

Resource Conservation in Estuarine Set Bag Net Fishery

M.P. Remesan

Fishing Technology Division, ICAR-Central Institute of Fisheries Technology, Kochi

E-mail: mpremesan@gmail.com

Estuarine set bag net (ESBN) also known as stake net or stow net is one of the important fishing gears supporting livelihood for several thousands of people in the artisanal fisheries sector around the world. In India, ESBN are operated in the estuarine zones of several rivers, lakes and backwaters wherever the tidal current is strong. The net is set against the current using poles fixed at the bottom (Fig.1) or using floats and anchors. The net is considered as a non-selective and destructive fishing gear as it capture juveniles and post larvae of most of the aquatic organisms. Major share of catch from bag nets are often dried and sold as most of the fishes caught are smaller in size. Due to the above reason ESBN is banned or restricted seasonally in several places. In states like West Bengal mosquito netting is used for cod end fabrication resulting in the capture of the larvae and juveniles of commercially important fishes.

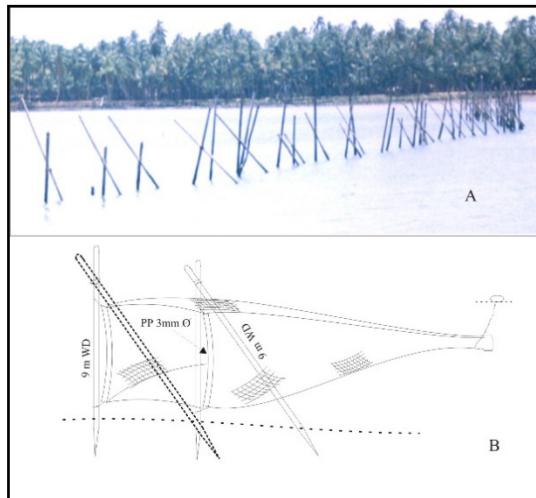


Fig.1 A. Stake nets set in a row. B. Illustration of stake net



Fig. 2. Bag nets set using outrigger canoes in Hooghly

Design of the net

Two bag nets are set on two sides of a canoe using outriggers and poles fixed in the bottom (Fig.2). In addition to the main stakes, auxiliary stakes of smaller diameter obliquely placed as props are tied to the main stake for additional strength (Boopendranath, and Shahul Hameed, 2010).

It is a passive fishing method and the principle capturing is by filtering the organisms which drift with the tide. Stakes are fixed in series at about 4.5m distance between by 6-7 people and two canoes (Pauly, 1991). It is a conical bag net with long tapering body with more than 30 m length. Mouth of the net is fabricated with relatively large meshes of 150-200mm and it gradually reduce to 10mm or less towards the codend (Fig.3). Mosquito net like webbing is used for the codend fabrication in the stationary bag nets operated in Hooghly river, West bengal. Loops were provided at the four corners to facilitate bunching of a few meshes in the adjacent pieces of netting and for tying to the stakes. Usually, areca nut tree trunks are used as stakes.

