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RESEARCH ARTICLE

RESOURCE POTENTIALITY OF INDIGENOUS ORNAMENTAL FISHES IN WEST BENGAL

***Manab Kumar Saha and Bidhan C. Patra**

Aquaculture Research Unit, Department of Zoology, Vidyasagar University, Midnapore- 721 102, West Bengal, India

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ABSTRACT

Ornamental fishes are often called as 'living Jewell' due to their colour, shape, behaviour and origin. They are peaceful, generally tiny, available in attractive colours and capable of living in confined spaces. The brilliant, flamboyant colour and uncommon appearance of the fish appeal to one and all children and aged alike. The trade in ornamental fish and aquarium supplies is a multi-million dollar industry that spans the globe. In West Bengal with its highly conducive climatic conditions provides scope for the development of indigenous ornamental fisheries. In the present study, different water resource (rivers and water bodies) of all the districts of West Bengal have been surveyed for make a database of natural ornamental fishes. During the survey period a total number of 77 natural indigenous ornamental fish species were collected and identified belonging to 09 orders, 26 families and 50 genera. From the survey order, Cypriniformes shows the maximum species variation, followed by Perciformes and Siluriformes. Many of them have huge market demand and value also. This sector assumes special significance due to its huge potential in providing employment and income to the young people of West Bengal.

INTRODUCTION

From 20th century, the Ornamental fish keeping is one of the most popular hobbies, both in the developed as well as in many developing countries. The growing interest in aquarium fishes has a direct proportional effect on aquarium fish trade, globally (Singh, 2005). Ornamental fishes market in the world for public aquaria is less than 1% at present and remaining 99% of the market is still confined to hobbyist. According to Food and Agriculture Organization (FAO, 2006), export earnings from ornamental fish trade is US $ 251 million .In addition more than 60% of the production comes from households of developing countries (Dey, 1996). Approximately the wholesale value of the global ornamental fish trade is US $ 14 Billion. More than 2500 species of ornamental fishes are dealings with this traded. Among them, 30-35 species of fresh water dominate the market (Bassleer, 1994). The top exporting country is Singapore, followed by Hong Kong, Malaysia, Thailand, Philippines, Sri Lanka, Taiwan, and Indonesia. China and South Africa are the emerging markets of ornamental fish trade (Jayasankar, 1998). In Indian context, the Ornamental Fish Trade contributes to the trade of an estimated Rs.158.23 lakh that is only 0.008% of the global trade.

The diversified Indian aquatic environment harbors about 2118 species of fishes, of which about 600 fish species are exploited as resources for Ornamental Fish Trade, and many have promising market as ornamental fish (Ghosh, 2006). Now the Ornamental fish keeping is not only just a hobby, but also a concept of entrepreneurship development. Therefore, the ornamental fish farming is gaining popularity by lips and bonus (Mukherjee *et al*., 1999). The hobbyists can study the behavior and biology of the fish during aquarium maintenance (Jayaram, 1999). Simultaneously a large numbers of people are entering into this business of culturing, breeding and farming (Mukherjee *et al*., 2002). In India between the two Hotspots of fresh water fish Biodiversity the majority of the indigenous ornamental fish trade is from the North Eastern states (Jayaram, 1999). MPEDA (The Marine Product Export Development Authority) has implemented several strategies to adopt in terms of technology, infrastructure in order of to develop export demand based production for major importers in EU, USA and Japan. The exporter (or) wholesaler plays on important role in promoting breeders and consumers (Ghosh, 2005). Wholesaler usually sells the fishes to local retailers and in turn, retailer's directly sales to local customers, hobbyists etc (Jayasankar, 1998). Our state has a rich and unique biodiversity with a variety of indigenous ornamental fishes (Basu *et al*., 2012). In India, as well as West Bengal out of total export of ornamental fish, 95% is based on wild collection (Kar, 2006). However, this resource has not been properly exploited. The main objectives of this study are to evaluating the ecology and the commercial valuation of the known ornamental fishes (Ghosh, 2006). In addition, the possibilities of the indigenous fishes as substitute to promote the equitable exploitation of the fish resources available through proper marketing channel (Panigrahi *et al*., 2009).

