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Banasree Sharma
Department of Ecology and Environmental Science, Assam University, Silchar.788011.

Jayashree Rout
Department of Ecology and Environmental Science, Assam University, Silchar.788011.

Saroj Kumar Swain
Central Institutes of Freshwater Aquaculture, ICAR, Kausalyaganga, Bhubaneswar

Correspondence
Jayashree Rout
Department of Ecology and Environmental Science, Assam University, Silchar.788011.

Traditional fishing gadgets used by fishermen of Barak valley, Southern Assam, North East India

Banasree Sharma, Jayashree Rout and Saroj Kumar Swain

Abstract
Current study was carried out in two viIlages, Irongmara and Dwarband of Cachar District, Barak valley, Southern Assam which is the home to various communities and hence has resulted in diverse fishing techniques and methods. Barak valley is blessed with vast water bodies in the form of rivers and tributaries, flood plain wetlands giving the fishermen ample opportunity for fishing. In these two areas fishing activity was found high due to large number of water bodies, which involve the use of various fishing gears and crafts which are operated in rivers, temporary pools, fishery ponds and low lying areas. The habit of fishing is practiced largely for their livelihood in this vicinity. In the present paper an attempt has been made to document the traditional methods carried out for fishing in the village area, which revealed a total of 21 fishing devices; in the area in the form of traps, nets and hooks accompanied with 3 accessories used while fishing. Bamboo was mainly used for the construction of fishing gadgets which is locally available and economical. Random fishing and use of fine mesh seine nets was found harmful for fishes in the area.

Keywords: Fishing, gadgets, Traps, nets, Barak Valley, Assam

1. Introduction
Derivation of fish farming in India probably dates back to 1900 AD which has been initially started with the fish seeds collected at the mouth of tidal inlets from the rivers and their various stockings (Ayappan *et al*. 2004) [2]. Fishing gear can be described as any sort of tools used for capturing fish from water body (Nuhu *et al*. 2005) [13]. North east India is a biodiversity hotspot zone. Indigenous technical knowledge of the fishing gears of Manipur, Tripura and Arunachal Pradesh, Mizoram, Meghalaya and Assam has been reported earlier (Devi *et al*. 2013; Dutta & Dutta 2013; Upadhyay & Singh 2013; Lalthanzara & Lalthanpuii 2009; Pravin *et al*., 2011 and Tynsong & Tiwari 2008., Haque 2017) [4, 5, 18, 9, 15, 17, 7]. The Barak valley, named after the large alluvial river Barak, superseding valleys and low-lying hills of Barak valley reveals an exclusive landscape of ridge and valley (Laskar and Phukan, 2013) [10]. However, only a few works have addressed this aspect in Barak Valley. Use of tree (*Barringtonia acutangula* (L.) twigs for catching fishes in the Chatla floodplain and those on fishing devices of Barak drainages has been recently reported Purkayastha & Gupta 2014; Nath *et al*. 2010 and Kar, 2007) [16, 12, 8]. The use of local bamboo by tea tribes for various purposes including fishing gadgets have also been studied (Nath *et al*. 2011) [11]. Rivers, temporary pools, fishery ponds and low lying areas are an integral part of the livelihood of the local people. Extensive fishing with an array of fishing gadgets is a characteristic feature of this region. The sites selected in the study have enormous fishing activity and the type of fishing devices depends on the physiographic condition of the water body. These traditional fishing practices among these economically poor fishermen provide them a better livelihood and ecofriendly as well. A positive association between traditional fish trap operation and waterbird counts and their diversity has been observed by Aarif *et al*. 2017 [1].
Accordingly the focus of the present work was to inventory the fishing gadgets being used by the local communities vis-à-vis those reported earlier from Barak valley.

2. Materials and methods
The present study was conducted in two adjoining villages of Cachar District of the state of Assam namely Irongmara ($24^0 41' 20.39''$ N 92^0 44′ 31.95″ E) and Dwarband ($24^0 35$ ′52.31″ N 92^0 43′ 16.10″ E) located 20km from the Silchar town. Information on fishing methods and devices were collected through primary sources such as intensive field survey and interaction

with the local fishermen (semi-structured questionnaire) during 2012-2013. A total of fifty respondents (48 male and 2 female) were interviewed (depending on fishing activity) where 28% are of age < 30 years, 58% belong to 30-50 years and 14% were in the range of 50-60 years. Various temporary pools, fishery ponds, river drainages and low lying areas of these two villages were visited. The fish landing areas in these villages were regularly visited and the fishermen were interviewed during the field survey. The photographs of the gadgets and the local fishermen were depicted in Fig 2-24. The data collected was compared with the existing literature. The fishing gadgets were categorized as traps, nets and lines and hooks.

