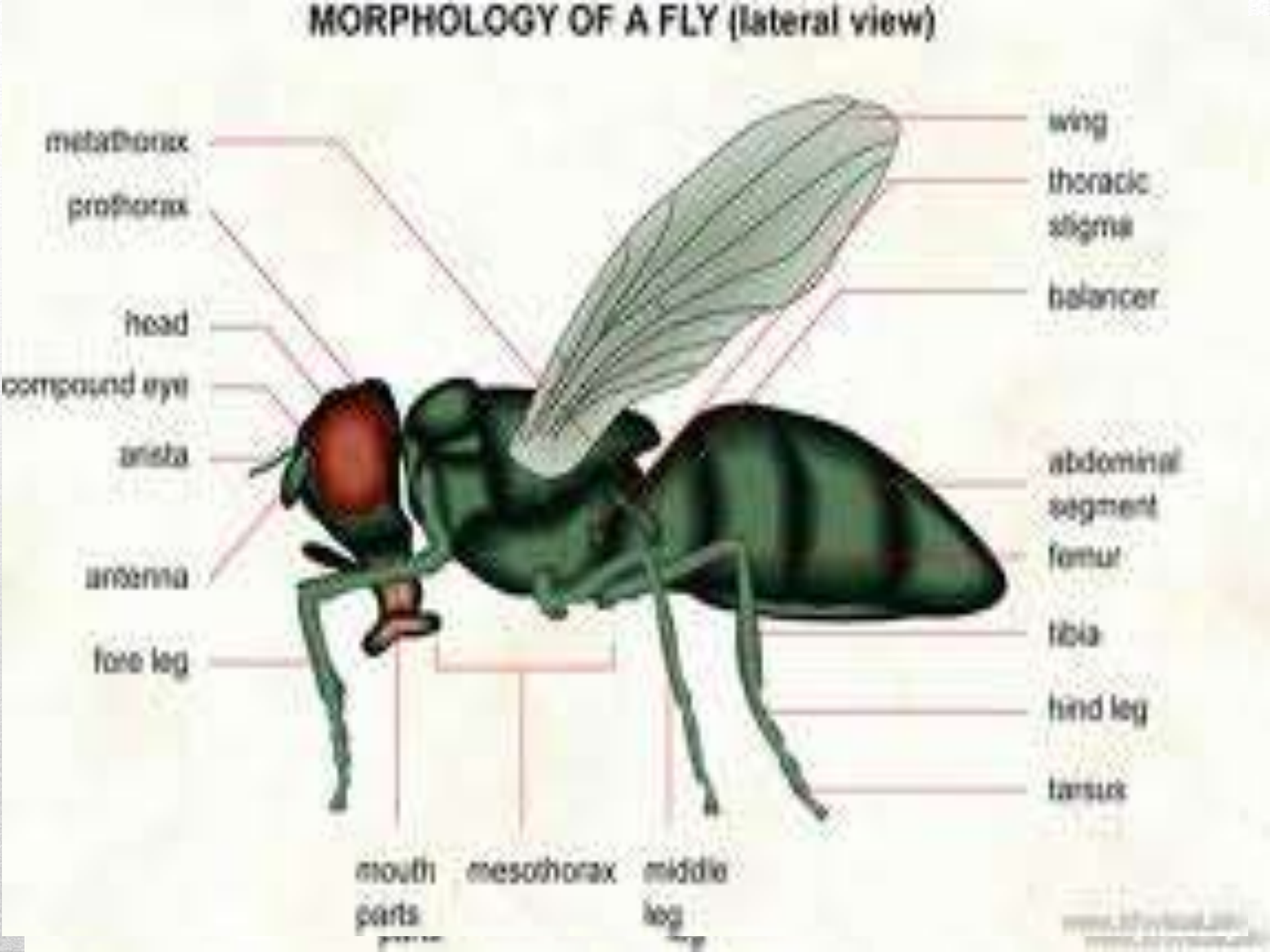
Main characteristics of Arthropoda :-

1. A hard chitinous exoskeleton .
2. A segmented body.
3. A jointed limb .



Body part of a typical "INSECT"

MORPHOLOGY OF A FLY (lateral view)

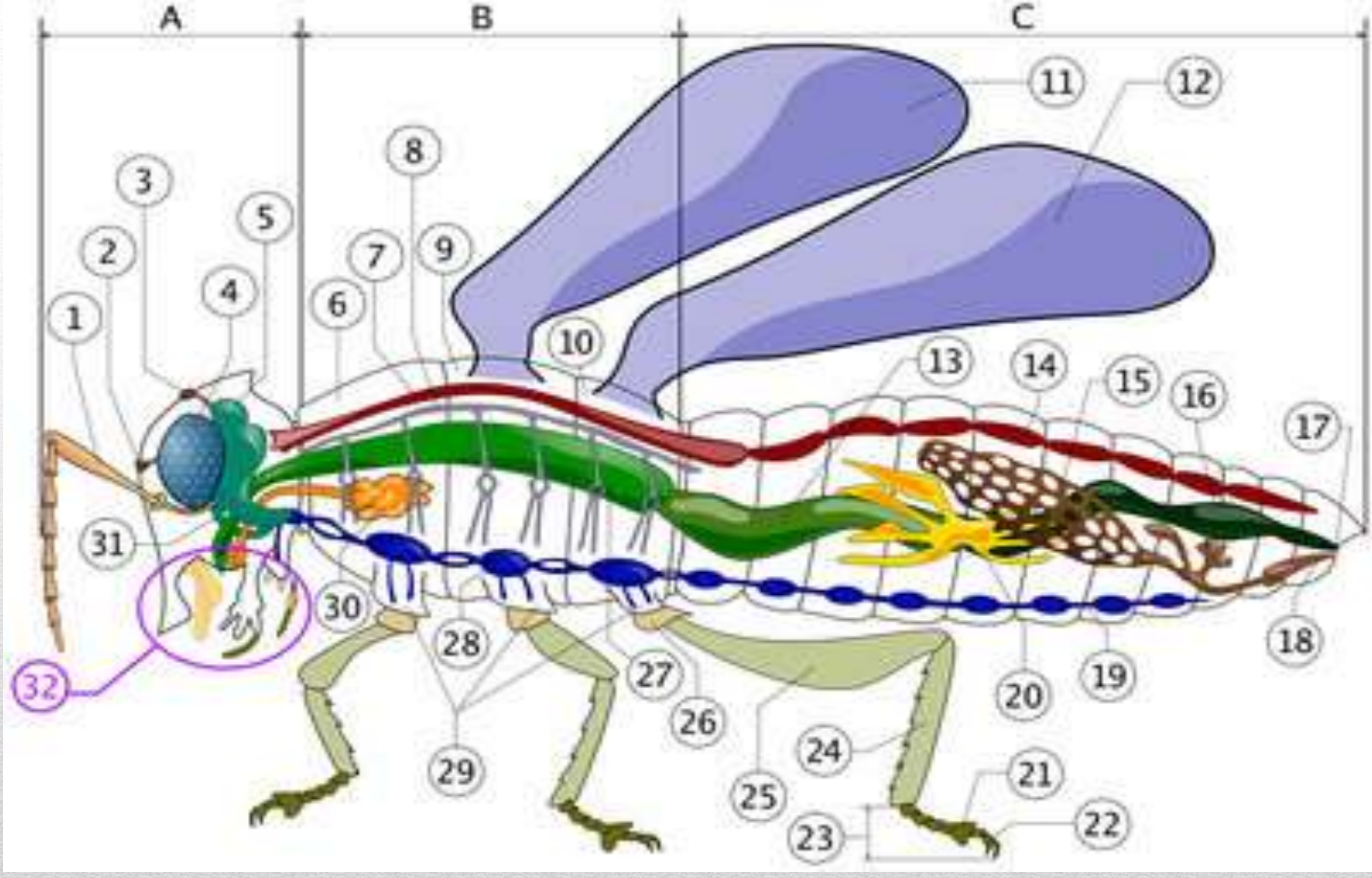


MOULTING :

Moulting is formation of new exoskeleton periodically after casting off the old chitinous covering during the growth of an arthropod , Each casting of the exoskeleton is called ‘ Moulting or Ecdysis,

