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Catch composition in the Coastal Set Bagnets of Hooghly-Matlah Estuary, West Bengal

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Short communication

Abstract

The study was conducted to determine the catch composition of indigenous winter migratory coastal set bagnet (CSBN) operating in Hooghly-Matlah Estuary. Experiments were carried out for a period of four months during the winter migratory fishing season from mid-November 2016 to mid-February 2017. A total of forty-eight (48) hauls was made in twelve (12) days of fishing trials. Two complete days were expended with an average of four trials in every fortnight sampling during both flood current and ebb current. The soaking period was fixed to six (6) hours for each trial including the time of setting and hauling. A total of 20 commercially important finfishes such as *Harpadon nehereus, Setipinna phasa, Setipinna taty, Coilia dussumieri, Coilia ramcarti, Otolithoides pama, Polynemus paradiseus, Daysciaena albida, Johnius dussumieri, Arius arius, Arius maculates, Arius jella, Mystus tengara, Ilisha megaloptera, Silaginopsis panijus,, Trichiurus lepturus, Osteogeneiosus militaris*, *Lepturocanthus savala, Chirocentrus dorab, Pampus argenteus.* Shellfishes like *Metapenaeus monoceros*, *Metapenaeus dobsoni, Penaeus indicus, Penaeus monodon*, *Macrobrachium lamarrei* and *Macrobrachim mirable* were also recorded in the winter migratory coastal set bagnet. 16.72% of the total catch were contributed by Bombay duck, which was the dominant fishery followed by ribbon fishes and total shell fish contribution was 17.81% of the total catch

Keywords: *Winter migratory coastal set bagnets, catch composition, Hooghly-Matlah Estuary*

Introduction

Hooghly-Matlah Estuary is bestowed with vast estuarine and coastal resources supporting the livelihood of artisanal fishermen of West Bengal. The main channel of the estuary, its distributaries and the small creeks constitutes the lower portion of Hooghly Matlah Estuary called Sunderban Delta and this sustains the multispecies fishery of the estuary (Mitra *et al.*, 1997)."Behundhi Jhal" or "Bheem Jhal" is the dominant fishing gear along the Hooghly – Matlah Estuary that accounts around 74.7% of the total catch in the area (Talwar *et al.*, 2013). The Behundhi Jhal is a set bagnet operated in estuarine regions (Estuarine Set Bagnet) and coastal region (Coastal Set Bagnet) of Sunderban Delta (Talwar *et al.,* 2013; Ahsan, 2015; Nabi and Ullah, 2012).

The Bagnet fishing by the migrant fishermen along the coastal and estuarine region during the winter season known as winter migratory bagnet fishery is prevalent, especially at the lower zone

of the Hooghly Estuary. A large number of fishermen migrate far away from the estuary during winter season and stay in the transitory fishing camps known as "Khuties" at suitable spots on the sea face of the estuary and engage in bagnet fishing from the end of October to early February. This fishery is commonly known as winter migratory bagnet fishery.

The non selective and destructive estuarine set bagnets are restricted or banned in various places of West Bengal as it catches the post larvae and juveniles of various aquatic organisms (Remesan, 2019). The fishery resources are heavily being exploited by the set bag net resulting in the declining trend in the yield from the coastal ecosystem of Bay of Bengal (Remesan, 2019; Nabi and Ullah, 2012). The juveniles of finfishes and shellfishes constitute 90% of the bagnet fishery and this destructive fishing reaches its maximum during the winter migratory fishing season (Remesan, 2019). So the main objective of the study is to know the catch composition of the winter migratory coastal set bag nets (CSBN) which is drastically being used along the estuary.

Material and methods

The study was conducted with the winter migratory set bagnets which are being used by the traditional fishermen during the "khutty" fishing along the Hooghly Matlah Estuary. The study was conducted between 20°35′ N to 23°20′ N latitude and87°45′ to 89° 0′ E longitude in the estuary (Fig. 1).

The indigenous estuarine set bag net is fabricated with equal head rope, breast rope and foot rope length which is 12.0 m in the studied gear. The mesh size of the gear used for the study was 10 mm in the codend and resembling the artisanal set bagnet all in its design, fabrication and rigging aspects. The design of the gear used in the study is given in Fig. 2.

