Journal of Fisheries
Volume 3 Issue 2 Pages: 251–258 August 2015
Peer Reviewed | Open Access | Online First

eISSN 2311-3111
pISSN 2311-729X

DOI: https://doi.org/10.17017/j.fish.100

Original article

Fishing devices of the river Siang in Arunachal Pradesh, India

Biplab Kumar Das[1] • Ngasepam Romen Singh[1] • Prasanna Boruah[2] • Devashish Kar[3]

[1] *Department of Life Science and Bioinformatics, Assam University, Silchar 788011, Assam, India*

[2] *Assam Remote Sensing Application Centre and Assam Science Technology and Environmental Council, Guwahati 781005, Assam, India*

[3] *Department of Life Science and Bioinformatics and School of Life Sciences, Assam University, Silchar 788011, Assam, India*

Correspondence: Biplab Kumar Das, Department of Life Science and Bioinformatics, Assam University; Email: biplabkumar1987@gmail.com

Received: 28 Jan 2015, Received in revised form: 17 Jul 2015, Accepted: 25 Jul 2015, Published online: 31 Aug 2015

Citation: Das BK, Singh NR, Boruah P and Kar D (2015) Fishing devices of the river Siang in Arunachal Pradesh, India. Journal of Fisheries 3(2): 251–258. DOI: 10.17017/j.fish.100

Abstract

Fish is one of the best sources of animal protein of the food. Fishing and hunting are the oldest profession of all mankind since man began his search of food. Traditional fishing catching devices which were operated in River Siang, Arunachal Pradesh have been studied with respect to its operation, structure and productivity. The small depicted work highlight 13 different types fish catching devices, which have been classified into 5 different types *viz.*, (i) Encircling Gear (*Khewali Jal, Angtha Jal* and *Ber Jal or Jeng Jal*) (ii) Entangling Gear (*Langi or Current Jal* and *Phansi Jal*) (iii) Scooping Gear (*Sip Jal* and *Thela Jal*) (iv) Hooks and Line fishing (*Nal Barshi* and *Doogabanshi*) (v) Traps (*Chepa, Dingora, Polo,* and *Kholaha*). The present study was carried out from June 2012 to July 2013 in a 58km stretch of River Siang in East Siang district of Arunachal Pradesh. Some methods can be considered as traditional as well as non-traditional since they are well known in some other states of North-East as well as also in the country with some different kind of variation. Various fishing techniques depend on various behavioral pattern and microhabitat type of fishes.

Keywords: Fish, fishing methods, rivers, Siang, Arunachal Pradesh

INTRODUCTION

Arunachal Pradesh, the entire 2000 km of rivers are of true rheophillic type (Kar 2007). An application of crafts and gears in the fishery is a result of experience gained over a long period of time (Baruah and Hazarika 2011). Selection of fishing methods and gears are influenced by various factors such as physiographic of the water body, nature of fish stock, characteristics of the raw material from which gear are fabricated and standard of living (Baruah and Hazarika 2011; Gurumayum and Choudhury, 2007). The survival, reproduction, growth, production or management of fish depends on good water quality variables (Imnatoshi and Ahmed 2012). Therefore, variation in application of gear can be observed in different rivers, which have characteristic of their own due to unique nature of the water resources of the region (Dutta and Bhattacharjya 2009; Gurumayum *et al.* 2006).

Primitive man was entirely dependent on wild life existing around him to full-fill his daily needs. He has been using various methods to catch fish since the prehistoric times, and fishing gear has undergone evolution in different parts of world giving rise to various methods of the present day. Most of fish catching devices have to break off operations after a certain period of activity, for rest and repair. The number of fishing cycle per day depends upon the daily pattern of occurrence (density) of fishes, types of fishing methods used, geographical condition of

fishing grounds and fisherman.

The traditional fishing methods in the different water bodies of Northeast India have been described by various authors (Gurumayum and Choudhury 2007). Fishermen all over the world use some kind of traditional knowledge or other to attract and aggregate the fish to facilitate its easy harvest. The artisanal fishermen of the state use wide fish catching techniques and methods. The fishermen of Arunachal Pradesh use wide varieties of fishing gears (Kar 2007).

