

Present Status of Ichthyofaunal Diversity of Damodar River at Burdwan District, West Bengal, India

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Abstract- Rivers conserve a rich variety of fish species which is the most important aquatic fauna, directly or indirectly related with human health and wealth. Fish diversity of river essentially represents the fish faunal diversity and their abundance. The present study deals with fish biodiversity recorded over a period of one year, from January 2011 to December 2012 in the Damodar River, Burdwan district, West Bengal. The result of present investigation reveals the occurrence of 46 fish species belonging to 7 orders, 18 families and 26 genera. Among the collected species Order Cyprinidontiforms constituting 38 %, Order Perciformes constituting 30%, Order Siluriformes constituting 26%, of the total fish species. The highest abundance and richness was found in sampling station 2 – Barsul.

Index Terms- River Damodar, Fish diversity, Human use, Conservation status, West Bengal.

I. INTRODUCTION

India has rich biological heritage that qualifies it as one of the mega diversity nations of the World (Gadgil, 1996). The diversity within the fresh water ecosystem has a great importance in terms of the livelihood and the economic importance of the people living around it. Accordingly the relation between the biodiversity and human well-being is inter related and is being promoted increasingly through the concept of ecosystem services provide by the species Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for understanding intrinsic worth of all species on the Earth (Vijaykumar, 2008). The lack of information on the Ichthyofauna is a big handicap for popularizing little known fish variety in a particular ecosystem. Thus there is need to survey fish fauna

associated with habitats, which will help in planning methods for their production and effective exploitation (Renjithkumar et al., 2011). The objective of the study was to give recent data regarding fish diversity, aiming to contribute a better knowledge of the fish diversity of the Damodar River and a tool for conservation planning of the aquatic environments in the Burdwan district. It is the first effort made in this direction, various indigenous, commercially important, and economically viable with ornamental value aided fishes were found in this area. This diversity is being eroded every day mainly because of unending anthropogenic pressure. Thus there is an argent need for proper inventorisation and documentation of this diversity in order to develop a fresh water diversity information system (Islam et al., 2013). Presently, the Ichthyofaunal diversity refers to variety of fish species (Johnson et al., 2012). Beside this fisheries are earning as an important economic activities globally. Fishery plays an instrumental role in the socio-economic development of the country, as it is a valuable resource of livelihood for a huge section of economically backward population. It also generates gainful employment, alternate income and stimulates growth of new subsidiary industries (Goswami et al., 2012). The Damodar River basin is a sub basin and part of the Ganges River spreading over an area of about 23,370.98 sq. Km in the state of Jharkhand and West Bengal. In some of the local languages of Jharkhand, Damodar River is called Damuda, damu means sacred and da means water. The geographical boundaries the basin lies between 22°15' to 24°30'N latitude and 84°30' to 88°15' E longitude. The total area of Burdwan district is 7028 sq. Km and the area of Damodar basin is 2113.61 sq. Km. The 30.07% area of the district in the basin of Damodar River (About the Region – Damodar Basin, 2012)



Figure 1: Google image of River Damoder basin (with 3 study site) at Burdwan district, West Bengal.

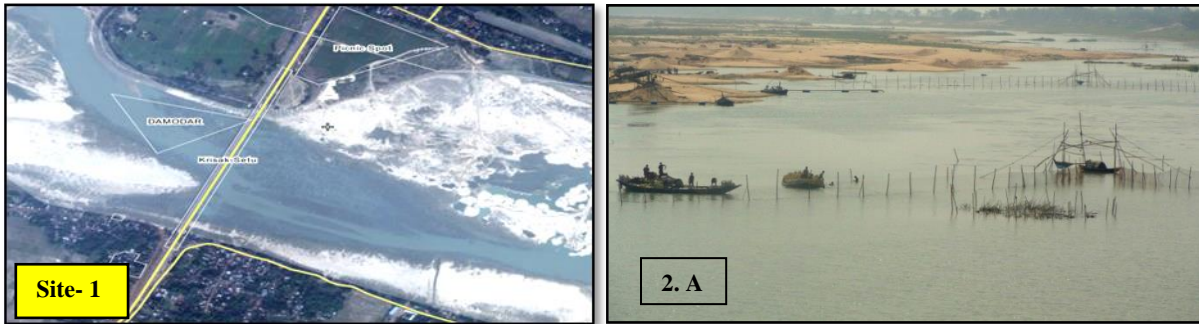


Figure 2, 2.A: Google image & normal image of River Damoder basin at Krisak setu.

