Catch assessment of artisanal marine fishing gears in Cox’s Bazar and Teknaf of Bangladesh

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Abstract

Studies were conducted on catch assessment of some artisanal marine fishing gears operated in Cox’s Bazar and Teknaf areas from April 2014 to April 2015. Sixteen types of fishing gears were identified, of which gill net, beach seine net, estuarine set bag net, marine set bag net and trammel net occupy major fishing activities. Although estuarine set bag net (ESBN) is a legally restricted fishing gear recorded the highest catch per unit effort (CPUE) (110 kg/gear/day) in July followed by marine set bag net (MSBN) (105 kg/gear/day) in Cox’s Bazar and the highest CPUE was recorded 100 kg/gear/day by ESBN in June followed by MSBN (90 kg/gear/day) in Teknaf. Out of 52 species of fishes, the major fish species abundantly caught by these gears were Poa (Otolithoides argenteus), Churi (Trichiurus haumela), Loitya (Harpadon nehereus), Ranga choukha (Lutjanus johni), Lal poa (Johnius argentatus), Olua (Coilia dussumieri), Rup chanda (Stromateus chinensis), (Stromateus argenteus) and Ilish (Tenualosa ilisha). Besides these fish species, 10 commercially important shrimp species and 3 important crab species were also recorded during the study period. The peak season of availability of most fish species was June and July while lean season was December and January. This study indicated that Otolithoides argenteus was the dominant fish species followed by Trichiurus haumela, Harpadon nehereus and Coilia dussumieri.

Key words: Artisanal fishing gears, catch assessment, CPUE, Cox’s bazar, Teknaf

Introduction

Fish is the major source of animal protein in the diet of the people of Bangladesh contributing 60% of the total animal protein supply. The per capita demand for consumption of fish is 19.30 kg per annum in 2013-2014 (DoF, 2015). Marine fisheries contribute 16.78% of total fish production of Bangladesh (DoF, 2015). Marine fisheries are divided into industrial and artisanal fisheries. Industrial fisheries based on trawl fishery (shrimp & fish), which contributes only 12.93% and artisanal fisheries contribute 87.07% of the total marine landings (DoF, 2015). In the year of 2013-2014, the total marine fish production was 5, 95,385 metric tons of which 5, 18,500 metric tons comes from artisanal fishing (DoF, 2015). As artisanal fisheries contribute to the majority of marine fish production, it is of profound significance to continue a research based activities on artisanal fisheries in order to the proper development of marine fisheries sector of the country as well as to enhance the blue economy. Blessed with a warm tropical climate and high rainfall, the coastal areas like Cox’s Bazar and Teknaf are enriched with nutrients from the land, which enable them to support a wide biological diversity, while the artisanal fisheries have provided a livelihood for coastal communities since earliest history (Hossain, 2001). However, available report suggests that there is a declining trend in fish catch in the artisanal fisheries due to overfishing, intensive fishing pressure, use of sophisticated technologies, repeated and confined use
of fishing grounds in a particular area, free access of fishing over the marine water resources of the country etc (Alam et al. 2002). Considering the contribution of these fisheries belong to the national GDP and foreign exchange earnings, it is mandatory to have a clear index on the state of artisanal fisheries. Apart from these, artisanal fisheries are also a vital source of income for a considerable amount of fishermen in Bangladesh. Taking all the aspects into account including the lack of reported data to ensure the perfect facilitation of artisanal fisheries, the present study was undertaken to investigate the types and characteristics of artisanal marine fishing gears operated in the Cox’s Bazar and Teknaf region, and their catch composition and seasonality of operation.

Materials and Methods

Study Area

The study was conducted in Teknaf and Cox’s Bazar areas because of greater importance of these two areas for artisanal fishing activities.

Data Collection

Primary data were collected by field survey that involved the investigation of the study areas in terms of artisanal marine fishing gears, particulars of operation, catch composition, seasonal abundance and species composition of fish. Data were collected from April 2014 to April 2015 where a total of 106 fishermen were interviewed with a combination of field survey, questionnaire interviews and participatory rural appraisal (PRA) methods viz. focus group discussion (FGD). A total of 7 FGD sessions were conducted in the study areas where each group had 10 to 20 persons and duration of FGD was approximately two hours. Thereafter data were cross-checked with proper authorization like Upazilla Fisheries Officer (UFO), Manager of BFDC for the accuracy of collected primary data.

