CHAPTER 4

RESEARCH FINDINGS

Findings of this research are presented under the following five units following the five objectives of the study:

Research finding 1: Water spread areas
Research finding 2: Fish Diversity and their Conservation,
Research finding 3: Fishing Gears,
Research finding 4: Fishing Communities and
Research finding 5: Fish as ingrained in Culture

4.1. RESEARCH FINDING 1: WATER SPREAD AREAS

Study of the water spread areas has been done following the National Wetland Atlas categorisation. According to the National Wetland Atlas, following are the different types of Inland wetlands -

Table 4.1.1: Wetland categories as per National Wetland Atlas

Wettcode	Level I	Level II	Level III
1000	Inland Wetlands		
1100		Natural	

1101			Lakes
1102			Ox-Bow Lakes/ Cut-Off Meanders
1103			High altitude Wetlands
1104			Riverine Wetlands
1105			Waterlogged
1106			River/stream
1200		Man-made	
1201			Reservoirs/ Barrages
1202			Tanks/Ponds
1203			Waterlogged
1204			Salt pans

Source: National Wetland Atlas, 2010

Out of these, the wetlands found in Assam falls under the categories – 1101, 1102, 1104, 1105, 1106, 1202, and 1203.

The study area has the following types of water spread areas-

Table 4.1.2: Types of water spread areas

Wettcode		
1101	Natural	Lakes
1102		Ox-Bow Lakes/ Cut-Off Meanders
1104		Riverine Wetlands
1105		Waterlogged
1106		River/stream
1202	Man-made	Tanks/Ponds
1203		Waterlogged

Source: National Wetland Atlas, 2010

Lakes (1101), Ox-bow lakes (1102), riverine wetlands (1104) and the hill streams (1106) are the main breeding grounds of fishes. Fishes that can survive in comparatively less oxygen concentration live in shallow marshes and swamps (1104). This type of fishes includes *Channa spp*, *Clarius*, *Heteropteunes*, *Tricogaster*, *Botia*, etc. Most carps breed in deep lakes

(1101) or larger flood plain wetlands (1104). All major carps including *Labeo*, *Catla*, *Cirrhinus*, *Puntius*, *Notoptrerus* etc breed in large wetlands. Wetlands with rooted, submerged, and free floating vegetations act as kidney to purify water.

Stone laid floor of the hill streams are used as breeding ground by the hill stream fishes like *Aspidoparia*, *Barilius*, *Danio* etc. Rivers contribute to diversity of fishes due to variations in altitude, temperature and food.

Except the hill streams in the Rangia sub division in Kamrup district, all the other hill streams in the three study districts are rain-fed. The Northern Tributaries of Brahmaputra (Puthimari, Bornoi, Nona, and Pagladia) originating in the Himalayas receive snow melt water. Hence, the fish composition of these rivers include fishes like *Barilius* that needs higher oxygen concentration to survive.

4.1.1. District-wise wetland Area in the study districts:

Goalpara district has 33221 ha of water spread area, which is 4.35% of the total wetland area in the state and 18.21% of the total geographical area of the district. (Table 4.1.3, Fig. 4.1.1 and7)

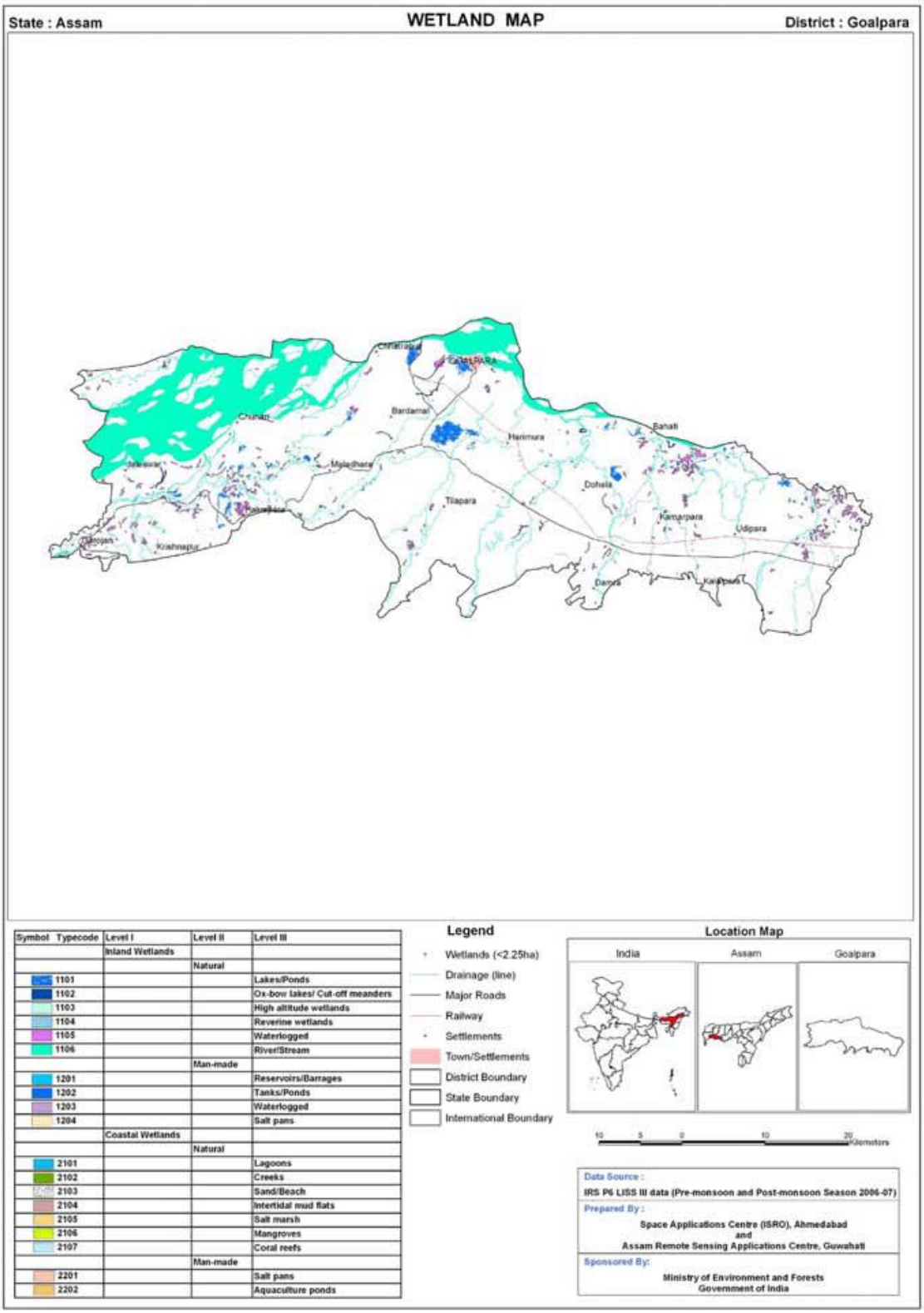
Kamrup and Kamrup Metro district wetland have been studied together in the NWIA and the total spread area of these two districts is 43655 ha, which is 5.71% of the total wetland area in the state and 10.05% of the total geographical area of the districts. (Table – 4.1.3, Fig. 4.1.5)

Table-4.1.3: District-wise wetland Area in the study districts

Sr. No.	District	Geographic Area (sq. km)	Wetland Area (ha)	% of total wetland area	% of district Geographic area
01	Goalpara	1824	33221	4.35	18.21
02	Kamrup & Kamrup Metro together	4345	43655	5.71	10.05

Source: National Wetland Atlas, 2010

4.1.2. Wetland area in Goalpara District:



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Source: National Wetland Atlas, 2010

Fig. 4.1.1: Map of Goalpara district showing the water spread areas (source NWIA)

The map in the previous page (Fig. 4.1.1) shows the water spread areas of the Goalpara district. This map produced in NWIA report was thoroughly consulted before making all the field visits to the water spread areas and during selection of the study villages.

Major wetlands in Goalpara District include the following –

1. Urpad beel
2. Hasila beel
3. Kumri beel
4. Jinari river
5. Jinjiram river
6. Krishnai river
7. Dudhnai river
8. Brahmaputra river

- **Urpad beel** (26° 6'6.95"N; 90°34'45.77"E)**:** Urpad beel (Fig. 4.1.2) is a fresh water lake located near Agia in Goalpara district. Urpad is one of the ***Wetlands of National Importance*** listed in the Ministry of Environment, Forests and Climate Change website. Urpad is very rich in aquatic biodiversity and is an important Elephant water hole. Numerous species of migratory birds flock this wetland in the winter. It is locally famous as the Pink beel due to the pink cover of water lily. Sampling of the fishes for identification of the species was done near the Jungle para village, near Khagrabari and near Garopara. Fish specimens were also collected from Bolbola, Agia and Solmari fish markets. For socio-economic information, the following habitations were visited –
    1. Solmari: Local market in Solmari was surveyed and community interactions were done here
    2. Garopara: Community interactions were done here
    3. Junglepara: Community interaction, fish sampling was done here
    4. Budhipara: Community interactions were done here
    5. Agia: Community interactions were done here
    6. Chandamari: Community interactions were done here
    7. Balbala: Market survey and community interactions were done here
    8. Khagrabari: Community interaction, fish sampling was done here
    9. Fofonga: Community interactions were done here

Fig. 4.1.2: Map of Urpad beel (prepared using Google earth online internet tool)

- **Hasila beel** (26° 9'57.53"N; 90°36'31.16"E): Hasila beel (Fig. 4.1.3) is a fresh water lake located within Goalpara town in Goalpara district. Migratory water fowls, especially Lesser whistling teal and Pintail duck visit Hasil beel during the winter. Sampling of the fishes for identification of the species was done near Hasilapara, Karbala and Kismatpur. For socio-economic information, the following habitations were visited –

    1. Kalpana nagar: Community interactions were done here
    2. Hasilapara: Community interaction, fish sampling was done here
    3. Kismatpur: Community interaction, fish sampling was done here
    4. Karbala: Community interaction, fish sampling was done here

Fig. 4.1.3: Map of Hasila beel (prepared using Google earth online internet tool)

- **Kumri beel** (26°10'34.98"N; 90°33'2.28"E): Kumri beel (Fig. 4.1.4) is a flood plain wetland located near Naranarayan Setu in Pancharatna in Goalpara district. It is located at the western foothill of Pancharatna hill. It is an important Elephant water hole. Flood water from Brahmaputra enters Kumri beel. Migratory water fowls visit Kumri beel during the winter. Sampling of the fishes was done in Pancharatna area. Socioeconomic interactions were done near Pancharatna and Dakurvita.

Fig. 4.1.4: Map of Kumri and Makri beels (prepared using Google earth online internet tool)

- **Makri beel** (26°10'14.64"N; 90°34'39.56"E): Makri beel (Fig. 4.1.4) is a small fresh water lake located at the eastern foothills of Pancharatna hill on the Karbala-Dakurvita road. It is an important Elephant water hole. Socioeconomic interactions were done with fishermen from Makri, Karbala, Dakurvita and Kalyanpur. Kalyanpur village is about 7-8 kilometer from Makri. But, some Rabha fishermen travel by bicycle to Makri beel for fishing.

- **Jinari river**: Jinari river originates at Urpad beel at 26° 5'15.60"N and 90°35'8.13"E. It flows through Paharkata, Agia, south of Lakhipur and finally merge in Brahmaputra near South Salmara (25°52'5.73"N; 90° 0'21.54"E). At the starting point, it is a very narrow and shallow stream. Now a days, it is a seasonal link and during the dry season, it gets disconnected from Urpad beel. Gradually as it travels westwards, many perennial hill streams merge with it and makes it a major tributary of Brahmaputra river.

Sampling from the beel was done at Agia and Balijana area. Community interactions done at Agia, Balijana, Darka, Baida area.

