



Indigenous Technical Knowledge on Use of Plants in Capture Fisheries in Northeast Region of India: A Review

Bibha ChetiaBorah*, Ankur Rajbonshi and Ranjit Bordoloi

Assam Agricultural University, Jorhat, Assam, India

*Corresponding Author: Bibha ChetiaBorah, Assam Agricultural University, Jorhat, Assam, India.

Received: November 11, 2024

Published: December 13, 2024

© All rights are reserved by **Bibha ChetiaBorah**.

Abstract

The North East region of India, comprised of eight states viz Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, is known as a hub for indigenous technical knowledge (ITK). A variety of ITKs had been developed among different ethnic tribes of the region for harvesting diversified fish species from the wide range of available natural water resources as well as for fish transportation, fish processing, maintaining water quality, disaster management in fisheries, traditional fish farming practices, conservation of fish biodiversity and use of fish in ethno-medicine and therapeutics. The present communication is based on review of available ITK on use of indigenous plants in different aspects of capture fisheries viz. As fish poison, fish attractant and aggregating device, as bait for angling, in making traditional fish traps and gears. A total of 122 plant species belonging to 46 families have been enlisted as piscicidal plants available in the region along with ITKs available on use of plant on different aspects of capture fisheries in the region have been reported in this review.

Keywords: North East Region; Indigenous Technical Knowledge (ITK); Piscicidal Plant; Fish Aggregating Device; Fish Attractant; Fishing Traps

Introduction

Indigenous technical knowledge (ITK) is the knowledge that has been developed over time by the people of a specific community of a region for betterment of their life and livelihood and is based on experience befitting the local culture, custom, available resource and environmental conditions. Most of the traditional knowledge acquired through ages, often tested over centuries of use, continue to develop and get improvised based on environmental and societal changes and transmitted from generations to generations verbally or through practical experience and demonstration.

Fishing communities of India are enriched with plethora of indigenous technical knowledge on traditional fish harvesting and management practices suitable for different types of aquatic resources. The North East region of India, comprised of eight states viz Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, is known as a hub for indigenous technical knowledge on fisheries. The region is bestowed with vast and varied freshwater resources comprising of rivers, tributaries, canals, ponds, reservoirs, mini barrages, floodplain wetlands, lakes, swamps, derelicts and seasonally inundated water bodies (Table 1), that are inhabited by around 422 diversified fish species be-

longing to 133 genera and 38 families [1]. The major natural fishery resources of the region encompasses the Brahmaputra and the Barak river system which along with their numerous tributaries and myriads of wetlands, distributed throughout different states of the region have been playing a pivotal role in life and livelihood of the people, in maintaining specific ecological characteristics, supporting aquatic and wild life biodiversity of the region. Majority of the available natural fishery resources of the region are typical artisanal fisheries where the fishing activities are commonly practised by using traditional gears and vessels and by adopting traditional method of fish catching based on available indigenous technical knowledge.

As per the census, 2011, the total population of the region is 45,587,982 that accounts for around 4% of the country's total. The region is the home to about 225 tribal communities and the tribal populations comprise a considerable part (27.2%) of the population of the region. Mizoram has the highest percentage of tribal population (94.44%) followed by Nagaland (86.46%) and Meghalaya (86.15%). About 90-100% of the population in different states of the region are fish eaters and fish is an integral part of their multifarious traditional activities and rituals. The region is

recognized as one of the ten bio-geographic zones of India because of the unique geographic features and biological diversity with rich floral and faunal biodiversity [2]. The region has the richest reservoir of plant biodiversity supporting more than 50% the floral diversity of the country [3]. According to the India State of Forest Report (ISFR, 2019), the NE Region has vast forest cover (1,71,964

sq. Km), which is around 65.05% of the total geographical area of the region. Majority of the indigenous plants available in the forests of the region are traditionally known to have ethno- medicinal, therapeutic and other economic value [4]. Indigenous technical knowledge had been developed in the region for betterment of life and livelihood by utilising the available natural resources including the floral diversity.

