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

SK Ghosh[1*], MK Ahsan[2], MK Ahmmed[1], SI Ahmed[1], MM Hasan[2], M Kamal[2]

[1]Faculty of Fisheries, Chittagong Veterinary and Animal Sciences University, Chittagong-4225, Bangladesh
[2]Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

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*), Loittya (*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

***Corresponding Author:** subratacvasu@gmail.com

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.

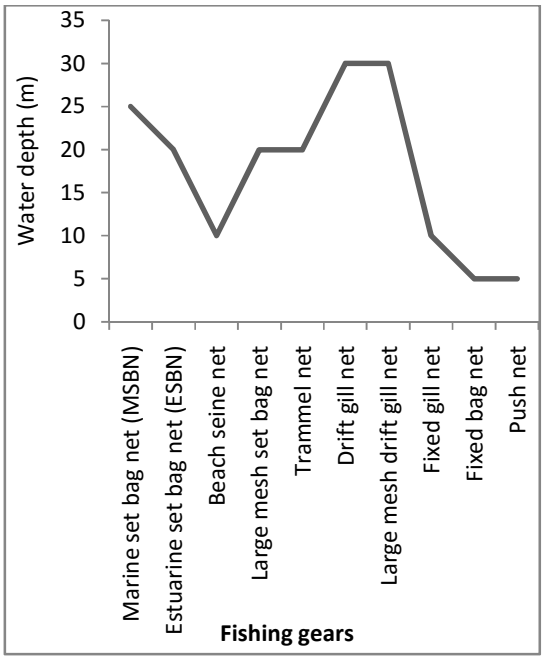

Figure 1. Different fishing gears and their depth of operation

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 Januaryby 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 esuarine 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).

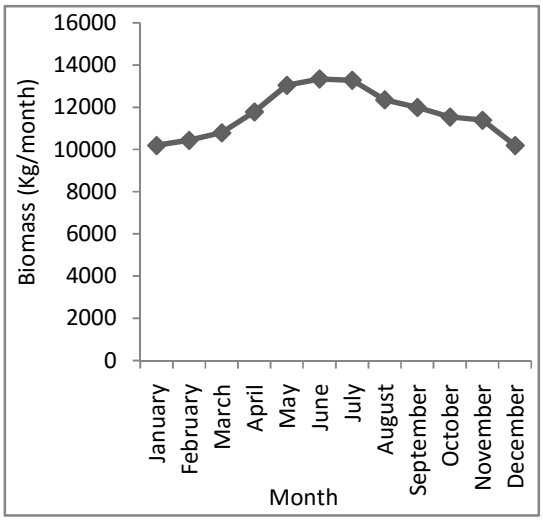

Figure 2. Seasonal variation of biomass of fish caught in Cox's Bazar

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).

