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First report on natural spawning of native Asian cichlid fish, pearl spot (*Eetroplus suratensis*) maintained in FRP tanks in Thiruvallur district, Tamil Nadu, India

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Abstract

Pearl spot (*Eetroplus suratensis*), an indigenous Asian cichlid fish is a candidate species for Indian aquaculture. However, sustainable seed production is hampered due to lack of natural breeding techniques under captive condition. In the present study, an attempt was made to induce natural spawning in small FRP tanks, using wild parent from Pulicat Lake, Tamil Nadu. Brooders with size ranging between 8-14 cm were transferred and acclimatized to pearl spot breeding unit for a week. Artificial substratum, mud pot and hide out, PVC pipe were introduced into the tank for induction of natural spawning. All experimental fish were fed with crumble feed daily twice ad libitum and water exchange performed daily. Natural spawning, with egg attachment in the substratum was recorded after 35-40 days transfer from Pulicat Lake, Tamil Nadu.

Keywords: Pearl spot, spawning, breeding, Pulicat Lake

1. Introduction

The pearl spot (*Eetroplus suratensis*), belonging to the family cichlidae and an endemic cichlid species to Asia, are widely distributed in the India and Sri Lanka [1, 3]. This species is also reported in the wild conditions in Asian countries like Singapore and Malaysia [4, 5]. In India, this fish is cherished as food fish, particularly in the state of Kerala and Goa [6, 7]. It is considered to be highly delicious and fetches good price in Kerala [8]. Importantly, this fish forms important fishery in the brackish water lakes of India. Its abundance in the Chilka lake, Pulicat lake and Vemband lake has been reported previously [9, 11]. This species show wide salinity tolerance [12]. In addition, basic biological studies of pearl spot in these brackish water lakes have been performed [7, 13, 14]. However, limited success has been achieved in the captive breeding for aquaculture, due to its complex reproductive behaviour [13-15, 17].

Peal spot is a substrate spawner, in contrast to the mouth brooding tilapia, falling under the same cichlid group. Pearl spot exhibit different reproductive behaviour such as courtship, pairing and nesting, pit nursing and parental care [3, 13, 14, 18]. Most of the previous studies on breeding of pearl spot were performed in brackish water [19, 20]. Even in brackish water condition, optimum salinity range for breeding of pearl spot has been demonstrated [19, 20]. Reports demonstrating breeding of pearl spot in freshwater is limited but warranted, due to its tolerance to wide environmental conditions and its suitability as both ornamental and food fish in India [15, 18]. The objective of the present research is to study the possibility of using small FRP tanks for induction of natural spawning of wild pearl spot and its suitability for undertaking reproductive studies under laboratory conditions.

2. Materials and Methods

2.1 Collection of wild parents

Pearl spot juveniles and adults, size above 8 cm was collected from the boat station and nursery ground regions, surrounding the Pulicat lake area (latitude 13°24' and 13°43'N and longitude 80°03' and 80°18'E) [21]. The altitude ranges from 100' mean sea level (MSL) to 1200' MSL (Tamil Nadu Forest Department, Chennai, India) [22].

These fishes were transferred to the pearl spot breeding unit of PRFF Campus (Fig. 1), using battery aerators. These fishes were acclimatized in the small FRP tanks (300 l) with 12-15 individuals in each tank. After acclimatization in the freshwater, mix of small and large size fishes based on eye observation (3 pairs or 6 fishes) were divided into individual tanks.



Fig 1: Pearl Spot Breeding Unit, established at Pulicat Research Farm Facility.

2.2 Feeding

The fishes were fed ad libitum with Marigold Feed (No. 1; Crumble) twice daily (crude protein, 36%) and water exchange (20-30%) was performed daily.

2.3. Induction of natural spawning

Preliminary experiment during October 2015 indicated that mud pot acts as suitable substratum for egg attachment of pearl spot eggs, when installed in the small FRP tanks (300 l; Fig. 1). Subsequently, standard size mud pot (1 no), sold in the market, was installed in the centre of the tank. In addition, PVC pipe hide outs (30 cm length; 2 nos) was provided in the sides of the pot as hide outs for the unpaired fishes (Fig. 2). Attachment of eggs in the substratum was monitored externally. Counting of eggs were performed manually [23].



Fig 2: Setting up of substratum and hide outs for pearl spot breeding in small FRP tanks.

3. Result and Discussion

3.1 Wild sampling of pearl spot juveniles from Pulicat Lake

Wild sampling of pearl spot juveniles (n=60) during May 2015 indicated that fish above 8 cm are suitable for inducing gonadal growth and maturation (Fig. 3). The data analysis indicated two groups of individuals (shaded regions in the

figure) at the onset of maturity, when the total length reaches 9 cm and above. The first group (group 1) diverts somatic energy towards development of gonad, with body weight declining. The other group (group 2) shows exponential growth, with body growth increasing, in correlation with body length. The size at first maturity of pearl spot has been demonstrated to vary with individual fish, as well as between fishes from different habitats [2, 4, 24]. In the present study, we found that wild specimens collected from Pulicat lake, displayed two different groups, slow and fast growing individuals, within same length, suggesting early and late maturing pearl spot under natural conditions. In these specimens, sex could not be differentiated clearly with internal structure of gonads, as it was very small in size. Future studies on wild sampling of pearl spot from Pulicat Lake during different time period would shed further light on these observation.

