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Selvaraj S

Fisheries College & Research
Institute, Tamil Nadu Fisheries
University, Ponneri, Tamil Nadu
India

Felix S

Pulicut Lake Field Research
Facility, Fisheries College and
Research Institute, Tamil Nadu
Fisheries University, Ponneri,
Tamil Nadu, India

Samuel Moses TLS

Pulicut Lake Field Research
Facility, Fisheries College and
Research Institute, Tamil Nadu
Fisheries University, Ponneri,
Tamil Nadu, India

R Durairaja

Pulicut Lake Field Research
Facility, Fisheries College and
Research Institute, Tamil Nadu
Fisheries University, Ponneri,
Tamil Nadu, India

Correspondence

Selvaraj S

Fisheries College & Research
Institute, Tamil Nadu Fisheries
University, Ponneri, Tamil Nadu
India

Preliminary report on minimum size at first maturity in Pulicut lake pearl spot (*Etroplus suratensis*), Tamil Nadu, India

Selvaraj S, Felix S, Samuel Moses TLS and R Durairaja

Abstract

The present study analyzed the minimum size at which the vitellogenic onset, spermiation and final oocyte maturation in pearl spot gonad takes place. External morphological analyses revealed early maturation in females in comparison to males. Vitellogenic and mature ovary was recorded when the body length reaches 8 and 12 cm above, respectively. Similarly, spermiating testis in males was found above 14.5 cm. The results of the present study will serve as a basic tool for induced breeding.

Keywords: Size at maturity, vitellogenesis, final oocyte maturation, spermiation

1. Introduction

Pearl spot (*Etroplus suratensis*), an Asian cichlid fish is widely accepted as food and aquarium fish. Aquaculture of pearl spot is performed in different parts of India. However, mass scale seed production of this food fish is hampered due to lack of induced breeding techniques [1-6]. Size at first maturity is an important parameter to be analyzed for various purposes in fisheries biology and resource management. Size at first maturity and differential growth in males and females are critical for selection of inducing agents and administration methods to perform induced breeding for mass scale seed production of candidate species [3, 7, 10]. In pearl spot, previous studies clearly demonstrated the influence of habitat on the determination of size at first maturity [8-10]. Also, it is likely that environmental pollution can alter the size at first maturity in different aquatic habitats. Understanding reproductive biology is an essential prerequisite for devising different strategies for mass scale seed production. In light of the above, we have performed a series of study under captive conditions [3, 5-7]. Transfer of wild stock of pearl spot in captive conditions and providing with suitable substratum and hide-out induces natural spawning [5-7]. Further, under similar conditions, multiple spawning was found [5]. Previous study recorded the natural spawning of pearl spot in captivity and recorded the fecundity and length-weight relationship of Pulicut lake pearl spot [3, 11]. The present study was conducted to understand the oocyte growth and maturation periods in wild stock of Pulicut Lake, Tamil Nadu.

2. Materials and Methods

Wild pearl spot (n=240) landed in the Pazhverkadu fish market were purchased and their gonads were dissected to record the vitellogenesis and final oocyte maturation (mature) in ovary. These differences were recorded based on the colour change and the size of the oocyte in the ovary. Vitellogenic ovary was found to exhibit light orange to yellow colour. Mature ovary exhibit dark brown colour, with large size eggs. Similar changes in colour were recorded during our previous study [4]. In males, presence of white fluid (milt) in the testis was found after dissection. Similar feature not observed in the immature testis [10]. Bi-weekly fresh fish was purchased from the Pazhverkadu fish market between June and August 2016. Body length (cm) and body weight (g) were measured using measuring scale and digital balance to the nearest 1 mm and 0.1 g, respectively [11]. All the fish used for the study were purchased from Pazhverkadu fish landing centre and market, Thiruvallur District, Tamil Nadu.

