# SEED PRODUCTION OF PEARLSPOT, *ETROPLUS SURATENSIS*, IN RECIRCUALTORY AQUACULTURE SYSTEM

## AN INNOVATIVE APPROACH FOR LIVELIHOOD OF AQUA-FARMERS

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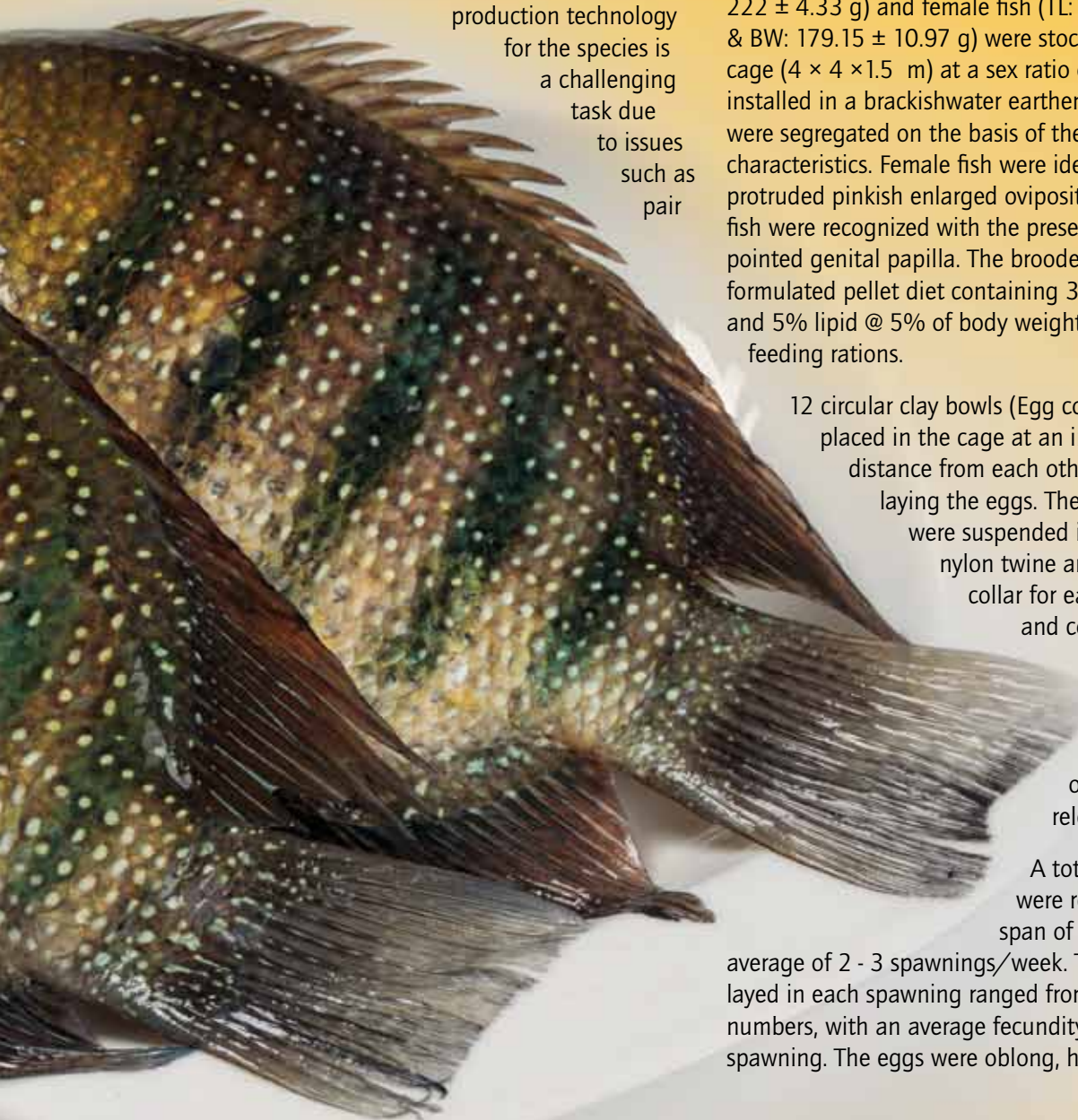
Pearlspot, *Etroplus suratensis* (Bloch, 1790) is commonly known as green chromide and is a popular brackishwater food fish in the western coast of India. Its firm meat texture and characteristic flavour makes it a favourite fish in the state of Kerala, which has recognized pearlspot as its state fish with the sole objective of conserving the natural stocks and enhancing its