Data Processing and Analysis

All the collected primary data were analyzed through simple statistical methods using Microsoft excel.

Results and Discussions

The study was focused on different fishing gears in the study areas, their particulars of operation; catch composition, CPUE/day/month and species composition.

Operation of different fishing gears

In this study, 16 types of fishing gears were found to be used by the fishermen of which beach seine net, estuarine set bag net, marine set bag net, five different types of gill net, bottom long line and trammel net. Estuarine set bag net (ESBN) is found to be mostly used fishing gears in the study areas as well as CPUE value was greater than other fishing gears. The types of gears used in the Cox’s Bazar and Teknaf areas are more or less similar with the finding of Islam (2003) in the Bay of Bengal where the fishermen used approximately 13 different types of fishing gears including five types of gill net (Large mesh gill net, fixed gill net, mullet gill net, drift gill net and bottom set gill net), three types of set bag nets (marine set bag net, estuarine set bag net and large mesh set bag net), trammel net, bottom long line and beach seine net. In another study, 10 types of fishing gears including different types of gill net, estuarine set bag nets, beach seine, and bottom long line, trammel net were found in Teknaf coast (Hossain, 2002). The results of this study revealed that the number of fishing gears operated in this regions support to a larger degree with the findings of Hossain (2002) and Islam (2003), where the types of gears operated in the study period are quite similar with the previously recorded gears. The fishing activities in the coastal areas largely depend on seasons. It is clear from the study that there were little or no changes in fishing activities in Teknaf and Cox’s Bazar area as reported by the previous workers Hossain, 2002; Islam, 2003). It is also clear that there is no new fishing gears introduced in these areas by this time.

Fishing gears depending on the depth of operation

This study revealed that marine set bag net (MSBN) and estuarine set bag net (ESBN), operated in water up to 25 meter and 20 meter respectively, were found to be the mostly used fishing gears in the study areas. Drift gill net, trammel net, large mesh drift gill net and beach seine net were found to be operated up to
30 meter, 20 meter, 30 meter and 10 meter respectively (Figure 1). Hussain (2010) found artisanal fishing gears operated up to a depth of 10 meter. In this study the fishing gears were found to be operated between 10-30 meter depth. This is because of innovation of modern fishing technology which makes fishing easier in different water depth. Tendency of catching more fish leads the fishermen go for deeper depth.

Figure 1. Different fishing gears and their depth of operation

Average catch per day with different types of fishing gears

Information was collected on the seasonal variation of species abundance in different season by different types of fishing gears used by the fishermen in Cox’s Bazar and Teknaf.

In terms of months, the highest catch per unit effort (CPUE) was found in July and the lowest in January in Cox’s Bazar. The highest CPUE (110kg/gear/day) was recorded in July by ESBN, whereas 105 kg/gear/day, 98kg/gear/day, 100kg/gear/day, and 90kg/gear/day were recorded by MSBN, beach seine, gill net and trammel net, respectively. The lowest CPUE (75kg/gear/day) was recorded in January by ESBN, whereas 80kg/gear/day by MSBN, 70kg/gear/day by beach seine, 75kg/gear/day by gill net and 70kg/gear/day by trammel net (Table 1). The result of this study is almost similar to the findings of Islam et al (1993) who concluded the highest CPUE in June by gill net whereas, the lowest CPUE in February by estuarine set bag net in the coastal areas. The previous study indicated gill net as the dominant fishing gear whereas the present study marked the estuarine set bag net as the intensively used fishing gear. Over the last few years estuarine set bag net has been used extensively as a dominant fishing gear in the coastal region (DoF, 2015).