- **Jinjiram river:** Jinjiram river originates in Meghalaya Hills and it is known as Bajeng river in Meghalaya. It enters Assam near Bajengdoba at 25°54'4.60"N and 90°30'48.05"E. From Bajengdoba it runs towards the plains of Assam in the North direction and meandering through the valley, crosses the National Highway 37 at Bolbola (26° 4'11.05"N; 90°35'56.87"E). Then it further travels Northwards until Dubapara. At Dubapara, it takes a Westward bend and confluence with the Brahmaputra at 26° 9'26.94"N; 90°40'49.74"E. Sampling for Jinjiram river was done in Bolbola and Dubapara. Community interactions done in Bolbola, Dubapara and Bajengdova area.

- **Krishnai river:** Krishnai river originates in Meghalaya hills and is known in Meghalaya as Damring river. Damring river enters Assam near Mendi Pathar (25°53'59.44"N; 90°37'8.95"E) and flows Northwards meandering through Krishnai (26° 1'51.04"N; 90°40'12.09"E) and finally confluence with Dudhnai river at Domani (26° 4'33.11"N; 90°45'11.11"E). Merger of Krishnai and Dudhnai river forms Mornoi river, which finally confluences with Brahmaputra near Mornoi (26° 6'54.65"N; 90°44'41.79"E). Sampling for Krishnai river was done in Krishnai area. Community interactions done in Mendi Pathar, Krishnai and Domani.

- **Dudhnai river**: Dudhnai river originates in Meghalaya Hills and enters Assam near Damra (25°55'36.08"N; 90°46'52.69"E). From Damra, it flows Northwards meandering through Dudhnai, (25°58'49.47"N; 90°47'27.14"E), Uportola, Matia (26° 3'38.82"N; 90°47'5.15"E) and confluence with Krishnai river at Domani (26° 4'33.11"N; 90°45'11.11"E Merger of Krishnai and Dudhnai river forms Mornoi river, which finally confluences with Brahmaputra near Mornoi (26° 6'54.65"N; 90°44'41.79"E). Sampling for Dudhnai river was done in Dudhnai, Matia and Domani area. Community interactions were done in Damra, Dudhnai, Uportola, Matia, Domani and Mornoi.

- **Brahmaputra river**: Brahmaputra river flows through the entire Northern Border of the Goalpara district. Sampling of fishes from the river was done at Goalpara, Dalgoma

and Pancharatna. Community interactions were done at Dalgoma, Guwaltuli, Goalpara fish market, Borobazar fish market, and Pancharatna.

4.1.3. Wetland areas in Kamrup District:

Major wetlands in Kamrup District include the following –

1. Brahmaputra river
2. Puthimari river
3. Bornoi river
4. Nona river
5. Kulsi river
6. Pagladiya river
7. Kalajal river
8. Chandubi beel
9. Sapdola beel

The map (Fig 4.1.5) in the right shows the water spread areas of the Kamrup and Kamrup Metro districts. Since Kamrup Metro is a newly formed district, wetland studies have been done together with Kamrup district.

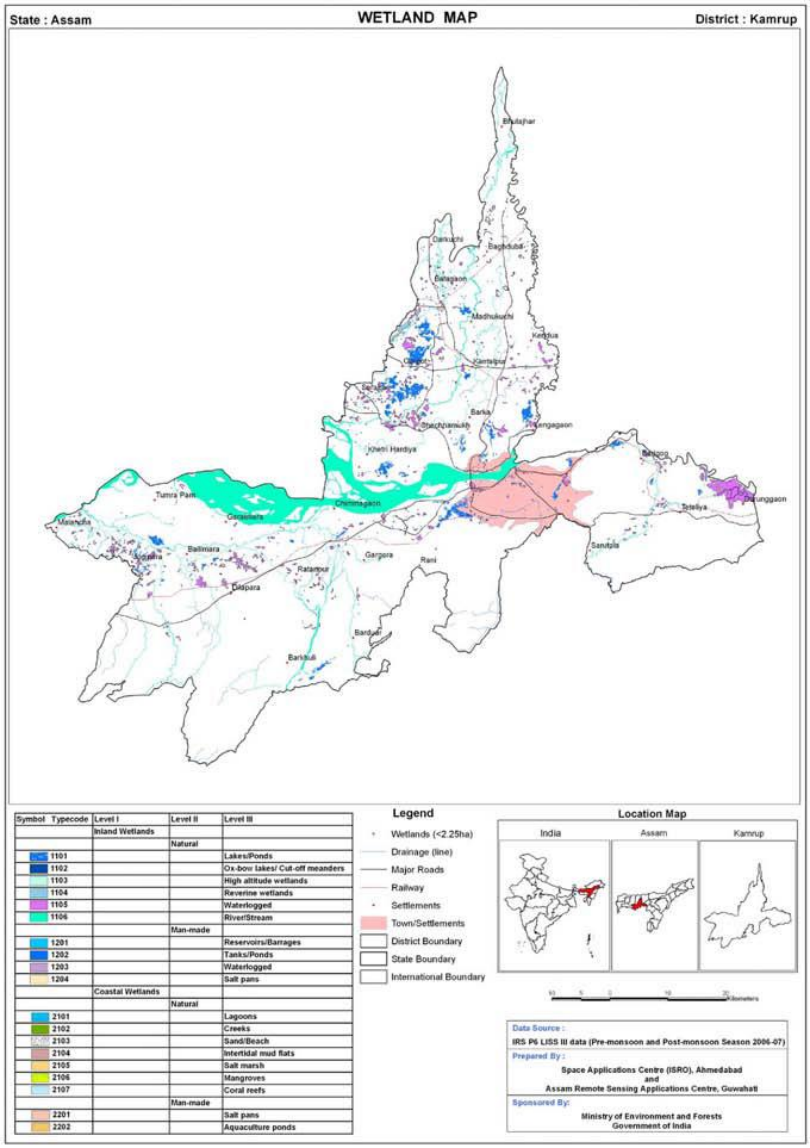


Fig 4.1.5: Map of Kamrup & Kamrup Metro district combined showing the water spread areas (source National Wetlands Atlas, 2010)

Since the topic of this thesis is restricted to South-West Assam, hence, only the waterbodies on the South bank of river Brahmaputra have been studied in detail. Only for some parameters like name of places or any unique traditional knowledge, visits to North Bank of Brahmaputra were made. The following water bodies and locations were studied -

- **Kulsi river**: Kulsi river originates in Meghalaya hills and enters Assam at Ukiam (25°50'21.57"N; 91°20'45.20"E) after merging with two other hill streams. One channel from Chandubi lake merges with Kulsi river and then it flows Northwards and bifurcate into Kulsi and Chaygaon rivers at Dimali (25°58'2.40"N; 91°24'54.58"E).

    - **Kulsi river**: Kulsi flows through Kukurmara (26° 4'24.66"N; 91°25'48.76"E) and flows North -Westwards to Makeli (26° 5'30.65"N; 91°23'10.27"E).

    - **Chaygaon river**: Chaygaon river flows through Chaygaon (26° 2'54.33"N; 91°23'20.80"E) and merge with Kulsi river at Makeli (26° 5'30.65"N; 91°23'10.27"E).

    - After merger of the two channels, Kulsi river flows through Nagarbera and confluence at Brahmaputra river at 26° 7'8.37"N; 91° 0'5.67"E.

- **Chandubi beel**: (25°52'40.88"N; 91°25'13.95"E): Chandubi beel (Fig 4.1.6) is a tectonic lake located near Rajapara village in Kamrup district. It is an important Elephant water hole. Migratory water fowls visit Chandubi beel during the winter. Socioeconomic interactions were done in the Rajapara area and Puijala area.

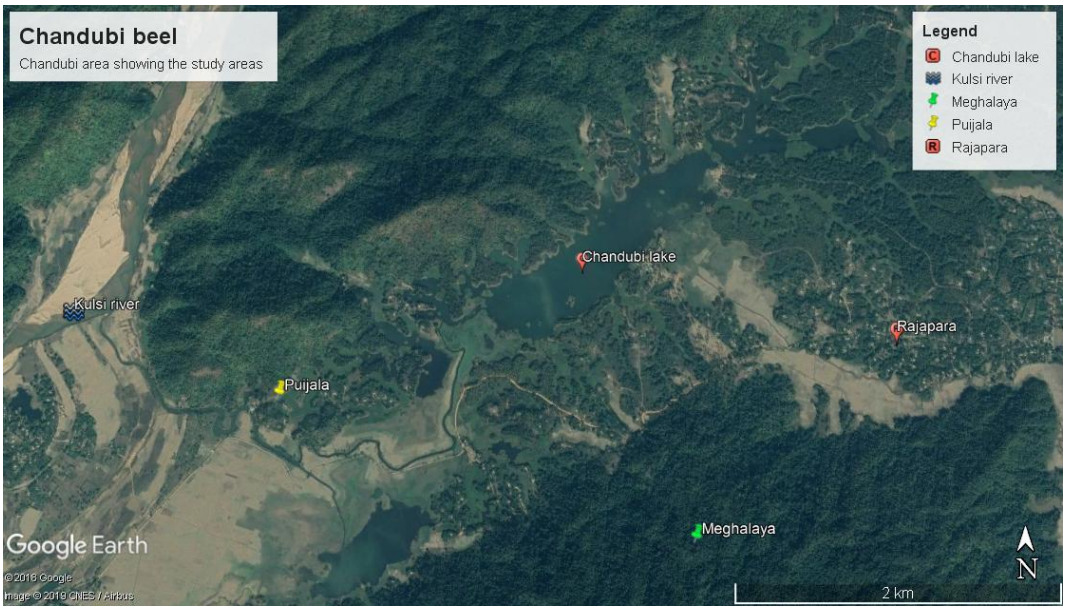


Fig 4.1.6: Map of Chandubi beel (prepared using Google earth online internet tool)

- **Brahmaputra river tract:** River Brahmaputra cuts through the Kamrup district. Fishes were sampled from Nagarbera, Palashbari and Suwalkuchi areas. Community interactions were done in Nagarbera and Suwalkuchi areas only. Although this study left out the North Bank of Brahmaputra from the detailed specific studies, but Suwalkuchi was included because during the study period, fishing net and fishing boat preparation could be studied in Suwalkuchi. Preparation of fishing net and fishing boat are unique traditional knowledge related to the fishermen communities.

4.1.4. Wetland areas in Kamrup Metro district

Major wetlands in Kamrup Metro District include the following –

1. Deepor beel
2. Silshako beel
3. Digaru river
4. Bharalu river
5. Kapili river
6. Brahmaputra river

- **Deepor beel**: Deepor beel (Fig 4.1.7) is a fresh water lake located near Azara/ Tetelia/ Pamohi in Guwahati city of Kamrup Metro district. Deepor is one of the ***Wetlands of National Importance and a Ramsar Site*** listed by the Ministry of Environment, Forests and Climate Change and Ramsar Committee. Deepor is very rich in aquatic biodiversity and is an important Elephant water hole. Numerous species of migratory birds flock this wetland in the winter. Sampling of the fishes for identification of the species was done near the Azara Keotpara village, near Tetelia and near Chakardo. Fish specimens were also collected from local fish markets in Chakardo, Azara Godhuli bazar, Dharapur and Rani gate. For socio-economic information, the following habitations were visited –
    - Tetelia (26° 8'4.81"N; 91°40'18.52"E): Located in the northern fringe of the wetland near the Tata Institute of Social Science (TISS) Guwahati campus

- Pamohi (26° 6'18.40"N; 91°42'8.63"E): Located in the eastern fringe of the wetland near the confluence of the beel with Bharalu river. It is predominantly a Karbi & Bodo village with some newly migrated families of other communities.

- Deochutal (26° 6'10.83"N; 91°40'59.46"E): Located toward the southern fringe of the wetland near the municipal waste dumping ground. It is an elephant corridor to the beel. Many stone quaries are established on the Rani-Garbhanga hill near Deochutal. It has Karbi and Bodo population.

- Chakardo (26° 6'38.30"N; 91°38'45.26"E): Located towards the southern fringe near the Watch tower of the wetland and the Forest Beat Office. It is predominantly a Karbi village.

- Azara Keotpara (26° 6'58.45"N; 91°37'7.72"E): Located towards the north-western fringe of the wetland near Azara circle head quarter. It is predominantly a Fisherman community (Keot/ Kaibarta) village.

