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Fish Diversity and Fishing Gears used in the Kulsi River of Assam, India

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ABSTRACT

A survey on fish diversity of the Kulsi River, a tributary of the Brahmaputra River was conducted. This small river is particularly important for its residential dolphin population as well as for its high quality of sand. A total of 57 numbers of fish species and five major types of gears have been recorded from the Kulsi River.

Key words: Fish diversity, fishing gear, Kulsi River, Brahmaputra

INTRODUCTION

The biodiversity and conservation of fish in the aquatic ecosystem have attracted the attentions of various workers [1- 8]. Watters [9] reviewed the diversity of freshwater fishes relative to habitat. Myers [10-12] identified important areas for freshwater high diversity termed "hotspots". Kottelat and Whitten [13] have reviewed various aspects of freshwater biodiversity in Asia, including discussion on taxonomy, hotspots and policy.

The fishing gears and craft in Assam are traditional, non- mechanized and mostly locally built. The highly diverse natural water areas, methods ranging from grappling with the operation of large and indigenously designed nets are adopted in Assam for capturing different varieties of fishes. The gear selection which may vary in respect of season, water body, types of fishes, sought, the gear efficiencies based on certain established principles.

Kulsi River is one of the few habitats of endangered river dolphin [14]. Along with geomorphology, riverbed structure, water depth, pH, the availability of prey base fish is utmost importance for the existence river dolphin [15]. There is no available record on the fish diversity and composition in the Kulsi River which drains directly into the mighty Brahmaputra. Therefore, the objective in this study was to provide accounts of the fish diversity and species composition in the R. Kulsi and also about fishing methods.

MATERIALS AND METHODS

Fish samples were collected regularly from fishermen operating in the sampling sites between August 2009 and July 2011. Fish species were also collected from the fish landing ports. Collected specimens were preserved in 4% formaldehyde solution for further study. Identifications of the fish species were carried out following standard literature [16 and 17]. Conservation status of each species was determined following [18]. The information was gathered through field visit and inquiring directly to the fishermen about the details of the fishing gear they used, mechanism of operation and types of fish caught in the study area.

RESULTS AND DISCUSSION

In this study fish species composition comprised fifty five (57) individuals from sixteen (16) families, thirty six (36) genera and fifty five (57) species (Table 1). Among the families recorded Cyprinidae is the dominant family with 24 species. Five (05) crustaceans were also recorded from the Kulsi river namely *Macrobrachium lamarrii*, *Macrobrachium dayanum*, *Macrobrachium altitrons*, *Macrobrachium birmanicum*, *Macrobrachium chaprae* have been recorded.

During the period of study, several forms of fishing gears have been recorded which includes diverse forms of fishing nets, bamboo traps, harpoons, hooks and lines to catch the fishes in relation to various factors such as physiography of the water body, nature of fish stock etc. Different fishing crafts, their structure, size mode of operation, type of fish trapped etc. are depicted in Table: 2.

Description of fishing gears and crafts

I. Encircling gear: The encircling gears are found to be operated in shallow water and the following types of encircling gears have been recorded.

a) *Khewali jal*: *Khewali jal* is a type of cast net (also locally known as *Jhankijal* or *Asrajal*), is the most common form of net used in the region. It is a conical cast net of 2-2.5m in length having 8-15 mm mesh size. Sometimes it is coloured dark brown. The circular edge of the bottom of the cone is doubled and 30-50cm in height. Along the inner edge of the mouth of the pockets runs a chain of drum shaped sinkers. A rope is attached to the apex of the cone. The end of the rope in the fisherman's left hand and the net folded on his right hand. Generally all types of fishes are caught with this net.

b) *Angthajal*: It is also a cast net of larger sizes (3 to 4 m in length & 2 to 3 m in circumference). *Angthajal* contains several pockets at the bottom end and are fitted with sinkers made-up of iron rings. This circular cast net is usually operated from boat. It is made up of nylon twine and usually contains more sinkers of 7 to 10 kg weight. The length of the net varies from 27 to 30 m. Medium and even large sized carp and cat fishes are caught by this net.

c) *Musharijal*: It is also known as '*Mohorijal*' in Kamrup district. It is used extensively throughout the year except monsoon season. The net is made up of 2-5 pieces of rectangular nylon mosquito net of mesh size 1-1.2 mm. Each piece of net varies 20-30 m in length and 6-8 m in breadth, tied together by nylon threads. At the time of operation the net is kept vertically erected from the bottom. This net is operated by at least 4-6 persons.

