

Ornamental Fish Culture: A Way Towards Sustainable Development and Alternative Livelihood for West Bengal Fisherwomen

Biplab Bhowmik* and Bipasa Dey¹

Keywords: Ornamental Fish, West Bengal, Ornamental Fish culture, Alternative Livelihood, Women Empowerment

Abstract:

The ornamental fish trade sector is gaining importance since past few decades. Demand for aquarium fish in both domestic and international markets is increasing constantly. India is rich in the biodiversity of freshwater and marine ornamental fishes but its contribution to the international trade is significantly low compared to the demand. Three main states contributing to the export of ornamental fish are West Bengal, Kerela and Tamil Nadu out of which West Bengal is the leading state. Still many fishermen community in the state are economically backward since they don't earn sufficient from fishing and many have to opt for other income sources like labour work. In this scenario, breeding and culture of ornamental fish could be a very good alternative source of income for these fishermen. Ornamental fish culture requires very little space, low investment and little labour force. This culture can also be done in the house's backyard in small circular or rectangular tanks. Since it can be done easily in the house with minimum labour, women can also engage in this activity and make a remarkable contribution towards this business. It can also provide them with financial stability. Proper and scientific ornamental fish culture will not only increase the rate of export and gain foreign exchange but also promote women empowerment in financially backward areas.

Introduction:

Ornamental fishes, also known as aquarium fish, are referred to the small-sized, beautifully coloured, peaceful-natured fishes that are kept in the aquarium for aesthetic, educational and decoration purposes. Due to their beautiful appearance, they are sometimes also called “Living Jewels” (Dey, 1996). Singh, 2005 reported that ornamental fish are the most common pets in the world and keeping aquarium fish in the house is the second most popular hobby after photography (Singh, 2005). Some ornamental fish also attract the eyes of the aquarist due to their interesting behaviour, like tail wagging, down crawling, sudden rise and fall movement,

Biplab Bhowmik

Parasitology Laboratory, Department of Zoology, Diamond Harbour Women's University, Sarisha -743368, West Bengal, India

E-mail:  panchakotbb@gmail.com

Orcid id:  <https://orcid.org/0009-0007-7156-4814>

Bipasa Dey

Parasitology Laboratory, Department of Zoology, Diamond Harbour Women's University, Sarisha -743368, West Bengal, India

*Corresponding Author: panchakotbb@gmail.com

and change of colours at different times of the day (Basu, 2012). Ornamental fish include both marine and freshwater fishes.

India has a rich diversity of many ornamental fish species. The two global hotspots of freshwater biodiversity of the Indian subcontinent i.e., ‘The Western Ghats’ and ‘The North-Eastern region’ have a huge abundance of the freshwater ornamental fish. North East alone has reported 266 species of freshwater aquarium fish out of the total 806 species from India. The North Eastern lakes, reservoirs and hill streams are home to some of the prominent Indian freshwater ornamental fish like barbs, catfish, eels, loaches and goby (Mondal, 2017). The Western Ghats consist of 155 species of ornamental fish, out of which 117 are endemic to that area. Apart from the northeastern states and western ghats, other coastal states like West Bengal, Tamil Nadu and Kerala are also rich in many species of indigenous ornamental fish. Therefore, India can be rightly regarded as the “Gold Mine” of freshwater ornamental fish (Talwar and Jhingran, 1991).

The state of West Bengal has over 288 species of exotic ornamental fishes. Freshwater ornamental fish include *Amblypharyngodon mola* belonging to Cyprinidae, *Anabas testudineus* from Anabantidae family, *Alia coila* from Cyprinidae, *Brotia derio* from Cobitidae family, *Channa fasciata*, belonging to Osphronemidae (Basu et al., 2012).

Table 1: Some common freshwater ornamental fish species of West Bengal with their families.