The net was operated at 8-10 nm away from the shore and 20-25 m depth in the vicinity of other traditionally operated bagnets. The operation entirely depends on the tidal effect of the estuary, such as the direction, strength and duration of high tide and low tide.

The fishing trips were made by one non-motorized boat known as 'Batchary boat' and another boat fitted with outboard motors, locally known as 'Chot boat' used for carrying fish to the shore. The net was taken to the depth of operation by using the non-motorized boat and it carries 3-5 nets, which in turn makes on an average of four hauls per day with six hours, duration for each haul. Bag nets are fixed using two bamboo poles at a fixed depth and the tidal fishing is done depending on the full moon day at the site of operation.

The fishing was carried out both day and night, along the estuary. After each operation of six hours, the catch was sorted out and grouped into finfishes, shellfishes and by-catch. Finfishes and shellfishes which were below the size at first maturity were categorized. Each category of fish reported was weighed separately by using i-scale weighing machine of capacity 5 Kg. After recording the weights of the groups they were separated species wise and were kept in separate tubs. The juveniles of

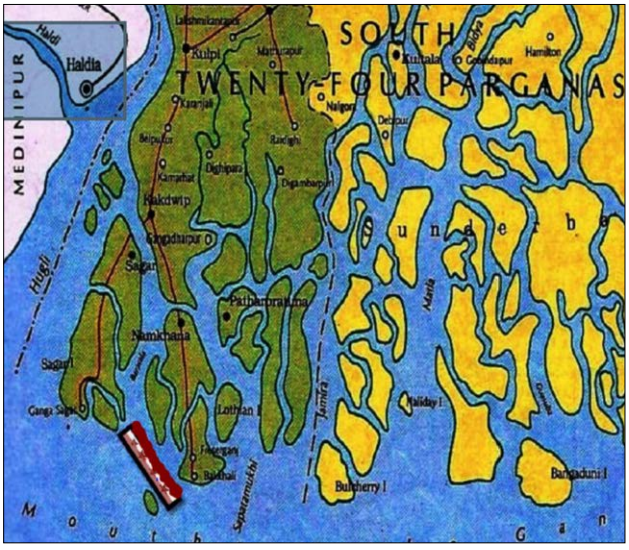

Fig.1. Area of sampling

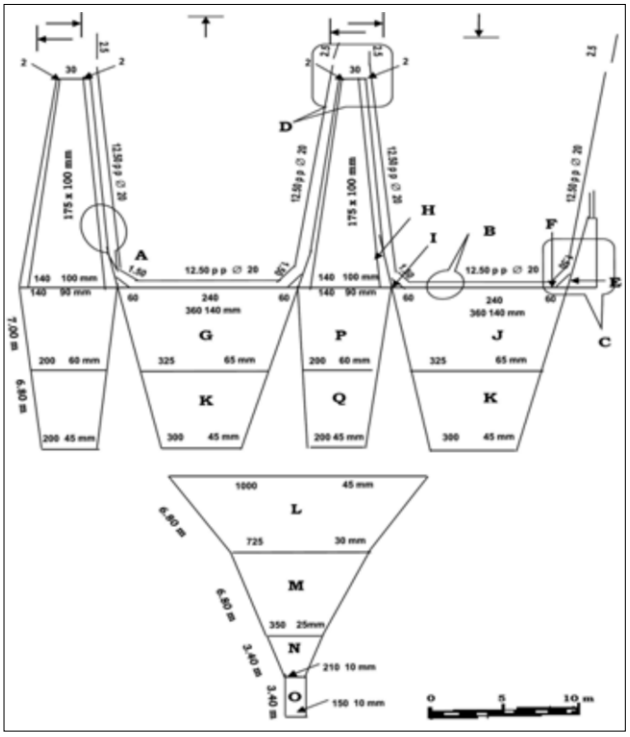

Fig.2.Design of experimental gear operated in Hoogly- Matlah Estuary

some commercially important finfishes, and shellfishes were grouped as by-catch. This bycatch was discarded back to sea. Simple mathematical tools like average and percentage are used to analyse the composition of Behundhi Jhal.

The diversity of species was measured using various indices like Shannon Wiener diversity index (H'), Margalef richness index, Evenness index (e ^ H/S), Dominance index, (D) and Simpsons Index (1-D). The software 'PAST' was used to analyze the diversity indices and all the graphs are plotted in MS Office.