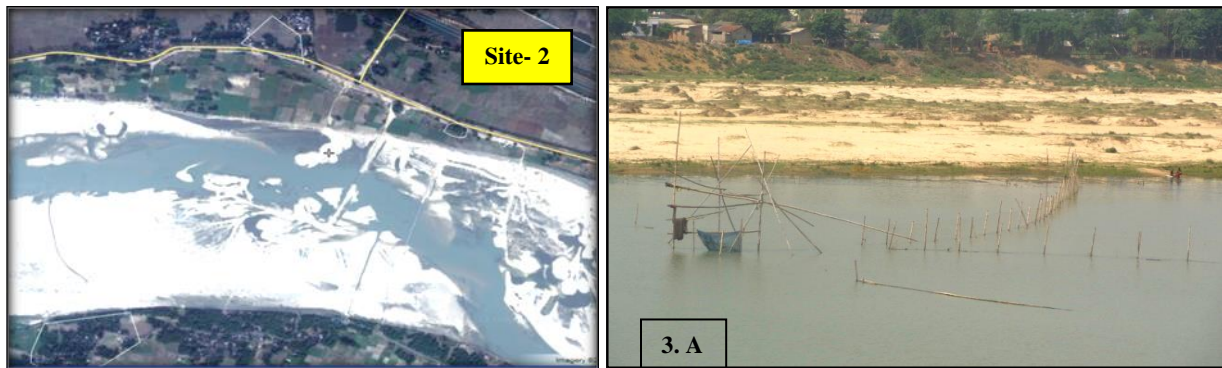


Figure 3, 3.A: Google image & normal image of River Damoder basin at Barsul, Burdwan district.



Figure 4, 4.A: Google image & normal image of River Damoder basin at Palla, Burdwan district.

II. MATERIALS AND METHODS

Table 1: Details of study site.

Sl. No.	Name of the sampling station	Latitude and longitude of the sampling station	Distance(Km.)
1	Krisak setu	23°12'44.82" North / 87°51'2.75" East	} 13.6
2	Barsul	23°10'10.51" North / 87°58'0.046" East	
3	Palla	23°9'37.45" North / 87°59'0.082" East	} 3.46

Collection of Fish samples: Fish samples were collected from various sampling sites under each sampling station and much other valuable information were collected from the local fisherman and resident adjacent to the selected sites of Damodar River. Fishing was carried out with the help of local fishers using gill net, cast net, drag net, scoop net including hooks and lines (Bose et al., 2013). The samples were photographed, immediately prior to preservation as formalin decolorizes the fish colour on long preservation. Various observation were also carried out if the water was clear, to understand the distribution of fish species.

Preservation: As soon as the small fishes were collected they were directly placed in a wide mouth jar having 2 liter capacity with 8% formalin solution (Bagra, 2010). Separated jar was used for preserving individual species and brought to the laboratory for identification.

Identification: The samples were identified based on keys for fishes of the Indian subcontinent (Day, 1996; Talwar and Jhingran, 1991) classification were carried out on lines of (Jayaram, 1999). In addition various morphological characters, shape, colors etc were recorded. The IUCN red list of threatened species was followed to assign the conservation status. The species richness was simply estimated by variety of fish species in 3 different sampling stations. Species diversity was calculated by Simpson's Index of Diversity:

$$D = \frac{\sum n(n-1)}{N(N-1)} \quad \text{Simpson's Index of Diversity} = (1 - D).$$

III. RESULT AND DISCUSSION

So far as the Ichthyofaunal diversity is concerned during the present study 46 species of fishes belonging to 7 Order, 18 families and 26 genera were recorded over a period of one year, from January 2011 to December 2012. Among the collected species Order Cyprinidontiforms constituting 38 %, Order Perciformes constituting 30%, Order Siluriformes constituting 26%, of the total fish species. The highest abundance and richness was found in sampling site- 2– Barsul. The maximum species richness (44) was recorded in site- 1 and low species richness (36) was recorded in site-2. The highest diversity value (0.97) in site-2, with the maximum abundance was recorded. The low diversity value was (0.95) in site- 3. Habitat loss and environmental degradation has seriously affected the fish fauna. Recent data regarding fish diversity of the study site, aiming to contribute a better knowledge of the fish diversity and a tool for conservation planning of aquatic environments in this region. To maintain fish biodiversity has an immense importance as it is not always possible to identify individual species critically to sustain aquatic ecosystem (Vijaykumar et al., 2008).

