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A Study on Fish Diversity, Marketing and Economics in Fish Markets at Kharagpur, West Bengal, India

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ABSTRACT

Background: There is no previous published record regarding different fish species found in fish markets of Kharagpur town. The place is internationally renowned due to first Institute of Technology of India. Due to largest railway establishment in Kharagpur town, an influx of population is always here from different states. As such their food preference and cultural practice is different. Present survey is relevant to depicts fish preference of the town dwellers and socio-economic status of market associated people.

Methods: The study have been conducted from November 2018 to January 2020 thoroughly from 13 fish markets of Kharagpur town, West Bengal, India. Fish specimens collected, identified and preserved. Market related data have been collected from different agents, wholesaler *etc*. through questionnaire interviews.

Result: During the study period it has been observed that 28 freshwater inland fish species; 6 freshwater exotic fish species; 19 marine fish species and 4 crustacean species are available in the Kharagpur town. Some marine molluscs like *Loligo sp* and *Sepia sp* are also sold here. There are different peoples, those belong from different districts of West Bengal and involved in fish marketing activities. Therefore, a marketing chain is being established which is interdependent to each other with a socio-economic framework. Some measures have been highlighted towards improvement of infrastructure, hygienic conditions.

Key words: Economics, Fish diversity, Fish marketing, Kharagpur.

INTRODUCTION

Fish is a vital part of the regular diet and a cheap source of protein for the peoples. India was the second largest fish producing country in the world in 2008-2010, 2012 and in 2017 ranked third (Barange *et al*. 2007). India has a coastline of 7 516 km, an Exclusive Economic Zone (EEZ) of 2.02 million km² and more than 1 billion people (nearly 20 per cent) live in the coastal areas. Export earnings from fish and fishery products total about USD 7.2 billion in 2017, with shrimps contributing over 65 per cent (Barange *et al*. 2007). Fisheries, aquaculture and finally fish marketing play a key role in economy and livelihood (Islam, 2006). An effective marketing system makes fish available to consumers at the right time and in the right place (Goswami *et al*. 2002). Transformation of socioeconomic condition of marketing people is only possible when intra and inter-linkage from producer to consumer function efficiently (Goswami *et al*. 2002 and Ghorai *et al*. 2014). It is a chain of various systems involved in marketing (Alam *et al.* 2010). As fish and fishery products are highly traded commodities, fish production has a necessary part of its marketing process to complete the entire cycle of fishery management (Sathiadhas and Narayanakumar, 1994 and Shyam *et al*. 2019).

West Bengal is the only state of the country, where fishes are cultivated in every kind of water body *i.e*. brackish water, fresh instead of sweet water, sewage water and marine water *etc.* Fresh water and marine fish marketing plays an important role in the economy of West Bengal as well as in India. Kharagpur is one of the major town of Paschim Medinipur district of West Bengal, India, some time called mini India because inhabitants of this town belonging to different religions and from almost all states of India. Kharagpur gets a very good facility for its topographical position. Communication facilities on road and railways are well connected and fish markets are situated near the Kharagpur Railway Station and also at the side of national highway. To transport fish over larger distances from Digha and adjoining area of Belda, Panskura, Mecheda, Bhogpur, Moyna *etc* and also from other states are well connected by road and railways. Two types of fishes are found here as ice preserved fish and live fish. Normally Shol (*Channa striatus*), Pangus (*Pangasius pangasius*), Koi (*Anabas testudineus*), Shingi (*Heteropneustes fossilis*), Magur (*Clarias batrachs*) *etc*. are transported here as live form. Preserved fish are carried to the market in ice box or cages but live fish by drum or tray. In Kharagpur landing facilities belong to municipal authorities. There are well developed

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landing facilities in Kharagpur fish markets such as sheds, packing sheds, landing terminal and proper drainage facilities. It is the place where demand of both fresh water and marine fishes are existed side by side. Traditionally places where buyers and sellers are brought together to purchase or sell fish are referred as fish market. A total of 13 fish markets (Table 1) are established in Kharagpur townand few markets are present surrounding the Kharagpur town. In Kharagpur totals number of wholesalers and aratdars are of 50 to 60. Over 400 people are associated with the trading as day labourers and they get Rs 300-1000 per day for their work-supports. They are not only the people of Kharagpur, they belong to different districts of West Bengal who are involved in fish marketing channel (Fig 2). The socio-economic conditions of many people have been supported by Kharagpur fish markets depending on various roles in fish marketing. Therefore, present studies will certainly a valuable documentation of fish species availability and reflection of socio-economy and livelihood of people working in fish marketing system in Kharagpur town.

