

# **Biology and culture of Tubifex and Chironomid (Microworm)**





# TAXONOMIC CLASSIFICATION

Kingdom:	<a href="#">Animalia</a>
Phylum:	<a href="#">Annelida</a>
Class:	<a href="#">Clitellata</a>
Order:	<a href="#">Oligochaeta</a>
Family:	<a href="#">Tubificidae</a>
Genus:	<a href="#">Tubifex</a>
Species:	<b><i>T. tubifex</i></b>

Known as **sludge** worm or sewage worm

More than 10 sp of tubifex

Tubifex tubifex

Kingdom:	<a href="#">Animalia</a>
Phylum:	<a href="#">Arthropoda</a>
Class:	<a href="#">Insecta</a>
Order:	<a href="#">Diptera</a>
Suborder:	<a href="#">Nematocera</a>
Infraorder:	<a href="#">Culicomorpha</a>
Superfamily:	<a href="#">Chironomoidea</a>
Family:	<b>Chironomidae</b>

Sub-familly 11 nos.

Chironomid is commonly known as **bloodworms** or non-biting midges

More than 5000 sps.



# HABIT AND HABITAT

## Tubifex

- Tubifex inhabit sewage drains.
- Dense worms can be seen reddish wriggling carpet.
- Anterior end embedded in mud while the posterior end webs above.
- They jerk into mud when disturbed.

## Chironomid

- Chironomid flies attract towards foul smell where organic matter decays and lay eggs.
- Eggs hatch into Chironomid larvae.
- Larvae initially live in soft tube made of organic matter.
- As larvae grow, come out of tubes and swim vertically in water by wriggling movement.
- Fully grown larvae are dark in colour.

