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# Ornamental Fisheries: A new Avenue to Supplement Farm Income

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**Abstract**

**The ornamental fish trade in recent years has turned out to be a commercial business in the country with a steady increase globally. The global ornamental fish industry is worth US$ 15 billion and more than 2 billion live ornamental fishes are traded. The majority of aquarium fish traded are fresh water species, but the proportion of marine species traded is also increasing each year in the international market. India's share to global ornamental fish trade is less than one percent but still it is projected as a "sleeping giant" because potential resources is not exploited. The technological interventions of Marine Biological Research Station (Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth), Ratnagiri in Ornamental Fish Sector and their utilizations for doubling farmers' income are reviewed in this paper.**

**Keywords:** Ornamental Fish Farming, Konkan, Doubling Farmers' Income, DFI.

## Introduction

Ornamental fish keeping is becoming popular as an easy and stress relieving hobby. About 7.2 million homes in the USA and 3.2 million homes in the European Union have aquaria (Felix 2009). The top exporting country is Singapore followed by Hong Kong, Malaysia, Thailand, Philippines, Sri Lanka, Taiwan and Indonesia. The largest importer of Ornamental fish is the USA followed by Europe and Japan, whereas the emerging markets are China and South Africa. Over US$ 500 million worth of ornamental fish are imported into the USA each year. Singapore and other East Asian countries account for 80% of the global trade.

The marine aquarium has become an affordable hobby for young and old, but compared to the fresh water aquarium the number of components used for the maintenance is much higher. The global marine ornamental fish trade is estimated at US$ 200-300 million. The marine ornamental fish trade is operated from South-East countries Philippines, Indonesia, Srilanka, Maldives and major pacific Island countries like Solomon Island, Australia, Fiji and Palau. These countries together supply more than 98% of the total marine ornamental fishes involved in trade (Sahayak 2009). There are good availability of different species of marine ornamental fishes in Ratnagiri coast and there is very good popularity among local aquarist (Satam *et al.* 2015, Chogale *et al.* 2017).

The internal ornamental fish trade of India is estimated to be the order of ₹ 25 crores and the export trade is to be 6.0 crores which is only 0.3% of the global trade. The major part of the export trade is based on wild collection. There is very good domestic market too, which is mainly based on domestically bred exotic species. About 90 percent of ornamental fish is traded from Kolkata port followed by 8 percent from Mumbai and 2 percent from Chennai (Ghosh *et al*. 2003). The country exported ornamental fish to the tune of around ₹ 5.65 crore in 2015-16 (Vinayak 2017). However, it has touched ₹ 9.5 Crore in 2016-17, with an increase of 40% over last year (Krishnakumar 2017).

On the commercial front, the ornamental fish trade is a growing business with Chennai, Kolkata, Mumbai Bangalore and Kochi turning out to be the major hubs. (Ramesh 2012) stated that demand for ornamental fishes in domestic market is high and mass production of the ornamental fishes has augmented supply of ornamental fishes in market.

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The unit value of ornamental fish is higher than the food fish. Hence this sector offers good opportunity for rural and urban households to augment income. Almost all of the tank bred ornamental fish in India comes from the small-scale or backyard type of breeding units. But due to the lack of adequate infrastructure and key inputs like appropriate feed, quality broodstock, etc., these units were not in a position to produce ornamental fish varieties, which are in demand in the international market. Organized trade in ornamental fish depends on assured and adequate supply of demand, which is possible only by mass breeding.

The government has stepped in to play its part. It has sponsored a series of workshops, seminars to raise awareness, particularly in parts of North-East India and states in the south. MPEDA (2008) has launched a set of schemes to promote an export oriented Ornamental Fish Sector such as scheme for providing financial assistance for establishment of ornamental fish breeding units and for establishment of ornamental fish marketing societies. MPEDA had proposed an aquatic rainbow technology park at Chennai focusing exclusively on promotion of ornamental fish.

Recently, National Fisheries Development Board (NFDB), Hyderabad had launched a set of new subsidy schemes (around 30 schemes) for development of ornamental fish sector in India under the blue revolution scheme. They included schemes for development of fresh water as well as marine ornamental fish seed production units and backyard units, aquarium retail and fabrication units, demonstration units, brood stock banks, aquatic plant production units, integrated ornamental fish units, etc. They also incorporated schemes for development of existing ornamental fish units, for establishment of wholesale market for aquarium fish and allied things, establishment of aquarium tanks for hobby development in schools, colleges and government offices, establishment of public aquariums and promotion of national/international aquarium shows and organization of capacity building programmes such as awareness programmes, demonstration and training programmes.

The popular ornamental fish production and trade in Kolathur village of Tamil Nadu is an excellent example to be prototyped. It provides a good mix of both cottage as well as commercial scale production, which largely cater to the export market (Felix 2009).

