



Present Scenario of Marine Ornamental Fish Trade in India

Captive Breeding, Culture, Trade and Management Strategies

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The marine ornamental fish industry has been expanding rapidly in recent years. The global annual marine ornamental trade as at present is estimated at US\$ 200 - 330 million. Nearly 98% of the marine ornamental fish species marketed are from the wild collected mainly from coral reefs of tropical developing countries. This has been threatening the long term sustainability of marine ornamental fishing due to the indiscriminate and damaging exploitation of coral reef areas for their collection. In addition to damaging techniques of collection, the over harvesting of target organisms and the high level mortality associated with insensitive shipping and poor husbandry practices also lead to depletion of wild stocks. This calls for an urgent need to evolve biologically sustainable management measures for marine ornamentals. In India only about Rs.3 crores worth of ornamental fishes are traded annually and they consist mainly of indigenous freshwater species collected from rivers. About 85% of ornamental fish exported from India are from North Eastern Region. India is bestowed with vast marine ornamental resource and even though a good deal of collection of marine ornamentals is in vogue in many of the Indian reef areas, till date no marine ornamental fisheries policies have been formulated. It is time to develop an organised marine ornamental fishery in India by formulating proper policies and management measures to ensure its sustainability. The Central Marine Fisheries Research Institute and National Bureau of Fish Genetic Resources can jointly develop a certification system on similar lines with the standards developed by the Marine Aquarium Council (MAC). A few entrepreneurs can be licensed to collect suitable species from selected areas by eco-friendly collection methods. Availability of necessary infrastructure for conditioning and maintenance of the harvested species should be one of the prerequisites for issuing licenses for entrepreneurs. The species thus collected and maintained by entrepreneurs can be certified and an export trade for the same could be developed by the Marine Products Export Development Authority. The impact of exploitation should be closely monitored by scientific institutions and the necessary management measures have to be recommended as and when required. Another option to promote the marine ornamental fish industry is to develop and

improve technologies for culture of desired species for the trade. Research conducted in this respect in CM.F.R.I, has resulted in the development of hatchery technology for 14 species of marine ornamental fishes such as Clown fishes viz. *Amphiprion percula*, *Amphiprion sandaracinos*, *A. ocellaris*, *A. sebae*, *Premnas biaculeatus*; Damsels viz. *Dascyllus trimaculatus*, *D. aruanus*, *Pomacentrus caeruleus*, *P. pavo*, *Neopomacentrus nemurus*, *N. filamentosus*, *Chormis viridis*, *Chrysiptera unimaculata* and Doty back *Pseudochromis dilectus* for the first time in India. The sustainable exploitation of wild collected and certified varieties for trade coupled with tank reared species can lead to a long term sustainable marine ornamental fish industry in India.

Currently, as many as 30 million coral reef fish belonging to around 1,000 species are collected annually and supplied to private and public aquaria around the world. In addition, over 100 species of invertebrates are also collected and supplied to millions of individuals. The majority of these specimens come from coral reefs and associated habitats, with about 45 countries supplying to the ornamental fish market. Considering the many pressures currently faced by reefs, it is vital that ornamental fisheries are to be investigated and monitored, and management strategies are needed to be formulated to ensure that they are sustainable. This requires research, monitoring, training, use of non-damaging collecting methods and adoption of conservation strategies for such as reserves, quotas and closed seasons for controlling exploitation. Such measures include limiting collecting effort, establishment of species-based or overall quotas, restrictions on exploitation of rare and/or endemic species, temporary closures and establishment of appropriately intermittent ornamental fish reserves. There are also a number of possibilities for enhancing the fishery, such as mariculture and construction of artificial reefs. It is well understood that India has a wealth of marine ornamental animals in its island ecosystems of Lakshadweep and Andaman- Nicobar, besides many water areas of mainland. In the context of the expanding global marine ornamental fish trade in recent years it appears that India has the potential to develop a lucrative marine ornamental fish trade. A critical assessment of the current global scenario of marine

ornamental trade can provide much insight into the complexities and conservational issues associated with trade, which will be of much relevance while formulating policies for the development of a marine ornamental industry in India. Apart from these, this contribution concentrates on some of the conservation measures that can be taken and discuss their application and effectiveness.