Table 1: List of markets in Kharagpur.

Name of the market	Latitude and longitude
Kharida bazar	22.3446° N, 87.2967° E
Gole bazar	22.3447° N, 87.3063° E
Inda bazar	22.3478° N, 87.3350° E
sMandal bazar	22.3408° N, 87.3357° E
Koushalla bazar	22.3314° N, 87.3376° E
Tengra bazar	22.3259° N, 87.3184° E
Dvc market	22.3155° N, 87.2933° E
Prem bazar	22.3048° N, 87.3047° E
Tech market	22.3146° N, 87.3002° E
New settlement market	22.3375° N, 87.2957° E
Gate bazar	22.3379° N, 87.3057° E
Nimpura market	22.3404° N, 87.2721° E
Talbagicha market	22.3134° N, 87.2855° E

MATERIALS AND METHODS

Study area (Fig 1)

The study was carried out in thirteen fish markets of Kharagpur town. The study was guided for a period for more than a year from November 2018 to January 2020. List of markets are given in tabular form (Table 1).

Data collection

The data have been collected from November 2018 to January 2020 thoroughly from 13 fish markets of Khargapur town. For collecting data, combinations of several survey techniques were adopted which are as follow:

i. Secondary data collection

From private concern such as Iqbal Fish Centre, Idgar Fish Centre, Gopal Matsya, Babosai Samity, Paresh and Company Fish store, Kali and Company Fish Store, Pijush Matsha Vandar, Rafik and Company *etc*, secondary data about fish distribution and marketing information were collected.

ii. Primary data collection

Field surveys were used for the collection of primary data. Specimens were collected and preserved in 6% formaldehyde solution. The study areas were visited for fish species supply on the day and relevant marketing information.

Table 2: List of exotic fishes.

Order	Family	Scientific name	Local name	Iucn	Use	RS/kg	Demand
		1. *Hypophthalmichthyes molitrix* Howes, 1981	Silver carp	NT	Food	120-150	Medium
Cypriniformes	Cyprinidae	2. *Cyprinus carpio* Linnaeus, 1758	Cyprinus	VU	Food	150-180	Medium
		3. *Ctenopharyngodon idellus* (Valenciennes, 1844)	Grass carp	NE	Food	120-150	Low
		4. *Cyprinus auratus* Linnaeus, 1758	Golden carp	LC	Food	150-200	Low
Characiformes	Characidae	5. *Colossoma macropomum* Cuvier, 1816	Rupchand	NE	Food	100-180	Medium
Perciformes	Cichlidae	6. *Oreochromis mossambicus* (Peters,1852)	Tilapia	NT	Food	100-200	High

Fig 1: Kharagpur in West Bengal, India.

iii. Questionnaire interviews

Fish traders of twenty in number have been chosen randomly in the study area through careful inspection for the questionnaire interviews. The questionnaire was normal and focusing only marketing information. In the market traders were interviewed through a formal conversation for this purpose. Information about fish marketing, pricing policy, trading auctions and socio-economic conditions of the traders were the subjects of the interviews.

Identification and preservation

The specimens have been identified using taxonomic keys for fishes of the Indian subcontinent. Identification was carried out with the help of some books on Indian fishes (Talwar and Jhingran, 1991; Jayaram, 1999 and 2010; Chanda and Bhattacharya, 2002; Rao, 1989; Fish Base, 2019). Identification of the species was done mainly on morphometrically. After identification different samples were preserved in properly labelled container within 4-8% formaldehyde solution.

Data processing and analysis

Using Microsoft Excel software, all data recorded into a database system.

