

BIOLOGICAL CONTROL METHODS- ANTI LARVAL MEASURES

INTRODUCTION

Fish have been widely used in public health, since as early as 1903. One of the most successful and widely used biological control agent against mosquito larvae is the top water minnow or mosquito fish ***Gambusia affinis***. Fish other than Gambusia which has received the most attention as a mosquito control agent is ***Poecilia reticulata***, the common guppy introduced in 1910.

ADVANTAGES OF USE OF FISH

- These fishes are self-perpetuating after its establishment and continuous to reduce mosquitoes larvi for long time.
- The cost of introducing larvivorous fish is relatively lower than that of chemical control.
- Use of fish is an environment friendly method of control.
- Larvivorous fish such as Gambusia and Poecilia prefer shallow water where mosquito larvae also breed

CHARACTERISTICS OF LARVIVOROUS FISH

- Should be small in size to survive in shallow water.
- Should be surface feeders and carnivorous.
- Should be able to survive in the absence of mosquito larvae.
- Should be easy to rear.
- Should be able to withstand a wide range of temperature and light intensity.
- Should be hardy and able to withstand transport and handling.
- Should be insignificant/useless as food for other predators.
- Should have preference for mosquito larvae over other types of food available at the water surface.

Gambusia affinis

- **Gambusia afinis** has been in use in India since 1928. It is an exotic species and has been distributed throughout the warmer and some temperate parts of the world

Habitat:

- It is a very hardy fish and can adapt to wide variations in temperature as well as to chemical and organic content of the water **but does not tolerate very high organic pollution**.
- The optimum temperature for reproduction ranges from 24 C to 34 C but the fish can survive at freezing temperatures. The most suitable pH of water is between 6.5 and 9.9. Gambusia frequents areas especially suitable for the mosquito larvae. It lives and multiplies in ponds stocked with larger fish provided pond is shallow and has protective vegetation for refuge.



Size and Longevity :

- The maximum size attained by a male is 4.5 cm. and by a female 5.2 cm to 6.8 cm. Its life span is approximately 4+1 years

Breeding Habit:

- The female matures in about 3 to 6 months. Each ovary contains approximately 120 eggs. Young ones are released in broods of 25 to 30 at a time.
- The young females have two gestations per season while the older females may have up to six generations per season. A season lasts about 30 days. A single female may produce between 900 and 1200 off springs during its life span.

Breeding Season :

- Gambusia breeds throughout the year after maturity, especially in tropical conditions.
- In relatively colder climate such as is found in north and north-west India breeding period lasts from May to September and in warmer climate of southern India from April to November.

Larvivorous Efficiency :

The larvivorous efficiency of Gambusia is due to following characters:

- A single full grown fish eats about 100 to 300 mosquito larvae per day.
- Gambusia is a surface feeder, hence it is suitable for feeding on both anophelines and culicines.
- It frequents the margins of the water container, pond or other ground water collections, except where there is dense vegetation at the margins of the water body.
- It is small and inedible.
- It can tolerate salinity.
- It can withstand transportation and does not require any specialized equipment or containers

Poecilia reticulata

Habitat :

- It is a very hardy fish and survives in all types of water bodies.
- It tolerates high degree of pollution with organic matter. The temperature range suitable for breeding is from 24 OC to 34 OC.
- It can survive in water with pH ranging from 6.5 to 9.0 However, **it can not survive in cold water** (often below 10 OC) and stock may need replenishment if the temperature fall below 10 OC.



Size and Longevity :

- The male is 3 cm long, whereas the female is upto 6 cm in length.
- The Guppy lives for 4 + 1 years.

Breeding Habitat:

- The guppy takes about 90 days to mature. Each ovary contains 100 to 160 eggs. The female gives birth to young ones in broods of 5 to 7 at a time.
- About 50 to 200 young ones are released by the female every four weeks.
- Breeding Season Reported to breed throughout the year at about four weeks interval after maturity.
- However breeding season will depend on climatic conditions. In warmer climate it may breed from April to November

Larvivorous efficiency :

The larvivorous efficiency of Poecilia is due to following characters:

- A single fish eats about 80 to 100 mosquito larvae in 24 hours. Therefore it is comparatively less efficient than Gambusia affinis.
- It is a surface feeder.
- Negotiates margins of ponds more easily.
- It is highly carnivorous and parents or older brood may eat up their own young ones. Therefore, a fair amount of weeds is required in the water so that young ones can hide and survive. Tolerates handling and transportation very well.
- Does not require specialized equipment for transportation.
- Survives and reproduces when introduced into new water bodies. Once well established, it can be found in the habitat even after many years

FISH HATCHERIES

The Hatchery for larvivorous fish can be established in:

- A Natural water body
- A special hatchery

The Natural water body Criteria for selecting a water body for a fish hatchery are: It should be a permanent water body. Depth of water should be at least 1.5 metre or more. Water should be confined and without big natural outlet. · The minimum size of water body should be at least 5 m X 4 m. The water body of 10 m X 5 m can support 50000 fish. It should be free from other carnivorous fish. Water should not be contaminated by chemical or other harmful substances. Easily accessible for daily or periodic inspection and for collection of fish. De-weeding in ponds and shallow water bodies and cleaning of margins should be carried out periodically.

Special Hatchery Following points may be kept in view, while constructing the special hatcheries for the rapid reproduction of the fish: Fish hatcheries should be established at state, district headquarters, CHC/PHC and subcentre levels and other places so that adequate quantities of the fish are available for supply. There should be a constant supply of fresh water .