The fishing gears of different water bodies have been studied by many researchers from time to time and they reported different types of fishing gears in India and adjacent countries. (Kar *et al.* 2007; Galib *et al.* 2009 and 2010, Gurumayum and Choudhury 2009; Lalthanzara and Lalthanpuii 2009; Remesan *et al.* 2009; McClanahan *et al.* 2011; Srivastava and Srivastava 2011; Islam *et al.* 2012; Chakravartty and Sharma 2013; Upadhyay and Singh 2013). In river Siang of Arunachal Pradesh till not anyone reported on fishing gears of the particular river. In this regard keep on mind, the present investigation has been taken up and emphasis is given on the fishing gears of different portions of the river Siang.

METHODOLOGY

The river Siang, is the largest river of Brahmaputra river system, originates from Chema Yungdung Glacier near Kubi at 5150 m in Tibet. In Tibet it is popularly known as Tsang-Po, flows in West–East direction. After traversing a distance of about 1625 km river in Tibet and then it takes a turn in south direction, enters the territory of India near Tuting in the Upper Siang district of Arunachal Pradesh and flows through North–South direction in East Siang district towards Assam and finally it merges with Lohit and Dibang in Assam and it becomes the mighty River Brahmaputra (Das *et al.* 2014).

The present study was carried out from June 2012 to July 2013 in a 58 km stretch of the river Siang in East Siang district of Arunachal Pradesh. The fishing techniques were classified based on Lal (1969) and Brandt (1972). The fishing techniques of Pumlen Lake were made by direct observation of fishing and consulted the local fisherman for demonstration of various techniques of fishing generally used in locality. Gear efficiency was determined on the basis of catch per haul and catch per man-hour (Dey 1981). The economics of the fishing gears was worked based on the field data, using standard procedure (FAO 1974). The local fish preservation of the fishes and socio-economic status of the fisherman community inhabiting around the island and peripheral villages were also studied by direct conservation and discussion with fisherman community.

The mighty Siang River flows through the district which joins the Brahmaputra in the plains of Assam. Information of fishing methods is collected through intensive field survey and interaction with local fisherman especially Assamese and Mishing Tribe and prominent citizens from different parts of river and also downstream of the river. The information was gathered through field visit and inquiring directly to the fishermen about the details of the fishing gear they used, mechanism of operation and types of fish caught in the study area.

RESULTS

A diverse range of fishing gears and methods had been evolved over a long period of time by the fishermen of river Siang of East Siang, to capture a wide range of fish species. The Aadi and Missing tribes of Arunachal Pradesh and in downstream of river (Assam) developed and practiced different types of fishing methods since the time immemorial. The indigenously used fishing devices, their construction and the methods of applications are described here-

Fishing without gears

This was probably the simplest method of catching the fishes, which was caught by hand in shallow water. In the hilly river, water flows out through narrow channels. The fishes that come out in the shallow channels are picked up by hand and also it usually used to collect the fishes from below of the boulder.

Encircling gear

The encircling gears were found to be operated in shallow water and the following types of encircling gears had been recorded.

***(a) Khewali Jal*:** Khewali Jal (Figure 1) was a type of cast net and this was the most common form of net used in the study area. It was a conical cast net of 4-6.5 m in length having 6-18 mm mesh size. Sometimes it colored dark brown. Along the inner edge of the mouth of the pockets runs a chain of drum shaped sinkers. A rope is attached to the apex of the cone. The end of the rope in the fisherman's left hand and the net folded on his right hand. Generally all types of fishes were caught by this net.

(b) Aangtha Jal: It was also a cast net of larger sizes, generally 4-6 m in length and 3-5 m in circumference. Aangtha Jal contains several pockets at the bottom end and were fitted with sinkers made-up of iron rings. This circular cast net was usually operated from boat. It was made up of nylon twine and usually contains more sinkers of 5 to 10 kg weight. Medium and even large sized carp

and cat fishes were caught by this net (Baruah and Hazarika 2011; Gurumayum and Choudhury 2007).

Figure 1: Khewali Jal

Figure 2: Aangtha Jal

(c) Ber Jal or Jeng Jal: It was a large rectangular seine net as surrounding net (Figure 3). The net was shut in a semi-circle with the shore as based and is hauled up on to the land by gradually pulling in either end.