s.no.	Common name	Scientific name	Local name	Family
1.	Rosy Barb	<i>Puntius conchoni</i>	Kanchan pungti	Cyprinidae
2.	Mola Carplet	<i>Amblypharyngodon mola</i>	Maurala	Cyprinidae
3.	Black Knife Fish	<i>Notopterus notopterus</i>	Pholui	Notopteridae
4.	Golden Cat Fish	<i>Mystus tengra</i>	Tengra	Bagridae
5.	Spotted Snake Head	<i>Channa punctatus</i>	Lata	Channidae
6.	Indian Glass Fish	<i>Pseudoambassis ranga</i>	Ranga Chanda	Ambassidae
7.	Gulper Cat Fish	<i>Ompok pabda</i>	Pabdah	Siluridae
8.				
9.	Indian Chacca	<i>Chaca chaca</i>	Chacca	Chacidae
10.	Leaf Fish	<i>Nandus nandus</i>	Nadosh	Nandidae
11.	Spiny green eel	<i>Mastacembalus punctatus</i>	Pankal	Mastacembelidae
12.	Striped dwarf catfish	<i>Mystus vittatus</i>	Tengara	Bagridae
13.	Gangetic scissor tail	<i>Rasbora rasbora</i>	Rasbora	Cyprinidae
14.	Long whiskered catfish	<i>Aorichthys aor</i>	Aar	Bagridae
15.	Indian tiger shark	<i>Pungassius pungassius</i>	Pungas	Siluridae
16.	Guntea loach	<i>Lepidocephalus guntea</i>	Gunte	Cobitidae
17.	Striped gourami	<i>Colisa fasciata</i>	Khalisa	Belonidae

History of Aquarium Keeping:

The earliest history of fish keeping dates back to 960-1279AD when the Sunga Dynasty ruled China. The rulers used to keep Goldfish in small tanks and ponds for recreational purposes. Goldfish is regarded as the first ornamental fish. In 1616AD, goldfish arrived in Japan and subsequently in Europe and Portugal in 1691AD and England 1728AD, respectively. Thereafter, breeding of the fish in captive conditions began to be emphasized and Holland became the first country in 1780AD to successfully breed the goldfish. Later on, goldfish started gaining popularity across the world and people started to consider a more sophisticated and efficient container in which the fish could survive longer.

Robert Warrington is credited as the first designer of the aquarium. He built square-shaped box made of glass and filled it with sand, snails and plants to create an ecosystem for the fish to survive. Using this method, aquariums were successfully established during the 1950s (Novak et al., 2020).

Few benefits of ornamental fish:

Ornamental fish keeping has many positive effects on the health and life of people. Some of them are described below:

- It stabilizes the blood pressure by triggering the GABA neurochemicals in the central nervous system, which inhibits the nerve transmission responsible for causing anxiety (Smith 2014).
- Huachinago, 2013 concluded that viewing these beautiful creatures can benefit the eyesight (Vargasmachuca et al.,2013).
- Gazing at the aquarium can release endocannabinoid, which is a neurochemical responsible for causing a sudden sense of happiness (Senske, 2019).
- Apart from the medical benefits, keeping an aquarium in the house can enhance the look of the interior and also help in children's education.

Ornamental fish trade:

Ornamental fish trade and the industries associated with it are a major source of overseas income, especially in tropical countries like South America, Africa and South East Asia (Andrews, 1989). The major exporting countries of ornamental fishes are Sri Lanka, Malaysia, Hong Kong, Indonesia, Thailand and India. Mostly, freshwater fish are traded, which contributes to almost 90% of the trade value profit and, whereas the marine ornamental fish accounts for the rest 10% (Lem, 2001). Generally wild fishes are harvested for ornamental fish trade, but a few, around 1-10%, are also bred in captivity (Wabnitz et al., 2003). Some of the ornamental fish with high market value include *Ctenochaetusn havaiiensis*, *Centropyge potteri*, *Z. flavescens* and *Acanthurus achilles* (Wabnitz et al., 2003). The trading of ornamental fish involves many people in different steps. The first step includes breeders, then wholesalers, and at last, retailers and consumers.

Larkin 2003, Wabnitz et al., 2003, Pelicice and Agostinho 2005 and Prang 2007 concluded that trade consisting of aquatic organisms is likely to become a multibillion-dollar industry in the recent future and ornamental fishes can form the most valuable fishery commodity on the basis of unit weight (Hardy, 2003). The trade consisting of aquarium fishes has diversified since the last four decades. These fishes are receiving increased attention due to the increase in their global and local demand. The trade related to ornamental fish is only 0.5% of the total fish trade in the international sector, but it plays a crucial role in providing employment and income opportunities to the developing countries (Monticini, 2010). Nammalwar 2008 concluded that due to their wide geographical spread and extensive species diversity, the ornamental fish business can be a promising field in the aquatic business sector (Nammalwar, 2008).