Results and discussion

The total catch in weight obtained in the set bagnet during the period of study is shown in Fig. 3. Maximum catch was observed in the month of December. The gear is set four times a day with operation duration of six hours including setting and hauling time. The catch obtained in a set bagnet during the period of study was grouped into finfishes, shellfishes and by-catch and are given in Table 1.

The main finfishes in the commercialized coastal set bagnet fishery were *Harpadon nehereus, Setipinna phasa, Setipinna taty, Coilia dussumieri, Coilia ramcarti, Otolithoides pama, Polynemus paradiseus, Daysciaena albida, Johnius dussumieri, Arius arius, Arius maculates, Arius jella, Mystus tengara, Ilisha megaloptera, Silaginopsis panijus, Trichiurus lepturus, Osteogeneiosus militaris, Lepturocanthus savala, Chirocentrus dorab, Pampus argenteus*. The juveniles of commercial fishes and other fishes caught in very less quantity were treated as miscellaneous catches (Mitra *et al.*, 2001). The non-marketable sized juveniles of commercially important fishes like *cynoglossus* spp, catfishes, *Johnius* spp, *Coilia* spp and the non-targeted catches like *Squilla* sp, *Dotilla* spp, *Thalassina* sp etc. are considered as miscellaneous catch. These were usually discarded back to the estuary.

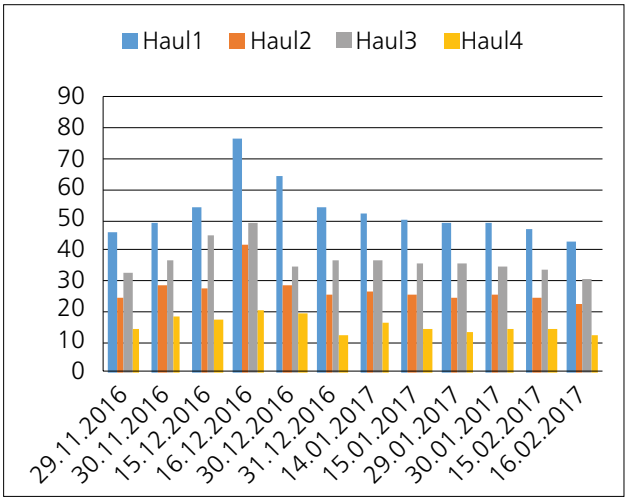

Fig. 3.Catch data of Behundhi Jhal during winter migratory bag net fishery

Table 1. Percentage composition of catch (by weight) obtained in Coastal Set Bag Net (CSBN)

Sl. No.	Fish Species	Catch Weight (%)
A	Finfishes	
1	*Harpadon nehereus* (Hamilton, 1822)	16.72
2	*Otolithoides pama* (Hamilton, 1822)	2.43
3	*Johnius dussumieri* (Cuvier 1830)	1.90
4	*Daysciaena albida* (Cuvier, 1830)	1.45
5	*Polynemus paradiseus* Linnaeus, 1758	2.12
6	*Ilisha megaloptera* (Swainson, 1839)	1.84
7	*Sillaginopsis panijus* (Hamilton, 1822)	1.81
8	*Trichiurus lepturus* (Linnaeus, 1758)	7.21
9	*Lepturacanthus savala* (Cuvier,1829)	0.19
10	*Pampus argenteus* (Euphrasen,1788)	2.29
11	*Chirocentrus dorab* (Forsskal,1775)	1.8
12	*Setipinna phasa* (Hamilton, 1822)	3.15
13	*Setipinna taty* (Valenciennes, 1848)	2.80
14	*Coilia dussumieri* Valenciennes, 1848	3.62
15	*Coilia ramcarati* (Hamilton, 1822)	1.63
16	*Osteogeneiosus militaris* (Linnaeus, 1758)	0.54
17	*Arius arius* (Hamilton, 1822)	1.03
18	*Arius maculates* (Thunberg, 1792)	0.81
19	*Arius jella* (Day, 1877)	0.32
20	*Mystus tengara* (Hamilton, 1822)	0.4
	Sub Total	54.06
B	Shellfishes	
1	*Metapenaeus dobsoni* (Miers, 1878)	5.71
2	*Metapenaeus monoceros* (Fabricius, 1798)	0.86
3	*Penaeus monodon* Fabricius, 1798	1.33
4	*Penaeus indicus* H.Milne-Edwards,1837	3.06
5	*Macrobrachium lamarrei* (H.Milne-Edwards,1837)	2.24
6	*Macrobrachium mirabile* (Kemp,1917)	4.61
	Sub Total	17.81
C	By–catch	28.12
	Grand Total (A + B + C)	99.99

