Original Research Article

Studies on Freshwater Indigenous Ornamental Fishes Available in Selected Sites Of Southern Bengal And Their Present Status In Natural Habitats

ABSTRACT

Aims: To study the diversity of Ornamental fishes as native species by origin from certain parts of Southern Bengal, have importance in export world of ornamental trading in and across India along with their status in natural habitats.

Study design: An intricate survey was performed along with formal-informal interviews

Place and duration of study: Survey sites includedHowrah, North 24 Paraganas and South 24 Paraganas, Fish Markets, Pet Markets, and Several Fish Farms.

Methodology: Live specimens after collecting from natural water bodies like ponds, canals, rivers with the help of fishing nets and gears, are immediately preserved in 5% formalin. Later identification and further investigations are completed in the laboratory.

Results: 70 native species from 9 orders were enlisted to for their potentiality but few are exporting from Kolkata market and have gained popularity. 23 indigenous varieties are regularly exporting from Southern Bengal. Some of those species can be kept commercially in aquarium without hurting their biology.

Conclusion: This entire practice of export and domestic supply rely upon mostly wild capture which is unorganised and sometimes unauthorised, ultimately impacts on declination of population and downward indication of biodiversity. Additionally, environmental issues and also anthropogenic activities such as habitat destruction, fragmentation, alteration of water quality due to water pollution, agri-based effluents etc. confirm their loss in nature. Finally, this study recommends that appropriate managements on breeding and culture, quality feed development, consciousness about the species, awareness on the role of species in ecological terms, proper training can only forbid these native wealth from extinction in near future.

Keywords: Ornamental fishes, Freshwater Indigenous fishes, availability, export, Southern Bengal, Declination.

1. INTRODUCTION

Fishes are the most dominating vertebrates in the world with approximately 33,600 species which not only act as biodiversity resources but are used as stress removers, subject of photography,

tools for interior decoration, and peaceful pet in homes and public aquariums. Generally, beautifully coloured fishes have high demand since ancient times. Besides,several other features such as charming behaviour, transparency, jumping behaviour, predatory habits and also have become a part of ornamental characteristics. India is extremely fortunate that it has an ample diversity of ornamental fish resources. Western Ghat and North Eastern states act as a mine of ornamental fishes. Swain et al.(2008) documented that the total reported species from North-eastern states belong to 114 genera under 38 families and 10 orders.[1] Prevailing species of ornamental fishes include Gold fish, Oscar, Fighter, Flowerhorn, Discuss,Tetra, Angel, Molly, and Guppy which are cultured near main exporting hubs;– Kolkata, Mumbai, Chennai, Kerala in India and have marked our country 31st rank in global trade. Kolkata market (Gallif street market) plays the key role in export followed by Mumbai and Chennai. It has been discovered that Indian native fishes too have high quality aesthetic parameters droving them towards the great demand in International markets. These Indigenous species also have emerged in exporting to Italy, China, Srilanka, and Belgium etc. Almost 267 species of indigenous species are exporting within our country and foreign countries too from western gGhat region and northeast India. Around 85% of the total market is contributed by the North eastern states of India such as West Bengal, and Assam etc. West Bengal is the only state of India which extends from the foot of the great Himalaya to Bay of Bengal between 85^0 55' and 89^0 50' east longitude, 21^0 25' and 27^0 13' north latitude with numerous hill streams, rivers, ponds, ditches, and canals etc. West Bengal has already achieved the sanctification certificates in fish production and trading and has been awarded by Central Government. This state is till now regarded as the pioneer state in ornamental fish trading and Kolkata is the main hub of this emerging business by contributingalmost 85%.

Raja et al. (2019) also described that there is a good demand for Indian indigenous ornamental fish in the international markets; limited numbers are exported due to many reasons.[2]

Though 174 indigenous fishes from West Bengal have ornamental values but only few fresh water species can be put in a confined space without harming fish biology. Like Loaches, 5 Barbs, Danios, *Colisalalia*, *Colisafasciatus, Badisbadis,* and*Macrognathuspancalus* etc.

