Stunted fingerling production ensures continuous supply of good quality seed for marine finfish farming

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Abstract

Application of compensatory growth pattern in finfishes for enhancing aquaculture production is an innovative method adopted by several farmers in freshwater farming systems. Stocking of stunted fishes have the primary advantages such as growth compensation, suitability for short duration farming, economic usage of feed, extended period of good quality seed availability and enhanced survival rate with better yield. An attempt has been initiated to adopt the principles of compensatory growth pattern in marine aquaculture systems and the possible interventions in these aspects is discussed. Preliminary results reveal that marine finfishes such as Snubnose pompano and Mangrove red snapper exhibits compensatory growth pattern during post- stunting rearing period in both marine and low saline conditions.

***Keywords**: stunting, compensatory growth, low saline, marine, mariculture*

Introduction

Marine and coastal cage farming has emerged as a potential food production sector in India. With a vast coast line of more than 8000 km, the country has an immense potential for mariculture activities for the development of the fisheries sector. ICAR-Central Marine Fisheries Research Institute, Kochi has initiated popularisation of marine and coastal cage farming activities in an elaborate way. Several commercially important species such as Cobia, Orange spotted grouper, Snubnose pompano and Indian pompano have been successfully utilised for this purpose by developing and standardising the seed production and farming technologies. Good quality stocking material is an important prerequisite for open water cage farming. Success of any aquaculture venture depends on year round availability of quality seeds and affordable price of the stocking material. Even though seed production technology is available for many of the economically important species, continuous seed availability is a major bottleneck in expanding the commercial mariculture activities in India. At the same time, stunted fingerlings are considered better stocking material for culture because of their higher survival rate and ability to compensate the growth. They are less vulnerable to predation and diseases and are more tolerant to environmental fluctuations; require less time to reach marketable size leading to higher production. Besides, production of stunted fishes ensure the availability of seed for a longer duration since the fishes can be maintained in the nursery facilities with minimum cost and effort.

Compensatory growth in stunted fishes has been commercially adopted in the farming of several freshwater fishes such as Indian Major Carp, Big Head carp, Nile Tilapia etc. Even though compensatory growth pattern is observed in marine finfishes such as European seabass, Gilthead sea bream, Atlantic halibut, Atlantic cod and Alaska yellowfin sole, adoption of this technology in mariculture at a commercial level, has not been reported yet. Commercial scale farming experience in freshwater fishes and experimental evidences in marine finfishes have indicated that the stunted fishes attained compensatory growth when shifted to a favourable condition with adequate feeding. This growth compensation is achieved through the phenomenon of hyperphagia (excess feeding). The degree of compensation attained is classified as no compensation, partial compensation and complete compensation or over compensation, depending on the method and species selected for stunting. Survival rates obtained by stocking stunted fishes is at par or more than that of the normal fishes, since many of the weak and unhealthy fishes may be eliminated from the stock during the stunting process. Since the size and growth rate of the stocking material after long term stunting is greater than the normal fingerlings generally stocked, usual problems such as cannibalism and predation will be reduced. Generally stunted fishes are found to be hardy, more tolerant to environmental fluctuations and diseases. Stunted fingerling production is more economical since the quantity of feed utilised for this purpose is minimal (only for the subsistence of the fishes) during stunting. Above all, long term stunting protocols ensures the maintenance of these animals for a longer duration which will help to extend the seed availability for a longer period.

Stunting and growth compensation in marine fishes

Compensatory growth pattern in Snubnose Pompano, *Trachinotus blochii*, a potential candidate species for commercial marine cage farming has been evaluated in both high saline (> 30 ppt) and low saline conditions (< 15 ppt) at Mandapam Regional Centre and Karwar Research Centre of ICAR-CMFRI respectively. The fishes were stunted for 30, 60 and 90 days duration followed by post stunting rearing for 30, 60 and 90 days respectively. During the stunting period high stocking density (100 / $m^{3)}$ and low feeding rate (3 % body weight) were maintained and during the post stunting period stocking density was reduced to 20 / m^3 with increased feeding rate (15 % of body weight). The fishes during stunting and post-stunting were fed using a commercial floating pellet feed with a 45 % crude protein content. In the marine condition, the 90 day stunted fishes have shown over compensation. In the low saline condition, the 60 days stunted fishes showed near complete compensation.