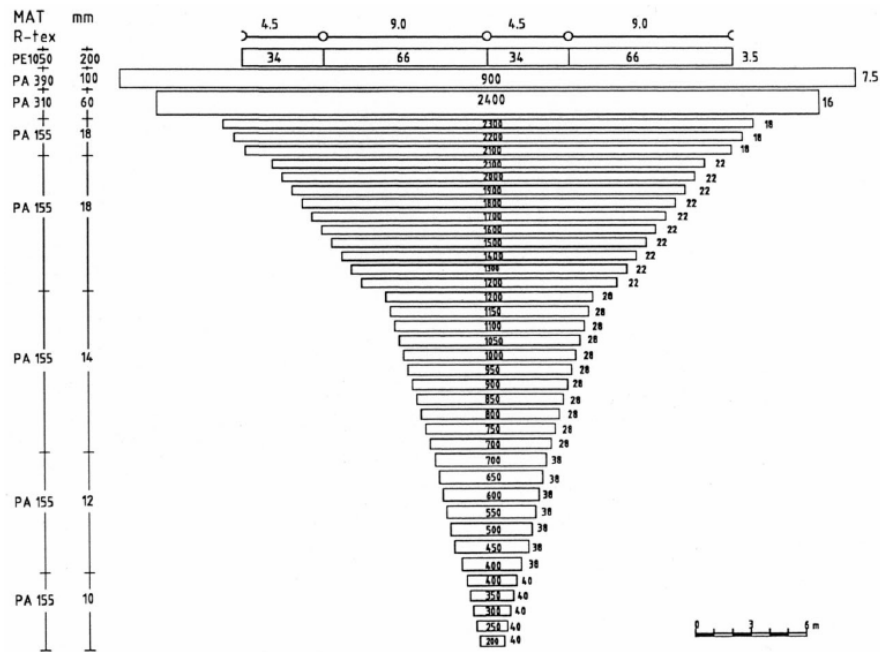


Fig. 3. Design of stake net from Cochin (source: Boopendranath & Shahul Hameed, 2010)

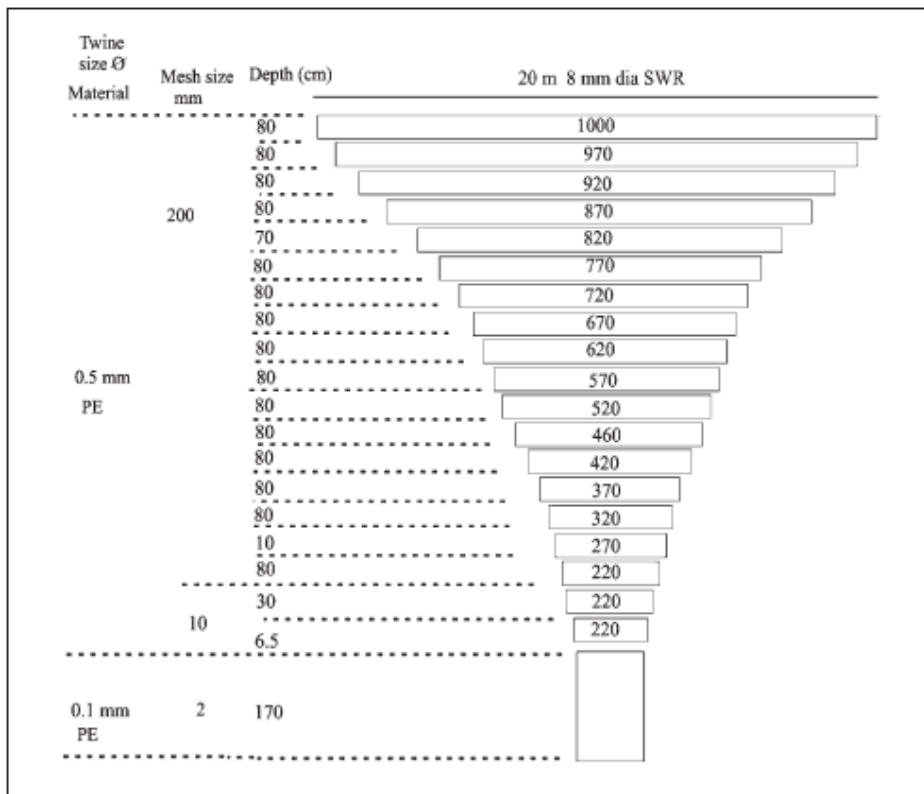


Fig. 4. Design of a bag net from Hooghly

Operation

Net is usually set at the onset of ebb tide. Codend of the net is closed and is tied to one of the stakes. A float is also tied to the codend to identify the location. The loops in the lower frame rope are attached first to the main stakes by a rope and pushed down using a forked pole. When the net is hauled up the lower loops are lifted by pulling the rope. The net is then shifted to the canoe and brought to the shore. Hauling is done towards the end of the ebb tide, when the tidal current is weak.

Usually fishing is done for 10 in a month and it starts 2-3 days before the new moon or full moon and lasts 2-3 days after the full or new moon. The nets are operated twice a day during these period in the forenoon and after noon.

Prawns constitute major share of the catch. *Metapenaeus dobsoni*, *M. affinis* and *Fenneropenaeus indicus* are the components in the descending order. Crabs and juveniles of finfishes also contribute to the catch.