MATERIALS AND METHODS

This survey programmed was conducted from, January 2011 to December 2012 of all the districts of West Bengal (Panigrahi *et al*., 2009). A total numbers of 77 natural fish species has been identified which having potentiality as ornamental fish species. In this survey, the focus was on their scientific identification, market price and market demand (As ornamental fish). The data were collected from various Government Departments and Non-Governmental Organizations (NGOs) and direct from market survey. For proper documentation, fish species were collected from different water resources at the selected area, throughout various types of fishing methods such as gill netting, drag netting, cast netting, bag netting and other local fishing contrivances (Basu *et al*., 2012). The collected sample specimens were immediately preserved in 4-8% formaldehyde. The identification was done according to Talwar and Jhingran (1991). Endemic status of the sample fishes were confirmed

Corresponding author: manabart@rediffmail.com

Table 1. District wise Natural distribution of Indigenous ornamental fishes with their endemic status and market value in West Bengal

Order	Family	Species	IUCN status	Market Price (pair)	District wise Ornamental Fish Distribution in West Bengal																			
					Darjeeling	Jalpaiguri	Coachbihar	U. Dinajpur	D. Dinajpur	Malda	Murshidaba	Bankura	Purulia	Birbhum	Burdwan	Hoogly	Nadia	Howrah	Kolkata	N.24Pargana	S.24Pargana	E.Midnapore	W.Midnapore	no. of Dist Sp. present
Anguilliformes	Anguillidae	*Anguilla bengalensis bengalensis*	EN	30-350	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	-	-	07
	Moringuidae	*Murraenesox cinereus*	NE	40-180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	02
Beloniformes	Belonidae	*Xenentodon cancila*	LC	25-110	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
Cyprinidontiformes	Aplocheilidae	*Aplocheilus panchax*	DD	35-200	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
	Cyprinidae	*Amblypharyngodon mola*	LC	10-35	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Barilius vagra	VU	12-40	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02
		Barilius shacra	LC	50-140	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02
		Brachydanio rerio	LC	20-80	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	17
		Chela laubuca	LC	25-95	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Chagunius chagunio	EN	15-30	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	03
		Danio devario	LC	10-55	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	+	15
		Esomus danricus	LC	10-35	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Garra annandalei	LC	30-150	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02
		Puntius ticto	LC	10-25	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Puntius sophore	LC	08-20	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Puntius phutunio	LC	10-30	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	17
		Puntius terio	LC	08-20	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	17
		Puntius conchonius	VU	10-40	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Puntius sarana sarana	VU	08-35	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Puntius gelius	LC	12-50	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	17
		Salmostoma bacalia	LC	15-90	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Labeo calbasu	LC	10-50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Labeo bata	LC	15-50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Danio rerio	NT	10-35	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	17
		Chela labuca	LC	25-95	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	10
		Rasbora rasbora	LC	20-180	-	-	-	-	-	+	+	+	+	+	+	+	+	+	-	-	-	-	-	09
	Cobitidae	*Botia derio*	VU	20-100	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	02
		Lepidocephalichthys guntea	LC	12-50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Lepidocephalus thermalis	LC	20-80	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	03
		Somileptes gongota	LC	25-80	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	03
	Balitoridae	*Nemacheilus beavani*	NE	20-80	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	03
Clupeiformes	Engraulidae	*Pterengraulis atherinoides*	NE	10-35	-	-	+	+	+	-	-	-	+	+	+	+	+	-	-	+	+	+	+	12
Osteoglossiformes	Notopteridae	*Notopterus chitala*	EN	20-80	-	-	-	-	-	+	+	-	-	-	+	+	+	+	+	+	+	+	+	11
		Notopterus notopterus	LC	25-60	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19

Source: (Primary Data Source).

