



AN ANALYSIS OF THE SIGNIFICANCE OF CERTAIN FACTORS THAT AFFECT THE BREEDING AND SURVIVAL OF *ETROPLUS MACULATUS*

Jomol Antony* and Natarajan, P.

Dept. of Aquatic Biology and Fisheries, University of Kerala, Thiruvananthapuram, Kerala.

*Corresponding author: jomolz@gmail.com

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Abstract: The 85% supply of indigenous ornamental fishes of Indian ornamental fish trade is based on catch from wild stock. The breeding patterns of indigenous ornamental fish species needs to be studied in detail as disastrous exploitation of the wild stock together with their habitat loss may result in the disappearance of this valuable germplasm. Cichlidae are well known for their elaborate courtship patterns, intense parental care and readiness to breed in the confines of the aquarium. Studies were carried out to find out the limiting factors that affect the spawning and survival in the Cichlid, *Etroplus maculatus* (orange chromide). The relation between size of the spawning couple and the number of eggs laid, significance of parental care in the survival of young ones, success of spawning in the case of artificially paired fishes, the need for substratum as well as the colour of the gravel in bringing about spawning of the fish were the factors examined. Paired fishes were collected from Veli Lake, Thiruvananthapuram, Kerala. Fishes were acclimatized under lab conditions and fed with artificially prepared feed. Experiments were carried out in glass tanks of configuration 90 x 45 x 45 cm and maintained in triplicates. The experimental fishes were observed for a period of two weeks. It was found that live feed was not necessary for the breeding of the fish. Size and health of the pairing couple were noticed to have profound influence in the pre-spawning behaviour, spawning behaviour, parental care and the rate of survival of the young ones. Survival rate of the spawn was also found to be directly proportional to the parental care extended. The strong bonding between the naturally paired couple as against artificially introduced ones was yet another fascinating observation made. It was also found that there is a need for substratum and that colour of the gravel has got an influence in inducing spawning tendency in this fish species. The experiment thus proved that even though *E. maculatus* is a prolific breeder, certain factors such as natural pairing of the couple, the need for substratum, and parental care are very decisive in bringing about effective spawning and survival of the fish. The study also highlights the importance of the protection of the habitat, as destruction of the habitat could prevent the fish from expressing its natural instincts of making/digging nests which is meant for protecting the spawn as well as boosting its spawning tendency. The details of the life history data with reference to habitat ecology and reproductive peculiarity are vital to formulate species and location specific strategies for conservation. Once we loose a particular species we cannot replace them. This emphasizes the need for behavioural studies of indigenous ornamental fish wealth

Key words: Indigenous ornamental fishes, limiting factors, spawning behaviour, parental care, survival

INTRODUCTION

Ornamental fisheries have developed into a multibillion dollar industry. The export details of the ornamental fish industry in India shows that 178 indigenous ornamental fishes are exported from India (Ramachandran, 2001). The details of the life history data with reference to

habitat ecology and reproductive peculiarity in different geographical populations are vital to formulate species and location specific strategies for conservation (Sarkaret *al*, 2005). Among the Cichlid group *Etroplus* is the only genus that is endemic to India. *Etroplus maculatus* (Orange

chromide) is a prolific breeder and experiments were carried out to find out whether there are any limiting factors that are crucial for the successful spawning and survival of its young ones. The factors that were taken into consideration were the size of the spawning couple, significance of parental care, success of artificial pairing, the need for substratum and the importance of the colour of the gravel in bringing about successful spawning and survival of young ones.

MATERIALS AND METHODS

Naturally paired fishes were collected from Veli Lake, Thiruvananthapuram, Kerala. Collected fishes were transported to the lab with minimum disturbance in well aerated polythene bags with sufficient quantity of water. All the glass tanks used were of 90 x 45 x 45 cm configuration. Each of the experimental set up was maintained in triplicate. About ½ the quantity of water in the tank was replaced weekly. The experimental set up was as follows.

1. A healthy pair was kept in each tank set with biological filter and gravel from natural habitat.
2. A less hardy pair was kept in each tank set with biological filter and gravel from natural habitat.
3. A single pair was introduced in each tank set with biological filter and white gravel.
4. A single pair was introduced in each tank with no substratum.
5. A single pair plus an additional fish was kept in each tank set with biological filter and gravel from natural habitat. .
6. The adults were removed soon after spawning was over from tanks set with biological filter and gravel from natural habitat. .

As these fishes were found to be prolific breeders these tanks were observed for a minimum of two weeks to study breeding behaviour. The fishes were fed with pelleted dry feed of 30% protein level three times a day.