Present Scenario

In India only about Rs. 3 crores worth of ornamental fishes are traded annually and they are contributed mainly by indigenous freshwater species collected from rivers. About 85% of ornamental fish exported from India are from North Eastern Region. Recent studies have revealed that Kerala has a rich biodiversity of freshwater ornamental fish fauna represented by 125 species. The Western Ghats have 85 endemic taxa of ornamental fishes. In recent years, the marine ornamental fish trade has emerged as a global multimillion dollar industry worth an estimated US\$ 200 - 330 million annually and operated throughout the tropics. The Philippines, Indonesia, Solomon Islands, Sri Lanka, Australia, Fiji, the Maldives and Palau supplied the major share of marine ornamental fishes during the recent years. The United States, the United Kingdom, the Netherlands, France and Germany were the most important countries of destination.

Unlike freshwater ornamental fishes, the trade in respect of which is mainly contributed by species that are farmed, the marine ornamental fishes are segregated wild collections. Since the tropical marine aquarium fish and invertebrates that contribute to the trade are directly netted from the coral reefs, long term sustainability of the aquarium fishes so sourced is a controversial aspect. The damaging techniques such as the use of sodium cyanide used for wild collection, the over harvesting of targeted organisms and the high level of post harvest mortality are the major constraints associated with the trade of marine ornamental fishes based on wild collections. However, if managed properly, the aquarium industry could support long term conservation and sustainable use of coral reefs. Management of marine ornamental fisheries has to be done in such a way that they are biologically sustainable, do not come into conflict with other resources and would keep post harvest mortalities to the minimum. Habitat damage





and negative impact to the ecosystem have to be avoided. Species that are unsuitable for keeping in aquaria should not be collected. It is evident from the global scenario of the marine ornamental fish trade that even though the trade is very lucrative and is expanding rapidly, the problems involved continue to be complex and requires appropriate management strategies.

In India, till date, no organised trade of marine ornamental fishes has come about. It is however a fact that a great deal of illegal collection of marine ornamentals is in vogue in many parts of Indian reef ecosystem and this is a matter of great concern due to the indiscriminate nature of exploitation and ecostyle methods of collection which damage the reef ecosystem. In addition to this, lack of knowledge on appropriate post harvest husbandry practices leads to large scale mortality of the collected animals. It is time to evolve a marine ornamental fisheries policy in our country for developing an organised trade of marine ornamental fishes. It is felt that, even though the ideal situation is to develop a sustainable trade of marine ornamental fishes through tank reared species, it has to be admitted that development of commercial level breeding technologies of all the species of demand will take a very long time and if we have to wait till then, we may fail to enter into this lucrative global trade in the near future.

A critical analysis of current global trade of wild collection of marine ornamental fishes reveals many ecological concerns which require policy interventions. The major aspect that should receive top most priority is in respect of taking appropriate action to ensure that the development of the trade should not threaten the sustainability of the coral reef ecosystem. The destructive collection practices such as use of cyanide should be banned by legislation coupled with its effective enforcement. Results from a recent study demonstrated that colonies of commonly traded species of corals and soft corals to varying concentrations of cyanide over different periods of time caused mortality in all corals. *Acropora*, the genus which is specifically targeted by fishers for collection of fish that tend to hide amongst its branches, is most vulnerable to cyanide exposure. This exposure shows rapid signs of stress and bleaching (Cervino, *et al.* 2003). Another aspect of concern is the impact of exploitation on population due to selective harvesting of species which are in high demand in the trade. Here also policy intervention through legislation has to play a key role. Several countries in Asia and South America have begun to implement collection restrictions on certain ornamental fish species (Corbin and Young, 1995; Friedlander, 2001; Ogawa and Brown, 2001). Although no marine fish species collected for the aquarium trade have been driven to global extinction, studies carried out in Sri Lanka, Kenya, the

Philippines, Indonesia, Hawaii and Australia have reported localised depletion of a number of targeted aquarium species due to heavy collection pressure. Studies have also shown that removal of larger quantities of cleaner wrasses and cleaner shrimps, which play key roles in reef health, creates negative impacts on reef diversity. The third aspect of concern is the exploitation of species which are not suited for aquarium. This also needs to be eliminated by legislation. The fourth aspect which demands regulations is in respect of post harvest mortality. Research on marine ornamental fish trade between Sri Lanka and the United Kingdom demonstrated that in mid 1980s about 50% fish died during and immediately after collection and another 10% during transport, and the rest 5% in holding facilities (Wood, 1985). As a result of such mortality more of fish often need to be collected for meeting the market demand. However, fish mortality has been very low where they are collected, stored and handled by adequately trained individuals and transported in suitable containers. The post harvest conditioning facilities should include modern gadgets such as UV lighting system, protein skimmers, carbon filters, etc.