3. Results and Discussion

Irongmara and Dwarband are inhabited by a number of communities of which Namashudra, Kaibarta, Deshwali communities residing in these areas are prominent in fishing. These communities also cultivate paddy, vegetables etc, and some even do business but their main focus is on fishing. A total of 21 fishing devices, 2 methods and 3 accessories were recorded and documented from the two villages, Irongmara and Dwarband. Namashudra community play a dominant role in the making of gadgets. Women's participation is also quite substantial. The most common gear used was the casting net. Among traps, duri (box trap) was commonly used. Various accessories needed for fishing has also been listed in the present paper. The handpicking technique, quite popular among children is also quite prevalent in the area. Bamboo are mainly used for the construction of fishing gadgets which is locally available and economical. The gadgets such as gui, paron, boro paron, hoopie, bandh, bhelka, dheki jal, hisna, jhata; macrophytes and handpicking methods found in the present study have not been mentioned in earlier works. This reflects that though Barak valley is a small region, various communities reside here in different areas. Therefore areas play a significant role in assortment of various fishing gadgets as the way of fishing may vary from one area to another. A number of similar fishing methods and devices have been found to occur in various parts of India (Prasad *et al*. 2012; Gurumayum *et al*. 2009; Chakravarty and Sharma 2013) [6, 3]. Traps are most widely used fishing gadget as they are made from locally available bamboos which are quite abundant in the district and are made with women participation and is enviroment friendly. Catching of a sizeable quantity of juveniles of the commercially important fishes with the use of nylon net should be prevented which other wise may lead to destruction of the species.

Notes on various traps, nets, hooks and lines used in Irongmara and Dwarband

3.1 Traps: Traps are fishing gears in which the fishes enter voluntarily through the entrance in such a manner that its return becomes unfeasible as they get stuck in the bamboo slits.

3.1.1 Box trap

3.1.1.1 *Duri*: It is a rectangular shaped box trap made of bamboo strips tied strongly with plastic threads (Fig-2). There is an opening at the inner side which is flexible. The traps are placed with two bamboo sticks inserted on the front side. The box trap is placed against the water current and the fishes readily enter the trap with the flow of water but cannot escape once they enter. This is especially designed to catch small fishes.

3.1.1.2 *Boro Duri*: It is a rectangular shaped box trap made of bamboo strips tied strongly with plastic threads. This has a larger slit and interlocking distance than that of the usual duri (Fig-3). This is especially designed to catch larger fishes. There is an flexible opening at the inner side of the trap through which the fishes enter the trap it contracts and closes preventing the fish to escape. The box trap is placed against the water current and the fishes enter the trap with the flow of water.

3.1.1.3 *Gui*: It is a rectangular to semi oval box trap made of bamboo strips tied strongly with plastic threads. (Fig-4). The gap between the slits is smaller than duri designed to catch small fishes like *Puti, Moka, Cheng, Gutum* etc. The fishes cannot escape once they enter. The device quite is similar to duri.

3.1.2 Cylindrical trap

3.1.2.1 *Paron*: It is a cylindrical trap made of bamboo strips with a broad base tapered at the top. There are two flexible opening inside, the outer one being larger than the inner one (Fig-5). The fish enter with the flow of water and get trapped in the first flexible opening and then pass on to the second flexible opening and gets trapped. Later the fishes are collected from an opening at the tapered end, which remains closed when the trap is submerged in water. The trap is placed vertically in the water body.

3.1.2.2 *Boro paron*: It is a tubular trap with broader ends made with bamboo splits. The trap is placed vertically in the water. The design mechanism is similar to Paron (Fig-6)

3.1.2.3 *Faron*: It is a cylindrical trap with a broad base and tapering at the top. The bamboo slits are kept open towards the tapered ends which are tied with a plastic thread (Fig-7). The fishes are collected by opening the tapered end. The internal design is similar to duri i.e one flexible opening through which the fishes enters but can not escape. The trap is supported by bamboo slit, which is firmly pushed inside the soil. The trap remains little above the soil for the entry of fishes.

