



Research Note

Square Mesh Window for Reducing Hilsa Juvenile Bycatch in Stationary Bagnets

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Hilsa shad, *Tenualosa ilisha* (Hamilton-Buchanan, 1822) is a commercial fish in the Indo-Pacific region supporting livelihood for millions of people. In India hilsa has a discontinuous distribution along the north east and north west coast and is the State fish of West Bengal. It is caught from the inland and marine waters in West Bengal, Odisha, Andhra Pradesh and Gujarat. Hooghly, Narmada, Brahmaputra, Godavari, Mahanadi, Chilika lake and Ukai reservoir are the inland water bodies where hilsa was reported. Availability of hilsa in most of the fishing grounds in India has been largely declined as their breeding run was severely hindered by construction of a number of dams, anicuts and barrages and also by overfishing (NOFIMA, 2013). In the North West coast hilsa fishery is mainly confined to Gujarat coast. Lower stretch of river Narmada and Vallabh Sagar reservoir are the major hilsa fishing centers of the state. Hilsa is known as *Palwa* in local parlance and hilsa fishing is the most important economic activity for fishers in downstream of Narmada estuary.

Hilsa fishing is mainly carried out using gillnets Bagnets locally called as *Golwa* and this fishing is mainly confined to the estuarine fishing village, Bharbhut. Hilsa fish migration in river Narmada is restricted to 40-80 miles away from the sea (Kulkarni, 1950). In Bharbhut, there is a distinct seasons for gillnet and bag net operation. Fish

landings in Bharuch district comprises of inland and marine catch. The inland fish production includes estuarine fish catch in which hilsa fish has a significant share.

Small mesh gillnets, seine nets, push nets and bag nets are responsible for the landing of juveniles of hilsa. Thousands of stationary bag nets are operated in the freshwater and brackish water zones of major hilsa fishing states including Gujarat. Bag nets are long funnel shaped net made of polyethylene twines with very small mesh size (10 mm or less) in the cod end. In some regions mosquito net like material is used for fabrication of the cod end, which prevents the escape of even the fish larvae (Remesan et al., 2009). Milton (2010) estimated the catch of hilsa juveniles from Hooghly estuary at an annual average of 85.1 t⁻¹ with a size range of 6 to 15.5 cm and weight 2.0 to 15.5 g. Adoption of simple bycatch reduction devices in bag nets can reduce the capture of juveniles, to revive the stock. This paper discuss the performance of Square Mesh Window Bycatch Reduction Device (SMW-BRD) in eliminating the juvenile fish catch.

The study area was Bharbhut, which is located in the Bharuch district of Gujarat, India. Participatory experimental fishing was conducted with BRD installed bag nets. The bag net operating in the Bharuch district has an average length of 90 m and is divided into seven major parts. Mouth of the net is with 1000 meshes in the circle with a mesh size of 100 mm and 10 mm for the cod end. Structural details of the net is given in the Fig. 1.

Bag net is a passive fishing gear which is operated with the help of tidal flow and is set usually during full moon and new moon period, when the velocity

