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ORIGINAL ARTICLE

Migratory behaviour based traditional fish trapping devices of Jeme-Naga tribe of Dima Hasao district, Assam

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ABSTRACT
The present study was carried out in the upper stretch of Jenam river, a tributary of River Barak, which flows through Dima Hasao district of Assam. Conventional fishing gears are not found to be very effective in fast flowing hill streams. Therefore, the local inhabitants of such areas generally use many traditional fish catching devices suitable to the location for catching fishes from these fast flowing hill streams. One such traditional fishing method namely Hebua and Heba operated by Jeme-Naga tribe is discussed in the present study. These traditional devices generally developed based on behavioural biology of the fish species and evolved over many generations. Participatory Rural Appraisal (PRA) methodology was adopted to collect information about this indigenous fishing method. A total number of 26 fisher folks as well as village elders were consulted through one to one interaction for detail documentation of the fishing method. In both these fishing methods, fishes are trapped by altering their path of movement and using the water current to the fullest extent to prevent their escape. Upward migratory behaviour of monsoon season and downward migratory behaviour of winter of hill-stream cyprinid fishes is effectively utilised in the operation of these fish trapping devices. The present study provides an insight to these eco-friendly, cost-effective and energy-efficient indigenous fishing methods.
Keywords; *Assam, Hebua, Heba, Jeme-Naga tribe, Jenamriver, Migratory behaviour, Traditional fishing traps.*

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INTRODUCTION

DimaHaso district formerly known as North Cachar Hills lies between 24° 57´ N to 25° 43´N latitudes and 92° 32´ E to 93° 28´ E longitudes in southern part of Assam. This hill district with an area of 4890 km^2, constituting roughly 6.24% of the total area of the state is one of the least populous districts of Assam. Borail hills cover a major portion of this district. Dima Hasao district shares its boundary with the states of Nagaland and Manipur in east; Meghalaya and Karbi-Anglong district in west; Karbi-Anglong and Nagaon districts in north; and Cachar district of Assam in south. Eleven different ethnic tribes namely *Dimasas*, *Jeme-Nagas*, *Hmars*, *Kukis*, *Biates*, *Hrangkhols*, *Khelmas*, *Jaintias*, *Karbis*, *Vaipheis* and *Rongmei Nagas* along with a sizeable population of non-tribals constitute the demographic profile of this hill district. Kapili, Dehangi, Diyung, Jatinga, Jenam, Mahur and Langting are the main rivers flowing through this district and drain ultimately into Brahmaputra and Barak rivers. These rivers are a rich repository of aquatic biodiversity particularly hill-stream fishes. Ethnic tribes of Dima Hasao employ a variety of fishing techniques in these rivers. Many of such fishing methods are based on indigenous knowledge and bear the distinction of being evolved in a particular community passed on through generations. Several documentations have been made pertaining to Indigenous technical knowledge (ITK) associated with fishing techniques in Assam and North east India [1][2][3][4][5][6][7]. Some other researchers have

documented ITK on fish harvesting of Karbi-Anglong, another hill district of Assam bordering Dima Hasao [8]. Traditional knowledge related to fish pond construction and maintenance, fish seed transportation and fish health management in the two hill districts of Assam (Karbi-Anglong and Dima Hasao) has also been reported [9]. However systematic studies on indigenous fishing methods employed by ethnic tribes in hill-streams of Assam in general and that of *Jeme-Nagas* of Dima Hasao district in particular are scanty. The present study is an attempt to document and scientifically analyse indigenous fishing methods employed in fast moving streams by *Jeme-Naga* tribe of Dima Hasao district of Assam.