RESULTS AND DISCUSSION

Present study reveals the presence of 28 freshwater indigenous fish species, 6 freshwater exotic fish species, 18 marine fish species, 4 crustacean species and 2 marine mollusc species in 13 fish markets those surveyed in

Table 3: List of inland fresh water fishes.

Order	Family	Scientific name	Local name	Iucn	Use	Rs/Kg	Demand
		1. *Amblypharyngodon mola* (Hamilton,1822)	Mourola	LC	Food Ornamental	300-400	Medium
		2. *Puntius sarana* (Hamilton,1822)	Punti	LC	Food Ornamental	150-250	Medium
		3. *Puntius sophore* (Hamilton,1822)	Punti	LC	Food Ornamental	150-250	Medium
		4. *Puntius chola* (Hamilton,1822)	Punti	LC	Food, Ornamental	150-250	High
Cypriniformes	Cyprinadae	5. *Labeo rohita* (Hamilton,1822)	Rohu	LC	Food	200-300	High
		6. *Labeo bata* Day, 1878	Bata	LC	Food	150-300	High
		7. *Labeo calbasu* (Hamilton,1822)	Kalbose	LC	Food	200-250	Low
		8. *Cirrhinus mrigala* (Hamilton,1822)	Mrigel	LC	Food	150-200	High
		9. *Catla catla* (Hamilton,1822)	Katla	NE	Food	250-350	High
Clupeiformes	Clupeidae	10. *Gudusia chapra* (Hamilton,1822)	Khaira	LC	Food	120-200	Low
Osteoglossi formes	Notopteredae	11. *Notopterus notopterus* (Pallas,1769)	Phulai	LC	Ornamental Food	150-230	High
		12. *Chitala chitala* (Hamilton,1822)	Chital	EN	Ornamental, Food	200-300	Medium
	Anabantidae	13. *Anabas testudineus* (Bloch,1792)	Koi	DD	Ornamental, Food	200-400	High
Perciformes	Latidae	14. *Lates calcarifer* (Bloch,1790)	Bhetki	NE	Food	200-350	High
	Ambassidae	15. *Parambassis ranga* (Hamilton,1822)	Chanda	NE	Ornamental, Food	120-200	Low
		16. *Chanda nama* Hamilton,1822	Chanda	LC	Ornamental, Food	120-200	Low
	Nandidae	17. *Nandus nandus* (Hamilton,1822)	Bheda	NT	Food	150-200	Low
		18. *Channa punctatus* (Bloch,1793)	Lata	LC	Food	100-150	High
Ophiocephali formes	Channidae	19. *Channa striatus* (Bloch,1793)	Shol	NE	Ornamental, Food	150-250	Medium
	Bagridae	20. *Mystus vittatus* (Bloch,1794)	Tangra	LC	Ornamental, Food	200-250	Medium
		21. *Mystus cavasius* (Hamilton,1822)	Tangra	LC	Food, Ornamental	150-250	Medium
		22. *Mystus tengara* (Hamilton,1822)	Tangra	LC	Food, Ornamental	200-250	Medium
	Clariidae	23. *Clarias batrachus* (Linnaeus,1758)	Magur	LC	Ornamental Food	250-300	High
Siluriformes	Pangasidae	24. *Pangasius pangasius* (Hamilton,1822)	Pangus	LC	Food	160-200	Medium
	Siluridae	25. *Wallago attu* (Bloch and Schneider, 1801)	Boal	NT	Food	200-300	Medium
	Hetero pneustidae	26. *Heteropneustes fossilis* (Bloch,1794)	Singi	LC	Ornamental Food	300-600	High
Masta cembeliformes	Masta cembelidae	27. *Mastacembelus armatus* (Scopoli, 1777)	Pankal	NT	Ornamental Food	150-200	Low
		28. *Macrognathus pancalus* (Hamilton,1822)	Pankal	LC	Food	170-200	Low