ECDYSIS / MOULTING

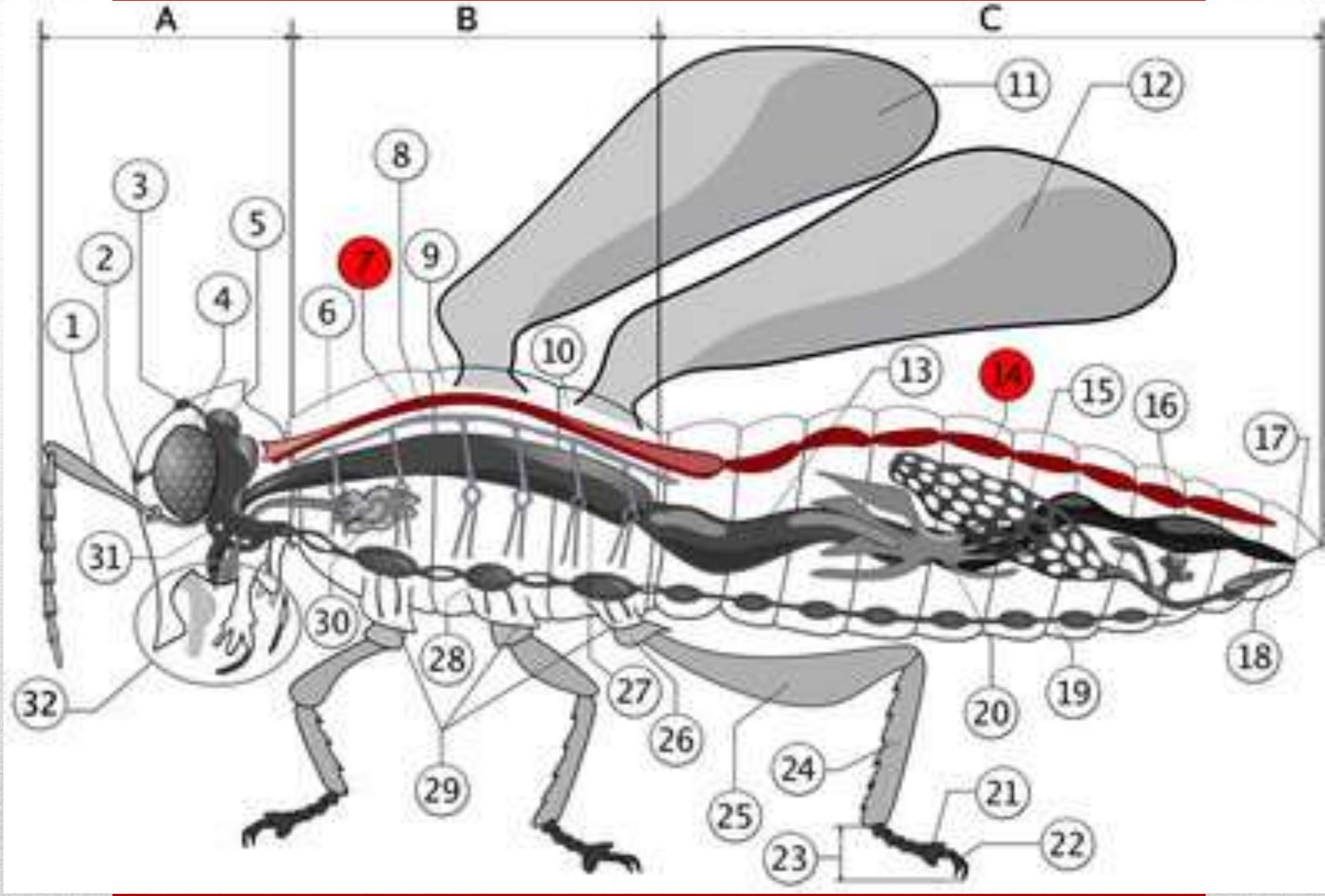
ECDYSIS OR MOULTING



THE INTERNAL ORGAN

CIRCULATORY SYSTEM

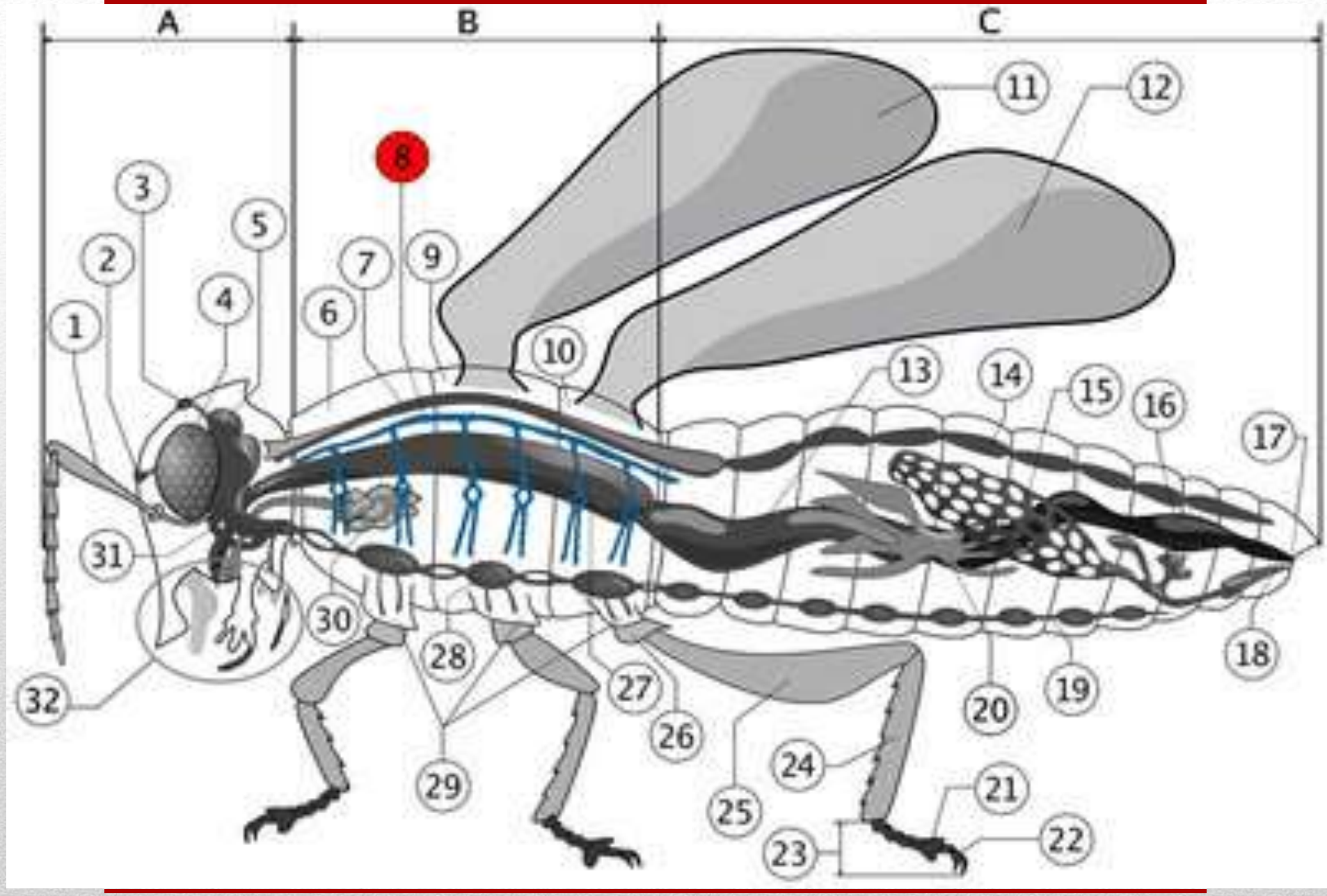
Circulatory system consists of enlarged dorsal blood vessels , which is enclosed in a compartment of the haemocoele full of blood called ‘Pericardium’. ‘Ostia’ is opening in its wall .



THE ORGAN OF CIRCULATION : "HEART"

RESPIRATORY SYSTEM

Respiratory system is small circular opening in the exoskeleton called ‘Spiracles’.Which allow air into the body.



THE ORGAN OF RESPIRATION

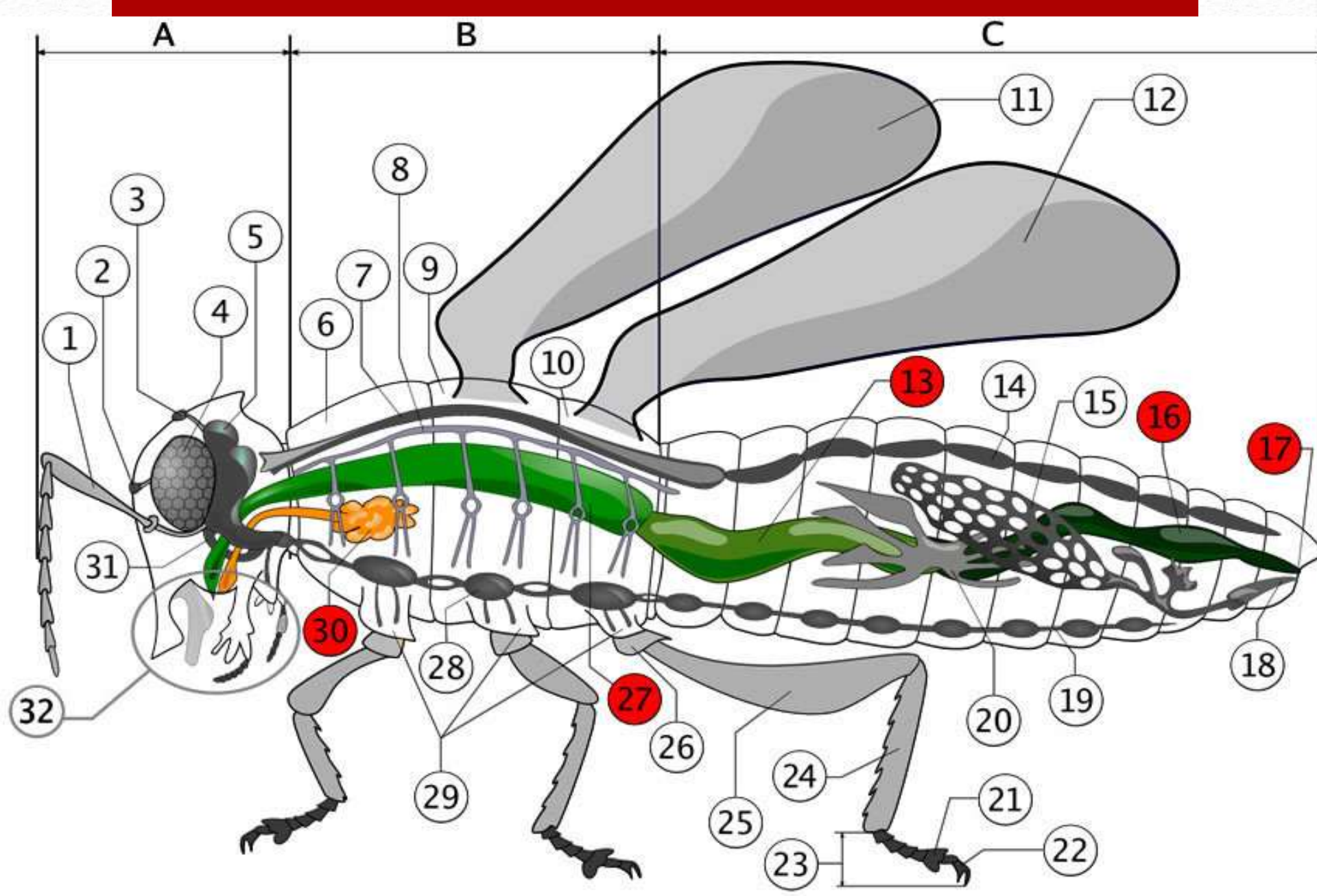
DIGESTIVE SYSTEM

Digestive system divided into three parts :-

(1)Fore gut or Stomodaeum.

(2) Mid gut or Mesenteron .

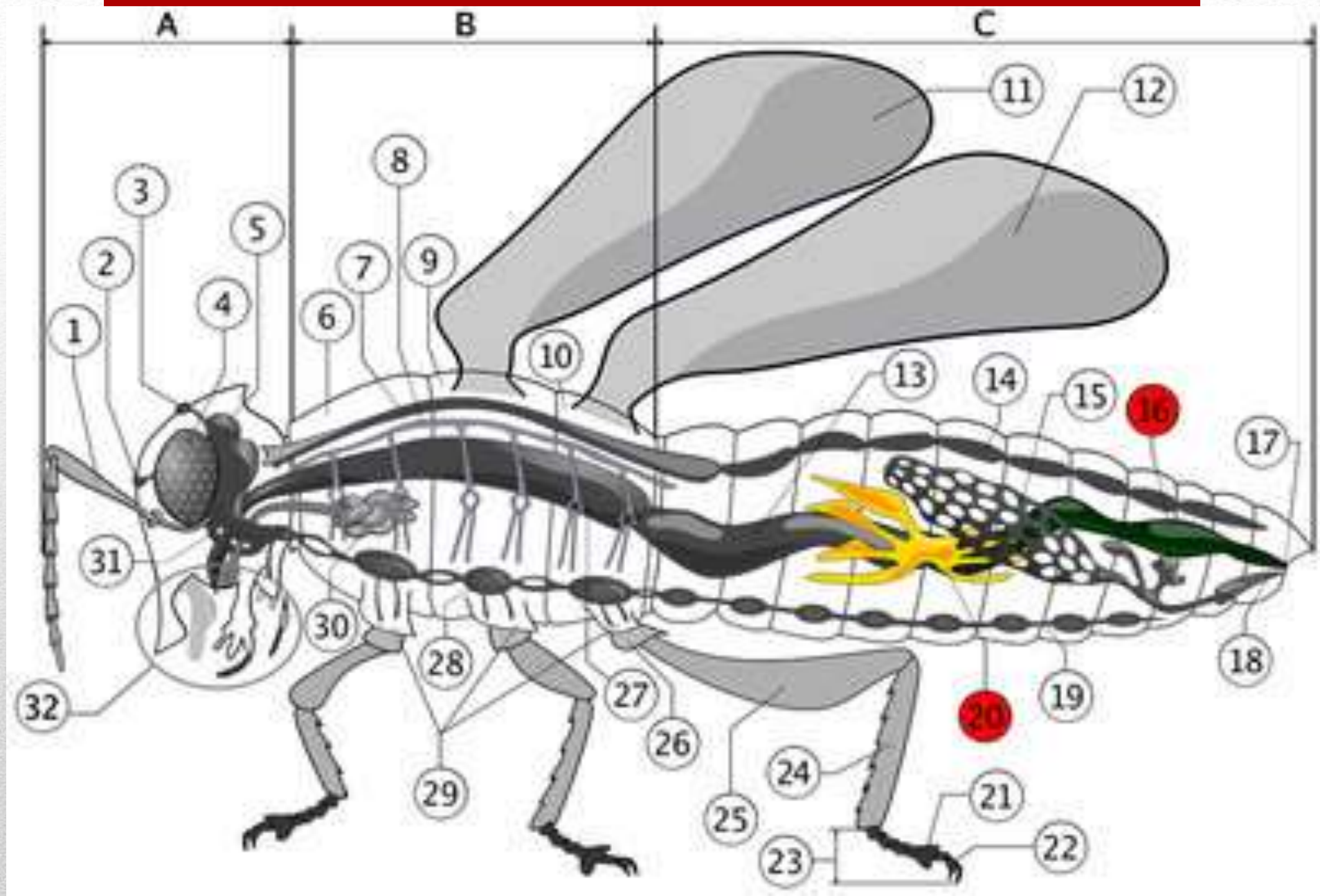
(3) Hind gut or Proctodaeum.



THE ORGAN OF DIGESTION

EXCRETORY SYSTEM

At the junction of mid gut and hind gut there are variable number of exretory tubules called as Malpigian tubules .



THE ORGAN OF EXCRETION

REPRODUCTION SYSTEM

Sexes are separate .

Male have a pair of testes , composed of seminal Vesicle , ejaculatory duct and copulatory organ .

Female have a pair of accessory structures i.e overy and overoles .

EXCRETORY SYSTEM

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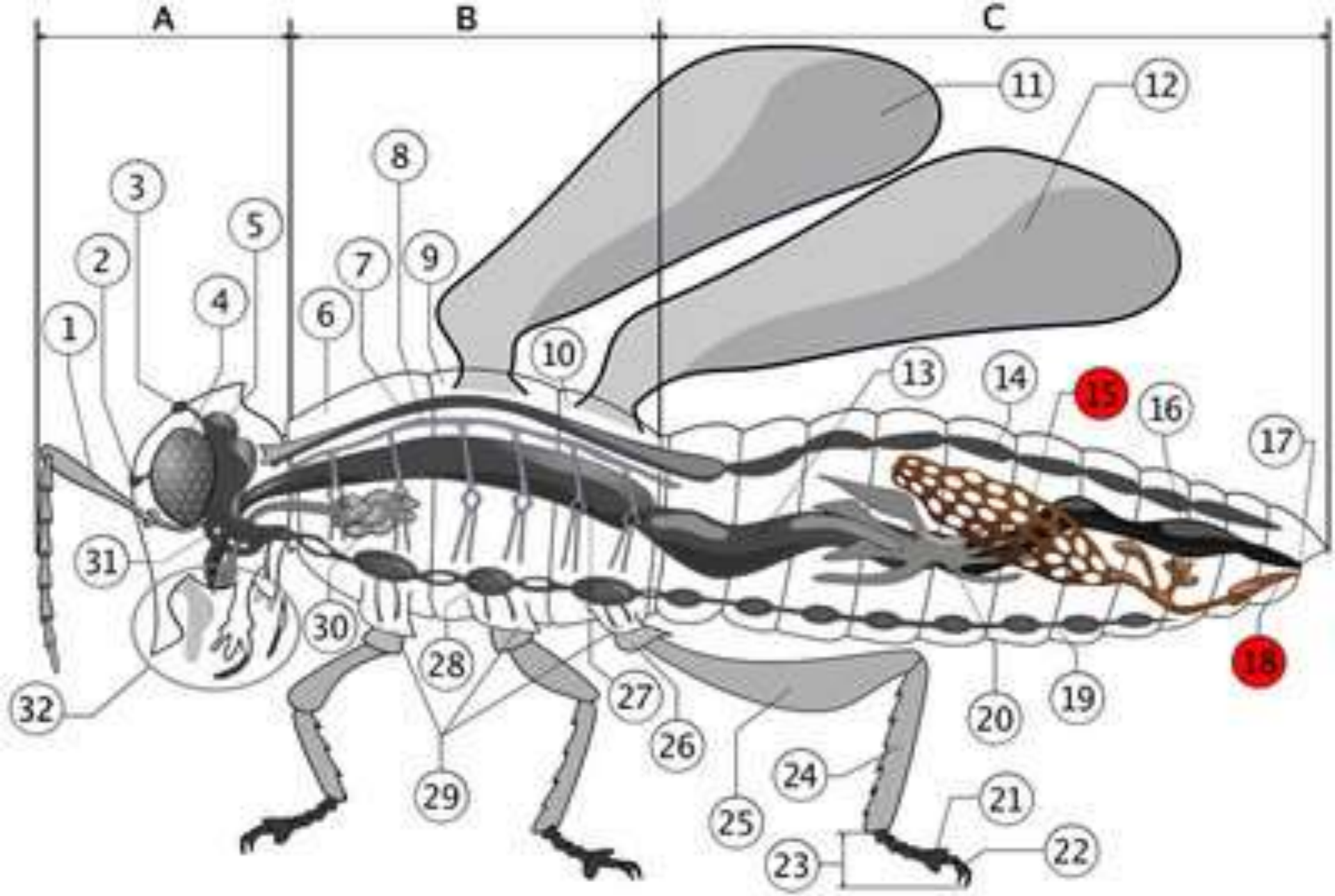


