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PRESENT STATUS, DISTRIBUTION AND POTENTIAL OF ORNAMENTAL FISHES OF RIVER GANGA

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Fish has always been a source of entertainment for several hobbyists for long time. Ornamental fishery is one such hobby carried out all over the world owing to its unique and vibrant colouration and activity. Besides this, the rising demand has made them an important constituent for domestic and foreign exchange. Natural open water bodies like ocean, rivers, estuaries and wetlands are some of the potential sources of native ornamental fish species. They can form an imperative contributor towards the upliftment of socio-cultural economy of a particular region. Ornamental fish and fishery have received a significant attention in developing countries in recent years. Ornamental fish trade is estimated around Rs. 2000 crores in world[1] and 1 billion ornamental fish are traded from 100 countries annually[2]. India is a rich hub of ornamental fish species with wide range of resources. The freshwater ornamental varieties inhabit mainly in hill stream, major riverine system specially north-eastern river and Himalayan river, lake as well as reservoir. The north-eastern states are the leading countries in India for ornamental fish trading. Around 150 indigenous fish species are considered under commercially important ornamental fish[2]. The potential has been estimated as Rs. 5000 crores in Indian trade market for ornamental fish[3], though India exports only US$ 1.02 million, with a rank of 29th in the world[2].

River Ganga (between 22°18’6.43" N to 31°02’49.31" N and 77°58’47.44" E to 88°30’37.89" E), the longest river of India in the plains initiates from the Himalayan foothills and drains various basins, joining with number of tributaries and streams before merging into the Bay of Bengal. During the present survey conducted by Central Inland Fisheries Research Institute, Barrackpore, 80 indigenous ornamental fish species belonging to 16 orders, 32 families and 56 genera were collected from the various sampling sites. Family wise species heterogeneity was observed, with Danionidae being the most dominant family with 14 species (17.5%) followed by Cyprinidae (13.75%) with 11 species, Sisoridae (8.75%) with 7 species, Channidae and Gobiidae with 4 species and Botiidae, Siluridae, Osphronemidae and Ambassidae with 3 species each (Table 1.).

Zone-wise classification of ornamental fishes was also evaluated to understand the region specific richness (Figure 1.). As per the recent study conducted by ICAR-Central Inland Fisheries Research Institute, higher percentage of ornamental fishes is reported from the middle stretch (N=54) of river Ganga extending from Bijnor to Varanasi in Uttar Pradesh. Likewise, lower stretch (Buxar to Godakhali) was recorded with 49 ornamental fish species. Both upper (N=19) and estuarine stretch (N=12) of the river was observed with less number of ornamental fish diversity.

Sitewise representations of ornamental fish diversity have been shown in Figure 2. As per the present status, site Bijnor in Uttar Pradesh was observed with highest number of ornamental fish species (57) followed by Farakka (49), Narora (48) and Berhampore (46) respectively. Sarkar et al.[4] has described 35 fish species as potential aquarium fishes from entire Uttar Pradesh. Tributaries connected with

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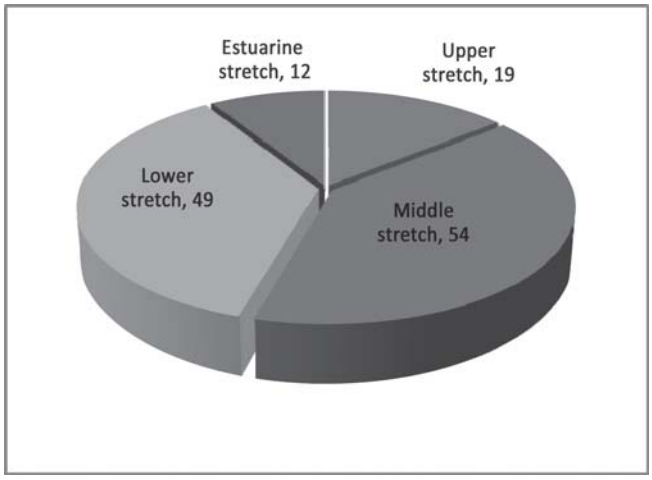