MATERIAL AND METHODS

The present study was carried out in the upper stretch of Jenam river, locally known as Henamamong (means a hill stream) flowing through Dima Hasao district of Assam (Fig.1). Jenam is a tributary of River Barak with an approximate length of 90 km and it originates at *Nkiaruilo* mountains (1700 m m.s.l) bordering Kipeilo and Nchaikui village (locally known as *Henamruak*area) of Barail range in the district. It flows through Jenam valley and joins the Jiri river and finally debouches into the Barak River near Tatiphai village of Harinagar area (46 m m.s.l) in Cachar district, Assam .This upper stretch of Jenam river has an approximate length of about 30 km between its origin to Hangrum village. A total number of 9 field surveys were conducted during the year 2015-16 along the river stretch in 3 villages namely, Laisong, BoroNianglo and Hangrum (25° 10′44′′ N latitude and 93° 07′ E longitude), under Mahur revenue circle, Haflong sub-division of DimaHasao district for observing operation of these fishing method and its catch composition. These villages are inhabited by *Jeme-Nagas*, an important tribe of DimaHasao district, constituting around 24% of the total population. Although a larger share (near to cent per cent) of the population are fish-eaters, fishing is basically a subsidiary activity. 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 involved during the process of data collection. A total number of 26 fisher folks and villagers were consulted through one to one interaction for detail documentation of the fishing method. Secondary information on these gears was obtained from fishers as well as other villagers using focussed group discussions [10,11]. Participatory observations were also made on the fishing operation in the river stretch. Prior informed consent (PIC) was obtained from community leaders of respective villages as per CBD guidelines in order to use and publish the recorded information on these indigenous fishing methods, because knowledge associated with these indigenous fishing methods may be in public domain. Identification of fishes caught in traps was done with the help of standard keys [12, 13]**.**

RESULTS AND DISCUSSION

Jeme-Nagas of DimaHasao district employ a variety of fishing gears such as cast net, gill net, hook and line etc. However the success rate of these gears is quite low owing to the hilly terrain. Fishing traps are also quite common among *Jeme-Nagas* and is suitable for operation in hill streams with a higher success rate. These energy efficient and comparatively less laborious fishing traps occupy a special place in the community.

Hebua

Construction

It is a combination of fishing methods/gear comprising diversion of stream water channel, barrier fishing and conical bamboo traps (Fig.3). This traditional fishing trap is operated in small hill streams during the months of April to June and from September to November. The frame of the trap is constructed with the help of 6-7 pieces of bamboo (*Bambusa* sp.) each of 0.9-1.2 m in length and tied with ropes made out of bamboo strips. The main body is constructed from 4-5 pieces of bamboo and has an overall length of 2.0-2.4 m. Operational life of this fish trapping device is around 2-3 months. Expert fishers of *Jeme-Nagas* can construct this trap within 2-3 hours. The trap is installed along the direction of water flow in small channels adjoining the main river with moderately strong water current (0.50-0.75 m/sec). Initially an adjoining portion/channel of the river of 15-20 m width is selected/artificially created which is gradually narrowed down to 0.3-0.5 m towards the end. The installation site is prepared by removing the bigger sized stones from river bed and replacing them with two parallel rows of smaller pebbles to ensure smooth water flow as well as to prevent escape of fishes. The trap is then installed at the tapered end of the channel. At first the frame is installed and fixed to the channel bed manually, followed by the main body. The frame of *Hebua* consists of two triangular structures fixed at opposite ends of the channel hold together by two pieces of bamboo, one each at the top and bottom of the frame respectively (Fig.2). The main body of this trap is made of two sections both of which are made of bamboo strips of 0.4-0.5 cm in diameter and fastened together by ropes made out of cane (*Calamus* sp.) supported by bamboo strips. A

gap of about 0.2-0.3 cm is maintained between the bamboo strips. The mouth section is semi-circular in shape with a tapering end. The tail portion of this trap is a conical structure with small meshes for draining out water once it is hauled (Fig.2). The mouth of the main body is placed at the tapered end of the prepared channel. It is fixed to the bamboo frame at a little height above the ground with the help of cane ropes and at the same time ensuring smooth flow of water through it. The tail end of this fish trapping device where fishes ultimately gets accumulated is then fastened to the mouth section at an angle of 35^{o} downwards so as to create a sudden increase in water velocity and prevent escape of fishes by swimming backwards. This tail end is then fastened to the frame with the help of coir ropes.