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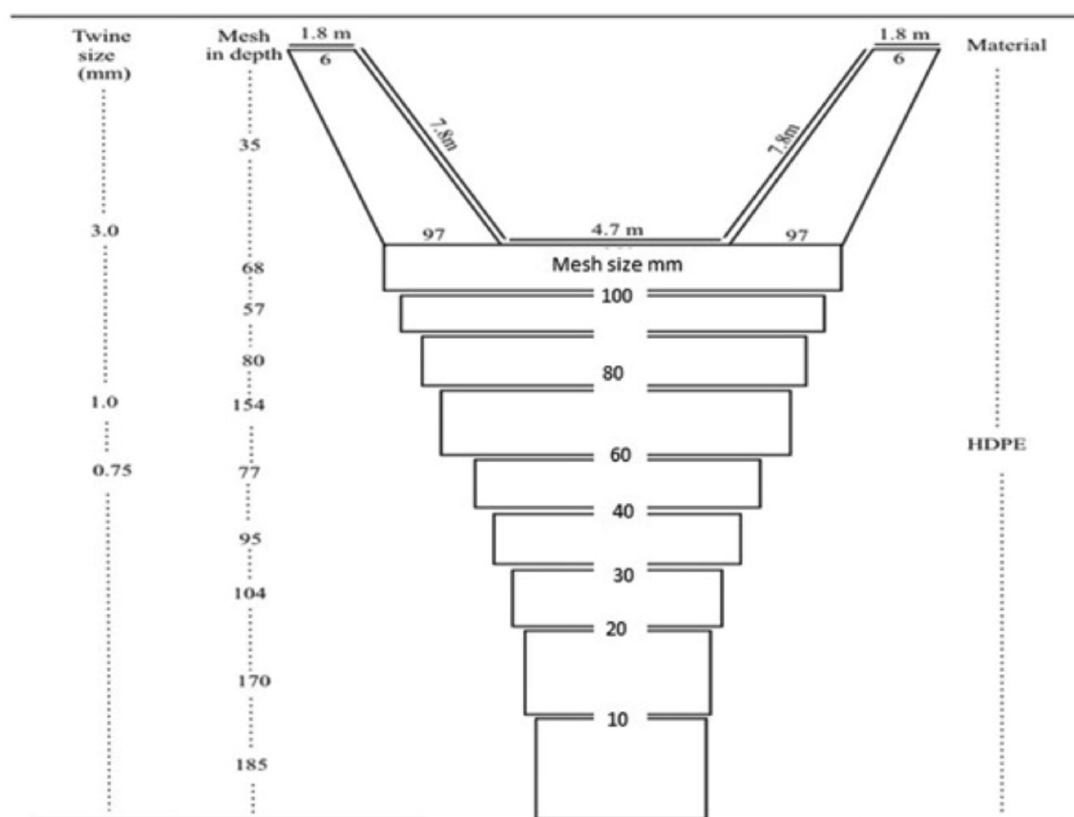


Fig. 1. Design of Bag net operating at Bharbhut fishing village

of tidal current is strong. Rains in the upper stretch also bring strong water flow which is essential for the success of operation. Net is set either in the bottom or surface supported from a canoe using two bamboo poles and anchors. Net is set against the tidal flow and it is hauled during the ebb tide. Catch is removed and it is again set in the opposite direction once again to face the returning tidal current.

The device consist of a square mesh window of size 1 m x 0.75 m made of 50 mm mesh installed near the cod end to permit the escapement of juveniles of hilsa and other commercially important species. Covers with very small mesh size are fixed over and on top of the square mesh windows to quantify the percentage of hilsa juveniles escaping through the window (Fig. 2). Total 12 fishing operations of 6 h duration each were carried out in the season. Catch from main cod end and cover were separately brought back to the shore immediately after hauling. If catch was more, 100 g of sub sample was taken after mixing the samples thoroughly. Species level

identification was done and ambiguous animals were brought into laboratory after preserving in 5% buffered formalin for further identification. The major species in the catch that led to differences in the fish assemblages in the catch were also identified.

During fishing trials, maximum and minimum catch recorded was 7.2 and 1.8 Kg respectively. As per the report of BOBLME (2010) CPUE (kg/net/day) of stationary bag net is in the range of 4-9 kg. 35% of the catch was constituted by *Wallago attu*, each weighing 0.5-1 kg, followed juveniles of by anchovy (22%) and hilsa (21%). Giant freshwater prawn, *Macrobrachium rosenbergii* was the only crustacean species (12%) caught. The average biomass of cover and cod end is given in Table 1. Results reveals that the only juveniles escaped through the window, which was retained by the cover. Fishes escaped includes 8-40% of commercially important fishes including hilsa. 46% of the escaped fishes were juveniles of anchovy (1-3 cm). Physical examination of the fishes tells that some fishes were in the post