Figure 1. Zone Wise Classification of Ornamental Fishes from River Ganga

the main channel of river Ganga also plays a significant role in feeding of ornamental fishes. River Ghaghara a major Gangetic tributary in Uttar Pradesh supports 48.40%of aquarium fishes out of the recorded 62 freshwater fishes[5]. Similarly, Gupta and Tripathi[6] has further elucidated 20 species (32.78%) out of the 61 recorded fish species from river Gomti near to Lucknow. Srivastava[7] during a field survey of 10 kilometres stretch from Chhitauni Bagaha Rail Bridge have recorded 41 (75.92%) different freshwater ornamental fish species out of the total 54 different commercially important ichthyofauna. On the other hand, river Yamuna another important tributary of river Ganges also supports 27.65% of ornamental fishes signifying a substantial amount of indigenous ornamental fishery potential[8].

The similarity in ornamental fish species composition across the river is depicted in Figure.3. The present study has recorded high similarity in study points in estuarine stretch of river. Similar pattern can be followed in few points in middle stretch of the river viz. Kanpur, Varanasi, Farukhabad and Prayagraj. Lower stretches especially Farakka, Berhampore has shown less similarity patterns. Sites like Tehri and Haridwar in upper stretch showed similarity trend.Although related, sites like Bijnor and Narora showed distant relationship showing less similarity in composition.

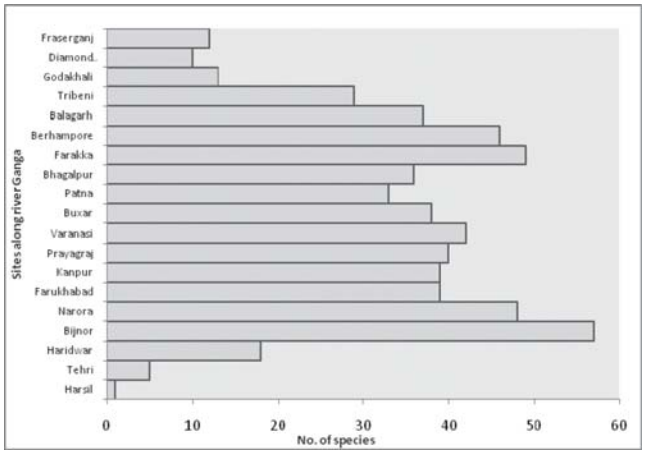

Figure 2. Site Wise Classification of Ornamental Fishes from River Ganga

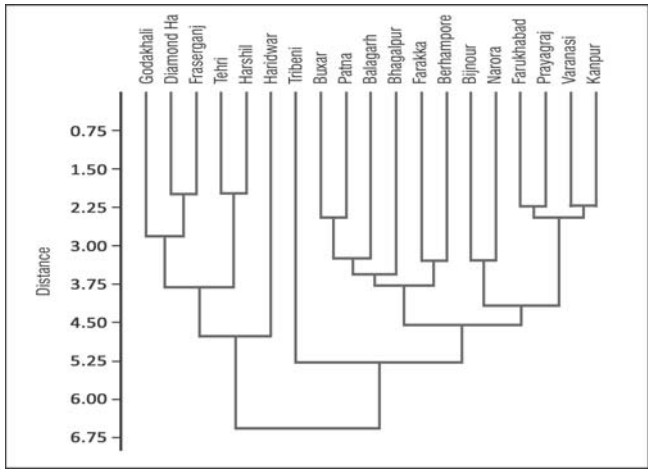

Figure 3. Dendrogram showing similarity between all sites in River Ganga

Documentation of the conservation status following the IUCN Red List of Threatened Species has revealed that among the 80 fish species, six species are under 'Near Threatened' (NT) category, one species is under 'Endangered' (EN) category and 70 species are under 'Least Concern' (LC). However, two species are under 'Not Evaluated' (NE) category (Figure 4).