State	Rivers and canals (km)	Reservoirs (ha)	Wetland, lake and swamp (ha)	Ponds/mini barrages (ha)
Arunachal Pradesh	10,957	136	3,277	29,122
Assam	4,820	1,096	1,54,650	77,250
Manipur	14,788	2,142	24,433	11,623
Meghalaya	4,200.87	717.53	284.78	3,465.4.
Mizoram	1,750	8,010	-	5,492
Nagaland	1,600	2,258	1,110	3,474
Sikkim	1,600	850	-	1,466
Tripura	2,975.8	3,049.34	-	18,530
Total NE	42,691.67	18,258.8	1,83,754.78	1,50,422.4

Table 1: Freshwater resources of the Northeast region of India. (Source: Adapted from Handbook of Fisheries Statistics, GoI. 2020).

This article is based on a review of the works done on the indigenous technical knowledge developed through ages on use of indigenous plants in traditional capture fisheries, as commonly practised by different ethnic tribes in the region.

ITK on use of herbs in fisheries in NE region

Traditional fishing practices involving use of plant based piscicides for cultural, commercial and environmental purposes has been reported in many parts of the world. In India, traditional fishing practices using wide varieties of herbal piscicides are common among various tribal groups of the country [5]. A variety of ITKs had been developed among different ethnic tribes of the NE region of India for harvesting diversified fish species from the wide range of natural water resources as well as for fish transportation, fish processing, maintaining water quality, disaster management in fisheries, traditional fish farming practices and conservation of fish biodiversity and use of fish in ethno-medicine and therapeutics [6-8]. The NE region of the country has rich legacy of ITK on use of different species of indigenous piscicidal plants for mass scale community fishing by following traditional methods and rituals [9-15].

Community fishing is an age old traditional practice among many ethnic tribes of different states of NE region of India [16-18]. It is a kind of festivity of fishing in wetlands and small rivers that involves massive fish capturing action where large crowd of people participate together with fun and fair and catch all varieties of

fish with traditional traps and gears. Community fishing practice is commonly reported from the states of Assam, Nagaland, Manipur, Meghalaya and Arunachal Pradesh. In addition to indigenous traps and gears, herbal preparations from different parts of indigenous piscicidal plants are used for mass scale killing or stupefying different fishes or for making them senseless and motionless for easy catch [9,19].

Review of literatures indicates that more than 100 species of indigenous plants with piscicidal properties are naturally available in this region [10,20]. A total of 23 locally available plants belonging to 14 families identified from Assam as commonly used herbal fish poisons [9]. Extensive use of *Polygonum hydropiper*, a common indigenous herb, as fish poison has been reported among the Karbi community of the state [21]. In Manipur, 45 species of piscicidal plants were reported to be used by the local communities for mass scale killing of fish with their specific mode of application [13]. Community fishing practice using toxic plants is common among the Mizo tribe of the region in which they use different parts of plants viz. leaves, seed, latex, root or trunk for large scale catching [12]. In Arunachal Pradesh around 150 species of plants having pharmacological importance are being used for mass scale traditional fish catching practice [22]. As per report [23], use of toxic plants is commonly practiced by the Khasi community of Meghalaya, for mass scale fish harvesting in the state. From the state of Sikkim, researchers have reported availability of 6 piscicidal plants [24]. A total of 114 species of piscicidal plants belonging to 83 genera and

44 families, used by different communities of Northeast region of India has been enlisted by Dutta., *et al*, 2019. A total of 11 species of indigenous piscicidal plants have been enlisted from Meghalaya and 14 species have been recorded from Nagaland [25]. Based on the available literatures and findings of studies conducted on the piscicidal plants available in Northeast Region of India a total of

122 diversified plant species belonging to 46 families available in different states of the region have been enlisted (Table 2). Family wise number of plant species (Table 3) reveals that family Fabaceae is the most dominant family with the highest number of piscicidal plant species (12 species) followed by the families Asteraceae, Euphorbiaceae and Leguminoceae (11 species each).

