

# Fishing gear and practices in flood waters of Assam

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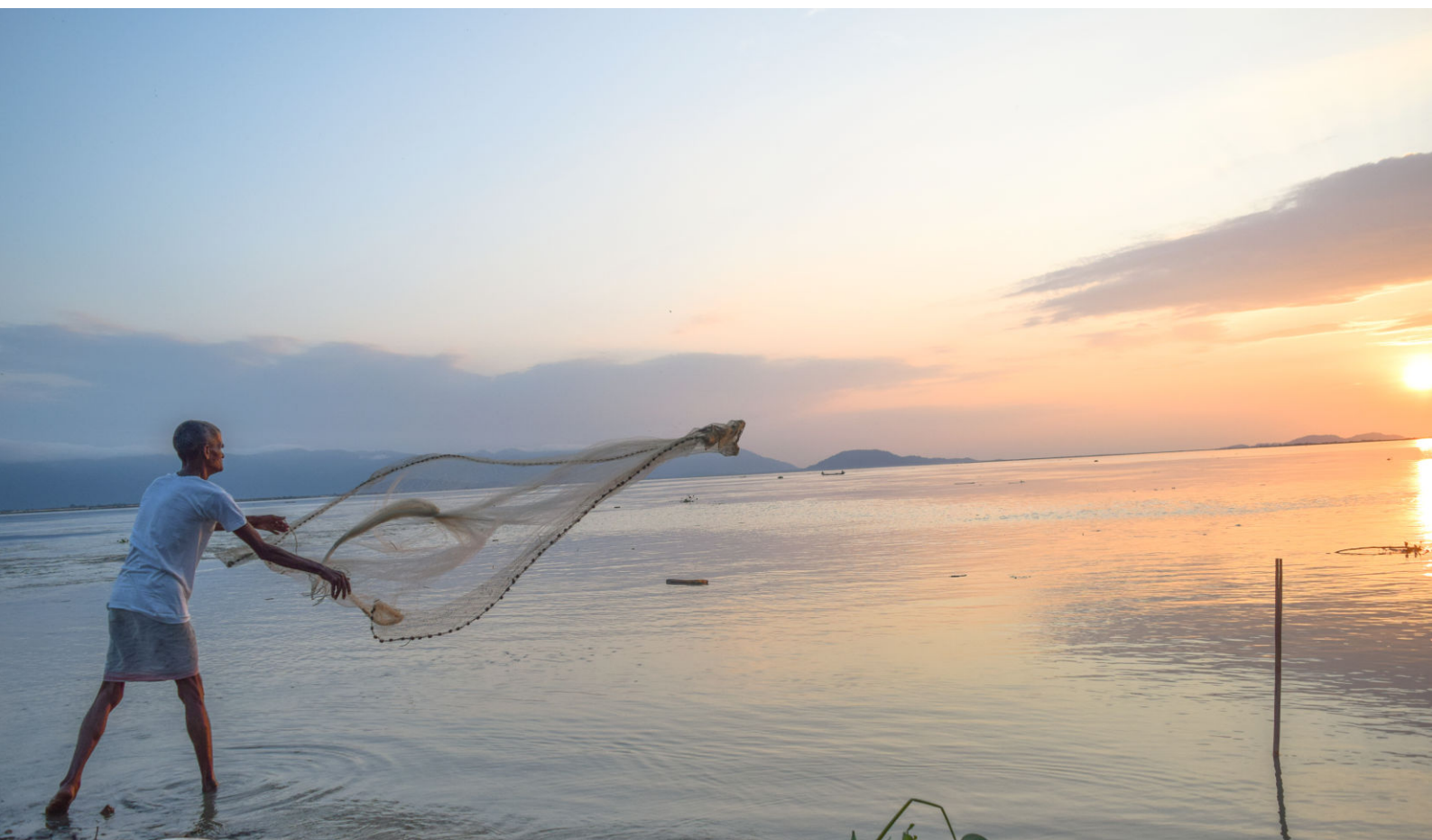
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Flooding is a common phenomenon for the people of Assam, a northeastern state of India. Annual flooding is mostly due to breaches of the embankments of the two major drainage systems of the state, the Brahmaputra and Barak rivers, along with their numerous tributaries. The situation is intensified by heavy rains during the south west monsoon, accounting for 1,100-11,000 mm rainfall per annum<sup>1</sup> in the hilly states surrounding Assam, resulting in a huge discharge of water into the Brahmaputra and Barak drainages. Altogether, the flood prone area in Assam is around 31,500 km<sup>2</sup> or nearly 40% of the total land area of the state and 9.4% of the total flood prone area of India<sup>2</sup>. The Brahmaputra and Barak river valleys in Assam also have the distinction of nurturing some of the finest floodplain wetlands of the country comprising 212,713 ha. The distribution of floodplain lakes (beels) in different parts of Assam is given in Table 1.

