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An indigenous predatory fish catching technique of lower Brahmaputra valley, Assam

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Abstract
An indigenous fishing technique practised in River Brahmaputra and two of its north bank tributaries namely Bhelengi and Chaulkhowa in Barpeta district of Lower Brahmaputra valley, Assam is described here. This particular fishing method involves catching of a predatory freshwater fish species *Wallago attu* (Bloch & Schneider, 1801) using *Salmophasia bacaila* (Hamilton, 1822), a small indigenous fish and *Lamellidens marginalis* (Lamarck, 1819), a freshwater bivalve as baits. Olfactory stimulation owing to the strong flavour and taste of the bait used is found to be the main reason of attracting highly predatory fishes like *Wallago attu*.

Keywords: Traditional fishing method, *Wallago attu*, *Salmophasia bacaila*, *Lamellidens marginalis*, Olfactory, Taste, Brahmaputra, Assam

Introduction
Asom (89° 42′ E to 96° E Longitude and 24° 8′ N to 28° 2′ N Latitude) is bestowed with rich aquatic resources in the form of rivers, floodplain wetlands, forest fisheries, derelict water bodies/swamps, ponds and tanks. Brahmaputra, which originates in Tibet, is the major river of the state with 41 major tributaries (25 on the northern bank and 16 on its southern bank). The river traverses a distance of 916 km in India out of which it flows through the heart of Assam for about 740 km [1]. A total of 126 fish species has been reported from Indian stretch of the river [2]. Observations made by ICAR-CIFRI, showed that miscellaneous fishes dominated the total catch contributing 55.2% of the total catch followed by catfishes with 14.2% in River Brahmaputra, Assam during 1996-98 [3]. The district of Barpeta (26° 5´ N to 26° 49´ N Latitude and 90° 39´ E to 91° 17´ E Longitude) lies on the north bank of River Brahmaputra in Lower Asom. A number of rivers, namely Manas, Bhelengi, Beki, Kaldia, Palla, Pohumara and Nakhanda flow through this district. Kaldia and Pohumara rivers join near Barpeta town to form Nakhanda river. Rivers Palla and Beki join with river Nakhanda to utimetly form Chaulkhowa River, which ultimately joins with river Manas, a major tributary of river Brahmaputra on northern bank. Indigenous technical knowledge (ITK) is accumulated over generations by a particular community living in a particular environment and area/region, which then may/may not percolate over space and people. It is generally passed by word-of-mouth through generations, across time, space and communities. Fishing crafts and gears operated in River Brahmaputra, Assam are generally traditional, indigenous as well as labour intensive [4]. A number of attempts have been made in recent years to document the fishing methods and associated ITKs of Brahmaputra valley as well as of North East India [5-10]. In the present communication, an indigenous fishing technique employed by fishers of Barpeta district, Assam for catching a predatory freshwater catfish *Wallago attu* (Bloch & Schneider, 1801) in the River Brahmaputra and two of its tributaries (Bhelengi and Chaulkhowa) using a small-sized Cyprinid fish species, *Salmophasia bacaila* (Hamilton, 1822) and a freshwater bivalve, *Lamellidens marginalis* (Lamarck, 1819) as attractants is described.

Materials and Methods
The present study was carried out in 9 villages namely Baghbar, Kandapara, Rupakuchi, Milijhuli, Mandia, Garemari, Morabas, Shituli and Chowdhary Bazar, located on the banks of River Brahmaputra, Bhelengi and Chaulkhowa in Barpeta district, Assam from September,

2015 to April, 2016. A total number of 6 field surveys were conducted in 9 villages adjoining the three rivers. Primary information on the fishing gear/ method and the associated ITK was collected by means of participatory observation at the time of operating the gear in field as well as through personal interviews with active fishers and villagers. A pre-structured interview schedule was developed for the study by incorporating queries in order to obtain maximum possible information. Participatory Rural Appraisal (PRA) methodology was adopted to collect information about this indigenous fishing method. Key informants including active fisher folks as well as village elders were interviewed during the process of data collection. A total of 23 fishers/villagers were consulted through one to one interaction for detailed documentation of the fishing method and the associated ITK. Secondary information on the gear was obtained from fishers as well as other villagers using focused group discussions [11, 12]. Prior informed consent (PIC) was obtained from Head of all the surveyed villages (*Gaonbura*) as per CBD guidelines in order to use and publish the recorded information on these indigenous fishing methods and ITK associated with it. Fishes caught using this fishing device and the baits used were identified with the help of published manuals [13, 14]. To compare the efficiency of the two baits, Catch per unit effort (CPUE) was determined for both the baits by calculating the total catch (weight in kg) per hook per unit time (12 hours).

Results

This unique fishing operation involves three steps- manual collection (handpicking) of the freshwater bivalve, *Lamellidens marginalis* (Lamarck, 1819) and *Salmophasia bacaila* (Hamilton, 1822) from natural water bodies such as floodplain wetlands (*beel/pitoni*) and roadside ponds (*khal*), partial decomposition of collected fishes and removal of flesh from bivalve shell and finally attachment of partially decomposed fish and bivalve flesh as bait to hook. The fishing device consists of barbed hook of No. 9-10 (Fig. 5), a rectangular/circular bamboo or plastic gauge for holdingthe line (nylon twine of 70-100 m length) (Fig. 6 and 7), an indicator which is a split bamboo erected in the river bank (Fig. 8) and sinkers made of iron/lead fastened to the line to facilitate sinking of baited hook.