Figure 3: Jeng Jal

Two boats each of which carries half of the net do the paying of the net. The boat proceeds to an appropriate distance from the shore turn to both side and raw towards the shore, simultaneously realizing the net. The net was then hauled up and the catch is collected at the middle point of the net. The size of the net was depend upon the on the size of the river or pond. This net was quite common water bodies of adjacent countries like Bangladesh and sometimes used by many researchers for sampling for fishes in their studies (Galib *et al.* 2009, 2010 and 2013; Mohsin et al. 2013 and 2014; Chaki *et al.* 2014).

Entangling gears

Entangling gears such as gill nets were passive fishing gears and usually operated by drifting in surface and column layer of water. Common types of drift nets were as follows:

(a) Langi Jal or Current Jal: Langi Jal (Figure 4) was rectangular nets which were provided with head and foot edges. This small meshed drift net was more effective in entangling the fish. Its length varied from 100 m while the breath from 0.4-1.4 m. Smaller bamboo sticks were used as floats while burned clay are used as sinkers. It was thrown over the water particularly from one shore to another. Sometimes the net was tied against the current and allowed to drift over-night. Fishes gets entangle in the net by their operculum.

Figure 4: Langi Jal or Current Jal

(b) Phansi Jal: Phansi Jal (Figure 5) was a common gill net. It was also rectangular in shape and are made of light materials *i.e.* nylon or cotton hemp. The method of operation involves several indigenous mechanisms to drive the away the fishes into the net. Nylon or cotton hemp was used for this net.

Scooping gears

These gears take the fish by moving the nets swiftly in water bodies and lifting the catch out of the water. This method was to submerge a hanging net, then pull it rapidly out of the water so as to capture any fish which happen to be over it. The smaller net of this type hand operated but bigger one needs mechanism on land or a boat. The netting was supported on a round or rectangular frame.

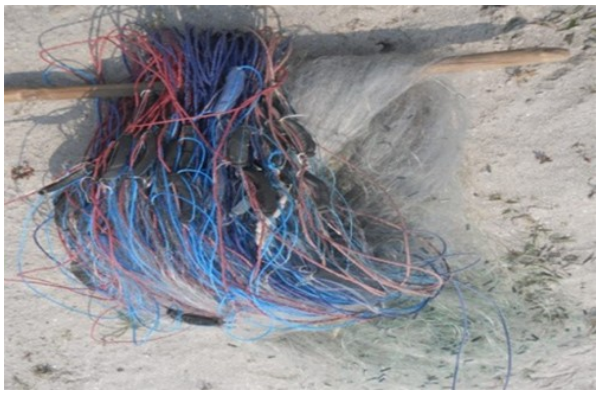

Figure 5: Phansi Jal

(a) Sip Jal: Sip Jal (Figure 6) was a mobile scooping gear. This square shaped net was a having area of 6 to 12 m. Each of the four corners was fastened to each of the four ends or two flexible bamboo tied together crosswise at the middle. Another bamboo pole was tied together at the center of the frame to act as a handle. The net was plunged into the shallow water and raised up at intervals to catch fishes entrapped on it.

Figure 6: Sip Jal

(b) Thela Jal: Thela Jal (Figure 7) was the common form of scooping gear. The net was fitted to a light triangular bamboo frame. The bamboo frame was constructed with three small bamboos. Two divergent bamboos, one being longer than the other, meet behind at acute angle and the third bamboo joins their free ends to form a triangular shape. The fisherman put their hands in the handle and walks in knee deep water and pushes the free end of the net through the bottom of the river. After a while the net was raised to collect the fishes that may come in the net.

Hooks and line fishing

The fishes were individually caught and retained by hooks. Though the quantity of catch was less, catch obtained by the line fishing was generally of high quality and of commercial value. Environmental impacts of the lines were considered to be minimal. The line fishing technique was highly energy efficient and the investment on gear operation was generally low. Line fishing was basically composed of a line and hook of different shapes and sizes.

Figure 7: Thela Jal

(a) Nal Barshi: This type of hook bears a rod instead of bamboo, which was of about 1 m long and was tied centrally with a nylon rope with a hook, which can float freely at the right angle (Figure 8). The size of the device was 1 m long.

