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*Etroplus maculatus*, commonly known as Orange chromide is a euryhaline fish endemic to brackishwater streams, lagoons, estuaries and the lower reaches of rivers in peninsular India and Sri Lanka. In India, it occurs in Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu. The Orange chromide at present is mainly utilized as freshwater and brackishwater ornamental fish as it is reported to survive in water close to 21‰ salinity after

gradual acclimatization. The present study was conducted to determine the salinity tolerance of *E. maculatus* to know the scope of this species to be selected as a marine ornamental fish.

### **Salinity tolerance studies**

*E. maculatus* were reared in water with different salinities such as 0, 15, 25 and 35‰ respectively. Twelve plastic crates having a height of 30 cm and

60 litre (L) capacity each were filled with water (upto  $20 \pm 2$  cm) of varying salinities. All the experimental tubs in triplicates, were provided with uniform aeration. Test individuals reared in freshwater (0 ppt) served as control. About 150 numbers of *E. maculatus* collected from the backwaters of Cherukunnu, Kannur were transported to the laboratory in oxygenated polythene bags. Their average initial length and weight was  $6.5 \pm 0.8$  cm and  $5.0 \pm 0.6$  g respectively. Ten numbers of *E. maculatus* were directly introduced to freshwater (0‰), brackishwater (15‰, 25‰) and seawater (35‰) and reared for 45 days. The study was carried out at room temperature ( $28.5^{\circ}\text{C}$ ) and under natural photoperiods. Commercial pellet feed (Nutrila 1.2 mm, Growel Feeds Pvt Ltd. India) containing 40% protein was given at 5% of initial biomass twice a day during day time (0800 and 1600 hrs). Mortality of fishes in each salinity level was recorded with time over the period of experiment. *E. maculatus* tolerated the direct transfer to 15, 25 and 35 ppt without any mortality or visible stress symptoms. When exposed for long periods to higher salinities also they exhibited 100 % survival and showed no signs of loss of appetite, thereby indicating that there is no imbalance in the physiological processes of the fishes. The results thus conclude as a recommendation on its potential as a candidate species for marine ornamental fish culture.

#### Breeding trials in saline water

Breeding of *Etroplus maculatus* has been

reported throughout the year in the backwaters of Kerala. Successful breeding and embryonic development of *E. maculatus* in freshwater was reported (Bindu and Padmakumar, 2012 *J. Mar. Biol. Ass. India*, 54 (1):13-19) but there are no reports of its breeding in sea water. This study aims to investigate their breeding behaviour, embryonic and larval development in sea water.

Brooders of *E. maculatus* were collected from backwaters of Cherukunnu, Kannur using stake nets and brought to the marine hatchery complex. About fifty numbers of fishes were stocked in FRP tanks (1 ton capacity) containing 15 ppt saline water maintained at a depth of 60 cm. They were fed with commercial pellet feed following same routine used in salinity tolerance studies. Two weeks after stocking the fishes started pair formation. The pairs exhibited a characteristic territorial behaviour. During pre-mating pair formation dark blotches appeared on the body of male fishes. In females, black spots and blotches appeared on the ventral side between pelvic and anal fins (Fig. 1).

The fishes that formed breeding pairs were transferred to plastic crates (60 L) filled with 30 ppt and 35‰ water. Feeding of brooders with the same commercial pellet feed, twice daily was continued. Since *E. maculatus* is a substrate spawner, piece of concrete slabs were introduced into the spawning tanks to facilitate spawning. Both male and female brooders cleared the surface of the substrate using their snout. After the courting process, the eggs attached one by one on to the



Fig. 1. *Etroplus maculatus*, male (Left) and female (Right)



Fig. 2. One day old hatchlings in 30‰ seawater

substrate by the female were spontaneously fertilized by the male with the sprinkling of milt over them.

Spawning was observed in both 30 and 35‰ salinity with the process completed within 15-30 minutes. The fecundity observed was about 350 to 400 eggs per female. After spawning, both parents alternately guarded the eggs by fanning and mouth incubation by turns while one parent foraged. During the experiment, in a few tanks where the brooders were disturbed, they themselves consumed the developing eggs. The eggs of *E. maculatus* in the saline water hatched out within 72 hours. This is in contrast to the report that the eggs of *E. maculatus* in freshwater generally hatched out in 48 hours. The presence of parental care provided high hatching upto 99% and most of the hatchlings remained on the substrate itself (Fig. 2). After a

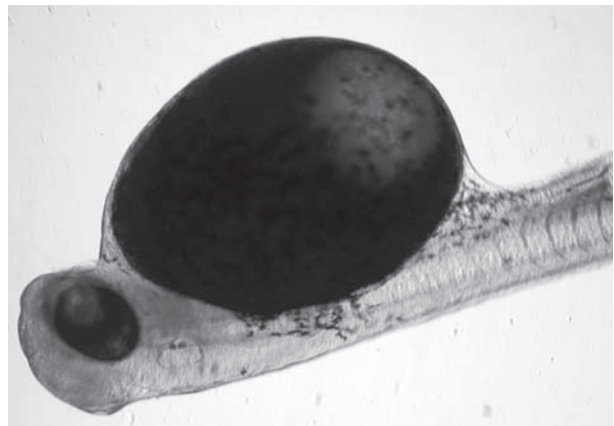


Fig. 3. Two days old *E. maculatus* larvae with yolk sac

few hours the hatchlings were found to sink to the bottom and were picked by the female in her mouth and transferred to one of the darker corner of the plastic crates. The hatchlings were swimming head down and tail up position with lashing movements. The newly hatched larvae were transparent with voluminous yolk sac containing large oil globules; large pigmented eyes and a prominent pulsating heart located between head and yolk sac (Fig. 3). Yolk absorption was completed in three days and after that the larvae accepted external feed.

In a few tanks it was observed that the two days old larvae were being devoured by the parents and they were immediately removed from each spawning tank. The fry become free swimming from the fourth day and congregated near the aeration points in swarms due to absence of parent in the tanks. Generally, fry move in shoals guided by the parents, swimming mostly underneath the parents. From fourth day immediately after the yolk sac absorption, fry were fed with *Artemia* nauplii, since the major feeding component of parental mucous protein was unavailable in the tanks. From tenth day onwards the amount of *Artemia* nauplii was reduced and *Artemia* flakes were added to the tanks. About 98% survival was observed after rearing for a period of 25 days when the fry had reached a size of 1.9 cm. The information obtained from above experiments reveals the possibility for seed production of *E. maculatus* in sea water and confirms its potential as a marine ornamental fish.