Table 1. Average catch per day with different types of fishing gears in Cox’s Bazar

| Month     | ESBN (kg/day) | MSBN (kg/day) | Beach seine (kg/day) | Gill net (kg/day) | Trammel net (kg/day) |
|-----------|--------------|---------------|----------------------|-------------------|----------------------|
| January   | 75           | 80            | 70                   | 75                | 70                   |
| February  | 80           | 80            | 75                   | 78                | 75                   |
| March     | 82           | 82            | 78                   | 80                | 78                   |
| April     | 85           | 88            | 80                   | 82                | 80                   |
| May       | 90           | 92            | 90                   | 90                | 82                   |
| June      | 105          | 100           | 92                   | 95                | 85                   |
| July      | 110          | 105           | 98                   | 100               | 90                   |
| August    | 90           | 90            | 85                   | 88                | 82                   |
| September | 90           | 85            | 82                   | 85                | 85                   |
| October   | 85           | 82            | 80                   | 82                | 83                   |
| November  | 80           | 82            | 78                   | 80                | 80                   |
| December  | 75           | 80            | 75                   | 80                | 75                   |

On the other hand, in Teknaf, the highest CPUE was found in June and the lowest in December. In June, the highest CPUE was found 100 kg/gear/day by ESBN whereas 90kg/gear/day by MSBN, 85kg/gear/day by beach seine, 85kg/gear/day in gill net and 85 kg/gear/day by trammel net. In December, the lowest CPUE was found 65kg/gear/day by ESBN whereas 65kg/gear/day by MSBN, 70kg/gear/day by beach seine, 70kg/gear/day by gill net and 70kg/gear/day by trammel net (Table 2).

Hossain et al. (2008) reported May and December as the peak and lean season of fishing and estuarine set bag net as the dominant fishing gear in the Teknaf coast. There is a significant degree of similarity with the findings of the present study.

Akter et al. (2009) conducted a study in the Cox’s Bazar and Teknaf region and concluded May to July as the peak season and December to February as the lean season. The findings support this study to a great extent.
Table 2. Average catch per day with different types of fishing gears in Teknaf

| Month   | ESBN (kg/day) | MSBN (kg/day) | Beach seine net (kg/day) | Gill net (kg/day) | Trammel net (kg/day) |
|---------|---------------|---------------|--------------------------|------------------|----------------------|
| January | 70            | 65            | 70                       | 65               | 70                   |
| February| 75            | 68            | 65                       | 70               | 70                   |
| March   | 75            | 70            | 70                       | 70               | 75                   |
| April   | 80            | 85            | 75                       | 75               | 78                   |
| May     | 90            | 100           | 85                       | 80               | 80                   |
| June    | 100           | 90            | 85                       | 85               | 85                   |
| July    | 80            | 88            | 90                       | 95               | 90                   |
| August  | 75            | 80            | 85                       | 90               | 82                   |
| September | 73           | 80            | 80                       | 85               | 82                   |
| October | 70            | 75            | 78                       | 82               | 80                   |
| November| 80            | 70            | 75                       | 80               | 75                   |
| December| 65            | 65            | 70                       | 70               | 70                   |

Seasonal variation of biomass of fish caught

Results of this study showed that the seasonal variation of biomass was almost equal between the month of January and March in Cox’s Bazar area. The seasonal variation of biomass was increased sharply at the end of March and increased gradually until July. Thereafter, it was found to be decreased gradually to December. The highest biomass of captured fish was found to be 15090 kg/month in July and the lowest was 11,100 kg/month in January (Figure 2).

Figure 2. Seasonal variation of biomass of fish caught in Cox’s Bazar

On the other hand, the seasonal variation of biomass in Teknaf area was almost similar to Cox’s Bazar area until March. At the end of March, the seasonal variation was increased sharply until it touched to the peak point in June. Thereafter, it was found to be decreased gradually to December. The highest biomass of captured fish was found to be 13350 kg/month in June and the lowest was 10,200 kg/month in December (Figure 3).

Figure 3. Seasonal variation of biomass of fish caught in Teknaf

Our results revealed that the recorded CPUE and total biomass have been found to decrease in comparison with the earlier documented data (BOBP, 1983). The decreasing trend of CPUE might be the result of several reasons including overfishing, intensive fishing pressure, use of sophisticated technologies, repeated and confined use of fishing grounds in a particular area, free access of fishing over the marine water resources of the country etc. The negative result in CPUE has become a concerned issue for sustainable development of artisanal fisheries sectors. However, the most important reasons in declining CPUE is due to overfishing. Moreover, lack of proper implementation of existing laws, excess number of people engaged in fishing, lack of general public awareness, to meet the excess demand of the country etc. were also responsible for declining CPUE. The effects of overfishing are well reflected on the catch composition of the studied areas. As a result, there is always a tendency to decrease in the CPUE value throughout the study period compared to the previously obtained data (Chowdhury et al. 2002).