Perciformes	Ambassidae	*Chanda ranga*	NE	15-110	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	18
		Chanda nama	LC	10-80	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	18
	Anabantidae	*Anabas testudineus*	VU	25-60	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	18
	Channidae	*Channa punctata*	LC	12-60	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Channa striata	LC	25-90	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Channa marulias	LC	50-250	-	-	-	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	15
		Channa gachua	LC	80-500	+	+	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	16
	Gobiidae	*Stigmatogobius sadanundio*	NE	90-350	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+	+	+	+	+	08
		Glossogobius giuris	LC	22-65	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Boleophthalmus boddarti	NE	30-150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	05
	Nandidae	*Badis badis*	VU	15-55	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Nandus nandus	LC	10-50	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	16
	Osphronemidae	*Colisa fasciata*	LC	45-190	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Colisa lalia	NE	50-200	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Colisa chuna	NE	50-230	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	18
		Colisa sota	LC	35-170	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
	Terapontidae	*Terapon jarbua*	LC	15-65	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	+	+	06
	Scatophagidae	*Scatophagus argus*	LC	50-200	-	-	-	-	-	-	-	+	-	-	+	+	+	+	+	+	+	+	+	09
Siluriformes	Bagridae	*Mystus cavassius*	LC	25-90	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	09
		Mystus aor	VU	20-90	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Mystus gulio	LC	45-250	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	12
		Mystus tengara	LC	25-210	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	09
		Mystus bleekeri	LC	15-230	-	-	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	14
		Mystus vittatus	LC	15-180	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	14
	Chacidae	*Chaca chaca*	EN	40-220	+	+	+	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	05
	Pangasidae	*Pungasius pungasius*	LC	25-200	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	16
	Schilbeidae	*Ailia coila*	VU	20-110	-	-	-	-	-	+	-	-	-	-	+	+	+	+	+	+	+	+	+	10
	Sisoridae	*Gagata cenia*	LC	20-100	+	+	+	+	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	07
		Glyptothorax telchitta	LC	12-55	+	+	+	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	05
		Hara hara	EN	30-90	+	+	+	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	05
		Bagarius bagarius	VU	20-50	+	+	+	+	-	+	+	-	-	-	+	+	+	+	+	+	+	-	-	13
	Siluridae	*Ompok pabo*	EN	30-190	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Ompok bimaculatus	EN	08-30	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Wallago attu	NT	20-240	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	14
		Ompok pabda	NT	30-190	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
Synbranchiformes	Synbranchidae	*Amphipnous cuchia*	LC	18-90	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	18
	Mastacembelidae	*Macrognathus pancalus*	NT	30-110	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Macrognathus aral	LC	40-140	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
		Macrognathus armatus	LC	30-140	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
Tetradontiformes	Tetraodontidae	*Tetraodon fluviatilis*	NE	50-200	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	09
		Tetraodon inermis	NE	45-210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	04
		Tetradon cutcutia	NT	40-280	-	-	-	-	-	-	-	+	+	+	-	+	+	+	+	+	+	+	+	11
		Chelonodon patoca	NE	40-180	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	09
Total	09	26	77		45	52	50	47	47	53	49	47	45	51	61	62	61	60	59	63	62	58	62	

(CR: Critically endangered, EN: Endangered, VU: Vulnerable, LC: Least Concern, DD: Data Deficient, NE: Not evaluated). In case of market value 5.1 rating scale is Applied: Very Low=4(<20%), Low=6(<30%), Medium=10(<60%), High=13(<80%), Very High=15(>80%).

by the threatened freshwater fishes of India and IUCN Red list of Threatened Species (TUCN, 2011).

RESULT AND DISCUSSION

During the survey period a total number of 77 natural indigenous ornamental fish species were collected and identified belonging to 09 orders, 26 families and 50 genera from different part of West Bengal. Moreover, the focus was on their scientific identification, market price and market availability.

Fig. 1. A. The riverine system of West Bengal.

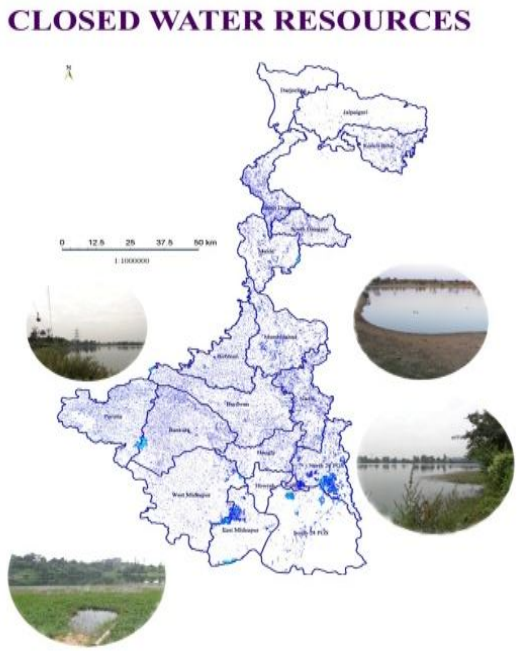


Fig. 1. B. The closed water bodies of West Bengal.

