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Icthyofaunal Diversity Study in Some Dolphin Habitat Zones of River Kulsi

Zoology

KEYWORDS : Kulsi river, Fish diversity index, Dolphin habitat.

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ABSTRACT

Rivers have been playing an important role in the conservation of rich varieties of fishery resources since the days of yore. The present study was conducted between January 2012 to January 2014 to assess the diversity and abundance of fish fauna of the dolphin populated three zones (Kukurmara ,Jiakur and Dorabeel confluence) of river Kulsi (a tributary of the River Brahmaputra), Kamrup District, Assam. The result of present investigation reveals the occurrence of 58, 56 and 63 fish species belonging 7 orders, 20 families and 38 genera from Kukurmara, Jiakur and Dorabeel confluence respectively. A total of 944, 874, 905 individuals were caught from 3 zones. Diversity indices such as Simpson'sindex(d), Shannon-Weiner index (H), Margalef's species richness (R) were recorded as -- (d)= 0.026(zone-I), 0.027(zone-II), 0.029(zone-III), (H)=3.811(zone-I), 3.781(zone-II) and 3.732(zone-III) and (R)=9.051(zone-I), 8.577(zone-II) and 8.817 (zone-III) respectively for the three Dolphin habitat zones. Estimates from this indices show low fish diversity, composition, and richness in the Dolphin populated habitat.

INTRODUCTION:

In the world rivers and associated freshwater habitats are among the most threatened Ecosystems (Revenga *et al.,* 2005; WWF 2006). India is one of the mega diversity nations of the world (Gadgil,1996). (Williams *et al.,*2003) reported that the historical formation of a river basin determines the structure of a fish community. In India some studies have been reported to document the fish diversity along with the environment gradients (Johnson, 1999; Arunachalam, 2003; Bhat, 2003; Srekantha *et al.,* 2007; Shahnawaz *et al.*, 2010). About 27,977 species of fishes have been recorded in the world ; falling under 62 orders, 515 families and 4494 genera of which 11952 species are mainly freshwater fish (Nelson, 2006). The North East including Assam reported 267 species (recorded and reported belonging to114 genera under 38 families and 10 orders (Sen,2003) out of which 196 fish species occurring in North- East have potential ornamental value (Dey *et al.,*2002). The Brahmaputra drainage system in the North-Eastern part of India is one of the largest hydrographic basins in the Southeast Asia sustaining a very rich and diverse aquatic gene pool, particularly fishes and as such the region is considered as one of the hotspots of freshwater fish biodiversity in the world (Kottelat and Whitten, 1996). The river Kulsi is an important and well-known Southern tributary of the River Brahmaputra.The freshwater ichthyo species of Assam reported by Dey (1973,1982), Nath (1987), Boruah (1999), Biswas and Boruah (2002), Das and Biswas (2008). The study of diversity indices of fish fauna of river Kulsi was conducted with an object to be aware the recent data regarding fish diversity. Kulsi river is in Kamrup district of Western Assam.The river originates from Meghalaya (91° 22´E & 25° 51´N)where it is known as Khir river. After travelling about 12 km from its origin the river enters Kamrup District in Assam at Ukium and it is known as river Kulsi from this point. The river finally discharge into the River Brahmaputra at Nagarbara discharge. The river is about 76 km in length from Kukurmara to Brahmaputra confluence. Kulsi river is known for a most valuable Cetacean species that is river Dolphin viz. *Platanista gangetica gangetica* (Roxburg, 1801) which is listed as Endangered Species by IUCN (Smith *et al.*, 2004) and placed in Schedule-I of the wildlife (Protection Act, 1972). The dolphin breeds only in Subansiri river and in Kulsi river of entire Brahmaputra. In Kulsi river a best estimate of 27 dolphin (Wakid,2005) and in 2008 survey recorded best estimated 29 dolphins (Wakid, 2008) and in 2012 survey about 30 dolphins were found in river Kulsi (Wakid,2012). As per as the prey base of national and state aquatic animal is concerned, the beel Dora (river confluence) plays an important role. Feeding areas of the dolphin lies in river confluences. The diversity is being eroded everyday mainly because of unending anthropogenic pressure. Therefore there is an urgent need for proper documentation of this diversity to help out the freshwater diversity information system (Islam *et al.,* 2013). Presently the icthyofaunal diversity refers to variety of fish species (Johnson *et al.,*2012.).Therefore our objective in this study is to provide accounts of the fish diversity and species composition in river Kulsi with particular reference to its dolphin habitat zones.

