

## Fish Diversity and Habitat Mapping of River Siang in Arunachal Pradesh using Remote Sensing and GIS

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### Abstract

*River is one of the most valuable resources, which supports human health, economic development and ecological diversity. The unique topography of North-East India and watershed pattern is an attractive field for Ichthyological studies. This region has already recognized as a global spot of freshwater fish diversity. Siang River is the one of the major river of Arunachal Pradesh. The present study on fish diversity of Siang River in Assam and Arunachal Pradesh was carried out from June 2012 to July 2013. Fishes are very important from the biodiversity point of view. The fishes are collected from the different parts of the river and the collected fishes were identified. A total 87 different fishes were collected under 55 genera; they are classified into 9 orders and 22 families. Cypriniformes dominates the whole river and found in higher numbers and Beloniformes and Tetradontiformes are found in less numbers. The River Siang is good potential of fish fauna.*

*The high spatial resolution of LISS III Satellite Images and the Toposheet of the Siang River are used in the present study in mapping the Geomorphology, Limnology, Biodiversity of the river and Land-use and Land-cover of the area. A number of fluvial geomorphic anomalies have been identified in the area. This study revealed that the development of topography and drainage system of the study area have been influenced by active subsurface geological structures.*

**Keywords:** Fish Diversity, Cypriniformes, Drainage, GIS and RS, River Siang.

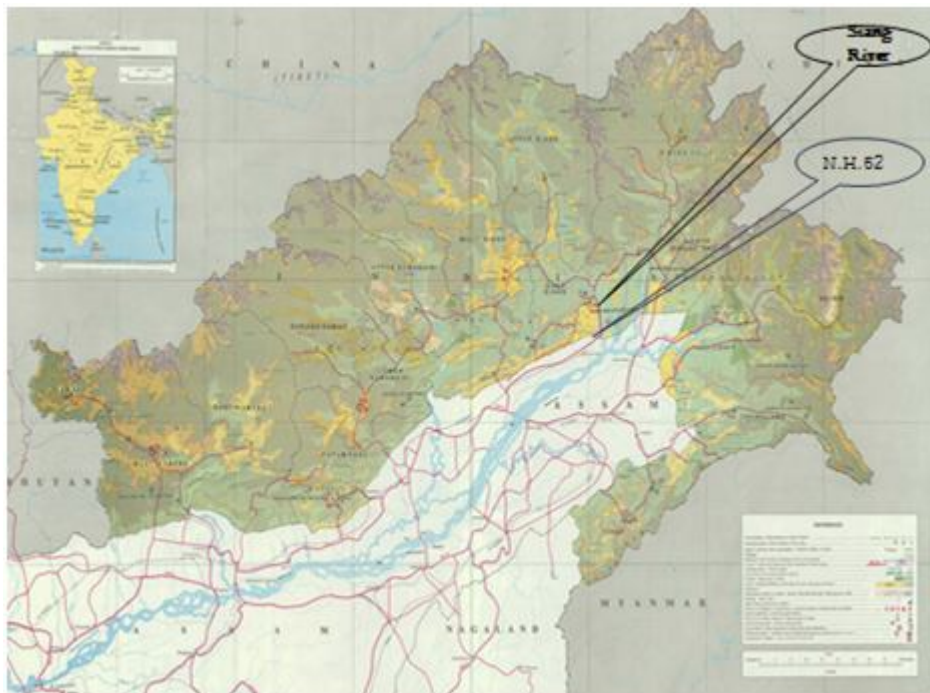
### INTRODUCTION

Fishes are in variable living components of water bodies. These organisms are important food resource and good indicators of the ecological health of the waters they inhabit. However, the rich biodiversity of the freshwater fish of the Indian region has been rapidly dwindling because of increasing degradation of inland water. Out of a total of 2500 species of fish in India, 930 are in freshwaters and belong to 326 genera, 99 families and 20 orders (Talwar and Jhingran 1991). India is one of the 12 mega biodiversity hot spots contributing 60-70% of the world's biological resources. India has about 11.72% of total global fish biodiversity. A great number of fish species have been reported from the North-Easter region.

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**STUDY SITE**

The River Siang, is largest river of Brahmaputra river system, originates from Chema Yungdung Glacier near Kubi at 5150 m in Tibet. In Tibet it is popularly known as Tsang-Po, flows in West–East direction. After traversing a distance of about 1625 km river in Tibet and then it takes a turn in south direction, enters the territory of India near Tuting in the Upper Siang district of Arunachal Pradesh and flows through North–South direction in East Siang district towards Assam and finally it merges with Lohit and Dibang in Assam and it becomes the mighty River Brahmaputra.