These are the main habitat of Indigenous Ornamental fishes in West Bengal. (Source: www.mapsofindia.com).

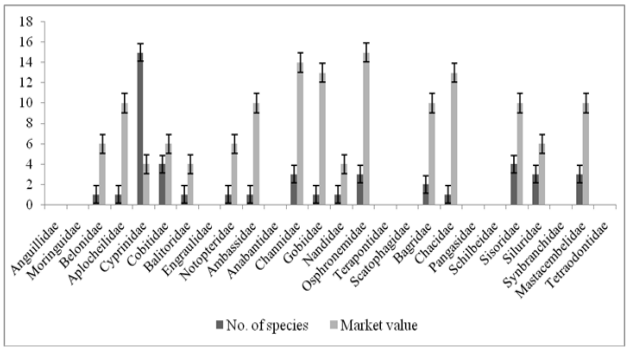


Fig. 2. Species abundance and their Market Value in Darjeeling (Error bars with Standard Errors)

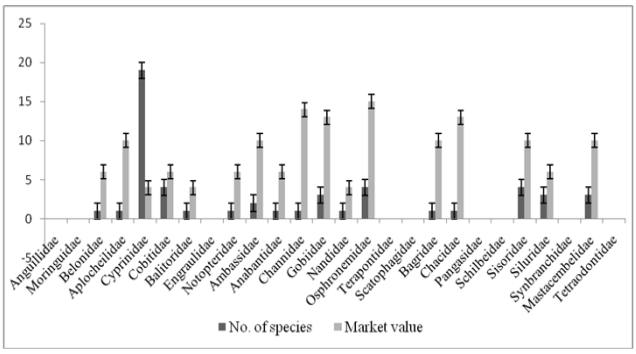


Fig. 3. Species abundance and their Market Value in Jalpaiguri (Error bars with Standard Errors)

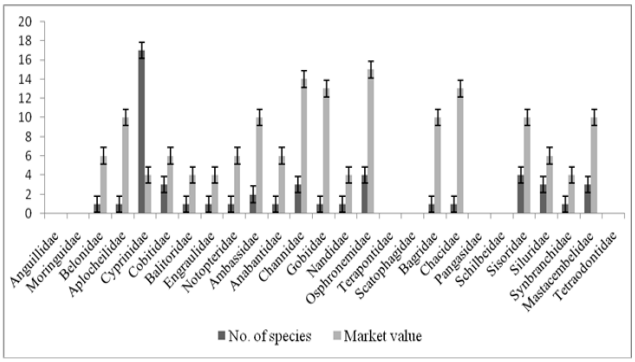


Fig. 4. Species abundance and their market Value in Coachbihar (Error bars with Standard Errors)

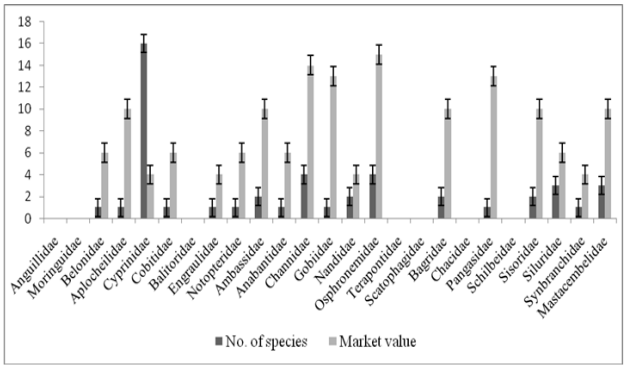


Fig. 5. Species abundance and their market value in Uttar Dinajpur (with Standard Errors)

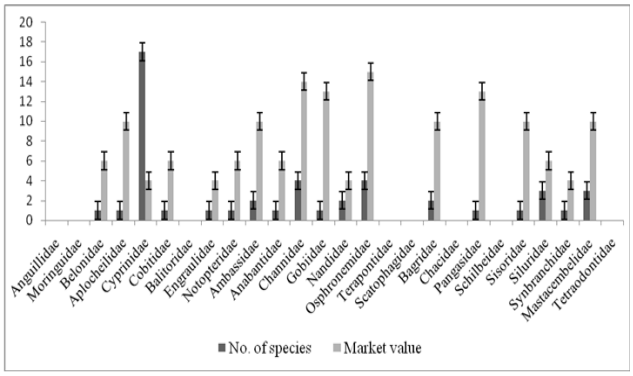


Fig. 6. Species abundance and their market value in Dakshin Dinajpur (with Standard Errors)