THE ORGAN OF REPRODUCTION

CLASSIFICATION

Arthropoda (Phylum)

Subphylum

Mandibulata **Chelicerata** **Pentastomida**

Class

Insecta **Arachinid**

Subclass

Apterygota **Pterygota**

Division

Endopterygota **Exopterygota**

ORDER

Siphonaptera (Fleas)

Diptera(True flies)

Hymenoptera (Bees)

Coleoptera (Beetles)

Lepidoptera (Butter flies, Moths)

Neuroptera (Lace wings)

ORDER

Orthroptera (Cockroach, Grasshopper)

Pthiraptera (Lice)

(a)Siphunculata’

Anoplura’(Sucking lice)

(b) Mallophaga(Biting lice)

Hemiptera (Bugs)

Odonata (Dragan fly)

Isoptera (Termites)

Diptera

SUBORDER

Nematocera | Brachycera | Cyclorrhapha

Family | **Family**

Ceratopogonidae (Midge)

Simuliidae (Black flies)

Psychodidae (Sand fly)

Culicidae (Mosquitoes)

Musidae(House,Stable Fly)

Calliphoridae (Blow fly)

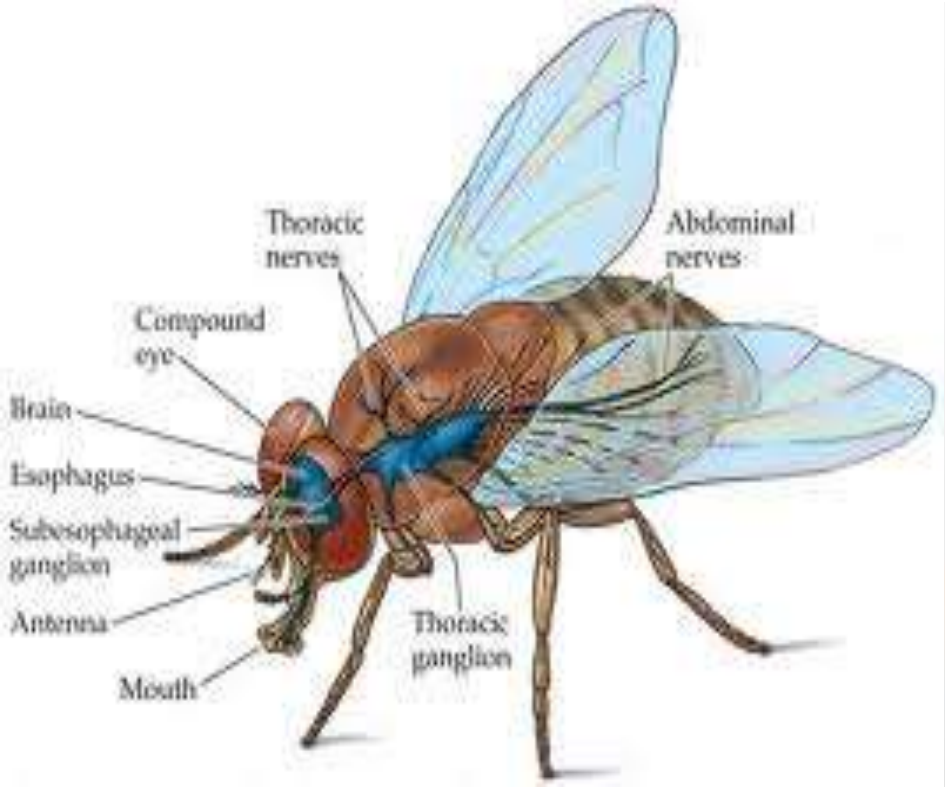
Hippoboscidae(Forest kid)

Osteridae (Bot fly)

Tabanidae (Horse flies)

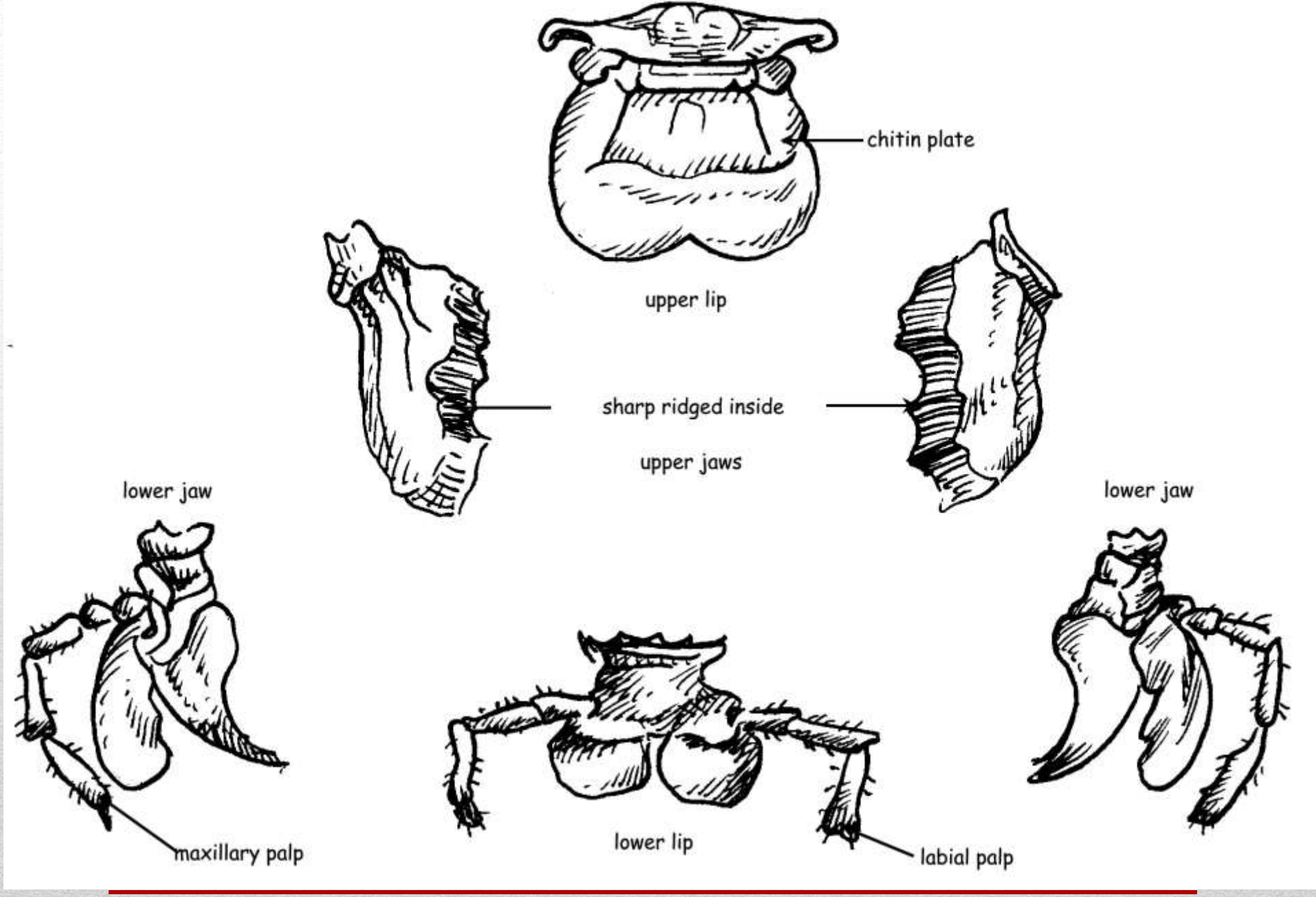
INSECTA

1. Three (3) pairs of legs .
2. Body is divided into 3 parts Head, Thorax, and Abdomen .
3. Single pair of sensory antennae .
4. Eyes are absent or reduced but well developed in blood sucking .

