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Clap net Operation in Brahmaputra Valley for Capturing *Tenualosa ilisha* (Hamilton, 1822)

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Abstract

Tenualosa ilisha (Hamilton, 1822) is an anadromous fish existing in estuaries and seas and migrates to freshwaters of river Brahmaputra for breeding. Clap nets, locally known in Assam as *shangla jal*, *kholar jal* and *kami jal* are specially designed fishing gear to catch hilsa. This gear has a purse shaped outline and comprises of a bag net supported on an elliptical bamboo frame opening. The net is operated in the month of May-July, when the flood level is high and the water velocity is strong. The maximum catch coincides with the peak migratory season of the fish, encountered in the lower reaches of the river Brahmaputra. Clap nets were observed to have an important contribution in terms of gear preference and selectivity by fishermen associated with hilsa fishing compared to seine nets and gill nets, mostly due to its ease of operation, low cost of fabrication and maintenance, low labour intensity and higher effectiveness.

Keywords: Clap net, purse net, *Tenualosa ilisha*, migration, Brahmaputra

Introduction

The hilsa belongs to genus *Tenualosa* (Fowler, 1934), family Clupeidae and is a eurohaline and anadromous fish which ascends freshwater rivers and adjoining water bodies for breeding. De (1910), Dey & Kar (1989b), Talwar & Jhingran (1991) reported

on the lone presence of *Tenualosa ilisha* in Brahmaputra and Barak river system among the 3 species found in inland water of Indian sub-continent. The upstream migration of hilsa takes place during their breeding season with the beginning of the southwest monsoon (May to July) and consequent flooding of the rivers (Islam, 1989; Bhaumik & Sharma, 2011). After reaching the spawning grounds in the river, the fish spawn and descend back to the sea. The long range migration of the fish to the upper reaches of the river Brahmaputra has been described by Pillay & Ghosh (1958); Pillay & Rosa (1963); Rao & Pathak (1971); Bhaumik (2015). Additional information on hilsa migration and their spawning biology in other major river systems Godavari, Krishna and Cauvery are reported by Chacko & Ganapati (1949); Chacko & Krishnamurti (1950); Chacko & Dixithulu (1951); Chacko (1952); Chacko (1954); Pillay (1958); Pillay & Rao (1960); Pillay (1964). Hilsa constitutes a prized fishery in the region for its commercial importance and this has led to development of harvest methods adapted to hydrological conditions of the water bodies. Fishing gear and methods for fishing hilsa in the Brahmaputra valley are those of Joseph & Narayanan (1965), George (1971), Pravin et al. (2011), Baruah et al. (2013). Additional records of efforts to document the hilsa fishery in other river systems have been worked by Swarup (1958) on hilsa fishery at Allahabad; Mitra et al. (1987), Remesan et al. (2009) on Hooghly-Matlah estuary; Nath et al. (2016) on operation of *Shangla jal* (clap net) for hilsa fishing in Barrackpore area of Hooghly estuary. Jones (1959a;b) described the fishing methods of Indian shad in the entire Indian region. Ahmad (1954) in his accounts on the fishing gear of East Bengal, briefly described the methods employed there for catching hilsa whereas Alam et

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al. (1997) reported over 100 types of fishing gears in the floodplains of Bangladesh including the clap nets. But very little information is available on hilsa fishing in the northeastern region and not much literature is found which cites the *modus operandi* of the clap nets in river Brahmaputra. This paper attempts herewith to describe the gear specification of clap nets and its selective method of fishing *Tenualosa ilisha* (Hamilton, 1822) employed in the Brahmaputra valley, Assam.

Materials and Methods

Survey was conducted along the Brahmaputra valley. During the study, fishing sites along the river, landing centers, fish markets, fishing villages (Table 1) were visited and data on clap nets were recorded by interaction with 40 hilsa fishermen, village heads, *mohaldars*, lessees and fishery officers of Dhubri district. *Shangla jal* has been categorized as clap nets or purse nets in this present work based on the classification of Jones (1959a,b); Alam et al. (1997); Brandt (1984); Sreekrishna & Shenoy (2001). The technical specifications and design details of the structure and method of operation were recorded following a prescheduled Perform by Miyamoto (1962); Nedelec (1975). Catch and effort data were analyzed to calculate catch per unit effort (CPUE) of the gear based on the time of operation of the gear by using the formula, $CPUE = C_t / E_t$, where CPUE is catch per unit effort (kg/hour-gear), C_t is catch in time t (kg), E_t is effort in time t (hour-gear). Fish samples were collected from the districts of Dhubri and followed up to Darrang along the river Brahmaputra (Fig. 1). Fish identification was performed at the site on the basis of morphometric and meristic characters as per Talwar & Jhingran (1991), Jayaram (1999) and Eschmeyer et al. (2017).