3.1.3 Spindle trap

3.1.3.1 *Seppa*: It is a spindle shaped trap made of bamboo slits (Fig-8).The trap is kept submerged vertically in the water body. The trap has two flexible openings at the middle of the trap on the opposite side. The opening traps are made such that one opening is against the water current and another along the water current, so that the fishes enter from both the sides. The trap is fixed in the water at bottom with the help of 6 bamboo slits/ sticks. Two sticks on both sides are placed at the base by crossing each other. Two sticks on the middle and two at the end.

3.1.4 *Conical trap*

3.1.4.1 *Hoopie*: This is trap with broad base and tapered end. (Fig-9). The trap is made with a bamboo, the bamboo is sliced into six portion keeping the closed end of the bamboo which remains untouched, then these six portions are again sliced into more six portions. One thin segment of the bamboo is sliced from the lower end and kept aside then one half coconut shell is placed inside the base and then woven with the segment. After weaving the shell is taken out. The trap is placed in the water and the fishes starts entering through the round portion and gets trapped in the bamboo. The smaller

mesh is giving good catch. The fishermen place the trap in the evening and collect the fishes in the morning.

3.1.4.2 *Hogra*: They are cylindrical in shape and made of bamboo with a broad base and tapered towards the end. (Fig-10). The design is similar to hoopie only the interlocking is more intense A nylon net is also wrapped from the outer side which minimizes the chance of escape.

3.1.5 Barricade

3.1.5.1 *Bandh*: This is a barrier created by the fishermen and locally known as bandh. It is fully made of bamboos and some plastic ropes (Fig-11). This bandh opens at one side which leads into long bamboo mat which is supported by the various bamboo poles. The mat is knitted very closely and is projected from sides to avoid escape. The bamboo on the upper side at end of the bandh is again attached to another bamboo pole fixed at the bank which is flexible and is used to adjust the slanting height of the mat. The fishes which gets obstructed by the bandh with the current of water flow into the mat and since the mat is in slanting position at the end by the time the fishes reaches the end the water drains out and they are unable to go back and forth. Sometime net is also used along with bamboo strips which restrict the flow of water as well as of fishes.

3.2 Net

3.2.1 Casting net

3.2.1.1 *Jhaki jal*: This type of net is simply thrown in the water (Fig-12).The edge of the net has sinkers which allow the net to drop down covering an area catching the fishes in that area. It is operated singly may be from the bank or form a shallower portion of water.

3.2.1.2 *Bhelka*: The operation is quite similar to jhaki jal but the circumference is much broader and are tied with thick cotton ropes which are bearing heavy sinkers at a regular interval (Fig-13).Often big fishes are also caught along with small fishes.

3.2.1.3 *Thela jal*: The net is knitted with a thin rope on three sides and then tied in a triangular shaped frame Here the two sides of the triangle are made of bamboo and one side remains attached to the rope (Fig-14). The two sides are tied at a regular interval with the bamboo and the other end is tied at the other end near the fishermen's hand. The fisherman dips the net in water and pushes forward and then takes out and collects the fishes. Repeated dipping and taking out is done for a good haul. Thela jal is small in size and is operated in very shallow water. Small fishes are caught with this type net.

3.2.2 Lift Net

3.2.2.1 *Dheki jal*: In this type of net two cane strips are tied at the middle by crossing each other so that it forms four tips (Fig-15).At the point of intersection one large bamboo pole is tied by a rope and the rest of the rope is kept free for helping in towing. The net which is cut in a square shape is then fixed at the four corners of the canes. The net is operated by throwing the net in water and fixing the bamboo in the soil and then lift the net with the help of the rope. This process is performed regularly to get a good haul.

3.2.1.2 *Dub jal*: The design is quite similar to dheki jal but in water it remains fixed to a bamboo pole (Fig-16).The net remains little submerged in water. The mesh size of the net is smaller than that of dheki jal. The fishermen fixes it in the evening and leaves it like that and collect the fishes next day very early morning Sometimes the net is simply tied to four bamboo poles and the poles are fixed properly in the water body so that the net remains little or half submerged in water.

3.2.3 Seine net

3.2.3.1 *Maha jal/ Nylon net*: These are fine mesh nets and very large. (Fig-17).This type nets first dipped and then withdrawn, it is quite destructive as it catch all size fishes (fry along with the mature one).

3.3 Hooks and Lines: Line fishing comprises lines and hooks of different shapes and sizes. All aged and gender people are engaged in this type of fishing. Some people practice this kind of fishing just for fantasy and other only for personal consumption. Very few people are engaged in commercial fish catching by this method since the quantity of catch is quite less here than others.

