**STRATEGIES FOR SUSTAINABLE GROWTH IN INDIA'S ORNAMENTAL FISHERIES SECTOR**

***B. Nightingale Devi, Sachin Sahu, Dushyant Kumar Damle and Basant Singh***

*Late Shri Punaram Nishad College of Fisheries, Kawardha (Chhattisgarh) -491995*

*Department of Fisheries, Kawardha, District- Kabirdham(C.G.)-491995*

*Corresponding author mail ID: devi.cof12@gmail.com*

The global ornamental fish industry boasts a staggering worth of US$ 15 billion, encompassing accessories and aquarium trade, with over 2 billion live ornamental fish exchanged. Despite the diverse array of approximately 2500 traded species, a mere 30-35 freshwater ornamental fish species dominate the market (Nair, 2012). Notably, the international ornamental fish trade's retail value surpasses US$ 8 billion, with the broader sector, including tanks, plants, accessories, feed, and medicines, approximating US$ 20 billion (Swain *et al.*, 2010). Beyond the export arena, India's domestic ornamental fish trade is estimated at nearly INR 15 crores, primarily concentrated in states like West Bengal, Maharashtra, Karnataka, Tamil Nadu, and Kerala. Presently, Kolkata, Chennai, and Mumbai serve as thriving ornamental fish trading hubs in India (Mahapatra *et al.*, 2000; Ghosh *et al.*, 2003; Ponniah *et al.*, 2008; Ambilikumar and Mercy, 2012). The domestic ornamental fish breeding landscape, however, remains fragmented and uncoordinated. In Kolkata, ornamental fish farms are dispersed across North and South 24 Paraganas, Nadia, Hooghly, and Howrah districts, involving around 2000 individuals (Ponniah *et al.*, 2008). Kolathur, near Chennai, witnesses the flourishing of 300 small-scale units managed by approximately 600 families. Meanwhile, in Ernakulam, Trivandrum, and Thrissur, about 100 commercial-scale ornamental fish units have arisen. Mumbai and its suburbs feature around 200 such units (Ponniah *et al.*, 2008; Devi *et al.*, 2013). Kerala's ornamental fish sector experienced remarkable growth from 1998 to 2009, embracing over 1000 practitioners (Ambilikumar and Mercy, 2012). The role of wholesalers proves pivotal, bridging the producer-consumer gap across states. Unfortunately, a multitude of intermediaries within India's ornamental fish market chain contributes to inefficient marketing and, consequently, diminished returns for producers (Devi, 2013).

Despite its substantial potential, the growth of ornamental fisheries in India remains constrained by an array of factors, varying from region to region due to diverse climatic conditions and resource availabilities. Table 1 presents a snapshot of these constraints, categorized between export and domestic sectors.

**Table 1. Constraints in Ornamental Fisheries in India**

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| **Sl. No.** | **Constraints identified** | **Authors** |
| ***Exports sector Studies*** |  |
| 1 | Breeding technology, freight charges and lack of incentives | Nopany (1986) |
| 2 | Wild collection, heavy exploitation, lack of quality foodstuff, inappropriate infrastructure, inadequate training and poor technology | Ajithkumar *et al.*, (2012) |
| 3 | High air freight, inadequate volume for making a full consignment | Shekharan and Ramachanadran (2007) |
| 4 | Inadequate transport facilities, high air freight, non-availability of brook stock of exotic fishes, lack of professional training in breeding, packing and handling, poor marketing strategies, restrictions on exports of marine fishes and invertebrates | Sane ( 2007) |
| 5 | Need for import of new variety of ornamental fishes, increased frequency of flights to major export markets and collaboration with foreign entrepreneurs | Kumar (1999) |
| 6 | Proper infrastructural facilities at reasonable rates | Alikunhi (1982) |
| 7 | Lack of technology transfer, poor disease management, lack of knowledge in advanced breeding techniques and inadequate air cargo facilities | Wijesekara and Yakupitiyage (2001) |
| ***Domestic Sector Studies*** |  |
| **1** | Illegal collection of marine ornamentals, use of cyanide in collection practices | Madhu *et al.* (2012) |
| **2** | Disproportionate profit sharing | Mandal *et al.* (2007) |
| **3** | Unorganized supply, lack if standardization and improper bargaining system | Ghosh *et al.* ( 2007 ) |
| **4** | Scattered production units, low volumes of production | Sundaresan (2011) |
| **5** | Poor ornamental fish resource assessment, lack of institutional finance, uneconomic breeding technologies, poor transportation facilities | Ziauddin *et al.* (2007) |
| **6** | Production, technical, financial, marketing and capacity building constraints, need for equating ornamental fish breeding and culture to agricultural sector for power and water charges, lack of quality consciousness | Sekharan (2008) |
| **7** | High power tariff, lack of training, insufficient infrastructure and space, shortage of quality brood stock and irregular demand | De and Ramachandran (2011) |
| **8** | Multiple institutional agencies and lack of institutional networking | Mukherjee and Das (2005) |
| **9** | Need for improved communication between stake holders | Oliver (2001) |