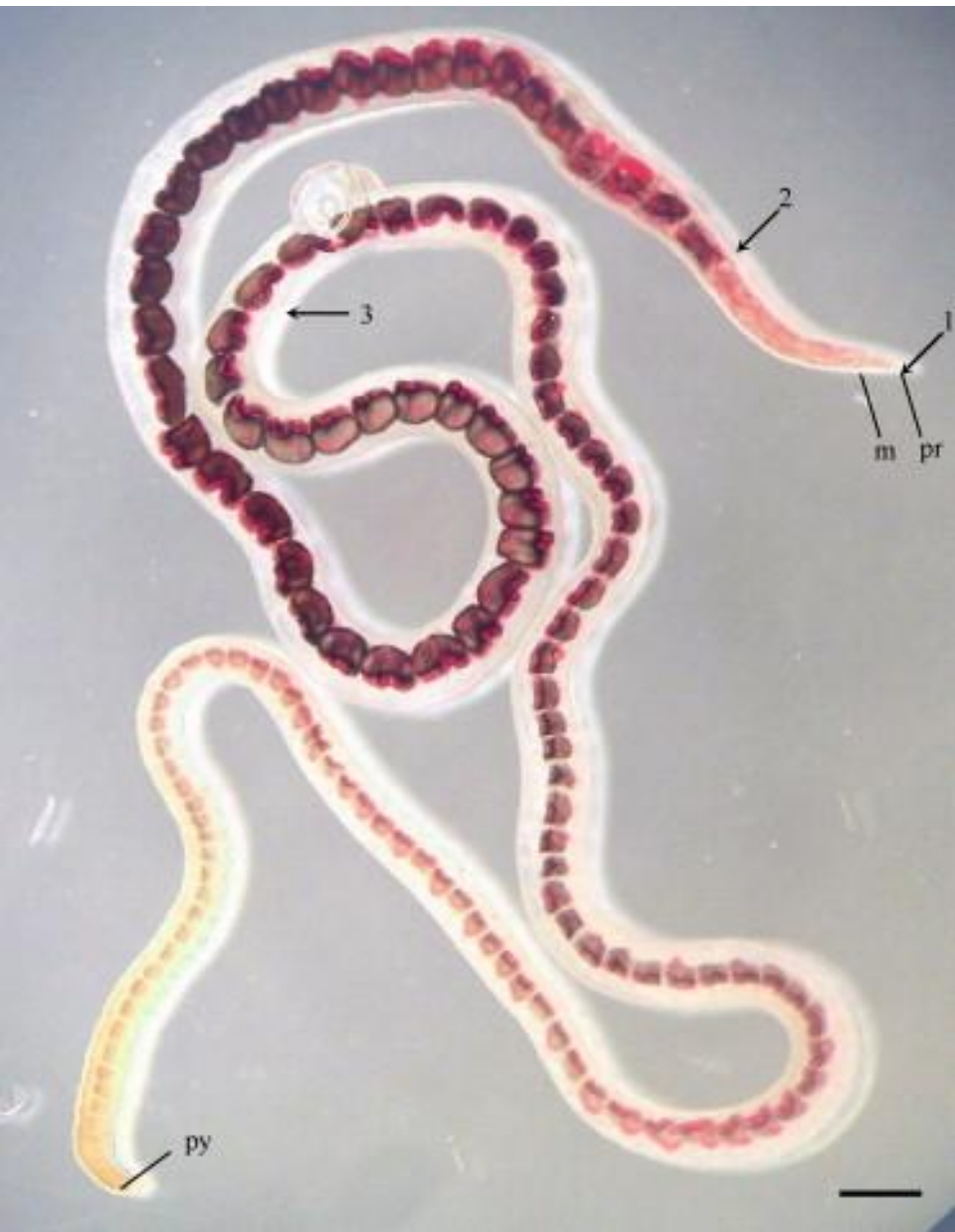
# MORPHOLOGY

## Tubifex

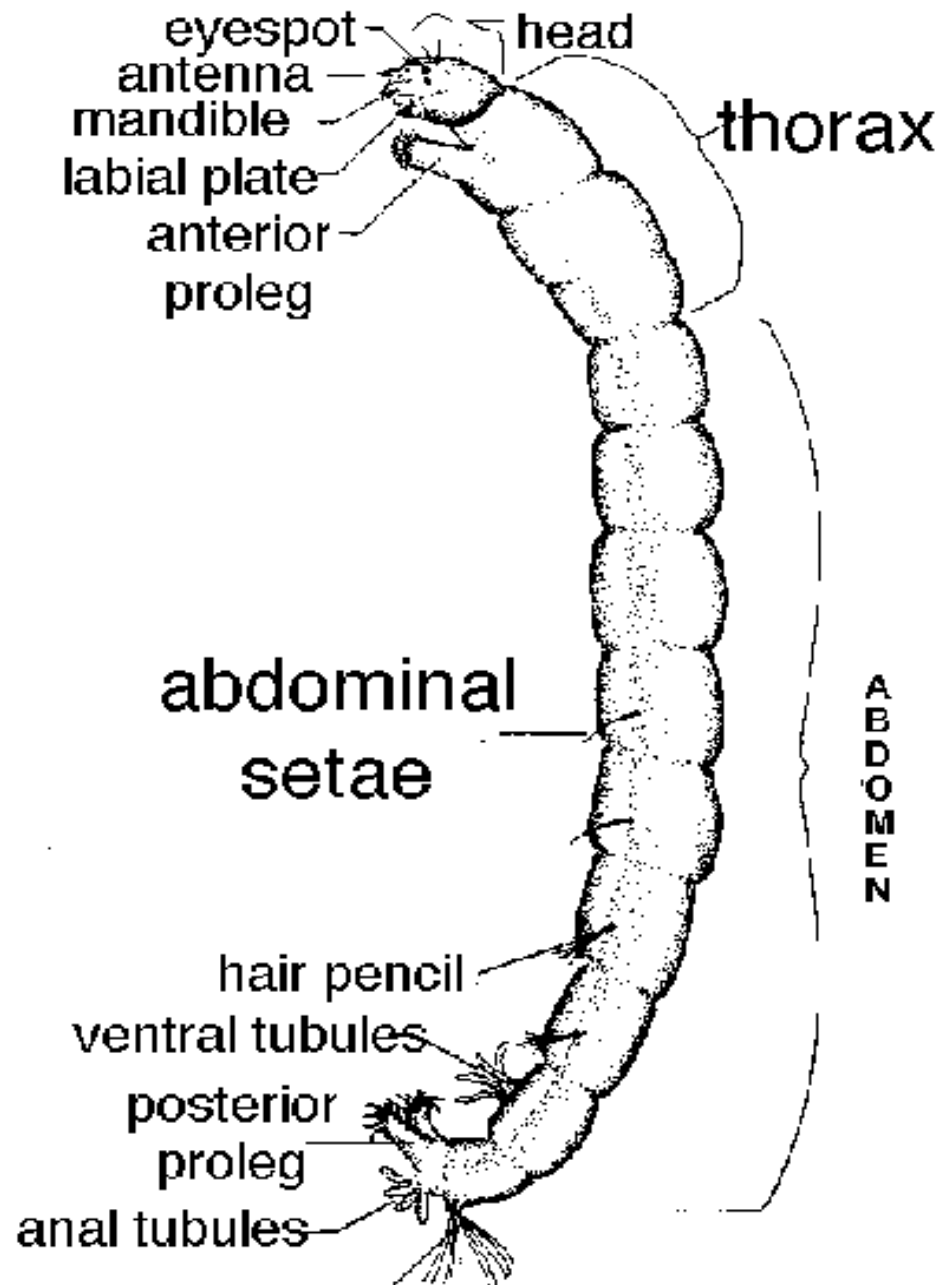
- Long, slender, no distinct head
- Prostomium (lip like) present at the extreme anterior end
- 1<sup>st</sup> segment (peristomium) lies behind prostomium
- Mouth is in peristomium
- Last segment is anal segment
- Coelom is divided into compartments by inter-segmental septa
- Anterior segments fused to form a swollen structure called as clitellum

