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INDIGENOUS TECHNIQUE OF CONVERTING SELECTED MARINE FISHES TO FRESH WATER CONDITIONS FOR ORNAMENTAL PURPOSE

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INTRODUCTION

Aquarium keeping is amongst the most popular of hobbies with millions of enthusiasts worldwide. This has resulted into attraction to uncommon colour varieties of ornamental aquarium fishes among aquarists. Although some marine aquarium fish and invertebrates are cultured by the industry and hobbyists, most of the marine ornamentals over 90% are from wild-caught fisheries and generally command higher prices than freshwater fish (Chapman, 2000; Cato and Brown, 2003). With the high demand and pricing of many beautiful species, ornamental fish are being harvested at greater volumes and higher rates, threatening the viability or sustainability of the fishery (Chao *et al.,* 2001; Vagelli and Erdmann, 2002; Cato and Brown, 2003; Lunn and Moreau, 2004). Responsible aquaculture practices rely on sustainable production systems, to minimize impacts on the natural environment, and support resource conservation. In other words, the harvest of fish from the wild or their domestic culture, if performed with sound foundations in ecological and economic principles, can be sustainable and self-reliant commercial industries. Although exact figures on the value and trade of the ornamental fish industry do not exist, the value of ornamental fish and invertebrates imported into different countries worldwide is approximately $278 million US dollars (FAO, 1996-2005). Although most fish kept in aquariums are from freshwater, the acquisition of marine ornamental fish has greatly increased, popularized by various media showing charismatic colourful fishes and other creatures.

Usual demand is of new varieties. To cater this rapidly increasing demand of new varieties and to conserve the wild stock, the new technique is practiced to convert the sea dwelling marine fishes of brilliant colour to freshwater tolerant forms. While maintaining Aquarium at MARC, we came across the demand to cater new varieties of fishes every time. But it is not possible to fulfill this demand throughout the year in all the season due to unavailability of different species in different seasons. We came across success stories of conversion of fresh water fishes to marine in various parts of world for ornamental purposes (Bringolf *et al.,* 2005; Kefford *et al.,* 2004; Ostrand and Wilde, 2001; Matern, 2001). But considering much diversity of colourful varieties of fishes in marine habitat we started the vice-versa practice with some coastal fish varieties. Later, it was developed technically to serve the need of our aquarium and used to other species and are being practiced for trade purpose by the fish suppliers. During conversion, the seasonal trend in environmental parameters was also taken into consideration. The salinity of the seawater around Digha coast found to be 33.5‰ in the post-monsoon and pre-monsoon months (Chatterjee *et al.,* 2008). During experiment this salinity of seawater was considered as 100% and it was lowered periodically.

Around fourteen common coastal ornamental varieties were used for this conversion experiment. The

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fishes used were Eel (*Gymnothorax meleagris* Shaw & Nodder), Pearl Spot (*Etroplus suratensis*), Tiger Perch (*Terapon jarbua*), Spotted Butterfish (*Scatophagus argus*), Common Shark (*Scoloidon laticaudus*), Sting ray (*Dasyatis zugei* Miller & Henle), Guitar fish (*Rhinobatus* sp), Grouper (*Epinephelus* sp.), Spade fishes (*Sillago* sp.), *Megalaspis* sp., *Acanthurus* sp., *Platax* sp., *Ephippus* sp. and Puffer fish (*Tetraodon* sp.). The earlier studies from the area shows that these species were abundantly available in the study area i.e. West Bengal & adjoining Orissa coast (Manna & Goswami, 1985; Talwar, 1984; Talwar *et al.,* 1994; Chatterjee *et al.,* 2000).

MATERIALS AND METHODS

The fishes brought to aquarium were first acclimatized for 48 hrs. in same salinity from where they were brought (i.e. normal sea water). This salinity is considered as 100% salinity and then it was gradually lowered by 10% at every 24 hrs. by diluting with filtered de-ionised water. The environmental parameters were regularly monitored during the experiment i.e., temperatue, pH, salinity, dissolved oxygen and nutrients. Feed was not given for initial 24 hrs. The chopped fish, shrimp and molluscs meat of 0.5% of body weight were provided every day. Overfeeding was avoided and any uneaten food siphoned out from the tank to avoid contamination. The cemented tanks of size 10' × 5' × 5' with epoxy paint were used for the experiment purpose. Observations for survival were made every day.

RESULTS & DISCUSSION

Out of 14 species tried under this experiment, only 6 species could be successfully converted into freshwater fishes. These fishes are Eel (*Gymnothorax* sp.), Pearl Spot (*Etroplus* sp.), Tiger Perch (*Terapon* sp.), Spotted Butterfish (*Scatophagus* sp.) and Puffer fish (*Tetradon* sp.). The impact of lowering salinity on the survival rate of various fishes is shown in the figure 1.

It was found that all the successful species converted to freshwater conditions attained approximately 90% survival rate. The species which could not attain more than 50% survival rate during initial decrease of salinity were considered at unsuitable for this technique. The species unsuccessful under this conservation technique are the fishes used were Sting ray (*Dasyatis zugei* Muller & Henle), Guitar fish (*Rhinobatus* sp.), Grouper (*Epinephelus* sp.), Spade fishes (*Sillago* sp.), *Megalaspis* sp., *Acanthurus* sp., *Platax* sp. and *Ephippus* sp.