Different Constraints Factors that affects the Ornamental Fisheries industry in these major ornamental fisheries state Viz. Kolkata, Chennai and Tamil Nadu were discussed as below

1. **Absence of standardized Breeding Technique**: The lack of standardized breeding techniques hampers efficient production processes and quality control, leading to inconsistencies in ornamental fish output.

2**. Inadequate Live Feed**: Limited availability of live feed, which is one of the important components for ornamental fish culture, affects fish health and growth, posing a challenge to sustaining optimal conditions in the culture environment.

3. **Inadequate Knowledge on Health Management**: Insufficient understanding of health management practices increases the risk of disease outbreaks, impacting the overall well-being and marketability of ornamental fish.

4. **Seasonal Effect on Production**: Fluctuations in production due to seasonal variations can disrupt supply and demand dynamics, affecting market availability and pricing.

5**. Energy Deficits**: Energy shortages can impede proper maintenance of facilities, water quality, and temperature control, compromising the health and growth of ornamental fish.

6. **Lack of Education and awareness of those handling the ornamental activities**: Limited education levels and awareness among stakeholders hinder the adoption of advanced techniques, sustainable practices, and access to information necessary for successful ornamental fish culture.

7. **Inadequate Water Supply**: Insufficient access to clean and suitable water affects fish health and growth, leading to suboptimal conditions and reduced market quality.

8. **High Rental Value**: High rental costs for business premises can increase operational expenses, reducing profit margins for ornamental fish farmers and traders.

9. **Lack of Institutional Credit**: Difficulty in accessing institutional credit limits investment opportunities, inhibiting the expansion and modernization of ornamental fish production.

10. **Dependent on Moneylenders**: Relying on informal moneylenders for financial support exposes stakeholders to high interest rates and financial instability.

11. **Inadequate Training Programmes**: Insufficient or ineffective training programs hinder skill development and innovation among ornamental fish farmers and traders.

12. **Lack of Market Infrastructure and market strategies**: The absence of proper market infrastructure negatively impacts distribution, storage, and market access, hindering the growth of the ornamental fish trade. And so insufficient marketing strategies limit market exposure and growth potential, restricting the reach of ornamental fish products to consumers.

13. **Locational Disadvantage**: Geographical disadvantages, such as remote or inaccessible locations, can limit market access and increase transportation costs.

14. **Inadequate Knowledge on Packaging and Transportation**: Packaging is one important factor that reduces stress and mortality of the fishes Poor knowledge of proper packaging and transportation methods leads to higher mortality rates during transit and reduced product quality upon arrival in the market.

15. **Changes in Consumer Preference**: Shifting consumer preferences and trends can result in decreased demand for certain ornamental fish species, affecting market sales and profitability.

16. **Poor Extension Support**: Insufficient outreach and extension services hinder the dissemination of best practices, technical knowledge, and innovations to stakeholders.

17. **Competition**: Intense competition within the ornamental fish market challenges market positioning, pricing, and differentiation of products.

20. **Poor Maintenance of Record and Document**: Inadequate record-keeping and documentation practices hinder data-driven decision-making, traceability, and business planning.

Addressing these constraints comprehensively through targeted interventions, capacity-building, and policy measures is crucial to fostering sustainable growth and development in the ornamental fisheries sector.

**Strategies for Overcoming Constraints in Different Locations**

It is crucial to acknowledge that the constraints impacting the ornamental fisheries' development. Given the differing constraints within the state and different location, addressing these constraints demands tailored strategies for each distinct set.