Economic Importance and Potential of Ornamental Fishes of River Ganga

The population of native ornamental fishes can fulfill the increasing demand of aquarium and promotes the

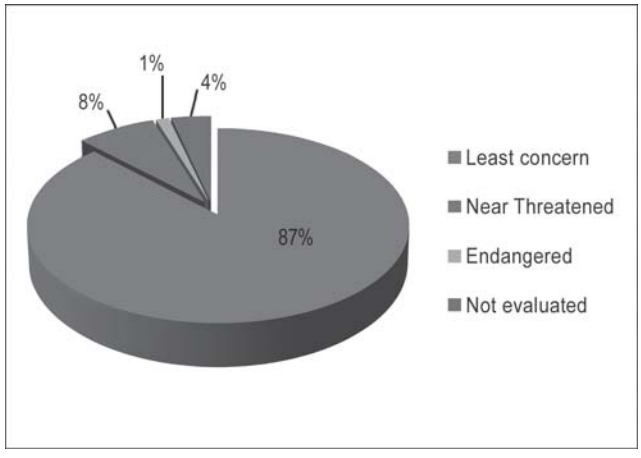

Figure 4. Percent evaluation of ornamental fish conservation status in river Ganga

Table 1. List of Ornamental Fishes of River Ganga

Sl No	Species	Family	Order	Common name	IUCN red list
1.	*Aborichthys elongatus* (Hora 1921)	Nemacheilidae	Cypriniformes	Stone loach	LC
2.	*Ailia coila* (Hamilton 1822)	Aillidae	Siluriformes	Gangetic Ailia	NT
3.	*Amblyceps mangois* (Hamilton,1822)	Amblyceptidae	Siluriformes	Indian torrent catfish	LC
4.	*Amblypharyngodon mola* (Hamilton,1822)	Danionidae	Cypriniformes	Molacarplet	LC
5.	*Aplocheilus panchax* (Hamilton,1822)	Danionidae	Cyprinodontidae	Blue panchax	LC
6.	*Badis badis* (Hamilton,1822)	Badidae	Anabantidae	Badis	LC
7.	*Barilius barila* (Hamilton 1822)	Danionidae	Cypriniformes	Barred Baril	LC
8.	*Barilius vagra* (Hamilton 1822)	Danionidae	Cypriniformes	VagraBaril	LC
9.	*Batasio batasio* (Hamilton 1822)	Bagridae	Siluriformes	Batasio	LC
10.	*Megarasbora elanga* (Hamilton 1822)	Danionidae	Cypriniformes	Bengala barb	LC
11.	*Boleophthalmus boddarti* (Pallas 1770)	Gobiidae	Gobiiformes	Boddart's goggle-eyed goby	LC
12.	*Botia dario* (Hamilton,1822)	Botiidae	Cypriniformes	Bengal loach	LC
13.	*Botia lohachata* (Chaudhuri 1912)	Botidae	Cypriniformes	Reticulate loach	NE
14.	*Botia rostrata* (Günther 1868)	Botiidae	Cypriniformes	Gangetic loach	NE
15.	*Brachirus pan* (Hamilton, 1822)	Soleidae	Pleuronectiformes	Pan sole	LC
16.	*Brachygobius nunus* (Hamilton 1822)	Gobiidae	Gobiiformes	Bumblebee goby	NE
17.	*Cabdio morar* (Hamilton 1822)	Danionidae	Cypriniformes	Morari	LC
18.	*Chaca chaca* (Hamilton, 1822)	Chacidae	Siluriformes	Squarehead catfish	LC
19.	*Chanda nama* (Hamilton,1822)	Ambassidae	Perciformes	Elongate glass-perchlet	LC
20.	*Channa gachua* (Hamilton,1822)	Channidae	Anabantiformes	Walking snakehead	LC
21.	*Channa marulius* (Hamilton,1822)	Channidae	Anabantiformes	Great snakehead	LC
22.	*Channa punctata* (Bloch 1793)	Channidae	Anabantiformes	Spotted snakehead	LC
23.	*Channa striata* (Bloch 1793)	Channidae	Anabantiformes	Striped snakehead	LC
24.	*Chitala chitala* (Hamilton,1822)	Notopteri	Osteoglossiformes	Humped featherback	NT
25.	*Devario devario* (Hamilton 1822)	Danionidae	Cypriniformes	Sind Danio	LC
26.	*Drepane punctata* (Linnaeus 1758)	Drepaneidae	Acanthuriformes	Spotted sicklefish	LC
27.	*Eleotris fusca* (Bloch & Schneider 1801)	Eleotridae	Gobiiformes	Dusky sleeper	LC
28.	*Erethistes hara* (Hamilton 1822)	Sisoridae	Siluriformes	Sylhet Hara	LC
29.	*Erethistes pusillus* (Müller &Troschel 1849)	Sisoridae	Siluriformes	Gangetic erethistes	LC
30.	*Esomus danrica* (Hamilton 1822)	Danionidae	Cypriniformes	Flying barb	LC
31.	*Gagata cenia* (Hamilton 1822)	Sisoridae	Siluridae	Indian gagata	LC
32.	*Gagata gagata* (Hamilton 1822)	Sisoridae	Siluridae	Gangetic gagata	LC
33.	*Glossogobius giuris* (Hamilton,1822)	Gobiidae	Gobiiformes	Tank goby	LC
34.	*Glyptothorax cavia* (Hamilton 1822)	Sisoridae	Siluridae	Heart Throat Catfish	LC
35.	*Glyptothorax garhwali* (Tilak, 1969)	Sisoridae	Siluridae	NA	LC
36.	*Hyporhamphus limbatus* (Valenciennes 1847)	Belonidae	Beloniformes	Congaturi halfbeak	LC
37.	*Labeo bata* (Hamilton,1822)	Cyprinidae	Cypriniformes	Bata labeo	LC
38.	*Laubuka laubuca* (Hamilton 1822)	Danionidae	Cypriniformes	Indian glass barb	LC
39.	*Leiodon cutcutia* (Hamilton,1822)	Tetraodontidae	Tetraodontiformes	Ocellated pufferfish	LC