**Fig. I:** Showing the Location of Siang River in Arunachal Pradesh.

**MATERIALS AND METHODS**

General survey of the fish biodiversity was done using standard procedures (Armontrout, 1990). Fish samples were collected from Siang River during June 2012 to December 2013 through experimental fishing; using cast nets, gill nets, drag nets, triangular scoop nets and variety of traps and also by hooks and lines. Local people were involved in the netting and also in the fish collection. Fish samples sites were chosen in the survey area based on micro-habitat types, substrate type, water quality, soil quality and the depth of the river. Fish species have been preserved at first in concentrated (100%) formaldehyde in the field. After that the fishes are transferred to into 10% formaldehyde glass container to preservations purpose. In the laboratory the fish species have been identified after standard literature by following Talwar and Jhingran (1991), Jayaram (1999), Kar (2007, 2013) and Vishwanath (2002).

**RESULTS AND DISCUSSION**

The results of the present study pertaining the aspects of fish diversity are given in the below mentioned Table III. The fish nomenclature is based on Fishbase.org. The present Studies on

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Siang River reveals the presence of 82 (Eighty Two) species of fishes belonging to 8 (Eight) orders, 24 (Twenty Four) families and 53 (Fifty Three) genera. Cypriniformes dominates the whole river and found in higher numbers and Beloniformes and Tetradontiformes are found in less number. The existing fish community comprising of terrestrial as well as aquatic and other organism will face the problems of loss of habitat, feeding sites and breeding grounds as a result of change of vegetation pattern due to change of normal water regime of the river.

**Table I: Habitat Characteristics of Siang River**

<b>Habitat Characteristics</b>						
<b>Stream Order</b>	<b>Microhabitat Type</b>	<b>Cover Type</b>	<b>Substrate Type</b>	<b>Riparian Land Use</b>	<b>Signs of Erosion</b>	<b>Valley Segment</b>
First Order	Riffle, Cascade,	Under cut bedrock, Overhanging, Depth, Turbulence Cover, Small Woody Debris.	Boulders Cobbles, Gravels and Fine Sands	Human Habitation, Fishing, Protected Areas as Reserved Forest and Agricultural Use	Visible	Colluvial

**Table II: List of Fishes of River Siang Recorded in June 2012 to July 2013**

<b>Sl. No</b>	<b>Fish Scientific Name</b>	<b>Order</b>	<b>Family</b>	<b>Conservation Status (IUCN)</b>
1	<i>Aborichthys elongatus</i> Hora, 1921	Cypriniformes	Nemacheilidae	LC
2	<i>Aborichthys kempfi</i> Chaudhuri, 1913	Cypriniformes	Nemacheilidae	NT
3	<i>Acanthocobitis botia</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Nemacheilidae	LC
4	<i>Ailia coila</i> (Hamilton-Buchanan, 1822)	Siluriformes	Schilbeidae	NT
5	<i>Amblyceps mangois</i> (Hamilton-Buchanan, 1822)	Siluriformes	Amblycipitidae	LC
6	<i>Amblypharyngodon mola</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
7	<i>Anabas testudineus</i> (Bloch, 1792)	Perciformes	Anabantidae	DD
8	<i>Aspidoparia jaya</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
9	<i>Badis assamensis</i> Ahl, 1937	Perciformes	Badidae	DD
10	<i>Badis badis</i> (Hamilton-Buchanan, 1822)	Perciformes	Badidae	LC
11	<i>Bagarius bagarius</i> (Hamilton-Buchanan, 1822)	Siluriformes	Sisoridae	NT

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12	<i>Bangana dero</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
13	<i>Barilius barna</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
14	<i>Barilius bendelisis</i> (Hamilton-Buchanan, 1807)	Cypriniformes	Cyprinidae	LC
15	<i>Botia dario</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cobitidae	LC
16	<i>Botia rostrata</i> Gunther, 1868	Cypriniformes	Cobitidae	VU
17	<i>Cabdio morar</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
18	<i>Chagunius chagunio</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
19	<i>Chanda nama</i> (Hamilton-Buchanan, 1822)	Perciformes	Ambassidae	LC
20	<i>Channa gachua</i> (Hamilton-Buchanan, 1822)	Perciformes	Channidae	LC
21	<i>Channa marulius</i> (Hamilton-Buchanan, 1822)	Perciformes	Channidae	LC
22	<i>Channa orientalis</i> Bloch and Schneider, 1801	Perciformes	Channidae	NE
23	<i>Channa punctata</i> (Bloch, 1793)	Perciformes	Channidae	LC
24	<i>Channa stewartii</i> (Playfair, 1867)	Perciformes	Channidae	LC
25	<i>Channa striata</i> (Bloch, 1793)	Perciformes	Channidae	LC
26	<i>Cirrhinus mrigala</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
27	<i>Cirrhinus reba</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
28	<i>Clarias magur</i> (Hamilton-Buchanan, 1822)	Siluriformes	Clariidae	EN
29	<i>Crossocheilus latius</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
30	<i>Cyprinion semiplotum</i> (McClelland, 1839)	Cypriniformes	Cyprinidae	VU
31	<i>Danio dangila</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
32	<i>Danio rerio</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
33	<i>Devario aequipinnatus</i> (McClelland, 1839)	Cypriniformes	Cyprinidae	LC
34	<i>Esomus danricus</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
35	<i>Garra annandalei</i> Hora, 1921	Cypriniformes	Cyprinidae	LC
36	<i>Garra gotyla gotyla</i> (Gray, 1830)	Cypriniformes	Cyprinidae	LC
37	<i>Garra kempfi</i> Hora, 1921	Cypriniformes	Cyprinidae	LC

