A study on sutijal (purse net) in the Chalan Beel

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Abstract
The present study on fishing technique using sutijal (purse net) in the Chalan Beel was conducted for a period of 3 years from July 2011 to June 2014. Net description, operation details and catch composition were studied through field survey in different parts of studied wetland. Three different categories of sutijal were recorded. Catch composition revealed that all types of aquatic organisms are being caught by this net. Benefit-cost ratio of studied fishing net was also calculated. Frequent fishing by this net, especially in streams of remote areas of the Chalan Beel resulting in decline of fish species and abundance. Appropriate management steps are recommended to get rid of this destructive fishing gear.

Keywords: Destructive fishing, ichthyofaunal diversity, Chalan Beel, sutijal, purse net

INTRODUCTION
The Chalan Beel in Bangladesh lies between 24.23° north latitude and 89.05 to 89.180 east longitude. It is the largest wetland in Bangladesh (Galib et al. 2009a). This water body is at distance of about 50 km, towards southeast from Rajshahi city. The Chalan Beel is a large drainage system. This vast drainage network endows rich diversity of fishes providing livelihood for large number of people living in remote areas of Chalan Beel. However, a sharp decline in the fishery resources are experienced in past few year (Shahnaz 2005). This decline of fishery resources in the Chalan Beel is largely by the habitat degradation and unsustainable exploitation by the use of some traditional, unscientific fishing methods and gears (Von Brandt 1962). Different kinds of nets are used for fishing in the Chalan Beel. Various types of nets used in different grounds for fishing purpose (Ahmed 1954). In Bangladesh, both professional and nonprofessional fishermen use nets to catch fishes in different fishing grounds. Hossain (1995) classified fishing nets into different categories: (a) special type of gear net, or fixed purse net- locally called sutijal; (b) seine net; (c) drag net; (d) dip net; (e) lift net; and (f) cast net. Sutijal is a special type of purse net one of the common implements for fishing in Bangladesh. It has some special characteristics than those of other nets. The front part of sutijal looks like an esophagus of an animal acting as a receiving part of fish (Rahman 1993). This front part is approximately same in wide as like as the length. From the front end to the last end this net assumes gradually narrow to narrower in structure. The case is that last end is tightly bound. And hence it creates a corner-thought to be tail end. Waste materials and fish are accumulated here. And hence, use of sutijal was declared banned by the government of Bangladesh (Hossain 1995). Despite it, these net are set up in every year by unfair means including a handsome baksheesh for appeaing to the influential leaders and to higher level of officials (Hossain 1995).

The fishing methods used in different water bodies of Bangladesh is poorly worked out by several researchers (Galib et al. 2009a, 2009b; Chakrabarti et al. 1995; Ahmed 1954; Dewan and Mazid 1994; Rahman et al. 1993; Khaleque and Islam 1985; Doha 1965). There are few studies carried out on different aspects of the Chalan Beel like fish diversity (Galib et al. 2009a), fishing gears (Galib et al. 2009b), and small indigenous fish species (Galib et al. 2010; Kostori et al. 2011). However, no study has been
carried out on status of fishing by sutijal not only in the Chalan Beel but also in Bangladesh and thus efforts have been taken to reveal the present status of fishing by sutijal in the Chalan Beel.

**METHODOLOGY**

**Study area and duration:** The present study has been carried out study in Chalan Beel- the largest wetland of Bangladesh situated in the northwest region (Figure 1). This research was conducted between July 2011 and June 2014.

![Figure 1: Map of the Chalan Beel, the study area](image)

**Sampling framework:** Extensive field surveys were made for the collection of primary data. Information regarding the gear structure, fishing technique, mode of operation and catch composition were collected through personal interview and detailed discussion with local fishermen as well as direct observation. Interviews were carried out using a prepared questionnaire which was pre-tested in field situation and updated before final use.

Amount of catch was measured in kilogram (kg) and weight was determined using a pan balance. Species in the catch were identified following published literatures (Rahman 1989, 2005; Talwar and Jhingran 1991). Benefit-cost ratio (BCR) of net was calculated using the following formula: \( BCR = \frac{B}{K} \) (FAO 1991); where \( B \) is the net benefit and \( K \) is the sum of cost. Standard market price of fishes was considered during this calculation.

**Data analysis:** Collected data were accumulated, grouped and interpreted according to the objective. Data were subjected to simple descriptive analysis using computer software Microsoft Excel 2007.

**RESULTS AND DISCUSSION**

**Materials used for making of sutijal:** Commonly used materials to make the studied fishing net in the study area were as follows: (a) nilon thread, (b) kaechi (A twisted rigid and thick rope made of plastic), (c) bamboo, (d) tarkata (knobbed wire), (e) nail, and (f) sacful of sand and pieces of stones.

**Types of net:** On the basis of shape and size of net, all the recorded sutijal were divided into three major types: (a) large sutijal, (b) medium sutijal and (c) small sutijal (locally called tona). On the basis of mesh size, sutijals were of three types: (a) four steps sutijal, (b) three steps sutijal and (c) two steps sutijal.

