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Breeding Behavior and Parental Care of the Induced Bred Striped Murrel *Channa striatus* Under Captive Conditions

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Abstract

Spawning behaviour of artificially induced Indian snakehead *Channa striatus* in captivity was investigated using a Nikon Digital camera, D 40 and Videotape recordings. Following a routine hormone treatment technique for this fish, mature snakeheads were artificially induced by intramuscular injections Human Chorionic Gonodotrophin (HCG) at a dosage of 6000 IU kg^{-1} BW 24 h after the acclimatization terminated. In this experiment, three pairs of such hormone-treated matured snakeheads were introduced into the fibre tanks (1 x 1 x 1 m) to observe the spawning behaviour and parental care. Before the HCG injections, both sexes were inactive, staying on the bottom or in shelters. Following HCG injections, after 6 h they became active and frequently left the bottom swimming in the water column. Egg release and sperm ejection occurred in the water column around the time brooders activity reached peaks. Brooders stayed motionlessly on the bottom of the fibre tank after spawning. Males arrived at activity peaks 11–13 h following HCG injections, 2–4 h ahead of the females (14–16 h). Courtship behavior indicative of spawning such as pairing, chasing and touching bodies was observed in this study. Brooders were found to "cruise together" in water column or frequently come together prior to releasing eggs and ejecting sperm.

Keywords: Snakehead, HCG Hormone, spawning, off-bottom swimming.

Introduction

The striped murrel *Channa striatus* commonly called snakehead belonging to channidae distributed almost all over India and south East Asia is one of the important air breathing freshwater fish. This species is a valuable food fish and has high market value due to its taste and flavor, less intramuscular spines and high medicinal value (Haniffa *et al.*, 2004; Marimuthu *et al.*, 2009). This fish can survive in harsh environments with low dissolved oxygen and high ammonia (Ng and Lim, 1990; Quin *et al.*, 1997) and therefore are often cultured in shallow waters. Mature males and females of *C. striatus* generally spawn in the flood plains with low water in the monsoon with comparatively low fecundity (De Silva, 1991; Haniffa *et al.*, 1999; Mollah *et al.*, 2009).

Fishes are exceptional among vertebrates because of their unparalleled variability of reproductive and social patterns (Taborsk, 1999; Setu and Ajithkumar, 2010). For development of hatchery production techniques it is necessary to understand the ontogeny of the fish (Haniffa *et al.*, 2002; Haniffa *et al.*, 2003). Breeding behavior or courtship behavior is a very important act in fish breeding. It varies from the simple swimming of the breeders along the side of each other to elaborate act of nest building and intense male competition inherent in group spawning. The absence of breeding behavior from any of the breeders often results in spawning failure (Marimuthu *et al.*, 2001). Several factors like body size, pigmentation, age, and social dominance, environmental conditions, mating history, female reproductive state, male dominance and aggression are known to affect the mating behavior of fishes in many species (Deaton, 2008; Marimuthu *et al.*, 2001; Arockiaraj *et al.*, 2004).

Egg guarding is the most common form of parental care (Clutton-Brock, 1991), and in majority of species only one parent is involved in parental care. Among teleost families male care is much more common than female care with 61% against 39% respectively and biparental care occurs in less than 25% of the families (Gross and Shine, 1981). Reduced egg predation and increased hatchability are the main benefits of the egg guarding (Baylis, 1981). Some fishes protect their eggs by hiding them in gravel or vegetation, without guarding whereas some have evolved elaborate techniques of nest building and caring for their off-springs. According to

Parameshwaran and Murugesan (1976) induced bred murrels never exhibited parental care. We report our observations on spawning behavior and parental care of the striped murrel, *C. striatus* induced with the natural hormone Human Chorionic Gonadotophin (HCG).