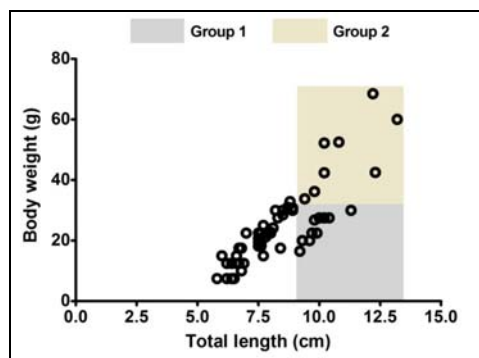


Fig 3: Individual plot of total length (cm) and body weight (g) of wild pearl spot sampled from Pulicat Lake during the month of May 2015.

3.2 Stimulation of natural spawning of pearl spot

Natural spawning was recorded on October 20, 2015. The fertilized eggs (350-400 nos.) were found attached on the sides of mud pot (Fig. 4A). The egg color was initially light brownish yellow, which later turned into darker colour before hatching. Hatching was recorded on October 23, 2015 at 4.00 a.m. Water temperature during the spawning day was 28 degree Celsius. Natural spawning was recorded in small FRP tanks on April 15, 2016 (Fig. 4B), April 24, 2016 (Fig. 4C), April 26, 2016 (Fig. 4D) and May 1, 2016 (Fig. 4E). Spawning event on April 26, 2016 was observed individually and the eggs were released by the female in the side of the tank (Fig. 4D). Water temperature during the spawning periods varied between 30-31 °C. Egg spawning of pearl spot in the present study was found when the water temperature ranged 28-31 °C. Field based studies in Sri lanka have recorded matured pearl spot in freshwater when the water temperature ranged between 25-30.5 °C [2, 4, 24]. The results of the present study clearly indicate that natural spawning of pearl spot can be induced in small FRP tank, through introduction of suitable substratum and hideout. In a previous study on tank based captive breeding and seed production of the pearl spot, the authors have provided bottom soil collected from a pearl spot broodstock pond, inside the plastic tubs for pit nursing, in addition to the substratum for egg deposition [19]. In contrast, the present study did not provide any additional material for pit nursing behaviour. The hatched out larvae were found in the bottom of the mud pot and when the larvae started free swimming, it moved out from the pot to tank surface. In the present study, there was no manipulation

performed in the drinking tap water supplied by government agency. The tap water was directly used for fish rearing. Under brackish water conditions, salinity range between 10-15 ppt was found to be optimum for pearl spot seed production [19, 20].

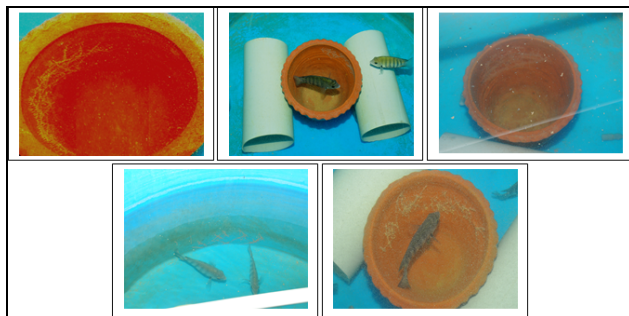


Fig 4: Natural spawning of pearl spot recorded in small FRP tanks. Egg attachment found inside the mud pot (A, B, C and E). Egg attachment found in the sides of FRP tanks (D).

3.3. Spawning behaviour of pearl spot

Spawning behaviour was monitored in small FRP tank (Fig. 5A-F). Paired female and male fish moved on one side of the tank. Female fish initially cleaned the side of the tank, where eggs were later laid. The female fish spent, almost more than an hour cleaning the side of the tank. Male fish prevented other fishes entering their region and was found very closely associated with female fish. Egg laying by female fish and fertilization by male fish lasted for more than an hour. Similarly, spawning behaviour was reported in a raceway tank [13, 14]. The quantity of eggs released during each spawning event is in agreement with the fecundity value recorded during our previous study [3]. However, a recent study found egg mass between 11 and 17 in pearl spot, during the spawning seasons [15]. To our knowledge, the present study is the first to report breeding of wild pearl spot in freshwater under captivity, in the Pazhverkadu region of Tamil Nadu. In conclusion, the present study demonstrated the suitability of small FRP tank for induction of natural spawning of wild pearl spot in captivity.

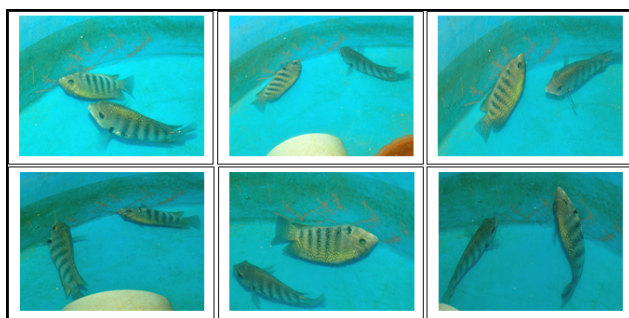


Fig 5: Spawning behaviour by paired female female and male pearl spot, recorded in small FRP tanks (A-F).

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