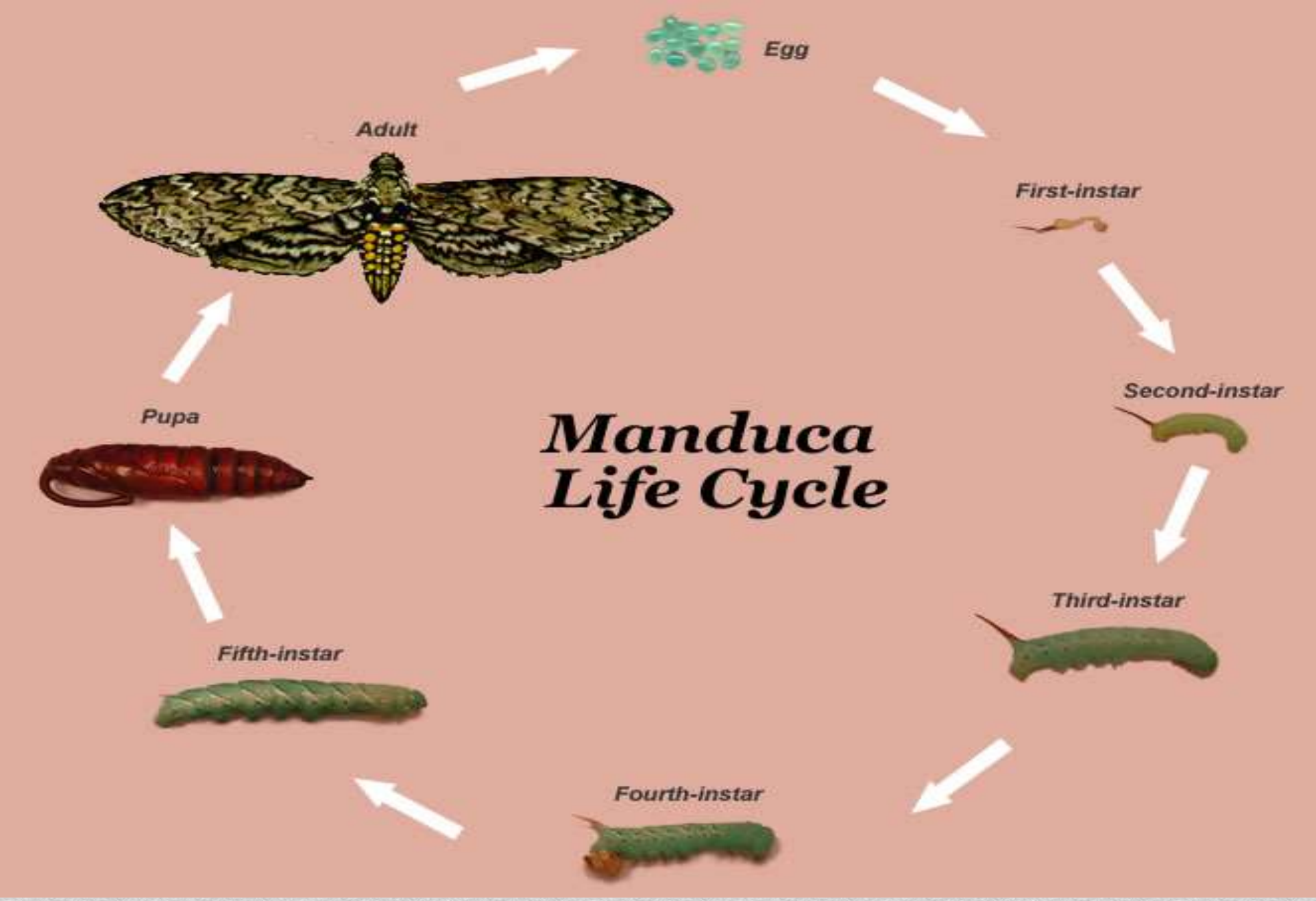


ARACHNIDA

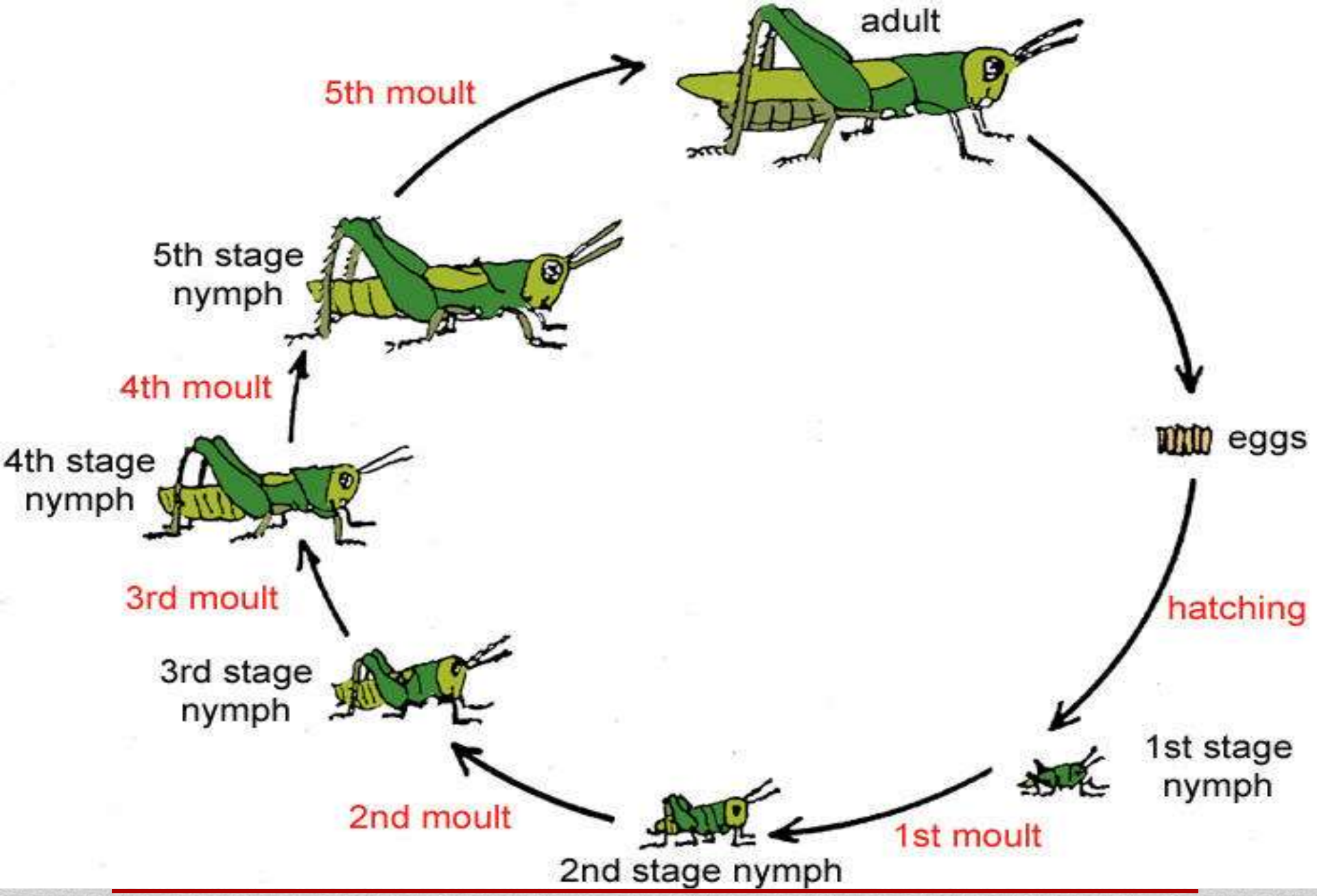
1. Four (4) pairs of legs .
2. Body is divided into 2 parts Cephalothorax & Abdomen .
3. No antennae .
4. Eyes are absent or reduced .