Stationary bag nets are operated in the freshwater and brackish water zones of Hooghly are long funnel shaped net made of polyethylene twines with very small mesh size (10mm or less) in the cod end. In some places material used for making mosquito net is used for fabrication the cod end which prevents the escape of even the fish larvae (Fig.5).

Bag nets are set usually during full moon and new moon period, when the velocity 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 (*duvo benthic*) or on the surface (*basa benthic*) supported from a canoe using two bamboo poles and anchors. Catch is removed and it is again set in the opposite direction to once again face the returning tidal current. Stationary bag nets are the prominent non-selective fishing gear used in the estuaries. The bag net in Hooghly is more than 25m long, 7 m wide at the mouth portion with long wings of about 10 m length and 2 m width. The net is made of polyethylene with 200 mm mesh size in the front and sometimes 2 mm for the cod end (Remesan et al, 2009). Study by CIFT revealed that incidence of hilsa juveniles are more when the net is operated as surface set



Fig. 5. Bag net codend made of mosquito netting

More than 90% of the bag net catch is constituted by juveniles of almost all finfish and shellfish species in the system (Fig.6). Destruction of juveniles is maximum during the winter migratory bag net fishery in the lower zones when number of bag netters from other place aggregate near the river mouth and operate the nets till the end of winter season. According to the fishermen, landings are high during this 4-5 months period.



Fig. 6. Catch from a bag net in Fraserganj, West Bengal



Fig. 7. Juveniles dominated by hilsa in bag net catches in Narmada, Gujarat and pomfret juveniles in the bag nets at Fraserganj, West Bengal

Bag net operations are generally carried out from the end of October to mid February. However, in certain pockets of Hooghly estuary, bag nets are operated throughout the year. In many places bag nets, poles and anchors are lifted during monsoon periods for facilitating drift gill net fishing for hilsa. Bag net catch is constituted mainly by about 30 species of which more than 90% is composed of juveniles of commercially important fishes, including hilsa. Priced items like shrimps, threadfins, Bombay duck, etc. are sorted and the remaining part is sent for drying. In the lean period 30-40% of the catch from bag net is often discarded due to uneconomic size and absence of buyers. Reports say that prawn landing in Hooghly estuary is declining year by year due to exploitation of undersized prawns. Catch statistics of Hooghly estuary indicates that hilsa catch has drastically declined during recent years.

There is no reason to use mosquito net type webbing for the codend of bag nets, especially when it is set in the surface. All mosquito net type netting used for bag net cod end should be immediately replaced with polyethylene netting with at least 10-15mm mesh size. Considering the importance of hilsa fisheries, the Government of West Bengal should strictly enforce legal minimum mesh size for bag net codend, as the first step. Similarly bag net fishing in the nursery grounds of hilsa should be prevented during the peak breeding season. Bag net fishing can be permitted only in the lower reaches and slowly it should be phased out from other places. Buyback scheme or alternate employment options may be explored to phase out the non-selective fishing gears like bag nets from the traditional hilsa breeding grounds to improve the landings of hilsa and other fishes.

Several attempts have been made to improve the selectivity of set bagnets. Jisha, et al (2017) carried out length frequency analysis of fishes in the stake nets operated in Cochin, Kerala and reported that 80% catch is juveniles. Amrutha et al (2017) tried T45 mesh windows at throat and belly of set bag net in West Bengal to reduce bycatch. Kathavarayan et al (2002) reported the reduction in landings of juvenile fishes in bagnet codend made of square mesh with mesh size of 20mm bar. Development of jelly fish excluder device for stake net has been attempted by Manojkumar et al. (2017).

CIFTs Intervention

In an attempt to reduce the landings of hilsa juveniles in the stationary bag nets ICAR-Central Institute of Fisheries Technology, Kochi in collaboration with ICAR-Central Inland Fisheries Research Institute, Barrackpore has taken up a project. In stationary bag nets, two types

of bycatch reduction devices (BRDs) were tried in selected centers in Hooghly (Tribeni, Godakhali, Diamond harbour and Frasersganj), West Bengal; Narmada river (Bhadbhut, near Bharuch) in Gujarat and Godavari (Odalarevu) in Andhra Pradesh. Square mesh window of 1 m x 0.75 m size made of 50 mm mesh size were fixed near the codend. Small mesh cover was fixed on top of the windows to retain the excluded fish (Fig. 8) for the study. Similarly bigeye BRD was also tried in all these centers.