Fig 4.1.7: Map of Deepor beel (prepared using Google earth online internet tool)

In addition to the above study villages, communities and fishermen from Khanamukh, Hatuwapara, Hirapara, Nowapara, Natun Basti, Borbori, Matiapahar, Maghuwapara, and Mainakhorong were also consulted for information.

- Silsako beel (26° 9'5.46"N; 91°49'2.43"E): It is a small oxbow lake in the eastern side of Guwahati city near Pathar quary (near Hotel Ginger and OKD Institution of Social Change Research). This wetland is almost dying due to encroachment and pollution. Commercial fishery is not viable anymore in this wetland at large scale. Hence, detailed study was not carried out in this area.

- **Digaru river**: Digaru river is known as Umtru river in Meghalaya. It originates in Meghalaya hills and enters Assam near Byrnihat (26° 3'1.75"N; 91°52'24.60"E). Then it flows Northwards and Westwards to flow through Sonapur and finally merge with Kopili river near Digaru (26°13'43.83"N; 91°57'37.76"E). Kopili river finally confluence with Brahmaputra near Gobardhan bazar (26°15'1.79"N; 91°57'22.94"E)

- **Kapili river**: Kapili river originates in the Kapili dam near Umrangso in Dima Hasao district. Then it flows through Amreng, Dayangmukh, Tumpreng, Jamunamukh. Kampur, Chaparmukh, Dharamtul, Bhakatgaon, Manaha and finally enters Kamrup Metro district near Maloibari. Kapili merges with Digaru river near Digaru (26°13'43.83"N; 91°57'37.76"E). Kopili river finally confluence with Brahmaputra near Gobardhan bazar (26°15'1.79"N; 91°57'22.94"E)

- **Brahmaputra**: River Brahmaputra runs through the Northern boundary of Kamrup Metro district. Fish sampling were done near Gobardhan bazar (26°15'1.79"N; 91°57'22.94"E), Uzan bazar ghat (26°11'43.11"N; 91°45'19.53"E) and Sadilapur (26°10'12.80"N; 91°40'5.22"E)

Plate 4.1a : Photos of important water bodies: Goalpara District

Fig: 4.1.8. Brahmaputra river, Goalpara

Fig: 4.1.9. Urpad beel, Goalpara

Fig: 4.1.10. Hasila beel, Goalpara

Fig: 4.1.11. Jinari river, Goalpara

Fig: 4.1.12. Jinjiram river, Goalpara

Fig: 4.1.13. Krishnai river

Fig: 4.1.14. Dudhnai river, Goalpara

Fig: 4.1.15. Kumri beel, Goalpara

Plate 4.1b : Photos of important water bodies: Kamrup & Kamrup Metro District

Fig: 4.1.16. Kulsi river, Kamrup

Fig: 4.1.17. Chaygaon river, Kamrup

Fig: 4.1.18. Singra river, Kamrup

Fig: 4.1.19. Chandubi beel, Kamrup

Fig: 4.1.20. Deepor beel, Kamrup Metro

Fig: 4.1.21. Silsako beel, Kamrup Metro

Fig: 4.1.22. Kopili after confluence with Digaru, Kamrup Metro

Fig: 4.1.23. Brahmaputra river, Guwahati

4.2. RESEARCH FINDING 2: FISH DIVERSITY AND THEIR CONSERVATION

4.2.1. Diversity of Fishes Available in the Study Area

Ninety (90) species of fishes have been identified from the study area. Identified fishes are arranged in Table 4.2.2 according to their taxonomic hierarchy. Local names and Common English names are also mentioned in the table. Classifications of the identified fishes were done after Talwar and Jhingran (1991), Nelson (1994), Jayaram (1999) and Jayaram (2010). Scientific names have been followed after the Online Identification site *Fish Base* (www.fishbase.org)

For the convenience of presentation, in Table. 4.2.2, IUCN Status have been denoted with a two-letter code as used by IUCN and a colour code that are mentioned in Table 4.2.1. While the letter code is followed after IUCN, the colour code is self-generated for the convenience of this study –

Table 4.2.1: IUCN Status, Code and Colour Code mentioned in the table 4.2.2

IUCN Status	Code	Colour code
Critically Endangered	CR	xxxxx
Data Deficient	DD	---
Least Concerned	LC	
Not Evaluated	NE	
Near Threatened	NT	xxx

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
A.	**Order**	**Osteoglossiformes**				
	Suborder	NOTOPTEROIDEI				
I.	**Family**	**NOTOPTERIDAE**				
1.	*Species*	*Chitala chitala* (Hamilton, 1822)	Clown knifefish, Chital	Citol,	NT	xxx
2.	*Species*	*Notopterus notopterus* (Pallas, 1769)	Bronze featherback	Kanduli, Foli	LC	
B.	**Order**	**Anguilliformes**				
II.	**Family**	**ANGUILLIDAE**				
3.	*Species*	*Anguilla bengalensis* (Gray, 1831)	Indian mottled eel	Nadal baami	NT	xxx
C.	**Order**	**Clupeiformes**				
III.	**Family**	**CLUPEIDAE**				
	Subfamily	**Alosinae**				
4.	*Species*	*Gudusia chapra* (Hamilton, 1822)	Indian river shad	Koroti, Korti	LC	
5.	*Species*	*Tenualosa ilisha* (Hamilton, 1822)	Hilsa shad	Ilish, Ilsha	LC	
IV.	**Family**	**ENGRAULIDIDAE**				
	Subfamily	**Engraulinae**				
6.	*Species*	*Setipinna phasa* (Hamilton, 1822)	Gangetic hairfin anchovy	Fasa	LC	

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
D.	**Order**	**Cypriniformes**				
V.	**Family**	**CYPRINIDAE**				
	Subfamily	**Cyprininae**				
7.	*Species*	*Bangana dero* (Hamilton, 1822)	Kalabans	Bhangna	LC	
8.	*Species*	*Gibelion catla* (Hamilton, 1822)	Catla	Katla, Bhokuwa	LC	
9.	*Species*	*Chagunius chagunio* (Hamilton, 1822)	Chaguni		LC	
10.	*Species*	*Cirrhinus mrigala* (Hamilton, 1822)	Mrigala	Mirka	LC	
11.	*Species*	*Cirrhinus reba* (Hamilton, 1822)	Reba carp	Lachim	LC	
12.	*Species*	*Ctenopharyngodon idella* (Valenciennes, 1844)	Grass carp	Grass carp	NE	
13.	*Species*	*Cyprinus carpio* Linnaeus, 1758	Common carp	Common carp	CR	xxxxx
14.	*Species*	*Labeo angra* (Hamilton, 1822)	-	Bhangna	LC	
15.	*Species*	*Labeo bata* (Hamilton, 1822)	Bata	Bata, Bhangon	LC	
16.	*Species*	*Labeo boga* (Hamilton, 1822)	-	Bhangon, Boga bata	LC	
17.	*Species*	*Labeo calbasu* (Hamilton, 1822)	Orange fin labeo	Kalbasu, Mali, Koliajora	LC	

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
18.	*Species*	*Labeo gonius* (Hamilton, 1822)	Kuria labeo	Kursa, Kurhi	LC	
19.	*Species*	*Labeo rohita* (Hamilton, 1822)	Roho labeo	Rou, Rui, Rohu	LC	
20.	*Species*	*Osteobrama cotio* (Hamilton, 1822)	-	Hafo	LC	
21.	*Species*	*Pethia conchonius* (Hamilton, 1822)	Rosy barb	Puthi	LC	
22.	*Species*	*Pethia phutunio* (Hamilton, 1822)	Spoted sail barb	Puthi	LC	
23.	*Species*	*Puntius chola* (Hamilton, 1822)	Swamp barb	Puthi	LC	
24.	*Species*	*Puntius puntio* (Hamilton, 1822)	Puntio barb	Puthi	NE	
25.	*Species*	*Puntius sophore* (Hamilton, 1822)	Pool barb	Puthi	LC	
26.	*Species*	*Puntius terio* (Hamilton, 1822)	One spot barb	Puthi	LC	
27.	*Species*	*Puntius ticto* (Hamilton, 1822)	Ticto barb	Puthi	LC	
28.	*Species*	*Systomus sarana* (Hamilton, 1822)	Olive barb	Seni Puthi	LC	
	Subfamily	**Cultrinae**				
29.	*Species*	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	Silver carp	Silver carp	LC	
30.	*Species*	*Laubuka laubuca* (Hamilton, 1822)	Indian Glass barb	Laupattia, Laubusa	LC	
31.	*Species*	*Salmostoma bacaila* (Hamilton, 1822)	Large razorbelly minnow	Selkana, Chela	LC	
32.	*Species*	*Salmostoma phulo* (Hamilton, 1822)	Finescale razorbelly minnow	Selkana, Chela	LC	

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
	Subfamily	**Rasborinae**				
33.	*Species*	*Amblypharyngodon mola* (Hamilton, 1822)	Mola carplet	Mowa	LC	
34.	*Species*	*Aspidoparia jaya* (Hamilton, 1822)	Jaya	Soru Boriala	LC	
35.	*Species*	*Cabdio morar* (Hamilton, 1822)	Morari	Boriala	LC	
36.	*Species*	*Devario aequipinnatus* (McClelland, 1839)	Giant danio	Laupattia, Laubusa		
37.	*Species*	*Devario devario* (Hamilton, 1822)	Sind danio	Bahpatia, Debari	LC	
38.	*Species*	*Danio rerio* (Hamilton, 1822)	Zebra danio	Darkina	LC	
39.	*Species*	*Esomus danricus* (Hamilton, 1822)	Flying barb	Darkina	LC	
40.	*Species*	*Rasbora daniconius* (Hamilton, 1822)	Slender rasbora	Darkina	LC	
41.	*Species*	*Rasbora rasbora* (Hamilton, 1822)	Gangetic scissortail rasbora	Darkina	LC	
	Subfamily	**Garrinae**				
42.	*Species*	*Crossocheilus latius* (Hamilton, 1822)	Stone roller	Kala bata	LC	
VI.	**Family**	**BALITORIDAE**				
	Subfamily	**Nemacheilinae**				
43.	*Species*	*Acanthocobitis botia* (Hamilton, 1822)	Mottled loach	Botia	LC	

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
VII.	**Family**	**COBITIDAE**				
	Subfamily	**Cobitinae**				
44.	*Species*	*Lepidocephalichthys guntea* (Hamilton, 1822)	Guntea loach	Botia, Gutum	LC	
	Subfamily	**Botiinae**				
45.	*Species*	*Botia dario* (Hamilton, 1822)	Bengal loach	Bagh Botia, Gethu, Rani mach	LC	
46.	*Species*	*Botia dayi* Hora, 1932	Fm, D	Rani mach,	NE	
E.	**Order**	**Siluriformes**				
VIII.	**Family**	**BAGRIDAE**				
47.	*Species*	*Sperata aor* (Hamilton, 1822)	Long whiskered catfish	Aari	LC	
48.	*Species*	*Sperata seenghala* (Sykes, 1839)	Giant river catfish	Aari	LC	
49.	*Species*	*Mystus bleekeri* (Day, 1877)	Day's mystus	Singora, Tengna	LC	
50.	*Species*	*Mystus cavasius* (Day, 1877)	Gangetic mystus	Bar singora, Gulsa	LC	
51.	*Species*	*Mystus tengara* (Hamilton, 1822)	*Tengara catfish*	*Singora, Tengna*	*LC*	
52.	*Species*	*Mystus vittatus* (Bloch, 1794)	*Stripped dwarf catfish*	*Singora, Tengna*	*LC*	
53.	*Species*	*Hemibagrus menoda* (Hamilton, 1822)	Menoda catfish	Gagol	LC	