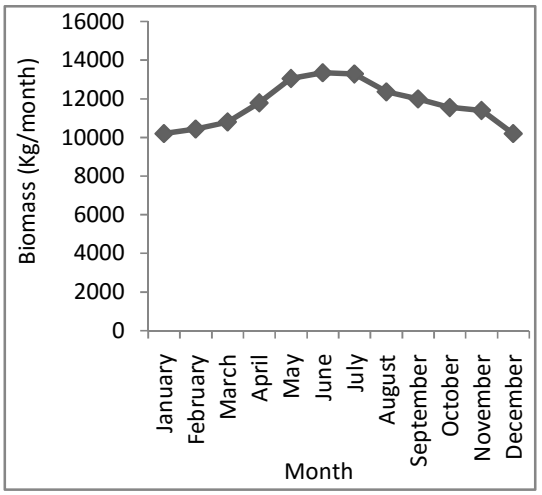

Figure 3. Seasonal variation of biomass of fish caught in Teknaf

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

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.	*Arius sp*	Kata Mach	Cat Fish
5.	*Mystus gulio*	Nuna Tengra/Guilla	Bagrid Cat fish
6.	*Ephippus orbis*	Hatir Kaan	Spade Fish
7.	*Gerres filanmentosus*	Dom Machh	Silverbiddies
8.	*Pentaprion longimanus*	Jagiri	Longfin Mojarra/Silver-biddies
9.	*Harpadon nehereus*	Loittya Machh	Bombay duck
10.	*Drepane longimanna*	Pann Machh	Sicklefish
11.	*Lactarius lactarius*	Sadha Machh	False Trevally
12.	*Lutjanus johni*	Ranga Choukya	Red Snapper
13.	*Lujanus sanguineus*	Ranga Choukya	Blood Snaper
14.	*Lutjanus malabaricus*	Ranga Choukya	Malabar Red Snapper
15.	*Leigonathus brevirostris*	Taka Chanda	Shortnose Ponyfish
16.	*Mene maculata*	Chan Chanda	Moon Fish
17.	*Upeneus sulphureus*	Sonali Bata	Goat Fish
18.	*Liza tada*	Gool Bata	Tade Grey Mullet
19.	*Liza subviridis*	Khurul Bata/Bhangna Bata	Green Back Grey Mullet
20.	*Mugil cephalus*	Khorul Bata	Flathead Gray Mullet
21.	*Valamugil speigleri*	Patha Bata	Speigler's Gray Mullet
22.	*Nemipterus japonicus*	Rupban	Japanese Threadfin Bream
23.	*Pomadasys hasta*	Sadha Datina	Lined Silver Grunter
24.	*Pomadasys maculatus*	Guti-Datina	Blotched Grunter
25.	*Polynemus indicus*	Lakhua	Indian Salmon
26.	*Polynemus paradiscus*	Tapsi	Paradise Threadfin
27.	*Eleutheronema tetradactylum*	Thailla	Four finger Threadfin
28.	*Platycephalus indicus*	Murabaila	Flat-head Fish
29.	*Priacanthus tayenus*	Pari Machh	Purple-spotted Big Eye
30.	*Psettodes erumei*	Samudra Serboti	Indian Halibut
31.	*Rachycentron canadus*	Samudra Gajar	Cobia
32.	*Saurida tumbil*	Achila/Tiktiki Machh	Greater Lizard Fish
33.	*Sillago domina*	Tolar Dandi	Lady Fish
34.	*Otolithiodes pama*	Lambu	Pama Croacker
35.	*Otolithes maculatus*	Gotipoa	Bloched Tiger Toothed Croacker
36.	*Otolithes cuvieri*	Poa	Less Tiger-toothed Croacker
37.	*Protonibea diacanthus*	Kala Katina/Kala Poa	Spotted Croacker
38.	*Johnius argentatus*	Lalpoa	Silver Pennah Croacker
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 argenteus*	Foli Chanda	Silver Pomfret
43.	*Coilia dussumieri*	Olua	Pointed Tail Anchovy
44.	*Escualosa thoracata*	Hichiri Machh	White Sardine
45.	*Ilisha fillgera*	Choukya	Big Eye Ilish
46.	*Tenualosa ilisha*	Ilish/Hilsa	Hilsa Shad
47.	*Sardinella fimbriata*	Takhia	Fringe-scale Sardine
48.	*Chirocentrus dorab*	Karatia-Chela	Wolf Herring
49.	*Parastromateus niger*	Hail Chanda	Black Pomfret
50.	*Scomberooides commersonianus*	Chapa Kori	Talang Queen Fish
51.	*Selar boops*	Moori/Salar	Oxeye scad
52.	*Alepes djeddaba*	Moori	Djeddaba crevalle

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*	Bagatara Chingri	Green Tiger Shrimp
3.	*Penaeus japonicus*	Dorakata Chingri	Tiger shrimp
4.	*Penaeus indicus*	Chaga Chingri	Indian white Shrimp
5.	*Penaeus merguiensis*	Baga Chama Chingri	Banana Shrimp
6.	*Metapenaeus monoceros*	Horina/Loilla Chingri	Brown/Speckled Shrimp
7.	*Metapenaeus brevicornis*	Loilla/Honney Chingri	Brown/Yellow Shrimp
8.	*Metapenaeus spinulatus*	--	Brown shrimp
9.	*Parapenaeopsis sculptilis*	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	Mud 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.

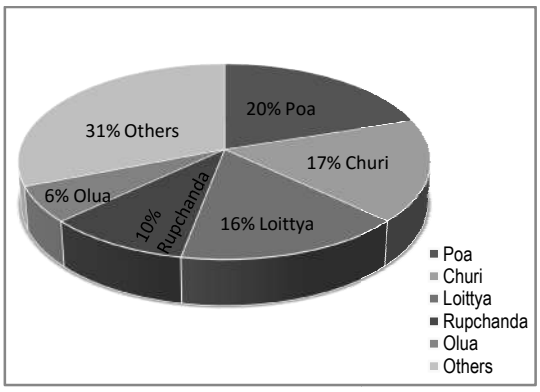

Figure 4. Dominant fish species in the study area

Barua *et al*, 2014 conducted the research on species composition in Bangladesh marine waters and found 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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