

Mariculture Nutrition Research at CMFRI

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Introduction

Mariculture is now accepted as an alternative to augment marine fish production in the backdrop of dwindling capture fisheries. CMFRI has prioritized mariculture research in three areas which are marine food fish production, production of high value marine crustaceans, and captive breeding and propagation of selected marine ornamental fishes for breeding and conservation. Mariculture in India was confined to shrimp farming in which disease outbreak made return on investments risky. The search for alternative marine candidates with financially viable technologies has also been the major force involved in the aforementioned prioritization. The present write up is to explain the research done by CMFRI in these areas with emphasis on nutrition and research initiated and envisaged for the coming five years where collaboration and collective effort is possible by cutting across institutional barriers.

Marine food fish nutrition

Cobia (*Rachycentron canadum*) mariculture has been initiated by CMFRI as an in-house research project in 2007. Presently, brood fishes of the size 4-5 kg are collected and stocked in outdoor cement tanks. These wild caught fishes weighing up to 11 kg are sourced from the local fishermen @ Rs.500 kg⁻¹ live weight. They are anesthetized using AQUI-S and transported to the Research

Centre in ton FRP tanks. These fishes are fed with lesser sardines, squid meat and shrimp. Stocking is done in 80 ton out door cement tanks containing filtered seawater with constant aeration. A quarantine protocol is under development because of heavy infestation of ectoparasites which eventually leads to fish mortality. They do not accept dry or wet compounded feed pellets. Emphasis is given to refining husbandry of these fishes at the moment. Broodstock nutrition research of cobia is one of our priorities now as achieving natural spawning of these fishes is the major objective. Development of larval and fry rearing protocols come next in which nutrition and health are areas where research and development in collaborative mode is possible.

Marine ornamental fish nutrition

Realizing that long term sustainable trade of marine ornamental fishes is only through the development of hatchery production technologies (Gopakumar et al. 2007), breeding and seed production of clown fishes was pioneered by CMFRI in India (CMFRI 2006). Breeding and larval rearing of three species of damsel fishes has also been standardized at the Mandapam Regional Centre of CMFRI (Gopakumar et al. 2007). Higher survival and growth of larvae was observed in feeding of a combination of rotifer and copepod, which signifies the suitability of copepods to *Artemia* (Ignatius et al., 2001).

One of the first comprehensive nutrition research works on the marine ornamental fish *Amphiprion sebae* is by Binu Varghese (2007). With the hatchery-bred striped damsel (*Dascyllus aruanus*) feeds supplemented with all micronutrients containing 36-46% protein and 5% lipid was found appropriate for their aquaculture without any adverse impact on their colour or general health (Vijayagopal et al. 2008). Formulated feeds for damsel fish shall be ready for commercialization after its field testing and identification of an appropriate and cost effective packaging.

With a need to feed the marine community aquaria, there is a necessity to commercialize nutritional products to support the sustainability dimension of marine aquarium trade. Based on scientific inputs generated and mentioned above, technology development for indigenous feed production and its commercialization can be taken up with a collaborative effort.

Crabs and lobsters

With *Portunus pleagicus*, several broodstock trials have been conducted with different wet feed combinations. In one experiment of 60 days duration, an artificial feed was also tested. The results reveal that a combination of sardines and squid resulted in maximum egg production and repeated spawning. The treatment with a compounded feed showed the lowest level of fecundity in comparison with the other wet feed treatments. At present, the hatchery at Mandapam attempts to produce baby crabs with survival rates ranging from 0.4 to 17.3%. Our priorities here are to improve larval survival rates and thereby improve the baby crab production to a level of farming them. Acceptance of artificial feeds produced using the wet material they feed in nature itself is found to be a challenge which has to be addressed (Josileen Jose and Menon, 2004).

CMFRI was successful in breeding, larval

rearing and seed production of the sand lobster, *Thenus orientalis* (Kizhakudan et al. 2004, 2005, 2006). This sand lobster has a short larval cycle and with the closing of its life cycle the emerging areas of research are, 1) broodstock nutrition 2) larval nutrition and 3) formulated feeds for fattening. By rearing *T. orientalis* seeds in closed recirculation systems with *in situ* fluidized substrate bed filters and reduced light intensity and using fresh clam meat as feed, the sub-adult size weighing approximately 35 g could be obtained in about 3-4 months, and in 180 days the animals attained average weight of about 150 g (160-164 mm TL), which is the minimum legal export size of *T. orientalis* (Kripa, 2007). Delineating the nutritional requirements and production of formulated feeds for commercial level production of these lobsters is envisaged within the coming five years.

Facilities

It may not be out of place to mention that the institutional facilities with CMFRI which can be shared with the other collaborating institutions and organizations are as follows:

1. Semi-automatic feed proximate composition analytical facility (Tecator, Sweden) at Cochin,
2. Conventional (wet process) feed proximate composition analysis facility at Mandapam,
3. Amino acid analysis facility (HPLC Waters) at Cochin,
4. Fatty acid analysis facility (GC Perkin Elmer) at Cochin,
5. Micro-bomb calorimeter (Parr) at Cochin,
6. Twin-screw extruder (BTPL Calcutta) at Cochin,
7. Pellet mill (conventional steam pelleting) at Chennai Research Centre.

With emphasis on marine food fish, marine ornamental fish, marine crabs and lobsters, the nutrition research at CMFRI is focused on

development of scientifically evaluated nutritional inputs to facilitate farming and aquaculture in the marine sector. Needless to say that collaborative effort in this direction would definitely add pace and value to the outputs targeted.

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