

Gambusia Fishes Once a Part of VBDCP: A Topic of Debate Now

Chetan R Kalasannavar

Abstract: Mosquito fish (*Gambusia affinis*) and common Guppy (*Poecilia reticulata*) now being considered as invasive species posing a threat for local native species. Some related information has been collected regarding their introduction in environment as a part of VBDCP, their varieties and characters etc with a conclusion with my own experience of fish keeping and breeding.

Keywords: Environmental studies, Community Health programs, Science education, Ecology, UG & PG Studies

1. Introduction

In syllabus of health science we have a topic known as National programs, in which we study of various vector (mosquito) borne diseases and various methods to control these vector under Vector Borne Disease Control Program. Among those programs adoption of fishes is one among

them. Fishes small or big have been widely used for consumption as regular food and for many other purposes in public health. Many of you may be surprised to know that they are used for biological control of mosquito. Those are named as Gambusia fish. They are on top list as mosquito larvae consumers, hence also called as mosquito fish.



Other than Gambusia, the other similar species which has received the maximum attention as mosquito control agent is *Poecilia reticulata* (common guppy). (VBDCP) Vector borne disease control programs are an integrated management program to reduce mosquito populations and keep the diseases they can transmit under control. Surveillance includes intensive field monitoring, laboratory testing, analysis and research studies on the newly emerging and previously known mosquito - borne diseases. Control methods include much number of procedures. Among them are public education, the elimination of standing or stagnant water, and the use of a variety of environmentally sensitive biological controls, including mosquito fish. These fishes used are also called as larvivorous fish as they consume mosquitoes at their larval stages.

Larvivorous Fish Features

These fishes are quiet small in size so easily survive in shallow water.

- It should be surface feeders and omnivorous as it should survive in absence of mosquito larvae.
- It should be easy to breed and look after.
- It should be able to tolerate a wide range of temperature and light intensity.
- It should be hardy and able to withstand handling and transport.

- It should not be an easy food for other predators.
- Should have preference for mosquito larvae over other types of food available at the water surface.

Why Gambusia was first choice

A single grown fish eats about 100 to 300 mosquito larvae per day. Gambusia is a surface feeder; hence it is suitable for feeding on both anopheline and culicine. It frequents seen at margins of water container, pond or other ground water collections, except where there is presence of very dense vegetation at the margins of water bodies.

It is small and very rarely used for human consumption. It can even tolerate mild salinity and can better withstand transportation in comparison with other species and does not require any specialized equipment or containers.

It survives and gets adapted to new places (water bodies) and multiplies easily. Usually this fish can survive in good numbers for years and does not require constant care.

In past many States were advised to use these fish as biological control method in rural areas.

Advantages of Using these Fishes Over Other

Volume 11 Issue 3, March 2022

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

Larvivorous fish such as Gambusia and Poecilia prefer shallow water, same which is preferred by mosquitoes to breed.

These fishes are self perpetuating after its establishment and continue to reduce mosquito larvae for long time.

The cost of introducing larvivorous fish is relatively much lower than that of chemical control.

Use of fish is thought to be quiet environment friendly method of control.

GAMBUSIA AFFINIS

These have been in use in India since 1928.

It is an exotic species which is found to be distributed throughout the warmer and some temperate part of the world.

It is a very hardy fish which can adopt itself to wide variations in temperature as well as to chemical and organic contents of water but doesn't tolerate very high organic pollution especially ammonia.

The most suitable Ph of water is between 6.5 to 9.9. These fishes readily get adjusted to the environment especially the one which suits mosquito larvae.

To see these fishes are small dull grey or brown in colour with a rounded tail. It easily survives and multiplies in ponds etc even if stocked with larger fish provided pond should be shallow and should have good vegetation, which will provide better hiding place for fry's.

The maximum size attained by male is 3 to 4 cm and female is 4 to 5 cm.

Usually they have a life span of 2 to 3 years, depends on its environment and feeding habits.

The female matures in 3 to 6 months. A single female is known to produce around 900 to 12000 offspring during its lifespan.

