

# **Present status, challenges and scope of ornamental fish trade in India**

## **Introduction**

Ornamental fish keeping at home is emerging as one of the most popular hobbies in the world. Aquarium keeping is said to be the second largest hobby next to photography in the world. Aquarium fish and accessories industry is fast gaining importance due to its tremendous economic opportunities and prospects. Minimum requirement of space and/or attention compared to other pet animals is the reason for growing interest in keeping aquaria all over the world. Further setting up of an aquarium is relatively inexpensive and can be installed in any location at home, where there is a diffused light. Ornamental fish keeping and their propagation have been an attractive activity for many people in the world, which provide not only aesthetic beauty and pleasure but also financial benefits. Aquarium keeping has become increasingly popular in developed countries. In developing countries including India, keeping aquarium at home is gaining its momentum. The brilliant, flamboyant colour and attractive appearance of certain fishes appeal to everyone. About ten per cent peoples in the world keep aquarium in their homes. People keep fish in their homes for variety of reasons: for decoration, children's education, enjoyment, good fortune and to collect rare species or even to propagate them. Indian waters possess a rich diversity of ornamental fish, with over 250 indigenous varieties with rich biodiversity hotspots like north-eastern states, Western ghats, Andaman & Nicobar islands and Lakshadweep. In addition to the above, many exotic species that are bred in captivity are also being exported from India.

Ornamental fishes are peaceful, generally tiny and available in attractive colours and capable of living in confined spaces like aquarium condition or garden pool. They are often called as 'living jewel' due to their colour, shape, behaviour and origin. Ornamental fish production is a multibillion dollar industry in the world. Initially, developed countries were the major ornamental fish keepers as attractive hobbies but recently it has been gaining momentum in developing countries too as they now contribute about two third of the total export value. Overall it is the growing interest in aquarium fishes that has resulted in steady increase in aquarium fish trade globally. Around 2000 species and 1.0 billion ornamental fish are traded annually, involving more than 100 countries, in the ornamental fish trade but only some 30-35 species of freshwater fish dominate the market. The developing countries continue to be the major source of ornamental fish. The UK is the largest importer of ornamental fish followed by USA, whereas, Singapore is the major exporter. In India, aquarium hobby is about 70 years old. In spite of having immense potential, India's contribution to the international ornamental fish trade is negligible. If the resources are managed properly, India can be one of the leaders of the world ornamental trade in coming years.

## **Benefits of aquarium fish keeping**

This has been well established that aquarium fish can fetch about 100 times more price than the food fish and marine ornamentals are about ten times costlier compared to freshwater

fishes. Profitability of an ornamental fish-exporting unit works out to be highly lucrative, provided the activity is taken up on scientific lines with appropriate marketing strategies. The ornamental fish culture and breeding activity is possible not only on large scale but on a small scale basis as well. It provides good opportunity even to small entrepreneurs. Institutional funding for research and development activities is, however, essential. Commercial banks can formulate schemes for extending financial assistance to prospective entrepreneurs for short-term training programs on production of ornamental fishes. Two of the major areas which require urgent attention are (a) in-house breeding of selected species of marine ornamental fishes which are in great demand to release the pressure on wild capture and (b) scheme for educating/training of fisher folk in more skilled and specialized techniques of collecting, handling, sorting and transport of ornamental fish which could revolutionize the fishery industry to greater extent.

### **Criteria for ornamental fishes**

The usual criteria of the fish to be classified under ornamental fish are attractive look with beautiful colouration, adaptability to live in small confined areas, peaceful nature and compatibility to live with other fishes, ready acceptability of artificial feed and size of the fish should be suitable for aquarium keeping like gold fish, angel fish, guppy, discus, tetra, gouramy, etc. But, it has been now claimed that in order to qualify for any fish to be called as an ornamental fish, it is not necessary for a fish to have very beautiful colouration. A common fish with a single dark streak or a blotch on its body is enough to qualify it as an ornamental fish. The natural dark colour with stripes, dots, blotches, brilliant silvery colour with yellow or pinkish hues, all have made fishes to get classified as ornamental fishes. Even a slow moving or sedentary fish and that having body movements, mouth, opercle or fin movements are considered a fish for aquarium. Thus, few criteria can be added to the traditional ones for selecting indigenous ornamental fish are- unique/ unusual appearance (Devil catfish, *Chaca chaca*), peculiar nature (colour changing *Badis badis*), rare species (colouring cheng, *Channa bleheri*).