The Galiff street market is a weekly market. Each Sunday is a destination for all the pet lovers of Kolkata and surrounding areas. It is the largest wholesale ornamental fish market of Eastern and North-Eastern India.

Kerala Aqua Ventures International Limited (KAVIL) is India's first public-private limited company established in year 2010 for promotion of ornamental fish industry. KAVIL has been set-up by ornamental fish farmers at Kochi with more than 51% of the shares are held by the fish farmers, entrepreneurs and traders, with hi-tech infrastructure for export and import.

**Major Categories of Ornamental Fish Trade in India**

Ornamental fish trade in India can be highlighted under categories *viz*. capture from wild, culture, breeding, export and marketing of fishes, plants and accessories (Das and Sinha 2003). Under the MPEDA subsidy scheme, there are many grow-out farms has been set-up in Tamilnadu, Kerala, West Bengal, Gujarat and Andhra Pradesh as well as in Maharashtra.

***Capture of wild stock***

Wild ornamental fishes are abundant in rivers and streams, which flow through dense forests and mountain terrains in India. These species, (e.g. *Puntius denisonii*) have good export potential and have a dominant place in the foreign market of aquarium fishes and reap a value of about 1 to 2$ a piece. In addition to these rivers and streams, the waters along the coastline and several islands which have around them lagoons and coral reefs abound in varieties of colourful marine fishes.

***Breeding of fishes***

Breeding of aquarium fishes fall under two categories i.e. those who lay the young ones (live-bearer) and those who lay eggs (egg-bearer).

The live-bearing fishes are easiest to breed, but the only problem encountered with them is that of saving the young from the cannibolism of their parents. They breed all the year round under congenial conditions. However reproduction is seasonal in natural conditions. Most livebearer fishes produce young ones at about 22 day interval.

The egg laying fishes are quite different and include most common fishes. The Gold fish lay adhesive eggs which stick to water plants, while Zebra fish lay non-adhesive eggs, which falls to the bottom. The hatching rate of these eggs depends on number of factors viz. water temperature, hygienic condition and extent of predation. The breeding of Angel and Discus fishes are initiated by many farmers of Mumbai, Thane, Raigad, Ratnagiri and Sindhudurg.

***Rearing of ornamental fishes***

For the starting of an ornamental fish farm, very sophisticated equipment is not necessary. Farmers procured young ones from breeders and rear them till marketable size. Fish farmers are used small earthen tanks for rearing juveniles in the backyard. Also farmers are used large earthen tanks, cement tanks, FRP tanks, plastic pools, plastic drums, etc. for rearing of larvae and juveniles. The small-scale farmers, who use to rear the fishes cannot afford artificial pelleted food or artemia. But they substituted it with low cost alternative live foods such as green water, water fleas, *Tubifex* or sludge worm, mosquito larvae and chopped earthworm.

***Export of ornamental fishes***

There are huge demands for export of fresh water and marine ornamental fishes. Hence, trained farmers may be encouraged to enter the export market. In fact, fish producers can become exporters so as to have the advantage of earning foreign exchange themselves. The MPEDA have many schemes for stimulation of ornamental fishes to export, but still it is not initiated on commercial basis.

***Marketing of accessories***

Many accessory industries also can be established for supply of rocks, gravels, artificial toys, natural as well as artificial plants, dry feed, live feed, aerators, filters, etc. are in use. These accessories material are required for the beautification and maintenance of aquaria in the ornamental fish industry. There is a great demand for all these accessories. Development and marketing of artificial feed for ornamental fishes is one of the important aspects of ornamental fish trade (Das and Sinha 2003).

**DBSKKV and Ornamental Fish Industry in Konkan, Maharashtra**

The Marine Biological Research Station, Ratnagiri is a one of the pioneer institute working in ornamental fish sector from its establishment. At present Aquarium and Museum of this research station is working at its Zadgaon field, and serving to near about 1.25 lakh visitors, including hobbyist, students, farmers, etc. This Aquarium and Museum creates awareness among visitors and develop hobby as well as business interest among them.

The technologies developed by the Marine Biological Research Station, Ratnagiri and Fisheries Research Station, Mulde of DBSKKV, Dapoli for the development of ornamental fisheries sector includes development of artificial flake food, named as *'fifoo'*; studies on fecundity, sex ratio and crossbreeding of different strains of Guppy; effect of thyroxine on hatching and on post-embryonic growth in *Brachydanio rerio* and *Cyprinus carpio*; the effect of sodium bicarbonate on the finnage and colouration of Guppy fish;the effect of sodium bicarbonate ($NaHCO_3$) on fry of rosy barb; the maintenance and breeding of Seahorses (*Hippocampus kuda*) in marine aquarium; mass culture of Gold Fish (*Carassius auratus*) round the year by induced breeding; development of artificial feed for some ornamental fishes; effect of different live foods on growth and survival of Seahorse (*Hippocampus kuda*, Signathidae) Ponies; production of live food such as rotifers and *Chaetoceros* sp. by using different diets.