d) *Berjal*: It is a large rectangular seine net as surrounding net is also known as *tanaber*. The method of operation is very much similar to that of *mahorijal*. The net is shut in a semi circle with the shore as based and is hauled up on to the land by gradually pulling in either end. Two boats each of which carries half of the net do the paying of the net. The boat proceeds to an appropriate distance from the shore turn to both side and raw towards the shore, simultaneously realizing the net. The net is then hauled up and the catch is collected at the middle point of the net. Operation of *Berjal* required 10-15 men 7 2-4 boats. The catch composition comprises mainly the surface and column feeders like *Labeo spp.*, *Cirrhinus sp.*, *Mystus spp.*, *Channa spp.*, *Wallago attu*, *Ompok spp.* and *Rita rita*.

II. Entangling gear: Entangling gear such as gill nets are passive fishing gears, and usually operated by drifting in surface and column layer of water. Common types of drift nets are as follows

a). *Langijal* (Gillnet): *Langi jal* are rectangular nets which are provided with head and foot edges. This small-meshed drift net is more effective in entangling the fish. Its length varies from 100 m while the breadth from 0.5 to 1.5m. Smaller bamboo sticks are used as floats while burned clay are used as sinkers. It is thrown over the water particularly from one shore to another. Sometimes the net is tied against the current and allowed to drift over night. Fishes gets entangle in the net by their operculum. There are different types of *Langi jals* are found i.e. *Puthijal*, *Kaai langi*, *Gorai langi*, etc.

(b) *Phansijal*: *Phansijal* is a common gill net, smaller than the *langijal*. It is also rectangular in shape and are made of light materials i.e. nylon or cotton hemp. The method of operation involves several indigenous mechanisms to drive the away the fishes into the net. Like *langijal*, these are also variously named depending upon the fish species sought. These are as *Illisha phansijal*, *Rou phansijal*, *Ari phansijal* etc.

III. Trawling gear: Trawling gears are also known as drag nets and are used for dragging the river beds. They are generally used in shallow water. Drag nets are large and exist in various forms and dimensions.

a) *Moiijal*: *Moiijal* is a small trawl net used for dragging shallow waters. The net is rectangular in shape, 40-50 m long and 1.5 – 2 m in breadth. A number of small iron drum shaped weights are attached to the lower half of the net. The top of the net is attached with a thin bamboo rod. The net is taken to the deep portion of the river and dragged towards the shore. Fishes blocked on the way by the net tend to go downwards and are eventually trapped in bottom bags. 6-8 persons are needed to operate the net which required 1-2 hours for a single operation. The catch composition includes *Puntius spp.*, *Mystus spp.*, *Clarias spp.* and *Ompok spp.*

b) *Harharijal*: It is a conical shaped, bag like trawl net, 8-10 m in length and 6-8 m in circumference at the mouth. It is made from cotton or nylon twine. The mouth of the net is distended two rods near the two ends where the drag ropes are fastened. The middle of the mouth is kept open by a vertical float of bamboo, attached to the middle of the upper edge. A chain of small drum shaped iron weights is sewn to the lower edge which keeps the net vertical in position. Two small boats are required during operation.

IV. Scooping gear: These gears take the fish by moving the nets swiftly in water bodies and lifting the catch out of the water. Both mobile and fixed types of scooping gears are used in Kulsi River. Four types of scooping nets are recorded in the present study.

(a) *Dhekijal*: This is a fixed type of triangular shaped net made from cotton or nylon. It consists of two long bamboo poles tied together to form an acute angle. The net is kept hanging on a rigid frame in such a manner that it usually put under water by a pulley design. To lift the net, the operator exerts extra pressure on the base of the triangular corner as weight. The net is generally lifted at an interval of 15 to 20 minutes or earlier subject to the detection of a shoal of fishes on the net. This gear is usually operated at the adjoining areas of the *beels* (wetland) with the Kulsi River.

(b) *Jakoi*: The *jakoi* is a bamboo trap, which is triangular in shape with a wide mouth (2 m circumference). It is made of bamboo sieves with intervals of 0.3-0.7 cm. A bamboo rod is fixed across the mouth from the middle of the base of the triangle to the vertex and prolonged to a short handle. The fisherman plunges it into the bed of shallow water with the mouth facing him and dances on the ground driving the fish at the bottom into the pouch. Then it suddenly lifts it up in slanting position. The catch composition comprises of mainly small fishes with surface and column feeders. This gear is used in the shallow areas of the bank.