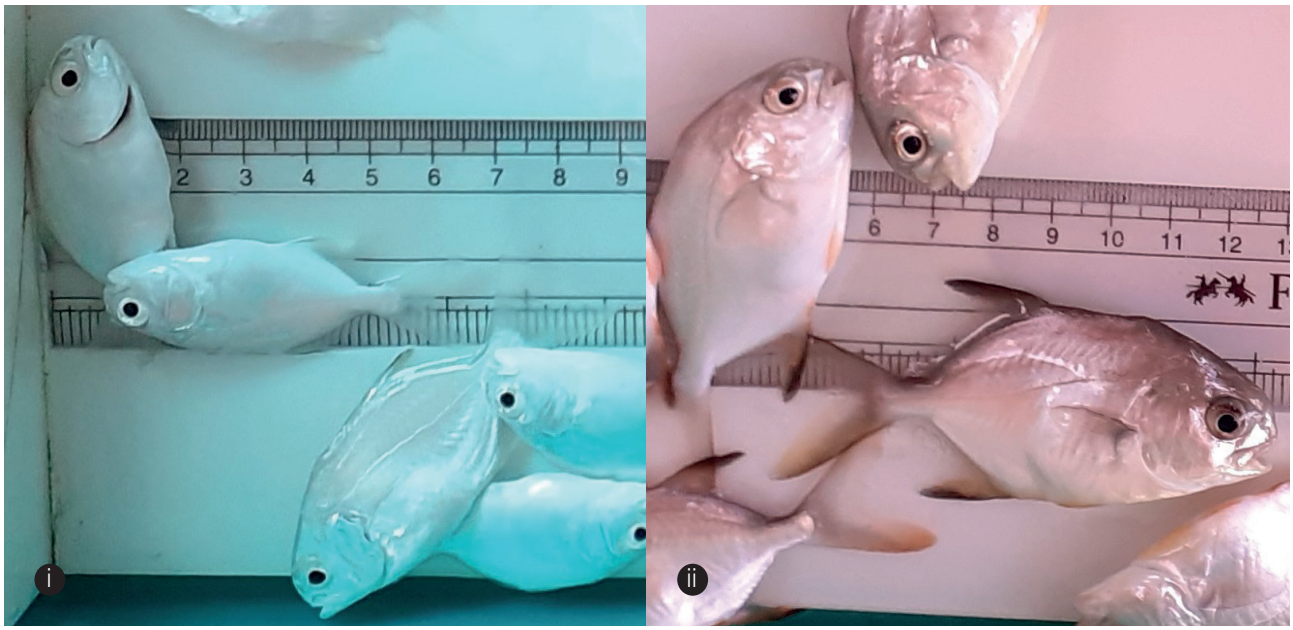

Fig.1. Stunted (i) and Normal (ii) Snubnose pompano belonging to same stock

Fig. 2. Normal (top) and stunted (bottom) *L. argentimaculatus* fingerlings

To standardise the stocking density of mangrove red snapper *Lutjanus argentimaculatus* fingerlings for stunting trials, experiments were conducted at Calicut Research Centre of ICAR-CMFRI. Red snapper fingerlings (wild collected) were stunted for 30 days at different stocking densities (@ 25, 50, 75 and 100 numbers / m^3) providing low value fish as feed at 5 % of body weight. The results indicated that high stocking density stunting is not possible in red snapper fingerlings due to aggressive behaviour of the fish. The ideal stocking density observed was 50 numbers per m^3 for stunting *L.argentimaculatus* fingerlings.

The compensatory growth pattern in stunted fingerlings of *L. argentimaculatus* was studied with thirty days stunting experiments conducted in high saline (35 ppt) and low saline (15 ppt) conditions. The fishes were stunted for 30 days at a stocking rate of 50/ m^3 providing trash fish at 5 % of body weight. They were further reared (post-stunting) for 30 days at a stocking rate of 20 / m^3 providing feed at 15% of body weight. Control was maintained at a stocking rate of 20 / m^3 and providing feed at 10 % of body weight for 60 days. The fingerlings exhibited partial compensatory growth compared to normal in low and high saline condition after one month stunting, with higher degree of compensation in low saline condition. Further stunting trials by increasing the stunting and post stunting duration to see whether complete compensation in growth can be achieved in this species is in progress.

A preliminary experiment was conducted with hatchery produced *Trachinotus mookalee* (Indian pompano) fingerlings at Vishakapatnam Regional Centre of ICAR-CMFRI. The 45 days stunted fishes have shown indications of compensatory growth in the refeeding period. The experiments on Snubnose pompano reveals that the long term stunted fish can be employed for the commercial cage culture practices in both low saline and marine condition. It demonstrated that stunting practice can be adopted even in carnivorous fishes such as red snapper and Indian pompano.