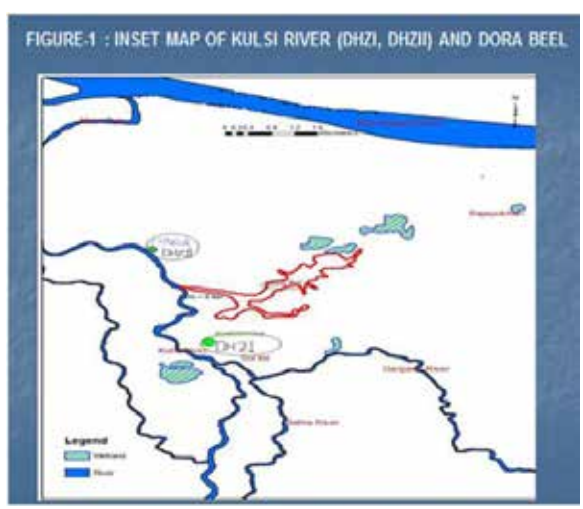

Figure 1.Map of River Kulsi including the study area (Kukurmara, zone I), (Jiakur zone II), Dora confluences, zone III) Sources:ASTEC

MATERIALS AND METHOD:

Study area and duration:

The present study was conducted in three spots of the river Kulsi of Kamrup district (Figure 1) for a period of 2 year from January 2012 to January 2014.

Collection of fish sample:- Fish samples were collected from various sampling site, sited above with the local fisherman between January 2012 to till December 2014 using traditional fishing nets viz.cast nets, gillnets and fishing traps including hooks and lines. The samples were photographed immediately prior to preservation. The species seemed are difficult to identify on spot were preserved in 10% formaldehyde. This species were identified after analyzing their morpho-metric and meristic characters under laboratory situation. Taxonomic identifi-cation of fish has

been done with the help of existing literature (Kottelat, M.1990, Dey, 1996; Talwar and Jhingran,1991; Vishwanath *et al.*,2007; and fishes are verified from fish base (http//fishbase.org).

Biodiversity parameters:-To understand the seasonal diversity of fishes in the study area month wise data were collected.In this study diversity was calculated by using following formulas.

Simpson's index (d)=$\sum n(n-1)/N(N-1)$
Simpson's index of diversity=(1-d)
Simpson's reciprocal index=1/d
Shannon-Weinerindex(H)=-pi ln pi
Evenness Index,$E_k=H/H_{max}=H/ln(S)$
Margalef richness index R=S-1/lnN

Results and discussion:

The present study concerned about 2,712 individuals comprising of 7 orders, 20 families, 38 genera and highest of 63 fish species were found in the river Kulsi have been recorded over a period of 2 year from 2012 to 2014. Among the collected species Order Cypriniformes (carps and minnos) were dominant by contributing 27 species. Order Cypriniformes constituting 51.83%, Siluriformes 26.31%, Perciformes 17.32%, Clupeiformes .48%, Beloniformes 1.31%, Syndranchiformes 2.61%, Tetradontiformes .37%. Family Cyprinidae was comprising of 23, 23, 22 fish species in the zone I, II and III respectively. It is the most abundant family. Cluipedae (.48%), Gobidae (.78%), Nandidae (1.12%), Anabantidae (2.73%), Badidae (.55%), Heteroneustidae (2.58%) Belonidae (1.31%), Claridae (.63%), Tetradontidae (.37) having only one species each. Presence of single species of such families among the population suggested that the species rare, in this water body Kulsi. The fish size was smaller as 1.25 cm. TL in *P.gelius* and as large as 55.5cm. long in *W.attu.* Presence of Clarias species in river Kulsi described high degree of hardness and tolerance this species could exhibit in fresh water such as river .Canthophrys gongota , a very rare species of Assam Himalayas (Dey, *loc.cit*) in the river Kulsi was significant.The fish species with order, families, scientific name, and sum total of fish caught were given in the table1.