Table 2: Species richness, species abundance, and Biodiversity index of Damodar River near Burdwan district.

Name of the study site	Species richness	species abundance	Diversity index
1. sampling station – Krisak setu	44	123	0.96
2. sampling station – Barsul	36	108	0.97
3. sampling station – Palla	39	96	0.95

Table 3: Fish species their local name, population status, Human use, feeding habit and conservation status in Damodar River near Burdwan district.

Order	Family	Sl. No.	Scientific Name	Local Name	IUCN	Population	Human Use	Feeding habit	Abundance			
									Site 1	Site 2	Site 3	Total
Beloniformes	Belonidae	1.	<i>Xenentodon cancila</i>	Kakia	LC	DE	Ornamental Commercial	Omnivore	02	00	01	03
Cyprinidontiforms	Aplocheilidae	2.	<i>Aplocheilus panchax</i>	Kanpona	DD	UN	Commercial	Herbivore	00	02	00	02
	Cyprinidae	3.	<i>Amblypharyngodon mola</i>	Mourola	LC	ST	Ornamental Commercial	Herbivore	03	01	01	05
		4.	<i>Danio devario</i>	Techokha	LC	ST	Ornamental	Herbivore	15	12	05	32
		5.	<i>Danio rerio</i>	Techokha	NT	DE	Ornamental	Herbivore	08	09	05	22
		6.	<i>Puntius ticto</i>	Punti	LC	DE	Ornamental Commercial	Herbivore	24	35	25	84
		7.	<i>Puntius sophore</i>	Punti	LC	UN	Ornamental Commercial	Herbivore	14	19	11	44
		8.	<i>Puntius phutunio</i>	Punti	LC	UN	Ornamental Commercial	Herbivore	05	02	00	07
		9.	<i>Puntius conchoniis</i>	Punti	VU	ST	Ornamental Commercial	Herbivore	09	05	02	16
		10.	<i>Salmostoma bacalia</i>	Chela	LC	ST	Commercial	Herbivore	09	04	02	15
		11.	<i>Labeo calbasu</i>	Kalbose	LC	ST	Ornamental Commercial	Herbivore	00	05	01	06
		12.	<i>Labeo bata</i>	Bata	LC	UN	Aquaculture Commercial	Herbivore	05	09	06	20
		13.	<i>Labeo rohita</i>	Rui	LC	UN	Aquaculture Commercial	Herbivore	02	05	09	16
		14.	<i>Cirrhinus mrigala</i>	Mrigel	LC	ST	Commercial Aquaculture	Omnivore	05	00	06	15
		15.	<i>Catla catla</i>	Katla	NE	UN	Aquaculture Commercial	Herbivore	08	06	01	15
		16.	<i>Amblypharyngodon mola</i>	Mourola	LC	ST	Commercial	Herbivore	35	31	25	91
		Cobitidae	17.	<i>Lepidocephalichthys guntea</i>	Guntay	LC	UN	Ornamental Commercial	Omnivore	01	04	06
Clupeiformes	Clupeidae	18.	<i>Gudusia chapra</i>	Khaira	LC	DE	Commercial	Herbivore	15	09	12	36
Osteoglossiformes	Notopteridae	19.	<i>Notopterus chitala</i>	Chital	EN	UN	Ornamental Commercial	Omnivore	05	00	01	06