Sl No	Species	Family	Order	Common name	IUCN red list
40.	*Lepidocephalichthys guntea* (Hamilton,1822)	Cobitidae	Cypriniformes	Guntea loach	LC
41.	*Macrognathus aral* (Bloch & Schneider 1801)	Mastacembelidae	Synbranchiformes	One-stripe spinyeel	LC
42.	*Macrognathus pancalus* (Hamilton,1822)	Mastacembelidae	Synbranchiformes	Barred spiny eel	LC
43.	*Monopterus cuchia* (Hamilton,1822)	Synbranchidae	Synbranchiformes	Cuchia	LC
44.	*Mystus bleekeri* (Bloch 1794)	Bagridae	Siluriformes	Day's mystus	LC
45.	*Mystus gulio* (Bloch 1794)	Bagridae	Siluriformes	Long whiskers catfish	LC
46.	*Mystus vittatus* (Bloch 1794)	Bagridae	Siluriformes	Striped Dwarf Catfish	LC
47.	*Nandus nandus* (Hamilton 1822)	Nandidae	Anabantiformes	Mud perch	LC
48.	*Ompok bimaculatus* (Hamilton 1822)	Siluridae	Siluriformes	Butter Catfish	NT
49.	*Ompok pabda* (Hamilton 1822)	Siluridae	Siluriformes	Pabdah catfish	NT
50.	*Ompok pabo* (Hamilton 1822)	Siluridae	Siluriformes	Pabo catfish	NT
51.	*Opsarius barna* (Hamilton 1822)	Danionidae	Cypriniformes	Barnabaril	LC
52.	*Opsarius bendelisis* (Hamilton 1807)	Danionidae	Cypriniformes	Hamilton's barila	LC
53.	*Opsarius tileo* (Hamilton 1822)	Danionidae	Cypriniformes	Tileobaril	LC
54.	*Oreichthys cosuatis* (Hamilton 1822)	Cyprinidae	Cypriniformes	Kosuati barb	LC
55.	*Pachypterus atherinoides* (Bloch 1794)	Horabagridae	Siluriformes	Potasi	LC
56.	*Pangio pangia* (Hamilton,1822)	Cobitidae	Cypriniformes	Pangia coolie-loach	LC
57.	*Paracanthocobitis botia* (Hamilton,1822)	Nemacheilidae	Cypriniformes	Mottled loach	LC
58.	*Parambassis baculis* (Hamilton,1822)	Ambassidae	Perciformes	Himalayan glassy perchlet	LC
59.	*Parambassis lala* (Hamilton,1822)	Ambassidae	Perciformes	Highfin glassy perchlet	NT
60.	*Parambassis ranga* (Hamilton,1822)	Ambassidae	Perciformes	Indian Glassy Fish	LC
61.	*Pethia conchonius* (Hamilton 1822)	Cyprinidae	Cypriniformes	Rosy barb	LC
62.	*Pethia gelius* (Hamilton 1822)	Cyprinidae	Cypriniformes	Golden barb	LC
63.	*Pethia phutunio* (Hamilton 1822)	Cyprinidae	Cypriniformes	Spottedsail barb	LC
64.	*Pethia ticto* (Hamilton 1822)	Cyprinidae	Cypriniformes	Ticto barb	LC
65.	*Pseudapocryptes elongatus* (Cuvier 1816)	Gobiidae	Gobiiformes	Estuarine goby	LC
66.	*Puntius chola* (Hamilton 1822)	Cyprinidae	Cypriniformes	Swamp barb	LC
67.	*Puntius sophore* (Hamilton 1822)	Cyprinidae	Cypriniformes	Spotfin swamp barb	LC
68.	*Rasbora daniconius* (Hamilton 1822)	Danionidae	Cypriniformes	Slender rasbora	LC
69.	*Rhinomugil corsula* (Hamilton,1822)	Mugilidae	Mugililformes	Corsula mullet	LC
70.	*Salmostoma bacaila* (Hamilton,1822)	Danionidae	Cypriniformes	Large razorbelly minnow	LC
71.	*Scatophagus argus* (Linnaeus 1766)	Scatophagidae	Acanthuriformes	Spotted scat	LC
72.	*Sisor rabdophorus* (Hamilton 1822)	Sisoridae	Siluriformes	Indian Whiptail Catfish	LC
73.	*Systomus sarana* (Hamilton 1822)	Cyprinidae	Cypriniformes	Olive barb	LC
74.	*Tariqilabeolatius* (Hamilton 1822)	Cyprinidae	Cypriniformes	Stone roller	LC
75.	*Terapon jarbua* (Fabricius 1775)	Terapontidae	Centrarchiformes	JarbuaTerapon	LC
76.	*Tor putitora* (Hamilton 1822)	Cyprinidae	Cypriniformes	PutitorMahseer	EN
77.	*Trichogaster chuna* (Hamilton,1822)	Osphronemidae	Cypriniformes	Honey gourami	LC
78.	*Trichogaster fasciata* (Bloch & Schneider 1801)	Osphronemidae	Cypriniformes	Banded gourami	LC
79.	*Trichogaster lalius* (Hamilton,1822)	Osphronemidae	Cypriniformes	Dwarf gourami	LC
80.	*Xenentodon cancila* (Hamilton,1822)	Belonidae	Beloniformes	Freshwater Gar	LC