**Large sutijal:** It has four steps on the basis of mesh size (Figure 2). The wide of the opening mouth was 70 ft. Out of four portions, the length of the 1st portion was 90-105 ft and the average length was 97.5 ft, 2nd portion was 120-150 ft and the average length was 135 ft, 3rd portion was 150-165 ft and the average length was 157.5 ft and the 4th portion or fail end was 150-180 ft and the average length was 165 ft. The breath of large sutijal varied between 70 and 120 ft.

Mesh size of large sutijal varied from 0.44 to 5.50 cm and average mesh size was found 2.97±3.58 cm. It was noticed that the size of mesh became large along the margin of net which allow the waste materials as well as small-sized fish to escape. This mesh size gradually decreased towards the tail end (mean mesh size 0.44 cm).

![Figure 2: Large sutijal showing different portions](image)
the average was 135 ft. The breath of the medium sutijal was 60-100 ft. Mean mesh size 2.5±2.87 cm (0.44 to 4.5 cm). Mesh size was found different in various portions of net.

**Figure 3: Medium sutijal showing different portions**

**Small sutijal:** It was only recorded from Singra area of Natore district. It had two portions only; mesh size was found large in first portion and small in last portion. The wide of the opening was 50 ft. Out of two portions, the mean length of the 1st portion was 13.5 ft (12-15 ft) and the 2nd portion or the tail end was 67.50 ft (60-75 ft). The breath was found 50 to 80 ft. Mesh size of small sutijal varied from 0.3 to 3.0 cm and mean mesh size was found 1.65±1.90 cm. Small native prawns were the prime target species of this net.

**Figure 4: Small sutijal or tuna**

**Table 1:** Mesh size of different portions of different types of sutijals

| Portions/ parts of net | Large          | Medium        | Small         |
|------------------------|----------------|---------------|---------------|
| 1st                    | 5.50±0.071     | 4.50±0.071    | 3.00±0.071    |
| 2nd                    | 4.50±0.071     | 3.50±0.071    | 2.00±0.071    |
| 3rd                    | 2.00±0.071     | 2.00±0.071    | 1.50±0.071    |
| 4th                    | 0.75±0.035     | 0.75±0.035    | 0.44±0.089    |
| 5th                    | 0.44±0.089     | 0.44±0.089    | 0.30±0.035    |

**Mode of operation:** Fishing by sutijal included the processes how to set up and operate. During set up, bamboo stakes were firmly driven into the soil which ensured protection of the net against heavy water current. A total of 15 to 20 fishermen and three fishing boats (locally called jaila nuka) were used at the time of fishing.

At the very beginning of lifting the net, bamboo stakes are lifted from the soil. Two fishing boats are – required to have at the both sides of front end of sutijal and the 3rd fishing boat is kept behind the net as support. Operators on the preceding boat start to raise up net with thrashing, beating by stick to detach everything from the mesh of net and to get fish in a corner, the tail end. When the tail end has completely been raised up, fish are caught conniving all waste materials and animals including crabs, unwanted minute aquatic organism are thrown away.

The amount of fish captured depends on different factors such as water current, season, duration, light, water temperature, turbidity, pH, wind, rainfall etc. In the rainy season, sutijal operated most in the study area because of the high flood during this period.

**Fishing sites:** Sutijal was set up in such a position in the wetland where continuous water flow was prevailed. After setting up the net into water, bamboo made fencing was also placed to gear up the water current and to get fish in a corner of this net. Fence was supported with sand full or pieces of stone full of sacs on it so that it could remain unchanged if exposed to heavy water current.

Large sutijal was found to be operated in all three upazilas of study area through the highest number (n=27) was recorded in Singra of Natore district (Table 2). Medium sized nets were being operated in Singra and Gurudaspur areas only; whereas, small net was only recorded in Singra area.

**Catch analysis:** Mean amount of fish catch and catch composition in different types of sutijal are shown in Table 2 and 3 respectively. It was found the all types of fishes including small to large were caught by this fishing net. During daytime, the highest amount of catch (16.70±2.69 kg) was obtained in October in Tarash area by large sutijal. At night, the largest catch (20.60±3.39 kg) was made in the same month (October) in the same locality (Table 2).

Like sutijal many other anthropogenic devices like harmful fishing gears were being operated in different water bodies of Bangladesh which were of destructive in nature and one of the prime reasons for the degradation of fish abundance as well as diversity. Results obtained through studies undertaken by several researchers have revealed same scenario (Galib et al. 2009a, 2013; Samad et al. 2010; Chaki et al. 2014; Mohsin et al. 2013, 2014; Galib 2015; Joadder et al. 2015).