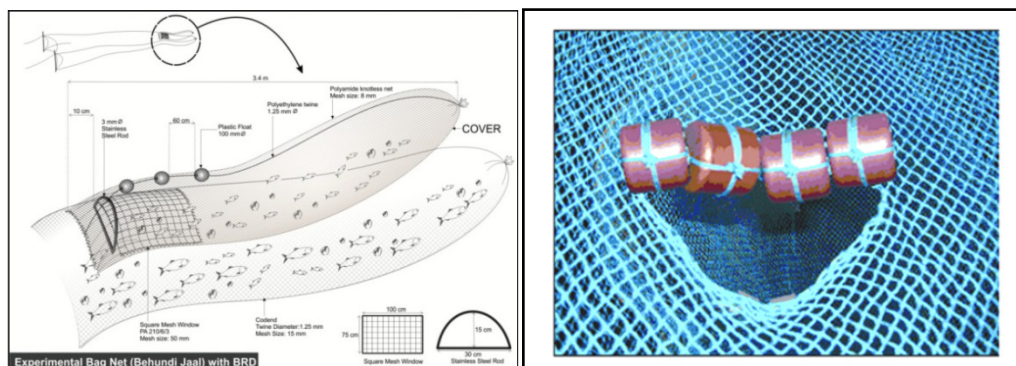


Fig. 8. Square mesh window with cover and Bigeye BRD (right)

Juveniles of 41 species could escape through the BRD in Hooghly. The mean escapement of all the species from the BRD was found to be 0.65 kg and juveniles of hilsa formed 11.60% of the total catch excluded (Prajith et. al. 2017). The length of the excluded hilsa ranged from 37 to 55 mm. It was also found that percentage of juveniles of hilsa was more in surface set bag net compared to bottom set bag net in Hooghly. Juveniles of hilsa were negligible in the bag net catches of Frasersganj. Among the three sampling stations, species diversity was maximum in Frasersganj followed by Godakhali and only 4-5 species were encountered at Tribeni, which is more less a freshwater zone.

The bag net fitted with a 50 mm square mesh window showed an average escapement of about 6.2 % of the total catch in Godavari. The catches at Odalarevu was dominated by small prawns (45.7%) followed by ponyfishes (18.0%), hilsa spp. (11.0%), ribbon fishes (9.0%), flat fishes (8.0%) and squilla (8.0%). The fishes excluded were anchovies, (35.1%), ponyfishes (32.4%), prawns (16.2%) and crabs (16.2%).

The results of the study conducted in Bhadbhut, Narmada had shown that 8-40% of juveniles of economically important fishes escaped through the BRD of which 7-15% were hilsa juveniles.

For optimizing the mesh sizes and position of the BRD to improve the escapement of juveniles, especially hilsa, further trials during breeding seasons are required. The highest abundance of juveniles of *T. ilisha* was observed at Tribeni centre. BRDs fabricated at different location for the trials are given Fig. 9.



Bhadbhut, Gujarat

Godakhali, West Bengal



Godavari, Andhra Pradesh

Fig. 9. BRD fabrication in selected centers in Hooghly, Godavari and Narmada estuaries

Based on the above study inputs were given for the preparation road map for the fisheries development in West Bengal. Three training programmes on hilsa conservation were also conducted in different places in West Bengal. Brochures and popular articles on hilsa conservation have been printed and circulated among the stakeholders.

Plastic litter in bag nets

It was found that along with fish catch, the strong currents bring large quantity of debris which clogs mesh openings of the net. Weight of debris per net per haul ranges 0.5kg in which plastics contributed major share (Fig.10). Large plastic bags and sheets entered in the net act as a screen, which almost fully prevents the filtration of the gears. Pradhan, et al (2017) reported that on an average, 10.3% of the catch of dol net is constituted by plastics.



