The Science Probe *Vol. 1 No. 1 (May 2012)* *Page No- 21-29* *ISSN: 2277 – 9566*

A Comparison of Fish Diversity of Kopili and Jamuna Rivers of Karbi Anglong District, Assam

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ABSTRACT

River consist of a complex mixture of distinctive habitats, which make it among the most productive and valuable ecosystem on earth. Kopili and Jamuna Rivers are the tributaries of the Brahmaputra drainages, which afford a lucrative field of ichthyological importance. The present study was aimed to examine temporal patterns of fish assemblage attribute of the Kopili and Jamuna River of Karbi Anglong district of Assam.

A total of 61 piscine species under 7 orders were collected over one year of monthly sampling. Assemblage attributes (species richness, species evenness and diversity) varied significantly between these two tributaries. Discrete temporal gradients were noticed in fish diversity in these riverine systems. Dominating order Cypriniformes had the greatest effect on the observed pattern of fish assemblages. Disparity in assemblage composition hence reflected the degree of hydrological connectivity. The present work therefore supports the view that the influence of adjacent ecosystems affect diversity-productivity pattern of local populations leading to regional persistence of species that are of great importance as bio-resource. This has the potential to provide novel fundamental insights into the dynamics and functioning of ecosystem leading to its stabilization and subsequent conservation of the whole community.

KEYWORDS: Fish diversity, Kopili River, Jamuna River, Karbi Anglong.

INTRODUCTION

Throughout the world, rivers are among the most modified and threatened environments. Scientific interest is increasingly focusing on the effects of major natural or human perturbations on riverine ecosystems. Riverine fish communities show seasonal changes in the composition and relative abundance of species, which may be influenced by constant fluctuations in environmental factors (Thiel *et al.*, 1995).

The Brahmaputra drainage system in North East India is one of the largest hydrographic basins in Southeast Asia and sustains a very rich and diverse aquatic gene pool, particularly fishes and such as the region is featured among the global hotspots of fresh water fish diversity (Kottelat and Whitten, 1996). All north-eastern states have handful resources of fishes as well as other aquatic species in terms of many rivers with their tributaries, streams, rivulets, wetlands, lakes, ponds, tanks etc. Assam has vast and varied fresh water aquatic resources and it being regarded as one of the richest spot of biodiversity in India.

One of the significant lotic systems serving as a potential fish habitat is the river Kopili ($25^0 43' 24.2''$ N and $92^0 49' 25.8''$ E). It originates from the hills of Meghalaya and enters the Assam Valley through its southern part. The river Kopili, further, flows through Dima Hasao, Karbi Anglong, Nagaon and Kamrup districts of Assam before joining the river Brahmaputra (Das, 2009). River Jamuna is an important tributary among the tributaries on the south bank of the Brahmaputra valley. It originates from west of Dombuksor Hill (1,360 meter) ($93^0 31'$ N and $26^0 8'$ E) of Diphu sub-division under Karbi Anglong district (Sarma, 1993). From its origin Jamuna flows towards south-east. Near Manja, Diphu River joins Jamuna from left and flows towards south-west by the side of NH 36.

River with its tributaries is a unique type of ecosystem which generally covers different types of climatic zones, landscapes and biogeographical regions. River is the natural drainage system of the land mass of the earth which move continuously. Near the source, the river is small, straight and swift while in downstream the velocity of water decreases and meandering of river begins in the plains. As the velocity of water current gets reduced, the load it carries is deposited as silt, sand and mud (Datta Munshi *et al*., 1995).

In India, there are 2,500 species of fishes; of which, 930 live in freshwater and 1,570 are marine (Kar, 2007). Out of the approximately 806 fish species inhabiting fresh water of India (Talwar and Jhingran, 1991), the North East including Assam is reported by 266 species (recorded and reported) belonging to 114 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 survey of fish fauna of Brahmaputra in Assam reported 41 fish species of commercial importance (Jhingran, 1999). In river Kopili 28 valid ichthyospecies belonging to 22 genera and 12 families have been recorded during the study period (Das, 2009). Ichthyological field survey conducted in the river Jamuna of Karbi Anglong district revealed the occurrence of 36 species of fishes (Das and Sharma, 2012).