SI No	Scientific name of the plant	Family	Parts of plant used	Available in
1	<i>Acacia pennata</i>	Mimosaceae	Fruits and Bark	Assam, Nagaland, Meghalaya
2	<i>Acacia rugata</i>	Mimosaceae	Stem	Arunachal Pradesh, Mizoram
3	<i>Acer oblongum</i>	Sapindaceae	Fruits	Meghalaya
4	<i>Acmella paniculata</i>	Asteraceae	Whole plant	Arunachal Pradesh, Assam, Nagaland
5	<i>Aesculus assamica</i>	Sapindaceae	Bark	Arunachal Pradesh, Assam, Manipur
6	<i>Aesculus pavia</i>	Sapindaceae	Bark and leaves	Nagaland
7	<i>Aesculus flava</i>	Sapindaceae	Leaves	Arunachal Pradesh
8	<i>Aegle marmelos</i>	Rutaceae	Root, bark	Assam, Nagaland
9	<i>Ageratum conyzoides</i>	Asteraceae	Whole plant	Arunachal Pradesh, Assam, Nagaland
10	<i>Alangium longiflorum</i>	Cornaceae	Leaves	Manipur
11	<i>Albizia odoratissima</i>	Fabaceae	Bark	Nagaland
12	<i>Albizia Chinensis</i>	Fabaceae	Bark	Arunachal Pradesh, Assam, Manipur, Nagaland
13	<i>Albizia lebbeck</i>	Fabaceae	Bark, leaves	Nagaland
14	<i>Albizia marginata</i>	Fabaceae	Bark	Sikkim
15	<i>Albizia odoratissima</i>	Fabaceae	Bark	All NE states
16	<i>Albizia procera</i>	Leguminoceae	Bark	Assam, Nagaland
17	<i>Anamitra cocculus</i>	Menispermaceae	Fruits	Arunachal Pradesh
18	<i>Anamitra paniculata</i>	Menispermaceae	Fruits	Assam, Meghalaya
19	<i>Annona squamosa</i>	Annonaceae	Seed, root, leaves	Assam
20	<i>Apama tomentosa</i>	Aristolochiaceae	Stem , leaves	Manipur
21	<i>Arisaema tortuosum</i>	Araceae	Shoots, Leaves, stem	Manipur
22	<i>Artemisia vulgaris</i>	Asteraceae	Leaves, shoots, Bark	Sikkim
23	<i>Asclepias curassavica</i>	Asclepiadaceae	Stem, root and leaves	Manipur
24	<i>Athyrium filix- femina</i>	Athyriaceae	Whole plant	Arunachal Pradesh
25	<i>Barringtonia acutangula</i>	Lecythidaceae	Bark, root, seed	Assam, Arunachal Pradesh and Manipur
26	<i>Blumea balsamifera</i>	Asteraceae	Leaves	Manipur
27	<i>Buddleia macrostachya</i>	Loganiaceae	leaves	All NE states
28	<i>Canarium strictum</i>	Burseraceae	Leaves	Arunachal Pradesh
29	<i>Canthium dicoccum</i>	Rubiaceae	Bark and leaves	Arunachal Pradesh
30	<i>Canthium gracilipes</i>	Rubiaceae	Whole plant	Arunachal Pradesh
31	<i>Cassia alata</i>	Fabaceae	Leaves	Arunachal Pradesh
32	<i>Cassia javanica</i>	Fabaceae	Fruits	Mizoram
33	<i>Cassia nodusa</i>	Fabaceae	Roots	Arunachal Pradesh
34	<i>Catunaregam uliginosa</i>	Rubiaceae	Fruits	Nagaland
35	<i>Catunaregam spinosa</i>	Rubiaceae	Bark	Meghalaya
36	<i>Chromolaena odorata</i>	Asteraceae	Leaves and root	All states
37	<i>Costus speciosus</i>	Zingiberaceae	Root	Manipur
38	<i>Croton tiglium</i>	Euphorbiaceae	Seeds, leaves, flowers, fruits	Assam, Meghalaya, Nagaland
39	<i>Croton wallichii</i>	Euphorbiaceae	Leaves, flowers	Mizoram
40	<i>Cyclosorus extensus</i>	Thelypteridaceae	Whole plant	Arunachal Pradesh