National status

The 'Food and Agricultural Organisation (FAO) reported that the live fish exports from India increased from US\$ 21.5 million to US\$ 315 million in the year 2007 (Monticini 2010). This includes both food fish and ornamental fish. Bojan, 2005 reported that India traded around 7 lakh value of ornamental fish in the year 2003-2004 (Bojan, 2005). India exports ornamental fish to the countries like Belgium, China, South Africa, the United States, United Kingdom and Singapore. About 90% of the aquarium fishes are exported from Kolkata, whereas Mumbai and Chennai export 8% and 2% respectively (Felix, 2009). Domestic trade value of aquarium fish in the Indian subcontinent is roughly around 10 crores annually, and it is increasing at the rate of 20% per year, the demand being much higher than the supply (Vinci, 1998; Madhu et al., 2022). Therefore, it is an excellent opportunity for business due to the strong demand for ornamental fish from domestic and export markets (Elamparithy, 1996).

Status of ornamental fish trade in West Bengal

West Bengal has so far reported 176 indigenous varieties of ornamental fish that can be well-bred in captivity (Mahapatra and Larka, 2012). The state leads India in the trade of aquarium fishes, generating an export value which is almost 50% share alone of the total export value generated by the whole country (Mahapatra et al., 2004; Dhara et al., 2016). The two major districts of West Bengal which are involved in the production and trade of ornamental fish to the international market are Howrah and South 24 parganas. Five community development blocks, namely Jagatballavpur, Panchla, Sankrail, Domjur, Jagacha, Falta, Budge Budge I and II, Bishnupur I and II and Magrahat I and II have ornamental fish trade (OTF) operations. Other districts of West Bengal having OTF operations include Nadia, Murshidabad, Hoogly, East Midnapore and Jalpaiguri. Domestic wholesale markets of the state are in Das Nagar, Howrah and CTI Bazar (Banerjee et al., 2019; Mukherjee et al., 2022). Following flowchart represents the distribution pattern and supply chain of ornamental fish in West Bengal.

Ornamental fish culture: An alternative livelihood source:

Ornamental fish culture and marketing are gaining importance day-by-day and are helping many rural and semi-urban fish farmers to earn their livelihood. The ornamental fish business in the developing rural area can promise a potent source of livelihood for many poor people as it can generate more employment opportunities, alleviate poverty, slow down urban migrations and also contribute the national income growth. This can promote equal distribution of income across the rural fishermen and fish breeders and can also enhance foreign exchange (Anon, 1979). The aquarium fish trade is considered 100 times more profitable compared to food fish. Belton and Little 2008, World Bank 2006 mentioned that the culture of aquarium fish can promote a sustainable alternative source of income. But, the involvement of local fishermen and women in the breeding and culture of ornamental fish is very low. Dey (1996) surveyed the five topmost ornamental fish exporting states, namely West Bengal, Kerela, Karnataka and Tamil Nadu, through census sampling and found that the ornamental fish workers were roughly around 2000 in number (Griffith and Cramp, 1998). Though the ornamental fish trade business has generated significant employment opportunities over the last 15 years, there is no proper symmetry between the collectors and wholesalers. The margin of the fish farmers and fish breeders is significantly low than the collectors.

West Bengal is blessed with many freshwater bodies like rivers and ponds, while estuarine water bodies line many coastal districts of the state. These water bodies are home to many fishes and therefore, fishing forms an important source of income for many rural fishermen. But, the unavailability of proper infrastructural facilities, low education, lack of awareness and improper marketing strategies have rendered them to suffer from social and economic backwardness. The economic condition of some fishermen is so poor that they are not even able to purchase proper technical gadgets for fishing and have to depend on handmade nets, gill nets and cast nets to catch fish. Bhoumik and Pandit (1994) discovered that many fishermen have to depend on other income sources like working as labour or rickshaw pulling during the offseason in order to feed their families and meet their needs, which do not fetch them much profit (Bhoumik and Pandey, 1994). Culture and farming of ornamental fish can be a promising alternative income source since it can be carried out with very little investment using integrated system (Belton and Little 2008). Moreover, breeding, culture and farming of ornamental fish is possible on a small scale which can enable small entrepreneurs to start small-scale setups (Raja et al., 2014). Therefore, more fish farmers should be motivated towards this business.

Role of fisherwomen:

In India, about one-third of the labour force consists of women. Therefore, their socio-economic empowerment cannot be neglected. India consists of 5.4 million active fishers, out of which 1.6 million are fisherwomen (Qureshi, 2013; Dutta et al., 2014). Women have made immense contributions in the field of fish sorting, processing and marketing of the fish. They

also do sorting, gutting, net mending, loading and icing of the fish. Harper et al. (2017) mentioned the employment of women in the fisheries sector sine times immemorial. These women support their house economy by involving in the possible fisheries sector areas. Women contribute to 58% of the activities like mending of the nets, making feed, and also selling the produce (FAO, 2020).

