An indigenous fish aggregating method practiced along the Kolong river in Nagaon district of Assam

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In the present study, an attempt has been made to document an indigenous fish aggregating method practiced along the Kolong river of Raha in Nagaon district of Assam. Vertically fixed branches of Saora trees in the selected deeper portions of river banks with a thick layer of aquatic vegetation mainly comprised by water hyacinth constitutes the fish aggregating structure. The entire structure is encircled by a two-tier barricade consisting of the outer netting called Mosuri Jaal and an inner drag net. The area encircled by the two nets is narrowed by inward repositioning of both the nets. After removing the branches of Saora trees and aquatic vegetation, the encircled fishes are caught by cast nets. The catch is comprised by both herbivorous and carnivorous fishes.

Keywords: Fish aggregating device, Mosuri-Jaal, Drag net, Saora tree, Water hyacinth (Eichhornia crassipes), Kolong river

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The state of Assam is bestowed with rich and diverse fish fauna available in ponds, tanks, natural lakes, marshy areas, swampy areas, rivers, beels, reservoirs, submerged cropped lands, etc. Assam has 5050 km of rivers including tributaries of Brahmaputra and Barak. Indigenous traditional fishing knowledge among the fishing communities is rich and varied. The traditional fishing methods in different water bodies of Assam and other North-east states have been described by various authors1-7.

In addition to the traditional fishing methods, fishermen all over the world have evolved some kind of traditional knowledge to attract and aggregate the fish to facilitate its easy harvest. Senanayak8 reported Athkotu as substrate based fishery from Sri Lanka. Other instances are the ‘Kathas’ of Bangladesh9, the ‘Samarahs’ in Cambodia10 and ‘Phoom’ of Manipur11. Katha, a fish aggregating device, is the traditional method of fishing in rivers where substrates like Colocasia esculenta and branches of bamboo, mango etc are used as a medium for algal attachment. Bernascek et al.12 have studied extensively the use of katha in the northeast region of Bangladesh. The ‘Samarahs’ in Cambodia is made out of the tree branches and bamboo shoots with floating aquatic weeds like water hyacinth. In the state of Manipur, substrate-based aquaculture systems are widely prevalent in the Loktak lake. Man-made floating islands of aquatic grass and weeds, locally called Phoom or Phoomdi, are spread throughout the lake and are used as the natural fish aggregating devices. In Assam, the fish farmers adopt a traditional practice in ponds and beels known as ‘Zeng’ fishery. In this method, bamboo branches, locally known as ‘Zeng’, are used as natural substrates in fish culture ponds to protect fish ponds from poaching. Besides attracting fish for shelter, it also provides food to the stocked fishes in the form of periphyton settled on rough surfaces.

Fish aggregating devices (FAD) are natural or artificial objects or structures placed at the bottom, suspended in the water column, or kept afloat on the surface of aquatic bodies to attract, aggregate and generate demersal, pelagic, resident or migratory fishes. These structures attract fish that congregate under and around them for the purpose of shade, shelter, food and breeding grounds. Several hypotheses have been reviewed for such aggregative and associative behavior of various fish species around natural or man-made objects13.

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The Kolong is a tributary of Brahmaputra which originates from Hatimura region of Jakhalabandha (Nagaon district). After traversing a distance of approximately 250 km through the districts of Nagaon, Morigaon and Kamrup, it meets the same at Kolongpar near Guwahati. The traditional fishermen along the Kolong river in Nagaon district of Assam use an age old practice that they have evolved utilizing the branches of Saora trees along with natural weed masses as a fish aggregating device. This is essentially a periphyton based aquaculture system which is also known as “brush park fishery” or “brush shelter fishery”. In addition to the use of traditional methods as mentioned above, this aggregation method provides an important source of livelihood for the fishermen. During the peak season, the riverine stretch is dotted with such aggregating complexes. This fishery lasts for 5 months (November to March) when the water level decreases and the rivers become calm and cool. The present study is a maiden effort to document an indigenous fish aggregating method using branches of Saora trees as a substratum for periphyton growth along with other weed masses.

Methodology

The study was conducted in the Kolong river during the month of November, 2012 to March, 2013. Field survey was conducted in the river stretch passing through Raha town of Nagaon district for studying the detailed operation of the fish aggregating device and the fishing method employed. Altogether four Fish Aggregating Device (FADs) were studied and its catch composition noted. Data on the FAD was collected through intensive field survey and interaction with the local fishermen and prominent citizens of the locality. To carry out the present study, the fishermen were contacted and a suitable date was fixed on which sufficient number of fishermen participated in the discussion. Relevant information about the FAD being practiced by the local fishermen was collected through PRA techniques. Besides, prior informed consent (PIC) was taken from the knowledge providers which in the present study were the local fishermen and prominent citizens of the area.