Usually multispecies are exploited by multi-gears in estuarine system (Mitra *et al.,* 2001). In this study Bombay duck (16.72%), was the major contributor in the experimental gear followed by *Trichurus lepturus* (7.4%). The anchovies such as *Coilia* spp and *Setipinna spp* together constituted around 11.2%. Among shellfishes, mainly six species were identified in this study, which were *Metapenaeus dobsonii, Metapenaeus monoceros, Penaeus indicus, Penaeus monodon, Macrobrachium lamarrei* and *Macrobrachim mirable.* In shellfishes the major contributor was *M. dobsoni* (5.71%) followed by *M. lamarrei* (4.73%) and *P. indicus* (3.06%). The minor contributors of finfishes were *Ilisha megaloptera* (1.84%) and *Silaginopsis panijus* (1.81%).

Various biodiversity indices calculated are presented in Table 2. The Shannon Wiener diversity index (H') values were found

Table 2. Diversity indices of Finfishes and Shellfishes in Hooghly – Matlah Estuary, West Bengal

	Dominance_D	Simpson_1-D	Shannon_H	Evenness_e ^ H/S	Margalef	Fisher_alpha
November	0.06415	0.9359	3.019	0.64	4.046	5.344
December	0.05733	0.9427	3.09	0.6662	3.685	4.612
January	0.05822	0.9418	3.07	0.6732	3.7	4.681
February	0.06642	0.9336	2.995	0.6247	4.003	5.257

maximum in December 2016 (3.09) and the minimum in February 2017 (2.995). The maximum value of Margalef richness index (d) 4.046 was recorded in November 2016. However the minimum value was found during the month of December 2016 (3.685). The maximum value of evenness index (e ^ H/S) was recorded in January 2017 (0.6732). The maximum value of Dominance index, D was found in February 2017 while in case of Simpsons Index (1-D), the maximum value was observed in December 2016.

The bagnets used by the artisanal fishermen are having the codend mesh size of 10 mm; even up to size (Ramesan *et al,* 2009). The major portion of the commercially valuable species are unable to mature due to set bagnet fishery and the result is failure in recruitment and decline in total production (Islam *et al.*, 2015). Indiscriminate exploitation through small meshed nets particularly bagnet in the estuary can have adverse effect on the stocks of those species whose juveniles (fry and fingerlings) are located within the exploited region and are subjected to wanton destruction (Mitra *et al.,* 2001).

The estuarine set bagnet (ESBN) fishery is very destructive to the natural stock rebuilding process as it catches large amount of juveniles of fish and shrimp (Alam and Palsson, 2016). The intensive fishing activity can lead to imbalances in ecosystem function by direct and indirect effects on fish populations and ecosystems (Pauly *et al.,* 2002). The present study showed that the contribution of the miscellaneous catch (28%) is much higher than shellfish (17.93%). It indicates that around 30% of the total catch in the experimental gear was discarded into the estuary which can create adverse effect on the ecosystem diversity (Krishnan, 2017).

The large number of species caught by set bagnet has many negative impact on biodiversity and fisheries, when compared with other fisheries (Ahsan, 2015). According to Mertz and Myers, 1998, the most commercially harvested fish stocks experience intense exploitation rates, with fishing mortality being up to four times higher than the natural mortality.The impacts of this grand scale commercial fishing can also be seen even on the evolutionary changes of the resources in the ecosystem.

The coastal set bagnets are non-selective fishing gear used along the entire stretches of Hooghly- Matlah Estuary. Akerman (1986) mentioned a general statement that catches of set bagnet contained large number of juvenile species which drifted with the current. So more experiments on the standardization of the gear design and mesh size is needed. The study recommends an increase in mesh size of codend or the incorporation of bycatch reduction devices in coastal set bagnet to minimize the over exploitation of juvenile stocks. Effective management measures help to conserve and manage the fisheries resources sustainably. But ultimately, the goals of management has to be decided through a democratic and political process during which the views of the public, stakeholders, and interest groups are duly heard and considered (Jorgensen *et al.,* 2007).

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