Kharagpur town. Taxonomic classification of different fin fishes and shell fishes were displayed in table numbers 1,2, 3, 4 and 5. During the study it has been observed that 28 freshwater fish species belong to 7 orders and 14 families; 6 freshwater exotic fish species belong to 3 orders and 3 families; 19 marine fish species belong to 7 order and 13 families; 4 crustacean species belong to 2 families of order Decapoda and 2 species of mollusc belonging from 2 families of order Myopsida from different markets of Kharagpur. It has been estimated that among the collected fresh water inland fish species, representatives of Order Cypriniformes contribute maximum (32.14%) followed by Order Siluriformes (25%) (Table 3, Fig 3, 4). Similarly, among the collected fresh water exotic fish species are from order

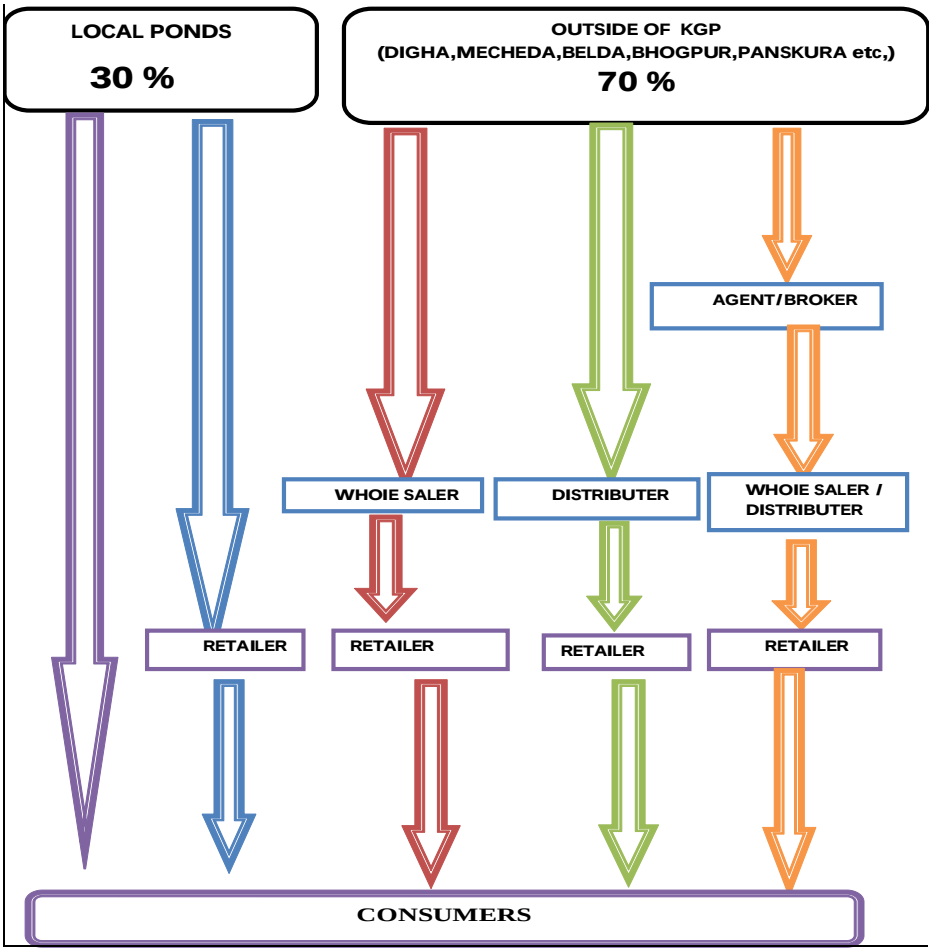

Fig 2: Flow chart of market channel in kharagpur (KGP).