41	<i>Dalbergia stipulaceae</i>	Leguminoceae	Bark	Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura
42	<i>Delphinium brunonianum</i>	Ranunculaceae	Whole plant	Arunachal Pradesh, Assam, Mizoram, Meghalaya
43	<i>Derris elliptica</i>	Leguminoceae	Root	All NE states
44	<i>Derris ferruginea</i>	Leguminoceae	Roots	Manipur
45	<i>Derris robusta</i>	Leguminoceae	Roots	Manipur
46	<i>Derris scandens</i>	Leguminoceae	Roots	Arunachal Pradesh, Manipur
47	<i>Diospyros variegata</i>	Ebenaceae	Fruit	Nagaland
48	<i>Diospyros lancifolia</i>	Ebenaceae	Bark, root and fruits	Nagaland
49	<i>Diospyros montana</i>	Ebenaceae	Leaves and fruits	Manipur
50	<i>Diospyros pilosula</i>	Ebenaceae	Fruits	Mizoram
51	<i>Duabanga grandiflora</i>	Lythraceae	Bark	Manipur
52	<i>Duranta plumeri</i>	Verbenaceae	Seed	Assam, Mizoram
53	<i>Emblica officinalis</i>	Euphorbiaceae	Bark	Mizoram
54	<i>Engelhardtia polystachya</i>	Juglandaceae	Bark	Assam, Meghalaya
55	<i>Engelhardtia spicata</i>	Juglandaceae	Bark and tender leaves	Nagaland
56	<i>Entada phaseoloides</i>	Mimosaceae	Whole plant	Manipur
57	<i>Eremostachys vicaryi</i>	Lamiaceae	Whole plant	Arunachal Pradesh
58	<i>Eupatorium odoratum</i>	Asteraceae	Whole plant/ Leaf and shoot	Manipur, Meghalaya, Nagaland
59	<i>Eurphobia nerifolia</i>	Euphorbiaceae	Root	Assam
60	<i>Eurphobia tirucalli</i>	Euphorbiaceae	Root	Assam, Meghalaya
61	<i>Exoecaria agallocha</i>	Euphorbiaceae	Latex	Assam, Nagaland
62	<i>Gardenia campanulata</i>	Rubiaceae	Fruit	Assam, Nagaland, Arunachal Pradesh
64	<i>Gnetum montanum</i>	Gnetaceae	Stem, root, bark, leaves	Manipur
65	<i>Gymnocladus burmnicus</i>	Fabaceae	Bark and leaves	Arunachal Pradesh
66	<i>Gynocrdia odorata</i>	Achariaceae	Fruits	Arunachal Pradesh, Mizoram
67	<i>Hydnocarpus kurzii</i>	Achariaceae	Fruits, Bark	Manipur
68	<i>Jatropha curcas</i>	Euphorbiaceae	Root	Manipur, Nagaland
69	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Bark, leaves	Manipur
70	<i>Juglans regia</i>	Juglandaceae	Bark, fruits	Mizoram, Nagaland
71	<i>Kayea assamica</i>	Guttiferae	Fruit	Assam
72	<i>Lasianthus longicauda</i>	Rubiaceae	Whole plant	Arunachal Pradesh
73	<i>Linostoma decadrum</i>	Thymalaeacea	Root	Assam, Mizoram
74	<i>Maesa chisia</i>	Primulaceae	Bark, root and leaves	Manipur
75	<i>Maesa indica</i>	Primulaceae	Bark, root and leaves	Manipur, Sikkim
76	<i>Melodorum bicolor</i>	Annonaceae	Root	Meghalaya
77	<i>Mesua assamica</i>	Calophylaceae	Fruits	Arunachal Pradesh, Assam
78	<i>Mikania cordata</i>	Asteraceae	Stem, leaves, Root	Manipur
79	<i>Mikania scandens</i>	Asteraceae	Whole plant	All NE states
80	<i>Millettia pachycarpa</i>	Fabaceae/ Papilionaceae	Fruits, Bark, root	Assam, Nagaland, Arunachal Pradesh, Mizoram, Meghalaya
81	<i>Millettia extensa</i>	Fabaceae	Root	Nagaland