Table 2. Ornamental Fish Distribution in the River Ganga

Sl no.	Species	Upper zone	Middle zone	Lower zone	Estuarine zone
1.	*Aborichthys elongatus*		+		
2.	*Ailia coila*		+	+	
3.	*Amblyceps mangois*		+	+	
4.	*Amblypharyngodon mola*	+	+	+	
5.	*Aplocheilus panchax*			+	
6.	*Badis badis*		+	+	
7.	*Barilius barila*	+	+	+	
8.	*Bariliusvagra*	+	+		
9.	*Batasiobatasio*			+	
10.	*Bengala elanga*		+		
11.	*Boleophthalmus boddarti*				+
12.	*Botia dario*		+	+	
13.	*Botia lohachata*	+	+	+	
14.	*Botia rostrata*			+	
15.	*Brachirus pan*			+	+
16.	*Brachygobius nunus*			+	+
17.	*Cabdio morar*	+	+	+	
18.	*Chaca chaca*		+	+	
19.	*Chanda nama*	+	+	+	
20.	*Channa gachua*		+		
21.	*Channa marulius*		+	+	
22.	*Channa punctata*		+	+	
23.	*Channa striata*		+	+	
24.	*Chitala chitala*		+	+	
25.	*Devario devario*		+	+	
26.	*Drepane punctata*				+
27.	*Eleotris fusca*			+	+
28.	*Erethistes hara*			+	
29.	*Erethistes pusillus*		+		
30.	*Esomus danrica*		+	+	
31.	*Gagata cenia*		+	+	+
32.	*Gagata gagata*			+	
33.	*Glossogobius giuris*		+	+	
34.	*Glyptothorax cavia*	+	+		
35.	*Glyptothorax garhwali*	+			
36.	*Hyporhamphus limbatus*			+	+
37.	*Labeo bata*	+	+	+	
38.	*Laubuka laubuca*		+	+	
39.	*Leiodon cutcutia*		+	+	
40.	*Lepidocephalichthys guntea*		+	+	