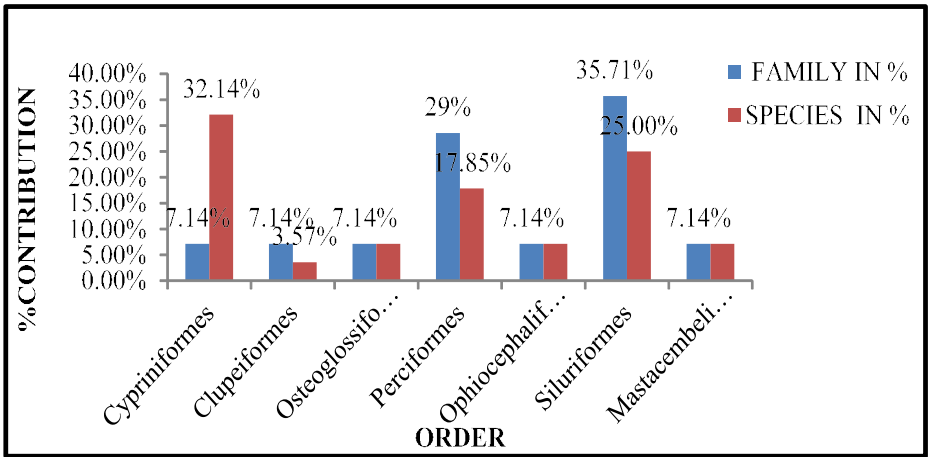

Fig 3: Percentage contribution of families and species under various order of fresh water Inland fishes in markets of Kharagpur.

Cypriniformes contributing maximum 66.67% followed by Order Perciformes and Order Characiformes contributing 16.67% both (Table 2 and Fig 7). In case of marine fishes Order Perciformes contribute maximum supply 38.46% followed by Order Clupeiformes, Scopeliformes, Rajiformes, Anguiliformes and Siluriformes each contributing 5.26% of fish supply (Table 4, Fig 5 and Fig 6). Therefore, Order Cypriniformes and Percifomes are dominating group of fish found in different fish markets at Kharagpur town (Table 2, 3, 4). According to the species wise distribution of fresh water inland fishes, freshwater exotic fishes, marine fishes, crustacean and molluscan species constitute respectively 47.45%, 10.16%, 32.20%, 6.77% and 3.38% (Fig 8). Survey also depicts that 15 species have high demand, 12 species medium and the rest species shows low demand in markets under study (Table 2, 3, 4, 5 and 6). Fresh water exotic fish has medium or low demand (Table 2). Among shrimps/prawns bagda and golda have always in high demand and fetch high rate (Table 5). The fresh water fishes singi, magur, tangra, kalbose, pankal, bhetki, boal, chital, pangas, rohu and catla has higher rate than punti, mourola, bata, mrigel, khaira, phulai, koi, lata, chanda, sol, bheda, *etc*. Among marine fishes ilish, pomfret, tapse, bhagon has higher rate than others (Table 4). The price rate of the fishes depends upon the production/catch, supply and demand of fishes to the people. Marine molluscs like *Loligo, Sepia etc*. are also sold here, which is surprising in fish markets of Paschim Medinipur as these are not of the culinary choice of local people. According to market survey, the daily supply of fish in Kharagpur fish markets relies on transport, cold storage, agents, traders *etc*. It has been found out that in the fish market about 30% is supplied from local sources and about 70% is supplied from outside Kharagpur and its surroundings. Maximum fish is supplied from different places like from Digha and adjoining areas of Belda, Panskura, Mecheda, Bhogpur, Moyna as well as from states

Table 4: List of marine fishes.