## Chironomid

- Chironomid larvae look like an annelid worm.
- Body segmented
- Head is free
- It is about 1-1.5 cm in length
- Larvae has three legs
- One in front and other two at rear end of body
- Rear end (tail) has tufts of hair



Tubifex Worm



Chironomid larvae

# Food and Feeding

## **Tubifex**

- Feed on decaying organic matter, detritus, vegetable matter

## **Chironomid**

- Larvae are herbivorous in feeding habits and feed on algae, detritus, decaying organic and vegetable matter



# Reproduction

- Tubifex is hermaphroditic, each individual has both male (testes) and female (ovaries) organs.
- These minute reproductive organs attached to the ventral side of the body wall in the coelomic cavity and are clearly seen in mature specimens.
- In mature specimens, the reproductive organs are clearly found on the ventral side of the body.

# Copulation and Cocoon formation

- Male and female organs mature at different times; thus self-fertilization is avoided, and cross fertilization is encouraged
- Two mature Tubifex worms undergo copulation by joining their ventral and anterior surfaces together with their anterior ends pointing opposite directions.
- Sperms of one worm are passed into the spermathecae of the other worm by penial setae of one Tubifex worm.

- After copulation, Tubifex worm separate and begin to produce egg cases (cocoon) containing eggs in clitellum.
- The case contains both sperms and ova. After fertilization several eggs are formed in the cocoon.
- Fertilized eggs undergo development in the cocoon by utilizing the albuminous nutritive fluid for growth.
- Period of development varies with temperature and lasts for 2 to 3 weeks. After complete development, young worms come out of cocoon.

# Culture of Tubifex

- Tubifex mass culture in container: Prepare Tubifex bed with 50-75 mm thick mud, decaying vegetable matter, bran, bread.
- Continuous mild water flow in the container with suitable drainage.
- Obtain Tubifex worm from nearby muddy canal or sewage canal.
- Inoculate Tubifex worms in the container of Tubifex bed.
- Clusters of Tubifex grow within 15 days.

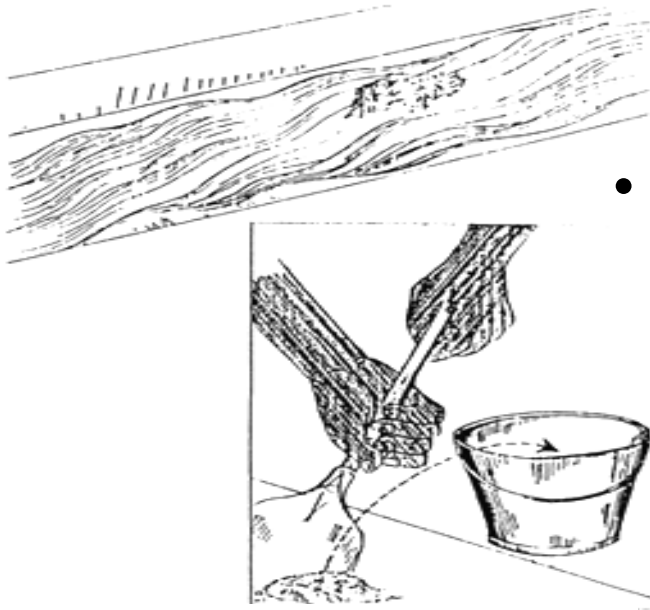
- Remove Tubifex mass in mud with spade and keep in wide mouth container.
- Collect the Tubifex when they come to surface due to lack of oxygen.
- Keep the collected Tubifex worms under the stream of water to clean and remove the residual mud in the worms. These worms are ready to be fed to fish.