3.3.1 *Chip/Borshi*: It consist of a bamboo with a length of about 3-5 m long, a nylon or a cotton twine (mostly nylon) of a desirable length is tied to a hook of different shapes and sizes (Fig 18). A small float or stick is tied in the middle of the twine which moves when the fishes gets captured in the hook. The hooks arebaited with maida paste or boiled rice paste mostly, earthworms are also used. Chip or Borshi is being used in the whole region extensively it is also taken as hobby by some people.

3.4 Miscellaneous

3.4.1 *Polo/ Plunge basket*: Polo is a bell shaped bamboo trap with a broad base and a narrow end. The narrower end is covered with small tyre piece to prevent injury from the sharp edges (Fig-19). The fisherman handle the polo from the narrower end and pushes it inside the water and stops after plunging it then puts his hand inside through the narrower end and catches the fishes in the mud. Then again walks and plunges the polo at some distance. It is practiced in shallow water.

3.4.2 *Hisna/ Heot*: It is made with bamboo (Fig-20). A very strongly and thickly woven bamboo mat is made like a pocket to which a long bamboo stick is attached. When the water level becomes very low the fishermen keep a small net in the middle. The fishermen draws water, plunges the hisna into the shallow water and draws out the water and pass it through the net and the small fishes are handpicked. Sometimes in place of bamboo mat, tin is used.

3.4.3 *Jhata/ Fishing spear*: This is made by bamboo and broken rods of the umbrella (Fig-21). The umbrella rods are collected and their edges are sharpened after which they are inserted in one side of the bamboo and tied with wire and fixed at one end the other end remains as it isIt is operated from boat or while walking in shallow water. It is pierced in the fish body just like the spear.

3.4.4 *Fish attractant*: Fishes are attracted by the fishermen to a particular place in the water body either by providing food or by shelter (Fig-22). The fishermen in some areas create a condition by placing some macrophytes like *Eichhornia sp*., bamboo and tree twigs which provides shelter to the fishes. These shelter furnishes a cooler place for the fishes to thrive. Local fishermen also use *Shidol* (Dry fish of *Puntius* sp) as

attractant. The strong flavor of the dry fishes lure the fishes to get trapped.

3.4.5 ***Hand Picking*****:** This is practiced mainly in beels, temporay pools, and ponds. The water is drained out of the area because of which the fishes starts surfacing and it becomes visible so easy to catch. Children's are mainly found practicing this along with one or two elder people.

3.5 Accessories

3.5.1 ***Chitka jal /Kholoi*****:** It is pot shaped made with bamboo splits (Fig-23). It is carried by the fishermen at the waist tied by a cloth or rope. The fishermen when catches some fishes in water can keep them in the kholoi. It is made of different sizes. And sometimes they are half submerged in water and the fish are kept their so that they remain alive for longer period

3.5.2 ***Dhusoin, Changaand chaloin*****:** These are circular and bowl shaped made with bamboo (Fig-24). Their base is little submerged in water during fishing and the fishes are kept here after fishing. They are later tied with plastic threads and hanged in bamboo sticks to carry the fishes for selling. The fishes are washed in dhusoin and are carried in Changa that is covered by chaloin or dala.

Table 1: Vernacular name, material used, manpower required and target fishes of different fishing gears used