Fish Species Composition
From this study, 52 fish species (Table 3), 10 shrimp species (Table 4) and 3 commercially important species were recorded in the catches by different gears at the study area from April 2014 to April 2015.

**Table 3.** Local, common and scientific name of the fish species recorded in the catches by different gears at the study area from April 2014 to April 2015

| SL | Scientific Name               | Local Name         | English Name                  |
|----|-------------------------------|--------------------|-------------------------------|
| 1. | *Lates calcarifer*            | Vetki/Koral Machh  | Giant Sea perch               |
| 2. | *Cynoglossus lingua*          | Kukkurjib          | Long Tung Sole                |
| 3. | *Cynoglossus bilineatus*      | Kukkurjib          | Four lined Tongue Sole        |
| 4. | *Arias sp*                    | Kata Mach          | Cat Fish                      |
| 5. | *Mystus gulio*                | Nuna Tengra/Guilla | Bagrid Cat fish               |
| 6. | *Ephippus orbis*              | Hatir Kaan         | Spade Fish                    |
| 7. | *Gerres filamentosus*         | Dom Machh          | Silverbiddies                 |
| 8. | *Pentapriion longimanus*      | Jagiri             | Longfin Mojarra/Silver-biddies|
| 9. | *Harpadon neheurus*           | Loitity Machh      | Bombay duck                   |
| 10.| *Drepane longimana*           | Pann Machh         | Sicklefish                    |
| 11.| *Lactarius lactarius*         | Sadha Machh        | False Trevally                |
| 12.| *Lutjanus johni*              | Ranga Choukya      | Red Snapper                   |
| 13.| *Lujanus sanguineus*          | Ranga Choukya      | Blood Snapper                 |
| 14.| *Lutjanus malabaricus*        | Ranga Choukya      | Malabar Red Snapper           |
| 15.| *Leigonathus brevirostris*    | Taka Chanda        | Shortnose Ponyfish            |
| 16.| *Mene maculata*               | Chan Chanda        | Moon Fish                     |
| 17.| *Upenaeus sulphureus*         | Sonali Bata        | Goat Fish                     |
| 18.| *Liza tada*                   | Gool Bata          | Tade Grey Mullet              |
| 19.| *Liza subviridis*             | Kharul Bata/Bhangna Bata | Green Back Grey Mullet   |
| 20.| *Magil cephalus*              | Khorul Bata        | Flathead Grey Mullet          |
| 21.| *Valamigil speigleri*         | Patha Bata         | Speigler’s Gray Mullet        |
| 22.| *Nemipterus japonicus*        | Rupban             | Japanese Threadfin Bream      |
| 23.| *Pomadasya hasta*             | Sadha Datina       | Lined Silver Grunter          |
| 24.| *Pomadasya maculatus*         | Guti-Datina        | Blotched Grunter              |
| 25.| *Polynemus indicus*           | Lakhua             | Indian Salmon                 |
| 26.| *Polynemus paradiscus*        | Tapsi              | Paradise Threadfin            |
| 27.| *Eleutheronema tetratactylum* | Thailla            | Four finger Threadfin         |
| 28.| *Platyccephalus indicus*      | Murabaila          | Flat-head Fish                |
| 29.| *Priacanthus tavenus*         | Pari Machh         | Purple-spotted Big Eye        |
| 30.| *Psetodes erumei*             | Samudra Serbotti   | Indian Halibut                |
| 31.| *Rachycentron canadus*        | Samudra Gajar      | Cobia                         |
| 32.| *Saurida tumbil*              | Achila/Tiktiki Machh | Greater Lizard Fish         |
| 33.| *Silago domina*               | Tolar Dandi        | Lady Fish                     |
| 34.| *Otolithyodes pama*           | Lambu              | Pana Croaker                  |
| 35.| *Otolithes maculatus*         | Gotipoa            | Bloched Tiger Toothed Croacker|
| 36.| *Otolithes cuvieri*           | Poa                | Less Tiger-toothed Croacker   |
| 37.| *Protonibea diacanthus*       | Kala Katina/Kala Poa | Spotted Croaker             |
| 38.| *Johnius argentatus*          | Lalpoa             | Silver Pennah Croaker         |
| 39.| *Argyrops spinier*            | Lal Datina         | Long spine Sea Bream          |
| 40.| *Sphyraena forsteri*          | Dharkuta           | Forster’s Barracuda           |
| 41.| *Stromateus chinensis*        | Rup Chanda         | Chinese Pomfret               |
| 42.| *Stromateus argentus*         | Foli Chanda        | Silver Pomfret                |
| 43.| *Colia dussumieri*            | Olua               | Pointed Tail Anchovy          |
| 44.| *Scomberoides commersonianus* | Chapa Kori         | Talang Queen Fish             |
| 45.| *Sardina communis*            | Choukya            | Big Eye llish                 |
| 46.| *Telenosilus ilisha*          | Ilish/Hilsa        | Hilsa Shad                    |
| 47.| *Sardina communis*            | Takhia             | Fringe-scale Sardine          |
| 48.| *Chirocentrus dorab*          | Karatia-Chela      | Wolf Herring                  |
| 49.| *Parastromateus niger*        | Hail Chanda        | Black Pomfret                 |
| 50.| *Scomberoides commersonianus* | Chapa Kori         | Talang Queen Fish             |
| 51.| *Selar boops*                 | Moor/Salar         | Oxeye scad                    |
| 52.| *Alepes djeddaba*             | Moor               | Djeddaba crevalle             |
catch assessment of artisanal marine fishing gear