Operation

The trap is installed at the site of operation during evening hours and the catch is collected in the morning hours of following day. Fishes trying to migrate from higher to lower altitudes of the stream faces the *Hebua*. Diversion of the stream water channel facilitates entry of the migratory fishes into the conical traps. As the fishes try to pass through the *Hebua*, they ultimately get trapped in the conical traps. At the time of harvest only the tail section of the trap is untied from the frame as well as from the mouth section of the main body. Once the trapped fishes are removed manually the tail section is then fastened again and the trap becomes ready for operation again.

Heba

Construction

This fish trapping device is a combination of barrier fishing, cylindrical bamboo poles and conical bamboo traps. It is another traditional fishing trap, indigenous to *Jeme-Naga* tribe of Dima Hasao hills. It is operated in small hill streams with moderate to strong water current (0.50-0.75 m/sec). Unlike *Hebua* this trapping device is operated in natural free-flowing channels of the river. This fishing trap consists of 3 sections namely, the *bana*, which is basically a bamboo screen made of split bamboo; a short bamboo pole with openings on both sides; and a bamboo basket for collecting fishes (Fig.3). A total of 10-12 bamboo pieces of 1-1.5 m length are required for constructing the *bana*. The height of the *bana* is approximately 0.8-0.9 m and the bamboo strips used for its construction has a diameter of 0.8-1.0 cm with a gap of 0.3-0.5 cm between the strips (Fig.3). A piece of bamboo of 0.5 to 0.7 m length with openings on both sides acts as the connecting link between the *bana* and the fish collecting basket (Fig.3). The conical bamboo basket is constructed from single piece of bamboo of 1.0-1.5 m length approximately. Expert fishers can construct this fishing trap within 3-4 hours. This fishing trap has an operational life of 2-3 months and is operated during October - November as the water temperature falls gradually. Initially a suitable narrow channel of the river with a steep slope is selected and depending on the width of the channel *bana* is constructed and installed. The bamboo screen is supported by 5-6 vertical bamboo/wooden poles erected on both sides of the screen at regular intervals as well as at both ends. These poles are supported by bigger stones placed at their base so as to keep the poles intact against the water current and prevent the *bana* from collapse. Besides 2-3 bamboo strips are tied horizontally to the *bana* with the help of slender bamboo strips or cane strips to add more strength to the bamboo screen. The *bana* is prepared with small mesh and fixed firmly to the river bed such that fishes cannot escape through or below the screen (Fig.4). The *bana* has two sections and at the time of installation the two portions are fixed at a distance apart such that there is a small gap sufficient for placing the bamboo pole which has opening on both sides. The *bana* is erected at a steep portion of the river. The bamboo pole is then installed parallel to the river bed right at the base of the *bana* i.e. at the small opening between the two portions of the *bana* and supported by stones piled on both sides so as to keep it intact. As the channel bed is steep, strong water current is created naturally at the site of installation. The fishes move through the hollow bamboo pole and are collected in the bamboo basket fixed at the end of the pole. This tail portion of the trap i.e. the basket is joined to the hollow bamboo pole at an angle of 30-35° downwards and is fastened tightly with the *bana* using cane strips. It is made of bamboo strips of 0.4-0.5 cm in diameter with a gap of 0.1-0.2 cm between the strips. A small sized stone is placed just behind the basket to maintain its stability and prevent it from getting washed away.

Operation

Construction of the bamboo screen creates an obstruction to the flow of stream water. As a result, a difference in water level and water current is developed at that spot. Fishes undergoing migrates faces this obstruction and tries to overcome it. As the fishes continuously tries to pass through the *Heba,* it suddenly enters the hollow bamboo pole connecting the two sides and immediately get trapped in the conical bamboo trap of the other side. The strength generated inside the bamboo pole and the tail section owing to the steep slope prevents the escape of fishes by swimming backwards. The tail end of the trap has numerous small openings/meshes through which the water flows out. At the time of harvest the tail end is untied from the main body. Once the fishes are collected, it is fastened again to the bamboo pole.

The basket used in *Heba* resembles the tail section of *Hebua* both of which acts as the fish collector in terms of shape, structure and application. These traps are also operated during the night hours and fishers collect the catch early in the morning.