Type	Local name	Material used	Area of operation	No. of fishermen required for operation	Target fishes
Box trap	*Duri*	Bamboo and Plastic threads	Beels,Rice fields	1	*Puntius sp, Amblypharyngodon* sp, *Colisa sp*, Loaches etc.
	Boro duri	Bamboo and Plastic threads	Rivers, beels	1	*Puntius sp*, Boal, catfish, *Anabas* sp *Puntius, lepidocephalichthys*, catfish etc.
	Gui	Bamboo and Plastic threads	Rivers, beels	1	*Puntius, prawns, Amblypharyngodon*, etc.
Spindle trap	*Seppa*	Bamboo and Plastic threads	Rivers, beels, rice fields	1	*Lepidocephalichthys, Glossogobius* etc.
Cylindrical trap	*Paron*	Bamboo and Plastic threads	Beels, rice fields, shallow ponds	1	*Chanda sp, Puntius sp, Colisa sp* etc.
	Boro paron	Bamboo and Plastic threads	beels, rice fields, shallow ponds	1	*Channa sp, Anabas sp, Mastacembellus* sp etc.
	Faron	Bamboo and Plastic threads	Beels, rice fields	1	*Mystus sp, Puntius sp*etc.
Conical trap	*Hogra*	Bamboo	Ponds, beels	1	*Channa sp, Puntius sp, Glossogobius sp* etc.
	Hoopie	Bamboo	Ponds, beels, rice fields	1	*Channa sp, Puntius sp, Mystus sp*, Catfish etc.
Barricade	*Bandh*	Bamboo and Nylon ropes	Rivers	2	*Puntius sp, Botia sp, Lepidocephalichthys sp, Glossogobius sp, Heteropneustes sp. Wallago attu* etc.
Casting Net	*Jhaki jal*	Nylon, stones	Rivers, Beels, Ponds	1	*Puntius sp, Botia sp, Puntius sp*,Carps etc.
	Bhelka	Nylon, iron balls	Rivers, Beels, Ponds	1	Gymnostomas sp, Puntius sp, Catfish, Carps etc.
Bag Net	*Thela ja*	Bamboo, nylon net, rope	Beels, Paddy fields	1	*Puntius sp, Colisa sp, Amblypharyngodon sp, Esomus sp* etc.
Lifting net	*Dheki jal*	Bamboo, nylon net, rope	Rivers, Beels, Ponds	1	*Puntius sp, Chanda sp, Esomus sp, Aplochelius sp*, etc.
	Dub jal	Bamboo, nylon net, rope	Rivers, Beels, Ponds	1	*Amblypharyngodon sp, Puntius sp, Chanda sp, Esomus sp, Aplochelius sp, Sicamugil sp* etc.
Seine Net	*Maha jal/ Nylon net*	Fine mesh nylon net	Beels, Ponds	3 -4	*Mystus sp, Puntius sp, Glossogobius sp, Lepidocephalichthus sp, Chanda sp, Badis sp*,Carps, Loaches,Catfish etc.
Hooks and lines	*Chip/Borshi*	Simple Bamboo rod, nylon thread, Hooks	Rivers, Beels, Ponds, Ditches	1	*Heterpneustes sp, Puntius sp*, Carps etc
Miscellaneous Plunge basket	Polo	Bamboo and plastic ropes	Rivers, Beels	1	Carps, Catfishes etc.
	Heot/Hisna	Bamboo mat, bamboo rod sometimes in place of Bamboo mat tin is used	Beels, Ponds	2	*Puntius sp, Loaches, Channa sp* etc.
Hand picking		*Eichornia* sp. Bamboo, Tree twigs	Beels, Paddy fields, Fishery ponds, small temporary pools.	3-6	Loaches, *Channa sp, Puntius sp, Colisa sp*, Carps etc
Shelter	Jhata	Bamboo, umbrella rods	Beels, Ponds Rivers, Beels, Ponds	2-3	*Puntius sp*, Loaches, Carps etc
Fishing spear			River, paddy fields, shallow water zone	1-2	Eels, big Carps etc

Fig 2-18: Duri, 3-Boro Duri, 4-Gui, 5-Paron, 6-Boro paron, 7-Faron, 8-Seppa, 9-Hoopie,10- Hogra, 11-Bandh, 12-Jhaki jal, 13-Bhelka, 14-Thela jal, 15-Dheki jal, 16-Dub jal, 17-Maha jal/ Nylon net, 18-Chip/Borshi,

Fig 19-24: 19-Polo/ Plunge basket, 20-Hisna/ Heot, 21-Jhata/ Fishing spear, 22-Macrophyte/twigs, 23-Chitka jal /Kholoi, 24-Dhusoin and chaloin

4. Conclusion

The areas under study comprises of a large number of water bodies in the form of rivers and channels, flood plain wetlands which gives the fishermen plenty of opportunity for fishing and it was observed that the fishermen uses an array of indigenous fishing gadgets and methods to capture fishes. The traditional knowledge of making the different varieties of fishing gadgets from local bamboos are passed on verbally or through demonstration to the generation next. Though present younger generation of the fishermen community do not seem to be interested to inherit the traditional knowledge to carry forward such activity. Newer economic options coupled with reduction in water bodies are believed to be the primary reason for this. Bamboos, predominantly utilized for the making of the gadgets are dwindling in numbers and also become quite costlier impacting the whole activity of gadget preparation and their use. The random fishing and use of fine mesh seine net was found harmful as they catch all those fish fries along with the large fishes, affecting the fish diversity in the area. The other methods were found sustainable and environment friendly.

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