Table1:Ichthyological diversity of river kulsi

Order	Family	Sl.no	Scientific name	Local name	% fish caught In three zones
Cypriniformes	Cyprinidae	1	Amblypharyngodon mola	Moa	3.49
		2	Aspidoparia jaya	Bariala	1.86
		3	Cabido morar	Bariala	4.68
		4	Cirrhinus reba	Lachim	1.34
		5	Labeo bata	Bhangone	1.49
		6	Labeo gonius	Kurhi	2.27
		7	Labeo rohita	Row	1.89
		8	Labeo pungusia	Lasu	0.89
		9	Osteobroma cotio	Hato	0.56
		10	Puntius sophore	Puthi	4.27
		11	Pethia conchonius	Puthi	1.41
		12	Pethia gelius	Puthi	0.74
		13	Puntius chola	Puthi	1.08
		14	Puntius phutonio	Puthi	0.26
		15	Puntius ticto	Puthi	2.40
		16	Puntius sarana	Cheniputhi	2.84
		17	Raimos bola	Korang	0.22
		18	Laubuca caeruleostigmata	Laubuca	0.56
		19	Chela cachius	Lauputi	1.60
		20	Barilius telia	Selleng	0.74
		21	Rasbora rasbora	Donikinah	1.90
		22	Devario devario	Laupati	2.17
		23	Esomus dandricus	Darikana	7.80
	Cobitidae	24	Botia dario	Baghbotia	1.94
		25	Lepidocephalichyhys guntea	Bakharbotia	1.87
		26	Canthophrys gongata	Botia	0.07
	Balitoridae	27	Acanthocobitis botia	Balibotia	1.49
Clupeiformes	Cluipedae	28	Gadusia chapara	Karoti	0.48
Perciformes	Osphronemidae	29	Trichogaster fasiatus	Kholihona	1.00
		30	Tricogaster labiosa	Bhasalyee	0.82
		31	Trichogaster lalius	Lolholisa	0.70
		32	Tricogaster chuna	Kholihona	0.14
	Ambassidae	33	Chanda nama	Chanda	3.85
		34	Paraambasis ranga	Chanda	1.71
	Channidae	35	Channa puntatus	Goroi	3.10
		36	Channa gachua	Cheng	0.82
	Gobiidae	37	Glossogobius giuris	Patitmutora	0.78
	Nandidae	38	Nandusnandus	Gadgadi	1.12
	Anabantidae	39	Anabus testideinus	Kawai	2.73
	Badidae	40	Badis badis	Vacheli	0.55

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Siluriformes	Bagridae	41	Sperata seenghole	Arii	0.26
		42	Batasio batasio	Batasimas	0.26
		43	Mystus bleekari	Tengra	2.05
		44	Mystus cavasius	Tengra	2.16
		45	Mystus vittatus	Tengra	3.92
		46	Mystus tengra	Tengra	2.84
		47	Mystus puntatus	Tengra	2.61
	Siluridae	48	Ompok bimaculatus	Paboh	0.41
		49	Ompok pabda	Paboh	0.52
		50	Ompok pabo	Paboh	0.82
		51	Wallagu attu	Borali	0.93
	Schilbeidae	52	Alia colia	Kadali	2.99
		53	Eutropiichthys vacha	Basa	2.84
		54	Neotropius atherinoides	Bardia	0.63
	Sisoridae	55	Gagata gagata	Keyakata	0.34
		56	Gagata cenia	Keyakata	0.15
	Heteroneustidae	57	Heteropneustes fossilis	Singhi	2.58
	Claridae	58	Clariu smagur	Magur	0.63
Beloniformes	Belonidae	59	Xenontodon cancila	Kokila	1.31
Syndranchiformes	Mastacembelidae	60	Macrognathus aral	Tora	0.52
		61	Macrognathus puncalus	Tora	0.63
		62	Mastocembelus armatus	Tora	1.46
Tetradontiformes	Tetraodontidae	63	Leidon cutcutia	Gangatope	0.37