The catch in both these traps is dominated by migratory cyprinid fishes. Cyprinids like *Garra elongata*, *G. gotyla*, *Labeo dyocheilus*, *Raiamas bola*, *Tor putitora, Acanthocobitis botia* comprise more than 80% of the total catch (Fig.4). In addition by catch in form of frogs, freshwater prawns and crabs are also trapped in these fishing devices. The catch in these traps comprise of small size fishes ranging from 8-20 cm in length and weighing up to 150-200 g. During peak season (October-November), the catch of these traps can be as high as 3-4 kgs/day (24 hours).It is basically a subsistence level fishing technique with the catch being primarily used for household consumption. Sometimes surplus catch of these traps are also sold in the local market.

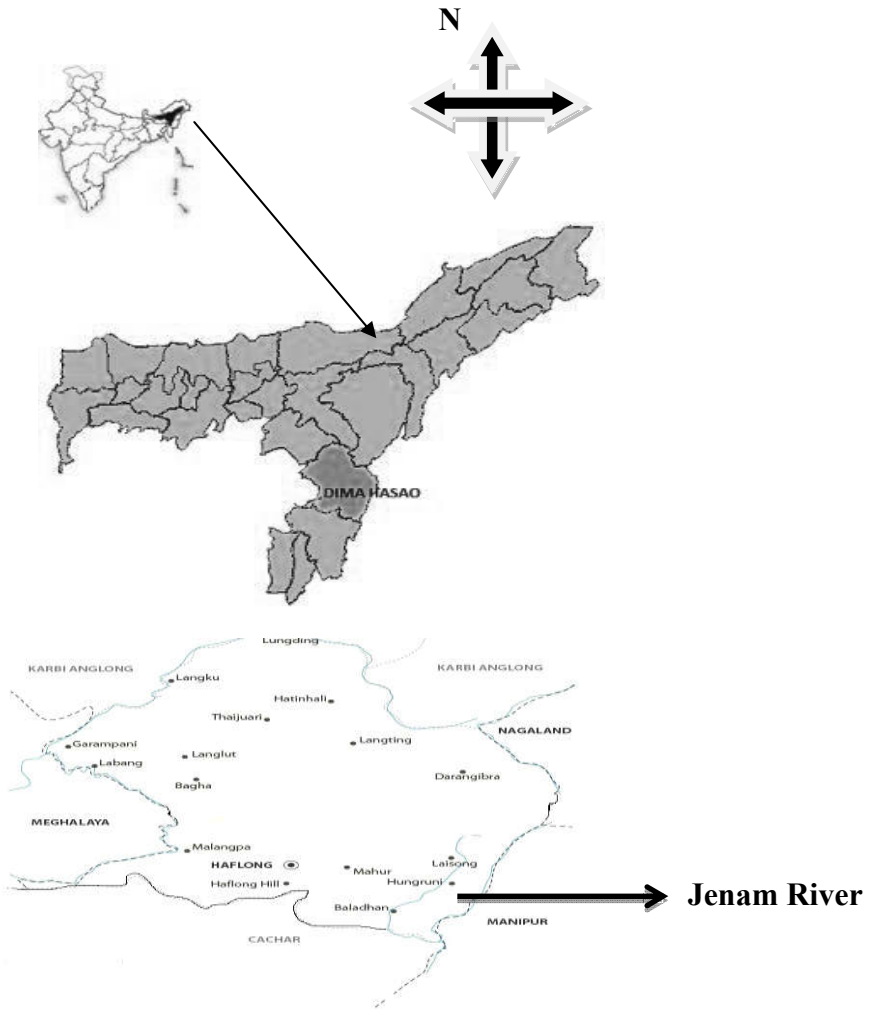

Fig. 1: Jenam River, DimaHasao district, Assam, India

Fish behaviour is one of the most important aspects to be considered for successful implementation of any fishing method/device. There are over 22000 different species of teleost fishes, each with its own characteristic world of reaction and behaviour, so that numerous appropriate fish capture systems have been invented over the years. In order to be successful, the fisherman must have local knowledge of the day-to-day/seasonal movements and life-history traits of fish as well as their likely distribution pattern.

