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RESEARCH ARTICLE

Exploring bioresource utilization in traditional fishing methods among the tribes of Arunachal Pradesh

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Abstract

Arunachal Pradesh, situated in the north eastern region of India, harbours rich biodiversity and cultural diversity. Traditional fishing practices have long been integral to the livelihoods and cultural heritage of indigenous communities inhabiting the region. This study investigates the utilization of bioresources within the context of traditional fishing methods practiced in Lower Siang, Lepa Rada, West Siang and Shi Yomi district of Arunachal Pradesh. Through a combination of ethnographic fieldwork, ecological surveys and community engagement, the study aims to document and analyse the diverse array of bioresources targeted, the traditional fishing techniques employed and the socio-cultural significance of these practices. Primary data has been collected from the villagers through a combination of field surveys and interviews with local fishermen. Key findings reveal a diverse array of traditional fishing techniques deeply rooted in the cultural heritage of the study area. These methods range from bamboo traps and hand nets to angling and basket weirs, each tailored to the unique environmental characteristics of the region. Utilization of local bioresources, including bamboo and natural plant fibers, in the construction of fishing gear, shows the sustainable practices embedded within traditional knowledge systems. The application of indigenous fishing gears and methods by the different tribal groups in the study area highlights the intimate connection between culture, tradition and sustainable resource management. The findings of this research offer valuable insights into the dynamics of bioresource utilization in traditional fishing methods in the study area.

Keywords: Arunachal Pradesh; Bioresource Utilization; Traditional Fishing Methods; Traditional Ecological Knowledge (TEK).

1. Introduction

The forests and rivers of Arunachal Pradesh have abundant wildlife in the form of animals, birds and fishes. Fishing is an age-old practice and various methods of catching fish have been used since the prehistoric times. Different types of trapping, angling and poisoning techniques are used to catch fish (Dutta and Riba, 2023). Fish are an integral part of the diet for tribal communities in North Eastern India, particularly in Arunachal Pradesh, which is renowned for its rich fish biodiversity. Fishing has been a traditional occupation for generations. The people in the study area possess a wealth of traditional knowledge regarding fishing practices, including the optimal timing for fishing, various techniques, suitable baits and tools used for different fish species.

Furthermore, they have expertise in using different herbs, like leaves, roots, barks and fruits, to stun or kill fish. These methods, along with specific techniques and tools designed for different fish and seasonal variations, demonstrate their extensive knowledge of traditional fishing. They utilize local fishing tools and methods to catch fish for food. These tools and gears are crafted by the fishermen themselves using materials like bamboo, cane, wood and stone found locally. This indigenous traditional knowledge is generously passed on to newer generations by older ones (Kalita et al., 2010).

The study area has an extensive network of rivers, streams and natural water bodies, providing abundant opportunities for fishing activities. Among these, numerous rivers such as Kidi, Hie, Hingen, Rimi, Iichi, Igo, Sigen, Simen, Siji, Siri, Sibum, Sipu, and Siyom, to name a few, are present, each harbouring a diverse array of fish species. This region is blessed with vast aquatic resources, characterized by a multitude of freshwater fish species, many of which thrive in the cool waters of hill streams.

The information on indigenous fishing gears and methods of fishing in Arunachal Pradesh is scanty owing to difficult terrain and remoteness, predominantly hilly state (Dutta and Bhattacharjya, 2008). The study was conducted with an idea to document the bioresource utilization in traditional fishing methods and traditional knowledge associated with the indigenous fishing methods practiced by the people of Lower Siang, Lepa Rada, West Siang and Shi Yomi district of Arunachal Pradesh.

2. Material and method

Initially, a stratified sampling technique is employed to create strata based on the different tribal groups concentrated in the study area, aiming to understand the various varieties of bioresources used for fishing, as well as the diverse types of indigenous fishing techniques. The study area encompasses four distinct tribal groups: Galo, Adi (Bokar, Libo and Ramo), Tagin and Memba. Notably, the Galo tribe stands out as the most populous and is dispersed across three districts (Lower Siang, Lepa Rada and West Siang) within the study area (Dutta and Riba, 2023).