82	<i>Myrica esculenta</i>	Myricaceae	Bark	Nagaland, Meghalaya
83	<i>Nerium odorum</i>	Apocynaceae	Fruits and roots	Nagaland, Assam
84	<i>Parthenocissus semicordata</i>	Vitaceae	Fruits	Arunachal Pradesh
85	<i>Persicaria barbata</i>	Polygonaceae	Whole plant	Arunachal Pradesh
86	<i>Persicaria lapathifolia</i>	Polygonaceae	Whole plant	Manipur
87	<i>Phoenix dactylifera</i>	Arecaceae	Whole plant	Arunachal pradesh
88	<i>Phyllanthus ninuri</i>	Euphorbiaceae	Leaves	Assam
89	<i>Phyllanthus urinaria</i>	Euphorbiaceae	Stem, root, leaves	Manipur
90	<i>Polygala elongata</i>	Polygalaceae	Whole plant	Arunachal Pradesh
91	<i>Polygonum chinense</i>	Polygonaceae	Root	Mizoram
92	<i>Polygonum pubescens</i>	Polygonaceae	Whole plant	Arunachal Pradesh
93	<i>Polygonum strigosum</i>	Polygonaceae	Whole plant	Manipur
94	<i>Polygonum hydropiper</i>	Polygonaceae	Whole plant	Assam, Nagaland, Meghalaya
95	<i>Pongamia paniculata</i>	Leguminoseae	Seed	Assam, Nagaland, Meghalaya
96	<i>Pongamia pinnata</i>	Leguminoseae	Seed	Assam, Nagaland, Meghalaya
97	<i>Potentilla fulgens</i>	Rosaceae	Root	Meghalaya
98	<i>Psydrax dicoccos</i>	Rubiaceae	Root	Arunachal Pradesh
99	<i>Pterocarpus dalborgiodes</i>	Leguminoseae	Bark, leaves, root	Manipur
100	<i>Raphidophora decursiva</i>	Araceae	Fruits	Arunachal Pradesh
101	<i>Randia dumetorum</i>	Rubiaceae	Fruit	Assam, Meghalaya
102	<i>Rhododendrum arboreum</i>	Ericaceae	Leaves	Nagaland
103	<i>Ricinus communis</i>	Euphorbiaceae	Seed	Assam, Nagaland, Meghalaya
104	<i>Sapindus mukorossi</i>	Sapindaceae	Fruits	Mizoram, Nagaland
105	<i>Schima wallichii</i>	Theaceae	Bark	Mizoram, Nagaland
106	<i>Senna alata</i>	Fabaceae	Bark	Arunachal Pradesh
107	<i>Solanum xanthocarpum</i>	Solanaceae	Fruits	Assam
108	<i>Sphaeranthus indicus</i>	Asteraceae	Stem, root, leaves	Manipur
109	<i>Spilanthes acmella</i>	Asteraceae	Whole plant	Assam
110	<i>Spilanthes peniculata</i>	Asteraceae	Whole plant	Arunachal Pradesh
111	<i>Stipa sibirica</i>	Poaceae	Seed, leaves	Arunachal Pradesh
112	<i>Taxus baccata</i>	Taxaceae	Bark, leaves, shoot	Nagaland, Meghalaya
113	<i>Tephrosia candida</i>	Leguminoseae	Leaf	Assam
114	<i>Thelypteris herbacea</i>	Thelypteridaceae	Leaf, Whole plant	Nagaland
115	<i>Thevetia peruviana</i>	Apocynaceae	Latex, seed	Assam
116	<i>Trevesia palmata</i>	Araliaceae	Fruits	Arunachal Pradesh
117	<i>Trichosallathes bracteata</i>	Cucurbitaceae	Fruit	Assam
118	<i>Vitis himalayana</i>	Vitaceae	Fruit	Arunachal Pradesh
119	<i>Zanthoxylum acanthopodium</i>	Rutaceae	Fruit, leaves	All NE states
120	<i>Zanthoxylum armatum</i>	Rutaceae	Fruit, root, bark, leaves	Arunachal Pradesh, Nagaland, Manipur, Meghalaya
121	<i>Zanthoxylum nitidum</i>	Rutaceae	Fruit	Arunachal Pradesh, Manipur
122	<i>Zanthoxylum rhetsa</i>	Rutaceae	Fruit	Arunachal Pradesh, Nagaland

Table 2: List of common traditionally used herbal piscicides in NE India.

Source: Adapted from [9,10,19,25-29].



Figure 1: Polygonum Hydropiper.



Figure 2: Ricinus communis.

In addition to use of plants as piscicidal agents, ITKS are available on use of different plant species, as fish attractant, fish aggregating device, fish bait to enhance catching different types of fish under different ecological conditions in the region. As the NE region of India is one of the most flood affected region of the country, several ITK have been developed to cope up with the flood havoc and mitigate impact of flood on fisheries for sustaining livelihood [30]. One of the coping up measures is using locally available plant as fish attractant in the flood plain wetlands and ponds in flood affected areas to minimise loss due to escape of fish during flood. Branches of the deciduous shrub *Grewia sapida* (Roxb) with leaves [31] and root exudates of *Ferula Asafoetida* (Linn) plant [32] are used as fish attractant in flood plain wetlands of Assam to attract and retain the fish biomass in the wetlands during flood and at the time of receding of flood water to avoid loss due to migration. Common agricultural byproducts like rice bran Mustard Oil Cake and cow dung are also used traditionally as fish attractant in natural water bodies in many parts of the region. In addition, locally available bamboo (*Bambusa* species) branch, coconut (*Cocos nucifera*) leaves, areca nut (*Areca* species) leaves, palm leaves, floating aquatic weeds like Water hyacinth (*Eichhornia crassipes*) are used for fish aggregation or as shelter for fish during flood. In Manipur, Hygoryza species of plants, locally known as *Kambong* (belonging to the family Graminae) grown in low lying areas is used traditionally as fish aggregating device [33]. primarily for catching the air breathing fish species. Branches of the tree *Barringtonia acutnagula* are used in some flood plain wetlands of Assam as fish aggregating device for enhancing production [34]. For indigenous Bush park fishing practice (*Katal* fishing) in floodplain wetlands of Assam, different aquatic weeds, plant branches, twigs are used as fish attractant [35]. Traditional knowledge on use of fruits of wild plants like *Lantana camara* (Family Verbenaceae) and *Viburnum foetidum* (Family Viburnaceae) as baits for angling to catch hill stream fishes by local people in Meghalaya has been reported by Bhuyan [36,37].