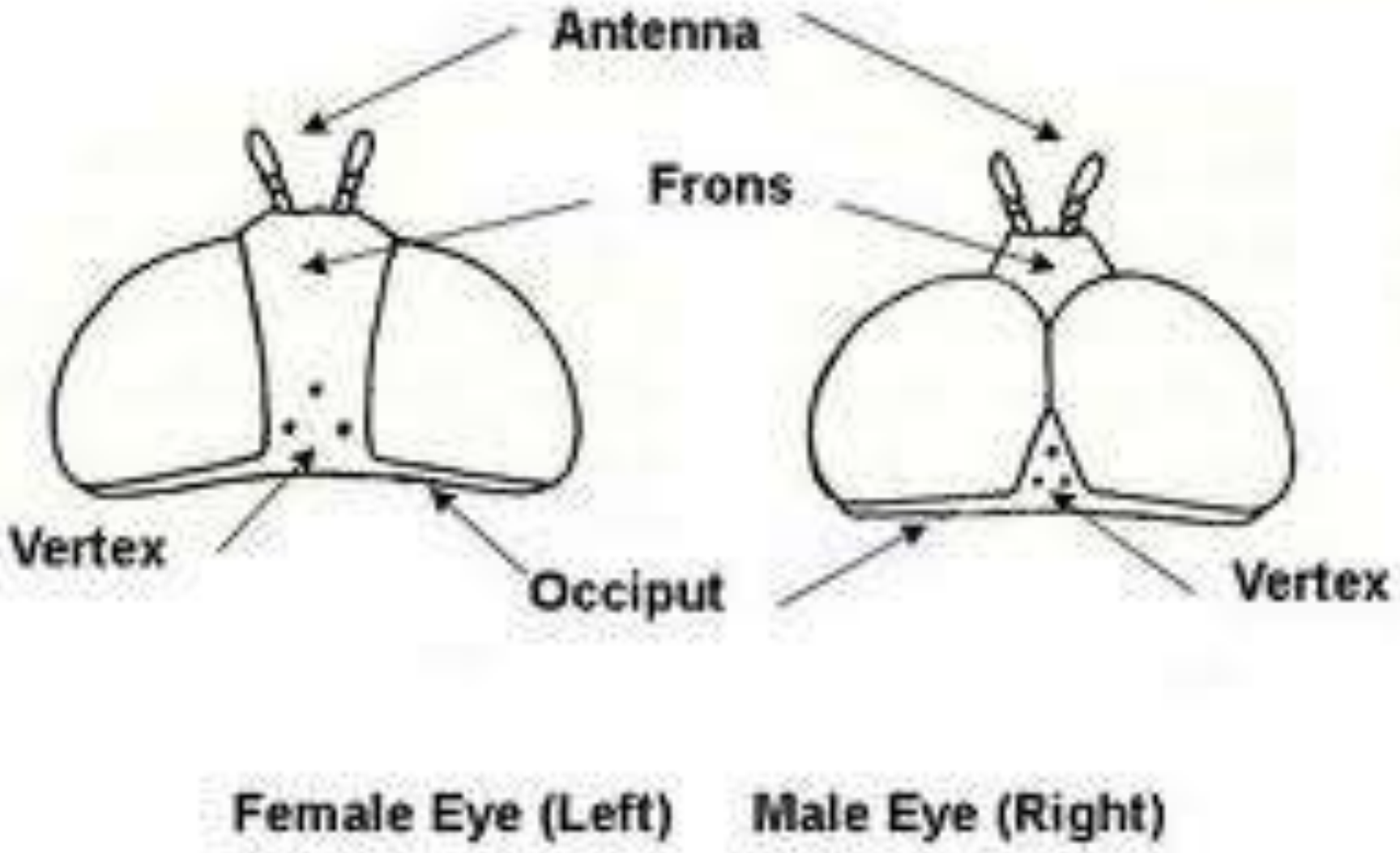
MOUTH PARTS OF AN INSECT



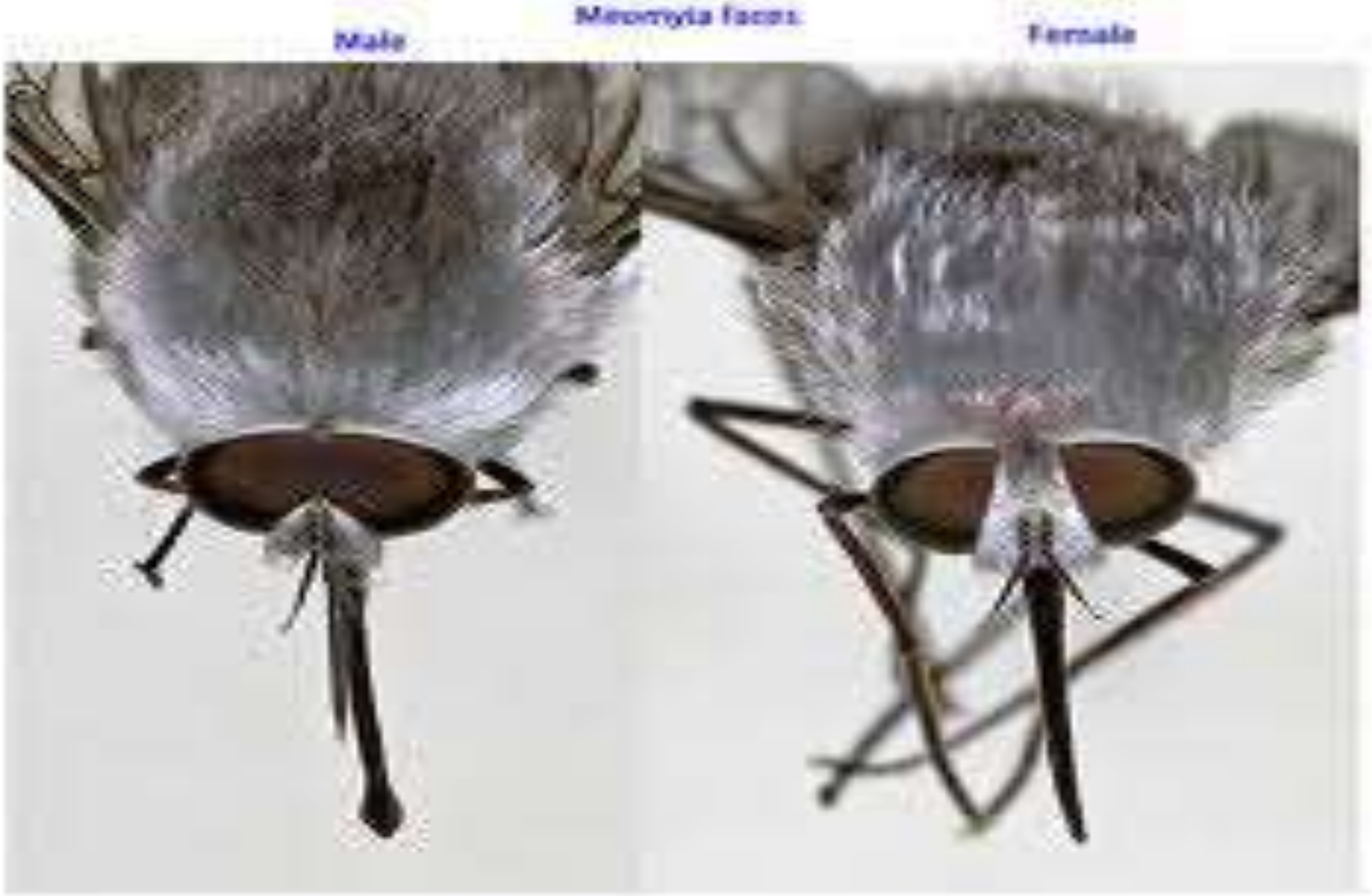
HOLOMETABOLUS LYFE CYCLE



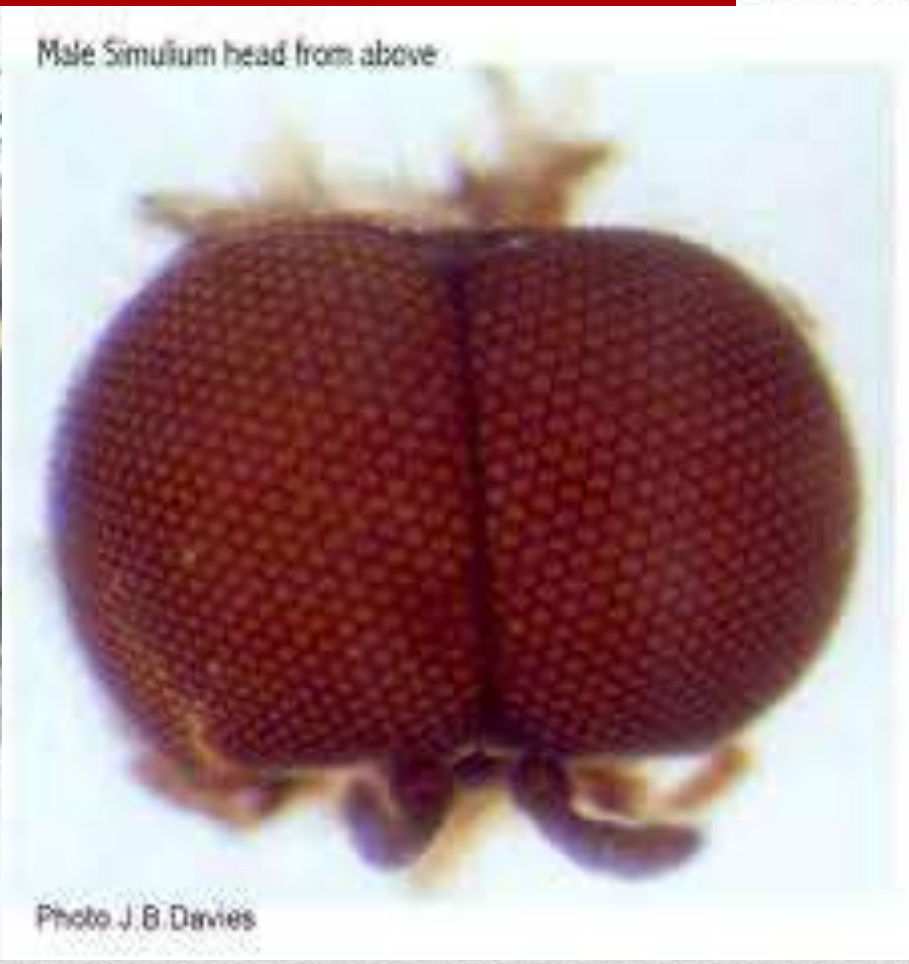
HEMIMETABOLUS LIFE CYCLE



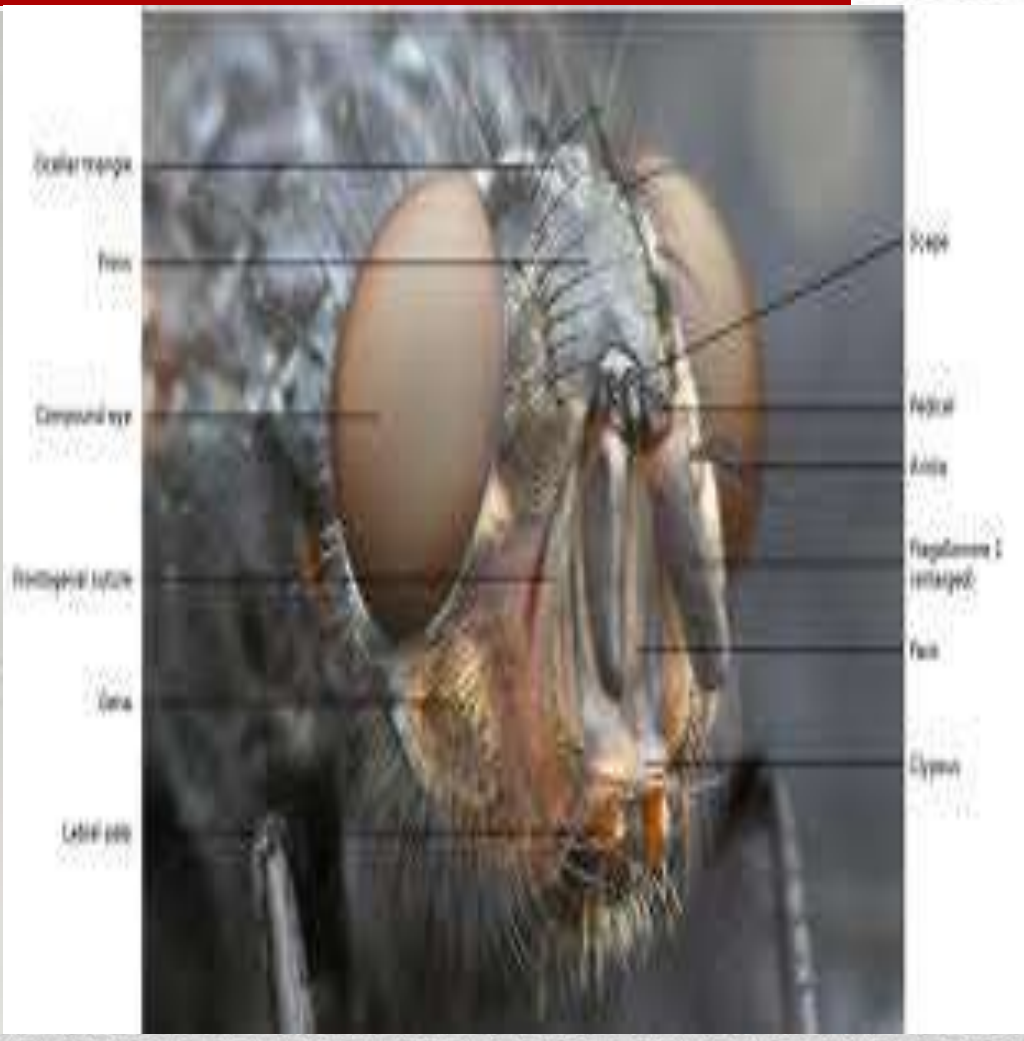
DICOPTIC & HOLOPTIC EYES



HOLOPTIC & DICOPTIC OF EYES



HOLOPTIC TYPE OF EYES



DICOPTIC TYPE OF EYES

CULICOIDES

Common name : Biting midge, No-see-ums , Moose flies.

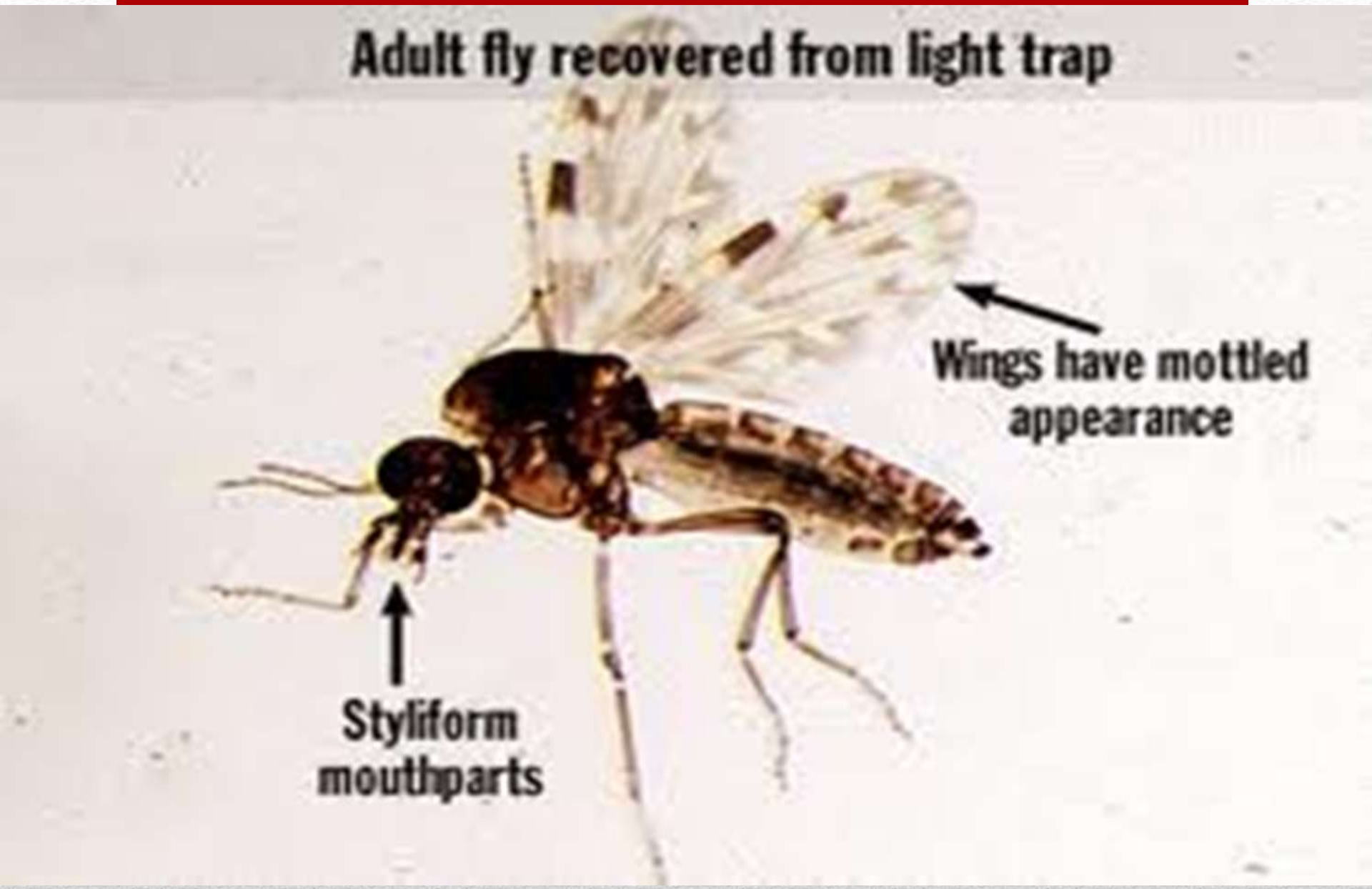
Host : All domesticated animals and man also.

Species : *Culicoides puncticolis* .

Morphology :

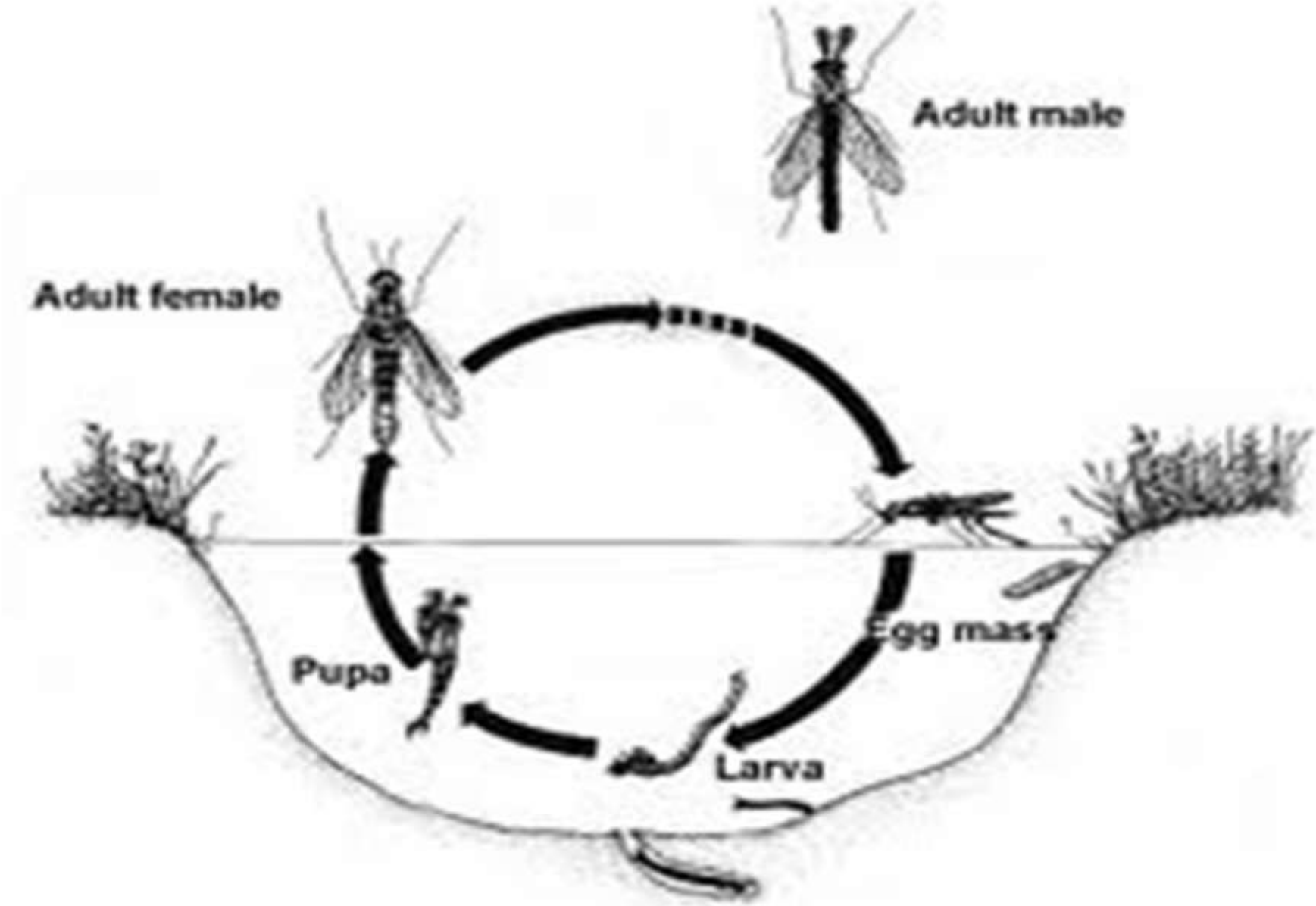
- The flies are very minute.
- The thorax and abdominal segments are similar.
- The wings are oval and hairy.

- Proboscis is adopted for blood sucking .



CULICOIDES FLY

CULICOIDES FLY



LIFE CYCLE OF CULICOIDES FLY

LIFE CYCLE

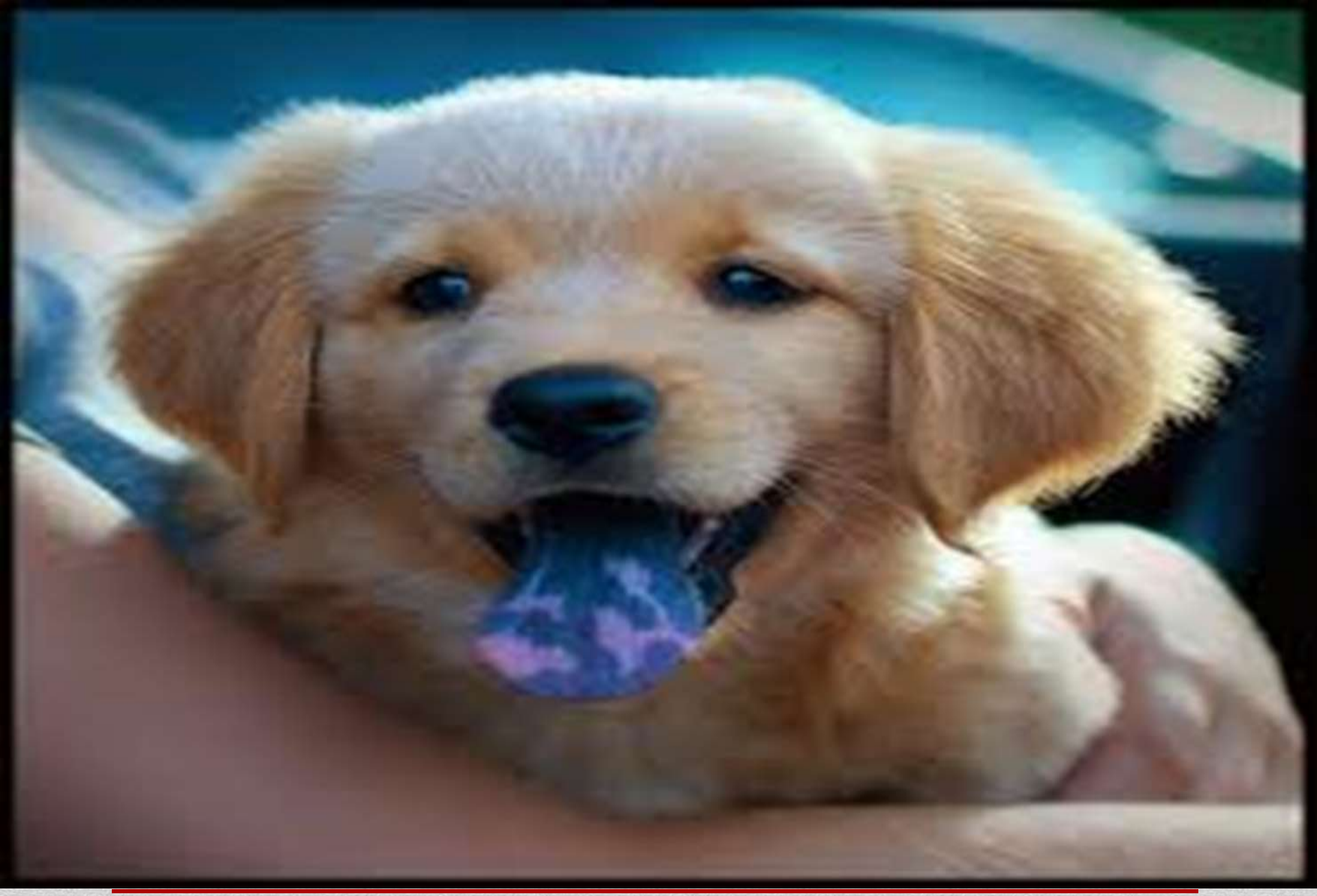
- The female flies laid eggs in mass damp marshy ground near water sources.
- Development proceeds the larva emerges out from the eggs .
- Four moulting occurs in larval stage ,which give rise to pupa
- After final moulting the pupa become adult .