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
54.	*Species*	*Rita rita* (Hamilton, 1822)	*Rita*	*Ritha, Rita*	*LC*	
IX.	**Family**	***SILURIDAE***				
55.	*Species*	*Ompok bimaculatus* (Bloch, 1794)	*Butter catfish*	*Pabha, Pavo, Pabda*	*NT*	**xxx**
56.	*Species*	*Ompok pabda* (Hamilton, 1822)	*Pabdah catfish*	*Pabha, Pavo, Pabda*	*NT*	**xxx**
57.	*Species*	*Ompok pabo* (Hamilton, 1822)	*Pabo catfish*	*Pabha, Pavo, Pabda*	*NT*	**xxx**
58.	*Species*	*Wallago attu* (Bloch & Schneider, 1801)	*Wallago, Fresh water shark*	*Borali, Bowali*	*NT*	**xxx**
X.	**Family**	**SCHILBEIDAE**				
	Subfamily	**Ailiinae**				
59.	*Species*	*Ailia coila* (Hamilton, 1822)	*Gangetic ailia*	*Kajoli, Bahpatia*	*NT*	**xxx**
	Subfamily	**Schilbeinae**				
60.	*Species*	*Clupisoma garua* (Hamilton, 1822)	*Garua bachcha*	*Gherua, Neria*	*LC*	
61.	*Species*	*Eutropiichthys murius* (Hamilton, 1822)	*Vacha*	*Bacha*	*LC*	

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
62.	*Species*	*Pachypterus atherinoides* (Bloch, 1794)	Indian Potasi	Batashi	LC	
XI.	**Family**	**PANGASIIDAE**				
63.	*Species*	*Pangasius pangasius* (Hamilton, 1822)	Pangas catfish	Pangas, Ponga	LC	
XIII.	**Family**	**SISORIDAE**				
64.	*Species*	*Bagarius yarrelli* (Sykes, 1839)	Goonch	Baghari, Goruwa	NT	**xxx**
65.	*Species*	*Gagata cenia* (Hamilton, 1822)	Indian gagata	Ram tengna	LC	
66.	*Species*	*Nangra assamensis* Sen & Biswas, 1994	Koshi nangra	-	LC	
XIV.	**Family**	**CLARIIDAE**				
67.	*Species*	*Clarias batrachus* (Linnaeus, 1758)	Philippine catfish	Magur	LC	
XV.	**Family**	**HETEROPNEUSTIDAE**				
68.	*Species*	*Heteropneustes fossilis* (Bloch, 1794)	Stinging catfish	Singi	LC	
XVI.	**Family**	**CHACIDAE**				
69.	*Species*	*Chaca chaca* (Hamilton, 1822)	Squarehead catfish	Cheka	LC	
F.	**Order**	**Beloniformes**				

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
XVII.	**Family**	**BELONIDAE**				
70.	*Species*	*Xenentodon cancila* (Hamilton, 1822)	Freshwater garfish	Kokila	LC	
G.	**Order**	**Synbrachiformes**				
XVIII.	**Family**	**SYNBRANCHIDAE**				
71.	*Species*	*Monopterus cuchia* (Hamilton, 1822)	Cuchia	Kusia	LC	
H.	**Order**	**Perciformes**				
	Suborder	PERCOIDEI				
XIX.	**Family**	**AMBASSIDAE**				
72.	*Species*	*Chanda nama* Hamilton, 1822	Elongate glass-perchlet	Chanda	LC	
73.	*Species*	*Parambassis ranga* (Hamilton, 1822)	Indian glassy fish	Chanda	LC	
XXI.	**Family**	**SCIAENIDAE**				
74.	*Species*	*Johnius coitor* (Hamilton, 1822)	Coitor croaker	-	LC	
XXII.	**Family**	**NANDIDAE**				
	Subfamily	**Nandinae**				
75.	*Species*	*Nandus nandus* (Hamilton, 1822)	Gangetic leaffish	Gedgedi, Bhetki	LC	
	Subfamily	**Badinae**				

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
76.	*Species*	*Badis badis* (Hamilton, 1822)	Badis	-	LC	
XXIII.	**Family**	**CICHLIDAE**				
77.	*Species*	*Oreochromis mossambicus* (Peters, 1852)	Mozambique tilapia	Japani Koi	NT	**xxx**
	Suborder	MUGILOIDEI				
XXIV.	**Family**	**MUGILIDAE**				
78.	*Species*	*Rhinomugil corsula* (Hamilton, 1822)	Corsula	Upor sokuwa	LC	
	Suborder	GOBIOIDEI				
XXV.	**Family**	**GOBIIDAE**				
	Subfamily	**Gobiinae**				
79.	*Species*	*Glossogobius giuris* (Hamilton, 1822)	Tank goby	Pani mutura	LC	
	Suborder	ANABANTOIDEI				
XXVI.	**Family**	**ANABANTIDAE**				
80.	*Species*	*Anabas testudineus* (Bloch, 1792)	Climbing perch	Koi, Kawoi	DD	---
XXVII.	**Family**	**BELONTIIDAE**				
	Subfamily	**Trichogasterinae**				

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
81.	*Species*	*Trichogaster fasciata* Bloch & Schneider, 1801	Banded gourami	Kholihona, kholisa, kholsa	LC	
82.	*Species*	*Trichogaster lalius* (Hamilton, 1822)	Dwarf gourami	Lal kholisa	LC	
	Suborder	CHANNOIDEI				
XXVIII.	**Family**	**CHANNIDAE**				
83.	*Species*	*Channa marulius* (Hamilton, 1822)	Great snakehead	Shaal	LC	
84.	*Species*	*Channa orientalis* Bloch & Schneider, 1801	Walking snakehead	Cheng, Chengeli	LC	
85.	*Species*	*Channa punctata* (Bloch, 1793)	Spotted snakehead	Goroi, Gorai	LC	
86.	*Species*	*Channa striata* (Bloch, 1793)	Stripped snakehead	Sol	LC	
	Suborder	MASTACEMBELOIDEI				
XXIX.	**Family**	**MASTACEMBELIDAE**				
87.	*Species*	*Macrognathus aral* (Bloch & Schneider, 1801)	One-stripe spinyeel	Turi, Tora, Guchi	LC	
88.	*Species*	*Macrognathus pancalus* Hamilton, 1822	Barred spiny eel	Turi, Tora, Guchi	LC	

Table: 4.2.2. Taxonomic position of the identified fishes

Sl. No.	Taxon	Name of the taxon	English name	Local name	IUCN Status	Colour code
89.	*Species*	*Mastacembelus armatus* (Lacepède, 1800)	Zig-zag eel	Baami, Baaim	LC	
I.	**Order**	**Tetraodontoformes**				
	Suborder	TETRAODONTOIDEI				
XXX.	**Family**	**TETRAODONTIDAE**				
90.	*Species*	*Leiodon cutcutia* (Hamilton, 1822)	Ocellated pufferfish	Gangatop, Tepa mach	LC	
		Total species 90				

Summary of Table 4.2.2:

90 total species of fishes were identified belonging to 9 orders. Cypriniformes, with 40 species (45%) is the largest group, followed by Siluriformese (23 species, 26%), Perciformes (18 species, 20%), Clupeiformes (3 species, 3%), Osteoglossiformes (2 species, 2%). Four orders Anguilliformes, Beloniformes, Synbranchiformes and Tetraodontiformes are represented by only 1 species each (about 1% each).

4.2.2. Commercial Exploitation of the Freshwater Fishes in the Study Area

For all the 90 species of fishes available in the study area, the commercial value was studied based on the market surveys and interview of fishermen. Except a few species, that are not yet commercially exploited, most freshwater fishes found in the area have commercial value as food or as decorative aquarium fish. Many species of fishes are exported to outside the state or even reportedly exported to outside the country as decorative fish. While interviewing fishermen and fish sellers, they classified some fishes as Major Food fishes and some as Minor food fishes. Several factors are considered for deciding this. The factors include – market price of the fish, landing kg/per day, size of the fish and popularity of the fish as a food fish (demand). Although the margin in all factors are thin and the weightage vary from place to place, their perception gives an interesting dimension to study. Since, it was not one of the objectives of this research to elaborately study the market factors and classify fishes in an Economic scale, a simple attempt has been made based on fishermen perception in the following table to classify fishes into – Non-commercial species (N), species with decorative value (D), species with major food value (FM), species with minor food value (Fm). Some of the species have commercial value both as food and as aquarium fish.

Codes used in the following table 4.2.3

N = Non-commercial species

D = Species with decorative value

FM = Species with major food value

Fm = Species with minor food value

Table: 4.2.3. Commercial value of the reported species

Sl. No.	Scientific name	Local name	Commercial value **FM= Food, major** **Fm= Food, minor** **D= Decorative** **N= Non commercial**
1.	*Chitala chitala* (Hamilton, 1822)	Citol,	FM, D
2.	*Notopterus notopterus* (Pallas, 1769)	Kanduli, Foli	FM, D
3.	*Anguilla bengalensis* (Gray, 1831)	Nadal baami	FM
4.	*Gudusia chapra* (Hamilton, 1822)	Koroti, Korti	Fm
5.	*Tenualosa ilisha* (Hamilton, 1822)	Ilish, Ilsha	FM
6.	*Setipinna phasa* (Hamilton, 1822)	Fasa	Fm
7.	*Bangana dero* (Hamilton, 1822)	Bhangna	Fm
8.	*Gibelion catla* (Hamilton, 1822)	Katla, Bhokuwa	FM
9.	*Chagunius chagunio* (Hamilton, 1822)	-	Fm
10.	*Cirrhinus mrigala* (Hamilton, 1822)	Mirka	FM
11.	*Cirrhinus reba* (Hamilton, 1822)	Lachim	FM
12.	*Ctenopharyngodon idella* (Valenciennes, 1844)	Grass carp	FM
13.	*Cyprinus carpio* Linnaeus, 1758	Common carp	FM
14.	*Labeo angra* (Hamilton, 1822)	Bhangna	Fm

Table: 4.2.3. Commercial value of the reported species

Sl. No.	Scientific name	Local name	Commercial value **FM= Food, major** **Fm= Food, minor** **D= Decorative** **N= Non commercial**
15.	*Labeo bata* (Hamilton, 1822)	Bata, Bhangon	FM
16.	*Labeo boga* (Hamilton, 1822)	Bhangon, Boga bata	Fm
17.	*Labeo calbasu* (Hamilton, 1822)	Kalbasu, Mali, Koliajora	FM
18.	*Labeo gonius* (Hamilton, 1822)	Kursa, Kurhi	FM
19.	*Labeo rohita* (Hamilton, 1822)	Rou, Rui, Rohu	FM
20.	*Osteobrama cotio* (Hamilton, 1822)	Hafo	Fm
21.	*Pethia conchonius* (Hamilton, 1822)	Puthi	Fm, D
22.	*Pethia phutunio* (Hamilton, 1822)	Puthi	Fm, D
23.	*Puntius chola* (Hamilton, 1822)	Puthi	Fm, D
24.	*Puntius puntio* (Hamilton, 1822)	Puthi	Fm, D
25.	*Puntius sophore* (Hamilton, 1822)	Puthi	Fm, D
26.	*Puntius terio* (Hamilton, 1822)	Puthi	Fm, D
27.	*Puntius ticto* (Hamilton, 1822)	Puthi	Fm, D
28.	*Systomus sarana* (Hamilton, 1822)	Seni Puthi	FM

Table: 4.2.3. Commercial value of the reported species

Sl. No.	Scientific name	Local name	Commercial value **FM= Food, major** **Fm= Food, minor** **D= Decorative** **N= Non commercial**
29.	*Hypophthalmichthys molitrix* (Valenciennes, 1844)	Silver carp	FM
30.	*Laubuka laubuca* (Hamilton, 1822)	Laupattia, Laubusa	Fm
31.	*Salmostoma bacaila* (Hamilton, 1822)	Selkana, Chela	Fm
32.	*Salmostoma phulo* (Hamilton, 1822)	Selkana, Chela	Fm
33.	*Amblypharyngodon mola* (Hamilton, 1822)	Mowa	FM
34.	*Aspidoparia jaya* (Hamilton, 1822)	Soru Boriala	Fm
35.	*Cabdio morar* (Hamilton, 1822)	Boriala	FM
36.	*Devario aequipinnatus* (McClelland, 1839)	Laupattia, Laubusa	D
37.	*Devario devario* (Hamilton, 1822)	Bahpatia, Debari	Fm, D
38.	*Danio rerio* (Hamilton, 1822)	Darkina	D
39.	*Esomus danricus* (Hamilton, 1822)	Darkina	Fm
40.	*Rasbora daniconius* (Hamilton, 1822)	Darkina	Fm, D
41.	*Rasbora rasbora* (Hamilton, 1822)	Darkina	Fm, D
42.	*Crossocheilus latius* (Hamilton, 1822)	Kala bata	Fm