The Fish Aggregating Device (FAD) employed for catching fish is normally carried out during the post-monsoon months. When the water level recedes and the surface currents subside during the months of November to December, the fishermen select a deeper portion along the banks of the Kolong river for construction of the FAD. For preparation of the FAD, bamboo poles, branches of ‘Saora’ trees, two types of net namely an outer encircling net locally known as ‘Mosuri Jaal’ and an inner drag net, country made boats, locally fabricated implements for collecting branches of Saora trees, fine meshed-hapa, water hyacinth (Eichhornia crassipes) are commonly used.

Saora (Streblus asper) tree is a small-sized tree which is indigenous to tropical countries such as India, Sri Lanka, Malaysia, Phillipines and Thailand (Fig. 1). In India, it is known by several vernacular names such as Shakhotaka (Sanskrit), Siora (Hindi), Sheora (Bengali) and Saora (Assamese). Streblus asper is a well known ethnomedicinal plant and its use in the Indian traditional folk medicine is also well documented. Various parts of the plant are used for the treatment of piles, toothache, leprosy, filiariasis, elephantiasis, dysentery and diarrhea.

Results

Once the site has been selected, the fishermen fix the freshly cut branches of ‘Saora’ trees vertically and in close proximity to one another in the river bed. Close arrangement within the defined area creates a meshwork of branches that aids in the retention of water hyacinth and other aquatic weeds such as Salvenia sp and Pistia sp on the surface. This aggregate of branches topped with a thick vegetation of aquatic weeds constitutes the FAD (Fig. 2). In a single fishing season, the fishermen construct 6-7 such FADs within a kilometer along the river stretch. These FADs, once constructed, are retained undisturbed in this condition for 2-3 months to create an ideal habitat and shelter for the fishes. Fish begin to inhabit these structures after about two months.

On the day of fishing, the area is encircled by two types of net as mentioned earlier. First, the inner barricade is constructed by fixing bamboo poles on the river bed in a semi-circular manner around the FAD (Figs. 3 & 4). This is immediately followed by attachment of the inner drag net to the bamboo poles to prevent escape of the fishes from the cordoned area (Fig. 5). On an average, 4 to 5 fishermen participate in the fixing of bamboo poles and net attachment. Thereafter, the outer barricade is constructed in the same manner to which the ‘Mosuri Jaal’ is fixed. The distance maintained between the two nets is approximately 4 - 5 feet.
The Mosuri Jaal, a fine meshed net fabricated of nylon netting, is approximately 80 feet in length and 20 feet in height. Its mesh size is 1 – 1.2 mm. When fixed to the bamboo poles, almost the entire net is submerged under water and kept upright by attachment of sinkers to the footrope. The total length and height of the inner net are approximately 70 feet and 30 feet, respectively. When fixed to the bamboo poles, 20 - 22 feet of the net is submerged under water while the remainder projects above the water surface acting as a vertical fence to prevent escape of fishes during actual netting operation. It is usually constructed of polyamide material. Sinkers made of iron material are used and regularly spaced along the foot rope to retain the net in vertical position.

The first step is to narrow down the area covered by the drag net. This is achieved by physically removing the bamboo poles (to which the drag net is attached) and repositioning it in an inward direction thereby reducing the encircled area. The inward repositioning of the bamboo poles with the net affixed is repeated 4 to 5 times. To maintain the uniform distance between the two nets, the outer net is also repositioned inwards in the same manner as the inner net.

Upon completion of the two-tier barricade, water hyacinth is removed manually by slightly unfolding one end of the drag net and expelling the weeds into the space between the inner and outer barricade (Fig. 6). However, the entire vegetation is not removed and a portion of it is retained at one corner within the area covered by the drag net. It is done with a view to congregate and catch those fishes which might attempt to escape during progressive reduction of the area by the drag net. Another reason for its retention is that during actual catching by cast net, some fishes might escape and take shelter under the retained vegetation. These fishes are then finally caught by cast net by removing the water hyacinth. The fishermen remove the branches of ‘Saora’ trees either manually from boats or use locally fabricated devices as shown in Figs. 7 & 8. The retrieved branches are not disposed but retained on the upper slopes of the river banks for use in subsequent operations.

To carry out the actual fishing operation, cast nets are slowly laid from the boats from one end to the opposite end so as to encircle the area below (Fig. 9). Once laid, the two ends of the head rope and foot rope are gradually pulled by fishermen towards the bank and finally hauled (Fig. 10). The fishes are extricated from the net, collected and stored in live condition in a temporary installed hapa nearby (Figs. 11 & 12). The cast net is cleaned off any adhering twigs of Saora trees. After complete harvest, the brush shelter is rebuilt for the next operation. Fishing by cast net is repeated several times for complete harvesting. The fishes are preserved in live condition in a hapa so as to sell it in the next day auction.

According to the information gathered from the fishermen, the same FAD is reconstructed and used in the same location three times during the season. After catching the fish, the fishermen remove the bamboo poles and the nets and stack it on the banks. The same branches of Saora trees, but now devoid of leaves and bark, and water hyacinth are arranged as done in the first case and kept for one month to create a suitable habitat and shelter for the fish. The entire process is repeated as described earlier. After complete harvesting in the third attempt, the entire structure is dismantled as fishing is banned in Assam from 1st April to 15th July.