Table 4. Commercially important Shrimps in the study area

| SL | Scientific Name    | Local Name       | English Name                  |
|----|-------------------|------------------|------------------------------|
| 1  | Penaeus monodon   | Bagda Chingri    | Giant black tiger Shrimp     |
| 2  | Penaeus semisulcatus | Bagata Chingri  | Green Tiger Shrimp           |
| 3  | Penaeus japonicus | Dorakata Chingri | Tiger shrimp                 |
| 4  | Penaeus indicus   | Chaga Chingri    | Indian white Shrimp          |
| 5  | Penaeus merguensis| Baga Chama Chingri | Banana Shrimp              |
| 6  | Metapenaeus monoceros | Horina/Loilla Chingri | Brown/Speckled Shrimp    |
| 7  | Metapenaeus breviceornis | Loilla/Horney Chingri | Brown/Yellow Shrimp    |
| 8  | Metapenaeus spinulatus | --          | Brown shrimp                 |
| 9  | Parapenaeopsis sculpitius | Ruda Chingri   | Pink/Rainbow Shrimp          |
| 10 | Parapenaeopsis stylifera | Rida Chingri  | Pink/Kiddi Shrimp            |

Table 5. Commercially important crabs in the study area

| SL | Scientific Name       | Local Name  | English Name       |
|----|-----------------------|-------------|--------------------|
| 1  | Scylla serrata        | Sila kakra  | Swimming crab      |
| 2  | Portunus pelagicus    | Samudra kakra | swimming crab    |
| 3  | Portunus sanguniolentus | Kakra    | Swimming crab      |

crabs species (Table 5) were identified. It was found that Silver jew fish (*Otolithoides argenteus*) was the most dominant species. It constitutes about 20% of total catch as a single species which is mainly caught by artisanal marine fishing gears such as beach seine net, ESBN, gill net etc. Ribbon fish (*Trichiurus haumela*) was the second dominant fish species constitutes about 17% of the total catch, caught by artisanal marine fishing gears especially with beach seine net (Figure 4). A considerable amount of Hilsha (*Tenualosa ilisha*) found to be caught mainly by gill net in the study areas.

56 major commercial fish species including silver jew fish, ribbon fish, pomfret, hilsha, white grunters, catfish, snappers and hair tails. The obtained results in the present study agree to a considerable degree with the previous findings. *Otolithoides argenteus* (Poa) and *Trichiurus haumela* (Chhuri) were the main dominant species because the study area is the principal habitat of these species in the Bangladesh coast. Besides, the natures of gears operated are suitable to catch those species.

**Conclusion**

This study concludes that there is very little or no change in fishing activities over the last two decades in Cox’s Bazar and Teknaf and there is almost no evidence of introducing new fishing gears. Fishermen are using the common fishing gears for fishing in marine areas. One of the major findings of this research shows that there is a fishing pressure in the study areas. The main reason which is markedly evident is the easy access in the water body for fishing and limitations in implementations of rules and regulations.

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