Secondly, villages located near the rivers have been selected for the survey. In Lower Siang district, Gensi and Siji villages were selected for study due to their proximity to River Sigen and River Siji, respectively. In Lepa Rada district, the study was conducted in three villages: Disi, Nyodu, and Nyigam. The Kidi River flows alongside Disi, Nyodu, and Nyigam villages, while the Hingen River also courses through Nyodu village. In West Siang district, Jini and Kamba villages were chosen for the study, with River Siyom passing through these two villages. In Shi Yomi district, the villages of Menchukha, Tato, Monigong, and Pidi were selected for study, all of which are traversed by River Siyom.

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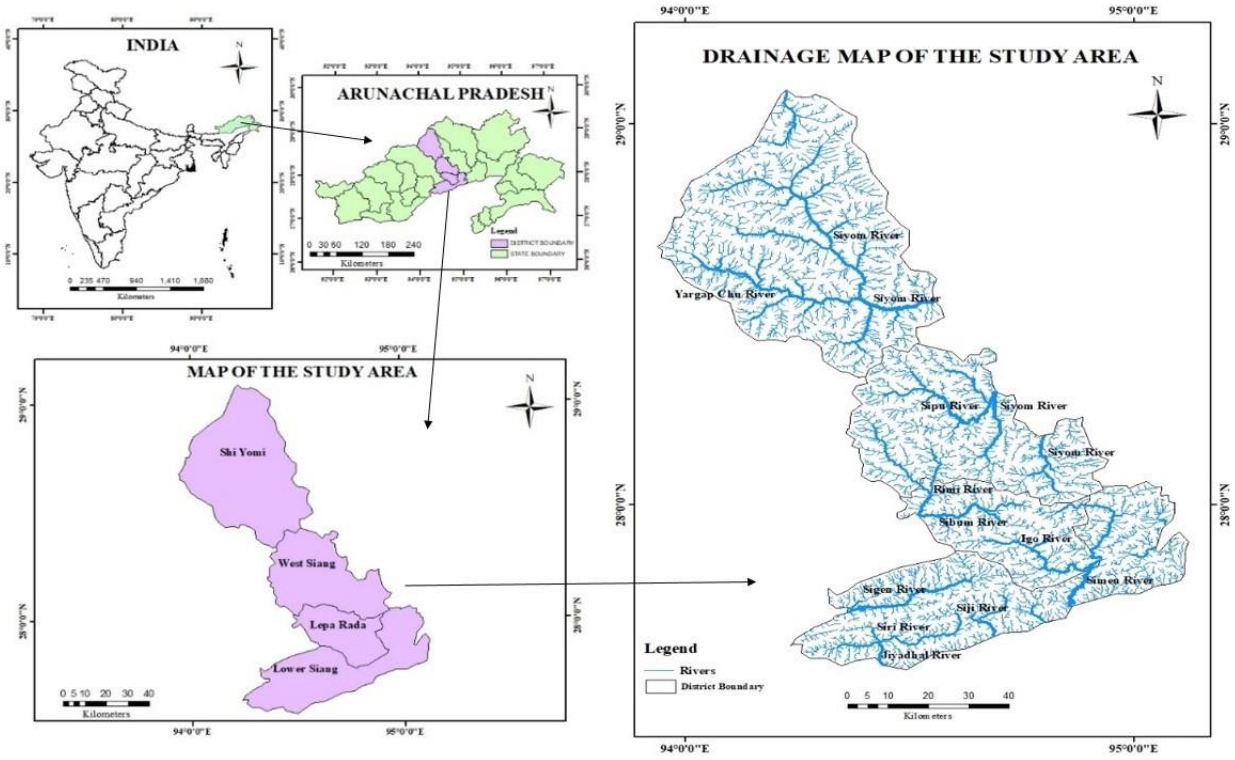