The floodplains are nutrient rich due to annual inundation and play a significant role in for four to five months where fish larvae, juveniles and adults are nourished in this activated habitat. Fish migrate back to the rivers or depressions at the end of the monsoon with the receding water<sup>3,4,5</sup>. Altogether,

the river systems of the northeastern region and their adjacent floodplains are reported to harbour some 422 fish species belonging to 133 genera and 38 families<sup>6</sup>, and make a substantial contribution to the fishery of the state and the livelihoods of fishers who have access to it.

Fishing remains a traditional activity with tremendous socio-economic impact in the rural sector and the flood waters impact the livelihoods of many people. In spite of the negative effects of flooding, local populations have become more resilient to flooding with time and adapted their livelihoods to take advantage of the available opportunities. The fisherfolk in particular share an intrinsic relationship with flood waters, employing a variety of traditional, non-traditional and professional fishing gears and methods to harness nature to its maximum. Non-professional, seasonal or casual fisherfolk near to the inundated catchments also put out their gear in anticipation of the arrival of the fish. Fishing therefore becomes an important economic activity for the people living adjacent to the rivers and floodplains<sup>7,8</sup> and this has led to the development of a diverse range of fishing gear and methods<sup>9</sup>. An attempt has been herewith to document some of the major



Operation of a cast net in flood waters.



*A fish aggregating device (hukuma)*

fishing gears and their method of operation during the flood season in Assam in with reference to their technique, efficiency, the targeted fish species and their probable impacts on human lives<sup>10-12</sup>.

**Pulling of water hyacinth:** A primeval method of fishing without using an actual fishing device, locally known as meteka tana. The water hyacinth or meteka grows profusely in floodplain wetlands, swamps and other derelict water bodies of Brahmaputra valley. During the floods, air breathing fishes such as *Channa* spp., *Anabas testudineus*, *Clarias batrachus*, *Heteropneustes fossilis*, *Nandus nandus*, *Colisa* spp., *Monopterusuchia*, and *Mastacembelus* spp., take shelter within the roots of water hyacinth. The plants are very carefully lifted by hand, brought ashore and fishes are separated from the roots. Women are mainly engaged in this method of harvesting fish during the day hours for a period of 3-4 hours.

**Spearing:** Spears are known by many names throughout the river stretches of Assam. Most of the spears in use have a single-pronged or multiple-pronged ends with pointed, barbed or barb less blades and are thrown by hand to wound the fish.

