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Observations on the growth of *Epinephelus malabaricus* (Bloch and Schneider) in the onshore recirculating sea water system

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Abstract.

Studies on growth of groupers in indoor tanks with recirculating sea water systems are very few. The present study on the grow-out production of the Malabar grouper, *Epinephelus malabaricus*, was carried out in indoor FRP tanks of 5 ton capacity, with recirculating sea water systems, using indigenously made *in situ* biofilters. Pre-sanitized, wild caught fingerlings were stocked at the rate of 12 to 17 numbers, with the total biomass not exceeding 1200-1400g, in each tank. Fingerlings were fed with trash fish twice a day initially, at 10% of their body weight. No supplementary formulated feed was given throughout this study period. After overcoming the initial period of stress due to transportation, growth was observed to be quite fast. At the end of seven months the fishes attained a weight ranging between 750 and 800g. The growth obtained in the present system was comparable to those obtained in other systems.

A number of species belonging to the family Serranidae are highly esteemed marine foodfish particularly in the South East Asian and the Carribbean countries. On account of the high aquaculture potential, Bardach *et al* (1972) recommended them to be good candidate species for culture. Groupers can be grown in ponds, in open sea net cages, coastal enclosures and also in tanks as in the present study. They are also considered a viable substitute for commercial culture in old shrimp farms in many South East Asian countries (Anon, 1999). Many species of groupers like *Epinephelus tauvina, E. malabaricus, E. coioides, E. fuscoguttatus, E. striatus, E. polyphekadion, E.salmoides, E.akaara* are cultured commercially in many parts of the world. (Hussain *et al* 1975, Kohno *et al* 1989, James *et al* 1998). The present work is an attempt to culture *E.malabaricus* in onshore FRP tanks of 5 ton capacity with recirculating seawater system. The recirculating water systems are especially desirable for conserving sea water as well as maximizing growth under conditions of water and space limitations.

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Methodology

The culture system

The present study was carried out at the Field Mariculture Laboratory of the Central Marine Fisheries Research Institute, located adjacent to the Cochin Fisheries Harbour, on the Cochin backwater system. The culture system is housed in an area of 2500 square feet, using FRP tanks of 5000 1 capacity. The tanks are

cylindroconical in shape, having a height of 1.25m and a diameter of 2.4m with smooth, sea blue coloured interior. Each tank has a volume of $4m^3$ (Fig.1.). Seawater of salimity 28-32 ppt is pumped from the adjoining Mattanchery canal at the peak of high tide. The seawater after sedimentation, was treated with chlorine of strength 20 ppm, aerated well to remove all the chlorine, filtered through fine filter bags and filled into the tanks to a height of 1.1m. Two to three numbers of indigenously made biofilters were installed inside each culture tank unit. The biofilters serve the function of recirculating the water approximately 16 to 18 times a day, also discharging the filtered, ammonia free, oxygenated sea water into the system.

The *in situ* biofilters are made using indigenous materials such as activated charcoal, gravel, sand, oyster shells or coral pieces etc, in different layers and in various proportions. Thoroughly cleaned oyster shells are loosely packed at the bottom of an HDP bin to a height of 8 inches. A PVC pipe of 1.5 inch diameter with perforations at the bottom end to a level of 6 inches is kept at the middle of the unit to reach its bottom. A layer of charcoal of six inch thickness is spread over the layer of shells, followed by gravel and sand, each 6" thick, separated using mosquito net screens. Over this, fine sand is uniformly spread to a layer of 6" thickness. The top of the bin is covered either by a perforated lid or by a well packed sponge. The entire biofilter unit is kept immersed in the culture tank. Water enters the unit through the perforated lid or sponge, passes through the different layers and the filtered water which is collected at the bottom of the unit is air-lifted through the central pipe and flows back into the tank. The biofilter harbours colonies of beneficial bacteria, which breaks up the ammoniacal wastes from the metabolites of the fishes. The flow rate from the biofilter unit is regulated so as to obtain ammonia free water with optimum dissolved oxygen. The culture experiments were carried out from March 1996 to February 1998.