Table: 4.2.3. Commercial value of the reported species

Sl. No.	Scientific name	Local name	Commercial value **FM= Food, major** **Fm= Food, minor** **D= Decorative** **N= Non commercial**
43.	*Acanthocobitis botia* (Hamilton, 1822)	Botia	Fm, D
44.	*Lepidocephalichthys guntea* (Hamilton, 1822)	Botia, Gutum	Fm, D
45.	*Botia dario* (Hamilton, 1822)	Bagh Botia, Gethu, Rani mach	Fm, D
46.	*Botia dayi* Hora, 1932	Rani mach,	Fm, D
47.	*Sperata aor* (Hamilton, 1822)	Aari	FM
48.	*Sperata seenghala* (Sykes, 1839)	Aari	FM
49.	*Mystus bleekeri* (Day, 1877)	Singora, Tengna	Fm, D
50.	*Mystus cavasius* (Day, 1877)	Bar singora, Gulsa	Fm
51.	*Mystus tengara* (Hamilton, 1822)	*Singora, Tengna*	*Fm, D*
52.	*Mystus vittatus* (Bloch, 1794)	*Singora, Tengna*	*Fm*
53.	*Hemibagrus menoda* (Hamilton, 1822)	Gagol	Fm
54.	*Rita rita* (Hamilton, 1822)	*Ritha, Rita*	*FM*
55.	*Ompok bimaculatus* (Bloch, 1794)	*Pabha, Pavo, Pabda*	*Fm*
56.	*Ompok pabda* (Hamilton, 1822)	*Pabha, Pavo, Pabda*	*FM*

Table: 4.2.3. Commercial value of the reported species

Sl. No.	Scientific name	Local name	Commercial value **FM= Food, major** **Fm= Food, minor** **D= Decorative** **N= Non commercial**
57.	*Ompok pabo* (Hamilton, 1822)	*Pabha, Pavo, Pabda*	*Fm*
58.	*Wallago attu* (Bloch & Schneider, 1801)	*Borali, Bowali*	FM
59.	*Ailia coila* (Hamilton, 1822)	*Kajoli, Bahpatia*	*Fm*
60.	*Clupisoma garua* (Hamilton, 1822)	*Gherua, Neria*	*Fm*
61.	*Eutropiichthys murius* (Hamilton, 1822)	*Bacha*	*Fm*
62.	*Pachypterus atherinoides* (Bloch, 1794)	Batashi	Fm
63.	*Pangasius pangasius* (Hamilton, 1822)	Pangas, Ponga	FM
64.	*Bagarius yarrelli* (Sykes, 1839)	Baghari, Goruwa	FM
65.	*Gagata cenia* (Hamilton, 1822)	Ram tengna	Fm, D
66.	*Nangra assamensis* Sen & Biswas, 1994	-	Fm
67.	*Clarias batrachus* (Linnaeus, 1758)	Magur	FM
68.	*Heteropneustes fossilis* (Bloch, 1794)	Singi	FM
69.	*Chaca chaca* (Hamilton, 1822)	Cheka	D
70.	*Xenentodon cancila* (Hamilton, 1822)	Kokila	Fm, D

Table: 4.2.3. Commercial value of the reported species

Sl. No.	Scientific name	Local name	Commercial value **FM= Food, major** **Fm= Food, minor** **D= Decorative** **N= Non commercial**
71.	*Monopterus cuchia* (Hamilton, 1822)	Kusia	FM
72.	*Chanda nama* Hamilton, 1822	Chanda	Fm, D
73.	*Parambassis ranga* (Hamilton, 1822)	Chanda	Fm, D
74.	*Johnius coitor* (Hamilton, 1822)	-	Fm
75.	*Nandus nandus* (Hamilton, 1822)	Gedgedi, Bhetki	Fm
76.	*Badis badis* (Hamilton, 1822)	-	D
77.	*Oreochromis mossambicus* (Peters, 1852)	Japani Koi	Fm
78.	*Rhinomugil corsula* (Hamilton, 1822)	Upor sokuwa	Fm
79.	*Glossogobius giuris* (Hamilton, 1822)	Pani mutura	Fm
80.	*Anabas testudineus* (Bloch, 1792)		FM
81.	*Trichogaster fasciata* Bloch & Schneider, 1801	Kholihona, kholisa, kholsa	Fm, D
82.	*Trichogaster lalius* (Hamilton, 1822)	Lal kholisa	Fm, D
83.	*Channa marulius* (Hamilton, 1822)	Shaal	FM
84.	*Channa orientalis* Bloch & Schneider, 1801	Cheng, Chengeli	Fm

Table: 4.2.3. Commercial value of the reported species

Sl. No.	Scientific name	Local name	Commercial value **FM= Food, major** **Fm= Food, minor** **D= Decorative** **N= Non commercial**
85.	*Channa punctata* (Bloch, 1793)	Goroi, Gorai	Fm
86.	*Channa striata* (Bloch, 1793)	Sol	FM
87.	*Macrognathus aral* (Bloch & Schneider, 1801)	Turi, Tora, Guchi	Fm, D
88.	*Macrognathus pancalus* Hamilton, 1822	Turi, Tora, Guchi	Fm, D
89.	*Mastacembelus armatus* (Lacepède, 1800)	Baami, Baaim	Fm, D
90.	*Leiodon cutcutia* (Hamilton, 1822)	Gangatop, Tepa mach	N
	Total species 90		

Summary of Table 4.2.3:

From the above table, it can be summarised that out of 90 species, there is only one species (*Leiodon cutcutia* (Hamilton, 1822), which is not commercially exploited. 28 species have importance as major food fish, 30 species are minor food fish, 2 major food species also has decorative value or value as aquarium fish, 4 species are exploited mostly as decorative fish and 25 minor food fishes also have decorative value.

PLATE 4.2a: Fish Species found in the study area

Fig 4.2.1. Chitala chitala (Hamilton, 1822)

Fig. 4.2.2. Notopterus notopterus (Pallas, 1769)

Fig. 4.2.3. Anguilla bengalensis (Gray, 1831)

Fig: 4.2.4. Gudusia chapra (Hamilton, 1822)

Fig: 4.2.5. Tenualosa ilisha (Hamilton, 1822)

Fig. 4.2.6. Setipinna phasa (Hamilton, 1822)

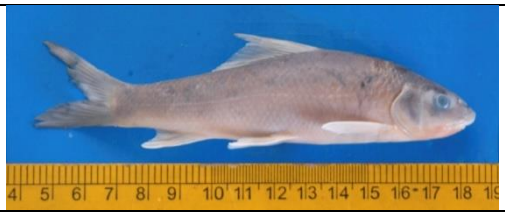


Fig. 4.2.7. Bangana dero (Hamilton, 1822)

Fig. 4.2.8. Gibelion catla (Hamilton, 1822)

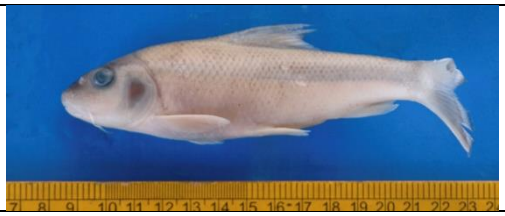


Fig. 4.2.9. Chagunius chagunio (Hamilton, 1822)

Fig. 4.2.10. Cirrhinus mrigala (Hamilton, 1822)

PLATE 4.2b: Fish Species found in the study area

Fig. 4.2.11. Cirrhinus reba (Hamilton, 1822)

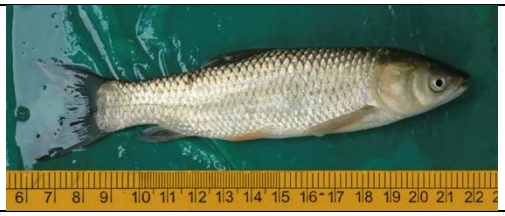


Fig. 4.2.12. Ctenopharyngodon idella (Valenciennes, 1844)

Fig. 4.2.13. Cyprinus carpio Linnaeus, 1758

Fig. 4.2.14. Labeo angra (Hamilton, 1822)

Fig. 4.2.15. Labeo bata (Hamilton, 1822)

Fig. 4.2.16. Labeo boga (Hamilton, 1822)

Fig. 4.2.17. Labeo calbasu (Hamilton, 1822)

Fig. 4.2.18. Labeo gonius (Hamilton, 1822)

Fig. 4.2.19. Labeo rohita (Hamilton, 1822)

Fig. 4.2.20. Osteobrama cotio (Hamilton, 1822)

PLATE 4.2c: Fish Species found in the study area

Fig: 4.2.21. Pethia conchonius (Hamilton, 1822)

Fig: 4.2.22. Pethia phutunio (Hamilton, 1822)

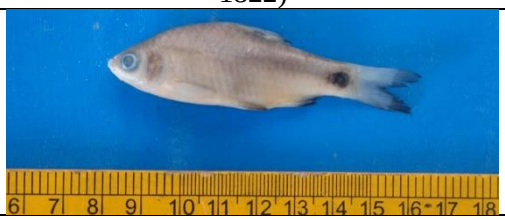


Fig: 4.2.23. Puntius chola (Hamilton, 1822)

Fig: 4.2.24. Puntius puntio (Hamilton, 1822)

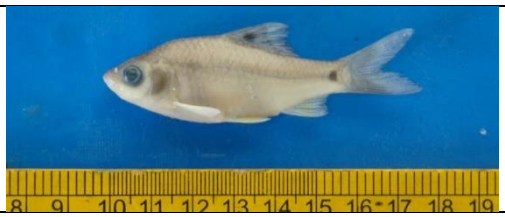


Fig: 4.2.25. Puntius sophore (Hamilton, 1822)

Fig: 4.2.26. Puntius terio (Hamilton, 1822)

Fig: 4.2.27. Puntius ticto (Hamilton, 1822)

Fig: 4.2.28. Systomus sarana (Hamilton, 1822)

Fig: 4.2.29. Hypophthalmichthys molitrix (Valenciennes, 1844)

Fig: 4.2.30. Laubuka laubuca (Hamilton, 1822)

PLATE 4.2d: Fish Species found in the study area

Fig: 4.2.31. Salmostoma bacaila (Hamilton, 1822)

Fig: 4.2.32. Salmostoma phulo (Hamilton, 1822)

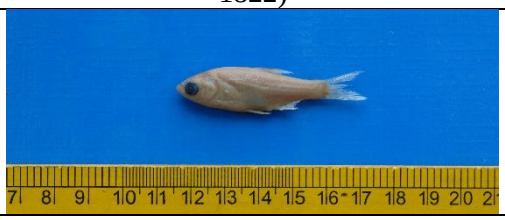


Fig: 4.2.33. Amblypharyngodon mola (Hamilton, 1822)

Fig: 4.2.34. Aspidoparia jaya (Hamilton, 1822)

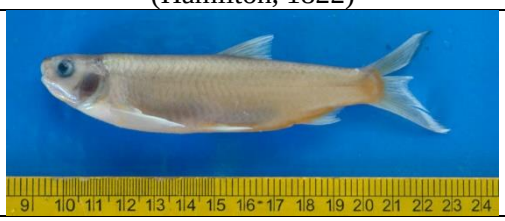


Fig: 4.2.35. Cabdio morar (Hamilton, 1822)