The fresh water ichthyodiversity of Assam was reported by Dey (1973, 1982), Nath (1987), Boruah (1999), Biswas and Boruah (2002), Das (2007), Das and Biswas (2006) and Das and Biswas (2008). At present many species like *Amblypharyngodon mola, Ompok pabo, Botia dario, Channa striatus,* etc. are found in very less quantity (Sharma and Das, 2010). Although survey on ichthyofauna of this region has been carried out by a few workers, but yet in Karbi Anglong, there is no detailed information regarding the diversity, abundance and status of Jamuna River.

This study mainly aims to characterize and compare the seasonal distribution patterns of nekton diversity of the Kopili and Jamuna River systems. The findings from the study will benefit the planning and management of fish community structure and conservation of natural resources at national level.

MATERIALS AND METHODS

Study Site:

The geographical locations of three sites of river Kopili surveyed during the study period are:-

(i) Panimur (upstream rheophilic stretch)– $25^{o}43^{/}24.2^{//}$N and $92^{o}49^{/}25.8^{//}$E, (ii) Kalighat (midstream region)– $25^{o}48^{/}48^{//}$N and $92^{o}55^{/}53.3^{//}$E and (iii) Kheroni (downstream region)– $25^{o}50^{/}92.5^{//}$N and $92^{o}53^{/}18.6^{//}$ E.

The three major places of Karbi Anglong district were considered as belonging to three independent sites of river Jamuna. These are:- (i) Silveta (upstream rheophilic stretch), (ii) Bakalia (midstream region) and (iii) Howraghat (downstream region), which are 38 Km, 55 Km and 71 Km respectively away towards west from the district headquarter Diphu.

However, no detailed systematic fish inventory and comparison has been available on the ichthyofauna of river Kopili and Jamuna in Karbi Anglong district of Assam. As such, the present communication happens to be the first detailed systematic list of the fishes occurring in the river Kopili and Jamuna on extensive surveys done from March 2011 to February 2012.

Sampling Design:

Fish sampling was carried out once in every month over a tenure of one year. The annual cycle was divided into three seasons as pre-monsoon (March-June), monsoon (July-October) and post-monsoon (November-February). A gill net of 20 m length with 1 cm spacing between adjacent knots for sample collection was placed alongside the river bank for 6 hrs in order to ensure maximum fish catch per unit effort. Afterwards, the mean of all these sub samples for every season was taken for further analysis. The specimens were retrieved from the net, identified and species abundance was recorded to investigate species assemblages. After preserving individuals representing each fish species in 5% formalin, the live fishes were released. Fish specimens were identified up to the lowest taxonomic level following Talwar and Jhingran (1991), Jayaram (1999) and Viswanath (2000).

RESULTS AND DISCUSSIONS

Continuous monthly netting over one year resulted in the capture of a total 61 piscine species distributed among 7 orders, 16 families and 35 genera (Table- 1). 54 fish species was reported from river Kopili and that of river Jamuna was 47 during the study period. Out of them, only 11 species were abundant in both the rivers. Assessment of fish diversity at higher taxonomic level (species count per order) indicated that the orders Cypriniformes, Siluriformes and Perciformes were most abundant in all the seasons in riverine habitats (Fig- 1). Among fish species Cypriniformes contributes highest in both the rivers (55% in Kopili and 56% in Jamuna river). Where as Cyprinodontiformes contribute lowest (2%) in both the rivers (Fig- 2 & 3). As per genera and species, family Cyprinidae had maximum diversity amongst all the families. The other orders were much less frequently abundant throughout the year, with relative fluctuations.

A comparison of species richness across seasons indicated that in riverine conditions, it was significantly higher in river Kopili than in river Jamuna. However, the species richness was always higher in riverine zone than that of the other lentic zone. The riverine habitat showed higher species evenness during post monsoon and monsoon season than that in pre monsoon.

Species similarity value between different seasons demonstrated a close resemblance of species composition between pre monsoon and monsoon in both the rivers. However, these two habitats showed resemblance of species composition though their sources are different.