HABITAT AND HABITAT

- Both animals and man are affected by these flies
- The flies are main habitat of decaying vegetation
- The flies are more active during sunset and sunrise .
- These flies fly short distance or near to their breeding places.
- The larva feeds on decaying aquatic vegetation the adults are predacious and feeds on protozoa, nematode and other predator.

PATHOGENESIS

- Many viral disease such as Blue tongue and African horse sickness are transmitted by these flies.
- They are also responsible for causation of kind of allergic dermatitis or seasonally occurring intense pruritus in skin caused by *Culicoides robertsi* in horse , called ‘Sweet itch’ Sweat itch’ or ‘ Queensland itch in Australia.
- There is loss of hairs on the dorsal part of body.



BLUE TONGUE IN DOG

BLUE TONGUE IN REPTILES

SUMMER DEMATITIS OR QUEENSLAND ITCH

AFRICAN HORSE SICKNESS

SIMULIUM

- Common name : Black flies ,Turkey gnats , Buffalo gnats.

Species : *Simulium indicum , Simulium ornatum .*

Morphology :

- They are stout bodied black coloured small sized flies .
- The piercing proboscis is short thorax is humped over the head
- The male and female are morphologically .
- The pupa is boot shaped or slipper shaped .
- The antennae is 11 segmented.

SIMULIUM FLY

SIMULIUM FLY

LIFE CYCLE

- The female fly laid their eggs just below the surface of water on partially submurged stones or vegetation in flowing water.
- Hatching occurs, larva comes out
- A mature larva formed after six moulting..
- The mature larva pupate in brownish silken cocoon like structure fixed to submerged stone .
- In presence of favorable tempt. and light the adult flies are emerges out .

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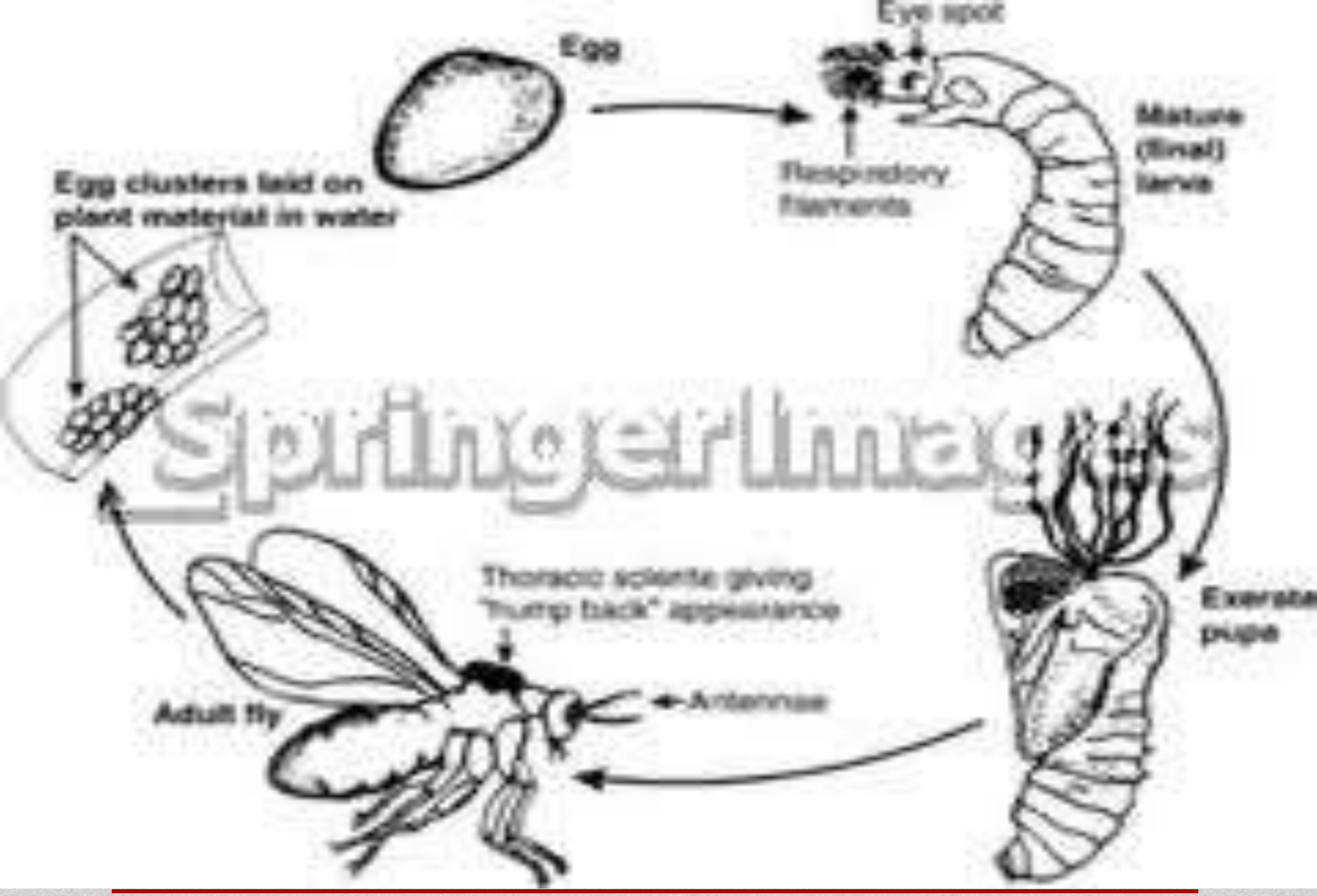
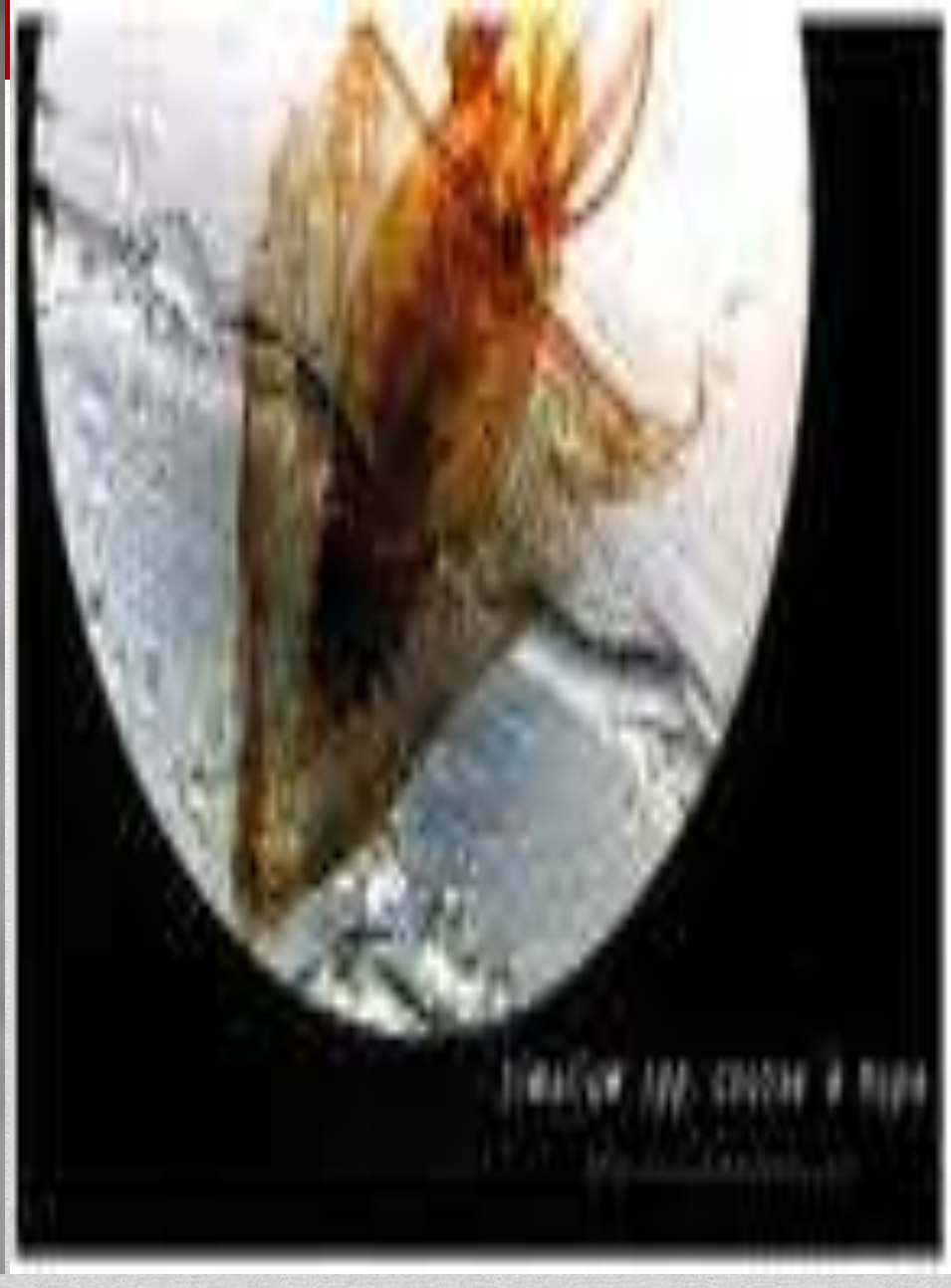


LIFE CYCLE OF SIMULIUM



SILICON COCOON LIKE PUPA OF SIMULIUM

PATHOGENESIS

- The adult females are blood sucker . Reponsible for causation of haemorrhage and oedema.
- There is restlessness and stampede caused by painful bite of flies.
- Interference with grazing resulting into heavy production loss.
- Intense bite cause vesicle and wart formation .
- The pathogens of Leucocytozoonosis transmitted by these flies.

.

Vesicular stomatitis

ESTERN EQUINE ENCEPHALITIS

PHLEBOTOMUS

Common name : Sand flies, Owl midge

Host : All domesticated animals,reptiles ,birds and man .