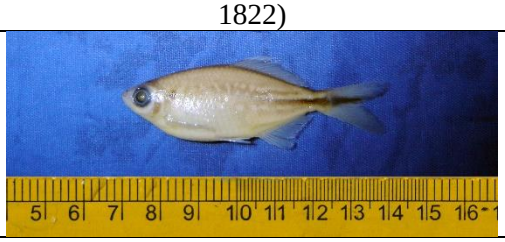


Fig: 4.2.36. Devario aequipinnatus (McClelland, 1839)

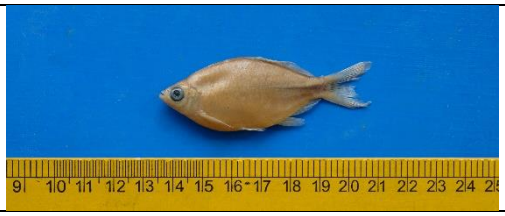


Fig: 4.2.37. Devario devario (Hamilton, 1822)

Fig: 4.2.38. Danio rerio (Hamilton, 1822)

Fig: 4.2.39. Esomus danricus (Hamilton, 1822)

Fig: 4.2.40. Rasbora daniconius (Hamilton, 1822)

PLATE 4.2e: Fish Species found in the study area

Fig: 4.2.41. Rasbora rasbora (Hamilton, 1822)

Fig: 4.2.42. Crossocheilus latius (Hamilton, 1822)

Fig: 4.2.43. Acanthocobitis botia (Hamilton, 1822)

Fig: 4.2.44. Lepidocephalichthys guntea (Hamilton, 1822)

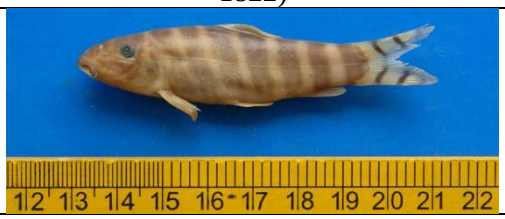


Fig: 4.2.45. Botia dario (Hamilton, 1822)

Fig: 4.2.46. Botia dayi Hora, 1932

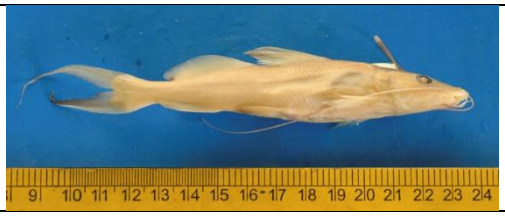


Fig: 4.2.47. Sperata aor (Hamilton, 1822)

Fig: 4.2.48. Sperata seenghala (Sykes, 1839)

Fig: 4.2.49. Mystus bleekeri (Day, 1877)

Fig: 4.2.50. Mystus cavasius (Day, 1877)

PLATE 4.2f: Fish Species found in the study area

Fig: 4.2.51. Mystus tengara (Hamilton, 1822)

Fig: 4.2.52. Mystus vittatus (Bloch, 1794)

Fig: 4.2.53. Hemibagrus menoda (Hamilton, 1822)

Fig: 4.2.54. Rita rita (Hamilton, 1822)

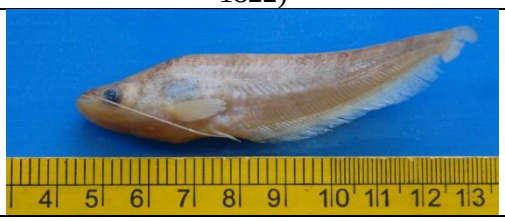


Fig: 4.2.55. Ompok bimaculatus (Bloch, 1794)

Fig: 4.2.56. Ompok pabda (Hamilton, 1822)

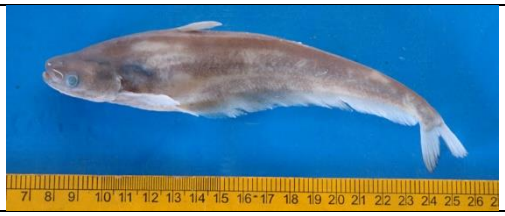


Fig: 4.2.57. Ompok pabo (Hamilton, 1822)

Fig: 4.2.58. Wallago attu (Bloch & Schneider, 1801)

Fig: 4.2.59. Ailia coila (Hamilton, 1822)

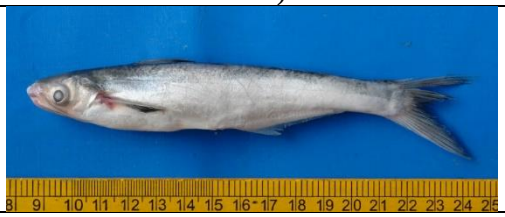


Fig: 4.2.60. Clupisoma garua (Hamilton, 1822)

PLATE 4.2g: Fish Species found in the study area

Fig: 4.2.61. Eutropiichthys murius (Hamilton, 1822)

Fig: 4.2.62. Pachypterus atherinoides (Bloch, 1794)

Fig: 4.2.63. Pangasius pangasius (Hamilton, 1822)

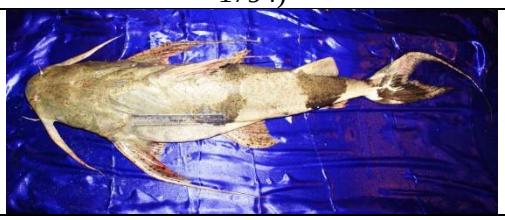


Fig: 4.2.64. Bagarius yarrelli (Sykes, 1839)

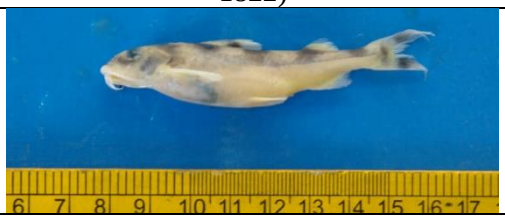


Fig: 4.2.65. Gagata cenia (Hamilton, 1822)

Fig: 4.2.66. Nangra assamensis Sen & Biswas, 1994

Fig: 4.2.67. Clarias batrachus (Linnaeus, 1758)

Fig: 4.2.68. Heteropneustes fossilis (Bloch, 1794)

Fig: 4.2.69. Chaca chaca (Hamilton, 1822)

Fig: 4.2.70. Xenentodon cancila (Hamilton, 1822)

PLATE 4.2h: Fish Species found in the study area

Fig: 4.2.71. Monopterus cuchia (Hamilton, 1822)

Fig: 4.2.72. Chanda nama Hamilton, 1822

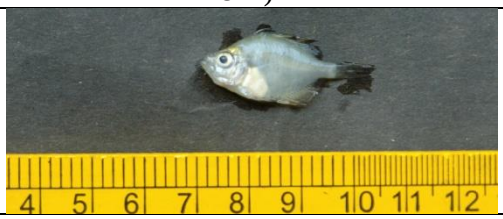


Fig: 4.2.73. Parambassis ranga (Hamilton, 1822)

Fig: 4.2.74. Johnius coitor (Hamilton, 1822)

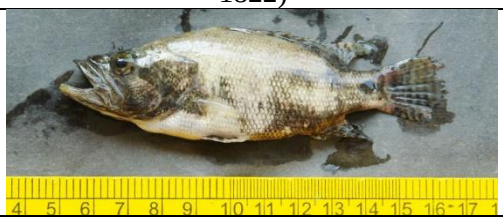


Fig: 4.2.75. Nandus nandus (Hamilton, 1822)

Fig: 4.2.76. Badis badis (Hamilton, 1822)

Fig: 4.2.77. Oreochromis mossambicus (Peters, 1852)

Fig: 4.2.78. Rhinomugil corsula (Hamilton, 1822)

Fig: 4.2.79. Glossogobius giuris (Hamilton, 1822)

Fig: 4.2.80. Anabas testudineus (Bloch, 1792)

PLATE 4.2i: Fish Species found in the study area

Fig: 4.2.81. Trichogaster fasciata Bloch & Schneider, 1801

Fig: 4.2.82. Trichogaster lalius (Hamilton, 1822)

Fig: 4.2.83. Channa marulius (Hamilton, 1822)

Fig: 4.2.84. Channa orientalis Bloch & Schneider, 1801

Fig: 4.2.85. Channa punctata (Bloch, 1793)

Fig: 4.2.86. Channa striata (Bloch, 1793)

Fig: 4.2.87. Macrognathus aral (Bloch & Schneider, 1801)

Fig: 4.2.88. Macrognathus pancalus Hamilton, 1822

Fig: 4.2.89. Mastacembelus armatus (Lacepède, 1800)

Fig: 4.2.90. Leiodon cutcutia (Hamilton, 1822)

4.2.3. Threats to Fishes:

Reid et.al. (2013) has studied the threats to fresh water fishes at the global level. IUCN Fresh Water Fish Specialist Group has identified the following as the major threats to fresh water fishes across the globe –

1. Habitat modification, fragmentation and destruction
2. Invasive species
3. Overfishing
4. Environmental pollution
5. Forestry practices and
6. Climate change

Sarkar, Pathak, and Lakra (2008) studied the challenges of fresh water fish conservation in India. Joshi et al. (2009) studied the fish diversity and threats in Betwa river. Lakra et.al.(2010) studied the fish diversity, habitat ecology and management challenges in Ganga basin. Sarkar, Gupta and Lakra (2010) studied the diversity, eco-hydrology, threats and conservation priorities in Gomti river. Sarkar et.al (2012) reassesses the biodiversity in Ganges, threats and conservation perspectives.

In North East India, Ponniah and Sarkar (2000) studied the fish biodiversity of North East India under an NBFGR project and listed out the threats to fishes in North East. Conservation status of fishes in various protected areas of Assam was studied by Kalita (2011). Deeporbeel was one of the study sites of that study and threats pertaining to Deeporbeel were analysed.

One of the aspects of the survey of this study was to find out people's perception about the threats that the fish fauna in the study area are facing. They listed the following as the main threats –

4.2.3.1. Overfishing and use of detrimental gears and methods for fishing:

86% respondents observed that fishing in the South Western Assam mostly include capture fishery. Pisciculture is yet to pick up as a popular vocation in the area. Traditional fishermen communities are culturally inclined towards capture fishery. As fishes are gradually

declining and fish catch are reducing, fishermen are resorting to measures of overfishing. And even some fishermen violate the Assam Fishery Rules in using the mesh size of nets, especially during the breeding season. Following detrimental methods and gears were recorded during the study –

a. **Nets with small mesh size:** Many fishermen in Goalpara and Kamrup area, (especially fishing in Brahmaputra) have replaced their traditional Ber jaal, Maha jaal with nylon nets with mesh size as small as mosquito net. This results in capturing of all fishes including the fries and fingerlings. The Assam Fishery Rule (1953) section 23 says – "**Restrictions on the use of nets -** The use of *Berjal* or *Mahajal* or any net with meshes less than 2 ½" sq. is prohibited during the period from the 1st April to the 15th June in any proclaimed fishery". So, use of the Mosari jaal is a clear violation of the Assam Fishery Rule.

b. **Captuing of brood fishes:** Fishes with eggs are called brood fishes. Brood fishes with mature eggs were frequently found in almost all fish markets in the study area.

c. **Use of fish poison:** Use of fish poison in upper reaches of Dudhnai and Krishnai river was reported. One dose of poison kills all types of fishes including the fries, fingerlings and eggs. Even fishes without commercial value and other smaller aquatic animals also die due to poising.

d. **Use of Explosives:** It is a recent trend to use explosives to kill fishes at mass scale. It is detrimental for fishery as it leaves the water polluted with the explosive. Informants appraised about the use of this method in Goalpara district, but it couldn't be witnessed by this researcher, because the people who use this method, use it in a secret manner.

e. **Electrocution:** Electrocution using a 12 volt battery in hill streams was witnessed in Assam Meghalaya border in Goalpara district. Two long wires are connected to the anode and cathode of the battery. With help of two long sticks, the fishermen give shock to the fishes that come to the surface of the shallow hill streams.