Sl no.	Species	Upper zone	Middle zone	Lower zone	Estuarine zone
41.	*Macrognathus aral*	+	+	+	
42.	*Macrognathus pancalus*		+	+	
43.	*Mystus bleekeri*		+		
44.	*Mystus gulio*				+
45.	*Mystus vittatus*		+	+	
46.	*Nandus nandus*		+	+	
47.	*Ompok bimaculatus*		+	+	
48.	*Ompok pabda*		+	+	
49.	*Ompok pabo*		+	+	
50.	*Ophichthys cuchia*		+	+	
51.	*Opsarius barna*	+	+		
52.	*Opsarius bendelisis*	+	+		
53.	*Opsarius tileo*		+		
54.	*Oreichthys cosuatis*		+		
55.	*Pachypterus atherinoides*		+	+	
56.	*Pangio pangia*		+		
57.	*Paracanthocobitis botia*			+	
58.	*Parambassi sbaculis*		+	+	
59.	*Parambassis lala*		+	+	
60.	*Parambassis ranga*		+	+	
61.	*Pethiaconchonius*	+	+	+	
62.	*Pethiagelius*		+	+	
63.	*Pethia phutunio*			+	
64.	*Pethia ticto*	+	+	+	
65.	*Pseudapocryptes elongatus*			+	+
66.	*Puntius chola*			+	
67.	*Puntius sophore*		+	+	
68.	*Rasbora daniconius*		+	+	
69.	*Rhinomugil corsula*		+	+	+
70.	*Salmostoma bacaila*		+	+	
71.	*Scatophagus argus*			+	+
72.	*Sisor rabdophorus*		+	+	
73.	*Systomus sarana*	+	+	+	
74.	*Tariqilabeo latius*		+	+	
75.	*Terapon jarbua*				+
76.	*Tor putitora*	+	+		
77.	*Trichogaster chuna*		+		
78.	*Trichogaster fasciata*		+	+	
79.	*Trichogaster lalius*		+	+	
80.	*Xenentodon cancila*	+	+	+	