The present work therefore supports the view that the influence of adjacent ecosystems affect diversity-productivity pattern of local populations leading to regional persistence of species that are of great importance as bio-resource.

Table- 1: List of fishes collected, based on the classification of Shaw and Shebbeare (1937), Day (1958) and Talwar and Jhingran (1991) during the study period. "+" represents presence and "-" represent absence of any species in the specific study site.

Order	**Family**	**Species**	**Kopili River**			**Jamuna River**		
			Pa	**Ka**	**Kh**	**Si**	**Ba**	**Ho**
Osteoglossiformes	Notopteridae	1. *N. notopterus* (Pallas, 1769)	-	+	+	-	+	+
Clupeiformes	Clupeidae	2. *Gudusia chapra* (Hamilton, 1822)	+	+	+	-	-	+
Cypriniformes	Cyprinidae	3. *Cirrhinus reba* (Hamilton, 1822)	-	-	-	+	-	+
		4. *Labeo bata* (Hamilton-Buchanan, 1822)	+	-	+	-	-	+
		5. *L. gonius* (Hamilton-Buchanan, 1822)	-	-	+	-	+	-
		6. *L. rohita* (Hamilton-Buchanan, 1822)	+	+	+	+	+	+
		7. *L. calbasu* (Hamilton-Buchanan, 1822)	-	-	+	-	-	-
		8. *Puntius chola* (Hamilton-Buchanan, 1822)	-	+	+	+	-	+
		9. *P. conchonius* (Hamilton-Buchanan, 1822)	-	+	-	-	-	-
		10. *P. sarana sarana* (Hamilton, 1822)	-	-	-	-	+	-
		11. *P. sophore* (Hamilton-Buchanan, 1822)	+	-	+	+	-	+
		12. *P. ticto* (Hamilton-Buchanan, 1822)	+	+	+	+	+	+
		13. *Chela cachius* (Hamilton-Buchanan, 1822)	-	+	-	-	-	-
		14. *C. laubuca* (Hamilton, 1822)	-	-	+	-	-	+
		15. *Salmophasia bacaila* (Hamilton-Buchanan, 1822)	+	-	+	+	+	+

		16. *S. acinaces* (Valenciennes, 1842)	-	+	-	-	-	-
		17. *Amblypharyngodon mola* (Hamilton-Buchanan, 1822)	+	-	+	+	-	+
		18. *Aspidoparia jaya* (Hamilton-Buchan, 1822)	+	-	+	-	+	+
		19. *A. morar* (Hamilton-Buchan, 1822)	+	-	-	+	+	-
		20. *Barilius barila* (Hamilton-Buchan, 1822)	-	+	+	-	-	-
		21. *B. barna* (Hamilton-Buchan, 1822)	+	+	-	-	+	+
		22. *B. bendelisis* (Hamilton-Buchan, 1822)	-	+	+	-	-	+
		23. *B. dogarsinghi* Hora, 1921	-	-	+	-	-	+
		24. *Danio devario* (Hamilton-Buchanan, 1822)	-	+	+	-	-	-
		25. *D. rerio* (Hamilton-Buchanan, 1822)	+	+	+	-	+	+
		26. *D. naganenesis* Chaudhuri, 1912	-	-	-	+	-	+
		27. *Esomus danricus* (Hamilton-Buchanan, 1822)	-	+	+	+	-	-
		28. *R. rasbora* (Hamilton-Buchanan, 1822)	-	-	+	-	+	-
		29. *Gara gotyla gotyla* (Gray, 1832)	+	+	-	+	-	-
		30. *G. naganensis* Hora, 1921	-	-	-	+	+	-
		31. *G. nasuta* (McClelland, 1839)	-	-	+	-	-	-
		32. *C. catla* (Hamilton-Buchanan, 1822)	-	+	+	-	+	+
	Balitoridae	33. *Acanthocobotis botia* (Hamilton-Buchanan, 1822)	-	-	-	+	-	+
	Cobitidae (Loaches)	34. *Lepidocephalichthys annandalei* (Chaudhuri, 1912)	-	+	-	-	-	-
		35. *L. guntea* (Hamilton-Buchanan, 1822)	+	+	-	+	-	-
		36. *Botia dario* (Hamilton-Buchanan, 1822)	-	+	+	-	+	+
		37. *B. rostrata* Gunther, 1868	-	+	+	-	-	-
Siluriformes	Bagridae	38. *Aorichthys aor* (Hamilton-Buchanan, 1822)	-	-	+	-	+	-
		39. *A. seenghala* (Sykes, 1841)	-	+	+	-	-	-
		40. *Batasio tengana* (Hamilton-Buchanan,	-	+	-	-	+	+