*Kuchiahana* is a sort of primitive hunting spear made of a smooth iron rod (1 m length) with one barb to ensure that fish will be held fast once the barbed point pierces the body. The tribal people of Assam use this gear to catch in particular *Monopterusuchia* (freshwater eel), which thrives in soft muddy inundated areas of aquatic bodies. The spike is continuously pierced through the soft mud and once the fisher gets the catch, he can immediately feel the jerk exerted by the restless fish. The fishers generally gather a single



*Operating a khorahie.*



*Lght fishing.*

**Table 1: Distribution of floodplain lakes (beels) in different parts of Assam**

Region	No. of beels	Area (ha)	River valley/lakes
Central Assam	342	31,080	Brahmaputra valley
Lower Assam	352	29,000	Brahmaputra valley
Upper Assam	376	23,000	Brahmaputra valley
South Assam (bordering Bangladesh)	322	800	Barak valley

Source: Handbook of Fisheries and Aquaculture



*Operation of scoop gear (jakoi) in inundated water bodies.*



*A bigger sized tubular trap (paori) in operation.*



A drift long line (*ponga boroxi*).

eel or 2-3 catches in a day. These fishermen are mostly non-professional and were seen to operate this gear in flood waters to catch eels.

**Kosh or Jakhra:** This implement possesses 18-24 split bamboo splits prongs, each measuring around 37 cm in length. Some designs are provided with sharp iron barbs capping the prongs at the other end. The splits are firmly tied towards the butt end in one bunch and the prongs are arranged in a way so as to cause them to diverge from one another. This is a heavy weapon and requires considerable strength to hurl. It is generally thrown by a man standing at the prow of a boat, sometimes from the bank of a stream. The spear is operated in inundated waters to catch larger sized fishes such as *Sperata aor*, *Wallago attu*, *Labeo rohita*, or *Cirrhinus mrigala* etc.

**Light fishing:** A lit torch, prepared using dried jute stems or other cheap combustible material such as discarded cloth pieces tied to a stick at one end. In many places a kerosene lantern is also used. The torch is placed at the forehead of a boat and the peddler at the stern propels the boat slowly and quietly while his companion remains statuesque and immobile at the prow. The fisher either holds a long spear, a harpoon or a sickle in the right hand to launch at fish that are attracted to the light. Larger sized insectivorous fishes such as *Channa marulius*, *C. straitus*, *Sperata aor*, *Wallago attu* and *Clarias magur* are mostly caught. This fishing method is locally known as jorakata in Assam.

**Angling by hook and line:** These are the devices consisting of baited hooks attached to a line or lines, the principle of capture based on the feeding and hunting behaviour of the fish species. This gear is being operated by any age group of people and is taken more as a sport.

**Hand lines:** A line made of nylon of certain length with or without sinkers and with an iron hook. Hand lines may be as short as 0.5 m with baits such as flour balls, earthworms, insect larvae, and cooked rice. The baited hook is slowly played in marginal water. Small sized fishes such as *Puntius*, *Anabas*, *Channa* spp are caught.

**Pole lines:** Pole lines become a common sight during the floods. This gear consists of cotton or nylon made hand lines attached to a bamboo pole or poles and are operated in water with baited hooks. This is a simple fishing method with a rod of suitable length (2-10 m) and girth (2-3 cm) and a line of desired length as per the water depth. Floats attached to the line are made of a piece of lightwood, sandal or rubber and the sinkers are made of a piece of lead or iron. Live baits are usually given in the form of tadpoles, small frogs, earthworms and small sized *Channa punctatus*. Predatory fishes such as *Wallago attu*, *Mystus seenghala*, *Sperata aor*, *Channa marulius*, *C. straitus* are caught via this method.

**Drift long lines:** Long lines without a fixed attachment that are free to drift with the current or shallow bank tides. These are locally known as *nol boroxi* or *ponga boroxi*. This is a



### Box shaped traps

single vertical line suspended from a short bamboo piece of 30-35 cm length or the stem of a water hyacinth as float. The line (s) carry a barbed hook and are operated by simply dropping it into the water waiting for the fish to bite. The length of the vertical line is dependent on the water depth. This device is most suitable for catching murrel (snakehead) in weed choked stagnant water bodies. Acceptable baits are earthworms, small fish, and eggs of bees and ants, and wheat balls.