Species : *Phlebotomus argentepes , phlebotomus papatasi .*

Morphology :

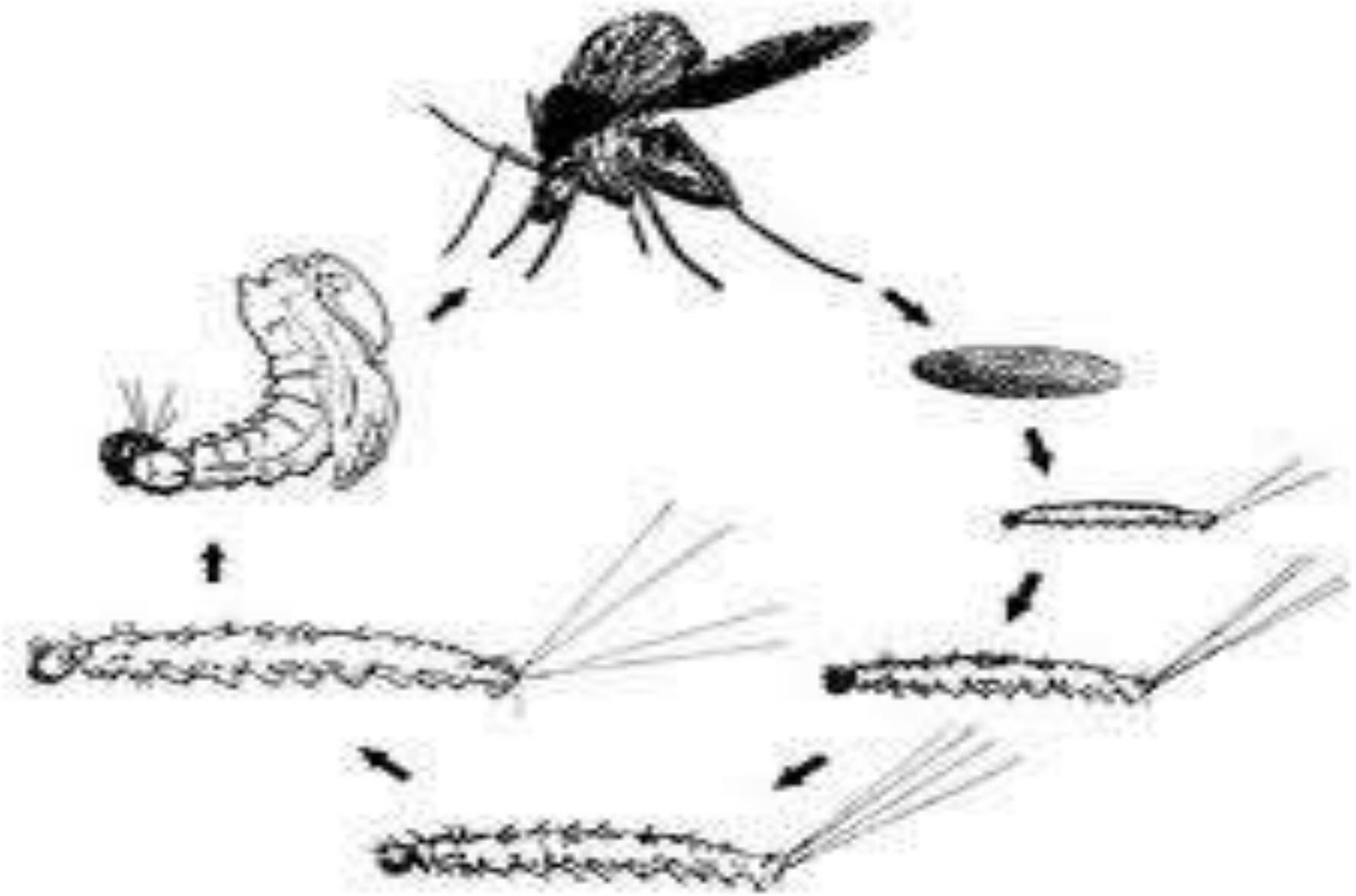
- These are brownish moth like small sized flies .
- The piercing proboscis is short thorax is humped over the head
- The whole body and wings are hairy .
- The mouth parts contains several knife like stylets .
- The antennae is 16 segmented.

PHLEBOTOMINE OR SAND FLY

PHLEBOTOMINE OR SAND FLY

LIFE CYCLE

- The mature female laid their eggs in dark and moist places e.g rock crevices .
- The eggs are white in colour then turn dark.
- Hatching occurs then grayish white small caterpillar like larvae come out
- These larva is transformed to pupa after three moulting.
- The whole life cycle can be completed in about 4-6 weeks.



LIFE CYCLE OF PHLEBOTOMINE FLY

PATHOGENESIS

- They are responsible for transmission of protozoa .
- *Phlebotomus argentipes* transmits *Leishmania donowani* , the causative agent of Visceral leishmaniasis or Dumdum fever or Kalazar.
- P. papatasii transmits Leishmania tropica causative agent of Oriental sore or Delhi boil or Jerico boil.
- They also transmits the viruses of Sand fly fever and Yellow fever.

KALAZAR OR VISCERAL LEISHMANIASIS

JERICO BOIL /KALAZAR OR BLACK FEVER

CUTANEOUS LEISHMANIASIS

SAND FLY FEVER/CARRION'S DISEASE

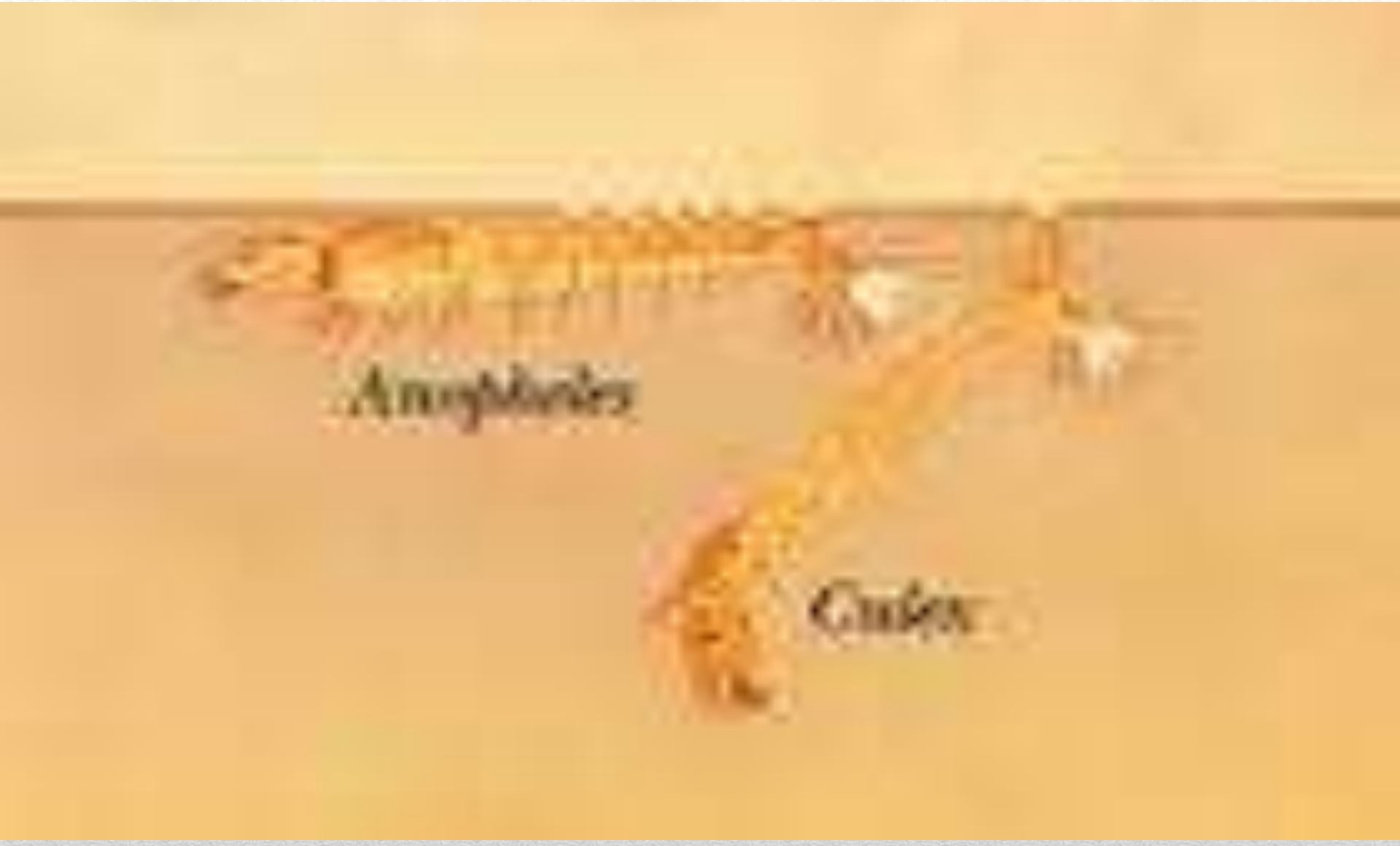
CULICIDAE

- Common name : Mosquitoes .
- Host : Man ,all domesticated animals,reptiles , and. birds
- Species : *Phlebotomus argentepes , phlebotomus papatasi* .

- Morphology :

- These are slender bodied flies .
- The legs are long and eyes are prominent
- The thorax is wedge shaped .
- The mouth parts is adopted for blood sucking .
- The antennae is 15 segmented.