(c) *Ghokajal*: *Thelajal* or *Ghokajal* is the commonest form of scooping gear. The net is fitted to a light triangular bamboo frame. The bamboo frame is constructed with three small bamboos. Two divergent bamboos, one being longer than the other, meet behind at acute angle and the third bamboo joins their free ends to form a triangular shape. The fisherman puts their hands in the handle and walks in knee deep water and pushes the free end of the net through the bottom of the river. After a while the net is raised to collect the fishes that may come in the net.

(d) *Parengijal*: *Parengijal* or *Dharmajal*, also called as *Sipjal* is used by all fishermen community of the area, such as *Kaibartas* and also by *Boro* and *Rabha* tribes. This is a mobile scooping gear. This square shaped net is having an area of 4 to 9 m². Each of the four corners is fastened to each of the four ends or two flexible bamboos tied together crosswise at the middle. Another bamboo pole is tied together at the centre of the frame to act as a handle. The net is plunged into the shallow water and raised up at intervals to catch fishes entrapped on it.

V. Hook & line fishing: Here the fishes are individually caught and retained by hooks. Though the quantity of catch is less, catch obtained by the line fishing is generally of high quality and of commercial value. Environmental impacts of the lines are considered to be minimal. The line fishing technique is highly energy efficient and the investment on gear operation is generally low. Line fishing is basically composed of a line and hook of different shapes and sizes. Two major types of hooks and line, *Nal barshi*, *Sip barashi* are widely used for fishing in R. Kulsi.

a) *Nal barshi*: This type of hook bears a *nal* (rod) instead of bamboo, which is of about 1.5 m long and is tied centrally with a nylon rope with a hook, which can float freely at the right angle to the *nal*.

b) *Sip barshi*: It is made up of bamboo, which often exceeds 6m in length. At the tip of the bamboo a nylon rope with a hook is tied with a grasshopper as bait. This type of hook is used to capture fish like *Mystus* and *Clarias*.

Fishing craft: Two types of country made boat, viz., dugout canoe and plank nailed boat are mostly used in R. Kulsi for fishing purpose. These boats are operated by one or two persons.

The success of these fishing techniques depends on various factors like selection of site, time, efficiency of materials used and availability of fish, etc. For successful fishing some attractant as a lure is popularly employed in other parts of the country [18, 19]. Chemical poisoning, dynamiting, electro-fishing, etc., become very popular but destructive for aquatic ecosystem including fishes against the discussed traditional methods. Therefore, with the use of these eco-friendly fishing devices and methods should be popularised for capturing of fishes among the fishermen in order to conserve the fish diversity in the rivers and streams. A total ban on poisoning, dynamiting and electro-fishing, fishing during breeding season should be enforced immediately for conservation of fish resources in Kulsi River.

Table 1: Frequency of abundance and conservation status of fish fauna in R. Kulsi