Figure 1. Showing location map of the study area and major drainage system and rivers of the study area (Lower Siang, Lepa Rada, West Siang and Shi Yomi)

Thirdly, data collection from villagers and local fishermen was conducted through random sampling.Primary data has been collected from the villagers through structured schedule, interviews and interactions with fisherman of the study area to understand the techniques, frequency and pattern of fishing. The study was conducted in the above-mentioned villages with an idea to document the traditional knowledge associated with the indigenous fishing gears and methods used by the villagers. Villagers demonstrated various types of traps used by them in the rivers for fishing. Occasionally villagers made models of the traps and explained the mechanism.

3. Result

The people in the study area employ a variety of indigenous fishing techniques that are both environmentally friendly and sustainable. The selection of fishing gears and methods of fishing are influenced by various factors including nature of application (Saha and Nath, 2013), physiographic condition of the water body, nature of fish stock, characteristics of the materials from which gears are fabricated and living standard of fishers (Gurumayum and Choudhury, 2009). So, variation in application of gear can be observed in different rivers and streams, which have characteristics of their own unique nature of the water resources in a particular region (Lalthanzara and Lalthanpuii, 2009).

Different types of indigenous fishing gears are used by the different tribes of the study area which are eco-friendly and sustainable. Fishing is also attached to their culture and traditions. It was found out that fishing is carried out mostly during winter season. The people in the study area prefer to consume fresh fish that they catch themselves from the rivers (Dutta and Riba, 2023).

In the study area the rivers serve as a convenient source of fish for farmers, particularly for villages located in close proximity to the water bodies. The assurance of getting fish is higher compared to hunting wild animals and birds. For farmers, it serves as a valuable retreat after prolonged periods of field cultivation.

The following outlines the various indigenous fishing methods employed by the villagers in the study area:

3.1. Traditional fishing methods

a. Takom gaanam: In takom gaanam, rivers are either fully or partially dammed, diverting water towards the riverbank, where a conical basket known as a "takom" is fixed to collect falling fish. During the initial floods, farmers stay close to the dam, collecting fish at intervals and removing debris carried by the floodwaters. During this period, larger fish move downstream with the strong current. It's important to note that these fish trapping points are typically owned by a clan or a family.

b. Hwpv/Sipeh moman: This method is akin to "takom" with the key distinction lying in the collection point. In this technique, the river is dammed as in "takom" but the water is directed to a raised platform. A lengthy platform is elevated, allowing the falling water and fish to be collected on it. Occasionally, these captured fish become prey for water birds, otters and wild cats.

c. Hwbok/Sibok pvnam: In this traditional fishing method, a river is partially dried by blocking one channel and redirecting the water to another, resulting in more fish being concentrated in the sunny area rather than the shaded section. Farmers own and manage secondary channels, which allow for flexible fish harvesting whenever necessary. The damming process is a communal event akin to a festival, with villagers of all ages and genders participating. Elderly individuals prepare baskets while children assist with various tasks. Before damming, bamboo nets are used to block the opposite end of the channel to prevent fish from escaping. Herbal poisons gathered from the forest are employed to kill the fish, with care taken to keep others away during application. After gathering the fish, they are divided equally among the participants and enjoyed with rice during festivities. The dam is later removed, and it takes four to five months for the channel to replenish with fresh fish, sometimes supplemented with feeds to attract them.

d. Lwwpum paanam: In the last part of autumn, when the water is low, farmer would pile stones under the water, preferably on sunny portion of the river for fish to dwell in winter season. During winter, fish prefer stagnant water than the running water. Favorable spots are selected and a little depression is made on the

Table 1. Showing different indigenous fishing techniques in the study area.