## **Precautions**

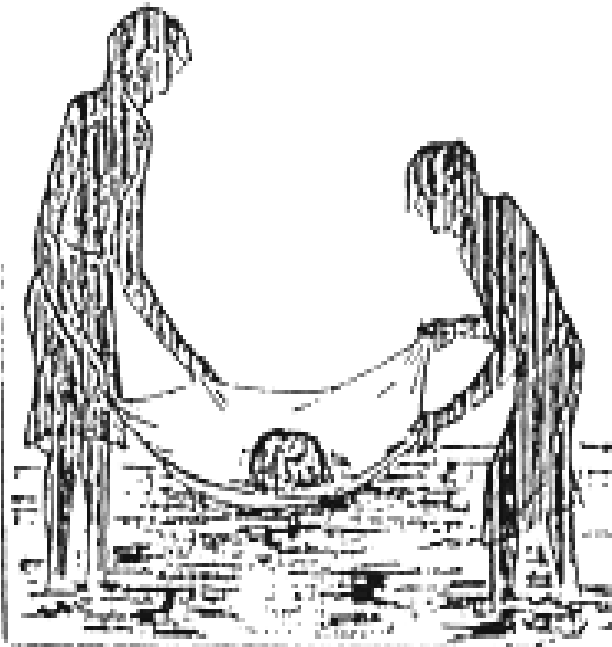
- Avoid brisk water flow on the culture bed of Tubifex; maintain uninterrupted mild water flow through out the tray without any dead area.



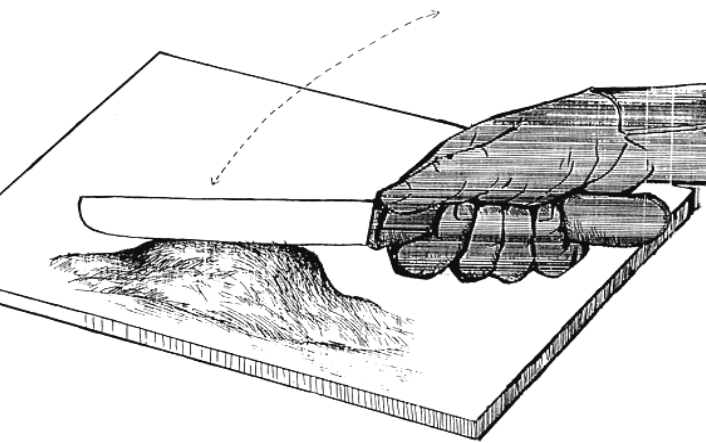
# TUBIFEX COLLECTION



- For collection of worms the places containing dense populations should be selected. Upper layer of soil (not more than 5–7 cm) mud in Tubifex worms should be removed by hand or by shovel and collected in a bucket.



- A heap of collected mud should be placed on a hapa-material with surface area 9–10 square feet and small-particle fractions of mud should be washed out through a fine mesh size material with continuous rinsing (shaking) cloth in water. This procedure can be done most effectively by two workers standing opposite to each other.



- Remaining material which was enriched in worms with rinsing of mud should be laid out in a 10 cm layer in a plastic washbasin and flattened with a piece of wood. Sand (1.0–1.5 cm) should be disposed in strata on surface of mud. Water (4–5 cm) should poured carefully in basin. As oxygen deficiency develops soon in mud covered with sand, worms will soon penetrate trough sand into water rich in oxygen. Colonies should be collected from surface and store under water current before use.

# Propagation of Chironomid

- Chironomidae (informally known as Chironomids or non-biting midges) are a family of nematoceran flies with a global distribution.
- Many species superficially resemble mosquitoes but they lack wing scales & elongate mouthparts of the Culicidae family.
- Males are easily recognized by their plumose antennae. Adults are known by a variety of vague and inconsistent common names, largely by confusion with other insects.