**Trapping:** Traps are either temporarily or permanently fixed to the bottom and the principle of capture is based on leading the fish to enter, but making it difficult to exit through openings that are often defended with non-return valves or labyrinths. Traps vary widely in shape from conical, cylindrical to rectangular or box shaped. The framework is formed of fine screen-work made of slender slips or splints of bamboo, separated by narrow interspaces and bound together by strands of coir fibers, fine strips of cane and bamboo or plastic ropes.

**Fish aggregating devices:** These are artificial implements stuffed with bunches of twigs, bushes, and weeds etc which afford refuge for fish. Some of the fish aggregating devices regularly seen in the flood waters of Assam are the bamboo made *dolonga*, *derjakori* or *tak* or *hukum*. These devices vary in their shape viz., bowl shaped, pyramid shape or cone shaped. The devices are submerged in water keeping a

bamboo pole or a banana trunk attached to the trap to mark its position over water. The device is typically around 1.0-1.5 m in height. The mouth is rigid with bamboo strips stitched along the perimeter. The device is lifted periodically to harvest the trapped fish.

**Tubular shaped traps:** These traps vary in shapes from spindle, cylindrical to bottle shape and are made of bamboo. The most commonly used traps are the spindle shaped *Seppa*. The trap has a girth maximum near to middle and tapering at both anterior and posterior ends. The trap is 20-86 cm in length and is provided with 1-4 trap doors located along the mid alignment of the base. Internal and external bamboo hoops maintain the rigidity of the receptacle. The trapped fish are removed from an opening at the posterior extremity. These traps are operated in inundated paddy fields and shallow water bodies during the monsoon season. Catch includes small size fishes such as *Mystus* spp., *Puntius* spp., *Botia* spp., small prawns, *Colisa* spp., *Channa punctatus*, *Chanda* spp., etc.

**Paori** is another category of trap operated during the flood season in Assam. It is one of the largest traps having a typical length of 1.2-2.5 m and a diameter of 47-94 cm. It is broader and circular towards the anterior end while tapering towards the opposite end. The splits are of 0.3-0.75 cm in thickness (0.6-1.5 cm circumference) and are tied firmly with one another with plastic ropes or cane cords, keeping an interstitial



A spear (*jakhra*).

space varying from 1.5-3.0 cm in between. Thick bamboo strips are stitched from both inner and outer sides of the body at certain intervals along its circumference to provide rigidity to the trap. The anterior end is concave and possesses a trap door for the entrance of fish. The trap is kept in water for a day or a week. The trap is operated either against the water current or along the current and grounded with a bamboo pole at its apex to avoid its drifting. The cost of the gear ranges from Rs. 100-1500 and the life span is 1-3 years. Large sized fishes weighing 1.5–15.0 kg comprise the major catch, which includes *Aorichthys aor*, *Chitala chitala*, *Channa marulius*. Tortoises can also become a catch in this trap. The trap is generally known as paori in Jorhat district, doo in Cachar district, *juti* in Karimganj district and sasha in Nagaon district of Assam.

**Box shaped traps:** These are box-shaped traps made of bamboo splits finely knitted with cane and bamboo strings. These traps are provided with a bamboo screen at the mouth to guide the fish into the trap door. Darki or bosna are some of these box shaped traps, typically with 1-2 trap doors placed just above the base along the periphery of the longer axis. The length of the trap varies from 63-150 cm, width 14.0-41.5 cm and height 28-74 cm. The trap door measures 4.5-25.0 cm in height, 3-18 cm in width and 8.5-17.0 cm in depth. The trap has an opening at the rear end of the apex or top for removing the trapped fishes. This trap is operated in either singly or in series, provided with bamboo screens. Thicker bamboo strips are used both at the top and the bottom of the trap at an interval of 13-35 cm depending on the size of the box in order to provide rigidity.

**Scooping:** This category of gear is made of bamboo in which the capture of fish is affected by a bailing or dipping action, manually disturbing the bottom dwelling fishes and capturing them through a scooping motion. Scoop gears are versatile gears and are operated mostly by the womenfolk in all districts of Assam.