Lot of the work undertaken to determine whether fish could survive the transition from freshwater to brackish water and then back to freshwater for ornamental practices and the impact on their eco-physiological aspects. In some species efforts were also done for low salinity tolerance tests (Allen and Avault, 1971; Kendall and Schwartz, 1968; Chen and Chen,

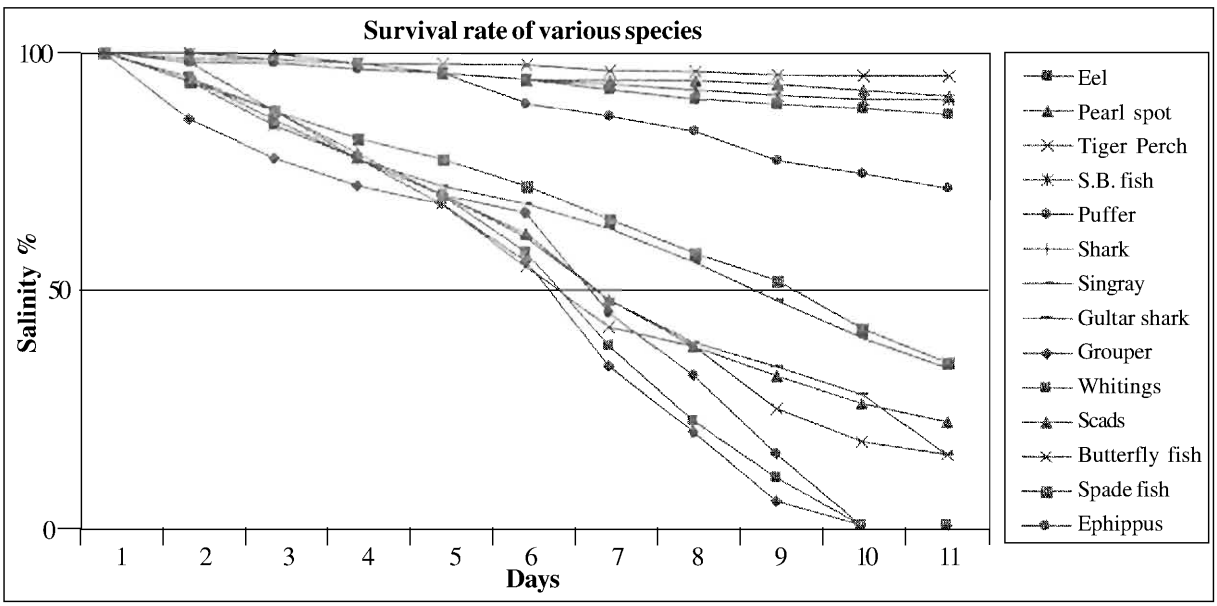

Fig. 1 : Survival rate of experimental species on various days of experiment after salinity changes.

2000). Fish in an estuarine environment would most likely be exposed to gradual changes in salinity, rather than abrupt changes. Some fishes are able to acclimate to higher salinities with gradual increases in salinity than with direct transfer into brackish waters (Eddy, 1981; Chervinski, 1984; Anyanwu, 1991). In the study of salinity tolerance of flathead catfish, it was found that more gradual rate of increase may result in every greater salinity tolerance and fishes can tolerate direct transfer to brackish waters but also can survive the converse transition from brackish water to freshwater (Bringolf *et al.,* 2005). In nature, high freshwater input events in estuaries and nearby coastal waters would certainly broaden the spatial limits that salinity would impose on dispersal of introduced fishes.

Knowledge of salinity tolerance could open doors to housing new combinations of species, and knowledge of salinity preference could bring an aquarist one step closer to providing ideal husbandry. Cichlids have long been known to be euryhaline and some occur in salty water. The Indian chromides (*Etroplus* sp.), have been observed in Negombo Lagoon, Sri Lanka at salinities ranging from 24-29 ppt (parts per thousand) (Ward and Wyman 1977). Although most aquatic organisms have physiological systems adapted to either freshwater or saltwater habitats, some species living in tidal marshes and streams experience daily fluctuations in salinity. Therefore, they must be able to rapidly to changes in their osmotic environment. These adjustments may be very similar to the thermal acclimation seen in many animals that occurs seasonally (Ricklefs, 2001).

CONCLUSION

It was observed that the best season for conversion experiment is monsoon and post-monsoon as the salinity in nature also decreased remarkable in this season and fishes won't face much stress. The conversion took approximately 9-10 days. After conversion, it was found that about 90% fishes survived successfully in the new salinity. So far, five species are converted successfully under this experiment. These fishes are Eel (*Gymnothorax* sp.), Pearl Spot (*Etroplus* sp.), Tiger Perch (*Terapon* sp.), Spotted Butterfish (*Scatophagus* sp.) and Puffer fish (*Tetradon* sp.). This is one of the most economic techniques for achieving various colored varieties of ornamental fishes. It is also expected that adoption of this technique will open a new avenue to the unemployed youth for earning. The technique also useful for arresting the over exploitation of particular fish varieties and depletion of bio-resources.

SUMMARY

The present study aims to establish indigenous technique of conversion of selected marine fishes to freshwater conditions for ornamental purpose. Trials were done with about 14 marine fish species and it was observed that at least five species out of them successfully survived after conversion to freshwater. These species are Eel (*Gymnothorax* sp.), Pearl spots (*Etroplus* sp.), Tiger Perch (*Terapon* sp.), Spotted butter fish (*Scatophagus* sp.) and Puffer (*Tetraodon* sp.). During the process, the salinity of water was gradullay reduced every day. Entire process took 9 to 10 days and the survival rate is quite satisfactory (about 90%). Hence, the technique will be very useful to the small-scale aquarists, fish suppliers as well as public aquariums to cater the need of new varieties.

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