Fig.10. Plastic debris in bag net catch in Hooghly

Jellyfish problems in bag nets

Migration of jellyfish into the backwaters is a problem as it interfere the fishing operations. Clogging of jellyfish in set bag nets hamper the operations and destroy the gear. Pradhan, et al (2017) reported that jellyfish discards in the estuarine bag nets of Maharashtra. Jellyfish migrate as huge shoal and completely choke all kinds of fishing net. Due to excess load the net and the poles get damaged causing economic loss.

Conclusion

Several species of fishes have disappeared in the fishery from the marine and inland waters of our country and some more are in the verge of depletion due to changes in the ecosystem and anthropogenic activities. There is no proper licensing, registration or fishing effort control in our waters. Further, most of the fishing gears are non-selective and mechanism to control is inadequate. Since livelihood issues are rampant in the inland sector total ban of the bag net is not possible. Any kind of BRDs or operational related control on the fishing systems are generally unacceptable to the community. Unless alternative employment or source of income is made available, phasing out of these kinds of gears are not practical.

Occurrence of juveniles and sub-adults of hilsa in the bag net catches are very common. As we are experiencing the signs of over fishing, fishermen should adopt self-regulation in the hilsa migrating grounds rather than enforcement of regulations from the government. In an open access fishery scenario, where the fishermen have all rights to catch the fish, they also have the responsibility to sustain the fishery (FAO, 1995). Since management of hilsa fishery is the subject of the state, Government of West Bengal should try incentive based schemes as seen in Bangladesh for sustainable fishery. Total ban of single use plastic materials will reduce the litter load in the water bodies.

Fishery regulation and recommendations

1. Licensing and registration for stationary bag nets (craft and gears) need to be enforced.
2. Bag net operation in nursery grounds can be avoided.
3. Replace stationary bag nets with more selective fishing gears.
4. Phase-out bag nets from the estuaries to conserve juveniles and improve the fishery
5. Buyback schemes for fishing units can be implemented.
6. Self-regulation and Co-management of bagnet fishery.
7. Seasonal ban of bag nets may be observed, wherever required, for fishery improvement.
8. Incentives for responsible fishing practices and punishment for violation

References/suggested editing

Amrutha R Krishnan, Talwar, N.A and Suman Das (2017) Experiment with T45 mesh windows in the throat and in upper-lower belly of coastal set bagnet. Book of Abstracts 11th IFAF, Fostering Innovations in Fisheries and Aquaculture. 95 p

Boopendranath, M.R and Shahul Hameed, M. (2010) Energy Analysis of the Stake Net Operations, in Vembanad Lake, Kerala, India. Fish. Technol. Vol. 47(1): 35 - 40

FAO (1995) Cod of conduct for responsible fisheries

- Jisha, H., SALY N. THOMAS, THOMSON, K.T. 2017. Bycatch and discards in stake nets off Kumbalam, Cochin backwaters, India. Book of Abstracts. 11th IFAF Fostering Innovations in Fisheries and Aquaculture. 107 p
- Manojkumar, B, Rakesh, C.G and Devika Pillai (2017). Development of jellyfish excluder device for stake nets. Book of Abstracts 11th IFAF, Fostering Innovations in Fisheries and Aquaculture. 97 p
- Kathavarayan et al (2002). Effect of square mesh panels on the catches of stationary bagnet in Hooghly Estuary. Fishery Technology. 39(1): 6-10
- Pauly, K. V. (1991) Studies on the Commercially Important Fishing Gears of Vembanad Lake, Ph.D. Thesis, 171p, Cochin University of Science and Technology, Cochin
- Prajith, K. K., M. P. Remesan, V. R. Madhu and P. Pravin (2017) Square Mesh Window for Reducing Hilsa Juvenile Bycatch in Stationary Bag nets. Fishery Technol. 54(2):137-140
- Pradhan, S.K, Ibrahlim, S. A., Kamat, S.S., Latha Shenoy (2017) Fishing systems of estuaries in Maharashtra. Book of Abstracts 11th IFAF, Fostering Innovations in Fisheries and Aquaculture.p119.
- Remesan, M. P., P. Pravin 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
- Uskelwar L. S., Nirmale, V. H., Bhosale, B. P., Metar1, S. Y. and Chogale, N. D. J. Indigenous knowledge used in stake net (wan) fishery practiced along the Ratnagiri coast of Maharashtra. J. Mar. Biol. Ass. India, 59 (2): 45-52