ANOPHELINE FLY

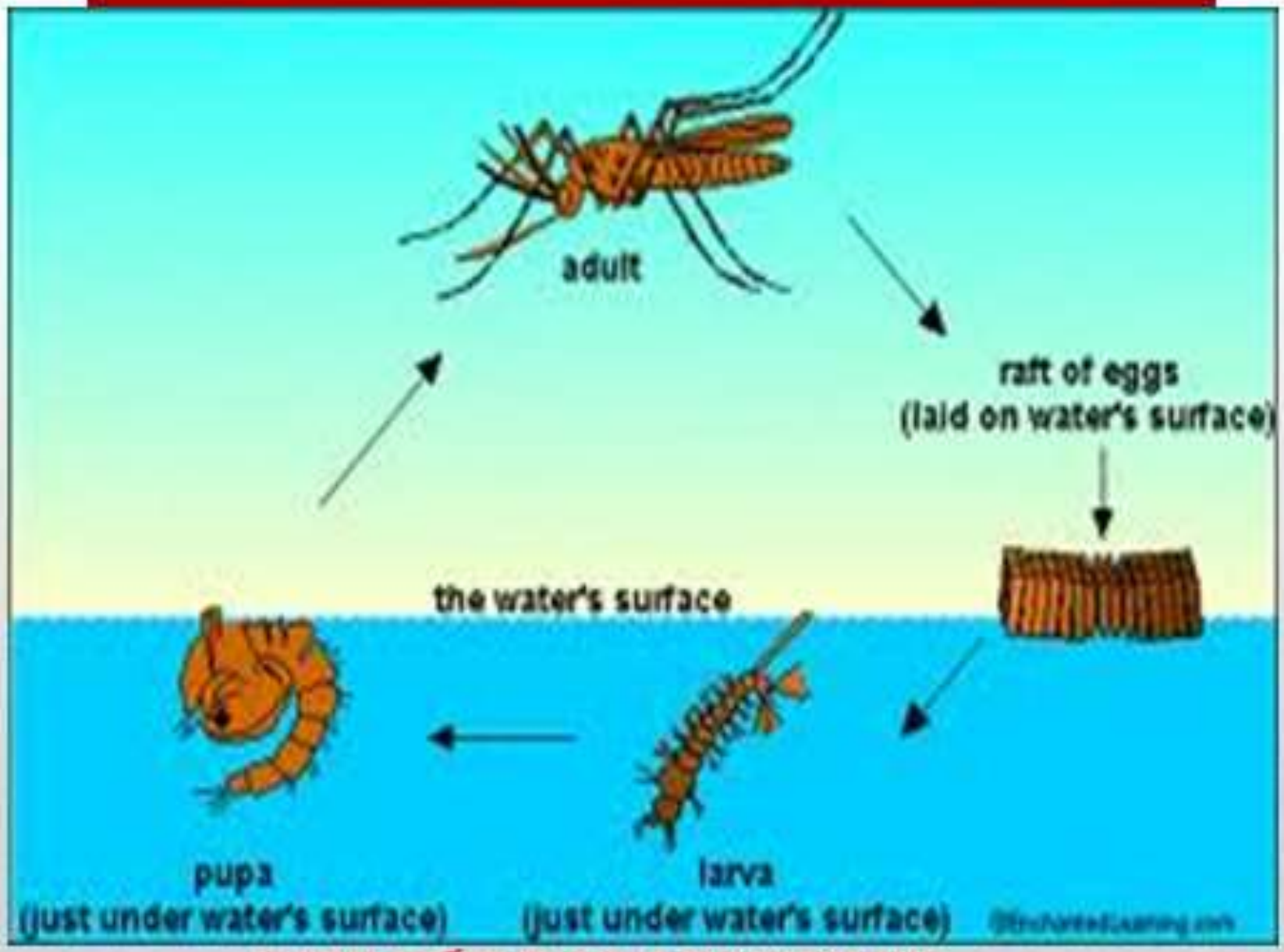


ANOPHELIES / CULEX

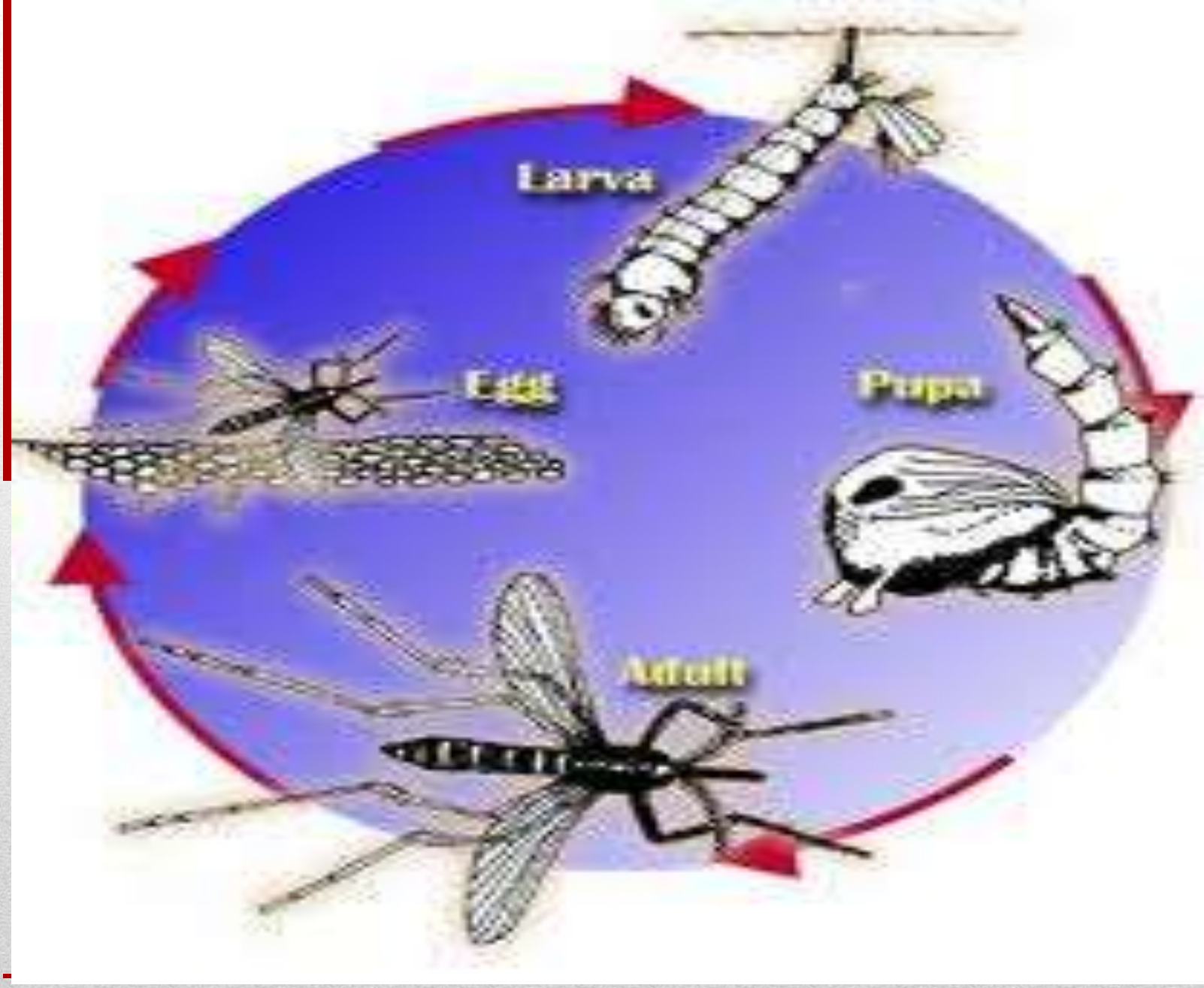
CULICINE FLY

LIFE CYCLE

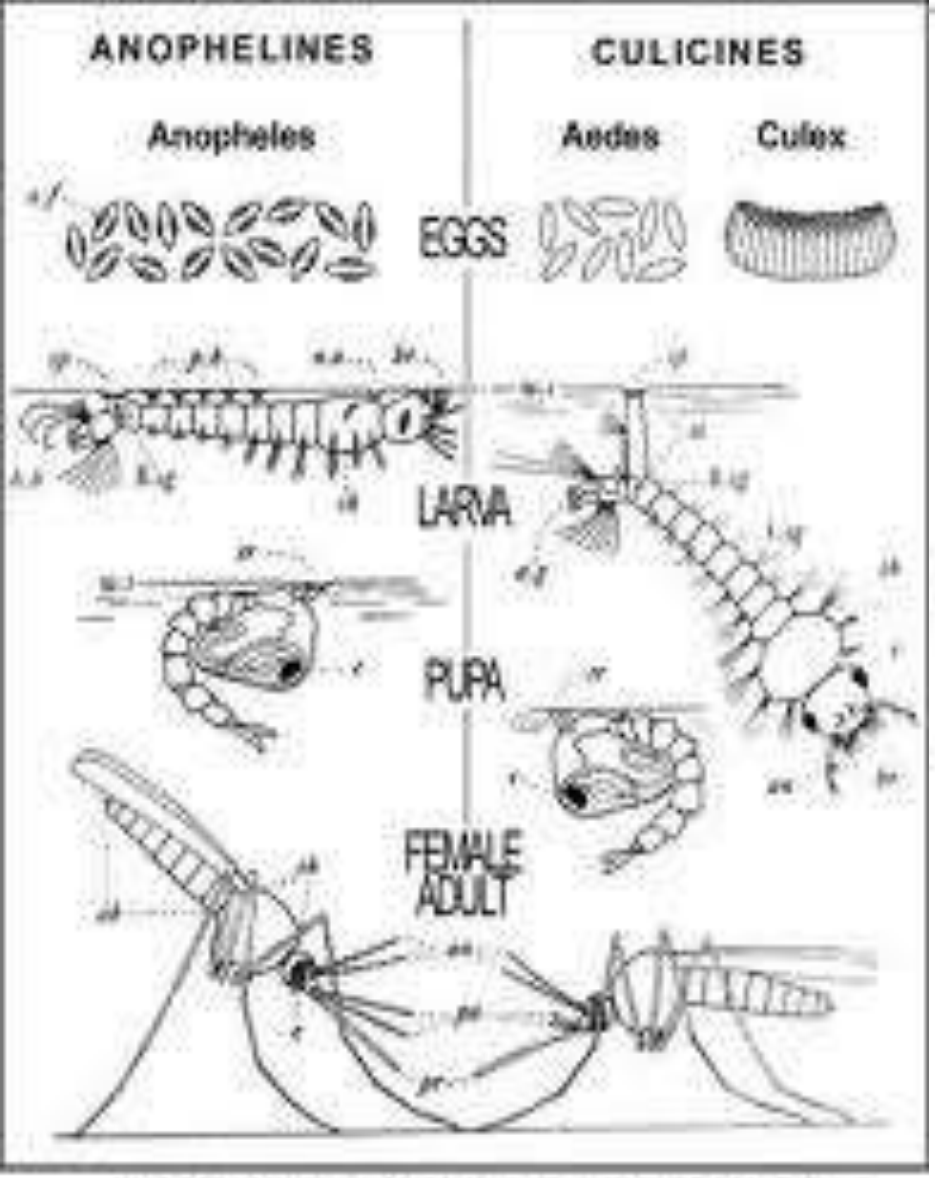
- Female anopheles prefer to laid their eggs during night hour.
- The eggs are always in batches having air filled floats on either.
- Hatching occur larva come out with in two days.
- After further development larva transform to pupa with in two days
- The adult mosquitoes emerges out after splitting on the dorsal aspect of the pupal covering.

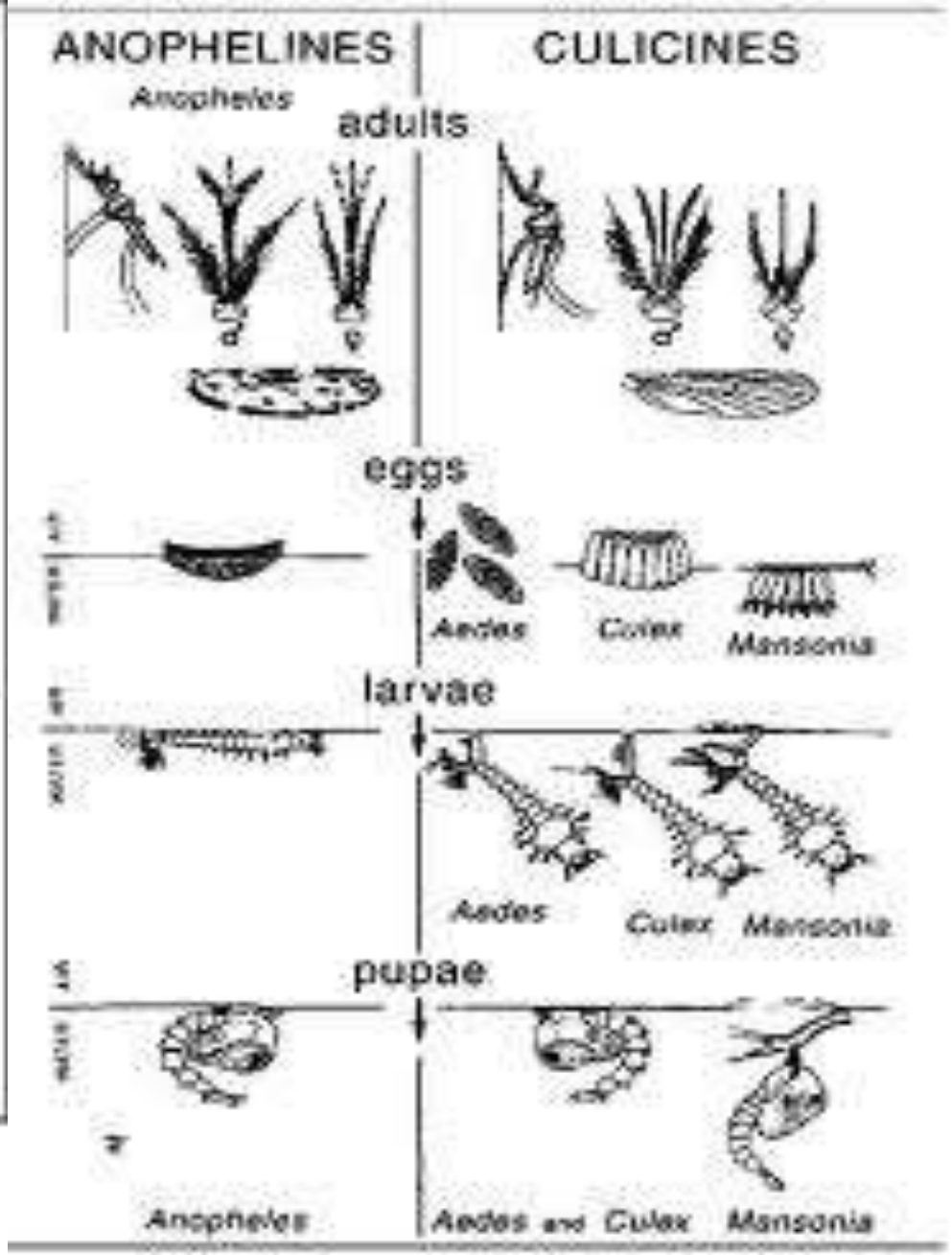


LIFE CYCLE OF ANOPHELES



LIFE CYCLE OF CULEX

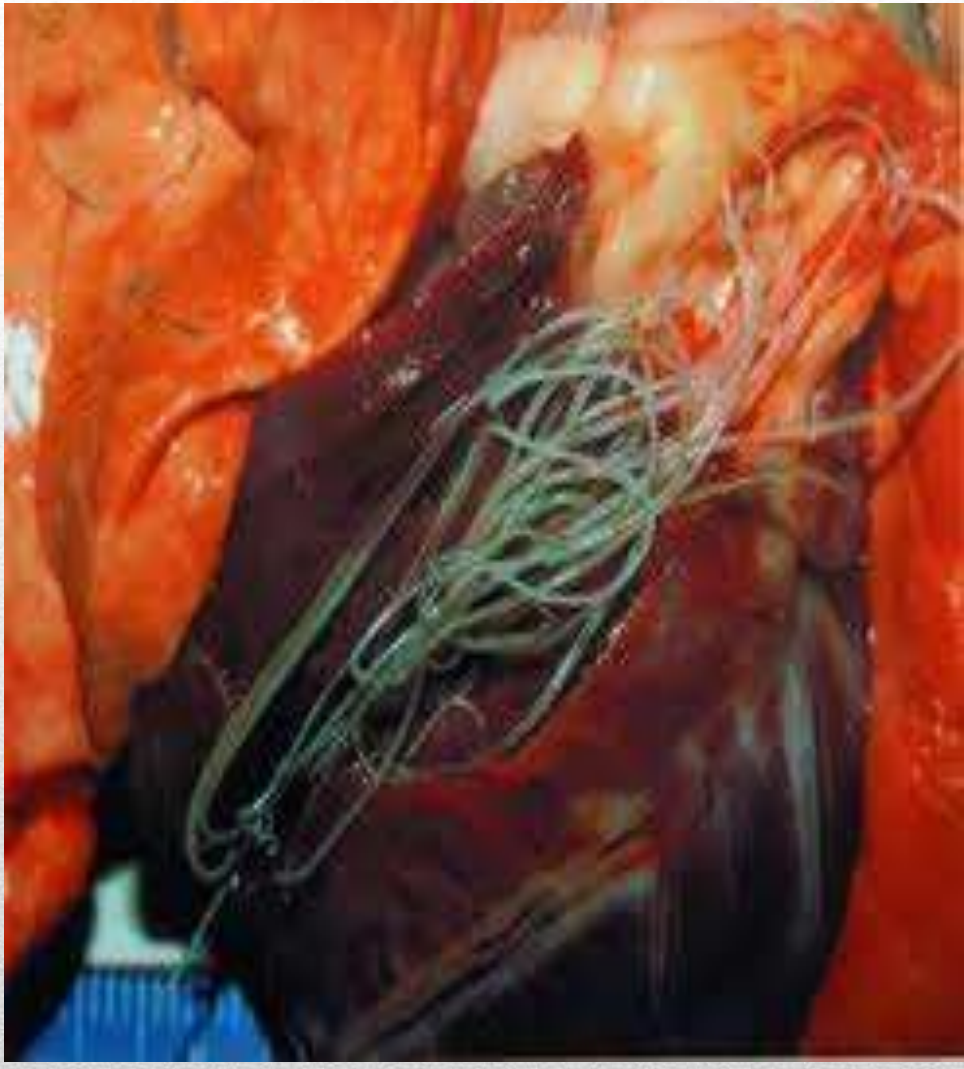




COMPRATIVE STUDY OF ANOPHELINE / CULICINE

PATHOGENESIS

- Anopheles responsible for transmission of various protozoan and nematodal disease like Plasmodium vivex the causative agent of human malaria .
- The are also transmits *Dirofilaria immitis*, the 'Dogs heart worm' and *Wuchereria bancroffti*.
- Culex transmits *Plasmodium gallinaceium* , the causative agent of avian malaria and *Dirofilaria immitis*.
- Aedes involve in transmission of viruses of Dengue fever and yellow fever in man.



DOG AFFECTED WITH 'HEART WORM'

Aedes causing ‘DENGU FEVER’