**Jakoi:** This is a bamboo made device with triangular outline. The body of the gear is made of bamboo matting which is supported with a rigid mouth made of a single piece of thick bamboo split. The thick bamboo split further extends beyond the apex to form a short handle. A string or rope is attached to two arms of the mouth near to its base. The operator places the gear with its mouth facing her and disturbs the bottom

with their feet, so that in a quest to escape, the fish enter the trap. The gear is scooped continuously under water to make the catch. *Mystus* spp., *Macrognathus* spp., *Mastacembelus* spp. etc are the major fish catch with this gear.

**Chalonnee:** This is a saucer shaped circular bamboo made sieve with a diameter of 0.8-1.2 m. The device is inserted below a patch of floating water hyacinth in weed infested water bodies such as *beels* and ponds. Fish taking shelter underneath and within the roots of the water hyacinths are shaken off the root tufts to fall onto the sieve. Murrels (snakeheads), perches and small sized eels are the major catch. The gear is operated in shallow inundated areas.

**Khorahee or paachi:** This device is similar to the above gear in the mode of operation, fishing season and the catch composition. However, these are bowl shaped (concave) baskets and thereby reduce the chances of fish escaping. A *paachi* is a bigger basket than *khorahee* and can lift heavier load of floating weeds and have higher longevity.

**Push nets:** Push nets are triangularly-framed gears and are operated by one person and capture is affected by a forward, horizontal pushing motion along the bottom of shallow waters by hand while wading or from boats by handle. Push nets are locally known as *ghoka* and *pah jal* in Kamrup district, *thela jal* and *faloin jal* in Dhubri. The triangular frame consists



A seine net (*ber jal*).



*A hand lift net operated by women.*



*A double stick seine net (tana jal).*



*Large sized traps operated in flood waters of Assam.*



*A tribesman with kuchia hana.*



*A hand operated lift net.*



of three bamboo poles. Two poles intersect each other and the third forms the base. Either of the arms in the frame is of equal length or one longer than the other. The net is operated along the riverbanks and water logged areas during the receding flood water to catch mostly small sized fishes, prawns and fingerlings. *Ghoka jal* or *pah jal* or *thela jal* is made of polyamide 210/1/3 with a mesh size of 7-35 mm. The net usually consists of nine selvedge (210/4/3) at its lower periphery. The width of the mouth is 2.65 m. The hanging height of the net from the intersecting point of the poles is 1.5 m. The cost of the gear is around Rs. 600 and has a life span of 4-5 years. Unlike *ghoka jal*, the webbing of this gear is made of fine mesh polyethylene mosquito net. The overall length of the gear varies from 1.3-1.5 m and the width at the base is 1.3 m. The major catch includes *Chanda* spp., *Mystus* spp., small fish and prawns.

**Seining:** Nets shot in such a position so as to enclose a definite body of water containing fish and then hauled toward the shore or to a vessel.

**Double stick seining nets:** This gear is operated in shallow water bodies, paddy fields, *beels* and other derelict water bodies impounded with water during flood. The gear is rectangular in shape with two bamboo poles fixed to its shorter sides. The webbing of the net is made of a material used in mosquito nets measuring 3.5-4.0 m length and 2 m in depth with a mesh size of approximately 1 mm. Two fishers (mostly women) operate the net by holding the bamboo vertically. The net is dragged for a distance into the water to encircle a certain area and the fish inside are caught. The catch is usually comprised of small sized fishes such as *Puntius* spp., *Colisa fasciatus*, *Mystus* spp. etc. The net is locally known as *tana jal* or *muglai jal* in different districts of Assam.