POECILIA RETICULATA (GUPPY)

Guppy is also an exotic fish introduced in India in 1910.

It is also now widely distributed in India and is an important larvivorous fish.

Even this also is a very hardy fish and survives in all types of water bodies. It tolerates high degree of pollution with organic matter. It can easily withstand minor fluctuations in temperature.

It can survive in water with pH ranging from 6.5 to 9.0. However, it cannot survive in too cold water.

Guppies are more colourful and attractive in comparison to Gambusia. And usually males are more colourful and attractive; hence it is quiet commonly seen in almost all aquarium shops or trades. It is usually first choice of fish for aquarium hobby beginners.

The male is 2.5 cm long, whereas the female is upto 4cm in length. The Guppy lives for 4+1 years.

It is also quiet easy to care fish, and it reproduces quickly and prolifically.

The Guppy takes about 90days to mature. 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.

Where are these fishes to be released

To release the fish in a water body, measure the perimeter of water body. Release the fishes at the rate of 5 .10 fish per linear meter. If the larval density is high more fish up to 20 can be released.

Precautions Considered before Releasing Fishes

Fishes should be released in the morning hours or in the evening.

Before releasing ensures that the temperature of the water both in container and in the larval habitat is more or less same. This can be done by slow acclimation process.

Before releasing fishes dense vegetation from the water body should be cleaned.

Ensure that the water body is free from predators of fishes being released.

Fishes Usually Introduced – Where?

Fresh water bodies in rural areas such as stagnant ponds, slow moving streams quarry pits, large borrow pits and margins of ponds are usually preferred. To maximize the effect Fishes should be introduced in all unused wells in the rural and urban areas before the high mosquito breeding season.

Such places are surveyed documented regarding prior and post condition of ponds etc to see efficacy, for this

continuous monitoring is done. In open mosquito breeding sites or rice fields, the fishes need to be protected from pesticides applied to crops, especially when used in rice fields.

Both these fish though exotic but have acclimatized very well in different types of climatic conditions prevailing in this country. These fish possess requisite qualities of good larvivorous fish viz. small size , hardy , extremely prolific breeders of shallow and deep waters , worthless as food , adaptable to various climatic conditions and able to tolerate considerable degree of organic pollution and salinity , able to withstand handling , transportation and capable of flourishing in confined water collections.

Gambusia affinis, an American top feeding minnow, was introduced into almost all the countries of the world where malaria was endemic. The fish was introduced in India during 1928 when 1st consignment was brought from Italy by Dr. B.A. Rao then at the Mysore State Health Department. Since then the fish has been used extensively in different parts of the country for the control of Anopheles stephensi breeding particularly in urban areas. Besides the size difference in the adults , males may be distinguished from females due to the modification of the normal round anal fin in male into a long thin intromitten organ ; the gonopodium for the transfer of sperms. The breeding season varies in different localities according to the climatic conditions. In North India it lasts from March till October.



Poecilia reticulata, it is commonly known as guppy or Barbados Millions or mosquito fish – a native of Barbados Island in South America. The fish was introduced in India by 1908 when a British army officer Major Selvy, who suffered frequent mosquito bites brought the fish from England. Initial attempts made to establish this fish in Indian Museum Compound, Calcutta failed. However, in 1967, a prolific breeding of this fish was detected in the sullage water of Nagnadi in Nagpur. The fish was brought to Delhi and since then the healthy colony of fish is being maintained at the NICD, Delhi (presently NCDC) and under field conditions. Since then the fish has been introduced in different parts of the country for the control of culicine breeding.

The little guppy *Poecilia reticulata* has developed a big reputation. For decades, the fish has been championed as a mosquito fighter and dumped into ponds and ditches to eat up the insect's larvae.

But among present some scientists, it has a different reputation – as an invasive species with a remarkable ability to reproduce and spread.



Now, as health officials in regions facing mosquito – borne viruses like Zika consider expanding use of these predatory fish, ecologists are urging them to think twice. In a paper published online today in *Biology Letters*, a group of ecologists argues that the guppies – and other non native fish used for mosquito control – haven't actually proven very effective mosquito fighters, but are known to pose ecological risks.