Sl. No.	Techniques	Materials Used	Species Targeted	Landscape	Season
1	Takom gaanam	Bamboo basket	Small fishes	Streams and river	Summer
2	Hwpv/Sipeh monam	Raised platform	Big fishes	River	Summer
3	Hwbok/Sibok pvnam	Stones and bamboo	Small fishes	Streams and river	Winter
4	Lwwpum paanam	Stones are piled under the water and basket	Both small and big fishes	Streams	Autumn
5	Tahum kunam	Bamboo basket	Shrimps and small fishes	Streams and river	Both summer and winter
6	Riid dunam	Pressed Maize, dry fish and smelly meat	Crabs	Streams and river	Both summer and winter
7	Ngorik ognam	Noose of bamboo rope	Cat fish	River	Both summer and winter
8	Isi mojik nam	Polluting the water with soil to make it murky and then use of nets	Small fishes	River	Both summer and winter
9	Tao/Maamo wwdwr	Thorny cane basket	Big fishes	River	Both summer and winter
10	Ngoi mvro ronam	Bamboo torch	Big fishes	River	Both summer and winter
11	Nya-be Dirch	Conical baskets	Catfish	River	Summer
12	Nyar	Raised platforms made of bamboo	Big fishes	River	Winter
13	Nyanga	Barrier made of bamboo and a conical basket	Small fishes and frogs	River	Summer
14	Nya-shong	Bamboo tubes with bait	Big fishes	River	Summer
15	Drupung	Bamboo basket with bait and stones	Both small and big fishes	River	summer
16	Vte anam	Cut pieces of bamboo are interwoven forming a tube	Prawn	River	Both summer and winter
17	Tamak rwwnam	Fishing lines is fixed with baits	Big eels	Bank of river	Summer
18	Mor nwgnam	Bamboo stick with iron needles or spikes made of bamboo	Big fishes	River	Winter
19	Lwwtvk tvgnam/ Do Cheb	Stones	Both small and big fishes	River	Winter
20	Riigo goonam	Baskets with boulders and grasses	Big and small fishes	River	Both summer and winter

ground and around it three or four rounded stones are placed like a traditional oven stand in a hearth for resting pot. On it a slab is placed and all the sides are covered with stones in standing position with gaps in the down part. The farmer would put a bamboo woven basket (chwrgo) around it pressed with stone and trap is fixed at a gap. Then slowly remove the stones and throw out of the basket. The escaping fish are collected in the trap. After the harvest, farmers again pile the stones back if it was harvested early.

e. Tahum kunam: This method is fishing with basket, exclusively done by females. Males are not expected to do this fishing. One or more female would go to the river during lean season to catch fish with the help of conical baskets (raaju). During fishing, basket is kept pressed between the two legs and two hands move the stones and drive fish towards the basket and suddenly the basket is lifted. Collected fish are kept in the ginchi (small basket carried on waist). Accuracy is more in tahum kunam. Sometimes they would place the baskets all around a big stone and the stone is moved with the help of wooden lever (lwwko koonam) and the escaping fishes are caught in the baskets.

f. Riid dunam: It is the method of collection of crabs. Sometimes farmers keep tender maize pressed with stone in the stream near to field to attract crabs and catch them after few hours. There is also another easy method to catch crab is to keep smelling meat or dry fish inside the trap and keep it in the stream for a night and collect it on the next day.

g. Ngorik ognam: In olden days, there were big catfish weighting even above fifty kilogram in the rivers of the hills. As the fish is not that much sensitive like other fishes, people used to tie them with rope and pull out of the water. First, they would locate the fish in the deep water and would go with bamboo raft and place a noose of bamboo rope in front of the fish, near the head. Other person would hit the fish with long bamboo stick from the tail to make it run forward and enter the noose. The noose would cross the head and whole body but the tail being tapering, the noose gets fastened there and then the fish is pulled out.

h. Isi mojik nam: It is a very simple method of fishing in the river by polluting the water with soil to make it murky to reduce the visibility and then throw nets and catch the fish.