No initiative was observed to regulate the use of this illegal banned fishing net in the study area. In a study by Mohsin et al. (2009), no conservation effort was noted in the Bookbhara Baor ofJessore district of Bangladesh. There is a crying need to implement appropriate
management techniques to save not only the water body but also its biodiversity. In several researches it was revealed that through there were remarkable anthropogenic activities but diversity and abundance of fishes were still high and establishment of sanctuaries can be an excellent option to save the aquatic biota.

Table 2: Mean catch amount in different months

| Location     | Month | Mean (±SD) catch (kg) |
|--------------|-------|-----------------------|
|              |       | Day                  | Night               |
| Large sutijal| Sep   | 13.27±2.39            | 13.76±1.68          |
| (n=27)       | Oct   | 14.11±2.80            | 15.27±3.13          |
|              | Nov   | 14.11±2.36            | 13.87±2.00          |
| Gurudaspur   | Sep   | 14.40±2.26            | 15.30±4.67          |
| (n=6)        | Oct   | 16.20±0.85            | 16.10±4.38          |
|              | Nov   | 13.10±0.42            | 12.90±1.56          |
| Tarash       | Sep   | 14.60±1.98            | 16.70±0.99          |
| (n=6)        | Oct   | 16.70±2.69            | 20.60±3.39          |
|              | Nov   | 13.70±3.25            | 12.70±0.71          |

Medium sutijal

| Location     | Month | Mean (±SD) catch (kg) |
|--------------|-------|-----------------------|
|              |       | Day                  | Night               |
| Singra       | Sep   | 15.56±0.79            | 14.60±1.91          |
| (n=15)       | Oct   | 14.60±2.40            | 17.40±2.29          |
|              | Nov   | 12.00±3.32            | 16.20±2.40          |
| Gurudaspur   | Sep   | 14.20±3.77            | 17.60±4.93          |
| (n=3)        | Oct   | 15.80±3.49            | 19.20±4.60          |
|              | Nov   | 11.00±3.00            | 17.60±5.32          |

Small sutijal

| Location     | Month | Mean (±SD) catch (kg) |
|--------------|-------|-----------------------|
| Singra       | Sep   | 14.29±3.50            | 14.11±2.91          |
| (n=21)       | Oct   | 14.20±2.28            | 16.14±2.72          |
|              | Nov   | 13.14±2.39            | 16.03±3.87          |

Table 3. Catch composition of major species

| Fishes and fisheries items (Group name) | Catch composition (in % kg) |
|----------------------------------------|-----------------------------|
|                                        | Large | Medium | Small |
| Major carps                            | 4.225 | 5.348  | 1.587 |
| Minnows and barbs                      | 5.634 | 8.417  | 9.524 |
| Air breathing catfish                   | 4.225 | 5.348  | 4.375 |
| Butter catfish                         | 7.746 | 8.556  | 6.349 |
| Freshwater shark                       | 5.282 | 4.278  | 3.155 |
| Squarehead catfish                     | 4.225 | 5.348  | 9.524 |
| Snake head                             | 3.621 | 4.478  | 5.175 |
| Tank goby                              | 7.602 | 8.556  | 6.349 |
| Featherback                            | 5.225 | 5.278  | -     |
| Shad                                   | 8.773 | 5.348  | 12.698|
| Anchovy                                | 7.746 | 7.487  | 6.349 |
| Loaches                                | 7.042 | 5.348  | 6.349 |
| Mud perch                              | 7.746 | 6.417  | 6.349 |
| Glassfishes                            | 7.049 | 8.028  | 9.524 |
| Climbing perch                         | 8.225 | 7.487  | 9.524 |
| Stinging catfish                       | 5.634 | 4.278  | 3.175 |
| Freshwater prawn/crab                  | 4.225 | 5.348  | 1.587 |

Economics of sutijal: The monthly expenditure and income status regarding studied net are shown in Table 4. The benefit-cost ratio (BCR) was found higher (1.06) for the small sutijal than that of large and medium sutijals. Major expenditure issues were net making and management, laborer wages, bribe to the local influential people and transportation cost. On the other hand, income came only from selling of harvested fishes.

Table 4: Monthly economics of sutijal in the study area

| Net type     | Cost  | Income | BCR  |
|--------------|-------|--------|------|
| Large        | 336333.33 | 606666.67 | 0.80 |
| Medium       | 311166.67 | 556666.67 | 0.79 |
| Small        | 118333.33 | 243333.33 | 1.06 |
No previous was found to be conducted where BCR of any fishing gear was calculated and thus it was not possible to compare the present finding with previous one. In Bangladesh, cost and benefit issues are calculated mostly for production oriented researchers, for example carp production status (Mohsin et al. 2012).

CONCLUSION

Sutijal is very harmful to all kinds of fish and other aquatic macro organisms and brood fish, fry and fingerlings are declining day by day in the study area because of this fishing net. Thus, for the proper management of rapidly dealing fisheries resources, there should be strict ban on the area of destructive fishing method and only scientific methods for sustainable fishing should be allowed.

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