



CHAPTER - ONE
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I INTRODUCTION

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I INTRODUCTION

1.0 General introduction and review of Larvivorous fishes:

During 20th century, there was considerable under development of aquatic management, hygiene and the medicine. There were repeated epidemics of gastro, cholera, malaria, filaria, Dengue and other water born diseases. Therefore a considerable work on the biological control of insect vectors had started early in beginning of the 20th century.

The earlier work on search of larvivorous fishes had started in West Bengal, (Aitkins, 1910; Anonymous 1924; Chaudhuri, 1909; Mac Donald, 1914; Murphy, 1914; Osborn, 1907). The work on the larvivorous potential of mosquito fish *Gambusia affinis* had reported by Bhaskar and Ramoo, 1942; Chacko, 1948; They had also studied the larvivorous affinity of another fish *Panchax parvus*. The larvae eating voracity of glass fishes (Ambassis) had earlier reported in marshy lands of the Bengal and Assam for the control of Malaria (Job, 1940). The mosquito destroying capacity had been tested in number of fishes namely, *Panchax*, *Barbus stigma*, *Esomus danricus* and *Trichogaster fasciatus* (Sen *et al*, 1937;) The indigenous species having different larvivorous potential had reported earlier in 1910. The indigenous species such as *Notopterus*, *oxygaster* (Chela), *Laubuca*, *Barilius*, *Rasbora*, *Danio*, *Esomus*, *Puntius*, *Aplocheilus*, *Oryzias*, *Horaichthys*, *Aphanius*, *Colisa*,

Macropodus, Etroplus, Anabas, Mugil, Ambassis, Therapon, Badis, Glossogobius, (Khanna, 1985).

Biological control of mosquitoes with the help of suitable larvivorous species of fish is the most practical and cheapest method, and with proper instructions can be practiced by the poor villagers also. A fish species to be used for mosquito control should be small active, hardy, prolific breeder and carnivorous in habit. It should be compatible with the existing fish fauna of the region. The similar need based work had started in the middle of the 20th century (Alcock, 1902; Bentely, 1910; Sewell and Choudhuri; 1912; Prasad, 1918; Hora, 1927; Chatterjee, 1934; Roy, 1938; Hora and Nair 1938; Job 1941 a; 1941b; 1941c and 1943; 1944; John, 1940; Chacko and Ganapati; 1949a; b reported their findings of systematic investigations on different aspects of certain indigenous species such as mosquito ratio in the diet of fish from diverse natural habitats; the extent of control exercised by the fish in different types of waters in nature; the effect in the field of introducing and withdrawing the fish life history and bionomics of some of the species of proven utility.

At beginning (1905-1920), there was wide spread of epidemic malaria, elephantiasis, gastro and vast mosquito biting annoyance in India, particularly Ganges river basin, coastal parts of peninsular India and the marshy lands in states of Bengal were main epidemic sites of malaria and other diseases hence, preliminary research- work on the

control of insect vectors had started at the states of Bengal and the coastal area of Madras.

The different species of fishes classified into six groups according to their efficiency in mosquito control, such as efficient surface feeders (*Gambusia*), less efficient surface feeders (*Orizian*, *Lebistes* and *Aphanius*), surface feeders (*Danio*, *Rasbora* and *Carassia*), column feeders in water stagnance (*Chanda* and *Puntius sp.*). The Larvae of Indian major-carps and original predaceous food fishes (*Wallago*, *Channa sp*, *Mystus* and *Rita rita*).

The large sized species of carnivorous fishes such as *wallago attu*, *channa punctatus* and *clarius batrachus* are voracious feeders of mosquito larvae as well as on daphnids and the worms; but the microhabitat of ditches, seasonal ponds and shallow sewage swamps are quite unsuitable for their rearing, therefore these were not tried for the aquarium maintenance, and the suggestion for the introducing into confined small water reservoirs.

There were extensive work on the gonads of the food fishes namely, *Labeo rohita*, *Labeo gonius*, *Labeo calbasu*, *Catla catla*, *Tilapia mosambica*, *cirrhina mrigala*, *Mystus seengala cyprinus carpio*, *Heteropneustes fossilis*, *clarias batrachas* (Khanna, 1985; Mote; 1981; Dhange, 1982 Fartade, 1982) Even the ovaries and testes of pacific salmon and there hormonal control well discussed (Hoar, 1969).