Materials and Methods

Collection of Fish and Experimental Trial

The present study was conducted in fiber tanks (1m x 1m x 1m) at Centre for Aquaculture Research and Extension (CARE). The brooders were collected from Thamirabarani river system in Tamilnadu (8.44° N, 77.44° E) and were safely transported to CARE Aquafarm. The brooders were acclimatized to laboratory conditions for a month and were fed with semi moist pellted feed and chopped chicken intestine *ad libitum*. Mature healthy males and females (length; 29-34 cm and weight; 710-890 g) were selected by sexual dimorphism for induced breeding (Figures 1 and 2). The abdomen in female fish is slightly bulged which is not observed in male fishes. Vent is pale and slit like in male, which is round in shape and reddish in colour in female fish. Anal papilla like structure appears prominently with pointed tip in male fish; a slightly reddish dot is noticed in female fish (Chakrabarthy, 2006). The female fish ooze eggs while stripping whereas male never. A week before the experiment the required brooders were selected and transferred to fiber tanks (1m x 1m x 1m) filled with tap water (dissolved oxygen: 5.8-6.5 ppm; CO_2 5.2-6 ppm; pH 7.5-8.1; salinity 1.01-1.04%; temperature: 27- 29°C).

Each breeding set consisted of one male and one female. Human Chorionic Gonadotropin (HCG), a natural hormone, was used to induce spawning. One dose of the hormone (6000 IU /kg body weight) was administered to assess the breeding response of the fish. Hormone was administered intramuscularly using 1 ml insulin syringe above the dorso-lateral line of the body (Figure 3). The induced bred fishes were immediately released into the breeding tanks. Breeding behavior was observed 6 hours after injection until spawning. Observations were conducted after one week period allowing the fish to adapt to the observers presence.

Results and Discussion

Male approaches a female, assuming a side by side position and starts to quiver. Male showed more aggressive and active participation in mating. Mating was preceded by an elaborate courtship. The active male chased the female and frequently excited its movement which commenced from 10-12 hours after the hormone injection. In all the sets, the important

Figure 1. Male fish.

Figure 2. Female fish.

Figure 3. Hormonal injection.

observation was that the male was more actively involved in the courtship and spawning. It was also observed that the male hitting the snout and vent region of the female more frequently. The mating pair inclined slightly to one side, keeping the anal regions close to each other forming an X- shaped appearance (Figure 4). The spawning activity was keenly observed till the gametes were released. At the time of courtship, the male starts to tilt its body close to genital papilla of female and the breeders joined together which ultimately resulted in spawning after about 26±4 h duration followed by external fertilization. The fertilized eggs were yellow in colour which usually floated and adhered to each other forming an egg mass of 10-15 cm in diameter, while the unfertilized eggs were white in colour, nonadherent and were scattered throughout the tank. In the present study the breeding behavior of *C. striatus* was observed 6 hours after administration of the hormone and continued till spawning upto 22-30 h. Similar results were reported on the spawning behavior of *Channa punctatus* (Haniffa *et al.*, 2004), *Clarius batracus* (Moitra *et al.*, 1979), *Mystus montanus* (Arockiaraj *et al.*, 2003) *Heteropeneustes fossils* (Thakur, 1976) *Heteropeneustes fossils* (Marimuthu *et al.*, 2000) and *Hoplias malabaricus* (Prado *et al.*, 2006).

Aggressive behavior was shown by male parent who remained curving around eggs and showed circular movement fanning the eggs with its pectoral fins (Figure 5). After 24 h, fibre tanks were found full of hatchlings black in colour. Both the parents showed care for hatchlings by guarding them right from the stage of fertilized egg till the fry stage but male care was more dominant (Figure 6).

According to Alikunji (1957), the murrels breed in natural conditions and both the parents were involved in parental care from egg to fry stage. But, in our study the induced bred murrel also showed parental care. Although the *C. striatus* showed biparental care it was observed that the male parent was more vigilant towards their young ones. Similar results were observed by Haniffa *et al.* (2004) in induced bred spotted murrel *C. punctatus.*

Generally the benefits of biparental care are to increase the offspring protection against predators and the possibility of one parent to take care if the other dies (Annett *et al.*, 1999). For example, the females of Icetalurid fish *Icetalures nebulosus* commonly remain in the vicinity of their brood, though males are primarily responsible for care (Blumer, 1986). However if the male disappears, the female takes over the male's role. In the case of *C. striatus* similar results were observed. Our studies reveal that male parental care is the normal form of parental care in *C. striatus*, but biparental care is also observed.

Figure 4. Courtship behaviour.

Figure 5. Fertilized eggs.

Figure 6. Parental Care.

In the present study it was observed that the eggs guarded by the parents remained clean, showed good development and reached post-larval stage with high survival rate. It was also observed that the parental care is much necessary to increase the hatching rate and to protect the eggs from the fungal infection and predation.

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