Order	Family	Scientific name	Local name	Iucn	Use	Rs/Kg	Demand
		1. *Megalaspis cordyla* (Linnaeus,1758)	Mackrel	LC	Food	150-180	Medium
	Carangidae	2. *Selar boops* (Cuvier, 1833)	Kankurda	NT	Food	140-200	Low
		3. *Decapterus macrosoma* Bleeker,1851	Pepsi fish	NT	Food	140-160	Low
Perciformes	Trichuridae	4. *Trichiurus lepturus* Linnaeus,1758	Rupa pati	LC	Food	150-180	Medium
	Polynemidae	5. *Polynemus paradiseus* Linnaeus,1758	Tapse	LC	Food	200-250	High
	Serranidae	6. *Daysciaena albida* (Cuvier,1830)	Vola	LC	Food	150-250	Medium
		7. *Epinephelua coioides* (Hamilton,1822)	Bol	LC	Food	160-180	Low
	Stromataeidae	8. *Pampus chinensis* (Euphrasen,1788)	Pomfret/Boul Chanda	NE	Food	250-350	High
		9. *Pampus argentius* (Euphrasen,1788)	Pomfret	NE	Food	300-600	High
	Clupeidae	10. *Tenualosa ilisha* (Hamilton,1822)	Ilish	LC	Food	350-800	High
Clupeiformes		11. *Raconda russeliana* Gray,1831	Kuna phasa	NE	Food	120-150	Medium
	Engraulidae	12. *Setipina taty* (Valenciennes,1848)	phasa	NT	Food	130-150	Medium
	Dussumieriidae	13. *Dussumieria acuta* Valenciennes,1847	Chala	LC	Food	120-140	Low
Mugiliformes	Mugilidae	14. *Rhinomugil corsula* (Hamilton,1822)	Bhangon	LC	Food	250-350	High
		Mugil parsia Hamilton,1822	Parse	NE	Food	200-250	Medium
Rajiformes	Dasyatidae	15. *Himantura bleekeri* (Blyth,1860)	Trygon	VU	Food	150-180	Low
Scopeliformes	Synodontidae	16. *Harpadon nehereus* (Hamilton,1822)	Loita	NE	Food	120-150	High
Anguiliformes	Muraenesocidae	17. *Muraenesox talabonoides* (Bleeker, 1853)	Ban	NE	Food	100-150	Low
Siluriformes	Ariidae	18. *Arius maculates* (Thunberg,1792)	Artengra	LC	Food	100-160	Low

Table 5: List of crustaceans.

Order	Familly	Scientific name	Local Name	Iucn	Use	Rs/Kg	Demand
		1. *Paeneus monodon* Fabricius, 1798	Bagda chingri	NE	Food	400-600	High
Decapoda	Penaeidae	2. *Paeneus indicus* H. Milne Edwards, 1837	Bagda chingri	NE	Food	300-400	High
		3. *Metapenaeus monoceros* (Fabricius,1798)	Harina chingri	NE	Food	400-500	Medium
	Plaemonidae	4. *Macrobacrium rosenbergii* (de Man, 1879)	Golda chingri	LC	Food	450-600	High

Table 6: List of molluscs.

Order	Family	Scientific name	IUCN	USE	Rs/Kg	Demand
Myopsida	Loliginidae	1. *Loligo duvauceli* (Orbigny,1848)	DD	Food	300	Medium
	Sepiidae	2. *Sepia aculeata* (Orbigny,1848)	DD	Food	300	Medium

like Andhra Pradesh and Madhya Pradesh. Mainly trucks, trains, vans are used for transport of fish to wholesalers in Kharagpur. Therefore, a distinct marketing chain is established (Fig 2), where there are various agents, wholesalers, distributors and retailers are associated with the fish business in Khargapur. They are not only the people of Kharagpur, they are different districts of West Bengal who are involved in different marketing activities. It was noted that most of the traders are satisfied with this job, but there are some traders who are not satisfied and rest made no comments. In general, most of the traders do this job as a family tradition. It is not only men who are involved in this

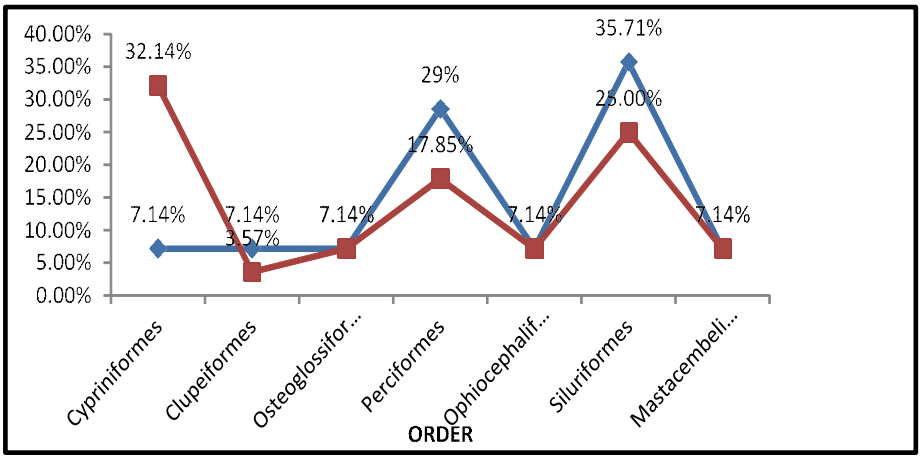

Fig 4: Relationship between family and species under various orders of fresh water Inland fishes in markets of Kharagpur.