		1822)						
		41. *Mystus armatus* (Day, 1865)	+	+	-	+	-	+
		42. *M. bleekeri* (Day, 1877)	-	+	+	+	-	+
		43. *M. cavasius* (Hamilton-Buchanan, 1822)	-	-	-	-	+	+
	Siluridae	44. *Ompok bimaculatus* (Bloch, 1797)	-	+	-	+	+	-
		45. *Wallago attu* (Schneider, 1801)	+	+	-	-	+	+
	Schilbeidae	46. *Clupisoma garua* (Hamilton-Buchanan, 1822)	-	-	+	-	-	+
		47. *Eutropiichthys murius* (Hamilton-Buchanan, 1822)	-	+	-	-	-	-
		48. *Eutropiichthys vacha* (Hamilton-Buchanan, 1822)	+	+	+	-	+	+
Cyprinodontiformes	Belonidae	49. *Xenentodon cancila* (Hamilton-Buchanan, 1822)	+	-	+	+	+	+
Perciformes	Chandidae	50. *Chanda nama* Hamilton-Buchanan, 1822	-	+	+	-	+	+
	Nandidae	51. *N. nandus* (Hamilton-Buchanan, 1822)	+	+	-	+	+	-
		52. *B. badis* (Hamilton-Buchanan, 1822)	-	+	-	+	-	+
	Gobiidae	53. *Glossogobius giuris* (Hamilton-Buchanan, 1822)	+	+	-	-	-	-
	Anabantidae	54. *Anabus testudineus* (Bloch, 1795)	+	+	+	+	+	+
	Belontidae	55. *Trichogaster fasciatus* (Bloch & Schneider, 1801)	+	-	+	-	+	+
	Channidae	56. *Channa marulius* (Hamilton-Buchanan, 1822)	-	-	-	+	+	-
		57. *C. orientalis* Bloch & Schneider, 1801	+	-	+	-	-	-
		58. *C. punctatus* (Bloch, 1793)	+	+	+	-	+	+
		59. *C. striatus* (Bloch, 1793)	-	+	+	+	-	+
Mastacembeliformes	Mastacembelidae	60. *Macrognathus aral* (Bloch & Schneider, 1801)	-	+	-	-	+	+
		61. *Mastacembelus armatus* (Lacepède, 1800)	-	+	+	-	-	-

Note: Pa- Panimur; Ka- Kalighat; Kh- Kheroni; Si- Silveta; Ba- Bakalia and Ho- Howraghat.

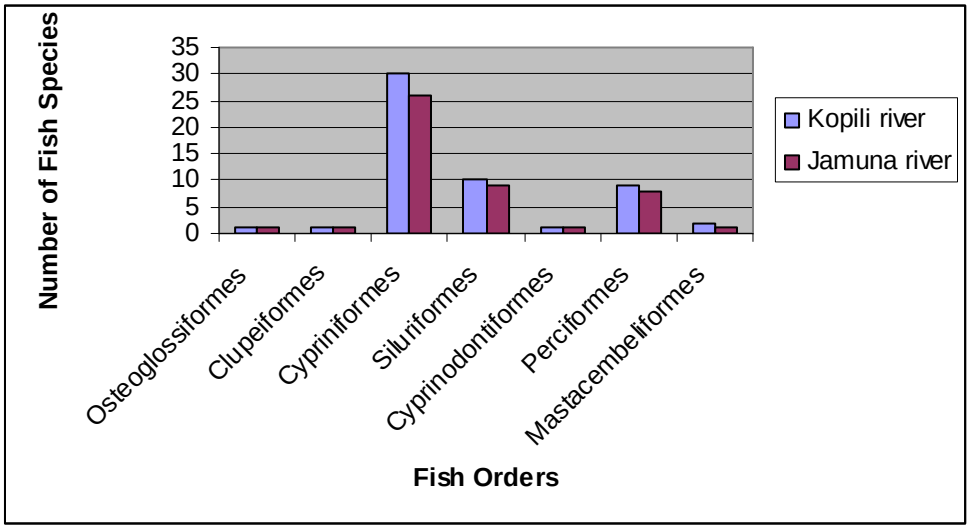

Fig- 1**:** Comparative abundance of fish species counted per order in Kopili and Jamuna River.