### **Ornamental fish resources in India**

India possesses rich resources of marine ornamental fishes such as the lagoons and coral reefs of Lakshadweep and Minicoy islands, Andaman and Nicobar islands, Gulf of Kutch, Coast of Kerala, Gulf of Mannar and Palk Bay are abound with highly attractive and varied species. The potential with regard to the freshwater ornamental fishes inhabiting the hill streams, major river systems, reservoirs and lakes are immense. Rivers of north-eastern states and their Himalayan streams have an abundant variety of ornamental fish species. In India, the north-eastern states play leading role in ornamental fish trade. India has recorded at least 150 commercially important ornamental fish species and trade mainly indigenous freshwater species, collected from rivers, streams, wet lands, etc. Prominent among the freshwater Indian ornamental fish are loaches, eels, barbs, catfish and goby. About 90 per cent of ornamental fish is traded from Kolkata port followed by 8 per cent from Mumbai and 2 per cent from Chennai. India's share to global ornamental fish trade is less than one percent but still she is projected as a "sleeping giant" because of yet untapped potential resources.

## **Ornamental fish trade in the world**

The average annual growth rate of ornamental fish trade in the world is 14 per cent since 1985 and the entire value of the industry inclusive of retail sales, associated materials, wages and non exported product was estimate to be US\$ 15 billion. The global market of ornamental fishes for public aquaria and research institutes is less than 1 per cent at present and over 99 per cent of the market continues to be confined to hobbyists. Although, freshwater species have dominated the ornamental trade in terms of value and volume, from the end of the 20<sup>th</sup> century the trade in marine tropical species and live coral reef appears to show an increasing trend.

The world trade of ornamental fish is estimated to be US\$ 6.0 billion. The developing countries continue to be the major producer of ornamental fish. Above 60 per cent of ornamental fish is originated from developing countries in 2015. It is reported that global imports and exports of ornamental fish in 2015 were valued at US\$ 271 million and US\$ 304 million, respectively. In 2015, USA was the largest importer of ornamental fish accounting for US\$ 49.67 million followed by United Kingdom (US\$ 24.31 million), Germany (US\$ 18.62 million) and Japan (US\$ 15.71 million), Singapore (US\$ 14.33 million). During 2015, India's import for ornamental fish was US\$ 0.34 million, with a ranking of 51, in the world. In 2015, top exporters were Singapore (US\$ 45.44 million), Spain (US\$ 36.07 million), Japan (US\$ 31.08 million), Czech Republic (US\$ 20.43 million) and Indonesia (US\$ 19.67 million). In the same year, India's export was only US\$ 1.02 million, with a ranking of 29<sup>th</sup> in the world. Asia is still the major ornamental fish supplier for USA and Europe with Singapore remaining the hub of Asian ornamental exports. The export of Singapore has decreased recently and still significant player in the trade.

Marine ornamental fishes are mostly harvested from the wild, with only 1 to 10 percent of species in trade estimated to be captive-bred. In the 1990's, the estimated annual global retail value of the marine aquarium fish reached US\$ 200 million and involved an estimated 35 million marine fishes. The marine aquarium fish trade accounted 12 per cent in terms of value. By contrast, approximately 90 percent of freshwater ornamental fish were reported to be captive-bred. It was estimated that about 14 to 30 million coral reef fish were collected every year for the aquarium trade and annual global trade in marine species of between 20 and 24 million fishes.