Results and Discussion

Hilsa (*Tenualosa ilisha*) (Hamilton, 1822) (Family: Clupeidae) occurs along the lower reaches of the

Brahmaputra valley confining the stretch from the district of Dhubri to Kamrup, ascending the river from Bay of Bengal for spawning. Sporadic catch of hilsa was recorded in drift gill nets at Darrang district during 2017 (Fig. 1). The drift gill nets were usually operated to catch carps and catfishes, where the catch of hilsa was reported to be incidental by the fishermen of the region. The hilsa fishery is mainly confined to the artisanal sector in inland water, captured mostly by the traditional gears and non-mechanized boats unlike in marine water. This fish is a source of livelihood for a large number of fishers especially in lower stretch of the river Brahmaputra covering a distance of 250 km approximately from Guwahati (Kamrup) to Dhubri Township (Dhubri). However, the hilsa population has been reported to have declined very drastically in the recent times caused by indiscriminate killing of these fishes of all sizes due to application of various destructive gears and methods, heavy siltation and environmental degradation. This has in turn led to confinement of hilsa catch within the Dhubri district at present as stated by the fishers and fishery officers of the district. The riverine population of hilsa is exploited exclusively by clap nets which share a major proportion of hilsa catch in the Brahmaputra valley. Size groups of 280-410 mm weighing 300 g on average were mostly recorded during the monsoon migration.

Clap nets are locally known in Assam as '*shangla jal*', '*kholar jal*' and '*kami jal*' and are specially designed to catch *T. ilisha* (Hamilton, 1822) (*Ilish* in Assamese). The net has an elliptical or bow like outline with crescent shaped mouth. The mouth part has an upper and lower lip like structures which are supported by arc shaped bamboo frames. The bamboo frame consists of two 6-7 m long slender bamboo splits (2.0-2.5 cm breadth) tied together at their extreme ends in the form of hinges. This bamboo made frame or mouthpiece of the gear is fastened to a bag net. Clap nets are also known as

Table 1. Surveyed areas in Dhubri district of Assam

River fishing grounds	Wetlands (Beel)	Landing center	Fishing village
Dhubri natun ghat (Brahmaputra river)	Chapor (Dheer beel, Kumuri beel) Rupsi (Soreswar beel) Khudimari beel Kachudhola beel	Dhubri New ghat	Satyapur Paulpara Satyantala Bahadur Tari Iron Jangla