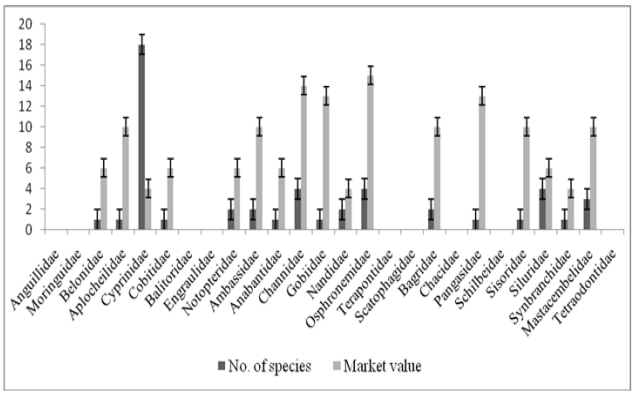


Fig. 7. Species abundance and their market value in Malda (Error bars with Standard Errors)

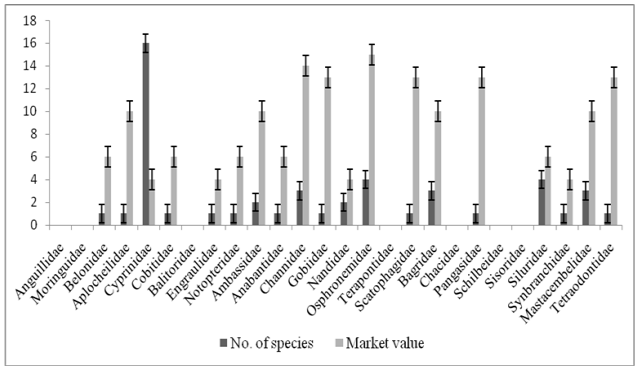


Fig. 8. Species abundance and their market value in Murshidabad (with Standard Errors)

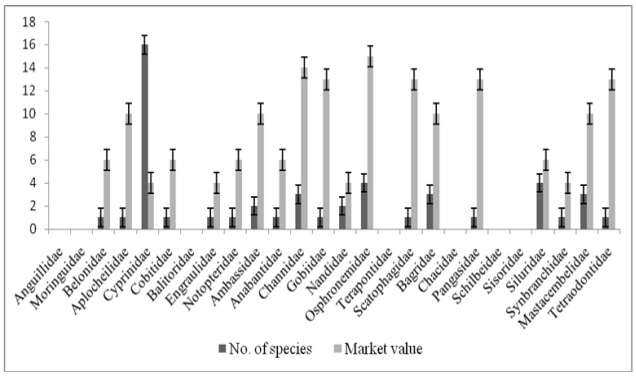


Fig. 9. Species abundance and their market value in Bankura (Error bars with Standard Errors)

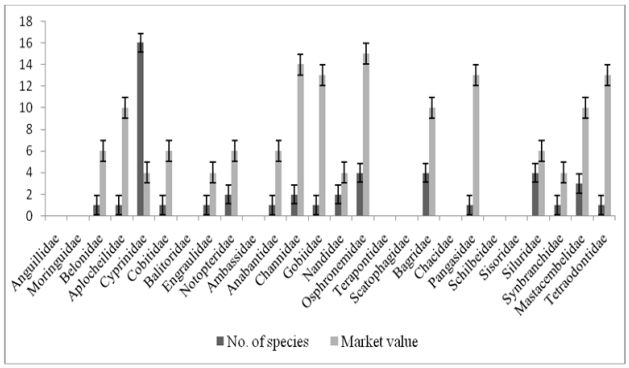


Fig. 10. Species availability and their market value in Purulia (Error bars with Standard Errors)