## **Present status of ornamental fish farming and trade in India**

India is blessed with a rich diversity of freshwater fishes both in the North-Eastern hills and Western Ghats. Among the 300 species of freshwater fishes in the Western Ghats, 155 are considered ornamental; of which 117 are endemic to the Western Ghats. At present, only a small fraction of the endemic fish diversity is utilized in ornamental fish trade in the domestic market and major share of ornamental fishes marketed in India are exotic varieties. Even though there are quite a lot of indigenous fishes, having high potential as ornamental fishes, they have not been properly exploited. The fish fauna of the Western Ghats include variety of barbs, rasboras, killifishes, glass fishes, catfishes, catopra, hill trouts, and danios, which are suitable candidates for ornamental fish trade. More than 100 varieties of indigenous freshwater ornamental fish

species are known in Indian waters. Some of the species fetch high price in the world market and support trade outside the country. This ornamental fishes due to the nature of breeding are broadly classified as live bearers and egg layers. Molly, platy, guppy and swordtail are typical examples of live bearers. Gold fish, barbs, koi carp, gouramies, fighters, oscars, discus, chichlids, gouramies, etc are egg layers.

The potential of streams and rivers of the Western Ghats as a rich source of the ornamental fish is yet to be recognized. About 80% of ornamental fishes are from freshwaters and the rest from brackish and marine waters. Most of the ornamental species are warm water tropical except some eurythermal carps like gold fish, koi, which are cold temperate in origin and now having a world wide distribution. Ninety per cent of the freshwater ornamental species are farmed and wild species through capture are only 10%. Incase of marine and brackish water species reverse is the case. The north-eastern states contribute around 85% of the total market and the rest comes from the southern states of India. There are about 58 indigenous ornamental fishes occurring in the North Eastern states are currently being exported. Demand for different indigenous ornamental fishes changes from year to year. Most potential species from north-eastern states for aquarium fish are *Botia dario*, *Dania dangila*, *Puntius shalynius* and *Schistura reticulofasciatus*.

The ornamental fish exports from India showed an increasing trend and an exponential growth over the years. The share of India in world ornamental fish exports fluctuated and remained less than one per cent for most of the years. India's share in world market ranged from 0.12% to 1.16% during 1991-2009. India gained highest market share of 1.16% during the year 2007. In 2008 it had a share of 0.64% which again declined to 0.33% in 2015.

In contrast to the freshwater ornamental fishes, marine ornamental fishes are the most popular attractions in worldwide due to their adaptability to live in confinement. The variety of shapes, sizes, colours, behavior and ecology exhibited by reef fishes is amazing. In Gulf of Mannar, a total of 113 marine ornamental finfish species have been recorded under 24 families of which the family Acanthuridae, Balistidae, Chaetodontidae, Haemulidae, Labridae, Pomacanthidae, Pomacentridae, Scaridae and Syngnathidae have a very rich biodiversity perspective in Gulf of Mannar.

#### ***a. Market destination***

The major destination for export of ornamental fishes from India is Singapore followed by Japan, USA, Malaysia and Germany. Markets for Indian ornamental fish have never been consistent and there has been a regular fluctuation with respect to destinations since the geographical spread of the markets has exhibited an ever changing hue. Singapore, USA, Hong Kong, Malaysia and Japan were India's favourite top five market destinations during 2003-09 which jointly accounted for about 70% of total export of ornamental fishes from India. Amongst them Singapore alone accounts for almost 43% of total export in ornamental fishes followed by Japan (14%) and Malaysia (10%). USA and Hong Kong both accounted for 7.5% each during the same period.

### **b. Unit value realization**

The market values of ornamental fishes have been fluctuating over the years. The average world unit value was very high about US\$23.6/kg in 1991 which later on decreased steeply to US\$5.1/kg in 2000. Among the major exporters, almost all except Japan faced a decline in their unit value realization during the period. This shows instability in supply/price of ornamental fish trade during 1991-2000. During 2001-2009 there was less fluctuations in the unit value realization in ornamental fish exports as compared to earlier decade. In initial years, India concentrated more on exporting high priced fishes, resulting in higher value realization even with small quantity of export. Though the quantity exported declined, the total value of export was compensated by the substantial increase in unit value (US\$), realized over the years. India seems to have gained high value per unit of exported quantity in most of the years which shows the better performance of India in terms of Unit value realization for the ornamental fishes.