“It all sounds like its magical – you put the guppies in, they eat the mosquitoes, everything is fine,” says Rana El-Sabaawi, an ecologist at the University of Victoria in Canada and lead author on the new paper. “Our concern is that you have a potentially invasive species that is being introduced haphazardly.”

And several studies suggest that introduced guppies threaten biodiversity. Researchers in Hawaii found that guppies released in 1920s drove down native fish populations, perhaps by competing with them for food and living space, and had likely changed the cycle of nutrients in water. Guppy-rich areas showed increased levels of dissolved nitrogen – from ammonium in fish urine and gill excretions – which, in turn, stimulated algae growth. (Another fish

commonly used in mosquito control – *Gambusia affinis* – has also been associated with declines in native fish species.) The authors also question whether guppies are reliable mosquito larvae feeders. Studies that back their effectiveness tend to have flaws, they say. Lab tests often starved the fish before exposing them to a diet of exclusively mosquito larvae. And studies in the wild have been small and poorly designed.

That critique may be correct, but dismissing guppies as a control strategy is counterproductive, says John Hustedt, senior technical officer of the nonprofit Malaria Consortium in Phnom Penh, which has been releasing the fish into water storage jars in rural households to combat dengue fever and other mosquito-transmitted diseases. Hustedt hopes that a study his group has just completed will provide new evidence for the guppies' value. Preliminary results showed that reductions in the number of adult mosquitoes were two times greater in households with guppies than in those without.

“If someone comes out and says, ‘actually it doesn't work and it's going to cause a problem, ‘that can decrease the chance that the government would be more open to trying (guppy release) on a large scale, ‘he says.

As for ecological risks, guppies in isolated containers may be less likely to spread than those dumped into urban sewers and ditches. But Hustedt also questions the distinction between native and non native for a species that is already so ubiquitous. The guppies used in his project were found in a farm in a province outside Phnom Penh; their original source is unknown. It seems to me that they have been here for a quiet long time, and they are already in the environment, he says.

Although the benefits and risks of guppy releases may be highly context-dependent, some researchers are simply taking a hard line. “The use of fish to control mosquito disease vectors should be abandoned by authorities,” says Valter Azevedo-Santos, an ichthyologist at Sao Paulo State University in Botucatu, Brazil, who co-authored a letter objecting to the strategy published in *Science* earlier this year.

He believes resources would be better spent on other control measures: insecticides, sanitary measures such as eliminating standing water in homes, and even the experimental release of genetically engineered mosquitoes to spread a lethal gene. As health workers cast around for ways to combat Zika, he hopes this paper will give them pause. “This management must be abandoned, or new fish invasions will occur in the near future,” he says. This is a special moment.

2. Conclusion

Me being an aquarium ornamental fish hobbyist have spent long years in fish keeping, rearing and breeding. Guppies have been my beginner fishes and are still being continued. My observation was guppies prefer over mosquito larvae even when fed together with regular aquarium flake or pallet foods. I feel the wiggling movement of larvae attracts or

triggers the fish towards it. And I have never seen single mosquito larvae in one of my outdoor ponds. But I could find larvae in buckets which I left untouched for a week or so, which I usually placed nearby pond itself. The same larvae usually I used to feed my indoor fishes. My small experience clearly states that they are really effective but the question of invasiveness over fishes still remains obscure. Hence more studies should be done as early as possible regarding invasiveness before local fishes perish. If they are not found to be invasive, they should be implemented in more and more upcoming VBDCP.

References

- [1] Global invasive species database, from invasive species specialist group.
- [2] Mosquito fish – Wikipedia
- [3] Science news from science daily
- [4] The invasive success of mosquito fish is due to its genetic variability from physorg.
- [5] Invasive species compendium from CABI.
- [6] Gambusia or mosquito fish from business Queensland
- [7] Western mosquito fish from Laura Johnson
- [8] Nandi document