* Both production and market infrastructure issues: Immediate attention is required to address production-related challenges such as energy, water supply, seasonality effects, and lack of improved equipment facilities. Additionally, market infrastructure shortcomings, including a lack of market infrastructure and high rental values, necessitate intervention. Establishing a robust institutional framework is imperative to organize and sustain this sector.
* The marketing constraint is evident in this sector. Focusing efforts on rectifying marketing challenges will be pivotal to establish a stable growth trajectory. Organizing the unstructured sector through institutional efforts is crucial.
* Disease management strategies and competition-related hurdles need to be tackled. Comprehensive extension and information dissemination programs, backed by research institutions, should be devised to address disease management. Ensuring buy-back arrangements for start-ups can foster their growth and marketing capabilities.
* Cooperative efforts among ornamental fisheries cooperatives are essential to tackle management issues collectively, leading to improved production, marketing, and management outcomes.
* Addressing operational difficulties concerning packaging, transportation, and insufficient knowledge requires targeted efforts. The Department of Fisheries (DoF) should work to alleviate these operational hindrances.
* The low level of education must be overcome to enhance awareness of institutional credit and state-sponsored training programs, thus enabling full sector development.
* Overcoming energy, water supply, and live feed challenges, vital inputs for the sector, necessitates robust institutional arrangements. Proper maintenance of records and systematic training programs should also be a priority.
* Enhancing education levels among producers is crucial to improve their capacity to handle market competition. Effective extension support from the Department of Fisheries and related agencies will empower producers with marketing strategies.
* Urgent attention to market infrastructure, operational credit availability, and regularization of extension efforts is imperative. SHGs and Producer Companies can be promoted with proper training. Promoting organized production and marketing through SHGs and Producer Companies can alleviate market infrastructure constraints and enhance credit availability.
* Strengthening institutional relationships and promoting effective cooperation among stakeholders will address the constraints related to contact with experts, maintenance of records, and cooperation.
* Establishing well-structured extension programs covering breeding, rearing techniques, health management, packaging, transportation, and strategies for handling seasonal variation is essential. Strengthening stakeholder coordination and knowledge dissemination is vital to overcome these constraints.
* Facilitating efficient transportation and knowledge sharing among stakeholders will alleviate constraints related to inadequate knowledge on health management and packaging.
* Promoting awareness of proper management practices and conducting outreach programs can address the limitations caused by inadequate stakeholder awareness.

A tailored approach is essential to address the specific constraints within each set for different ornamental fisheries centers. By implementing focused strategies and institutional interventions, the ornamental fisheries sector can progress towards sustainable growth and organized development.

**Conclusions**

The promotion and cultivation of ornamental fishes in India have garnered the attention of key agencies such as the Marine Products Export Development Authority (MPEDA), National Fisheries Development Board (NFDB), National Cooperatives Development Corporation (NCDC), and National Bank for Agriculture and Rural Development (NABARD). These agencies are actively involved in various initiatives across different regions of the country where the potential for ornamental fisheries is substantial. This sector distinguishes itself by offering enticing benefits, including low investment requirements, attractive returns within a short gestation period, a diverse range of ornamental species, and a growing demand in both national and international markets. The sector's dynamic nature also allows for the development of new products and accessories to meet evolving market needs.

The establishment of ornamental fish cooperative societies and Self-Help Groups (SHGs), often supported by state and central governments or through joint integrated efforts, has contributed to the sector's growth. Notably, women-centric ornamental fish cooperative societies have thrived in West Bengal, becoming a primary source of livelihood in rural areas and providing regular income to families. In locations such as Kolathur, Chennai, homestead ornamental fish culture has generated significant income, with households earning up to INR 20,000 per month. The involvement of women, exemplified by the Kumbalam Panchayat Ornamental Fish Farmers’ Welfare Society (KPOFFWS) in Kerala, underscores their potential to uplift communities and combat poverty.

Ornamental fish production distinguishes itself from other aquaculture practices due to unique characteristics. The trade involves live organisms, demanding meticulous care, experienced handling, live packaging, transportation, and after-sales service. After-sales service is a pivotal component of the ornamental fish trade, contributing to the sophistication of the market, especially in metropolitan areas. A significant proportion of ornamental fish production operates within the livelihood segment. These seemingly disparate production systems are united by market dynamics rooted in age-old traditions, as seen in Kolkata's Gallif Street market. The Kolathur culture center in Chennai, with its foundation in homestead ornamental fish culture, demonstrates how local conditions, such as freshwater availability and sewage treatment plants producing live feed, can shape the development of the sector. The Mumbai market, bustling with activity, exemplifies the intricate web of ornamental fish culture, procurement, marketing, and after-sales arrangements.

Despite its substantial potential in both domestic and international markets, the ornamental fish trade remains largely unorganized, often due to improper marketing techniques and inadequate awareness among stakeholders and institutions. Coordinated efforts involving all agencies and stakeholders could pave the way for the breeding of indigenous and exotic ornamental fish species, opening up new horizons for the sector's horizontal and vertical expansion. By addressing these challenges collectively, the ornamental fish industry can further flourish and contribute to the socio-economic development of the country.

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