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Note

Broodstock development and induced spawning of the John's snapper *Lutjanus johnii* (Bloch, 1792) under controlled conditions

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ABSTRACT

Broodstock of the John's snapper *Lutjanus johnii* were raised in sea cages from wild collected juveniles of the species. Individual fishes were tagged using passive integrated transponders (PIT), cannulated and gonadal biopsies were examined periodically for assessing the maturity status. The matured fishes were shifted from cages and maintained in indoor FRP tanks. Females were given two doses of human chorionic gonadotropin (hCG) and ovaprim @ 800 - 900 IU kg^{-1} and 1.25ml kg^{-1} respectively. Males were given only hCG in a range between 400 and 600 IU kg^{-1}. Two successful spawning were obtained with 80-85% fertilisation rate. In both the trials, embryonic development was observed to be arrested before hatching which could be attributed to nutritional deficiency of the broodfishes and high water temperature in the spawning tank.

Keywords: Broodstock development, Hormonal induction, John's snapper, *Lutjanus johnii*, Spawning

Snapper species are popularly recommended for mariculture activities because of their consumer demand and adaptability to captivity including higher stocking density, acceptance of artificial feed and less aggressive nature (Arnold *et al*., 1978; Cano, 2003; Boza-Abarca *et al.,* 2008). Species of the genus *Lutjanus viz., L. argentimaculatus, L. johnii, L. russelli* and *L. sebae* are popular candidate species for sea farming. Snappers form spawning aggregations in their natural environment (Domeier *et al.,* 1996). In India, trials are in progress for the broodstock development and breeding of *L. argentimaculatus* and *L. johnii.* (Madhu *et al.,* 2014). Snapper breeding was achieved in many places mostly by environmental or hormonal manipulations. Breeding trials conducted using luteinising hormone-releasing hormone analog (LHRHa), human chorionic gonadotropin (hCG) and ovaprim individually as well as in combinations were mostly successful (Singhagraiwan and Doi, 1993; Emata *et al.,* 1994, 1999; Clarke *et al.,* 1997; Watanabe *et al.,* 1998; Fielder *et al*., 2002; Emata 2003; Dumas *et al.,* 2004). However, there is no published information available on successful breeding and larval production of the John's snapper *L. johnii* in India. The present study reports successful broodstock development and induced spawning of *L. johnii* under controlled conditions, for the first time in India.

Snapper broodstocks were raised in sea cages at the marine cage farm of the Karwar Research Centre of ICAR-Central Marine Fisheires Research Institute, from the juveniles collected from various natural habitats. The juveniles stocked in sea cages ranged from 210 to 340 g in weight and 22 to 26 cm in length. The juveniles were reared in circular cages of 6 m dia and 5 m depth. A total of 45 nos. *L. johnii* juveniles were reared for broodstock development. Fishes were fed on Oilsardine (*Sardinella longiceps*). Fishes reached 500 g size from stocking size with in 4 months of stocking. The fishes were PIT (passive integrated transponder) tagged and once they reached 500 g weight, periodical cannulation was initiated for gonadal biopsies in order to assess the maturity status of the gonads.

Ovarian biopsies were collected periodically from the females and the ova diameter measured. First sexual maturity was attained when the females reached 950 g weight and 40 cm length. In case of males, first maturity was observed when they attained 1.1 kg weight and 43 cm length. Once attained sexual maturity, fishes were fed with shrimp, squid and crab meat thrice a day @ 2% of their biomass. Females with desirable egg diameter (Fig. 1) were transferred to spawning tank along with ripe males. Brooders were maintained in the ratio of 1 female: 2 males in 5 t capacity circular FRP tanks. Photoperiod of 14L: 10D was maintained in the experimental tanks throughout the study period of 45 days. The matured adults maintained under photoperiod manipulation showed increase in oocyte diameter from an average of 180 to 380μ with in

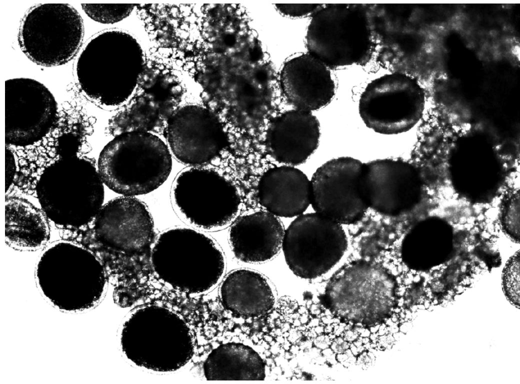

Fig. 1. Photomicrograph showing ovarian biopsy from mature female *L. johnii*

45 days, while the adults reared in normal photoperiod regime exhibited an increase in average oocyte diameter from180 to only 280 μ during the same period. After every feeding, 100% water exchange was done with fresh seawater of similar pH, salinity and temperature along with a 30 min flow through.