According to Ghosh et al. (2002), indigenous species are classified into two broad categories: classified aquarium and non-classified aquarium.[3] Classified aquarium native fishes are relatively sound in foreign market rather than domestic market. Hence, supply of these fishes are mainly based on wild capturing which ultimately resulting with a reduction in population leading to biodiversity loss in near future.Saha M.K. and Patra B.C, (2013) recommended the demand for indigenous ornamental fish variety is increasing.[4]The huge variety and potentiality of indigenous ornamental fish make the business powerful. The objective of indigenous ornamental fish culture is to minimize the loss of fish species from natural habitat.

A lack of proper documentation has driven away these living wealth from all concerned biologists. Southern part of West Bengal is suffering from this gradual declination of species richness and ecological imbalances. Industrialisation, urbanisation, decreasing water quality accelerate reduction rate. Some of the species were plenty in natural bodies for ten years ago which become very rare species today. Present work is done to draw attention of the competent authorities to take initiatives to protect native wealth from future extinction.

2. EXPERIMENTAL DETAILS

An intricate limited tenure survey was performed from August'2019 to September'2022 over the three districts of Southern Bengal namely Howrah, North and South 24 paragans. Howrah is situated between 22^{0}48' N and 22^0 12' N latitudes and 88^{0}23' and 88^{0}50'E longitude. North 24 paraganas lies between 22^0 11' north to 23^{0}15'north latitude and from longitude 88 degree 20 minutes E to 89 degree

5 minutes. South 24 paraganasextends latitude North $20^0 20'$ and $22^0 06'$ south and longitude 88^0 20'east to 88^0 60' west.

Study areas of Howrah:

i. Pakuria
ii. Ramrajatala and Santragachi adjacent areas
iii. Nibra and Shalap areas
iv. Uluberia
v. Amta

Study areas of South 24 Paragans:

i. Budge budge
ii. Pujali
iii. Durgapur

Specimens were collected from river, ponds, canals, and ditches by using different forms of nets and gears, from local fishermen, wild collectors, and different fish markets. Immediately after capturing, the specimen is preserved in 5% formalin for further investigations. Alive specimens are packaged with oxygen and taken to keep in aquarium.

Formal and non-formal conversations with local people, fishermen and exporters helped to gather information about fish species. Moreover **'HatiBagan'** pet market located in Gallifstreet has provided the domestic market position and price of every species.

Identification of specimen is done on the basis of Hamilton, Bloch &Scheidner. Conservation status of all collected specimens were denoted according to the record of NBFGR (National Bureau of Fish and Genetic Resources) and IUCN(International Union for Conservation of Nature and Natural Resources) Red List. Fish photographs were taken from the fresh live samples using mobile camera.

3. **RESULTS AND DISCUSSION**According to earlier report by Basu et al. (2012), 54 indigenous fish species have ornamental value belonging to 9 orders.[5]Among the enlisted species some are edible fishes too and hence categorised as non-classified aquarium fishes. 23 fishes have good quality ornamental values and thus have demand in export market.

Procurable freshwater ornamental species of indigenous variety from

Howrah:

Zebra fish, *Badisbadis, Aplocheiluspanchax,* mainly 3 types of gouramis, *Puntiusconchonius, P. ticto, Chandanama, Nandusnandus, Xenentodoncancila,* and few varieties of catfishes are also available from the interior regions of Howrah district. *Channamarulias*,(14 inch) very popular in export world as it yields Rs. 10,000 from middle east countries specially Japan. Inspite of having food value this species and some ornamental characters too.

South 24 paraganas:

This place provides habitats for danios such as *daniodevario*, *daniorerio*, gouramis, barbs such as *Pethiagelius, Chandaranga, Chandanama*, *Badisbadis*, bumble bee, *Rasboradaniconius, Bagariusbagarius, Rita rita, Notopteruschitala*and*Scatophagusargus.*

Members of order Cypriniformes are reigning over the entire kingdom of indigenous ichthyofauna followed by perciformes. 5 species under order Cypriniformes are glamorous. 3 species of

Perciformes are very well in domestic as well as foreign market for their uniqueness. Order Symbranchiformes includes two varieties of eels, most peaceful in fish with snake like attitude.