As such no such technologies are been developed by DBSKKV, Dapoli but the technologies already available in scientific literature are being popularized through various extension media.

However, a recommendation has been accepted by

**Table 1**. Impact of trainings conducted by DBSKKV, Dapoli on the ornamental fisheries enterpreneurship development among the trainees.

| Sl. No. | Name of trainee | Impact of training |
|---|---|---|
| 1 | Vijay Rane | live-bearer fish rearing, established hatchery for breeding of Angel fish and Fighter fish |
| 2 | Akshay Kadam | Retailer of ornamental fish and aquarium |
| 3 | Chinmay Rane | Retailer of ornamental fish and aquarium |
| 4 | Rupesh Birje | Retailer of ornamental fish and aquarium |
| 5 | Suraj Belekar | Retailer of ornamental fish and aquarium |
| 6 | Krishikesh Kamble | Retailer of ornamental fish and aquarium |
| 7 | Chetan Salukhe | expansion in marine ornamental fish breeding and trade |
| 8 | Rakesh Sawant | expansion in marine ornamental fish breeding and trade |
| 9 | Sandesh Bambardekar | expansion in marine aquatic plants trade |

Maharashtra SAUs (2014) suggests that Gold fish – *Carassius auratus* @ 250 nos. per cubic meter in plastic lining pond and fed four times in a day with commercial shrimp feed @ 8% of body weight for 60 days to obtain better growth and survival

These institutes have also demonstrated the culture of ornamental fish (Koi carp) in polyethylene lined freshwater farm-ponds in collaboration with Matrumandir organization based in Devrukh, Maharashtra.

From year 2006, the DBSKKV offshoots have organized several training programmes of five days duration on ornamental fish breeding, rearing and management. Out of these, 3 trainings were organized specially on marine aquarium management. The main targets of these training programmes were to empower the hobbyist, rural and unemployed youths through entrepreneurship in ornamental fish sector. Research station also organized awareness programme on conservation of sea horses, new rules by Govt. of India on cruelty to aquatic animals and aquarium shop management, etc.

Trainees of these programmes have started or expanded their entrepreneurship activities in this sector (Table 1). There are around 20 numbers of aquarist in the Ratnagiri district alone and their complete livelihood depends upon this business.

**Success stories**

Name of the famer:-Shri Murari Shantaram Palekar, Address - At Post- Palekarwadi, Tal. Devgad, Dist. Sindhudurg. No such activity was earlier taken up by him as he was a Alphonso mango orchard owner and trader and now he has taken up the ornamental fish culture activity. Initially he used to get 3 to 4 lakhs from his orchard by selling and trading the mangoes but half of the income had to be spent for maintenance of mango orchard (*i.e.* fertilization, spraying of scheduled Pesticides and insecticides, labour wages). The mango orchard activity is very risky due to natural calamities and steep price fluctuation in major markets. But after taking up the ornamental fish activity he gets a steady yearly income of five lakhs and it has effectively doubled his income through this non-farm interention. He used to produce 36,000 number marketable size fishes from 0.02 ha area. He used to produce 3,000 fishes per month of different varieties like Angel, Severum, Goldfish, Live bearer varieties, Flower horn etc. He has a turnover of ₹ 4,50,000 year$^{-1}$ and incurred expenditure ₹ 1,90,000 year$^{-1}$ and got an income of ₹ 2,60,000 year$^{-1}$. He also helped the other ornamental fish culturist in marketing in Mumbai and gets good remuneration of this activity.

**Way Forward**

***Present barriers for wide spread adoption of technology***

- Marketing of ornamental fish in Mumbai market.
- Transportation of ornamental fish to major Market like Mumbai, Pune etc.
- No specific feed for ornamental fishes is available so shrimp feed is been used which is very costly.
- Live feed problem which is major constraint in seed production of ornamental fishes.
- Shortage of ornamental fish seed at reasonable price and availability of good brood stock.

***Constraints faced in ornamental fish sector***

Some of the constraints faced by the industry were analysed and the same are recorded as under:

- Technical know-how on breeding, biology and behaviour aspects, nutrition and feed formulations, disease diagnosis and comprehensive health management.
- Fabrication of aquarium associated equipments such as aquarium tanks, aerators, fitters, etc.
- Lack of skilled manpower.
- Non-availability of quality brood stock and quality seed.
- Marketing of the produce being in the hands of few wholesalers, the growers are not getting remunerative prices.

DBSKKV, Dapoli has initiated several programmes for the establishment of linkages between aquarist, breeders and other entrepreneurs. However, the linkages between government organizations, state agricultural universities and ornamental fish farmers need to be improved. For the further development purpose this research station is working on marine ornamental fishes, their availability in by-catch on-board vessels and live fish transportation, etc.

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