		20.	<i>Notopterus notopterus</i>	Pholui	LC	DE	Ornamental Aquaculture	Carnivore	01	05	02	08
Perciformes	Ambassidae	21.	<i>Chanda ranga</i>	Chanda	NE	DE	Ornamental Commercial	Omnivore	02	06	02	10
		22.	<i>Chanda nama</i>	Chanda	LC	UN	Ornamental Commercial	Omnivore	09	05	04	18
	Channidae	23.	<i>Channa punctata</i>	Lata	LC	UN	Ornamental Aquaculture	Carnivore	19	14	24	57
		24.	<i>Channa marulias</i>	Sal	LC	UN	Ornamental Aquaculture	Carnivore	05	00	03	08
		25.	<i>Channa gachua</i>	Chang	LC	UN	Ornamental Commercial	Carnivore	05	02	00	07
		26.	<i>Channa striatus</i>	Sol	NE	UN	Ornamental Commercial	Carnivore	01	03	01	05
	Gobiidae	27.	<i>Glossogobius giuris</i>	Bele	LC	DE	Ornamental Commercial	Omnivore	09	18	12	39
	Nandidae	28.	<i>Nandus nandus</i>	Bheda	LC	DE	Ornamental Commercial	Carnivore	04	00	01	05
	Osphronemidae	29.	<i>Colisa fasciata</i>	Khalisa	LC	DE	Ornamental	Omnivore	25	35	30	90
30.		<i>Colisa lalia</i>	Khalisa	NE	DE	Ornamental	Omnivore	30	25	20	75	
Siluriformes	Bagridae	31.	<i>Mystus cavassius</i>	Tengra	LC	DE	Commercial	Carnivore	25	10	19	54
		32.	<i>Mystus aor</i>	Aard	VU	ST	Ornamental Commercial	Carnivore	12	06	09	27
		33.	<i>Mystus seenghala</i>	Tangra	NE	UN	Commercial Aquaculture	Carnivore	02	00	01	03
		34.	<i>Mystus tengara</i>	Tangra	LC	DE	Ornamental Commercial	Carnivore	32	25	19	76
		35.	<i>Mystus vittatus</i>	Tangra	LC	DE	Ornamental Commercial	Carnivore	12	21	13	46
		36.	<i>Rita rita</i>	Rita	LC	DE	Ornamental	Herbivore	03	00	00	03
	Clariidae	37.	<i>Clarias batrachus</i>	Magur	LC	UN	Ornamental Commercial	Carnivore	13	08	11	32
	Pangasidae	38.	<i>Pungasius pungasius</i>	Pangus	LC	DE	Ornamental Commercial	Omnivore	06	04	02	12
	Sisoridae	39.	<i>Bagarius bagarius</i>	Garua	VU	DE	Commercial	Herbivore	01	02	01	04
	Siluridae	40.	<i>Wallago attu</i>	Boal	NT	DE	Commercial	Carnivore	02	00	01	03
		41.	<i>Heteropneustes fossilis</i>	Singi	LC	ST	Ornamental Commercial	Carnivore	04	05	02	11

	Mastacembelidae	42.	<i>Macrogathus pancalus</i>	Pankal	NT	UN	Ornamental Commercial	Omnivore	02	02	00	04
		43.	<i>Macrogathus aculeatum</i>	Ban	LC	UN	Ornamental Commercial	Carnivore	01	02	00	03
		44.	<i>Macrogathus armatus</i>	Ban	LC	UN	Commercial	Carnivore	02	00	01	03
Tetradontiformes	Tetraodontidae	45.	<i>Tetraodon fluviatilis</i>	Potoka	NE	DE	Ornamental	Herbivore	01	02	00	03
		46.	<i>Tetraodon cutcutia</i>	Tepa	NT	DE	Ornamental	Herbivore	02	00	03	05
Total									395	448	300	1143

1. IUCN Red list: DD: Data Deficient, LC: Least Concern, VU: Vulnerable, NE: Not Evaluated, EN: Endangered, NT: Near Threatened.
2. Population trend: DE: Decreasing, UN: Unknown, ST: Stable.