Once the oocyte diameter of the female brooder reached 400 to 420 μ, first injection of hCG (hCG care, Gufic Pvt. Ltd., Gujarat, India) at a concentration of 900 IU kg^{-1} was given. Females were given a second booster dose of both hCG and ovaprim (WeVA-FH Biostadt India Ltd., Mumbai, India) at the rate of 800IU and 1.25 ml kg^{-1}, respectively, 24 h after the first dose. Pairing males were also given injection of hCG at a concentration of 500 IU kg^{-1} at the time of the second dose injection to the females. After administration of the second booster dose, water was not exchanged in the experimental tanks to avoid disturbance.

After a period of about 22 h post-second injection eggs were released and fertilisation took place. During the spawning process, the female was found slowly moving near to the surface with the male, swimming just below the female. Two spawnings were observed and in the first spawning, approximately 1.75 lakhs fertilised eggs were obtained from the female weighing around 3.1 kg and the weights of the pairing males were 2.7 and 2.5 kg. In the second spawning, 2 lakhs fertilised eggs were obtained from the female weighing 1.9 kg and the weights of the pairing males were 1.8 and 1.5 kg. The fertilisation rate obtained was 80-85% in both the trials. Unfertilised eggs which settled at the bottom were removed by slowly siphoning without disturbing the fertilised eggs. In the first spawning, embryonic development was arrested at the blastula stage while in the second it was arrested at late gastrula stage and a very few at neurula stage (Fig. 2).

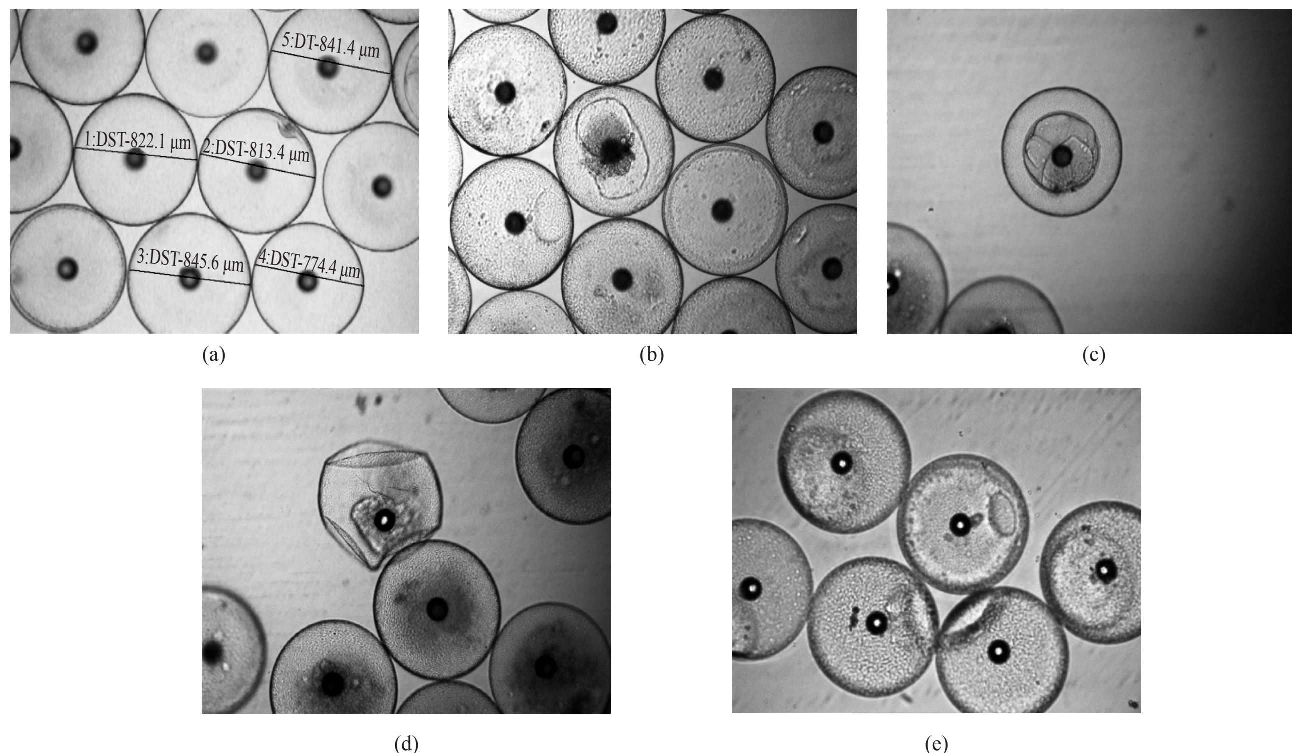

Fig. 2. Early embryonic development in *L. johnii* (a) Eggs at blastodisc formation stage; (b) Cell division stage; (c) 8 cell stage; (d) Blastula stage; (e) Gastrula stage

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