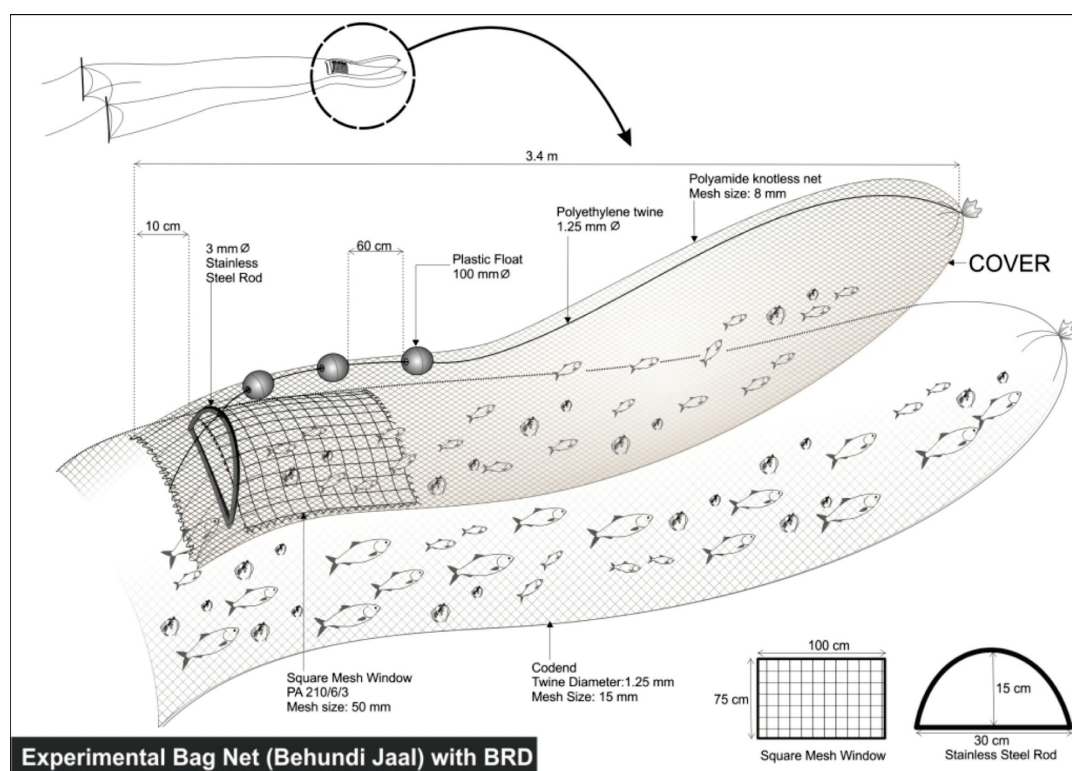


Fig. 2. Pictorial representation of SMW-BRD Installed Bag-net

Table 1. Catch composition of bagnets (Average of 12 operations)

Sl. No.	Species	Cover		Cod end	
		Weight (Kg)	Percentage	Weight (Kg)	Percentage
1	<i>Tenualosa ilisha</i>	0.146±0.1	26	0.656±0.3	20
2	<i>Macrobrachium rosenbergii</i>	0.031±0.5	6	0.447±0.3	24
3	<i>Puntius</i> sp	0.004±0.08	2	0.008±0.02	0.5
4	<i>Polynemus heptadactylus</i>	0.038±0.1	7	0.006±0.01	0.5
5	<i>Trypauchen</i> sp	0.003±0.08	1	0	0
6	<i>Stolephorm</i> sp	0.26±0.19	46	0.568±0.3	26
7	<i>Liza</i> sp	0.046±0.05	8	0.10±0.1	3
8	<i>Periophthalmus</i> sp	0.013±0.01	2	0.019±0.00	1
9	<i>Hemirhamphus</i> sp	0.01±0.02	2	0.013±0.03	1
10	<i>Wallago attu</i>	0	0	1.02±1.3	20
11	<i>Chanos chanos</i>	0	0	0.003±0.00	0.5
12	<i>Scatophagus argus</i>	0	0	0.005±0.001	0.5
13	<i>Cynoglossus</i> sp	0.013±0.03	3	0.015±0.01	2
14	<i>Lesser sardine</i>	0	0	0.004±0.02	0.5
15	<i>Johnius</i> sp	0	0	0.016±0.04	1
16	<i>Synodus indicus</i>	0	0	0.005±0.01	0.5