Table-1: List of fishes (Ornamental/ Food) available from Southern Bengal

Order	Family	Scientific name	Remark
Cyprinodontiformes	Aplocheilidae	*Aplocheiluspanchax*	F, CA
Perciformes	Nanidae	*Badisbadis*	F, CA
Cypriniformes	Cyprinidae	*Brachydaniorerio*	F, CA
Perciformes	Ambassidae	*Parambassisranga*	F,B; CA
Perciformes	Ambassidae	*Chandanama*	F,B; CA
Perciformes	Channidae	*Channagachua*	F,CA
Perciformes	Channidae	*Channamarulias*	F,CA
Perciformes	Osphronemidae	*Colisafasciatus*	F,CA
Perciformes	Osphronemidae	*Colisalalia*	F,CA
Cypriniformes	Cyprinidae	*Chela laubuca*	F,B; CA
Cypriniformes	Cyprinidae	*Daniodevario*	F,CA
Cypriniformes	Cyprinidae	*Esomusdanricus*	F,CA
Perciformes	Gobiidae	*Glossogobiusgiuris*	F,B; minor CA
Cypriniformes	Cobitidae	*Lepidocephalicthysguntea*	F,B;CA
Synbranchiformes	Mastacembilidae	*Macrognathuspancalus*	F,B; minor CA
Synbranchiformes	Mastacembilidae	*Mastacembelusarmatus*	F,B;CA
Perciformes	Nanidae	*Nandusnandus*	F,B;CA
Cypriniformes	Cyprinidae	*Puntiusconchonius*	F,CA
Cypriniformes	Cyprinidae	*Puntiusticto*	F,CA
Cypriniformes	Cyprinidae	*Puntiussophore*	F,CA
Cypriniformes	Cyprinidae	*Puntiusterio*	F,CA
Tetradontiformes	Tetradontidae	*Tetradoncutcutia*	F,CA
Beloniformes	Belontidae	*Xenentodoncancila*	F,CA
Siluriformes	Bagaridae	*Mystustengara*	F,CA
Siluriformes	Bagaridae	*Mystusvittatus*	F,CA
Cypriniformes	Cyprinidae	*Rasboradaniconius*	F,B; minor CA
Siluriformes	Sisoridae	*Bagariusbagarius*	F,B; Game fish
Siluriformes	Bagaridae	*Rita rita*	F,B; NCA
Siluriformes	Heteropneustidae	*Heteropneustesfossilis*	F,B; NCA
Osteoglossiformes	Notopteridae	*Notopteruschitala*	F,NCA: Game fish
Siluriformes	Siluridae	*Ompakpabda*	F,NCA
Cypriniformes	Botiidae	*BotiaDario*	F,CA
Cypriniformes	Cyprinidae	*Ambylopharngodonmola*	F,CA

Perciformes	Scatophagidae	*Scatophagusargus*	F,B; CA
Perciformes	Channidae	*Channaorientalis*	F,CA

F:Freshwater fish**, B:**Brackish water fish**, CA:**Classified Aquarium fish**, NCA:**Non- Classified Aquarium fish

Among the enlisted indigenous fishes, 23 species have desirable ornamental characteristics and thus have a market demand in both local and export domain. Though local market requisition is less due to less popularity as commercial fish. Table–2 shows the variety of indigenous species from southern Bengal which are exporting for their beauty and their monetary values in export trading**.**