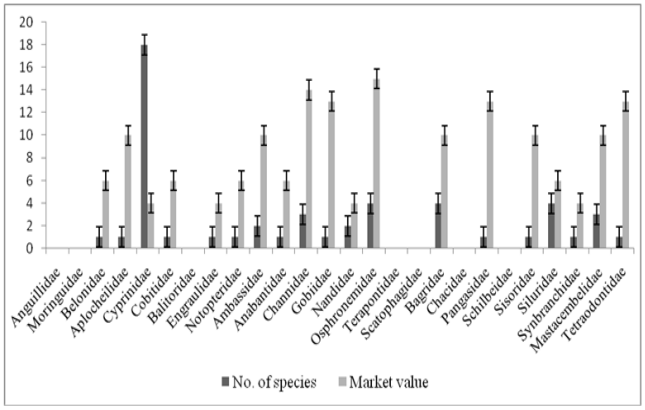


Fig. 11. Species abundance and their market value in Birbhum (Error bars with Standard Errors)

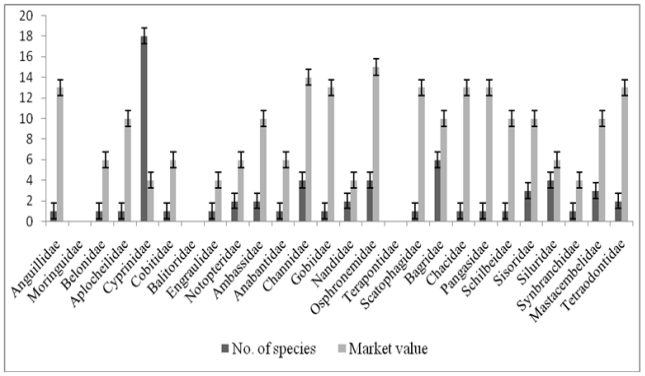


Fig. 12. Species abundance and their market value in Burdwan (Error bars with Standard Errors)

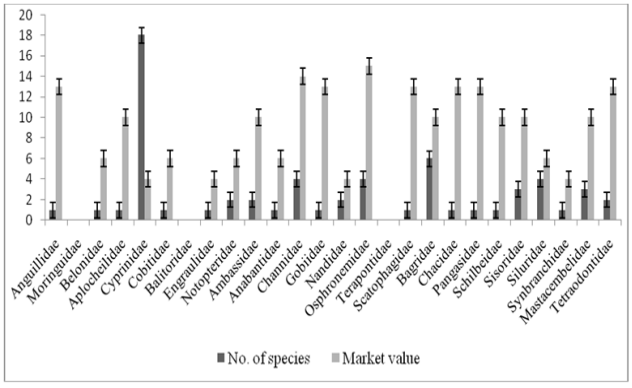


Fig. 13. Species abundance and there market value in Hoogly (Error bars with Standard Errors)

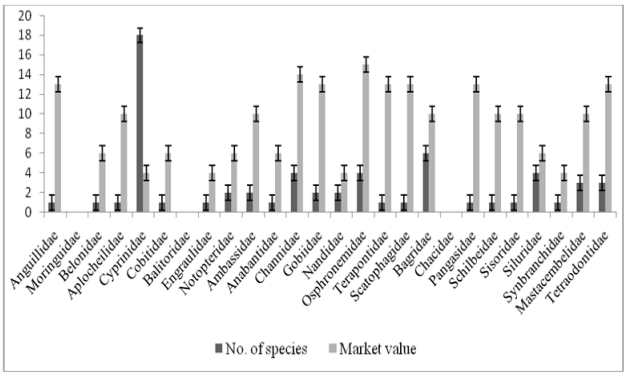


Fig. 14. Species abundance and there market value in Nadia (Error bars with Standard Errors)

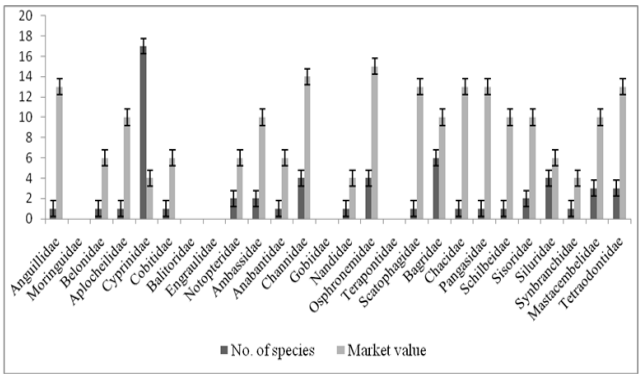


Fig. 15. Species abundance and there market value in Howrah (Error bars with Standard Errors)