**Ber jal or maha jal:** This is one of the biggest nets used in Assam. This net is rectangular in shape and is composed of a number of pieces with different mesh sizes and joined together to form a single big wall net, as long as 200-450 m. The width of the net is adjusted according to the depth of the water to be netted, ranging from 6.8-18 m. The webbing material is made of polyamide. The head rope is 0.6-1.0 cm thick and is made of HDPE. The head rope may be single or double. Floats are made of plastic cans, pieces of wood or bamboo and are attached to the head rope by polyamide or polyethylene twines at regular intervals. The foot rope is 18-35 mm thick and is made of jute. The net is attached to the foot rope with a 1.5-12 mm thick polyethylene rope. The foot rope is either provided with sinkers made of burnt clay (28 x 18 x 0.5 mm) or iron (58 x 30 x 10 mm) or devoid of sinkers in thicker foot ropes. The net is operated in fast flowing areas of rivers and beels during rainy season with a peak from April-June. Depending upon size, the net is operated with 1-2 boats and 8-20 persons operated both during day and night. The catch of the gear comprised of *Catla catla*, *Labeo gonius*, *Labeo rohita*, *Wallago attu*, *Catla catla*, *Cirrhinus mrigala*, *Sperata aor*, *Chitala chitala*, *Rita rita*, *Bagarius bagarius* and other such large sized fishes. The cost of the gear ranges from Rs 40,000 to Rs. 100,000. The life span of the gear is 2-5 years.

**Lifting net:** Lift nets are sheet of net, usually square but may sometime conical stretched by several rods, ropes, or a frame, set either at the bottom or in mid water for some time and then lifted to trap the fish swimming above it.



A chalonee.



Gill nets for operation in Brahmaputra valley.



A berjal of the Brahmaputra valley.



*Lift net (dheki jal) in operation.*



*Pole and line.*



*A Fixed lift net (porongi jal).*



*V shaped lift net (dheki jal).*

**Porongi jal:** This lift net is a common sight in Assam and is locally known as *porongi jal* or *dharma jal* and are made of two split bamboos crossing each other and fixed in the form of an arch. To this frame is attached the square shaped net which has an uneven mesh size ranging from 15-60 mm. The intersecting point of the cross bars or splits are fastened to a handle made of a whole bamboo piece of desirable length. The cross bars are approximately 2.4 m in length. The web material of the net is made of polyamide 210/1/3. The net is operated by hand or ground to shore. The net is frequently dipped in water and lifted to get the catch. A single person can operate the net. Women take part in fishing during floods with this gear, which is used throughout the year. Small fish are its usual catch such as *Danio* spp., *Puntius* spp., *Rasbora* spp., *Clupisoma garua*, *Eutropichthys vacha*, *Gudusia chapra*, *Setipinna phasa* etc.

**Dheki jal:** This net is a lift net consisting of a 'V' shaped frame to which the webbing is attached. The frame is constructed by securing bamboo poles at an angle between 45-90°; the two arms of the 'V' forming the sides (13-15 m in length) of the mouth and the side opposite the angle being the base. The width of the mouth is 15-16 m. The webbing is divided into different mesh sizes from 18-60 mm. This gear is locally known as *dheki jal*, *jata jal*, *khora jal* and *ghat jal* in different parts of state Assam. The net is fixed on a bamboo platform down the riverbank and is operated against the water current throughout the day and night. The net is installed in such a manner that its base comes out of water for 1-1.5 m in height when weight is applied on its angle during lifting. The net is

mostly operated in rivulets, channels and beels during the flood season when the water is advancing or receding. At certain places, split bamboo or tree branches are installed as barriers in front of the net in 'V' shape to direct the fish into the net. This net is non selective in its catch ranging from the Indian major carps, minor carps, *Wallago attu*, clupeids etc.