To get finest view of the fish diversity, a measurement of species richness and evenness were undertaken in the river kulsi.

Table.2. :Diversity index of fish species of 3 zones of river Kulsi

Sl.no.	Diversity index	DHZI	DHZII	DHZIII
1.	Total number of site visits	50	50	50
2.	Number of species(species richness,(S))	63	59	61
3.	Number of individual	944	865	903
4.	Simpson's diversity index(d)=∑n(n-1)/N(N-1)	0.0269	0.0277	0.0300
5.	Simpson's index of diversity=(1-d)	0.9731	0.9723	0.9700
6.	Simpson's reciprocal index=1/d	37.174	36.101	33.333
7.	Shannon-Weiner index(H)=-piInpi	3.811	3.728	3.718
8.	In(S)	4.143	4.077	4.110
9.	$E=H/H_{max}=H/In(S)$	0.919	0.914	0.904
10.	Margalefrichnessindex R=S-1/InN	9.051	8.577	8.817

Here N= is the total no of organisms of all species.n=no of individuals of a particular species,d=diversity index,S=species richness ,i=an index no for each species present in a sample,pi=ni/N,In=natural log.

The diversity indices of fish species indicated low fish diversity in river Kulsi (Table2). The Simpson's diversity index (d) ranges between 0 and 1. With this 0 represents infinite diversity and 1 no diversity. The bigger the d value the smaller the diversity .The highest diversity value were (.0269) in zone I and low diversity is (0.0300) in zone III. The Simpson's index of diversity (1-d) represents the probability that two individual fish randomly selected from a sample which belong to different species. The value of this index also ranges between 0 and 1. The greater the value the greater the sample diversity. Shellfishes such as prawn crabs, shrimps are mostly encountered in the river Kulsi. The diversity indexes as estimated from the three zones of the river were d=0.0269, 0.0277, 0.0300; and H=3.811, 3.728, 3.718; and E=0.919, 0.914, 0.904; and S=4.143,4.077, 4.110; respectively. The Simpson's index of diversity (1-d) and reciprocal index 1/d were 0.9731, 0.9723, 0.9700 ; and 37.17, 36.10, 33.33 respectively.In order to preserve biodiversity in a given area we need to understand how diversity is impacted by different management strategies. Because diversity indices provide more information than simply the number of species present (that is they account for some species being rare and others being common), they serve as valuable tools that provide important information on rarity and commonness of species in the community.The ability to quantify diversity in this way is an important tool for biologists trying to understand community structure. (Beals *et al.*, 2000).

Conclusion:

External factors affecting fish population in the river Kulsi include habitat loss resulting from withdrawal of water for human use, impact of anthropogenic factor and direct exploitation such as wetland drainage and flood control causing the load of inorganic and organic pollutants in flowing waters to increase. During this survey in the three zones juveniles and sub-adults were encountered which shows this river as a breeding and nursery ground for fish species. Gangetic dolphin mainly feeds on those sub adults and juveniles of fish species and *Macrobrachium altifornus, M.dayanum, M.lamarrei.* In conclusion over fishing by using gill nets, cast nets and sand mining is probably responsible for low composition and diversity in the River Kulsi.The information related to fish diversity in river Kulsi will serve as a baseline guide for future study for carrying out further study on ecology conversation, sustainability and management of fishery resources Cetacean species i.e.river dolphin.

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