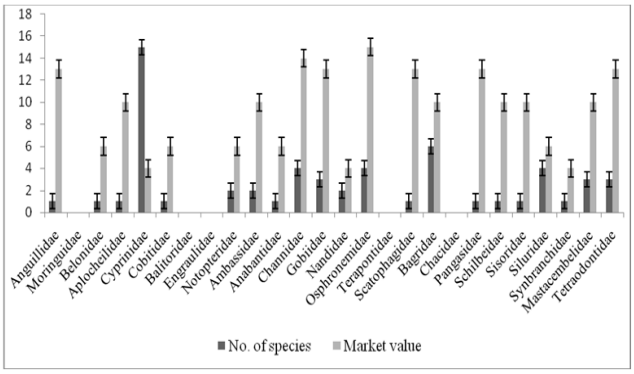


Fig. 16. Species abundance and there market value in Kolkata (Error bars with Standard Errors)

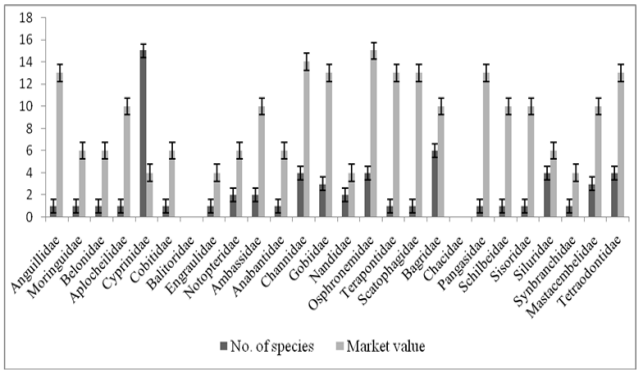


Fig. 17. Species abundance and there market value in North 24 Pargana (with Standard Errors)

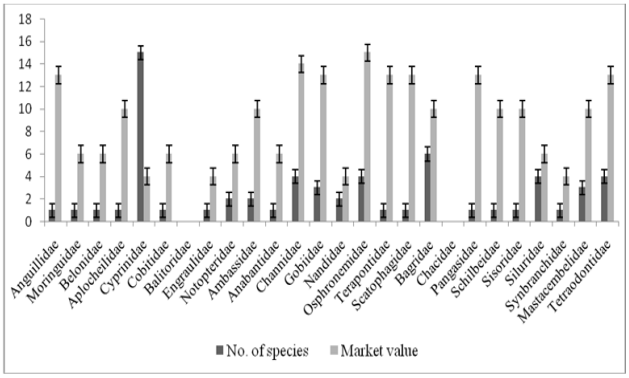


Fig. 18. Species abundance and there market value in South 24 Pargana (with Standard Errors)

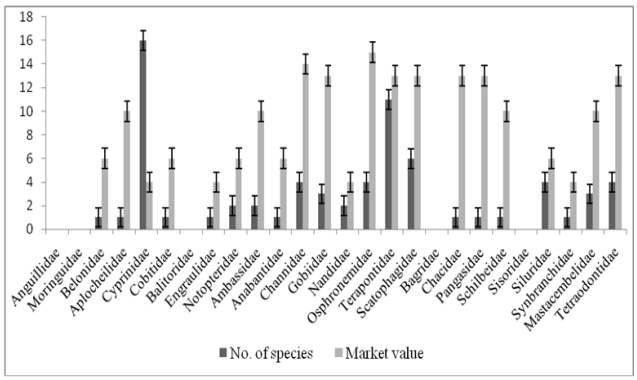


Fig. 19. Species abundance and their market value in East Midnapore (with Standard Errors)

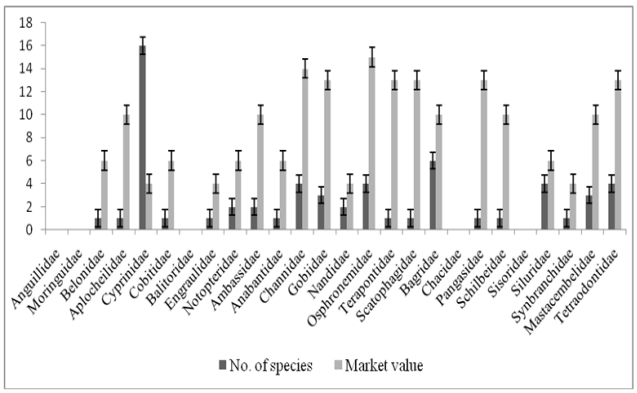


Fig. 20. Species abundance and their market value in West Midnapore (with Standard Errors)