i. Tao/Maamo wwdwr: Some people make a fish trapping basket with barbwire tendril of cane (rattan) to catch big fish. A long and narrow basket is made with the thorny tendril, thorns pointing inward. Inside the basket, baits like frog or earthworm are kept hanging and thrown into deep water tied with a long rope to pull it out. When big fish enters the hole to eat the bait, it cannot come out by backward movement due to sharp thorns that prick the scales. Due to narrow basket, fish cannot turn the head back.

j. Ngoi mvro ronam: In this method of fishing two men would go for fishing at night where current is gentle. One would hold bamboo torch (mvro) and other would cut the fish that come to light.

k. Nya-be Dirch: In this method, numerous conical baskets are strategically placed in different locations throughout the river. The term "Nya-be" in Memba refers specifically to catfish; hence the name Nya-be Dirch for this fishing technique. This technique is primarily practiced during the months of May and June. The baskets are carefully positioned to maximize the chances of catching catfish, which are the targeted species in this fishing technique. As the baskets are placed, they create a network of traps that take advantage of the natural movements of catfish in the river. The conical shape of the baskets is effective in trapping the catfish once they swim into them. This method is particularly efficient

Figure 2. Fishing tools and techniques in the study area. (A)Takom in summer season, (B)Takom in lean season, (C)Takom, (D)Hipv, (E)Sibok pvnam, (F)Paakam, (G)Collection of crabs, (H)Lwwko koonam, (I)Tahum Kuman, (J)Lwwpum , (K)Riid Dunam, (L)Ehap vrnam

during the specified months when the conditions are favourable for catfish activity.

l. Nyar: This traditional fishing technique is specifically practiced during the winter season when fishes tend to gather in warmer waters. This method involves the construction of raised platforms with bamboo in the river and it typically sees the participation of 10-15 villages setting up platforms in different sections of the same river. This technique is predominantly carried out in the month of October.

m. Nyanga: This fishing technique is predominantly employed during June and July, specifically targeting both fish and frogs. The name itself breaks down to "Nya" referring to fish and "ga" signifying a barrier. This method involves creating a barrier in the river using bamboo, alongside the placement of a conical basket. The process starts by constructing a barrier in the river using

Table 2. Showing different angling techniques of fishing in the study area

Sl. No.	Techniques	Materials Used	Species Targeted	Landscape	Season
1	Ekvr vrnam	Bamboo and hooks with bait	Small fishes	River and ponds	Both summer and winter
2	Lud dunam	Bamboo and hooks with bait	Small fishes	River and ponds	Both summer and winter
3	Ngoi ognam	Bamboo rope	Big and small fishes	River and ponds	Both summer and winter
4	Nya-kofch	Bamboo hook with bait	Big fishes	Rivers	Winter

Table3. Showing different poisoning techniques of fishing in the study area

Sl. No.	Techniques	Materials Used	Species Targeted	Landscape	Season
1	Lwwru `hwwnam	Tree bark	Small fishes	Rivers	Winter to spring
2	Rigdik	Fern	Small fishes	Rivers	Winter
3	Deeptam	Grass	Small fishes	Rivers	Winter
4	Swb rwwnam	A raised platform and herbal poisons	Both small and big fishes	River	Both summer and winter
5	Paakam	Stones and herbal poisons	Small fishes	River	Autumn

Figure 3. Plants used as herbal poisons for fishing. (A) *Amphineuron opulentum*, (B) *Zanthoxylum rhetsa*, (C) *Derris elliptica*, (D) *Persicaria hydropiper*