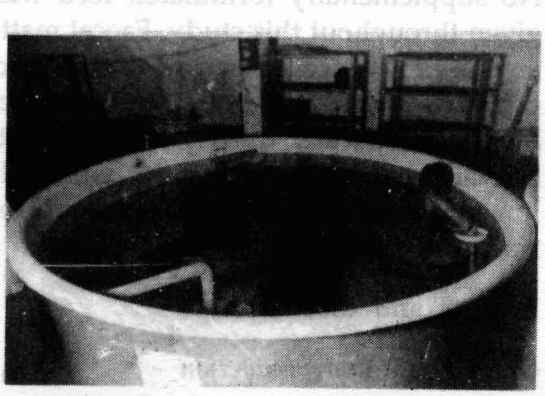

Fig.1. *The culture system with the biofilters inside.*

Throughout the experiment, salinity of sea water in the culture tanks was maintained between 28 and 32 ppt and the temperature varied from 26.5°C to 29°C during peak summer. Depth of water inside the tanks was always kept between 1.1 to 1.15m; pH was maintined between 7 and 8 and dissolved oxygen at a saturation level of 3.5 -5 ml/l. Nitrite nitrogen and ammonia levels were also maintained at a minimum. (Fig.2).

Stocking of Fingerlings

Grouper fingerlings for the present study were collected from the nearshore areas off Tuticorin. The fingerlings of size

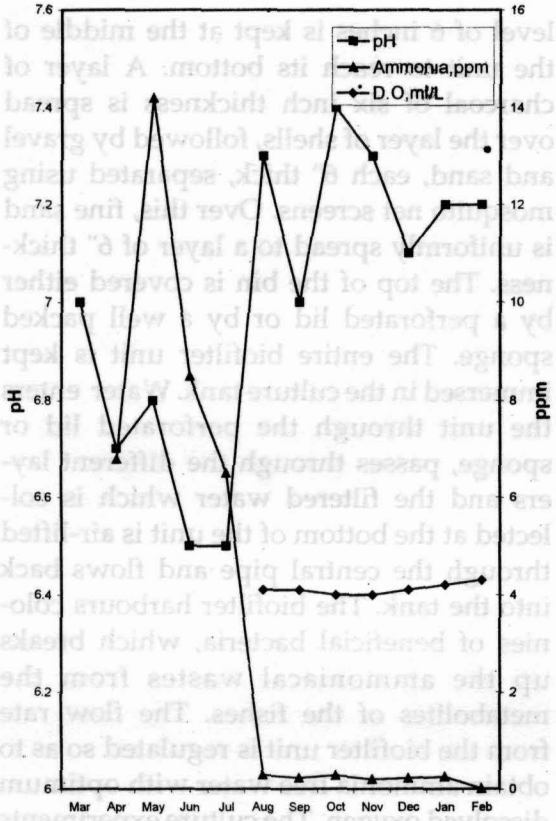

Fig.2. *Water quality parameters in the recirculating sea water system.*

90 mm to 200 mm were transported in well oxygenated polythene bags in sea water of salinity 32 ppt, to the Field Mariculture Laboratory at Fisheries Harbour. The fingerlings were initially quarantined and sanitized by giving half an hour bath in 100ppm formalin. Total length and weight measurements as well as the health status of the fingerlings were ascertained before stocking them in growing tanks. Fingerlings were stocked according to size, since uniform size reduced possibilities of cannibalism. Initial stocking was at the rate of 12 to 17 numbers with the total biomass not exceeding 1200 to 1400 g in each tank. Stocking was made in eight tanks. Occasionally bath treatment with 100 ppm formalin for half an hour duration was given to take care of any parasites present. Bacterial diseases, mainly vibriosis were frequently encountered, especially during summer months. This was controlled by giving bath treatment with oxytetracycline at the rate of 1g/50l sea water for 1-hour duration, twice a day for four days.

Groupers being rock or reef dwellers in their natural habitat, were provided with a few artificial hiding places made from broken bins, bricks or granite pieces within the tanks. Being demersal, they remian at the bottom of the tank and in the hiding places, almost sluggish, during most part of the day, moving out only at the time of feeding. Therefore, the tank bottom area is taken into consideration while determining the holding capacity of the tank.