### **Women self help groups (SHG) in ornamental fish farming**

The culture of ornamental fish is becoming a source of income day by day for the rural people and semi-urban areas. Few people in our country are maintaining their livelihood through ornamental fish culture. As part of the poverty alleviation measures, the Government of India launched the Swarnjayanti Gram Swarozgar Yojana (SGSY) in 1999 where the major emphasis is on self help group (SHG) formation, social mobilization and economic activation through Microcredit finance. These groups use participatory processes to provide opportunities for people to share knowledge, common experiences and problems. Through their participation, members help themselves and others by gaining knowledge and information and by obtaining and providing emotional and practical support. Now, ornamental fish farming is included as one of the activities of SHGs and also plays an important role to maintain livelihood of the local people.

### **Commercially important ornamental fishes**

Different varieties of ornamental fishes including very difficult to breed and costly fishes are produced and traded in the global ornamental fish market. But, among all the ornamental fishes, gold fish and angel fish are the most sought after ornamental fish in the world. Gold fish is native of Eastern Asia. Angel fish is a choice of all the beginners due to its lovely appearances. It is regrettable that the endemic ornamental species were until recently neither promoted nor its potential realized. The species dominating in the market are being mostly of South American origin. The top ten brands are the tetra, guppy, gold fish, catfish, molly, gourami, platy, loach, cichlid and the barbs. Among the 30 to 35 species of aquarist's favorite species, only a few are of Asian origin- *Brachydanio rerio* and *Puntius conchonius* being the most common. Hill stream fishes belonging to the genera *Balitora*, *Barilius*, *Garra*, *Homaloptera*, *Lepidocephalus*, *Nemacheilus* are considered to be cold water species and found in warm waters too and could be easily acclimated to the stagnant water conditions in the aquaria condition and their multiplication can be achieved.

### **Sustainable harvesting of indigenous ornamental fishes**

Utilization of ornamental fish resources in sustainable manner is an important aspect of conservation. The ethics of the trade is a very important point to look into. Utmost care should be taken to minimize mortality in wild-caught fish and considerable progress is being made. The nature of the aquarium market in western countries and Japan is that they want high quality fish are wanted. Improved packing technology allows high stocking densities for longer periods. Freshwater ornamental fish in general are relatively easy to acclimatize. The transit of fishes through right channels also decreases the time between packing and unpacking on arrival at its destination. Improvement in transport arrangements and choice of export point are very important considerations in the ornamental fish trade.

A wide range of collection methods are used, with scuba commonly being used. The industry has often received negative publicity concerning damage from collection methods and high rates of mortality, although such malpractice is considered to be the exception rather than the norm. Considerable skill is required to collect fish efficiently without causing damage to the habitat. Techniques vary and may be specific to a particular species. Lines with small barbless hooks are used for species that are difficult to trap and tubular nets may be used to catch species that live in burrows as they are tickled out of their hiding place. Different types of non-destructive nets are used in Sri Lanka, Australia, Hawaii and the Pacific. In Philippines and Indonesia, many marine ornamental collectors are free divers, who collect using hand-made goggles and fins and sometimes a piece of rock to go deeper in a short time. Similar techniques can also be employed in Indian waters to harvest costly marine ornamental fishes.