Table 4. Showing varieties of fishes that are found in the study area

Sl. No.	Common name	Scientific name
1	Red Tailed Squirrel Loach	*Aborichthys elongates*
2	Indian Torrent Catfish	*Amblyceps arunachalensis*
3	Mottled eel	*Anguilla bengalensis*
4	Indian hill Trout	*Barilius- bendelisis*
5	Spotted snakehead	*Channa punctatus*
6	Striped snakehead	*Channa striata*
7	Dwarf snakehead	*Channa-gachua*
8	Gangetic Latia	*Crossocheilus latius*
9	Moustached danio	*Danio dangila*
10	Zebrafish	*Danio rerio*
11	Giant danio	*Devario aequipinnatu*
12	Bengal danio	*Devario devario*
13	Annandale Garra	*Garra annandalei*
14	Gotyla	*Garra gotyla*
15	Khasi garra	*Garra- lissorhynchus*
16	Minor carp	*Labeo gonius*
17	Rohu	*Labeo rohita*
18	Barred Loach	*Nemacheilus devdevi*
19	Rainbow trout	*Oncorhynchus mykiss*
20	Giant Catfish	*Pangasianodon gigas*
21	Rosy barb	*Pethia conchonius*
22	Ticto barb	*Pethia ticto*
23	Mountain carp	*Psilorhynchus arunachalensis*
24	Balitora Minnow	*Psilorhynchus balitora*
25	Pool Barb	*Puntius sophore*
26	Brown trout	*Salmo trutta*
27	Dinnawah snowtrout	*Schizothorax progastus*
28	Assamese Kingfish	*Semiplotus semiplotus*
29	Golden mahseer	*Tor putitora*
30	Tor mahseer	*Tor tor*
31	Ladder loach	*Botia rostrata*
32	Assamese kingfish	*Cyprinion semiplotum*
33	Common Carp	*Cyprinus carpio*

bamboo. This barrier is strategically placed to create a semi-enclosed area in the water. The purpose of the barrier is to guide and concentrate the movement of fish and frogs, making it easier for the fishermen to catch them. Simultaneously, a conical basket is positioned within the enclosed area of the barrier. This basket serves as the primary tool for capturing the fish and frogs drawn to the confined space. The conical shape of the basket allows for an effective trapping mechanism, ensuring that once the fish and frogs enter, they are less likely to escape.

n. Nya-shong: This fishing method is employed primarily during June, July, and August, utilizing bamboo tubes with bait. The process begins by preparing bamboo tubes, which are typically used as containers for the bait. The bait itself consists of various items such as earthworms, watermelon and cucumber flowers. During the specified months, when the fishing conditions are optimal, the bamboo tubes filled with bait are strategically placed in the water. The tubes may be submerged or set along the riverbanks, allowing the bait to attract fish. The earthworms, watermelon and cucumber flowers serve as enticing elements to lure the fish towards the bamboo tubes. Once the fish are near, the bamboo tubes function as effective traps, providing a traditional and resourceful means of catching.

o. Drupung: It is a traditional fishing method utilized during the rainy season, employing a large bamboo basket. This technique involves placing substantial boulders into the basket, which is then thrown into the middle of the river. A rope is securely tied to the basket to facilitate retrieval. The purpose of drupung is to take advantage of the freshwater conditions in the river during the muddy and turbulent rainy season.

p. Vte anam: This is a simple method for prawn fishing. Cut pieces of bamboo are interwoven, forming a tube with one end open and the other end secured with a knot. These bamboo tubes are then placed in stagnant water. After a certain period, they retrieve the bamboo tubes, with the open end facing upward and bring them to the bank. Subsequently, the water is poured out, revealing the presence of one or two prawns within.

q. Tamak rwwnam: In this method fishing lines is fixed with baits in the hooks and kept along the bank at night and in the morning, fish are collected. Sometimes big eels are caught if the line is fixed in the gap of big boulders.

r. Mor nwgnam: Mor is a bamboo stick of two to three meters long fitted with iron needles or spikes made of same bamboo to hit fish resting on the floor of the water. Experts can hit even the moving fish. During olden days, when number of big fish was more, people used to hit fish with stick fitted with iron cup at the end (kali bangi).

s. Lwwtvk tvgnam/Do Cheb: It is a very easy method of fishing mostly done by children. In this method, stones are thrown into the river where fishes are present and the injured or stunned fishes are then caught. It is not only a fishing technique but also a recreational activity for children, fostering a connection with the environment and imparting practical skills.

t. Riigo goonam: This is another method where all the baskets are placed under the water, mouth facing the opposite direction of the current. Boulders and grasses are kept inside the basket. Next, from a distance of about 15 to 20 meters, all would drive the fish downward, along the current splashing the water and then baskets are lifted suddenly.