SI No	Family	No of species	SI No	Family	No. of species
1	Achariaceae	2	24	Leguminoseae	11
2	Annonaceae	2	25	Loganiaceae	1
3	Apocynaceae	1	26	Lythraceae	1
4	Araliaceae	1	27	Menispermaceae	2
5	Aristolochiaceae	1	28	Mimosaceae	3
6	Araceae	2	29	Myricaceae	1
7	Aracaceae	1	30	Primulaceae	2
8	Asteraceae	11	31	Poaceae	1
9	Asclepiadaceae	1	32	Polygalaceae	1
10	Athyriaceae	1	33	Polygonaceae	6
11	Burseraceae	1	34	Ranunculaceae	1

12	Calophylaceae	1	35	Rosaceae	1
13	Cornaceae	1	36	Rubiaceae	10
14	Cucurbitaceae	1	37	Rutaceae	5
15	Ebenaceae	4	38	Sapindaceae	4
16	Ericaceae	1	39	Solanaceae	1
17	Euphorbiaceae	11	40	Taxaceae	1
18	Fabaceae	12	41	Theaceae	1
19	Gnetaceae	1	42	Thelypteridaceae	2
20	Guttiferae	1	43	Thymalaceae	1
21	Juglandaceae	3	44	Verbanaceae	1
22	Lamiaceae	1	45	Vitaceae	2
23	Lecythydaceae	1	46	Zingiberaceae	1
				Total	122

Table 3: Family wise piscicidal plant diversity in NE India.



Figure 3: *Grewia sapida* (Roxb) used for fish aggregation in wetlands of Assam.

Plethora of indigenous technical knowledge is available for fish harvesting in natural resources in different states of the region [34]. as well as in making traditional fishing gears and traps by using locally available suitable plant species. Several varieties of Bamboo (both wild and cultivated) and Rattan species are available in the states of the North East Region of India. Most of the indigenous traps and gears used traditionally in catching fish in the region are made from Bamboo and Rattan as the primary component (Figure 4). A total of 14 types of traditional traps and gears have been reported from Assam that are made using Bamboo as the major component [41]. Commonly used bamboo made fishing gears and traps in Assam are fishing spears (*Posha/Jhakra*), bows and arrows (*Dhenu Kar*), Pole line (*Boroxi*), passive traps made from split bamboo with different shapes and sizes (*Dolonga, Derjakori, Tak, Hukuma, Chunga/dhund, Sepa, Khoka, Ubhoti, Paori, Sasha, Bana*), active traps made from split bamboo like Scoop gear



Figure 4: Some Bamboo made traditional traps and gears of Assam.

(*Jakoi, Chalonee, Polo, Juluki*), lift nets made from bamboo poles and net (*Dhekijaal, Khorajal*). Similar kind of bamboo made traps and gears were developed in all the states of the region with indigenous technical knowledge, with suitable location specific modification/improvisation and are known by local names in a particular area or state [14,17,38,39].