Figure 8: Nal Barshi

(b) Doogabanshi: It was such kind of a nylon wire or a line that used to collect the fishes from the river (Figure 9). These fishing gears generally operated by two to four individual in the hill stream river. The length of gear was depends upon on the river type and number of operated persons. 5-10 m long wire were used in this kind of fishing.

Fishing traps

Traps were fishing devices where fishes were bait or shelter spaces or enclosures where they were guided to enter. The trap was a passive fishing process of ancient origin.

(a) Chepa: It was most commonly used fishing trap. It was a drum shaped sieved bamboo trap, tapering at both ends

(Figure 10). One opening was closed by a piece of wood while the opening on the other side was half closed by another piece of wood. There was also an opening at the side of the trap with bamboo stripes extended inwards so that fishes get an easy entry to the trap while extended gill like bamboo stripes prevent them from escaping. The trap was facing the opening against the current.

Figure 9: Doogabanshi

Figure 10: Chepa

(b) Dingora: It was made up of bamboo stripes, rectangular in shape having a mouth at one side with the sieve directed inwards, like spines (Figure 11). It was set between two guard walls, made of screw of vertical split bamboo, inclined to each other at an obtuse angle.

(c) Polo: The polo (Figure 12) was a bell shaped slit bamboo trap with a small opening on the top is 10 - 25 cm and in bottom 50 - 80 cm; usually 0.5 - 1 m in height. The fishermen walk into the water press down the Polo in front of him/her and the stopping down plunges his/her hand through the opening at the top and gropes in the mud for fish that were trapped.

Figure 11: Dingora

Figure 12: Polo

(d) Kholaha: It was a funnel shaped fishing trap (Figure 13). Funnel shaped fishing basket was made up of several stripes. A ring of bamboo supports the circular wide mouth. The whole body was woven by a spirally travel bamboo or cane slip.

Figure 12: Kholaha

Table 1: Distribution, size and major target species of traditional fishing devices used in the river Siang

Category	*Name of the Gear*	*Gear description*	*Major target species*
Fishing without gear	Hand	-	*Monopterus cuchia* and *Mastacembelus armatus*
Encircling gears	Khewali Jal	4-6.5 m in length and 6-18 mm mesh size	*Puntius* sp., *Mystus* sp., *Glossogobius giuris, Devario aequipinnatus* and *Cabdio morar*
	Aangtha Jal	4-6 m in length and 3-5 m in circumference	*Esomus danricus, Garra* sp. and *Amblypharyngodon mola*
	Ber jal or Jeng Jal	Based on the size of the water body	*Catla catla, Wallago attu, Labeo* sp. and *Xenentodon cancila*
Entagling gears	Langi Jal or Current Jal	Length 100 m and width 0.4-1.4 m	*Labeo* sp. and *Cirrhinus reba*
	Phasi Jal	Nylon or cotton hemp	*Salmophasia bacaila,* and *Puntius* sp.
Scooping gears	Sip Jal	6-12 m	*Eutropiichthys vacha, Sperata aor,* and *Clarius batrachus*
	Thela Jal	-	*Notopterus*, IMC,
Hooks and lines	Nal Barshi	1 m long	*Catla catla, Ompok* sp. and *Rita rita*
	Doogabanshi	5-10 m long wire	*Tor tor* and *Mastacembelus armatus*
Traps	Chepa	-	*Acanthocobitis botia* and *Aborichthys elongatus*
	Dingora	-	*Badis* sp. and *Amblyceps mangois*
	Polo	10 - 25 cm opening, height: 0.5 - 1 m.	*Wallago attu* and *Channa* spp.
	Kholaha	-	*Macrognathus aral* and *Cyprinion semiplotum*

DISCUSSION

Different types of nets and fishing traps are used in river Siang for fishing. The common and effective fishing gears operated in river Siang were cast net, gill net, scoop net, different types of fishing traps, hooks and also line fishing (Doogabanshi) and these were operated in the different zones of the river. Diversification of the river channel and fishing by the hand were common methods that are usually practiced by the common people of the East Siang district of Arunachal Pradesh. Destructive fishing methods like use of pesticides, chemicals and blasting etc. were imposing serious threat to the fish diversity of the Siang River.