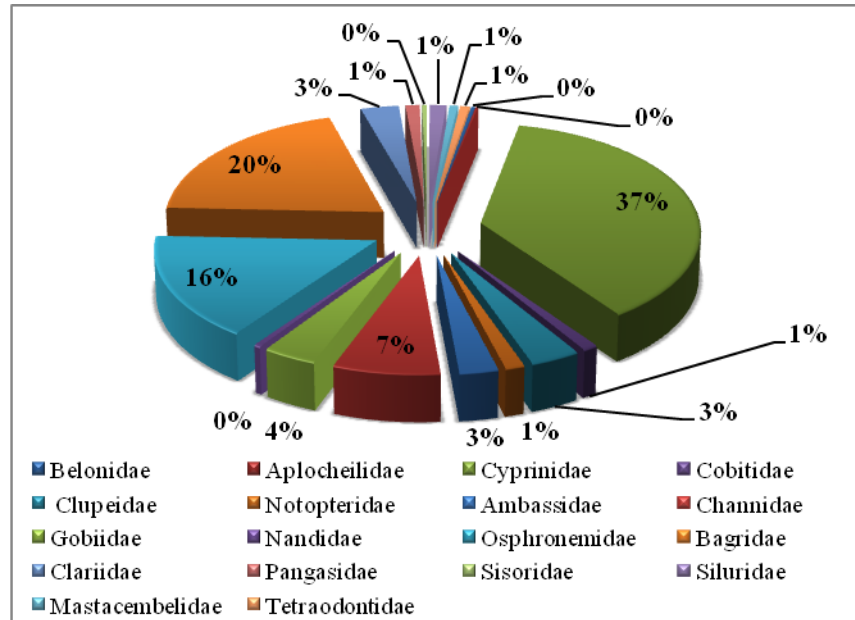


Figure 5: Percentage representation of species at family level in the exploited fishery in River Damodar (2011-2012).

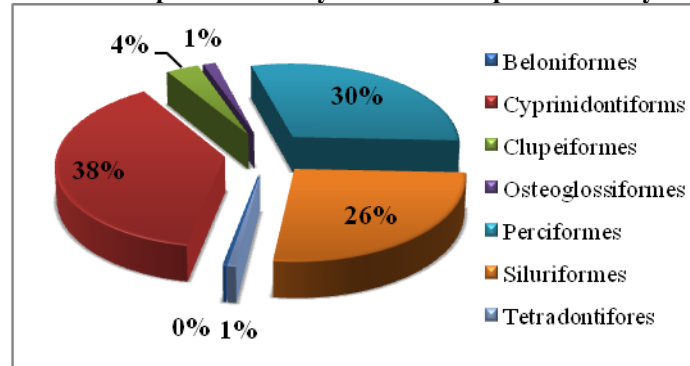


Figure 6: Percentage representation of species at Order level in the exploited fishery in River Damodar (2011-2012).

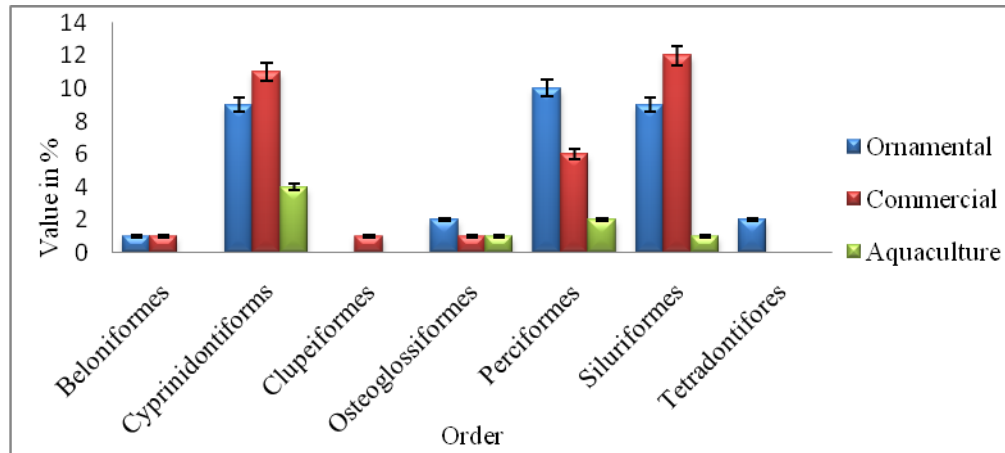


Figure 7: Percentage representation of species (error bars with percentage error) use by local fisherman at Order level in the exploited fishery River Damodar (2011- 2012).