Fibre prepared from indigenous plant like Tamak (*Caryota urens*, Linn), belonging to the family Palmae is often used for making some of the cast nets (Locally called as *Esap* by Galo tribes)

used specifically for fishing in the shallow rivers, streams and other water bodies of the state of Arunachal Pradesh [39]. The hard wood of this species of plant is used for making oars for boats in the region [4]. Another important ITK for increasing the life of fishing net by toughening or strengthening the twines is the use of the plant species *Diospyros emhryopteris* (family Ebenaceae) available in Assam, Nagaland and Meghalaya [4]. Fisherman community traditionally take out the juice of the green fruits of the plant in a large container and dip the net in it to toughen the twines and make it durable. Gums derived from unripe fruits of the plant *Diospyros emhryopteris* is traditionally used to coat bottom of fishing boats to make it strong and leak proof [4]. Sharma [42] reported that the trifoliolate leaves of the commonly available Wood Apple plant (*Aegle mermelos*) has a tranquilizing effect on fish and are traditionally used to keep particularly the highly active air breathing catfish *Clarias magur* calm and motionless for easy handling and transportation.

Indigenous Technical Knowledge in general reflects the wisdom, skill, innovations, resourcefulness and socio economy of a community. These ITK available on fisheries of NE region hold immense importance in sustainable management aquatic resources of the region and therefore need to be considered as essential element to formulate location specific management plans for ecologically sustainable development of the fisheries sector [6]. With the growing importance of artisanal fisheries and aquaculture in global economy as sustainable source for livelihood and nutrition, that hold enormous potential to bring about the needed transformation in the global food production sector with minimum impact on the environment [43], the available ITKs in the sector need to be documented, validated and incorporated in the management plans for ecological and economic sustainability of the sector.

Bibliography

- Goswami UC., et al. "Fish diversity of North East India, inclusive of the Himalayan and Indo Burma Biodiversity hotspots zones: A check list of their taxonomic status, economic importance, Geographical distribution, present status and prevailing threats". *International Journal of Biodiversity and Conservation* 4.15 (2012): 592-613.
- Balasubramanian A. "Biodiversity Profile of India" Technical Report: March 2017, Centre for advanced studies in Earth Science, University of Mysore, Mysore (2017).
- Mao AA., et al. "Plant wealth of North East India with reference to ethno botany". *Indian Journal of Traditional Knowledge* 8 (2009): 96-103.
- Dutta AC. "Dictionary of economic and medicinal plants". First Edition (1985): 371.
- Jawale CS. "Piscicidal plants in India". *Trends in Fisheries Research* 7.2 (2018): 33-45.
- Kumar D., et al. "Indigenous Technical Knowledge in Fisheries of Northeast India. CIFE, Mumbai (2010): 122.
- Bordoloi R and Muzaddadi AU. "Indigenous Technical Knowledge associated with Disaster management and fisheries related activities in the highest flood affected district (Dhemaji) of Assam, India". *Indian Journal of Traditional Knowledge* 14.3 (2015): 407-415.
- Chetia Borah B and Bordoloi B. "Use of small indigenous freshwater fish species as ethno medicine in the Northeast region of India". *Acta Scientific Nutritional Health* 7.8(2023):68-72.
- Chetia Borah B and Baruah UK. "Plants that kill fish- the traditionally used piscicidal plants of Northeast India". *Indian Journal of Hill Farming* 18.1-2 (2005): 140-143.
- Dutta MP., et al. "Piscicidal plants of Northeast India and its future prospect in aquaculture-A comprehensive review". *Indian Journal of Natural Products and Resources* 10.3 (2019): 165-174.
- Dominic R and Ramanujam SN. "Traditional knowledge and ethno-botanical uses of piscicidal plants of Nagaland, North-east India". *Indian Journal of Natural Products and Resources* 3 (2012): 582-588.
- Lalthanzara H and Lalthanpuui PB. "Traditional fishing methods in rivers and streams of Mizoram, Northeast India". *Science Vision* 9.4 (2009): 188-194.
- Moyon WA and Singh LA. "Ichthyotoxic plants of Manipur". *International Journal of Fauna and Biological Studies* 4.4 (2017): 29-36.
- Moyon WA and Chara E. "Indigenous fishing methods of the Moyon Tribe of Manipur (India) and Myanmar". *Society and Sustainability* 3.2 (2021): 55-67.
- Ovung EY., et al. "Indigenous community fishing practices in Nagaland, Eastern Indian Himalayas". *Sustainability* 14 (2022): 7049.
- Baruah D. "Traditional community fishing practices of rural Kamrup of Assam". *Aquaculture Asia Magazine* 21.1 (2017): 7-17.
- Devi BN., et al. "Traditional Fishing Methods of Central Valley Region of Manipur, India". *Indian Journal of Traditional Knowledge* 12.1 (2013): 137-143.