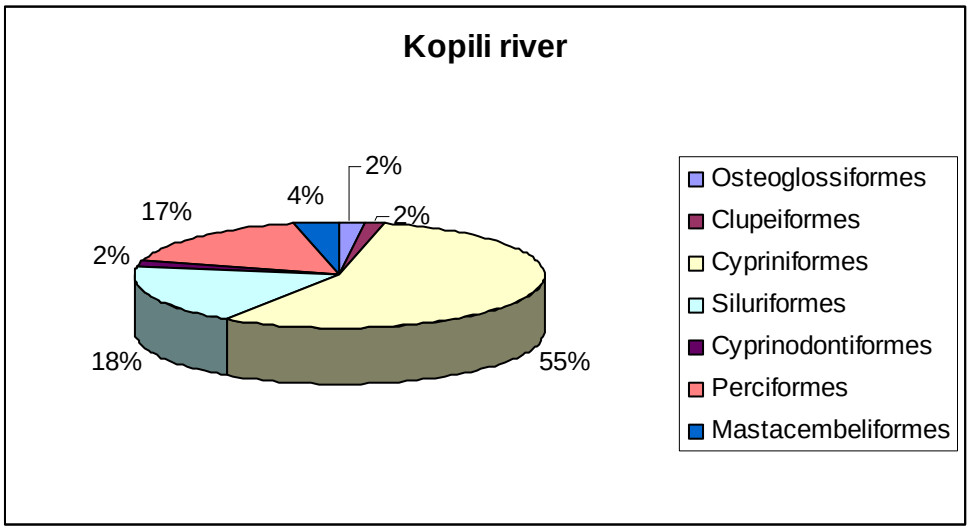

Fig- 2**:** Percentage contribution of different orders of fish in Kopili River.

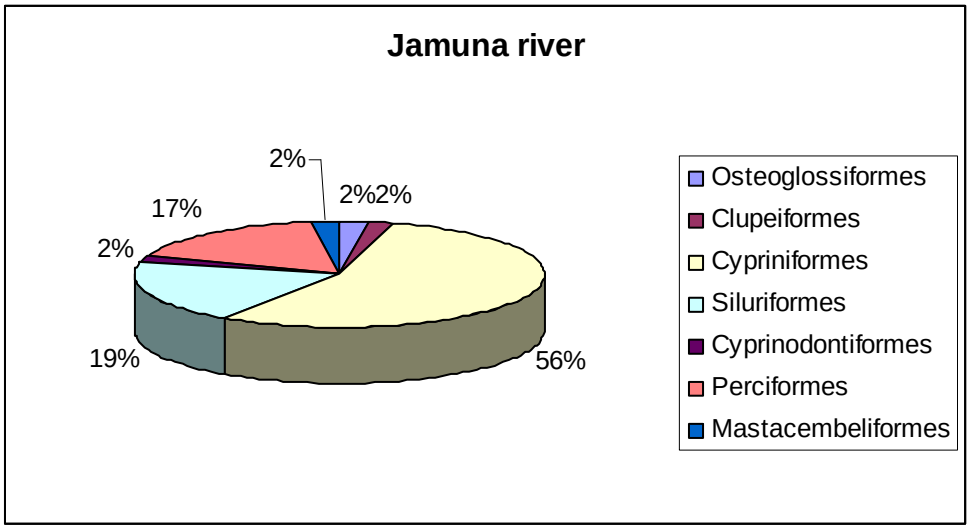

Fig- 3: Percentage contribution of different orders of fish in Jamuna River.

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