Besides it is imperative that in all fisheries, one of the most important of the fisherman's skills is to use the appropriate fishing technique at the right time in the right place [14]. Most of the cyprinids found in hill-streams are migratory by nature. They migrate to the upper stretches during monsoon for breeding and migrate downstream for food and shelter as well as to get rid of the low temperature regime in the upper stretches during winter [15]. The fishers of *Jeme-Naga* tribe make use of this migratory behaviour biology of hill-stream cyprinids. Traps (*Hebua* and *Heba*) are placed along the path of fish migration and

fishes are channelized in to the traps by diversion which is done either by creating a new channel or obstructing their path of movement. The angle of attachment (30-35° downwards) of the tail section (where fishes accumulate) of both the traps, along with the increased water velocity at this point make it impossible for the captured fishes to escape by swimming backyards. Traps are devices designed to encourage entry of animals, which are then prevented from escaping either by particular aspects of their behaviour or by design of the trap itself [16]. Catching fishes by deploying traps along their path of movement is a common fishing method employed by traditional fishers all over the world [17] .Traps can fish continuously during day and night with periodical checking and the organisms can be retrieved alive without any damage [18]. This fishing method has some resemblance with *Bheta* fishing practiced by Nocte tribe of Tirap district, Arunachal Pradesh. The *Hebua* and *Heba* traps operated by *Jeme-Naga* tribe are found to be very efficient in terms of fish catch.

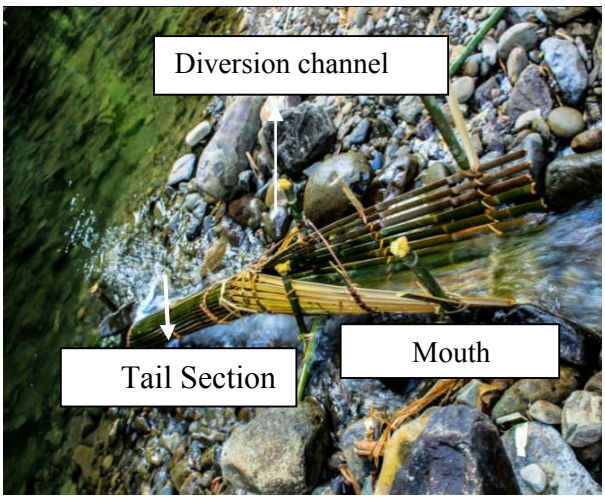

Fig. 2: Hebua

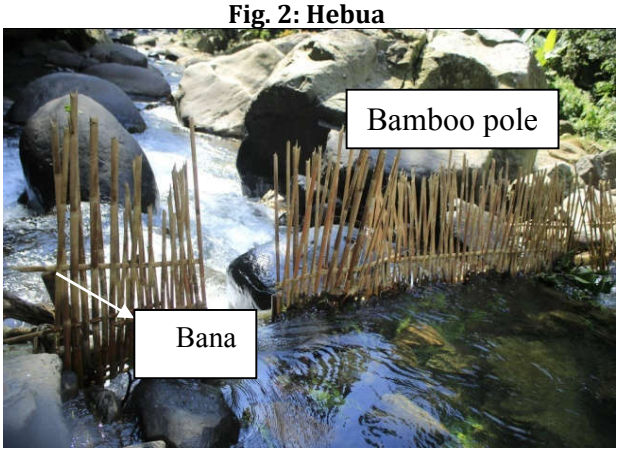

Fig.34: Heba

Fig. 4: Catch from *Hebua* and *Heba*

Fish trapping devices are environment friendly and energy-efficient passive gears. These traps are made out of locally available materials making them cost-effective. Fishing with conventional gears such as fishing nets is not very efficient in hill-streams, due to uneven stream bed and torrential flow. Of late, there are increasing incidences of destructive fishing as poisoning and dynamiting has been reported from hill-streams of India [3]. These destructive practices cause wanton destruction of both target and non-target species, thereby posing a major threat to riverine biodiversity and should be strongly discouraged. Fishing with traps like *Hebua* and *Heba* based on indigenous knowledge inherited from their ancestors is an integral part of the culture of *Jeme-Naga* tribe. Fishing with these eco-friendly, cost-effective and energy-efficient indigenous traps should be encouraged which can help in judicious utilization of our precious riverine ichthyo-faunal resources and at the same time provide a sustainable livelihood to the poor fishers.