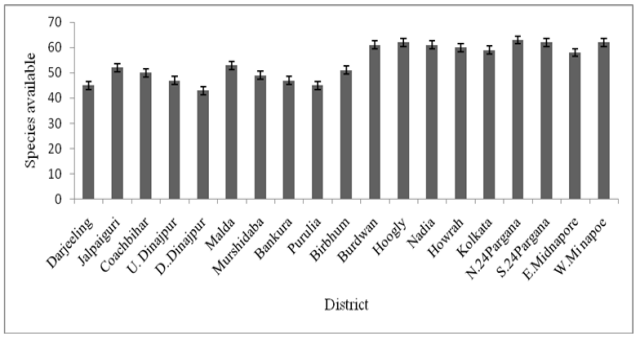


Fig. 21. District wise Ornamental fish potentiality in West Bengal (with Standard Errors)

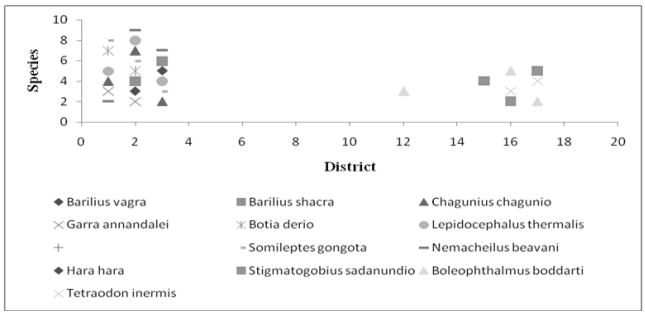
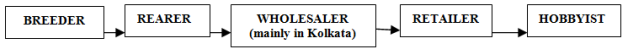


Fig. 22. 'Pocket distribution' of ornamental fishes in West Bengal

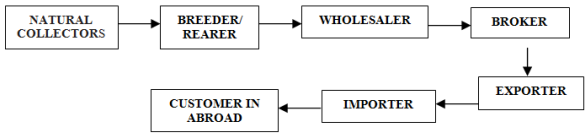
MARKETING CHANNEL

The ornamental fish trade is directly related to the supply and market demand. Therefore, it is possible only when breeding will conducted in large scale (Bassleer, 1994).The exporter and wholesaler play an important role in promoting breeders and consumers/ hobbyist. In West Bengal the ornamental fish market channel mainly two types i.e. Export market and Local market channel (De *et al*. 2011).

For Local market channel



For Export, market channel



DISCUSSION

The agribusiness opportunities of Indigenous Ornamental fishes have been recognized by the producers, collectors and traders. From this study it is clear that the West Bengal has a high resource potentiality of Ornamental fishes in terms of Ecology and Economy. Specially Hoogly, Nadia, South 24 Pargana, Burdwan are highly enrich district (De *et al*., 2011). Some special 'Pocket habitat' also found in the district of Darjeeling, Jalpaiguri, Coachbihar, N.24 Pargana, S.24 Pargana for special ecological habitat. The ornamental fish of Bengal needs an urgent attention on formulating sound ecological and economic strategies. The ornamental fish production in West Bengal has been observed to be financially as well as economically viable and investment friendly. With some initiatives by the government like providing incentive to establish ornamental fish production unit, considerable private investment can be attracted to this industry, which would generate additional employment opportunities (Champman, 1997). Since, almost the entire volume of ornamental fishes is collected from the natural aquatic resources of West Bengal. It is serious threat to the sustainability of these natural resources. Many species are in endemic condition for anthropogenic activities (Bhattacharya *et al*., 2003). So, it is a serious matter regarding the socio-economic up liftmen, Biodiversity resource management and conservation. If the natural resource of Indigenous ornamental fisheries can be manipulate and utilized in scientific way, will gain a larger share in the world market (Swain *et al*., 2007). Public-private co-operation can be faster and farmed establishment of Indigenous ornamental fish production units in different district of the West Bengal to make this sector more potential in terms of ecologically and economically.

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