Scientific Name	Frequency	Conservation status
Family: Clupeidae		
1. <i>Gudusia chapra</i> (Hamilton)	Occasional	LR-lc
Family: Cyprinidae		
2. <i>Amblypharyngodon mola</i> (Hamilton)	Common	LR-lc
3. <i>Aspidoparia morar</i> (Hamilton)	Occasional	LR-nt
4. <i>Barilius tileo</i> (Hamilton)	Occasional	LR-nt
5. <i>Bengala elanga</i> (Hamilton)	Occasional	
6. <i>Chagunius chagunio</i> (Hamilton)	Rare	LR-nt
7. <i>Chela cachius</i> (Hamilton)	Occasional	Vu
8. <i>Chela laubuca</i> (Hamilton)	Occasional	Vu
9. <i>Cirrhinus reba</i> (Hamilton)	Occasional	Vu
10. <i>Danio devario</i> (Hamilton)	Occasional	LR-nt
11. <i>Esomus danricus</i> (Hamilton)	Occasional	LR-lc
11. <i>Labeo bata</i> (Hamilton)	Occasional	LR-lc
12. <i>Labeo gonius</i> (Hamilton)	Occasional	LR-nt
13. <i>Labeo pangusia</i> (Hamilton)	Occasional	LR-nt
14. <i>Neolissocheilus hexagonolepis</i> (Mc Clelland)	Occasional	EN
15. <i>Osteobrama cotio cotio</i> (Hamilton)	Occasional	LR-nt
16. <i>Puntius chola</i> (Hamilton)	Occasional	LR-nt
17. <i>Puntius conchoni</i> (Hamilton)	Common	LR-lc
18. <i>Puntius gelius</i> (Hamilton)	Occasional	LR-nt
19. <i>Puntius phutonio</i> (Hamilton)	Occasional	LR-nt
20. <i>Puntius sarana sarana</i> (Hamilton)	Occasional	NE
21. <i>Puntius sophore</i> (Hamilton)	Common	LR-nt
22. <i>Puntius terio</i> (Hamilton)	Occasional	LR-nt
23. <i>Puntius ticto</i> (Hamilton)	Common	LR-lc
24. <i>Rasbora rasbora</i> (Hamilton)	Occasional	LR-nt
25. <i>Salmophasia bacaila</i> (Hamilton)	Occasional	LR-nt
Family: Cobitidae		
27. <i>Nemacheilus botia</i> (Hamilton)	Occasional	NE
28. <i>Botia dario</i> (Hamilton)	Occasional	NE
29. <i>Lepidocephalus guntea</i> (Hamilton)	Occasional	NE
30. <i>Canthophrys gongota</i> (Hamilton)	Occasional	NE
Family: Bagridae		
31. <i>Spherata aor</i> (Hamilton)	Common	NE
32. <i>Spherata seenghala</i> (Sykes)	Rare	LR-nt
33. <i>Batasio batasio</i> (Hamilton)	Rare	LR-nt
34. <i>Mystus bleekari</i> (Day)	Occasional	VU
35. <i>Mystus cavasius</i> (Hamilton)	Occasional	LR-nt
36. <i>Mystus tengra</i> (Hamilton)	Common	LR-nt
37. <i>Mystus vittatus</i> (Bloch)	Common	LR-nt
38. <i>Ompok bimaculatus</i> (Bloch)	Occasional	EN
39. <i>Ompok pabo</i> (Hamilton)	Occasional	LR-nt
40. <i>Wallago attu</i> (Schneider)	Common	LR-nt
41. <i>Ailia coila</i> (Hamilton)	Occasional	LR-nt
Family: Sisoridae		
42. <i>Eresthistes pussilus</i> (Muller & Troschel)	Occasional	NE
43. <i>Gagata cenia</i> (Hamilton)	Common	NE
44. <i>Gagata gagata</i> (Hamilton)	Occasional	LR-nt
45. <i>Nangra viridescens</i> (Hamilton)	Occasional	LR-nt
46. <i>Hara hara</i> (Hamilton)	Occasional	LR-nt
Family: Chacidae		
47. <i>Chaca chaca</i> (Hamilton)	Rare	VU
Family: Belonidae		
48. <i>Xenentodon cancila</i> (Hamilton)	Common	LR-nt
Family: Ambassidae		

49. <i>Chanda nama</i> (Hamilton)	Common	LR-lc
Family: Nandidae		
50. <i>Nandus nandus</i> (Hamilton)	Occasional	LR-nt
Family: Gobidae		
51. <i>Glossogobius giuris</i> (Hamilton)	Occasional	NE
Family: Channidae		
52. <i>Channa gachua</i> (Bloch & Schneider)	Common	LR-nt
53. <i>Channa punctatus</i> (Bloch)	Common	LR-nt
54. <i>Channa stewartii</i> (Playfair)	Occasional	
Family: Mastacembellidae		
55. <i>Macrognathus aral</i> (Bloch & Schneider)	Common	Lr-nt
56. <i>Macrognathus pancalus</i> (Hamilton)	Common	Lr-lc
Family: Tetraodontidae		
57. <i>Tetraodon cutcutia</i> (Hamilton)	Occasional	LR-lc

Table 2: Crafts used for fishing in R. Kulsi

Craft	Size (m)	Material for construction	Operation	No of crews
Dug out canoe	Length 3.0 – 6.0 Width 0.5 – 0.9 Depth 0.45 – 0.5	Hollowing out single log of wood.	Manual	1-2
Plank nailed boat	Length 4.0 – 8.0 Width 0.8 – 1.2 Depth 0.5 – 0.8	Wooden planks nailed together to form a rigid frame	Manual	1-2

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