RESULTS AND DISCUSSION

The healthy pairs of orange chromide were found breeding every fortnightly under appropriate conditions. The digging of nest in the gravel is an important spawning activity performed by the fishes when they were sexually motivated. Together about 4-5 nests were built by a single pair of bigger fish whereas the smaller pairs were found to be digging only 1-2 nests. The number of eggs laid by the larger pairs was around 400 while it numbered only around 250 by the smaller pairs. At the time of hatching of eggs the bigger pairs were seen incessantly fanning and mouthing them. This caring was not pronounced in the case of smaller pairs. Theyoung ones were taught to graze by the bigger pair of parents by taking the batch out with them and shown how to feed. They would spit the feed into granules and encourage the young ones to take them up. The young ones were seen rubbing and bouncing against the body of the hardy parents. This care and attention was not strong in the case of smaller pairs. Fin digging and micro nipping are two parental behaviours in Cichlids which makes food more readily available for the fry (Noakes, 1979). During fin digging the adult settle on the substrate and with vigorous rapid beats of pectoral fins stirs up loose materials for feeding the fry. In micro nipping the fry ingest mucous from parent and swallows mucous. Since the major component of parental mucous is protein apparently this assists in nutritional management of broods and larviculture (Khen and Chien, 2006). The young ones with hardy parents this was happening while the spawn kept without parents and those with less hardy parents this phenomenon was not taking place and hence could be one of the reasons for malnutrition and thereby less survival of young ones. When it came to the guarding of eggs, the larger pairs was profoundly guarding, while the smaller pairs, were comparatively less attentive. The tanks with healthy pairs were found to be attacking the intruder whereas the less hardy pairs were found to be hiding and only occasionally attacking. On further disturbance the eggs were totally missing in the case of the less hardy couple.

Fryer and Iles (1972) and Ribbinik *et al.* (1983) have postulated that all cichlids regardless of their trophic specializations, opportunistically prey upon their eggs and embryos if given a chance to do so. It may be another facet of parental care by which the parents did not want their young ones to grow up in a disturbing environment and hence devoured them. May be this is the reason for the disappearance of young ones from the tank of less hardy pair. The pairs kept in white gravel were found to become disturbed, paler and less active. Even after keeping for two weeks they were found to be uncomfortable, not taking food properly and were not showing any spawning tendency. Anatomical and physiological evidence strongly suggest that cichlids have strong colour vision (Muntz, 1976). The strong sense of vision must be the factor that prevented them from breeding in an alien habitat. It must be the highly reflecting property of the white gravel that produced a faded colour in the breeding pair. Lam (1983) concluded that manipulation of environmental conditions can induce the timing of spawning. Here when the colour of the substratum was manipulated from that of the natural habitat, they were inhibited from breeding. This shows the importance of conservation of natural habitat for the protection of this fish species. The same is the reason for the inhibition of breeding of those fishes kept without substratum.

The eggs possess stalk and cement glands to attach themselves to the substratum. In the absence of the substratum the fish finds it difficult to attach the eggs. Also presence of a substratum is necessary, as one of the major pre-spawning activities of the fish includes digging of the nest to keep its young ones protected. The introduction of an additional fish in the tanks holding a naturally paired couple proved to be a disaster. The fishes that were paired naturally and moving together did not welcome the presence of the intruder. They were found to be fighting ferociously until the intruder got worn out. So it could be concluded that only natural pairing is possible in this fish species. In all the cases the eggs that were kept without parents were found to be infected due to fungal attack. Bergmann

(1968) observed that egg guarding fishes facilitated cleaning of eggs by two unique cleaning processes *viz.*, mouthing and snapping. Balshine-Earn (1997) observed that a fish that shows parental care, not only protects the eggs against predation but also aerate the eggs, and this promotes the growth and development of the offspring. These could account for less survival or no survival of young ones in the case of eggs kept without parents. Several authors have indicated that detailed knowledge of reproductive biology and specific habitat requirements are the crucial factors for reproductive manipulation and captive breeding of fishes (Seth, 2001; Rutaisire and Booth, 2005). The significance of behavioural studies cannot be underestimated owing to its importance in habitat selection, reproductive isolation and a large number of other ecological and evolutionary factors. The study could establish that even though *E. maculatus* is not an endangered fish species there are limiting factors which should be satisfied for bringing about effective spawning and survival of young ones. By giving importance to indigenous ornamental species that fetch high price alone we should not make the mistake of loosing a valuable species which could be a biotechnological tool in the near future.

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