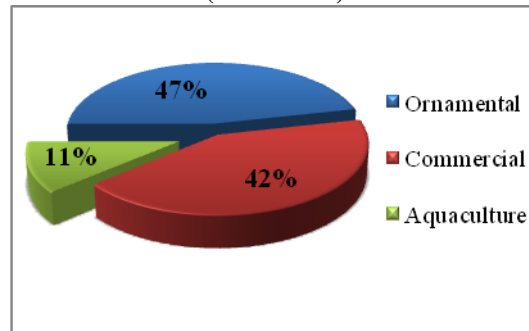


Figure 8: Percentage representation of species having Aquaculture, Commercial and ornamental value in the exploited fishery River Damodar (2011- 2012).

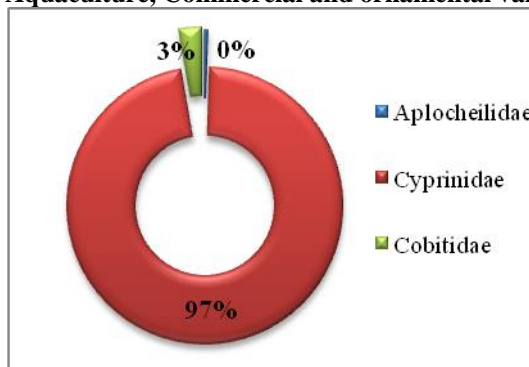


Figure 9: Percentage representation of species at family level (order- Cyprinidontiforms) in the exploited fishery in River Damodar (2011- 2012).

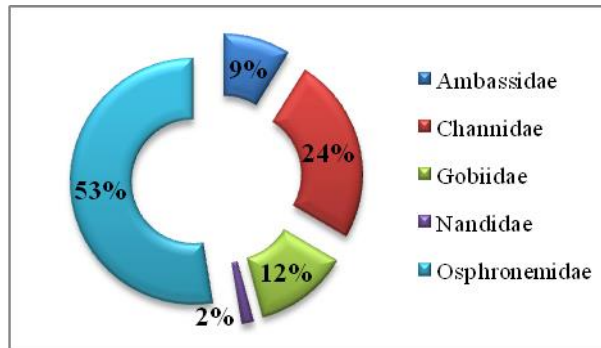


Figure 10: Percentage representation of species at family level (order- Perciformes) in the exploited fishery in River Damodar (2011- 2012).

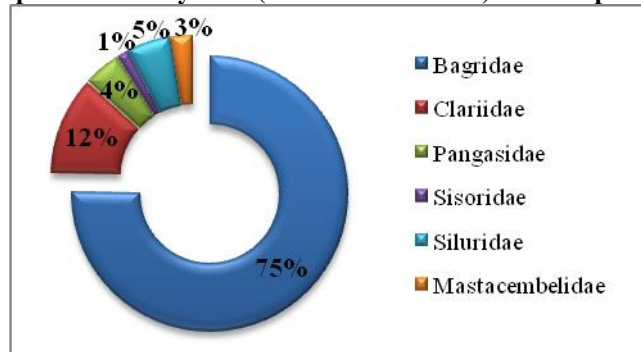


Figure 11. Percentage representation of species at family level (order- Siluriformes) in the exploited fishery in River Damodar (2011- 2012).

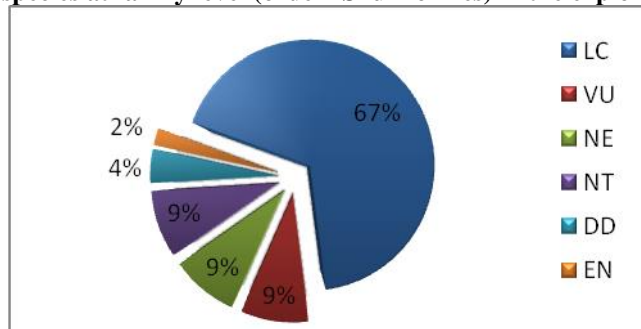


Figure 12: Biodiversity assessment of fish species in the River Pampa (2011-2012).