larval stage with feebly developed fins and tails, and they may be expelled from the net by water current. The anchovy juveniles were aggregated as a mass both in the cover and cod end. Hilsa juveniles with a size range of 5.5 ± 0.5 cm constituted 21%. Motwani et al. (1957); Kulkarni (1950); Pillay (1964) and Karmachandani (1961) reported that the breeding season of hilsa in the Narmada estuary commences in the middle of June and it lasts up to September. The larval development and the nursery phase of hilsa lasts for 6-10 weeks. From the fishing calendar (Fig. 3) of the Bharbhut village, it is clear that the gillnet operation is performed during the migrating season of hilsa and the bag net operation is carried out during post spawning season. During bag net fishing, hilsa will reach the fingerling size and along with the other fishes it constitutes one of the major catch. Cod end made of mosquito net like netting in which more hilsa juveniles are caught, should be banned strictly and bagnets may be phased out based on an incentive scheme at the state level to sustain and improve the hilsa fishery in India.

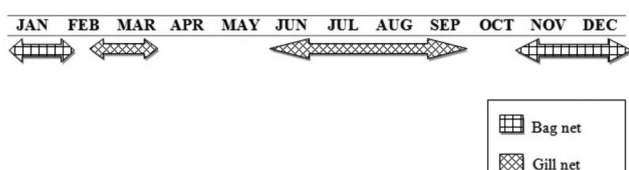


Fig. 3. Fishing calendar of Bharbhut, Bharuch, Gujarat, India

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Reference

- BOBLME (2010) Status of hilsa (*Tenualosa ilisha*) management in the Bay of Bengal. BOBLME-2010-Ecology-01
- Karamchandani, S. J. (1961) On the location of spawning grounds of Indian shad, Hilsa *ilisha* (Hamilton) in freshwater regions of the Narmada river. Ibid., 30(10): 373-375
- Kulkarni, C. V. (1950) Breeding habits, eggs and early life history of Indian shad, *Hilsa ilisha* (Hamilton) in the Narmada river. Proc. Nat. Inst. Sci. India, B15(2): 169-176
- Milton, D.A. (2009) Living in Two Worlds: Diadromous fishes and factors affecting population connectivity between tropical rivers and coasts. In: Ecological Connectivity among Tropical Coastal Ecosystems (Nagelkerken, I., Ed), Springer, New York, pp 325-355
- Motwani, M. P., Jhingran. V. G., Karamchandani. S. J. (1957) On the breeding of the Indian shad, *Hilsa ilisha* (Ham.), in freshwater. Sci. Cult. 23(1): 47-48
- NOFIMA (2013) Report of Norway-India-Bangladesh consortium for hilsa aquaculture in South Asia. <http://www.nofima.no/filearchive/Rapport%2002-2013.pdf>
- Pillay, S. R. (1964) Maturation and spawning of the hilsa, *Hilsa ilisha* (Hamilton), of the Saurashtra coast. Proc. Nat. Inst. Sci. India, Sec. B, 30(1): 8-1
- Remesan, M. P., Pravin, P. and Meenakumari. B (2009) Non-selective Fishing Gears and Sustainability Issues in the Hooghly-Matlah Estuary in West Bengal, India Asian Fisheries Science 22 (2009): 297-308