Discussion

Fig. 13 shows the average catch composition in the four FADs. In the present study, the catch was dominated by carnivorous fishes. On an average, Chitala chitala comprised nearly 44% of the total catch followed by Wallago attu which constituted 26%. Labeo calbasu and Aorichthys aor comprised nearly 10 % and 8%, respectively. The total catch in the four FADs studied is shown in Fig. 14.

Fish aggregating Device (FAD) is a permanent, semi-permanent or temporary structure or device made from any material and used to lure fish. Use of substrates to aggregate fish in the natural environment has been in practice for several centuries in different parts of the world. The FAD employed by the traditional fisher folk in the present study is being used from time immemorial. It is probable that the ancestors of the fishermen exploited the knowledge of fish behavior by practical observation and experience in evolving the present technique. In the present study, it was reported by the fishermen that the fish catch decreases when the same FAD is constructed and used three times in the same location and in the same season. That is, the catch is high in the first fishing attempt which decreases in the subsequent second and third attempts. According to the traditional belief, the high fish catch in the first attempt is attributed to the use of freshly cut branches of Saora trees with leaves and bark intact. The fisher folks believe that the fishes eat on the leaves and bark...
of the Saora trees. The lower yields in the subsequent attempts are believed by the fishermen to be due to the use of denuded Saora trees.

According to the authors, the high fish catch in the first attempt could be attributed to the retention period of the first FAD for 2 to 3 months after its construction. This period encourages good growth of periphyton on the rough bark surfaces of Saora trees and thereby provides abundant food for the congregated fishes. The subsequent FADs, once constructed, are retained for only one month. However, the Saora trees used in the subsequent

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Fig. 1-12 — Saora (Streblus asper) tree; (2) Fish aggregating device bounded by two tier net barricade; (3 & 4) Fixation of the inner net; (5) Fixation of the outer drag net; (6) Removal of weeds (7) Removal of Saora tree branches; (8) Wooden implement used for removal of Saora branches; (9) Laying of cast net; (10) Hauling of cast net; (11) Collection of harvested fish; (12) Harvested fish being stored in a hapa.
attempts are devoid of barks. This short retention period along with denuded stems may lead to lesser periphyton growth that is manifested in the lower yields of fish.

In _katha_ fisheries, fishermen mostly employ different types of floating aquatic vegetation such as _Enhydra fluctuans_, _Ipomoea aquatica_ and _Eichhornia crassipes_. For shelter of fishes, branches and roots of different trees such as _Barringtonia acutangula_, _Tamarindus indica_, _Enterolobium saman_, _Mangifera indica_, _Psidium guajava_ are widely used. In the present case, fishermen mostly used water hyacinth (_Eichhornia crassipes_) as aquatic vegetation and branches of _Saora_ trees for providing shade and shelter.

**Conclusion**

The brush park fishery using branches of _Saora_ trees is a simple, efficient, low cost, eco-friendly traditional fishing technique which contributes to satisfy the nutritional requirements of the fisher-folk besides generating additional income. These FADs are prepared with cheap and locally available materials. The fish catch obtained using this FAD can be increased if suitable modifications are incorporated. In brush park fishery, farmers employ several strategies to increase productivity. For instance, in ‘phoom’ fishing in Manipur, the fishermen increase weed density with the objective of stimulating periphyton growth and thereby augmenting fish production. Besides, the fishermen in Loktak lake fix porous feed bags containing broken rice and rice bran in the area to attract fish in the early stages of ‘phoom’ establishment. The following additional alternatives can be suggested to the fisher folk to increase fish production from FADs:

1. Dry coconut husks, which are easily available in rural households, with its rough surfaces can be tied to the branches of _Saora_ trees to encourage additional periphyton growth and fish yields.
2. Intact coconuts leaves can also be vertically fixed in the river bottom along with branches of _Saora_ trees thereby increasing the proportion of rough surface area availability and thereby stimulate periphyton growth and fish production.
3. Old jute bags and paddy straws can also be tied in the same manner which will contribute to periphyton and fish growth.
4. Locally fabricated bamboo mats can also be placed along with _Saora_ branches to achieve the objectives mentioned above.
5. In addition to the above alternatives, a traditional practice exists in some parts of Assam which makes use of the hollow stems of coconut and betel nut trees to stimulate the breeding of _Chitala chitala_, a predacious fish. Hence, initial incorporation of coconut stems during FAD construction will stimulate periphyton growth and will promote fish production. Retention of these stems after complete fishing will aid in the breeding of the predacious fish.

The alternatives suggested above are simple and shall contribute to increase in fish production. However, field trials are necessary to evolve technologies that are appropriate to the fishing practices noticed. Therefore, interaction with fishermen in carrying out field trials under the actual conditions would result in generating more useful information.

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