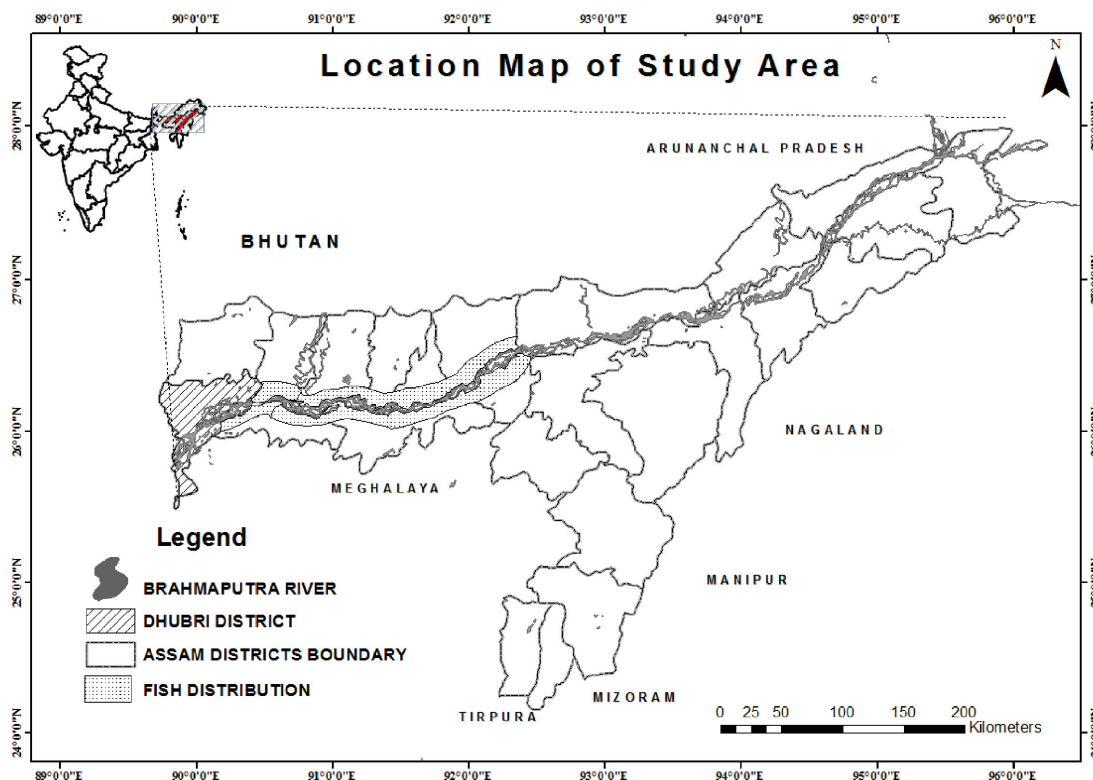


Fig. 1. Map of surveyed areas and hilsa distribution area in the Brahmaputra valley

purse nets in some places due to their appearance as a purse shape bag net hung from the bamboo splinters. The bag net has a mesh size of 22-70 mm and is made of hemp, cotton or polyamide multifilament webbing (210Dx1x3) with a hanging coefficient of 0.5-0.6. The net has a depth of 1.5-1.75 m (3.0-3.5 m for the total round). The frame is kept open (Fig. 2 and 3) by a piece of brick or stone weighing 1.5-4.0 kg fastened at the center of the lower bamboo split. There is a feeler cord fixed to the upper portion of the net to transmit the disturbance created by the fish while entering the net (Fig. 4). The feeler cord is held in the left hand and the haul rope in the right hand of the fisherman. The stout haul rope is paved out to the desired depth so that the net remains suspended at about the subsurface or mid water region where hilsa are predicted in appreciable numbers. This closing or haul rope passes through a ring or “Y” shaped piece of wood in the upper lip and attached to the lower lip of the frame in the mid part immediately above the weight. The length of the rope that can pass through this ring is limited by fixing a knot or seizing along the length of closing rope just above the limit of upper arc.



Fig. 2. A clap net in closed position

The net is operated from the fore end of a boat drifting down the water current in the month of May-July, the catches being more when the flood level is high and the water velocity is strong. Two persons are required for the operation of the gear. One person operates the net while the other rows the boat. The principle of operating clap nets is to trap or purse in the migratory hilsa fishes in this bag shaped gear (Fig. 4). Since there is every chance of



Fig. 3. A clap net in open position

the fish to escape, the closing or pursing mechanism is very well developed and the action is quickly been taken in these nets. The net is usually operated from the fore end of one boat at a time and when two nets are operated from the same boat, the second net is paved from the aft as well. The gear is selective for catching *Tenualosa ilisha*, however other fishes entering the net are also caught. The fish hilsa, being migratory in nature ascends the river and get trapped in the net that drifts down in the opposite direction. Once the desired distance is traversed downstream, the boat is rowed back towards its origin point and the caught fishes are harvested. The process is repeated several times in the day. The catch is often alive and of high quality. The average catch per unit effort (CPUE) of clap nets was recorded as $2.82-7.20 \pm 1.36$ kg/ hour/gear during the fishing season. The gear is operated for 3-4 h in a day. The price fetched from hilsa ranges from Rs. 300-1000 kg⁻¹ as this fish is highly relished in Assam. Clap nets are inexpensive (Rs. 500/gear) due to low fabrication and maintenance cost. The gear has a life span of 5-6 years and less labour intensive.

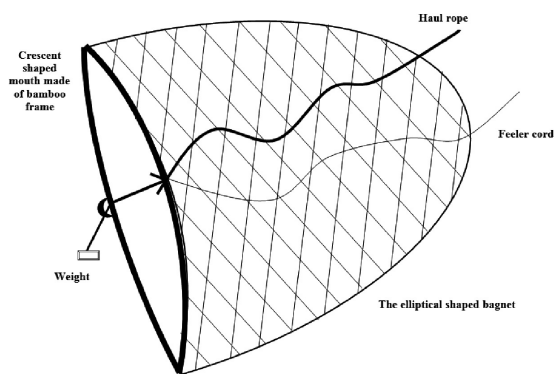


Fig. 4. A sketch of clap net for catching *Tenualosa ilisha* in the Brahmaputra valley