**Plunging baskets:** The principle is to catch the fish by dropping gear down from above. These are bell-shaped entrapping devices with an opening both at the base and the apex. The gear is locally known as *polo* and is made of finely woven bamboo strips. The strips are 0.5 cm thick and are stitched at a spacing of 0.5-1.5 cm and 5-12 cm within vertical and horizontal strips respectively. The height of the gear varies from 47-155 cm with a diameter of 57-125 cm at the base and 15-25 cm at the apex. The gear is operated in *beels*, shallow water bodies, inundated paddy fields, etc. The fisher carries the trap in hand, slowly wades and plunges it into the water in a probable place. The fisher firmly presses the pot, insert one hand through the top or apex and takes out any fishes caught inside. Very small sized fishes like minnows and barbs and medium sized fishes are caught in this gear. In certain locations, feed such as rice bran, flour is applied over a small canopy in shallow water areas to attract fishes before operating the gear. Cost of the gear ranges from Rs. 80.00-400 and the life span of the gear depends on its usage.

**Cast nets:** These cast nets are conical in outline and their lower edges are folded or turned up inwardly and stitched to the webbings at regular intervals to form peripheral pockets.



*Pulling water hyacinth (meteka tana).*



*Traps operated in flood waters of Assam.*

The nets are heavily weighted around the base by fixing iron weights to the free edges of the pockets and each is provided with a retrieving line attached to the apical portion. As soon as the net is thrown, it is pulled down by the marginal weights. The disturbed fishes enter the pockets and are hauled. Based on the mesh number and net size the cast net is known by various local names viz., *khewali jal*, *asra jal*, *rekh jal*, *pachon jal*, *afolia jal*, *jhaki jal*, *athar jal* and *angtha jal*. The principle catch includes *Labeo bata*, *Cirrhinus reba*, *Labeo gonius*, *Tor spp.*, *Sperata aor*, *Channa marulius*, *Channa striatus*, *Chitala chitala*, *Labeo rohita*, *Labeo calbasu*, *Cirrhinus mrigala*, *Bagarius bagarius* etc.

**Gill nets:** These are rectangular shaped nets employed as walls in which the capture of fish is affected by actual gilling in the meshes of the net. The meshes of the nets vary with the types and size of fish to be caught. To the head ropes are attached floats while the ground ropes may or may not have any sinkers fastened to them. The floats and sinkers are so adjusted that the nets can remain in vertical position at any desired depth. Gill nets may be set gill nets or drift gill nets based on the mode of operation. The set gill nets are locally known as *fasi jal*, *langi jal* and *current jal* and are used throughout the year and the catch is miscellaneous. Some of the drift gill nets are locally known as *current jal*, *gosaila jal*, *bagar jal*, *bhasan jal*, *bagh jal*, *fesi jal* and *sessa jal*.

## Conclusion

Fishing areas in the state Assam are mostly river basins, often associated with extensive areas of floodplains and their connecting channels and an array of smaller streams, irrigation and drainage canals and a variety of seasonal or permanent small water bodies. Floodplain wetlands constitute a very significant resource of Assam and are considered as one of the highly productive ecosystems in terms of biomass and fisheries production potential<sup>13</sup>. Food and nutritional security is the primary concern of fishers, since large proportions of their efforts are invested in fetching them. Fishing activities are more prominent for a considerable part of the year, in the water bodies flooded during monsoon season and fishers operate alternate gears of fishing. It was observed that the advent of new fabrication materials has led to rise of many efficient fishing techniques and the ones that were efficient in the past have become non-remunerative and unattractive, and hence they are naturally being phased out<sup>14</sup>. Bamboo made fishing implements and traps are widely being operated in Assam due to low cost and readily availability of materials<sup>15</sup>. Fishing in the flood waters as a whole is a disarranged sector and therefore the livelihoods systems of fishers associated with floodwater are complex, diverse and intricately associated with many issues outside the fisheries management systems.

## Acknowledgement

The authors are highly grateful to the fisherfolk of Assam for sharing their knowledge and information in preparation of this manuscript. The services rendered by the officers and field staff of the Department of Fisheries, Government of Assam are highly acknowledged. The authors also acknowledge the support received from ICAR-CIFT, Kochi and ICAR-DCFR, Bihmtal in carrying out this R&D programme.

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*Tubular shaped traps (Seppa) in operation.*