4.2.3.2. Water pollution

Pollution of the waterbodies is another major threat to fishes, especially in and around urban centres. The most polluted waterbodies witnessed during this study were –

1. ***Deeporbeel***: Located at South Western fringe of Guwahati city, it is one of the most polluted waterbodies. The surface run-off from the municipal dumping ground located near Tetelia pollutes the water. Also, many small industries and business establishments used to release wastes to the wetland. Eutrophication in many parts of the beel is a clear indication of polluted water. Also, this researcher found floating dead fishes on the surface of the beel during the study. Fishes dying through any natural process are normally consumed immediately by predators and scavengers. The dead fishes were not consumed by the foraging fisheating birds in the areas. That is another indication of pollution. Fishermen also reported increase in skin diseases, which may be also attributed to contaminated water.

Fig: 4.2.91: Municipal dumping at Deepor beel

Fig: 4.2.92: Eutrophication in Deepor beel

2. ***Silshako beel*:** Located at the Eastern fringe of Guwahati city, Silshako is amidst human habitations in all sides. Fringe communities use to throw household garbage into the wetland.
3. ***Bharalu river***: Running meandering through the city of Guwahati, Bharalu river has to bear the load of garbage and liquid waste discharged by numerous localities. In some parts of the river, it almost looks like a municipal waste water drain.

4. ***Hasila beel***: Hasila beel is located at the heart of Goalapara city. Many motor garages are located around the wetland. Grease and automobile discharge reach the wetland and the water quality is deteriorating.

4.2.3.3. Habitat destruction and change of land use:

The water spread area of three large wetlands in the study area are shrinking due to encroachment and change in land-use pattern. These are Deeporbeel, Silshako beel and Hasila beel. Due to their location in urban localities, there is a huge encroachment pressure. Large parts of these wetlands have already been converted into human settlements and businesses. A railway track has been constructed through Deeporbeel. This not only has occupied and converted water spread area, but has also added to pollution. It has also posed as a barrier in the way of surface mineral runoff from the adjoining hills. In the Kumri beel area also, a railway track cuts off the mineral surface runoff from the Pancharatna hills.

Fig: 4.2.93: Human habitations in Silshako

Fig: 4.2.94: Railway track through Deepor

4.2.3.4. Invasive species

It is a recent phenomenon to culture invasive species of fishes like Tilapia (*Oreochromis mossambicus*) (locally known as Japani Kawoi), and Thai magur (*Clarius gariepinus*). These two species of fishes grow very fast and they consume all kinds of waste. Hence, to get fast economic return, some fish culturists have introduced these two species. They consume small fingerlings of all other fish species. During the flood, they escape from ponds and enter into beels, and rivers. Thus, these species have become a threat to fishery.

4.2.3.5. Climate Change:

Climate change is also impacting the fishery in the area. Due to rising temperature, unpredictable drought and flooding, fishery has become challenging. But, since climate change is a gradual and slow process, most of the respondents in the survey expressed little concern about climate change. Only a small fraction of 7% respondent could say that climate change is impacting fishery.

4.2.4. Ten (10) Most Threatened Fishes in the Area

During the survey, respondents were asked to give their choice of 10 most threatened fishes in the area. Based on the 384 responses obtained, the top 10 threatened fishes in the area have been listed below –

1. *Anguilla bengalensis*
2. *Aspidoparia morar*
3. *Botia Dario*
4. *Chitala chitala*
5. *Cirrhinus reba*
6. *Nandus nandus*
7. *Puntius sarana*
8. *Rita rita*
9. *Salmophasia bacaila*
10. *Tetraodon cutcutia*

4.2.5. Traditional Conservation Methods

Threats to fishes will ultimately result in threats to fishery as a livelihood. While, one cross section of fishermen was found to be involved in unsustainable ways of fishing, the indigenous fishermen in the area have good practices that addresses the sustainability concerns. Following conservation measures were recorded as community best practices.

4.2.5.1. No-fishing months or restricted fishing months

Section 23 -A of the Assam Fishery Rules (1953) imposes restrictions on fishing of brood fishes and undersized fishes during the breeding months. It also specifies the species of fishes, length of fishes to be considered for each species as undersize. Breeding season in Assam is identified by the Rule as the period between 1st April to the 15th June.

Traditionally, however, many fishing communities are observing no fishing months or restricted fishing months during the breeding season. In Deepor area, fishermen of five large fishing villages have come together to form a common committee that takes all collective decisions about the beel. This committee is called 'Pach-para committee' (Five – village committee). According to Mr. Purna Das, the then President of the Pach para committee, the area of Deeporbeel has been demarcated into two zones – a Core zone and a Buffer zone. During the breeding season, they fix poles and tie ropes to demarcate the core zone, which is at the centre of the beel. Fishing is allowed in the buffer zone during the breeding season as per the Assam Fishery Rule. But, they have imposed an additional self-regulation on themselves that they won't fish in the core zone during the breeding season even if it is not restricted by the law.

4.2.5.2. No-fishing days

Fishing communities observe many days in a year as no-fishing days. There are some days on which fishing and agricultural activities are traditionally not allowed. These days are called as '*Haal-Jaal khoti*'. These days include – All Hindu Puja days i.e. Lakshmi puja, Durga Puja, Manasa puja, Suwori, Baat puja, Ganesh puja, Saraswati puja, Ganga puja, Sivratri etc.

4.2.5.3. Vegetarian days

Although most communities in the area are fishiterian, they observe certain days in a calendar year as strict vegetarian day. On these days, they don't consume any fish, meat or egg. These days vary from community to community and from belief system to belief

system. Some such days include – *Purnima* (full moon day), *Amabasya* (New moon night), *Ekadashi* (11th day of Lunar fortnight), and most Hindu puja days. Followers of different cults observe different days in a week as vegetarian day. The following table attempts to summarise it –

Table 4.2.4: Vegetarian days observed by different belief

Days in the week	Followers of
Monday	Shiva
Tuesday	Hanuman
Wednesday	Ganesha
Thursday	Brihaspati, Lakshmi
Friday	Santoshi Maa
Saturday	Kaali Maa, Shani devta
Sunday	Surjya devta

4.2.5.4. Protection of Brood fishes

If any brood fish is accidentally caught, the Kaibarta community living in the Deepor beel and Urpad beel areas release the brood fishes back in water.

All species of genus *Channa* shows a characteristic pattern of movement during the breeding season. After the eggs are hatched, all fries until they attain certain size move with the mother fish. Normally they lay thousands of eggs and numerous fries hatch at the same time. So, when they move under water, it appears like a dark shadow in moving. One can easily spot the dark areas created by the shoal of the Channa fries. The Muslim fishermen in Goalpara area were found to follow this and attempt to kill the mother with pocha or jathi or jakra. But, the Kaibartas don't kill the mother fish at this stage. Because, if the mother is killed, the fries will be unguarded, and they will be eaten by predators.

4.2.5.5. Releasing of undersized fishes

All fishermen living in the Deeporbeel, Urpad and Kumri areas were found to release the undersized fish back in water. Normally the effort is not to catch undersized fishes. But, if accidentally some are caught, then those are released back into water.

4.2.5.6. Releasing of fingerlings

In the recent past, it has been a new trend in Deepor beel area to release fresh fingerlings into the beel. Although beels are believed to be auto-stocked during the flood, in Deepor beel it has been observed that fingerlings of major carps are released by the Pach para committee, some local socially responsible people and by the Fishery Laboratory of Gauhati University.

Some researchers did cage culture using modern rectangular bamboo baskets in Deepor beel to produce quality fish seed. Fingerlings thus produced were released into the beel.

Fig: 4.2.95: Cage culture in Deepor beel to release back fingerlings

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4.3. RESEARCH FINDING 3: TRADITIONAL FISHING GEARS IMPLEMENTS AND METHODS USED BY THE COMMUNITIES

Various types of fishing gears used in the area were explored by field visits, interaction with key informers and fishermen and photo documentation. For identification and classification of the gears, works of Joseph and Narayanan (1965), Nedelec (1975) and Bhattacharjya, Manna and Choudhury (2004) were followed. Works various other authors were also referred during the study, which includes - Homell, J. (1924, 1950) Faruqui and Sahai (1943), Job and Pantulu (1953), Saxena (1964), Yadava and Choudhury (1981a, 1981b), Yadava, Choudhury and Kolekar (1981), Dey, S. C. (1984), Kar and & Dey (1991, 1993, 1996), Alam, Ali and Tsai (1997), Gurumanyu & Choudhury (2009), Das, N. C. (2013) and Dutta, Das and Kar (2016).

4.3.1. Impaling gears:

The word 'Impaling' means *transfix or pierce with a sharp instrument.* Impaling gears are elongated projectiles with sharp head. The operator throw the gear on the fish and the gear pierce into the flesh of the fish. Depending on the nature of the water body and type of fishes to be caught, different varieties of impaling gears are used. Six different varieties of impaling gears have been recorded from the study area. A brief description of the gears are given below –

4.3.1.1. Koch or Jathi or Khappor:

Local name:	Koch / Jaathi / Khappor
English name (if any):	Spear
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is an elongated gear with a sharp (both sides) spear fitted to a bamboo shaft. Length varies between 1.5 m to 2.5 m

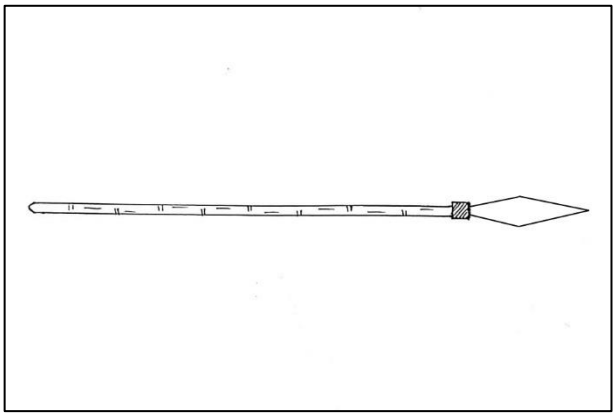

Fig: 4.3.1: Koch or Jaathi or Khappor

Raw materials used:

(1) Dimond / leaf shaped iron head with sharp edges

(2) Bamboo shaft: Preferred bamboo is Kota baah / Jaati baah (*Bambusa tulda*)

(3) An iron ring similar in diameter as that of the bamboo pole

(4) Old polythene bags/ lac/ M-seal

Fabrication of the gear:

(1) The diamond/ leaf shaped iron head with sharp edges on both sides is made by the blacksmith. One end is made pointed like a nail.

(2) The bamboo shaft is dried properly. Old polythene bags are inserted in one end of the shaft.

(3) The spear head is heated to become red hot and with help of a big pincer, the pointed end of the spear head is inserted into the bamboo.

(3) The polythene is heated by the red hot iron and melted. The pointed iron head makes its entry into the bamboo shaft when the iron piece is still hot. It melts the polythene and partially burn the bamboo head. Once the molten polythene dries, it gives binding strength to the joint.

(4) Some people also use lac or M-seal in place of polythene now-a-days.

(5) Finally, the iron ring is fitted at the end of the bamboo where the spear head is already inserted. This ring gives additional strength and the bamboo is not split.

Target fish species:	Koch is used to catch medium to large sized fishes between 500 g to 2 kg. Depending on the size of target fish, the size of the spear may vary. Most common fishes found to be caught using Koch during the study period was Shol (*Channa striata*) and Catla (*Gibelion catla*).
Water bodies used in:	It is normally used in shallow water bodies, i.e. water-logged field, marshes, peatlands, edges of beels, edges of rivers. Most commonly seen during the flood season in water logged fields.
Modus operandi:	The operator holds it in hand and throws on the targeted fish from a very near distance. Person may stand on the bank or get into knee deep water.
Use in commercial fishery:	It is mostly used by the artisanal fishers for household consumption of fishes. Commercial fishing was not noticed.