Among the nets used for hilsa in the Indian region, the *shangla jal* may be considered as the most specialized ones (Jones, 1946). The *shangla jal* and *kholar jal* observed in the river valleys of Assam resemble to *kamel* net of Allahabad, *shangla jal* of Hoogly estuary, *sungail jal* or *hilsauri* in Bihar and *kamail jal* of Uttar Pradesh. Similar clap nets were also reported by Ahmed (1956) to be extensively operated in the rivers of Bangladesh by the name of *khosh jal* in Bakarganj, *kharkijal* in Rajshahi and Dhaka, *hilsa jal*, *biri jal* in Mymensingh and *lewa jal*, *hongal jal* in Sylhet. Hornell (1950) stated that it is of the same shape as that of the *toni jal* of Bogra from which it appears to be directly derived. According to Ahmed (1956) the *toni jal* of East Bengal is a trawl net. The webbing is rectangular in *kamel* net of Allahabad while it is polygonal in *shangla jal* of Assam with a mesh size ranging from 22-70 mm, gear dimensions of 1.5-1.75 by 3.0-3.5 m (mouth width to net depth) and the material made of hemp, cotton or even nylon. Remesan et al. (2009) described the gear as *Sanglo jal* in Hoogly-Matlah estuary. Much variation in the size dimensions of clap nets were observed by Ahmed (1956) in Bangladesh ranging from 3.7-5.5 by 3.0-3.7 m to 9.0 by 14.0 and the mesh size varying from 40.0-100.0 mm. However, in all the cases, the ethnic origin of this method of fishing is not known. But, resemblance of the gear with the neighbouring countries ascertains its foundation in some part of this continent which might have stretched out to the countries of India, Bangladesh and south eastern countries, probably by the ancient immigrants and sustained with the present demographic changes.

The technique of purse netting for hilsa during flood months has been described by Joseph & Narayanan (1965). The closing cum hauling rope is called as '*kassi*' and the feeler rope as '*kutni*' (George, 1971). The closing rope is sometimes substituted by slender bamboo rod as at Allahabad when operated in shallow waters (George, 1971). Signal lines or feeler ropes are used with the stow nets in Finland fishery (Graham, 1954), in bag net fisheries of Californian coast and in salmon dip nets in Pacific North West coast (Thompson & Ben-Yami, 1984). From the present study, it was confirmed that the operation of purse net was restricted within Dhubri district, confining to the lower stretch of river Brahmaputra. This is attributed due to the restriction in the path of migratory hilsa somewhere which was once known to ascend as far as Dibrugarh district, now forming a sizable fishery in the lower

districts of Assam. Similar observations were also made by Joseph & Narayanan (1965) in their study on fishing gears of Brahmaputra valley. Furthermore, frequent water traffic caused by motorized inland waterways due to lack of adequate numbers of bridges in Dhubri district and adjoining districts has a greater impact on the hindrance of hilsa for its upstream migration. Intensive use of monofilament fabricated drift gill nets for catching the riverine fish to achieve higher catch per unit gear has also put more of fishing pressure in the region. The average landing from drift gill nets at Darrang district was reported more than 100 kg/day in the initial period of migration (July-Aug) which gradually got subsided to an average of 10 kg/day in the later phase (after August). The zero catch of this fish and non-operation of the clap nets in winter in the Brahmaputra indicate their negative migration into the river. Interestingly, the catch of hilsa in monofilament drift gill nets were initially incidental and later due to its effectiveness the fishermen in the middle reaches laid the nets purposefully to target hilsa. But the majority of the hilsa caught in those monofilament drift gill nets were found gravid during their upstream migration which proved to be a major threat in swiping away the entire hilsa population in the Brahmaputra river system.

The studies on the fishing gears and methods in the region and understanding of available literature on the subject reflects that there has been a continuum in development of fishing gears, specifying a targeted fish or a shoal. This evolution and timely refinement of the techniques of fishing in inland water has been resulted from modernization factors viz., fabrication materials, easy road-transport and communication and its distribution by demographic changes. The adaptation of new fishing technologies could help small scale fisheries increase their catch, but the introduction of any new fishing technology always demands good rational management and regulation (Eyo & Akpati, 1995). Clap nets in the region were artisanal and operated from non-mechanized boats, both indicating towards a pollution free environment and serving as a responsible harvesting method for long term sustainability of the hilsa fisheries. Indiscriminate killing of the gravid females and mature males by profuse usage of monofilament drift gill nets must essentially be banned in the river system by enacting strict rules and regulations, as a conservative measure towards hilsa fisheries in the Brahmaputra valley.

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