*Pearlspot – Etroplus suratensis*

aquaculture production. Pearlspot fetches upto INR 250 to 500 in markets across the country and it sells for even higher prices in the niche markets. Recently, the fish has also started becoming popular among fish hobbiyists as an ornamental fish. Being a fish with an omnivores feeding habit, aquaculture of pearslpot is considered economical and highly adaptable to different culture systems like pond, pen and cages. A major bottle neck that is limiting the expansion of pearlspot farming is the insufficient availability of quality seed for stocking in different growout systems. Although, several studies report the breeding and seed production of pearlspot in earthen ponds, cement tanks and raceways, large scale seed production technology for the species is a challenging task due to issues such as pair formation and parental care among others. In order to overcome these issues as well as to carry out mass scale seed production, the Navsari Gujarat Research Center of CIBA (NGRC-CIBA) has developed a **cage based mass spawning system** for pearlspot and an **RAS based Hatchery system (Incubation & larval rearing)** at its research farm in Matwad, Navsari, Gujarat.



## Mass spawning of pearlspot in floating net cage installed in brackishwater pond

Twenty four nos. (12 pairs) of pearlspot brooders comprising of both male (TL: 20.5 ± 0.201 cm & BW: 222 ± 4.33 g) and female fish (TL: 18.57 ± 0.44 cm & BW: 179.15 ± 10.97 g) were stocked in a floating cage (4 × 4 ×1.5 m) at a sex ratio of 1:1. The cage was installed in a brackishwater earthen pond. The brooders were segregated on the basis of the secondary sexual characteristics. Female fish were identified using the protruded pinkish enlarged ovipositor whereas, male fish were recognized with the presence of the whitish pointed genital papilla. The brooders were fed using formulated pellet diet containing 32% crude protein and 5% lipid @ 5% of body weight daily in two equal feeding rations.

12 circular clay bowls (Egg collectors) were placed in the cage at an interval of 1 m distance from each other as a substrate for laying the eggs. These egg collectors were suspended in the cage using nylon twine and tied to the cage collar for easy observation and collection of eggs. The number of egg collectors required depends on the number of breeding pairs released into the cage.

A total of 27 spawnings were recorded within a span of 3 months, with an average of 2 - 3 spawnings/week. The number of eggs layed in each spawning ranged from 600 to 1,600 numbers, with an average fecundity of 900 nos./ spawning. The eggs were oblong, heavily yolked, light

*Fig 1. Pair of pearlspot brooders*

*Fig 3. Fertilized eggs attach to clay bowls*

peach in colour and were adhesive in nature and attached to the substrate. Regular inspection of the egg collection bowls were carried out during morning and evening at 07:30 and 18:00 hours respectively, for presence of eggs. The physico-chemical parameters of the pond water during the spawning of pearlspot in the cage ranged as follows, temperature: 29 – 31°C, salinity: 9 – 17 ppt, Dissolved oxygen: 5 – 6 ppm and pH: 8.1 - 8.3.

## Collection of fertilized eggs, acclimatization and treatment

The egg collectors (substrate) along with the attached fertilized eggs were removed from the cage 24 hrs after spawning and washed repeatedly with clean seawater along with the substrate to remove any attached debris. As a prophylactic measure, the eggs were subjected to $KMnO_4$ dip treatment at 10 ppm concentration for

*Fig 4. Microscopic view of fertilized egg*

30 seconds. They were then placed (along with the substrate) inside the incubation tanks for hatching. The substrate removed from the cage was replaced with another one and kept in the same position of the cage to facilitate further spawning and to avoid movement of brooders to another location/substrate.

## Incubation, hatching and larval rearing in RAS based indoor hatchery

The incubation cum larval rearing tanks are attached to a RAS system, A series of plastic tubs (LRTs of 70L cap) with inlet and outlet, were placed above a 2 tonne rectangular FRP tank with the support of a steel frame installed above the tank. A submersible power head (2,500 liter/hr) placed inside the 2 ton FRP tank (reservoir for collection of filtered water) circulated the water between tanks and the filtration devices (sand and biofliter). Vigorous aeration and mild flow rate of 1 L/min was maintained for incubation and hatching of eggs. The eggs hatched after an incubation period of 2 - 3 days depending on water temperature and egg stage. An average hatching rate of 90% was observed. After the completion of hatching, the substrate was removed and the hatchlings were reared in the LRTs for a period of 21 days.

