

17. Investigation on Larvicidal Efficacy of Two Native Indigenous Ornamental Fishes Under Laboratory Condition

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Abstract:

*A study was carried out to evaluate the possible larvicidal efficacy of two indigenous ornamental fish species found in and around wetlands of Sonitpur District, Assam; India. The mosquito larval preferences of two local fishes (*Amblypharyngodon mola* and *Trichogaster lalius*) were studied to emphasize their importance in mosquito control management. Under laboratory conditions, the consumption rate of mosquito larvae by two separate indigenous fish species of aesthetic value revealed that, of the two species, *Amblypharyngodon mola* is the prospective choice for mosquito control, followed by *Trichogaster lalius*.*

Keywords:

Amblypharyngodon mola, Trichogaster lalius, Indigenous ornamental fish, Larvicidal efficacy.

17.1 Introduction:

Malaria is emerging as the major public health problem in the entire eight sister states of the northeastern India. It is reported that the incidence of malaria is increasing significantly since the year 2001. A series of epidemic seasonal malaria outbreaks occurred which caused 29,710 (average) clinical attacks annually. In India, the yearly average prevalence of malaria is 106 per 100,000 people. The prevalence rate of malaria in Meghalaya is highest amongst the northeastern states and second in India. In the pre-DDT period, introducing fish for controlling mosquitoes was an effective strategy (Floore, 2006; Walker & Lynch, 2007). Typically, Fish were often put into all potential mosquito breeding sites, such as rice fields, marshes, dams, canals, and ponds (Motabar, 1978). Fish have been used effectively to control culicine as well as anopheline mosquitoes (Tabibzadeh *et al.*, 1970; Victor *et al.*, 1994). The utilization of fish for mosquito control has primarily concentrated on a small selection of species, namely *Gambusia affinis* Baird and Girard, as well as *Poecilia reticulata* Peters, which have traditionally served as effective agents for managing mosquito larvae (Cech & Linden, 1987; Homsy *et al.*, 1987; Blaustein, 1992; Valero *et al.*, 2006; Walton, 2007). One of the most significant concerns when introducing exotic fish for mosquito control is their influence on native species (Das & Amalraj 1997; Novak & Lampman, 2001).

To address the concern of introducing non-native species, this study aimed to examine the effectiveness of native fish species in controlling mosquito larvae. The objective was to explore alternative options for mosquito control without relying on exotic species.

17.2 Material and Method:

For this study, two native ornamental fish species viz. *Amblypharyngodon mola* and *Trichogaster lalius*, were selected for the current experiment because of their high species richness in malaria prone areas of Assam. The experiment was conducted in the months of June through August of 2016 during the monsoon season in order to gather an acceptable quantity of mosquito larvae. A small plankton net was used during catching the larvae from the still waters in and around. Larvae of Anopheles were also reared in the laboratory of PDUAM, Behali, in a 25-liter plastic tub. Cow dung and chunks of vegetables were added to the tub of freshwater, which was then left undisturbed for approximately 6 days. Mosquitoes were drawn to this microhabitat, where they lay eggs and produced a significant number of mosquito larvae within a week. The larvae were collected by utilizing a tiny net to feed the fish used in the experiment.

The selected fishes were separately reared in glass aquaria (measuring 20cm×17cm×20cm) for a week and given commercial aquarium fish pellets. The fishes were starved for 24 hours prior to the commencement of the actual experiment. A total number of 300 larvae were introduced into the aquarium and one fish allowed at a time for predation upon the larvae with 10 replicates. The quantity of larvae consumed by each fish was documented at both 1-hour and 24-hour intervals. Simultaneously, one control group with fish feed with mosquito larvae was maintained. The significance of the control group in relation to the consumption of larvae by the fish was statistically analyzed (SPSS-18Version).

The present paper is based on our laboratory experiments on two indigenous fishes as predatory against mosquito larvae causing malaria. The fish species, in the present study to assess their potential as larvicidal agents includes, *Amblypharyngodon mola* consumed more larvae per hour and it increases with an increase in time, followed by *Trichogaster lalius* in the aquarium. There was no noteworthy distinction observed when comparing the experimental group with the control group.

There are certain concerns regarding the use of biological control methods against malaria, which are perceived to be more challenging to implement compared to chemical approaches (Das & Amalraj, 1997) and sometimes agents can be effective in controlled laboratory conditions, but they may be unsuccessful in the field. Furthermore, biological control methods may exhibit specificity regarding the particular mosquito species they can effectively target and the specific habitat conditions required for optimal performance. *A. mola* and *T. lalius* are carnivorous in nature and therefore, it consumes a large number of mosquito larvae if available in the surrounding and they prefer insects and especially all types of larvae. The intensive use of chemicals for controlling mosquito larvae resulted resistant strains, the decline in beneficial insects, outbreak of secondary pests, contamination of the environment and food stuffs, and bioaccumulation of pesticide residues in non-target organisms, including human (Novak & Lampman, 2001).

The mosquito control method requires alternative simple and sustainable means of control. Biological control has many advantages as compared to other methods because it can be effective and safe to human and non-target populations, it has a low cost of production, and lower risk of resistance development (Yap, 1985). Moreover, these fish species are almost well habitant in all water bodies. Unlike exotic species, these fish species do not cause any harm to other native fish. As these fish species breed naturally and is of great advantage. So, they can be applied rapidly in the malaria control programme especially in the Northeastern states which will be eco-friendly and economic.

Table 17.1 Mosquito larvae consumption rate by two indigenous ornamental fish species under laboratory conditions.

Name of the Fish	Size (cm)	Number of fish	Time (hr)	Total consumption (per species) Mean±standard deviation
<i>Amblypharyngodon mola</i>	12.2 to 15	10	1	188±19.8
			24	232±18.1
<i>Trichogaster lalius</i>	3.2 to 4.8	10	1	102±19.4
			24	104±10.33

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