Trade name	Scientific name	Author	Export value	Local value
Blue panchax	*Aplocheilus panchax*	Hamilton,1822	Rs. 8	Rs. 3.50
Chameleon fish	*Badis badis*	Hamilton,1822	Rs. 9	Rs. 5
Zebra danio	*Danio rerio*	Hamilton,1822	Rs. 5	Re 1
Indian glassy fish	*Parambassis ranga*	Hamilton,1822	Rs. 5	Rs. 2
Elongate glass perchlet	*Chanda nama*	Hamilton,1822	Rs. 5	Rs. 2
Asiatic snakehead	*Channa gachua*	Hamilton,1822	Rs. 70	Less demand
Honey Gourami	*Colisa chuna*	Hamilton,1822	Rs. 6- Rs. 10	Rs. 7
Banded gourami	*Trichogaster fasciatus*	Bloch & Schneider,1801	Rs. 44 -Rs. 64	Rs. 20
Dwarf gourami	*Trichogaster lalius*	Hamilton,1822	Rs. 25	Rs. 10
Bengal danio	*Devario devario*	Hamilton,1822	Rs. 27-Rs. 30	Rs. 10
Moustaced danio	*Danio dangila*	Hamilton,1822	Rs. 30	Rs. 10
Indian flying barb	*Esomus danricus*	Hamilton,1822	Rs. 70	Less demand
Guntea loach	*Lepidocephalicthys guntea*	Hamilton,1822	Rs. 18	Rs. 5
Striped spiny eel	*Macrognathus panculus*	Hamilton,1822	Rs. 250	Rs. 80
Tire track eel	*Mastacembelus armatus*	Lacépède,1800	Rs. 900	Rs. 250
Leaf fish	*Nandus nandus*	Hamilton,1822	Rs. 40	Less demand
Indian rosy barb	*Puntius conchonius*	Hamilton,1822	Rs. 4- Rs. 10	Rs. 9
Fire fin barb	*Puntius ticto*	Hamilton,1822	Rs. 10- Rs.12	Rs. 4- Rs. 25
Terry barb	*Puntius terio*	Hamilton,1822	Rs. 10	Less demand
Emerald puffer	*Tetradon cutcutia*	Hamilton,1822	Rs. 100	Rs. 50
Silver needle fish	*Xenentodon cancila*	Hamilton,1822	Rs. 100	Rs. 12- Rs. 15
Golden barb	*Pethia gelius*	Hamilton,1822	Rs. 4- Rs.10	Rs. 2
Stripped dwarf catfish	*Mystus vittatus*	Bloch 1794	Rs. 24	Rs. 4- Rs.6

Table-2: List of indigenous species, and their export and local prices

IUCN Red List provides the conservation status of reported fishes which are classified aquarium fish and can be kept in aquarium for fun and fancy are briefly coded in **Table**-3.

Order	Family	Trade Name	Conservation status
Cyprinidontiformes	Aplocheilidae	Blue Panchax	Least Concern
Cypriniformes	Cobitidae	Guntea loach	
	Cyprinidae	Zebra danio	
		Indian glass barb	
		Silver danio	
		Moustaceddanio	
		Indian flying barb	
		Indian rosy barb	
		Fire fin barb	
		Pool barb	
		Terry barb	
Perciformes	Nanidae	Chameleon Fish	
		Leaf Fish	
	Ambassidae	Indian glass fish	
		Elongate glass perchlet	
	Osphronemidae	Giant gourami	
		Dwarf gourami	
		Honey gourami	
Symbranchiformes	Mastacembilidae	Stripped spiny eel	
		Tire track eel	
Beloniformes	Belontidae	Silver needle fish	
Tetradontiformes	Tetradontiade	Emerald puffer fish	

Table -3 : Conservation Status of indigenous species exporting from three districts

Orders and families of potential indigenous fishes are represented graphically in **Fig 1** and **2** respectively.