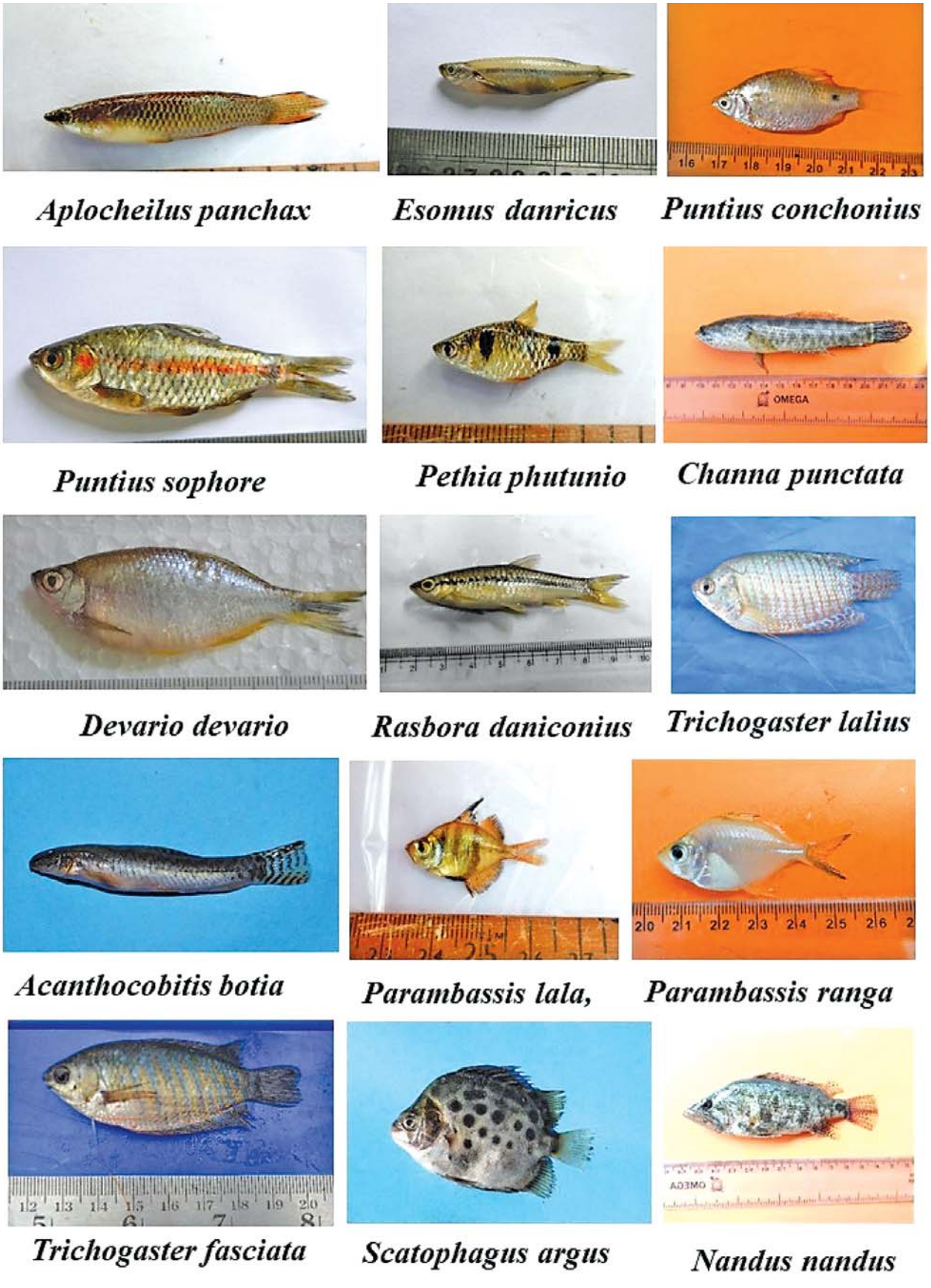

Fig. 5 Commercially important ornamental fishes of River Ganga

economic growth of fishermen. The genera like *Pethia, Barilius, Salmophasia, Devario, Trichogaster* and *Rasbora* are mostly observed aquarium fish group recorded in Ganga fish diversity. High ornamental valued fish species are recorded as *Aplocheilus panchax, Esomus danricus, Puntius conchonius, Puntius sophore, Pethia ticto, Channa punctata, C. striata Devario devario, Rasbora daniconius, Trichogaster lalius, Acanthocobitis botia, Parambassis lala, Parambassis ranga* etc. and they can be commercialized for ornamental fish marketing. The variety of ornamental fish available in the river Ganga over the periods could increase the *Artha Ganga* concept as it was planned in recent year under National Mission for Clean Ganga project. The wild variety of ornamental fish found in the river could be promoted for its ornamental values by different agencies. The generated money would enhance the domestic as well as international trade. The range of price varied between Rs. 10-80/ piece in domestic market and Rs. 50-1000/piece in international market. Finally, the economic return can enormous from trade when it will be put in active practice. The potential of Ganga River for ornamental fishes can help to improve the rural economy by extending the marketing strategy for wild caught species.

Conclusion

Conservation and management of biodiversity in specific eco regions is important for maintaining the sustainability of ecosystems. Conservation, management and sustainable utilization of biological resources mainly depend on the quantitative and qualitative assessment of biodiversity and accurate identification of exploited taxa.Few of the Indigenous ornamental fish species like *Amlypharyngodo nmola*, *Aplocheilus panchax*, *Esomus danricus*, *Puntius conchonius*, *Puntius sophore*, *Pethia ticto*, *Channa punctata*, *C. striata* etc. have greater self-recruiting capacity and can breed throughout the single spawning season in batches in river system. On the other hand, besides ornamental valuation of this species, they have tremendous nutritional importance supporting micro nutrient deficiencies and thus providing nutritional security for the fisher communities. Destructive and irrational fishing practices, pollution, habitat destruction, damming and overexploitation of the resources have resulted in decline of the riverine fish fauna in recent years. This has resulted in the overall decline of overall population. Until now, the ornamental fish trade in other parts of the country depends on capture and backyard-pond based fishery, with no added expense. So, in this background, sustainable ornamental fish trading from river Ganga can be a profitable and rewarding business for the local people to enhance their livelihood alternatives. ❐

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