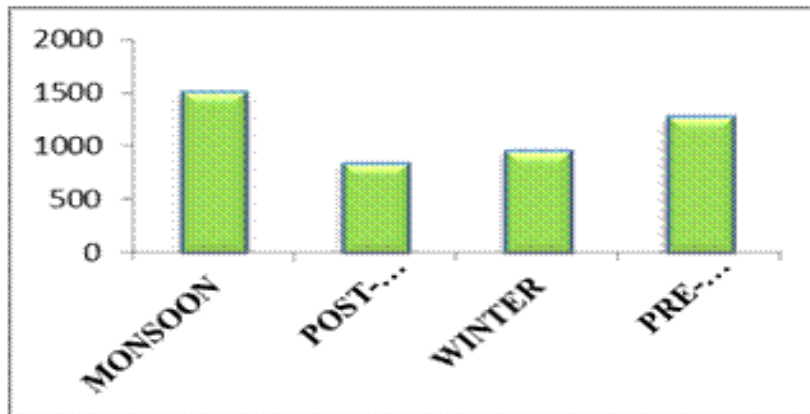
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38	<i>Garra lissorhynchus</i> (McClelland, 1842)	Cypriniformes	Cyprinidae	LC
39	<i>Garra mccllelandi</i> (Jerdon, 1849)	Cypriniformes	Cyprinidae	LC
40	<i>Glossogobius giuris</i> (Hamilton-Buchanan, 1822)	Perciformes	Gobiidae	LC
41	<i>Glyptothorax annandalei</i> Hora, 1923	Siluriformes	Sisoridae	LC
42	<i>Glyptothorax cavia</i> (Hamilton-Buchanan, 1822)	Siluriformes	Sisoridae	LC
43	<i>Gudusia chapra</i> (Hamilton, 1822)	Clupeiformes	Clupeidae	LC
44	<i>Heteropneustes fossilis</i> (Bloch, 1794)	Siluriformes	Heteropneustidae	LC
45	<i>Labeo bata</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
46	<i>Labeo calbasu</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
47	<i>Labeo gonius</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
48	<i>Labeo pangusia</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	NT
49	<i>Labeo rohita</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
50	<i>Lepidocephalichthys guntea</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cobitidae	LC
51	<i>Macrogathus aral</i> (Bloch and Schneider, 1801)	Synbranchiformes	Mastacembelidae	LC
52	<i>Macrogathus pancalus</i> Hamilton-Buchanan, 1822	Synbranchiformes	Mastacembelidae	LC
53	<i>Mastacembelus armatus</i> (Lacepede, 1800)	Synbranchiformes	Mastacembelidae	LC
54	<i>Megarasbora elanga</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
55	<i>Monopterus cuchia</i> (Hamilton-Buchanan, 1822)	Synbranchiformes	Synbranchidae	LC
56	<i>Mystus bleekeri</i> (Day, 1877)	Siluriformes	Bagridae	LC
57	<i>Mystus cavasius</i> (Hamilton-Buchanan, 1822)	Siluriformes	Bagridae	LC
58	<i>Mystus vittatus</i> (Bloch, 1794)	Siluriformes	Bagridae	LC
59	<i>Nandus nandus</i> (Hamilton-Buchanan, 1822)	Perciformes	Nandidae	LC
60	<i>Neolissochilus hexagonolepis</i> (McClelland, 1839)	Cypriniformes	Cyprinidae	NT
61	<i>Notopterus notopterus</i> (Pallas, 1769)	Osteoglossiformes	Notopteridae	LC
62	<i>Ompok bimaculatus</i> (Bloch, 1794)	Siluriformes	Siluridae	NT
63	<i>Ompok pabda</i> (Hamilton-Buchanan, 1822)	Siluriformes	Siluridae	NT