The present study reveals that the Siang River is suitable for fish growth and propagation but due to the effects of some anthropogenic activities especially unscientific methods of fishing like blasting, use of chemical and pesticides for the fishing, diversification of channels hampers the high rate of fish growth and propagation in this ecosystem as these methods kills the mature, gravid as well as brood fishes.

CONCLUSION

The success of these fishing techniques depends on various factors like selection of site, time, efficiency of materials used and availability of fish, etc. instead of modifying and improving the existing traditional methods, destructive methods of fishing like chemical poisoning, dynamiting, electro-fishing, etc., become very popular but destructive for aquatic ecosystem including fishes against the discussed traditional methods. Therefore, with the use of these eco-friendly fishing devices and methods should be popularized for capturing of fishes among the fishermen in order to conserve the fish diversity in the rivers and streams. So, it is high time to total ban on poisoning, dynamiting and electro-fishing, fishing during breeding season should be enforced immediately for conservation fish resources in River Siang of Arunachal Pradesh for developing appropriate fishing gear in order to exploit the fishery resources in a proper judicious manner.

ACKNOWLEDGEMENT

The authors are thankful to Assam University, Silchar and to the UGC, New Delhi for granting UGC-Fellowship to the First author. Most importantly, I thank the Fishermen of villagers and specially Missing and Assamese people of Assam and Arunachal Pradesh for their kind necessary help and co-operation for this study.

REFERENCES

Brandt AV (1972) Fish catching method of the world. Fishing News (Book) Ltd. London.

Baruah D and Hazarika LP (2011) Present environmental and biodiversity status of the Down Stream of Subansiri River basin, Riparian Zone and Forest: A Pre-Impact assessment of the 2000 MW Lower Subansiri Dam. Final Technical Report of UGC Major Research Project.

Chaki N, Jahan S, Fahad MFH, Galib SM and Mohsin ABM (2014) Environment and fish fauna of the Atrai River: global and local conservation perspective. Journal of Fisheries 2(3): 163-172. DOI: 10.17017/jfish.v2i3. 2014.46

Chakravartty P and Sharma S (2013) Different Types of Fishing Gears used by the Fishermen in Nalbari district of Assam. International Journal of Social Science and Interdisciplinary Research 2(3): 177-191.

Das BK and Kar D (2011) Habitat Mapping, Spatial Analysis of Fish Diversity of River Subansiri during winter season in Assam and Arunachal Pradesh (India). Environment and Ecology 29 (4A): 1948-1951.

Das BK, Boruah P and Kar D (2014) Study of Seasonal Variation of Water Quality of River Siang in Arunachal Pradesh, India. IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) 8(2IV): 11-20.

Dey SC (1981) Studies on Hydro-biological condition of some commercially important lakes (Beels) of Kamrup district of Assam and their bearing on fish production, Final Technical Report, North-Eastern Council (Govt. of India), Shillong. 177 pp.

Dutta R and Bhattacharjya BK (2008) An indigenous community fishing practice of Tirap district, Arunachal Pradesh. Indian Journal of. Traditional Knowledge 7(4): 624-626.

Dutta R and Bhattacharjya BK (2009) A traditional fishing method of Assam for catfishes using duck meat as an attractant. Indian Journal of. Traditional Knowledge 8(2): 234-236.

FAO (1974) Design of Fisheries Statistical Surveys: Inland Waters. FAO Technical Paper 133, pp. 1-122.

Galib SM, Samad MA, Kamal MM, Haque MA and Hasan MM (2009) A Study on Fishing Gears and Methods in the Chalan Beel of North-West Bangladesh. Journal of Environmental Science & Natural Resources 2(2): 213-218.

Galib SM, Samad MA, Hossain MA, Mohsin ABM and Haque SMM (2010) Small Indigenous Species of Fishes (SISF) in Chalan Beel with Reference to their Harvesting and Marketing. Bangladesh Journal of Progressive Science and Technology 8(2): 251-254.

Galib SM, Naser SMA, Mohsin ABM, Chaki N and Fahad MFH (2013) Fish diversity of the River Choto Jamuna, Bangladesh: Present status and conservation needs. International Journal of Biodiversity and Conservation 5(6): 389-395. DOI: 10.5897/IJBC2013.0552

Gurumayum SD, Arun G and Nandeesha MC (2006) Women participation in fisheries activities in Manipur valley in India with traditional fish based beliefs and customs. In: Global symposium on Gender and Fisheries World Fish Center, Penang. pp. 149-158.