However, the gonadal histomorphology was very least studied in the larvivorous fishes (Khanna, 1985). Even other text books on the Ichthyology had given very scanty account of gonad in larvivorous fishes. Therefore present M.Phil dissertation is mainly concerned with the search of other larvivorous fishes, the study of gonadal histomorphology and histochemistry.

1.1 Reasons for undertaking present investigation:

Now days an increased organic load and surface run off during the rainy season is resulted into partial eutrophication of river water and the formation of river stagnances and hence such a type of habitat become the breeding and spawning place for different types of mosquitoes. This type of situations leads to spread of epidemic diseases such as gastro, cholera, malaria, filariasis, Dengue fever, chikun guniya etc.

In recent years (2003-2007), the repeated flash flooding in Krishna river have created aesthetic problem of public health and the hygiene. There was also considerable increase in the breeding places of mosquitoes such as freshwater ditches, ponds, dystrophic swamps and the marshy wet lands (e.g. Marshy area at Karnala near, sangli). Therefore the introduction of Larvivorous fishes in such reservoirs not only important for biological control but also the destroying cyclops, guinea worms and the rotifers from the polluted water is quite essential for the public health and hygiene. So the larvivorous fishes were selected for their proliferation

and propagation and redistribution for the control of insect vectors and larvae. This research work is mainly concerned with the histology and histochemistry of gonads of selected larvivorous fishes for their rapid and prolific reproduction, basic understanding of gonadal histomorphology and histochemistry however their maintenance in aquarium, propagation and wide range of redistribution have given first priority and it is essential for public health. Therefore the present investigation, to little extent is undertaken extensively in our department of Zoology.

1.2 Geographical study area and relivance:

The segments of Yerala and Krishna rivers in Sangli district were selected for this research work,

1) Krishna river-

The river Krishna originates in Sahyadri Ghat at Mahabaleshwara and joins Bay of Bengal at Masulipattam, after covering a span of 1200km.

It is 2nd largest river in Maharashtra having total geographical area 307690 sq.kms. in this state. It has 3.38% of India's total water source. The catchment area of Krishna is 258948 km² and the rate of flow is 243403 m³/km²

The Krishna basin is the 2nd largest in the peninsula and the 3rd largest in the whole India. The river flows with a south easterly trend in

Maharashtra state through the Satara and Sangli district till it reaches south of Miraj city where it enters Karnataka. Its tributaries in Maharashtra are Venna, Koyna, Warna, Panchaganga, Vedganga, South Mand, North Mand & Yerala.

2) Yerala river-

The Yerala river is a one of tributary of Krishna river. The Yerala is a slow flowing, shallow and seasonal river. Previously before year 2003, it was practically dry during summer season but recently it is rejuvenated and recharged with the freshwater resource from the “Arphal tunnel.” (underground water tunnel measuring about 17km, A connection between Krishna Dhome irrigation canal and the river Yerala)

Thus the Yerala river become periannual. There are many weir tanks on the Yerala river viz, Ramapur bundh, Baliraja, a weir at Balwadi, Wazar reservoir, Nimani Vasant bundh etc. Thus running fresh water in Yerala not only important for the breeding activities of different fishes but also forms important and promising resource for the inland fishery activities.

The hydrobiological observations of the Krishna recorded during July 1949; showed the temperature of the river water to be 28.1 – 28.6⁰c, carbonate – 7.8-31.0 ppm and bicarbonates 81.9-105.4 ppm. The water was well saturated with oxygen (3.07-5.46 mg/l) and the chloride content ranged from 10-30 ppm. Phosphate values were recorded to be 0.24 –

Plate No.1 : Caption to Figures

Fig. No. 1 - Figure showing “Baliraja” water reservoir at Balwadi, showing eutrophication and mosquito breeding places in the corner of the village.

Fig. No. 2 - Figure showing “Wazar” temporary water reservoir on Yerala river at Wazar showing wide spread of water in near by nala's and ultimately raising the breeding grounds for the mosquito.

PLATE NO. 1



Sathpewadi, Dudhonadi, Pundi, Nagrale, Nagthane, Burli and Amnapur.

- 3) Effluents of Walva sugar factory and sewage.
- 4) Dumping of Puja garbage at Shri. Skhetra Audumber and Bhilawadi.
- 5) Release of “Sheri-nala” drainage and industrial ingredients in Krishna-river at Sangli.