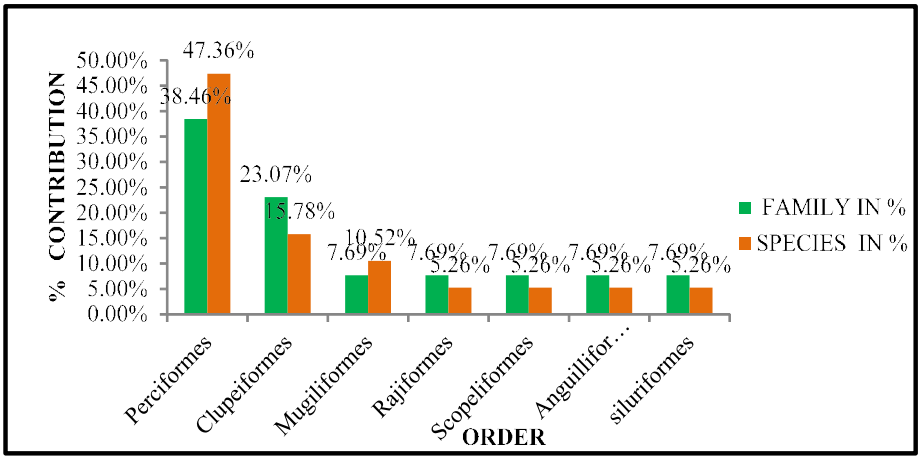

Fig 5: Percentage contribution of families and species under various orders of marine fishes in markets of Kharagpur.

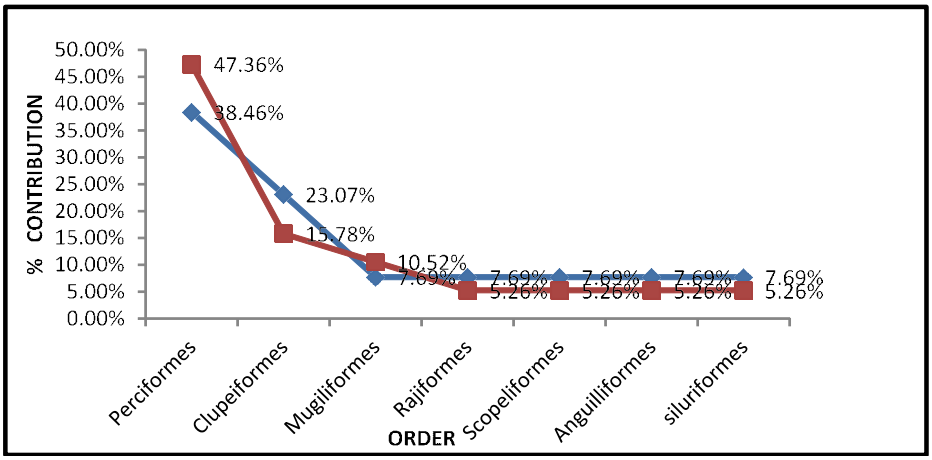

Fig 6: Relationship between family and species under various orders of marine fishes in markets of Kharagpur.