In the light of the above, it will be evident that while developing a marine ornamental fish industry in India, it will become inevitable to formulate legislations on these issues which are of vital concern to the sustainability of the trade. It is suggested that a few entrepreneurs can be licensed to collect suitable species from selected areas using ecofriendly methods. Availability of necessary infrastructure and technical know how for conditioning and maintaining of harvested species should be one of the prerequisites for issuing license to an entrepreneur. The Central Marine Fisheries Research Institute (CMFRI) and the National Bureau of Fish Genetic Resources (NBFGR) can combine to develop a certification system similar to the standards developed by the Marine Aquarium Council (MAC). The Marine Products Exports Development Authority (MPEDA) can take the lead to develop an export market for the certified varieties. The impact of exploitation on stocks has to be closely monitored by scientific agencies at periodic intervals and required management measures have to be implemented as and when required.

Captive Breeding of Marine Ornamentals in India

India is endowed with more than 200 varieties of export-oriented ornamental fishes. It is accepted widely that their collection from the flimsy reef ecosystem of the wild will lead to habitat damage and overexploitation of the species which are in high demand. In this context, the only alternative for the development of a long term sustainable trade of marine ornamental fishes is through hatchery production of seed for farming. The decline of exploited marine fishery resources is mostly due to increasing fishing pressure.

The setback in shrimp farming is due to disease outbreak and the impact of the recent tsunami has adversely affected the livelihood of Indian coastal villagers. So much so, an alternative livelihood option is felt very essential. Considering these situations, the Central Marine Fisheries Research Institute (CM.F.R.I.) and Fisheries Division of Central Agriculture Research Institute (CARI) of ICAR have intensified research activities on breeding and culture of marine ornamental fishes. One of the recent achievements is the success in the hatchery production of clown fish and few damsel fishes (Gopakumar *et al.*, 2001; 2002; Ignatius *et al.*, 2001, Madhu and Rema Madhu, 2002). Research was undertaken with the objectives to generate scientific knowledge on ornamental fish maintenance, behaviour, influence of social status on sex change, pair formation, breeding, influence of lunar periodicity in spawning, parental care, egg incubation and hatching, development of larvae, and juveniles. These investigations have resulted in the development of hatchery technology for 14 species of marine ornamental fishes such as Clown fishes viz. *Amphiprion percula*, *Amphiprion sandaracinos*, *A. ocellaris*, *A. sebae*, *Premnas biaculeatus*; Damsels viz. *Dascyllus trimaculatus*, *D. aruanus*, *Pomacentrus caeruleus*, *P. pavo*, *Neopomacentrus nemurus*, *Chormis viridis*, *Neopomacentrus filamentosus*, *Chrysiptera unimaculata* and Doty back *Pseudochromis dilectus* for the first time in India (Madhu and Rema Madhu, 2006; Madhu *et al.*, 2006a,b,c; Gopakumar *et al.*, 2007; Rema Madhu, *et al.*, 2007; Madhu *et al.*, 2008). It is well accepted that the trade developed from tank reared fish and other ornamentals is the final solution for a long term sustainable ornamental fish trade. The economic viability of ornamental fish production is more lucrative when compared to other mariculture species, due to their high unit value. The complete package of practices developed for their production can be taken up as an alternative livelihood option for small and large scale fish farmers. The transfer of technology to the public and private sector entrepreneurs who have approached for the technology is being planned by imparting hands-on training through different modes under the Consultancy Processing Cell (CPC) of the CMFRI and other organised trainings. In addition, the hatchery produced seeds are also being sold to the farmers and aquarium hobbyists and traders through Single Window System and seed counters are in operation in marine hatcheries of CMFRI at Cochin and Mandapam. This has resulted in the emergence of several ornamental fish trade shops all over the country. Recently, the National Fisheries Development Board (NFDB) has also developed schemes to provide funds for ornamental fish seed production from unutilised hatcheries of the shrimp farmers in India. In the near future

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