Goswami 2011 found the ornamental fish culture to be a very suitable livelihood opportunity for women as it can be easily performed under small scale (Goswami 2011). And women are fortunately showing interest in this sector. A training programme conducted on Dakshin Dinajpur on the theme of “Ornamental Fish Breeding and Culture” witnessed more than 40% of women trainees who actively participate in the programme (Goswami and Dana 2012). This indicates that on being given the right opportunities and facilities, women from the rural fisherwomen communities can start earning decent livelihood income.

Sundarbans is dotted with many species of mangroves. The water bodies associated with it boast of huge biodiversity of ornamental fishes. Sundarbans have recorded 67 species of ornamental fishes (Mondal et al., 2012). Majority of the people are economically backward and depend solely on the localised earning or on a single source of income. In this scenario, ornamental fish culture and trade could be very beneficial for them as an alternative source of livelihood. The fisherwomen sector of the Sundarbans can also opt for ornamental fish culture as it can be easily done in a house backyard with very little space requirement and minimum investment (FAO 2004). Thus, aquarium fish culture can prove to be a promising way of earning for these women, which can ultimately contribute to women's empowerment.

Role of the Government to Promote Ornamental Fish Culture:

The Government of India and West Bengal can play a very crucial role in promoting the culture of ornamental fish. Government has taken many schemes such as the “Pradhan Mantri Matsya Sampada Yojna (PMSSY)” which has generated almost 7 lakhs employment under this field; “Swarna Jayanti Gram Swarojgar Yojna (SGSY)” that emphasizes on the economic activation, social mobilization and formation of self-help groups (SGH). The ICAR-CIFA (Indian Council for Agricultural Research- Central Institute of freshwater Aquaculture) have developed many breeding culture techniques, especially for the indigenous ornamental fishes.

Discussion

The trade of ornamental fish has diversified since the last four decades. Most of the ornamental fish farmers generally rely on the captured fish for marketing. But unplanned and vigorous catching of these fishes could lead to a decline in their population which may threaten their species. Moreover, since the market demand for these ornamental fishes is far exceeding the supply. There is a need for the breeding and culture of these fishes. The breeding of the captive fish can be performed with very low investment and labour. Proper brood stock management should be done which enables the fish to produce large numbers of fertilised eggs. Most ornamental fish farmers generally rely on wild fish feed, but due to the rising demand,

which is creating pressure on the production rate, there is a dire need for the commercial. For this, the nutrient requirements of fish should be known. Proper network between the fish breeders and stakeholders may also help in smooth marketing practices. Active involvement of the women in this sector can play a very crucial role in their empowerment. The government should organise periodic training like breeding of fish, packaging and transportation, fish disease management, cluster development, scientific procedures related to the management of fish farms, entrepreneurship and marketing. Breeders who follow good practices should be awarded.

The Government of India should take the necessary steps to promote the culture and trade of ornamental fishes. Sundarbans have recorded nearly 67 species of ornamental fishes, which is a poor number as compared to the rich biodiversity of the area. The Government should motivate more taxonomic researchers to identify any potential new species of ornamental fish and promote them for culture and trade. This would generate more employment opportunities for the young rural fisherwomen and motivate them to engage in the ornamental fish culture and business sector actively.

Conclusion

Ornamental fish trade is gaining importance day by day in both national and international market. Due to huge demand and low supply, a greater number of fish farmers, especially the fisherwomen should actively engage in this field. Sundarbans district of West Bengal has many varieties of ornamental fishes. Proper breeding, culture and marketing of these fishes could help to contribute to the export of the aquarium fishes in the international countries and gain foreign exchange. It will help the fisherwomen to earn a better mode of living and improve their financial status.