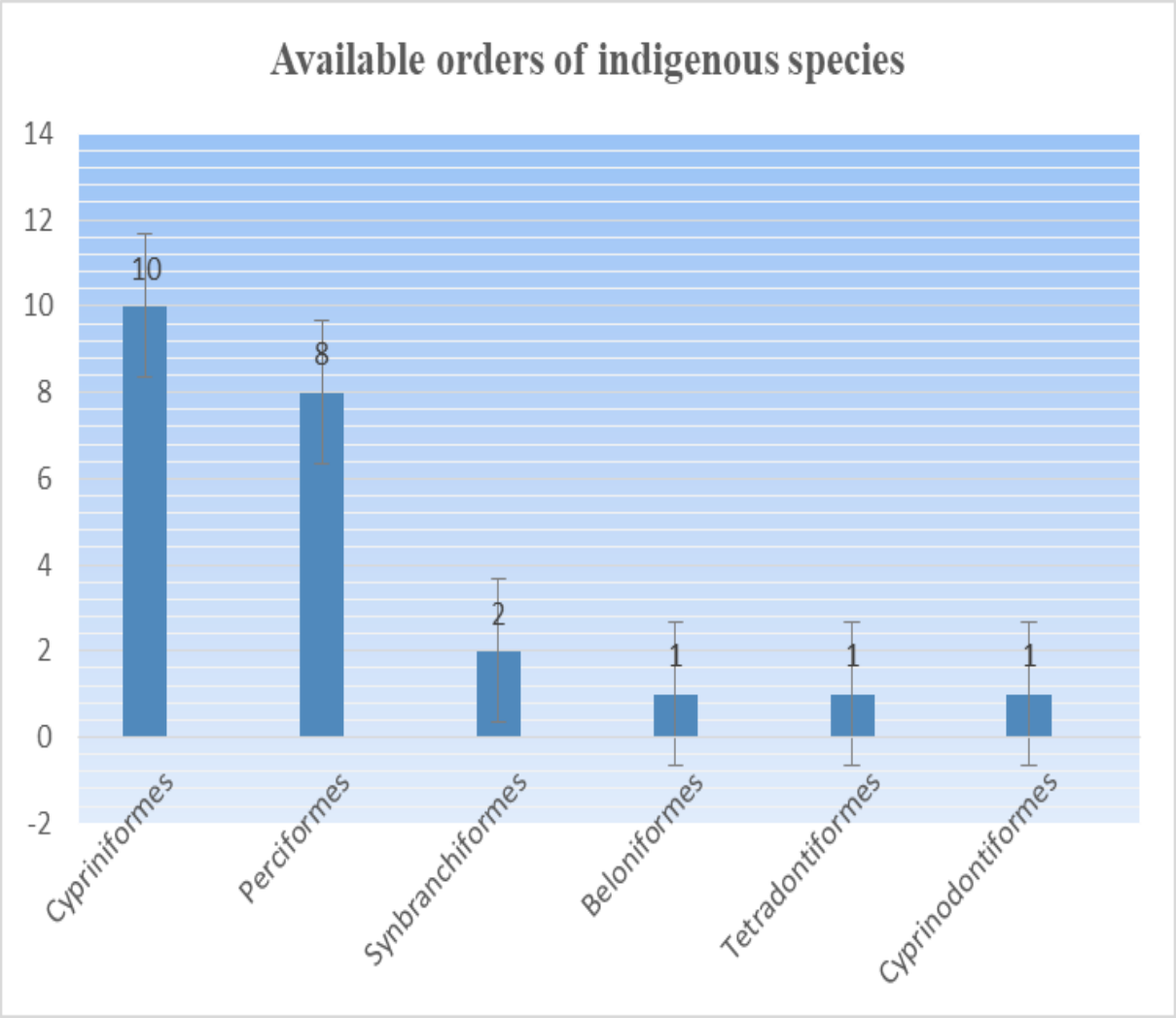

Fig-1: Available Orders of Indigenous Species

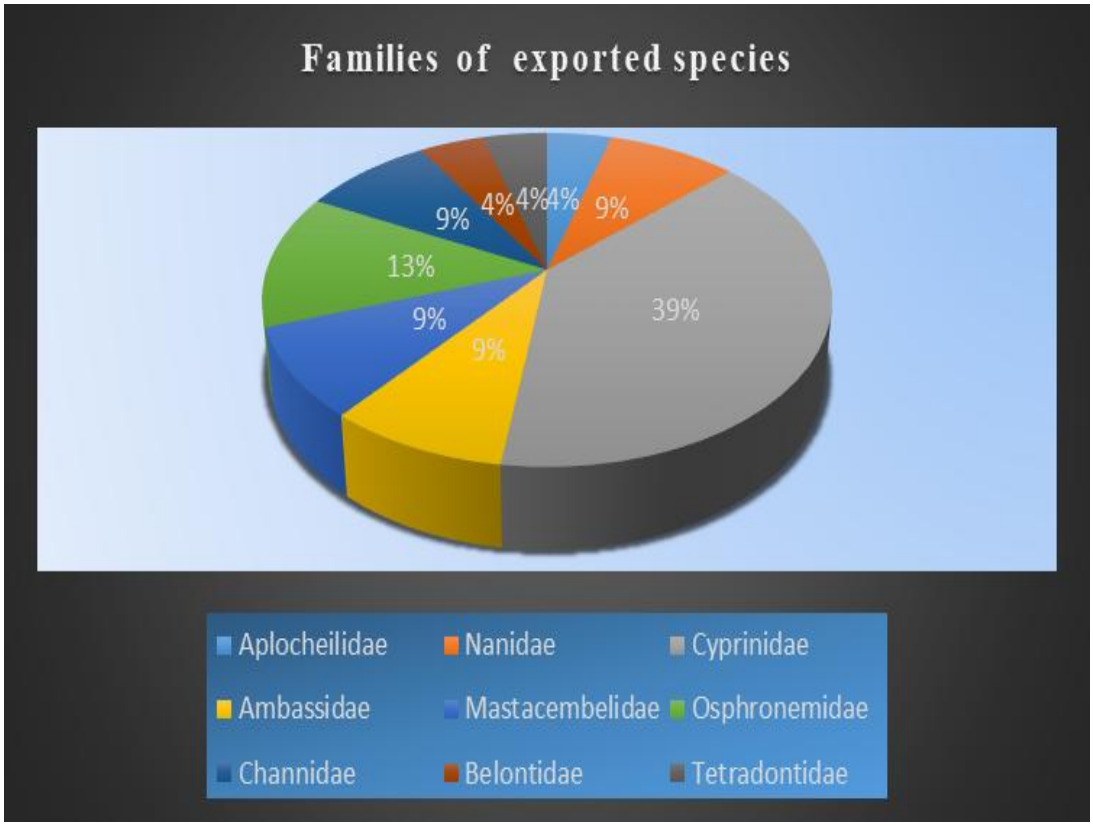

Fig-2: Families of Indigenous species exported from Southern Bengal

Fishes with less nutritive value are selected for aquarium keeping for their ornamental features, food habits of those species studied in brief. **Table 4** shows the trophic level of those selected species.

Fishes	Food Habits
Zebra fish	Omnivorous
Dwarf gourami	Omnivorous
Giant gourami	Carnivorous
Honey gourami	Carnivorous
Blue panchax	Larvivorous
Chameleon fish	Omnivorous
Rosy barb	Omnivorous
One spot barb	Omnivorous
Indian glass fish	Carnivorous