18. Dutta R and Bhattacharjya BK. "An indigenous community fishing practice of Tirap district, Arunachal Pradesh". *Indian Journal of Traditional Knowledge* 7.4 (2008): 624-626.
19. Chetia Borah B. "Mach Akarshan aru Osetan Korat Porompogot bhabe Udvidor Bybohar. In: Meen Khetrat Tholua Proyugik Gyanor Proyug". College of Fisheries AAU (2013).
20. Gurumayum SD and Choudhury M. "Fishing Methods in the rivers of North East India". *Indian Journal of Traditional knowledge* 8 (2009): 237-241.
21. Kalita B., et al. "Herbal fish toxicant used by fishers of Karbi Anglong District, Assam". *Indian Journal of Traditional knowledge* 6.2 (2007): 334-336.
22. Wangpan T., et al. "Traditional use of plants as medicine and poison by Tagin and Galo tribe of Arunachal Pradesh". *Journal of Applied Pharmaceutical Science* 9.9 (2019): 98-104.
23. Tynsong H and Tiwari BK. "Traditional knowledge associated with fish harvesting practice of War Khasi community of Meghalaya". *Indian Journal of Traditional Knowledge* 7.4 (2008): 618-623.
24. Sundriyal M., et al. "Wild edible and other useful plants of Sikkim, Himalayas, India". *Oecologia Montana* 7.1-2 (1998): 43-54.
25. Ramanujan SN. "Traditional Method of fish catching using piscicidal plants. Technical Knowledge (ITK) in Fisheries of Northeast India, A Resource Book". Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010): 114-116.
26. Chetia Borah B. "*Era (Ricinus communis Linn)* as Fish Poison. Indigenous Technical Knowledge (ITK) in Fisheries of North-east India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010a): 122.
27. Chetia Borah B. "*Konibih (Croton tiglium Linn)* as Fish Poison. Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010b): 122.
28. Chetia Borah B. "*Bokolbih (Derris elliptica)* as Fish Poison. Indigenous Technical Knowledge (ITK) in Fisheries of North East India-A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010c): 122. ISBN.
29. Chetia Borah B. "*Polygonum hydropiper* as Fish Poison. Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010d): 122.
30. Chetia Borah B. "Impact of flood on Fisheries in North East India: coping up and mitigation measures. In Perspectives on Climate Change and Inland Fisheries in India, edited by UK Sarkar, BK Das, P. Mishal and G. Karnatak, Published by ICAR-CIFRI, Barrackpore (2019).
31. Chetia Borah B. "Soura" (*Grwia sapida Roxb*) Plant as Fish Attractant. Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010e): 122.
32. Murmu K., et al. "Use of *Hing (Asafoetida)* as fish Attractant Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010): 122.
33. Devi BN. "*Kambong (Hygoryza sp.)* as fish aggregating Device in lowlying areas in Manipur. Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010): 122.
34. Nath AJ., et al. "Traditional use of *Barringtonia acutangula* in fish farming in Chatla floodplain of Cachar, Assam". *Indian Journal of Traditional Knowledge* 9.3 (2010): 544-546.
35. Kakati BK and Shirma R. "Katal fishing-an unique fishing method in Beels of Assam, India. Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010): 122.
36. Bhuyan RN. "Use of *Sholang* fruit as bait. Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010a): 122.
37. Bhuyan RN. "Use of *Sohpankhli* fruit as bait. Indigenous Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010b): 122.
38. Singh HN and Singh OR. "Traditional Fishing systems in Manipur". *International Journal of Creative Research Thought* 1.3 (2013): 806-809.
39. Karga J., et al. "Traditional fishing gears and fishing methods of West Siang District, Arunachal Pradesh". *Journal of Krishi Vigyan* (2020): 293-299.
40. Kechu M and Pankaj PP. "Traditional fishing methods practiced by Ao and Sumi tribes in Dihkhu river of Nagaland, India". *Journal of Fisheries* 11.2 (2023): 112202.

41. Baruah D. "Indigenous bamboo made fishing implements of Assam". *Journal of Krishi Vigyan* 3.1 (2014): 37-41.
42. Sharma R. "Tranquilizing fish for easy handling. "Indigenous-Technical Knowledge (ITK) in Fisheries of North East India, A Resource Book. Central Inland Fisheries Education (Deemed University, ICAR), Mumbai (2010): 122.
43. FAO. "International year of Artisanal Fisheries and Aquaculture 2022- Final Report, Rome (2023).