3.2. Traditional angling techniques

Angling is a prevalent practice among the local population in the area. Various sizes of hooks, baits and fishing techniques are employed depending on the season. Earthworms are the most commonly used bait. When angling, fishermen typically walk in the opposite direction of the water's current.

The following are the different types of angling techniques in the study area:

a. Ekvr vrnam: This technique involves using a bamboo stick equipped with a hook that is baited with an earthworm. This method likely entails attaching the earthworm to the hook to attract fish, which are then caught when they bite onto the bait. The bamboo stick serves as a simple fishing rod, providing a means for anglers to cast their baited hooks into the water and reel in any fish that are caught.

b. Lud dunam: This technique, similar to angling, differs in its approach. It is primarily used to capture snakehead fish (talo) that reside in the crevices of rocks. It involves using a shorter rod with a robust line and a larger hook, baited with an earthworm. Fishermen repetitively lower and retrieve the baited hook at the entrance of the rock where the fish is anticipated to be.

c. Ngoi ognam: It is an angling, but the difference is, it does have neither hook nor bait. Fish are caught by noose. At the end of line, where hook used to be, one stone weight is hung. Above it, series of noose are kept hanging. Fisherman would move along the current in a bamboo raft with weight and noose in the water. Accidentally fish are fastened in the noose. Fish are trapped not only in the head, but also in any portion, even in the fins and tail. It is mostly practiced in the river Siyom.

d. Nya-kofch: This method involves using a bamboo hook with bait, typically insects found in the river. Nya-kofch is predominantly practiced during the summer season, from July to September.

3.3. Traditional fish poisoning techniques

In the case of large rivers, even after diverting the water through damming, it's often not possible to completely dry the riverbed. A significant amount of water always remains due to seepage into the sand. Many fish take refuge in the holes of large stones, beyond the reach of human hands. In such situations, farmers resort to using herbal poisons to eliminate the fish. They possess knowledge of various herbal poisons found in the forest for this purpose. Herbal poisons like *Persicaria hydropiper, Zanthoxylum oxyphyllum, Amphneuron extensus* etc. are used.

These herbal poisons do not have side effects. These are effective only in small portion and don't last longer. In most cases, fishes are stupefied and become unconscious. Many of them regain consciousness after mixing of fresh water. Some herbs are effective and quick in action. Effectiveness depends on various factors like the maturity of the herbs, seasons, technique of application, temperature of the water, volume of water and disturbances. In low temperature, the action is very less. Thus, generally it is applied during noon time.

The different types of poisoning techniques used for fishing are as follows:

a. Lwwru `hwwnam: It is one of the easiest methods of fishing where the farmers would insert packets of herbal poisons inside the holes of stone and then plug all the holes to prevent the mixing of fresh water. After an hour or more, they would collect the dead or unconscious fish from the holes.

b. Swb rwwnam: In olden days, large scale fishing was performed where whole length of the river is used to be poisoned without drying the river. A platform is raised across the river where huge quantity of herbal poisons are kept and beaten into the water. Effectiveness is less due to continuous addition of fresh water. It used to cover long distance of about ten kilometres as per the quantity of poison applied. Sometimes this form of poisoning of river was done to thwart of the village from visit of epidemic.

c. Paakam: In this method, stones are piled around the partially submerged big rocks near the bank. In order to collect the fish, the outer portion is blocked with stones and leaves to prevent the mixing of fresh water. Next, the stone are gradually removed and then herbal poisons are applied to kill fish inside the big rock. Generally, fish come out of the hole before death.