*Fig 2. Brackish water floating net cage installed in pond for spawning*

*Fig 5. Portable tub based RAS system for egg incubation and larval rearing of pearlspot*

*Fig 6. Beneficaries with pearlspot fry*

*Fig 7. 21 day old pearlspot fry*

## Larval rearing

The hatchlings of pearlspot measured approximately 5.5 mm in total length and were demersal in nature due to the presence of heavy yolk sac. The newly hatched larvae were maintained in the plastic tubs (LRTs) at a density of 15 nos./litre. The larvae were fed from the 3rd day onwards using freshly hatched Artemia nauplii at 5 nos./ml. By the 7th day post hatch, the stocking density of pearlspot larvae was reduced to 6 nos./litre (around 400 nos. in each tub). From the 10th day post hatching, larvae were fed twice a day using formulated larval feed (200 – 500 µ) and 3 times using freshly hatched Artemia nauplii. After 21 days post hatching, the larvae attained a size of 9 - 10 mm at a survival rate of 80%.

Around 12,000 early fry were obtained from 27 spawnings at the hatchery unit within three months. Pearlspot seed produced from this model were supplied to the beneficiaries under the scheduled caste sub plan (SCSP) scheme at regular intervals for demonstration of nursery rearing of pearlspot as a source of livelihood generation activity. It is estimated that around 9,000 no's early fry can be produced in a month using 12 - 15 pairs of brooders, at an average of 650 nos. fry per spawning. The peak breeding season suitable for pearlspot seed production is during the months of July to October. The investment required for setting up of 1 cage unit and a portable RAS incubation and larval rearing system for the production of 50,000 fry/annum costs INR 90,000.

## Nursery rearing of pearlspot in hapa based system

Nursery rearing is a very important step in aquaculture for the production of appropriate sized fingerlings. Nursery rearing of pearlspot can be carried out in ponds, tanks and net cages (hapa). However, nursery rearing in hapa is considered superior, as it is economical, easy to monitor and suitable for large scale production of fingerlings in 45 – 60 days of rearing.

Twenty one days old, early fry of pearlspot (0.9 – 1 cm) were stocked in hapas (2×1×1 m dimensions) installed in earthen ponds @ 500 nos./hapa. Early fry were fed 3 times daily using artificial larval diet at 15% of their total biomass. Early fry attained a size of 2.0 – 2.5 cm (fry) in 30 days of nursery rearing. Further, the fry were reared for another 30 – 45 days to attain the fingerling


*Fig 8. Distrubution of pearlspot seeds to beneficiaries*

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*Fig 9. Nursery rearing of pearlspot in nylon hapas*

size (4 - 4.5 cm). An average survival rate of 80% was obtained during the nursery rearing of early fry to fingerling stage. During nursery rearing, cleaning of hapas on regular basis is very much essential to avoid clogging and to facilitate water circulation for better growth and survival of the stocked fry.

A total of 10,000 pearlspot fry and fingerlings were produced at NGRC–CIBA farm with the involvement of SCSP beneficiaries (women Self Help Groups) during this period. Around, 8,000 pearlspot fingerlings (4.5 – 8 cm) were sold to local brackishwater fish farmers at INR 15/fingerling resulting in generation of revenue to the tune of INR 1,20,000 to the SCSP women beneficiaries.

## Advantages of spawning in floating net cages and seed production of pearslpot in RAS system

Pair formation is very easy in cage based breeding model of pearlspot, as it promotes natural selection of pairs within a community of brooders.

- Risk free maintenance of brooders in cages whereas other systems need expensive RAS system.

*Fig 10. Pearlspot fingerlings*

- Enhanced breeding frequency due to complete curtailment of parental care
- Complete control over egg incubation and larval rearing results in better fry production.
- Cages can be easily installed in any unutilized water body and establishment of a small RAS system exclusively for larval rearing requires low capital investement
- Mass scale seed production can be easily achieved from this model.
- Periphyton attached to the cage mesh forms additional nutrient rich feed for the brooders.