The fishing operation starts during October-November and lasts up to the month of February. During this period the water level in rivers recede and water current too slows down. Fishers take advantage of such conditions to harvest fish with hook and line. The bait fish (*Salmophasia bacaila*) collected with the help of drag nets/gill nets/cast nets from rivers are partially smashed and decomposed and attached to the hook to attract the target fish species. For the operation, 8-10 numbers of fish specimens are secured to a single hook (Fig. 4). Freshwater bivalve, *Lamellidens marginalis* collected by handpicking from wetlands and ponds are cut open using a sharp knife and the flesh is taken out. The flesh is rounded to the entire hook to make the hook invisible. After attaching the bait the hook is thrown into the water from the bank and the line attached to the hook is fixed to the split bamboo (indicator) driven in the earth along the river bank. The whole line is mounted on the gauge and the length of the released line is adjusted accordingly. As soon as the target fishes (*Wallago attu*) gulp the bait and get trapped in the hook, fishers who are waiting on the banks can immediately sense it by taking note on the movement of the indicator. The line is then hauled to bring the hooked fish to the river bank. When the hooked fish remain calm the line is loosened to some extent and again the line is hauled at faster pace as the fish behaves erratically. A single fisherman operates 2-3 lines at different places of the river at the same time. Fishers from different communities *viz. Bhatiya, Ujani* and *Koibartra* practice this fishing method. The recorded weight of *Wallago attu* caught by this method ranges from 2-15 kg during December-January. The average CPUE was found to be 3-5 kg fish/day/hook. Among the two types of baits *Salmophasia bacaila* with a CPUE of 4-6 kg catch/hook/day was found to be more effective compared to freshwater bivalve with a CPUE of 2-4 kg catch/hook/day. Other than the target fish species (*Wallago attu*), bycatch such as *Chitala chitala, Notopteru snotopterus, Mystus* spp. are also caught during this fishing operation.

Fig 1: *Salmophasia bacaila*

Fig 2: *Lamellidens marginalis*

Fig 3: Mussel flesh as bait

Fig 4: Fish flesh/whole fish as bait

Fig 5: Hook and line

Fig 6: Circular gauge

Fig 7: Rectangular gauge

Fig 8: Operation of fishing gear

Fig 9: *Wallago attu*

Discussion

People living around river banks have acquired indigenous knowledge about the fish species occurring in the river, their abundance, seasonality of occurrence, food preference and behavioural patterns based on which they have developed specialized fishing methods to catch certain fish species/ group. *Wallago attu* (Bloch and Schneider, 1801) is a foul feeder/scavenger, feeds both during day as well as night [15]; is predatory by nature; and feeds on prey aided by smell and taste. This particular feeding behaviour has been effectively used by local fishers of Barpeta district, Assam, to catch this species from the rivers with simple fishing gear, involving least drudgery. *Wallago attu* (Bloch & Schneider, 1801) has a well-developed olfactory system which is supported by its elongated olfactory rosette consisting of 62 to 64 primary lamellae in each left and right rosette and the total olfactory area of this fish is considerably greater than the total retinal area. The lamellae are covered with mixed sensory and ciliated non-sensory epithelium [16]. The cilia of the supporting cells, an unique feature in the olfactory epithelium of this fish species create a slow current of water across the olfactory lamellae and at the same time remove the remains of the stimulating substances and keep the receptor cells ready for new stimuli and creates adequate ventilation is necessary to bring the odorants in the olfactory chamber for perceiving the chemical signals [17]. *Salmophasia bacaila* (Hamilton, 1822), is a small indigenous fish, found in rivers of Assam, with a high fat (18.43%) and protein content (13.75%) [18]. Partially decomposed whole fish/fish flesh which is being used as bait would release strong flavours owing to oxidation of its high fat content which attracts predatory fish species such like *Wallago attu* (Bloch & Schneider, 1801). Moreover, the high protein content in the flesh of this fish species makes it tasteful for consumption. Proximate analysis for 100g

muscle protein of *Lamellidens marginalis* (Lamarck, 1819), a freshwater mussel revealed that it contains 34.1% crude protein, 6.6% moisture, 11.1% ash, 0.1%crude fibre, 43.1% carbohydrate and 4.3% fat [19]. High protein content in the flesh of this freshwater mussel attracts *Wallago attu* (Bloch & Schneider, 1801) owing to the taste. Fishers along River Kalong-Kapili in Nagaon district, Asom, have used duck meat as attractant to catch small cat fishes (*Mystus* spp.). In this particular fishing method strong flavour of the duck meat attracts the fish and then the fish are caught using simple implements [6]. Fishers of *Bin* community in Dhubri district, Asom, uses goat liver mixed with fats of Ganges river dolphin, *Platynista gangetica* (Roxburgh, 1801) as bait to catch *Clupisoma garua* (Hamilton, 1822) in the River Brahmaputra. The strong flavour of the dolphin oil used attracts the fish which are then caught with the help of specialized fishing gear [20]. The technique of attracting and concentrating fish into the range of a fishing gear is a part of development of fishing methods by traditional fishers all over the world using chemical bait so as to stimulate the sense of smell and taste of the target fish species/group [21]. The present fishing method ensures a good catch from rivers with minimum effort, where operation conventional fishing gear is difficult owing to the large volume of water and strong current.

Conclusion

Indigenous technical knowledge (ITK) amassed by different fishermen communities over a larger time frame, taking into account the behavioural biology of fishes has resulted in development of species specific fishing techniques/ tools. Detailed assessment of such fishing methods shows that they are energy efficient, effective and eco-friendly as well as plays a key role in providing livelihood security to traditional fishers. Such indigenous fishing techniques and the associated ITKs are passed on verbally from one generation to the next. Over the course of time many such ITKs vanished due to lack of proper documentation, hence there is an urgent need to document such techniques along with associated ITKs to preserve them, which can act as a base material for further modification or upgradation.

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