References:

- Andrews, C. (1989). The conservation of fish by zoos and aquaria. Proceedings of the 5th World Conference on Breeding Endangered Species in Captivity, pp. 9–20.
- Anon, (1979). International trade in tropical aquarium fish, International Trade centre (ITC), UNCTAD/GAIT, Geneva.
- Basu, A., Dutta, D., and Banerjee, S. (2012). Indigenous ornamental fishes of West Bengal, Aquaculture Research Unit, Department of Zoology, University of Calcutta, West Bengal, India. *Recent Research in Science and Technology*, 4(11), 12-21.
- Belton, B., Little, D. C., & Sinh, L. (2010). Pangasius catfish seed quality in Vietnam: Part 1: User and producer perceptions on broodstock and hatchery production. *Aqua Culture Asia Pacific*, 6(2), 36-38.
- Bhattacharjee, M. (2016). Fish behavioural changes in exploited ecosystems: A laboratory study. *Int. J. Exp. Res. Rev.*, 6, 12-20.
- Bhaumik, U., and Pandit, S.K. (1994). Socio-economic Status of fishermen in some beels of West Bengal. *Environment and Ecology*, 9(3), 600-603.

- Bojan, J. (2005). Aquatechnology parks to promote ornamental fish from India.
- Castillo-Vargasmachuca, S., Ponce-Palafox, J. T., Rodríguez-Chávez, G., Arredondo-Figueroa, J. L., Chávez-Ortiz, E., & Seidavi, A. (2013). Efectos de la temperatura y salinidad sobre el crecimiento y supervivencia de juveniles de huachinango *Lutjanus peru* (Pisces: Lutjanidae). *Latin American journal of aquatic Research*, 41(5), 1013-1018. <https://doi.org/10.3856/vol41-issue5-fulltext-22>
- Dey, V.K. (1996). Ornamental fishes and Handbook of Aqua farming. The Marine Products Export Development Authority, Cochin.
- Dhara, K., Mukherjee, S., Madhu, N.R., & Roy Karmakar, S. (2016). Exotic food fishes in North 24 Parganas district, West Bengal and their ecological assessment. *Int. J. Exp. Res. Rev.*, 5, 67-73.
- Dutta, A., Madhu, N.R., & Behera, B. K. (2014). Population builds up and diversity of Odonate species in relation to food preference in a fish farming Lake at Media, West Bengal, India. *Int. J. Adv. Res. Biol. Sci.*, 1(7), 199–203.
- Elamparthy, B. (1996). Culture of ornamental fishes and their export potential. Proceedings of the Seminar on fisheries- A multimillion dollar industry. Aquaculture Foundation of India and the fisheries Technocrat's forum, Chennai.
- Felix, S. (2009). Developing Ornamental Aquaculture (Aquariculture) Present Scenario and Scope in Tamil Nadu. *Fishing Chimes*, 29, 8-9.
- Goswami, B., & Dana, S. S. (2012). Ornamental fish breeding and culture-an impact analysis. *Exploratory Anim. and Medical Res.*, 1(2), 151-155.
- Griffith, D.A., and Krampf, R.F. (1998). An examination of the Web-based strategies of the top 100 US retailers. *Journal of Marketing: Theory and Practice*, Summer, pp.12-22. <https://doi.org/10.1080/10696679.1998.11501801>
- Hardy, R. (2003). Introduction to the special issue on 'Ornamental fish. *Aquacult. Res.*, 34, 903. <https://doi.org/10.1046/j.1365-2109.2003.00962.x>
- Harper, S., Grubb, C., Stiles, M., & Sumaila, U. R. (2017). Contributions by women to fisheries economies: insights from five maritime countries. *Coastal Management*, 45(2), 91-106. <https://doi.org/10.1080/08920753.2017.1278143>
- Larkin, S.L. (2003). The U.S. wholesale marine ornamental market: Trade, landings, and market opinions. In *Marine Ornamental Species: Collection, Culture and Conservation*, Edited by: Cato, J. C. and Brown, C. L. pp.77 – 89. <https://doi.org/10.1002/9780470752722.ch6>
- Madhu, N.R., Sarkar, B., Roychoudhury, S., Behera, B.K. (2022). Melatonin Induced in Cancer as a Frame of Zebrafish Model. © Springer Nature Singapore Pte Ltd. 2022, S. Pathak et al. (eds.), *Handbook of Animal Models and its Uses in Cancer Research*, pp. 1-18. ISBN: 978-981-19-1282-5 https://doi.org/10.1007/978-981-19-1282-5_61-1
- Mahapatra, B.K., & Lakra, W.S. (2012). Indigenous ornamental fish diversity of West Bengal Conservation and Management for sustainability. In: 23rd All India Congress of Zoology