### **Conservational strategies of natural resources**

Intensive and selective catching techniques and dynamite fishing pose major threats to the delicately balanced reef ecosystem and this is of particular concern in marine ornamental fish trade. These unscrupulous practices result in natural stock depletion. Additionally, overdependence on natural populations, coupled with the increasing demands, jeopardise the future of the ornamental fish industry. Developing and utilizing aquaculture techniques, such as broodstock management and captive breeding to supply fish to the trade can ease the pressure on wild-capture and thus reduce overexploitation of the reef fish. This should receive the highest priority to stop supply of sick fish to the market abroad, to save the wild stocks from depletion, to save the fragile coral environment from destruction, to avoid conflicts over fishing rights and to provide continuous and increased opportunities particularly in rural sector. Emphasis should be given for the protection of environment, adoption of non-destructive capture methods, monitoring the exploitation, breeding and culture as well as establishment of sanctuaries, formulating policy of exploitation and export of marine ornamental fishes for better economic return in the sector.

The concept of marine public aquaria should receive greater attention in our country. These aquaria stimulate interest and develop knowledge about marine aquatic environments. Conservation is reflected in a subtle blend of science and art, reminding visitors that our quality of life depends on a fragile balance which must be nurtured by all of us. The benefits from

establishment of public seawater aquaria could be summarized as (a) they offer an educational window to a diversified aquaculture world from which some of us make a living. (b) facilitate families to observe a simulated natural habitat of a variety of species without donning a wet suit. (c) create awareness on the importance of ecology and (d) provide first hand experience with state of art of technology in aquaculture. Technologies on handling, packaging and transportation of live marine ornamentals, marine aquarium setting and maintenance, captive propagation and seed production have to be perfected and transferred to the fisher folk for better profits.

### **Breeding and culture in captivity**

Standardization of captive breeding technology of many of freshwater ornamental fishes has been established. In contrast only a few of marine species could be successfully bred in captivity. One of the main obstacles in the establishment of a marine ornamental fish industry is the complex nature of the reproduction and rearing of the larvae of these fishes in captivity. Due to the efforts of a small number of private entrepreneurs, a few species of marine ornamental fishes could be commercially raised but governmental support has been insignificant. Some important issues need to be considered in the propagation of marine ornamentals, such as broodstock development, larval management, larval tank characteristics, environmental conditions, water management, larval nutrition and disease control. The Tropical Marine Centre (TMC) in UK is one of the major commercial producers of hatchery reared clown fishes. The TMC is Europe's premier importer and wholesaler of a wide range of marine ornamental organisms including mollusks, live rocks and crustacean. There are also a few reports of spawning of marine ornamental fish in aquaria such as *Amphiprion clarkii* and *A. percula*.

### **Aqua Aquaria India**

Aqua Aquaria India is one of the largest aquaculture products shows in Asia, organized by the Marine Products Exports Development Authority (MPEDA), Ministry of Commerce and Industry, Government of India, as a biennial event concentrating on the aquaculture and ornamental fish culture sectors. The exhibition at Vijayawada organized involving recent developments in aquaculture and ornamental fish sectors focusing on themes relevant for the development of the sectors attracting large number of farmers, hatchery operators, feed manufacturers, input suppliers, manufacturers and suppliers of various aquaculture and aquarium implements, scientists and experts from around the world. The 3<sup>rd</sup> edition (2015) of the event was an overwhelming success with 155 exhibitors, 5000 delegates and thousands of visitors at the expo. Aqua Aquaria India is an ideal platform for farmers, hatchery operators, feed manufacturers, input suppliers, manufacturers and suppliers of various aquaculture and aquarium implements, scientists and experts from around the world to update the latest developments in the field of fisheries and aquaculture with special emphasis on ornamental fisheries development in India.

### **Problems and prospects of ornamental fish industry**

In India, the ornamental fish sector is facing many problems including technical and economic aspects. The major constraints are lacks of technical know-how, scientific information regarding breeding, types of feeds and feeding and health management. Most of the entrepreneurs are not aware that this upcoming sector/industry is far more lucrative than the shrimp, involving much less capital and little risk. India could not make any big headway in the export of marine ornamental fishes so far due to non availability of infrastructure. Most of the indigenous ornamental fishes of India are low priced and used as food fish in rural areas/ small towns due to lack of awareness. The Indian ornamental fish trade is not well organized in many aspects.