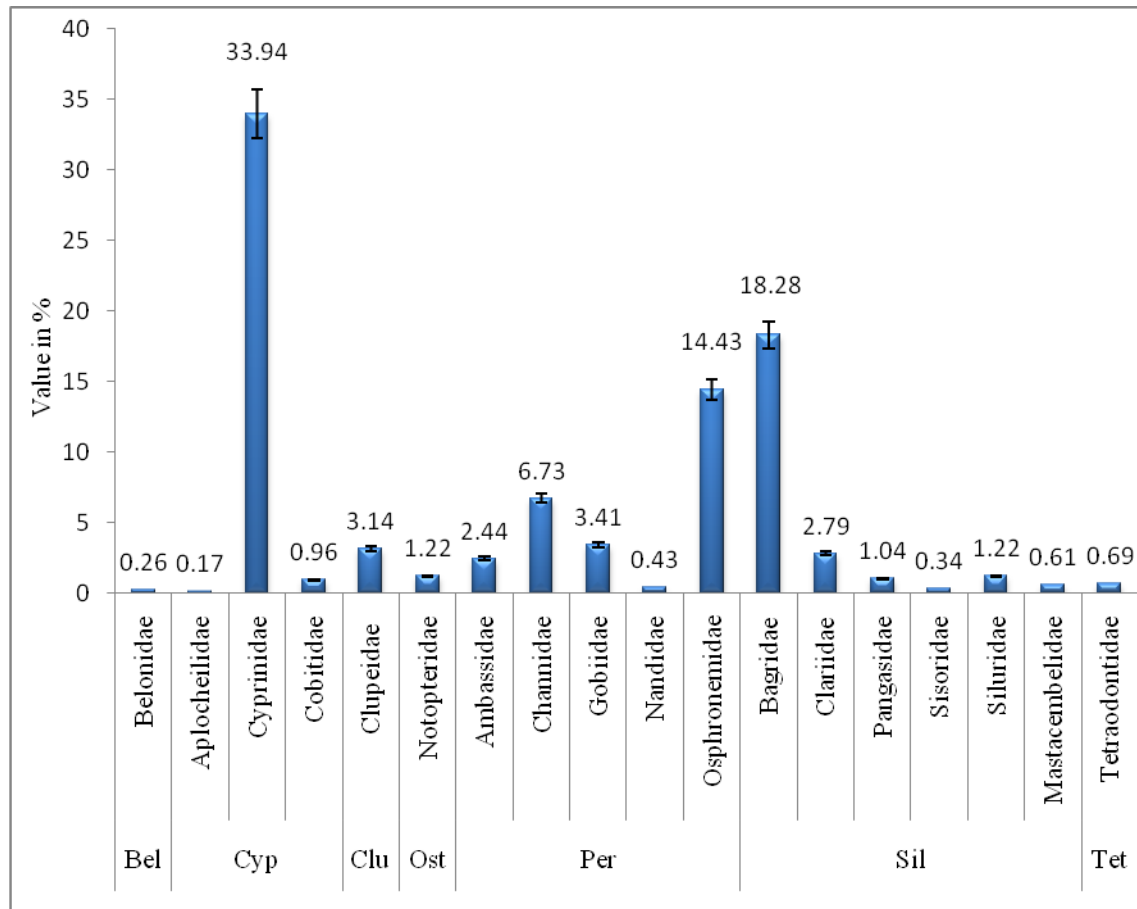


Figure 13: Percentage representation of available species (error bars with percentage error) at family level (under each order) in the exploited fishery in River Damodar (2011- 2012).

IV. CONCLUSION

The fish diversity of Damodar River passing by Burdwan district constitute a valuable natural resources in Economic, aesthetic and scientific and educational terms and its conservation and management are critical to the interests of humankind itself. The information collected from the local people and fisherman of the region reveals high decline in the fish population in last decade (Dey et al., 2013). This may be due to uncontrolled fishing to meet the high market demand of the local fishes. In addition, the fishing activities were intensified with the introduction of modern fishing gears and techniques. In view of the extinct practices there is urgent need to take up certain conservation approach to control the drastic drop down in fish population and to save some of the valuable species from wiping out of the region. The use of indigenous fishing gears, which are eco-friendly as well as sustainable need to be encouraged instead of modern gears (Shinde et al., 2009). To this all concerned, conservationists, government and nongovernmental agencies have a major role to play in creating public awareness and support for the conservation mechanisms for the fish species.

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