- & National Conference on Conservation and Management of Faunal Resources for CMFRI, Chennai, pp. 7-8.
- Mahapatra, B.K., and Mondak, B. (2019). International Journal of Fisheries and Aquatic Studies Ornamental fish trading pattern in West Bengal Subhalaxmi Banerjee, *BK Mahapatra and Basudeb Mondal*, 7(6), 130-134.
- Mahapatra, B.K., Vinod, K., & Mandal, B.K. (2004). Ornamental fish of North Eastern India- Its distribution and conservation status. *Environment & Ecology*, 22(3), 674-683
- Mandal, B., Mukherjee, A., Sarkar, S., & Banerjee, S. (2012). Study on the ornamental fin fish of Indian Sundarbans with special reference to few floral sources for carotenoid pigmentation. *World*, 4(6), 566-576.
- Monticini, P. (2010). The Fish Trade, Production and Commerce of Ornamental Fish: Technical-Managerial and Legislative Aspects. GLOBEFISH Research Programme, Vol. 102, FAO: Rome, pp. 132, 2010.
- Mukherjee, P., Saha, A., Sen, K., Erfani, H., Madhu, N.R., & Sanyal, T. (2022). Conservation and prospects of Indian Lacustrine fisheries to reach the Sustainable Developmental Goals (SDG 17). © International Academic Publishing House (IAPH), Dr. N. R. Madhu & Dr. B. K. Behera (eds.), *A Basic Overview of Environment and Sustainable Development*, pp. 98-116. ISBN: 978-81-957954-2-0. <https://doi.org/10.52756/boesd.2022.e01.010>
- Nammalwar, P. (2008). Geographical indications of ornamental fishes in India. International Conference on Green certification for ornamental fishes, Marine Products Export Development Authority, Cochin.
- Novák, J., Kalous, L., & Patoka, J. (2020). Modern ornamental aquaculture in Europe: early history of freshwater fish imports. *Reviews in Aquaculture*, 12(4), 2042-2060. <https://doi.org/10.1111/raq.12421>
- Pandey and Mandal (2017). Present status, challenges and scope of ornamental fish trade in India. Conference paper: Aqua Aquaria 2017 at Mangalore, 2017
- Prang, G. (2007). An industry analysis of the freshwater ornamental fishery with particular reference to the supply of brazilian freshwater ornamentals to the UK market. *Uakari*, 3, 7 – 51. <https://doi.org/10.31420/uakari.v3i1.18>
- Quereshi, N. W., Krishnan, M., Sundaramoorthy, C., Ramasubramanian, V., & Melake Araya, T. (2017). Qureshi data mining. pdf.
- Raja, S., Babu, T.D., Nammalwar, P., Thomson, J.C., & Dinesh, K.P.B. (2014). Potential of ornamental fish culture and marketing strategies for future prospects in India. *International Journal of Biosciences and Nano science*, 1(5), 119-125
- Senske, W. F. K., Reigada, Á. L. D., de Carli, B. P., Ramires, M., & Rotundo, M. M. (2019). Registro de invertebrados bioinvasores no Complexo baía-estuário de Santos, São Vicente e Canal de Bertiooga, SP, Brasil. Anais do Encontro Nacional
- Singh, T. (2005). Emerging trends in world ornamental fish trade. *Infofish Intrenational*, 24(3), 15-18.

- Smith, L. A. (2014). Mortality in the Ornamental Fish Retail Sector: an Analysis of Stock Losses and Stakeholder Opinions (Doctoral dissertation, University of Kent (United Kingdom))
- Talwar, P. K., & Jhingran, A. G. (1991). Inland fishes of India and adjacent countries (Vol. 2). CRC press.
- Talwar, P.K., and Jhingran, A.G. (1991). Inland Fishes of India and adjacent countries, Vol. 1 & 2. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
- Vinci, G.K. (1998). Introduction to aquarium fishes. *Fishing Chimes*, 2(3), 25.
- Wabnitz, C., Taylor, M., Green, E., and Razak, T. (2003). From ocean to aquarium. Cambridge, UK. United Nations Environment Programme – World Conservation Monitoring Centre.

HOW TO CITE

Biplab Bhowmik and Bipasa Dey (2024). Ornamental Fish Culture: A Way Towards Sustainable Development and Alternative Livelihood for West Bengal Fisherwomen. © International Academic Publishing House (IAPH), Dr. Somnath Das, Dr. Ashis Kumar Panigrahi, Dr. Rose Stiffin and Dr. Jayata Kumar Das (eds.), *Life as Basic Science: An Overview and Prospects for the Future Volume: 1*, pp. 38-47. ISBN: 978-81-969828-9-8 doi: <https://doi.org/10.52756/lbsopf.2024.e01.004>