1.4 Reasons for selecting Larvivorous fishes for present dissertation :

All major rivers system of India get polluted with effluents, molasses and the detrimental changes like dystrophication and eutrophication.

The fresh water pollution is not uncommon for the river Krishna, Yerala, Bhima, Warna and the Panchganga. These rivers were severarly also affected with the flood, during the year 2005 and year 2006. The flooded situations resulted into increase in the mosquito breeding places and spread of Malaria, Dengue, Cholera and the other epidemics. Following factors were found to play important role in mosquito breeding-

- 1) Formation of ditches and ponds during the flood.
- 2) Sewage accumulation in the river.
- 3) Eutrophication and habitat deterioration.

0.51 ppm The plankton comprised copepods (Cyclops, Diatoms), Cladocerans (Daphnia, Diaphanosoma, moina) and Rotifers (Brachionus, Salpina)

1.3 Present situations of freshwater habitats in the sangli district :

Since for the last 4-5 decades of 20th century, the major rivers in a deccan plateau of Penninsular India, have been reported for their extreme water pollution and the health hazards (Mote, 1991) The industrial effluents, organic load of molasses, domestic waste water, drainages and garbage have had continuously dumped into the river water. *For example-* river Godavari at Trambkeshwar and Nasik, river Bhima at Pandharpur, Panchganga river at Kolhapur and Inchalkaranji, river Mula and Mutha at Pune and the Krishna river at Sangli.

Source of water-pollutions in Krishna and Yerala river in Sangli district –

As compared to river Yerala, the Krishna river is highly polluted at various places. Followings are the sources of water-pollutants –

- 1) Molasses and other industrial effluents from the different sugar-factories. *Viz*, Rethre, Sakharale, Walve, fifth mile sugar industry of Tasgaon and Vasant Dada sugar factory at Sangli.
- 2) Addition of domestic waste water and dungs into fresh-reverine water at the several ghats of river Krishna *viz*, Borgaon, Takari,

irrigation canal, and other water reservoirs of Yerala and Krishna rivers of selected study area.

Biological control of Insect vectors-

Fishes like top minnows and carp minnows viz. *Gambusia affinis*, *Puntius chola*, *Puntius sophore*, *Puntius ticto*, *Esomus*, *Barbus*, *Panchax*, *Poecilia reticulata* etc, feed voraciously on the crustacean and mosquito larvae. The larvivorous fishes were propagated and distributed in ponds, lakes, gutter swamps (eg. Sheri-nala swamp near Sangli) and various new places in study area.

1.5 Histological and Histochemical Techniques:

Following histological and histochemical techniques were used for the present investigation.

- 1) Routine HE technique.
- 2) Alcian Blue (AB), PH.1. (Nalwade 1975; Scott et al 1964; Lev
And Spicer 1964) .
- 3) Alcian Blue (AB), PH 2.5 (Nalwade, 1975; Mowry 1956; Scott and
Dorling 1965; Quantarell, G. 1963).
- 4) Periodic acid schiff (PAS) technique (Schabodasch 1947;
McManus 1946).

4) Accumulation of rainwater in terrace containers, tires and empty pots.

The cases of resistant malaria, Dengue, yellow fever and other water – born diseases have had frequently reported in the regional leading news-papers viz, Daily Sakal, Pudhari and Daily ‘Lokmat’ therefore the breeding places of different mosquito species should have been destroyed with the help of larvicidal fishes rather than their control by chemicals because chemical control of the vectors is more hazardous and hence the present research work have had focused on the new search of larvivorous fishes, their reproduction and precise wide range distribution from small containers to garden ponds, village tanks, ditches, water reservoirs drinking water wells in arid zones also.

The present research work is not only related to mere survey of larvivorous fishes from the selected area for research but some of the larvivorous fishes have also studied for their reproduction, histomorphology of gonads and the histochemistry.

First attention had focused on the search to potential species of larvivorous fish, their maintenance in laboratory aquaria, natural freshwater ponds and the distribution of flourished species in different aquatic habitat. The small fishes were tested for their larvicidal propensities.

Eco-friendly zooplankton and phytoplankton for the larvivorous fishes were analyzed from the fresh water ponds, ditches, wells, Krishna