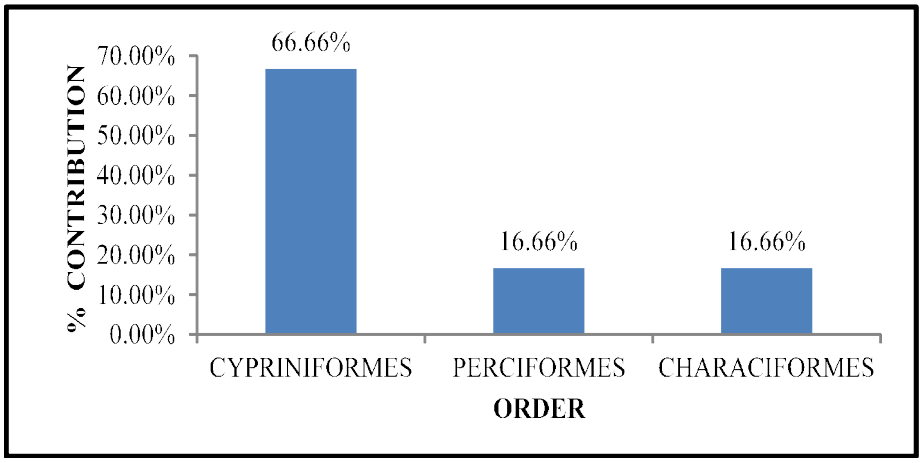

Fig 7: Percentage contribution of species under various orders of exotic fishes in markets of Kharagpur.

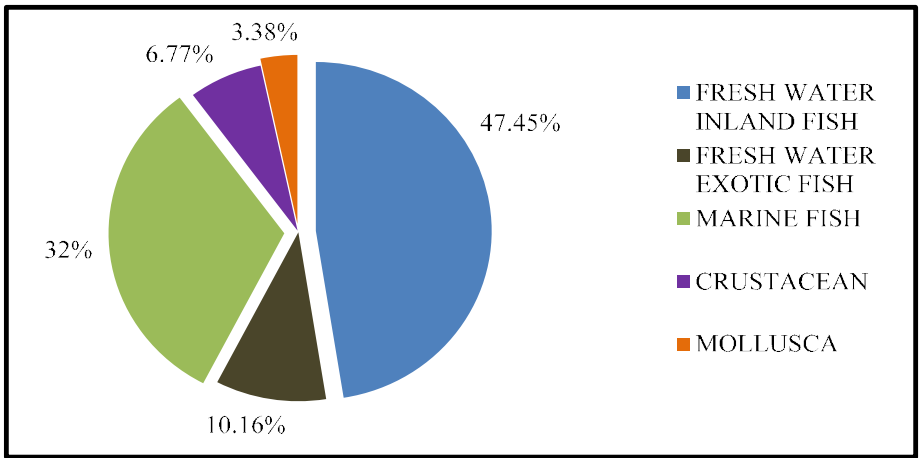

Fig 8: Percentage contribution different types of fishes in the markets of Kharagpur.

fish marketing but also about 10% women are involved in it for their daily livelihood. The fish markets of Kharagpur have well developed market chain but all markets are suffering from disappointing good market infrastructure, unhygienic conditions, lack of attention of government interest *etc.* This unorganized marketing system needs immediate attention otherwise no improvement of socio-economy of areas under study will occur.

CONCLUSION

Fish market reflects the preference of fish food of local inhabitants. Khargapur fish markets reflect the existence of 46% marine fish and 54% of freshwater fish which indicate that a good number of populations prefer marine fish. Marketing influences socio-economy and livelihood of people related to marketing activities. Fish markets of Kharagpur town influence the livelihood of a good number population associated through fish marketing channel. The Government intervention and public private intervention is necessary for commercial implementation and improvement of the existing system of fish marketing in Kharagpur. As such some steps need to be taken to improve the socio-economy of the people involved in this fish business, such as: advancement of sanitation, hygienic condition, drainage, washing facilities and sufficient auction places, appropriate attention should be paid to the personal hygiene, development of existing fish market infrastructure, modern wholesaling facilities, financial and technical assistance, training programme *etc.*

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Abbreviations

DD = Data Deficient; EN = Endangered; IUCN = International Union for Conservation of Nature; LC = Least Concern; NE = Not Evaluated; NT = Near Threatened; VU = Vulnerable.

Contribution of authors

AJ and GS Fish specimen collection; AJ,GS and AC Data analysis; AJ,GS and AC Manuscript preparation; AC Designing, Monitoring, Reviewing, Communication.

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