3. Results and Discussion

Puberty is the period during which the vitellogenic onset occurs in the oocytes [9]. This period coincides with the transfer of vitellogenin into the oocytes and prominent colour change in the ovary. The minimum size recorded was 8 cm that undergo vitellogenesis (n=38). The minimum size of mature specimen with fully grown oocytes was 12 cm (n=45). Spermiation in males was recorded in 14.5 cm (n=52). Gonadal sex could not be identified externally in the remaining individuals (n=135). The data representing minimum size at first maturity in Pulicut lake pearl spot are presented in Table 1. The present study for the first time clearly revealed sexually dimorphic growth pattern in Pulicut lake pearl spot (Table 1). Overall, wide differences in the body weight were observed, in comparison to body length in the present study. Prominent differences in the large percentage of individuals within a specified body weight range were recorded for each gonadal stage in female and male, respectively (Table 2). Also, vitellogenic female showed more differences in body weight, in comparison to other gonadal stages. The results of the study is in agreement with our induced natural spawning trials using small FRP tanks under freshwater conditions, with large sized male pairing with relatively smaller sized female, in several cases (personal observation). In a previous study in large sized individuals for fecundity estimation, body length found to be critical for higher fecundity in Pulicut lake pearl spot [3]. Also, in the same length group, fecundity was found differ drastically, suggesting involvement of other physiological factors in the growth and reproduction of Pulicut lake pearl spot. In a separate and single sampling of pearl spot (n=60) during May 2015, we recorded two group of individuals during the maturation periods. The first group consist of

individuals with body weight declining, suggesting utilization of somatic energy for gonadal development. Another group of individuals show exponential growth [7]. Also, length-weight relationship of pearl spot (n=120) collected from Pulicut lake with total length and body weight ranging between 3.5-10.5 cm and 2.0-34.0 g, respectively show significant difference between sexes [11]. These results clearly indicate sexually dimorphic growth patterns in pearl spot, due to unknown neurophysiological and neuroendocrinological factors. The size at first maturity for males and females has been reported to be 14 cm and 14.4 cm, respectively [8]. Also, results of stimulation of natural spawning in pearl spot indicate that size above 14 cm, resulted in breeding [12]. Similarly, in Sri Lanka, similar differences were recorded [12, 13]. These results clearly indicate that habitat differences result in differences in minimum size of fish that undergo vitellogenesis and final oocyte maturation, under natural conditions.

Onset of maturity under natural conditions linked to the availability of food during different seasons. Pearl spot is considered to be an omnivore cum detritivore, feeding on large variety of feed items. Gut content analysis of pearl spot collected from different natural habitat clearly revealed *Spirogyra* to be a major filamentous algae present in the gut of pearl spot, during most time of the year. The diverse food and feeding habits in pearl spot is also linked to the presence of specialized grinding apparatus, such as presence of pharyngeal jaw. The food and feeding habit of pearl spot have been reported previously by several research groups [14-16]. In the pearl spot, energy distribution pattern in the edible and non-edible body region shown to vary in males and females, respectively [17]. In conclusion, the results of the present study will serve as basic information for performing induced breeding in pearl spot and closely related cichlid species.

Table 1: Minimum size at first maturity of Pulicut lake pearl spot (*Etroplus suratensis*) recorded between June and August 2016

Gonadal stages	Body length (cm)			Body weight (g)		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Vitellogenic female	8.0	8.5	8.2	14.8	34.4	23.7
Mature female	12.0	12.8	12.2	50.8	68.3	57.7
Spermiating male	14.5	15.7	14.5	65.2	81.7	73.9

Table 2: Body weight variation in Pulicut lake pearl spot (*Etroplus suratensis*) during different different gonadal stages

Gonadal stages	Body weight (g) range	Percentage of fish
A. Vitellogenic female	14.8-19.8	15.8
	19.9-24.8	68.4
	24.9-30	10.5
	Above 30	5.3
B. Mature female	50.8-58.0	53.3
	58.1-65.0	15.6
	Above 65	31.1
C. Mature spermiating male	65.2-70.0	11.5
	71.0-75.0	57.7
	Above 75	30.8

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