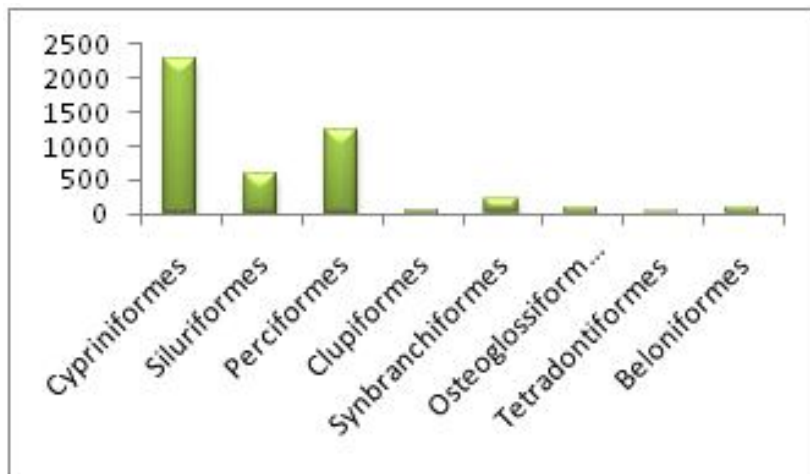
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64	<i>Parambassis baculis</i> (Hamilton-Buchanan, 1822)	Perciformes	Ambassidae	LC
65	<i>Parambassis ranga</i> (Hamilton-Buchanan, 1822)	Perciformes	Ambassidae	LC
66	<i>Psilorhynchus balitora</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Psilorhynchidae	LC
67	<i>Pethia ticto</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
68	<i>Puntius chola</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
69	<i>Puntius sophore</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
70	<i>Raiamas bola</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
71	<i>Rasbora rasbora</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
72	<i>Rita rita</i> (Hamilton-Buchanan, 1822)	Siluriformes	Bagridae	LC
73	<i>Salmophasia bacaila</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
74	<i>Schizothorax progastus</i> (McClelland, 1839)	Cypriniformes	Cyprinidae	LC
75	<i>Schizothorax richardsonii</i> (Gray, 1832)	Cypriniformes	Cyprinidae	VU
76	<i>Systemus sarana</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	LC
77	<i>Tetraodon cutcutia</i> (Hamilton-Buchanan, 1822)	Tetraodontiformes	Tetraodontidae	LC
78	<i>Tor putitora</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	EN
79	<i>Tor tor</i> (Hamilton-Buchanan, 1822)	Cypriniformes	Cyprinidae	NT
80	<i>Trichogaster labiosa</i> Day, 1877	Perciformes	Osphronemidae	LC
81	<i>Wallago attu</i> (Bloch and Schneider, 1801)	Siluriformes	Siluridae	NT
82	<i>Xenentodon cancila</i> (Hamilton-Buchanan, 1822)	Beloniformes	Belonidae	LC

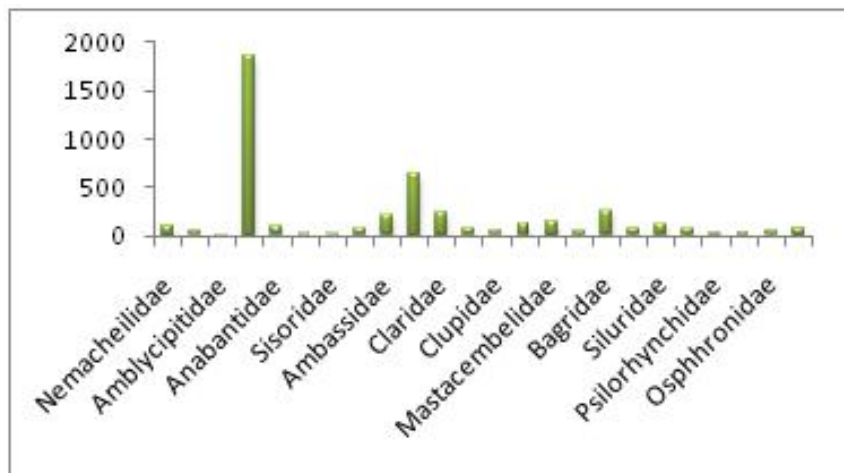
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**Fig. II:** Total Fish Population of Siang River in the Different Seasons



**Fig. III:** Total Fish Collected in Order wise of Siang River



**Fig. IV:** Total Fish Collected in Family wise of Siang River



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An analysis of the drainage network of a part of Siang River, Arunachal Pradesh, India, is undertaken to reveal the role of drainage water activity of the area. A number of fluvial geomorphic anomalies have been identified in the area. This study revealed that the development of topography and drainage system of the study area have been influenced by active subsurface geological structures. Formation of paleochannels, compressed meanders, reticulate streams, swamps, sagging of grounds, stream alignments, lineaments, knick points and abandonment of rivers as well as development of smaller drainage anomalies also substantiate the active nature of the subsurface structures. Species richness in a region is governed by a number of factors which operate at different spatial and temporal scales. Biotic as well as abiotic factors act together in regulating the local species richness.

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