Gurumayum SD and Choudhury M (2007) Fishing methods in the rivers of North-East India. Indian Journal of Traditional Knowledge 8 (2): 237-241.

Imnatoshi and Ahmed SU (2012) Geomorphology and Seasonal Variations of Physicochemical Parameters of Doyang River, Nagaland. The Ecosca 6(1 and 2): 05-09.

Islam MR, Das B, Baruah D, Biswas SP and Gupta A (2013) Fish Diversity and Fishing Gears used in the Kulsi River of Assam, India. Annals of Biological Research 4(1): 289-293.

Jayaram KC (2010) The freshwater fishes of the Indian region. Narendra Publ. House (Delhi). Second revised edition. xxxi+616 pp.

Kalita B, Dutta A, Bhagabati SK and Sharma A (2010) Indigenous technical knowledge for fish harvesting in Karbi-anlong district of Assam. Indian Journal of. Traditional Knowledge 9(2): 252-255.

Kar D (2007) Fundamentals of Limnology and Aquaculture Biotechnology. Daya Publishing House. New Delhi. India. xvi+609 pp.

Kar D, Barbhuiya AH, Ariffuddin, Barbhuiya MA, Chetia P, Islam R and Rahman S (2007) Traditional Riverine Fish Catching Devices of Assam. Fishery Technology 44(2): 137-146.

Khanna SS (2003) An Introduction to fishes. Central Book Distributors, Allahabad, India. xii+636 pp.

Lal KB (1969) An Introduction to Fishing Gear Technology. 1st edition, Metropolitan Book Co. Pvt., Delhi, India. pp. 1-229.

Lalthanzara H and Lalthanpuii PB (2009) Traditional Fishing methods in Rivers and Streams of Mizoram, North-East India. Miprograss 9(4): 188-194.

McClanahan TR, Sebastian CR, Cinner J, Maina J, Wilson S and Graham NAJ (2011) Managing fishing gear to encourage ecosystem-based management of coral reefs fisheries. Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale. pp. 1012-1016.

Mohsin ABM, Haque SMM, Galib SM, Fahad MFH, Chaki N, Islam MN and Rahman MM (2013) Seasonal Abundance of Fin Fishes in the Padma River at Rajshahi District, Bangladesh. World Journal of Fish and Marine Sciences 5(6): 680-685. DOI: 10.5829/idosi.wjfms.2013.05.05.75109.

Mohsin ABM, Yeasmin F, Galib SM, Alam B and Haque SMM (2014) Fish fauna of the Andharmanik River in Patuakhali, Bangladesh. Middle-East Journal of Scientific Research 21(5): 802-807. DOI: 10.5829/idosi.mejsr.2014.21.05.8415.

Nath P and Dey SC (2000) Fish and Fisheries of North Eastern India (Arunachal Pradesh), Narendra Publishing House, Delhi, India.

Remesan MP, Pravin P and Meenakumari B (2009) Non-selective Fishing Gears and Sustainability Issues in the Hooghly-Matlah Estuary in West Bengal, India. Asian Fisheries Science 22: 297-308.

Sharma R (2001) Traditional Fishing Methods and Fishing Gears of Assam. Fishing Chimes 20(12): 23.

Srivastava PK and Srivastava SJ (2011) Indigenous fishing gears in Suraha Lake, Ballia, Uttar Pradesh, India. Journal of Wetlands Ecology 5: 73-78.

Talwar PK and Jhingran AG (1991) Inland Fishes or India and Adjacent Countries, Vol I and Vol II. Oxford and IBH Co, Pvt. Ltd, New Delhi, India.

Tynsong H and Tiwari BK (2008) Traditional knowledge associated with fish harvesting practices of *War Khasi* community of Meghalaya. Indian Journal of Traditional Knowledge 7(4): 618-623.

Upadhyay AD and Singh BK (2013) Indigenous Fishing devices in use of capture fishing in Tripura. Indian Journal of Traditional Knowledge 12(1): 149-156.