## Conclusion

The cage based pearlspot community breeding model carried out in this study has produced promising results towards continuous breeding and supply of fertilised eggs and larvae to hatchery units. The production of 10,000 fry within a period of 3 months from a very small experimental setup, is indicative of the immense scope for mass scale seed production of pearlspot in the region. A total of 50,000 fry/annum can be produced using 12-15 pairs of brooders stocking in floating net cages and subsequent seed production in RAS system. This technology can be propagated to other coastal states of India for mass scale seed production of pearlspot for the benefit of aquafarmers and self-help groups as a livelihood generation activity.

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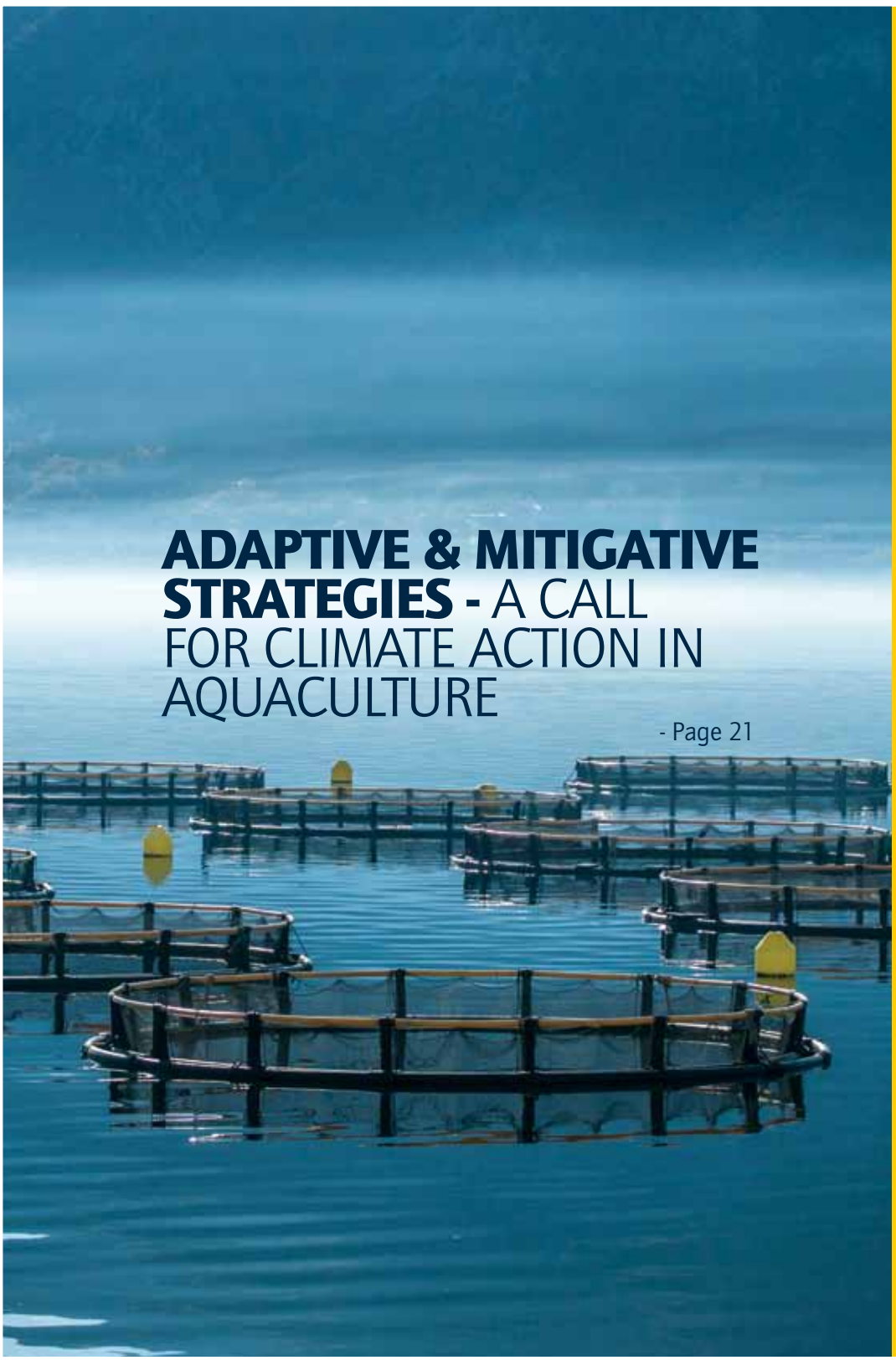

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