4. Discussion

The exploration of bioresource utilization in traditional fishing methods sheds light on the intricate relationship between indigenous practices, cultural heritage and sustainable resource management. The indigenous communities in the study area have developed a rich array of fishing techniques over generations, deeply rooted in their cultural identity and traditional knowledge systems. One key aspect highlighted in this exploration is the utilization of locally available bioresources in crafting fishing tools and gear. Bamboo, cane, natural fibres, and locally sourced plants and roots serve as primary materials for constructing traps, nets and other fishing implements. This reliance on natural materials not only reflects the community's intimate connection with their environment but also ensures the sustainability of their fishing practices. By harnessing bioresources in their natural habitat, the communities minimize environmental impact and reduce reliance on external resources, aligning with principles of ecological sustainability (Gurumayum and Choudhury, 2009).

Moreover, it also shows the effectiveness and efficiency of these indigenous fishing methods. Despite their simplicity, these techniques have been refined over centuries to suit the local environment and fish species. The use of bioresources such as natural fibers and plant extracts for fish poisoning showcases the community's ingenuity in utilizing local knowledge to maximize fishing yields while minimizing adverse effects on aquatic ecosystems (Kalita et al., 2010). Furthermore, the adaptability of these methods to diverse environmental conditions underscores their resilience in the face of changing circumstances, including fluctuating fish populations and environmental degradation.

Additionally, it highlights the socio-economic significance of traditional fishing practices in Arunachal Pradesh. Fishing serves as a vital source of livelihood and food security for many indigenous communities, providing sustenance and income generation opportunities (Dutta and Riba, 2023). The utilization of bioresources in fishing not only reduces costs associated with purchasing modern fishing equipment but also fosters local entrepreneurship and skill development. Furthermore, the preservation of traditional fishing knowledge and techniques strengthens social cohesion and cultural continuity within indigenous communities, contributing to their overall resilience and well-being.

5. Conclusion

The various tribal groups in the study area rely on a wide range of indigenous fishing gears and methods, which play a crucial role in supporting their livelihoods and ensuring food security. These fishing practices are deeply ingrained in their culture and are passed down through generations as part of their traditional heritage.

These methods involve the utilization of a diverse array of local bioresources, which are readily available in their natural environment. By harnessing these natural materials, such as bamboo, cane, natural fibers, and locally sourced plants and roots, the communities are able to create fishing gear that is both effective and sustainable. These indigenous fishing gears and methods are indigenously designed and fabricated by the local fisher folks using locally available materials like bamboo and wood which are cheap and efficient (Karga et al., 2020).

One notable aspect of these indigenous fishing methods is their minimal environmental impact and low investment requirements. Unlike modern industrial fishing practices that often deplete resources and harm ecosystems, these traditional methods are designed to work in harmony with nature, ensuring the continued availability of fish stocks for future generations.

The people in the study area possess a rich Traditional Ecological Knowledge of fishing, employing various locally available bioresources. Locally sourced materials such as cane, natural fibers, bamboo, plants, and roots are utilized for trapping, angling, and fish poisoning. Different herbs, including leaves, barks, fruits, and roots, are used for poisoning. The effects of fish poisoning typically last for 30 minutes to an hour and the potency of the poison diminishes when freshwater is introduced, reducing its impact on the aquatic environment. Therefore, this practice is proven to be less harmful to the aquatic ecosystem. Consequently, the bioresources utilized by local inhabitants in the study area are environmentally friendly and have been passed down through generations. They possess a profound understanding of the natural resources available and how to harness them effectively.

Overall, the utilization of indigenous fishing gears and methods by different tribal groups in the study area highlights the intimate connection between culture, tradition and sustainable resource management. By preserving and passing down these traditional practices, the communities are not only securing their own livelihoods but also contributing to the conservation of local ecosystems and biodiversity.

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