Present export of ornamental fishes from India is mainly confined to freshwater varieties and mainly fishes from the North-Eastern states. Our country is rich in natural water bodies and species diversity, which has a great potential to increase the export earning to more than US\$ 20 million every year. Aquatic plants of ornamental value are also available in our water bodies. Apart from natural collection, cultivation can also be practiced for these plants to meet the ornamental fish industry demand. There is also a tremendous scope of entrepreneurship development in aquarium and its accessories with less capital investment.

### **Strategies for improvement of ornamental fish industry in India**

Even though, India has vast ornamental fish resources in freshwater and marine sector, but the industry is not yet organized, due to which contribution to the global trade is insignificant. With proper utilization of these resources, export earning of the country can be increased to many folds. To improve the ornamental fish industry in India, the following important strategies are recommended:

- ✓ Systematic studies on the different aspects of feeding and reproductive biology of indigenous ornamental fish.
- ✓ Commercial farms with necessary infrastructural facilities and due support by technical experts are necessary to be set up for mass production of these fishes.
- ✓ Culture, breeding and marketing of indigenous ornamental plants should be given due emphasis.
- ✓ Ornamental fish breeding and rearing unit should have constant supply of good source of water and electricity.
- ✓ Farms with small-scale production capacities need to be provided with necessary support for enhancing their output.
- ✓ Brooders chosen should be of superior quality to obtain healthy and high quality offspring having good demand in domestic as well as international market.
- ✓ Regular supply of feed ingredients like oil cakes, rice polish and wheat bran, and animal-based protein such as fish meal and prawn-head meal, should be available for preparation of pelleted feed for ornamental fishes.
- ✓ Application of probiotics, which helps the well being of the host animal and contribute, directly or indirectly to protect the host animal against harmful bacterial pathogens.



- ✓ Incorporation of pigment rich locally available ingredients through diets to impart a desired colouration of cultured ornamental fish to increase market price.
- ✓ Improvement of transportation facilities to supply of ornamental fish into domestic and international markets with minimum stress to the live fish.
- ✓ Complete knowledge on market demand, customer preference and the process of a marketing network through personal contacts and public relation is essential.
- ✓ People involved in breeding and export should always be kept in touch with the recent developments in breeding, rearing and marketing as well as research advancements in the field of ornamental fisheries.
- ✓ Ornamental fish farms are necessary to be equipped with fish pathology laboratories with basic facilities to overcome disease outbreaks in the system.
- ✓ Establishment of health centers for quarantine certification at key locations to meet the desired standards of the importers is essential.
- ✓ Frequent organization of training on different aspects of aquarium management by resourceful institutes for short and long durations depending on the clientele groups and requirements are necessary to boost the ornamental sector.

## **Conclusion**

The trade opportunities of ornamental fishes from India have been recognized by the producers, collectors and traders both nationally and internally. Business opportunities in ornamental fish farming can be realized by production, marketing and wild catch of ornamental fishes. Even though, India is one of the global hotspots of ornamental fish biodiversity but its ornamental fish trade is based mostly on wild collection. To conserve these species and to get economic benefit on sustainable manner, development and due attention is required. There is ample scope to develop entrepreneurship on the indigenous fish and plant species having ornamental value. Apart from the ornamental fish, there is a scope for the development of industry on live food and artificial feed and aquarium accessories required for ornamental fish keeping. More intensified research and development in both fresh and marine water fishes can lead to development of culture technologies for many species of demand in the aquarium trade in the globe.

There is no proper policy for the development of ornamental fish industry in India, especially in the export trade at present. More initiatives by the government like providing incentive to establish ornamental fish production units, considerable private investment can be attracted to this industry, which would generate additional employment opportunities and improvement of livelihood of the community. With the intensive efforts of all stakeholders, the ornamental fish farming can be developed substantially in the region and thereby will gain a larger share in the global market. Public private partnership can be encouraged through establishment of ornamental fish production units in different parts of the region to make this sector more vibrant and remunerative for employment generation and livelihood improvement.

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