The grouper fingerlings were fed twice a day initially. Trash fish comprising of small goatfish, sciaenids, nemipterids and small cephalopods landed by the trawlers was given as feed. Feeding was on an average 10% of their body weight in the early growing age. After one year, this was reduced to 4-5% of their body weight. No supplementary formulated feed was given throughout this study. Faecal matter as well as uneaten feed were siphoned out daily from the culture system. Strict measures of water quality management, sanitation and disease control were followed throughout the experimental period.

Results and discussion

Growth rate and production

After overcoming the initial period of

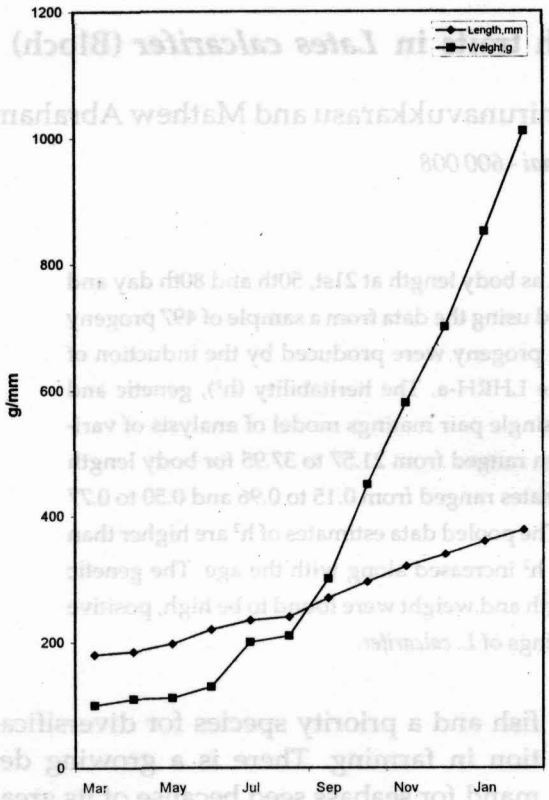

Fig 3. *Growth of E.malabaricus in the recirculating system.*

stress due to transportation, the growth rate of fishes was observed to be fairly fast. Though considerable variations in growth were observed between the very small and slightly larger fingerlings, the average increment in weight was observed to be 140-155 g per month. (Fig.3). At the end of seven months, the weight of the fishes was observed to range between 750 and 800g, which is the preferred market size in Hong Kong, Singapore and other South East Asian countries. The growth of groupers in the present study, is quite encouraging. This rate of growth is comparable to that obtained in the open sea net cage culture system in the South East Asian countries (Surtida, 1999); and better than the results obtained in the tank culture system in Saudi Arabia where groupers were grown in aerated, running sea water, where the average daily growth rate ranged from 0.62 to 3.38 g/day (James *et al.* 1998). Better survival and growth rates were observed with lower stocking rate in the present study. The fairly high growth of *E. malabaricus* obtained suggests that the present culture system, using biofilters and recirculating facilities, is quite feasible in the mariculture of groupers.

The average weight attained after seven months, in the present grow out culture system, with water quality parameters remaining constant throughout the period and feeding to point was 775 g. At the present rate of growth, the production could be estimated as 27,125 kg per hectare, within a period of eight months. The optimum stocking rate of fingerlings of mean length 115 mm, determined from the present study was 35000 nos per hectare.

References

Anon. 1999. *SEAFDEC Asian Aquaculture* 21(1) : 18-24.

Bardach, J.F, J.H. Rhyther and W.O. Mc Larney. 1972. Aquaculture. John Wiley and sons. Inc. Newyork.

Hussain, N.A., Saif, M. and Ukawa M. 1975. On the culture of *Epinephelus tauvina* (Forskal) Kuwait Institute of Scientific Research, Kuwait.

James, C.M, S.A. Al-Thobiti, B.M. Raseem and M.H. Carlos. 1998. *Aquaculture Research.*, 29: 381-388.

Kohno H, A. Trino, D. Gerochi, M. Duray. 1989. *Phil.J. Sci.*, 118: 89-100.

Surtida M.B 1999. *SEAFDEC Asian aquaculture* 21 (1) : 22-24.