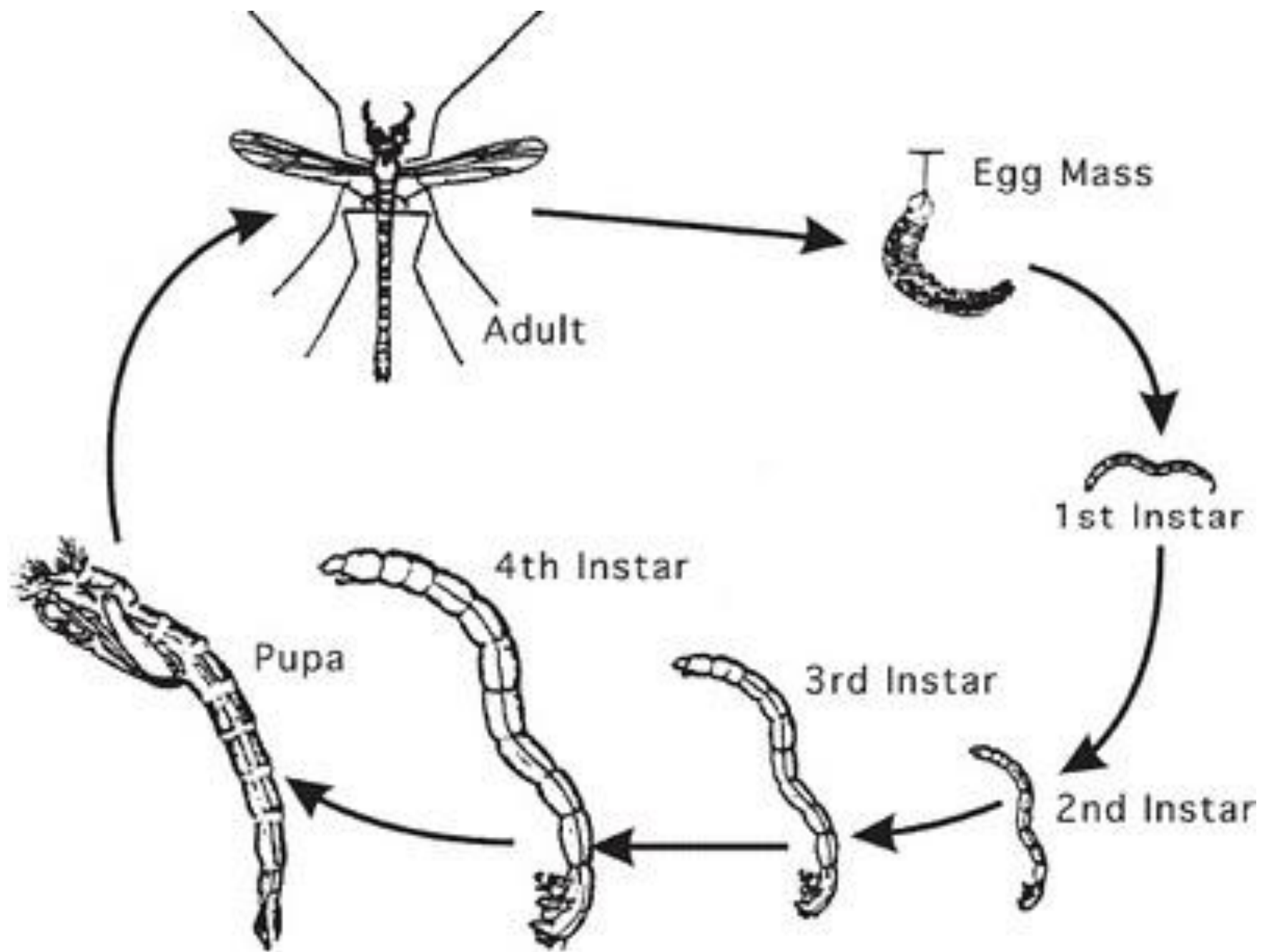


Figure 1. Chironomid life cycle (adapted from Walker 1987).

- Chironomidae are important as indicator organisms, i.e, the presence, absence or quantities of various species in water can indicate whether pollutants are present.
- Chironomid flies lay eggs on organic matter which is immersed in water.
- The eggs hatch straight into the **proboscis larvae** which in turn metamorphose into adult flies.
- The larvae initially live in soft tubes and become free swimming in water.



# Culture of Chironomid larvae

- Fill a flat container with water, composted manure or organic matter, decaying vegetable matter to attract chironomid flies to deposit eggs.
- Each female lay batch of 20000 eggs which hatch within 3 days.
- Larvae are herbivorous and feed on algae, detritus, decaying vegetable matter etc.
- Initially the larvae live in soft tubes. After 2-3 days, they come out of tubes and swim vertically.

# Alternate method of chironomid larvae culture

- Fill the cement cistern with freshwater up to a height of 0.6 m
- Add 1.0 kg of compost cattle dung attracts the chironomid flies, to lay eggs and acts as a fertilizer to produce algal blooms which acts as feed to the larvae.
- The eggs hatch in about 3 to 4 days.
- Larvae form soft tubes on the tank bottom and sides with the help of organic matter and live in them initially.

- Thin worm like light red coloured larvae comes out from the tubes.
- As they grow the larvae turn blood red in colour.
- Harvest the larvae with a scoop net made of 500 micron mesh cloth.
- Clean the larvae thoroughly and feed to the fish.

### **Precautions:**

- Do not disturb the tank water particularly when the tubes are formed on the tank bottom and sides



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