Table 4. Selected fishes for aquarium keeping and their food habits

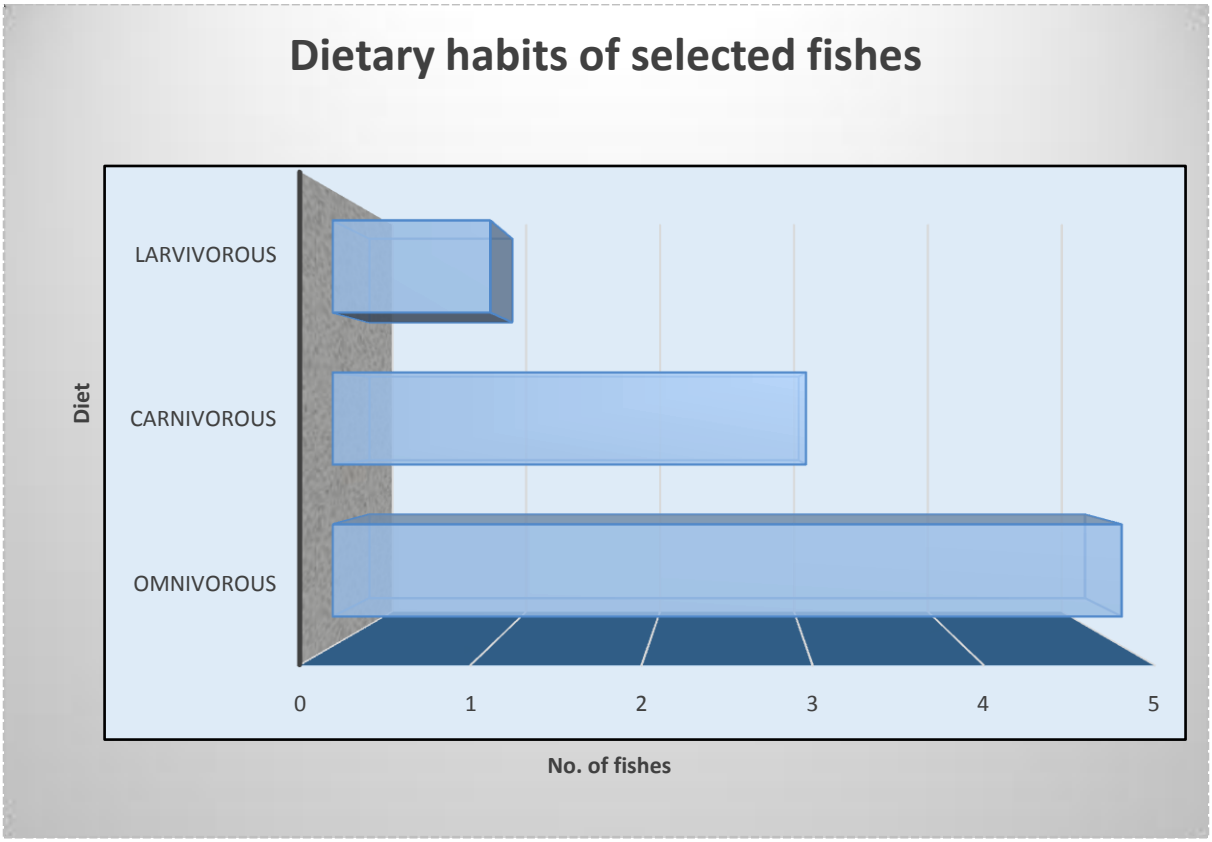

Fig-3: Dietary habits of selected Indigenous species

The availability status of aquarium indigenous fishes in natural aquatic systems is shown below in Table-5

Plenty	Rare	Very rare
Zebra fish	Tire track eel	*Channamarulias*
Mystusvittatus	Spiny eel	*Tetradoncutcutia*
Blue panchax	*Channagachua*	*Botia Dario*
Chameleon fish	Indian gar fish	*Esomusdanricus*
Indian rosy barb	*Nandusnandus*	*Pethiagelius*
Colisachuna	*Colisafasciatus*	Bengal danio
Colisalalia	Guntea loach	???

Table-5: Availability of selected fishes exporting from southern Bengal

Puntiusconchonius popularly known as Indian Rosy barb with a vibrant yellowish orange colour and a black dot prior to tail, is one of the hardiest aquarium species,inhabits in pondwater,benthopelagic,feed upon both plant and animal matter. A school of 5 to 6 individuals can roam within an aquarium of minimum size 85 cm.

*Brachydaniorerio,*called as zebra fish in domestic world of ornamental fish, small indigenous fish with maximum length of 4cmis found in streams, canals, and ponds, carnivorous in food habit. A group of 5 to 6 members of zebra fishes are supported in a minimum size confined space. Additionally this

species is very much favoured by researchers. Another member of that same order is Bengal danio, *Daniodevario* maximum 8cm long, benthopelagic, found in beels,ponds, carnivorous in food habit,with a combination of indigo blue and golden colour, share same neighbourhood with zebra fish and rosy barb.

Three above mentioned species are randomly collected from wild habitat and are handed over to middle men who either export or send to local markets. Bulk of the recorded native fishes wasobserved at least concern(LC) conservation status assessed by IUCN. Unfortunately, present survey work is opposing the past data as the availability of indigenous species is warning about their gradual falling off from most abundant to rare. All three varieties of gouramis have high risk to fall off from nature as they are exported more than thousands in number.

In respect to gouramis, zebrafish, chameleon fish, panchaxetc are quite safe due to their abundance in natural water bodies. Locally high demanding rosy barb is plenty in nature but became restricted to few zones of these districts. Simultaneously *Pethiagelius* is suffering from limitedness. The leaf fish has became a rare species of both the 24 paraganas. Indian flying barb, ensuring a rate of Rs. 70 to Rs. 80 per piece has turned into a rare species due to lack of awareness. Bengal danio is also on the same platform of flying barb.Presently, freshwater puffer can be coined as endangered. *Channamarulias*, locally known as sal shows a sharp depletion in abundance in all three districts. Eel varieties also has become resident of mainly north 24 paragnas which is denoting population reduction.