CONCLUSION

In both these fishing methods, fishes are trapped by altering their path of movement and using the water current to the fullest extent to prevent their escape. Upward migratory behaviour of monsoon season and downward migratory behaviour of winter of hill-stream cyprinid fishes is effectively utilised in the operation of these fish trapping devices. The present study provides an insight to these eco-friendly, cost-effective and energy-efficient indigenous fishing methods.

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REFERENCES

1. Bhattacharjya BK, Manna RK, Choudhury M. (2004). Fishing Crafts and Gear of North East India, Bulletin no. **102**, (CIFRI, Barrackpore): 67
2. Baruah D, Dutta A, Pravin P. (2013). Traditional fish trapping devices and methods in the Brahmaputra valley of Assam. Indian J Trad Knowle; 12(1): 123-129
3. Dutta R, Dutta A. (2013). Bheta fishing-A traditional community fishing practice of Nocte tribe of Tirap district, Arunachal Pradesh. Indian J Trad Knowle; 12(1): 162-165
4. Dutta R, Bhattacharjya BK. (2009). A traditional fishing method of Assam for catfishes using duck meat as an attractant. Indian J Trad Knowle; 8(2): 234-236
5. Dutta R, Bhattacharjya BK. (2008). An indigenous community fishing practice of Tirap district, Arunachal Pradesh. Indian J Trad Knowle; 7(4): 624-626
6. Nath KD, Borah S, Chetia BR, Saikia N, Saud BJ, Majumdar RK. *et al*. (2018). Indigenous fishing techniques and their effectiveness as perceived by fishers in Cachar district, Assam, India. Indian Journal of Fisheries; 65(1):110-115.
7. Ahmed I, Borah S, Bhattacharjya BK, Landge AT *et al*. (2018). An indigenous predatory fish catching technique of lower Brahmaputra vally, Assam. Journal of Entomology and Zoology studies. (In press)
8. Kalita B, Dutta A, Bhagabati SK, Sharma A. (2010). Indigenous technical knowledge for fish harvesting in Karbi-Anglong district of Assam. Indian J Trad Knowle; 9(2): 252-255
9. Kalita B, Choudhury M, Ojha SN. (2004). Indigenous technical knowledge on pond construction and maintenance, fish seed transportation and fish health management in Assam hills. Indian J Trad Knowle; 3(2): 192-197
10. Townsley P. (1993). Rapid appraisal methods for coastal communities, (Bay of Bengal Programme, Madras): 110
11. Schonut M, Kieveltiz V. (1994). Participatory learning approaches- Rapid rural appraisal; Participatory rural appraisal- An introductory guide, (Springer-Verlag, Berlin): 183
12. Talwar PK, Jhingran AG. (1991). Inland fishes of India and adjacent countries, Volume 1&2, (Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi): 1158
13. Kottelat M. (2013). The Fishes of the Inland Waters of Southeast Asia: A catalogue and core bibliography of the fishes known to occur in Freshwaters, Mangroves and Estuaries, Raffles Bulletin of Zoology, Supplement; 27: 1-663
14. Wardle CS. (1986). Fish Behaviour and Fishing Gear. In: The Behaviour of Teleost Fishes (Eds.: T.J. Pitcher). Springer, US; p463-495
15. Hora SL. (1922). Structural modification in fish of mountain torrents, Rec IndMus: 24-31
16. King MG. (2007). Fisheries Biology, Assessment and Management. Blackwell Publishing Ltd., Oxford, UK.

17. Brandt A. (1984). Fish catching methods of the world. Fishery Newsbooks Ltd., Farnham Survey, England
18. Baruah D, Dutta A, Pravin P. (2010). Fish trapping devices in the Brahmaputra valley of North Eastern India. In: Coldwater fisheries management (Eds.: P.C. Mahanta and D. Sarma). DCFR, Bhimtal, UA; p177