From the above table-4, Zebra fish, *Mystusvittatus*,BluePanchax, Chameleon fish, Indian rosy barb and two species of gourami are quite abundant in nature but *Channamarulias, Tetradoncutcutia, Botia Dario,* and*Pethiageliuse*tc show a danger sign in abundance.

Lack of knowledge about the species, its role in natural aquatic ecosystem and high export demand, are boosting up these ornamental fishes in the dark den of extinction. Besides, habitat fragmentation and destruction, poor water quality, and agri-based pollutants add on the depletion of population.

- **Lack of awareness:**
  Deficit knowledge about fish species available in local areas, its role in nature, market demand is the main cause of population reduction of native fishes. Most of the local people,fishermen, collectors are unaware about the species. As an outcome they are using this bioresource according to their wish and pushing them in the path of extinction.
- **Habitat destruction and fragmentation:**
  To meet up the space crisis for growing population and urbanisation, ponds are filled up and sky-touching buildings are constructed by destroying total biodiversity of that ponds and ditches.
- **Poor water quality:**
  Day by day water quality of any region is decreasing due to sewage pollutants, heavy metals, several mineral salts deposition. Highly civilised multi-storeyed buildings with poor sewage treatment means produce huge amount of untreated waste water which mouths open into near body water body like rivers or ponds. Moreover industrialisation along with urbanisation act as a good source of oil based effluents, heavy metals like chromium,cadmium,zinc,lead etc. the anthropogenic activities multiply the aquatic pollution causing aquatic loss.
- **Agri - based pollutants:**

Application of chemical pesticides to eradicate pests from agricultural field is actively affecting the fishes by changing their histopathological conditions of liver, kidney, gills and hence increases the rate of mortality. Herbicides, fungicides of paddy field usually drain into adjacent canals where danios, chameleon fish, panchax inhabits. Endosulfan, dimethoate, malathion are very common representative of pollutants that detoriate fish biology. Implications of Aqua- eco friendly measures would reduce agri- based pollutants accumulation in fish.

4. CONCLUSION

Having all kinds of geographical landforms, West Bengal is a native place of vast range of indigenous ornamental fishes other than table fishes and can be termed as a hidden treasure of ornamental fish industry. After this survey work, it may be concluded that southern Bengal is highly prosperous in indigenous ornamental fish sector if conservation of piscine diversity is strictly operated and the entire exporting channels are controlled with efficient experts and accurate documentation.

- Native fishes have great potentiality as they are exporting from southern Bengal to different states of India and countries. These species can be cultured in proper scientific way after getting details about its biology for enhancing the trading as well as piscine resource of our country. Appropriate breeding techniques, quality brooder stock, prime feed for each and every stage from hatchling to adult ones will raise the quality and quantity of the species which will increase the species availability.
- Specific breeding and rearing of several indigenous species are developed by Sinha and Mahapatra (2012), but no real implications can be seen in this sector as exporters and collectors solely depend upon wild capturing.[6]
- Indigenous ornamental fishes would evolve into a business like exotic ornamental fishes if farmers culture them with same attention. Thus they can be benefitted by exporting and in wholesaling. Culture of molly will return Rs. 6 on average whereas Indian rosy barb will return minimum Rs. 10. A remarkable profit can be achieved by indigenous culture.
- Government organizations can promote exhibitions especially on native fishes to popularise them in domestic domains along with aquarium equipment like aquatic plants, hiding places, stones and lights to draw attentions of children, aquarists, photographers. Block -wise workshops by fishery officer in charge on native fish popularisation with local fishermen, traders will increase the interest in native fish keeping and consciousness about species richness and quality.
- Though both the central and state government mainly concern with culture and rearing of Indian major carps and popular aquarium fishes. They should also take initiatives to save native ornamental fishes to esteem the economy by domestic claims and exports.
- If government fishery institutions could set up large scale facilities and provide specialised training and support to breeders, more indigenous ornamental fish can be produced for enhancing export from the country.

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