4.3.1.2. Jakra:

Local name:	Jakra
English name:	-
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is an elongated gear with about 10-20 thin sharp spokes fitted to a bamboo shaft. Length varies between 1.5 m - 2.5 m

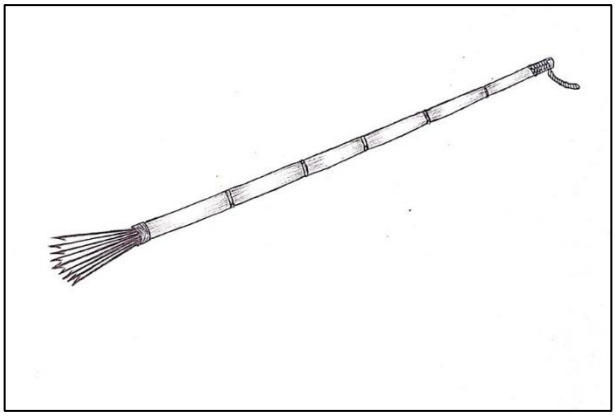

Fig: 4.3.2: Jakra

Raw materials used:	(1) Old bicycle spokes / thick iron wire – 10-20 (2) Bamboo shaft: Preferred bamboo is Kota baah / Jaati baah (*Bambusa tulda*) (3) An iron ring similar in diameter as that of the bamboo pole (4) Old polythene bags/ lac / M-seal
Fabrication of the gear:	(1) About 10 to 20 old bicycle spokes / thick iron wires are sharpened on one end (2) The bamboo shaft is dried properly. Old polythene bags are inserted in one end of the shaft. (3) The non-pointed ends of the spokes are hold together and heated to become red hot and with help of a big pincer, the hot end of the spokes are inserted into the bamboo. (3) The polythene is heated by the red-hot spokes and melt. The spokes make their entry into the bamboo shaft when the iron pieces are still hot. It melts the polythene and partially burn the bamboo head. Once the molten polythene dries, it gives binding strength to the joint. (4) Some people also use lac or M-seal in place of polythene now-a-days. (5) Finally, the iron ring is fitted at the end of the bamboo where the spokes are already inserted. This ring gives additional strength and the bamboo is not split.
Target fish species:	Jakra is used to catch small sized fishes between 100 g to 500 g. Depending on the size of target fish, the number, thickness and length of the spoke may vary. Common fishes found to be caught using Jakra during the study period were Goroi (*Channa punctatus*), small Shol (*Channa striata*), Magur (*Clarius batracus*), Featherback (*Notopterus notopterus*) etc.
Water bodies used in:	It is normally used in shallow water bodies, i.e. water-logged field, marshes, peatlands, edges of beels, edges of rivers. Most commonly seen during the flood season in water logged fields.

Modus operandi: The operator holds it in hand and throws on the targeted fish from a very near distance. Person may stand on the bank or get into knee deep water.

Use in commercial fishery: No. It is mostly used by the artisanal fishers for household consumption of fishes.

4.3.1.3. Pocha:

Local name: Pocha

English name: -

Geographical distribution (within the study area): Entire range of the study area

General description: It is an elongated gear with 3 - 4 thick pointed barbed spokes fitted to a bamboo shaft. Length varies between 1.5 to 2.5 m

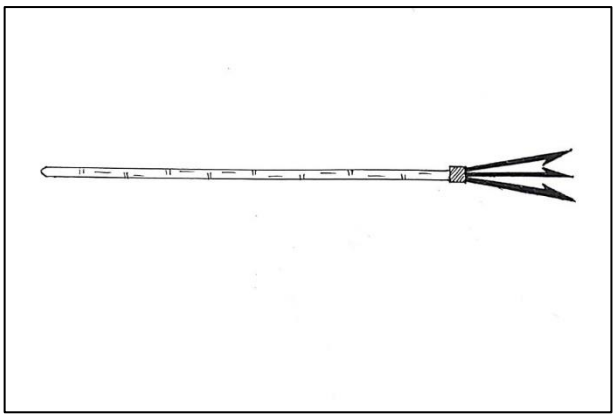

Fig: 4.3.3: Pocha

Raw materials used: (1) Thick iron spokes with barbed head – 3 – 4 nos.
(2) Bamboo shaft: Preferred bamboo is Kota baah / Jaati baah (*Bambusa tulda*)
(3) An iron ring similar in diameter as that of the bamboo shaft
(4) Old polythene bags/ lac / M-seal

Fabrication of the gear: (1) 3 to 4 iron spokes with one barbed end are made by blacksmith. Other end is pointed like a nail

	(2) The bamboo shaft is dried properly. Old polythene bags are inserted in one end of the shaft. (3) The pointed nail-like ends of the spokes are hold together and heated to become red hot and with help of a big pincer, the hot end of the spokes are inserted into the bamboo. (3) The polythene is heated by the red-hot spokes and melt. The spokes make their entry into the bamboo shaft when the iron pieces are still hot. It melts the polythene and partially burn the bamboo head. Once the molten polythene dries, it gives binding strength to the joint. (4) Some people also use lac or M-seal in place of polythene. (5) Finally, the iron ring is fitted at the end of the bamboo where the spokes are already inserted. This ring gives additional strength and the bamboo is not split.
Target fish species:	Pocha is used to catch medium and large sized fishes between 500 g. to 3 kg. Depending on the size of target fish, the thickness and length of the spoke and barb may vary. Common fishes found to be caught using Pocha during the study period were Shol (*Channa striata*), Shaal (*Channa marulius*), Rohu (*Labeo rohita*), Catla (*Gibelion catla*), Featherback (*Notopterus notopterus*), etc.
Water bodies used in:	It is normally used in shallow water bodies, i.e. water-logged field, marshes, peatlands, edges of beels, edges of rivers. Many fishermen use pocha from boat in combination with nets as a secondary gear.
Modus operandi:	The operator holds it in hand and throws on the targeted fish from a very near distance. Person may stand on the bank or get into knee deep water or may operate from a boat.
Use in commercial fishery:	Mostly used in artisanal fishery. Occasionally seen to be used by commercial fishermen in combination with other gears as a secondary gear.

4.3.1.4. Dhanu- kaar:

Local name:	Dhanu kaar
English name:	Bow and arrow
Geographical distribution (within the study area):	Tribal localities in the Meghalaya foothills
General description:	It is a bamboo bow measuring about 1.5 m and arrows with sharp iron heads. Arrows measures 0.8 to 1.00 m

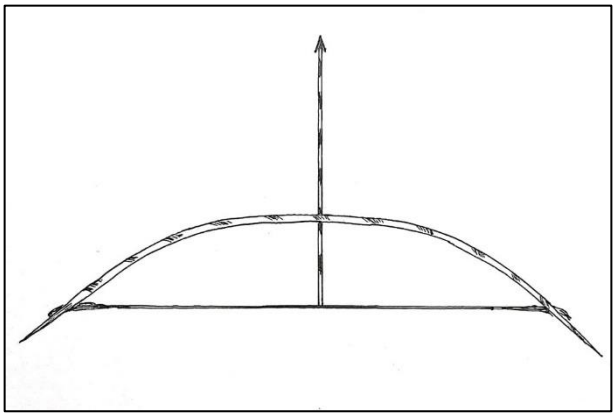

Fig: 4.3.4: Dhanu- kaar

Raw materials used:	(1) Bamboo – about 2 meters long, preferably Jaati baah (*Bambusa tulda*) (2) Jute rope (3) Barbed or pointed iron head of the arrows measuring about 3 -6 cm (4) A sharp knife for slicing and shaping the bamboo
Fabrication of the gear:	(1) For the bow, about 2 m long mature green bamboo is sliced into 4 pieces. (2) At the middle of the bamboo (at about 1 m from both ends), the thickness is kept about 6-7 cm. (3) With help of a sharp knife, the bamboo piece is shaped to obtain a long spindle shape with the ends measuring about 3 cm. (4) On both sides, cuts are made where the taut string would be tied

	(4) Another piece of bamboo measuring about 12-18 cm shorter than the main bamboo is taken and sliced into a string like structure. The green side of the bamboo is kept so that the string strength is more. (5) Jute ropes are tided on both ends of the string. With help of the jute ropes, the string is affixed with the main bow. (6) For arrow, bamboo pieces of about 1 m is taken and sliced into cylindrical sticks. (7) Iron heads are fabricated by blacksmith and are fitted to the arrow head by tying with a wire
Target fish species:	Hill stream fishes of moderate size.
Water bodies used in:	It is normally used in clear hill streams where the fishes underneath water can be easily seen.
Modus operandi:	The operator holds bow in one hand and throws the arrow with the help of the bow. The arrow pierces the flesh of the fish. Operator either stands on the bank of the water body or gets into water.
Use in commercial fishery:	Not used in commercial fishery. Only used in artisanal fishery. Mostly used by the Tribal communities

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4.3.1.5. Dao:

Local name:	Dao / the process is known as Jora kata
English name:	Sword / knife
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is an iron knife with a bamboo/ wooden handle. Length varies between 0.3 m to 0.6 m. The shape and design vary from tribe to tribe / community to community.

Fig: 4.3.5: Dao

Raw materials used:

(1) Iron plate of about 50- 60 mm thickness, 6 – 9 cm broad and 20 to 40 cm long

(2) Bamboo shaft: Preferred bamboo is Kota baah / tip part of Bholuka baah

(3) Old polythene bags/ lac / M-seal

(4) An iron ring similar in diameter as that of the bamboo shaft

Fabrication of the gear:

(1) The main iron knife with one sharp end is made by blacksmith. One end is made pointed like a thick nail

(2) The bamboo shaft (about 18 to 25 cm) is dried properly. Old polythene bags are inserted in one end of the shaft.

(3) The pointed nail-like ends of the knife is heated to become red hot and with help of a big pincer, the hot end of the spokes are inserted into the bamboo.

(4) The polythene is heated by the red-hot end of the knife and melt. The pointed iron makes its entry into the bamboo shaft when the iron piece is still hot. It melts the polythene and partially burn the bamboo head. Once the molten polythene dries, it gives binding strength to the joint.

(5) Some people also use lac or M-seal in place of polythene now-a-days.

	(6) Finally, the iron ring is fitted at the end of the bamboo where the knife is already inserted. This ring gives additional strength and the bamboo is not split.
Target fish species:	Dao is used to catch small and medium sized fishes between 80 g. to 750 g. Common fishes found to be caught using Dao during the study period were Goroi (*Channa punctatus*), Shol (*Channa striata*), Shaal (*Channa marulius*), Bata (*Labeo bata*), etc.
Water bodies used in:	It is normally used in shallow water bodies with clear water, i.e. water-logged field, edges of beels, edges of rivers.
Modus operandi:	The operator holds it in hand and throws on the targeted fish from a very near distance to cut the fish into two pieces. The person may stand on the bank or get into knee deep water.
Use in commercial fishery:	Used in artisanal fishery.

4.3.1.6. Jong:

Local name:	Jong
English name (if any):	Kuchia fishing rod
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is an elongated gear with a long, pointed iron rod fitted to a short bamboo shaft. Length varies between 1 m to 1.5 m

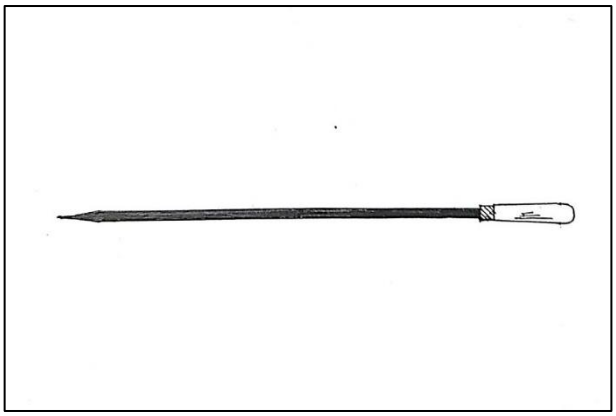


Fig: 4.3.6: Jong

Raw materials used:	(1) Long (80 cm to 120 cm) iron rod with a sharp pointed end (2) Bamboo / wooden shaft: of about 15-25 cm length (3) An iron ring similar in diameter as that of the bamboo pole (4) Old polythene bags/ lac / M-seal
Fabrication of the gear:	(1) The long, pointed iron rod is made by the blacksmith. Both ends are made pointed like nail. (2) The bamboo shaft is dried properly. Old polythene bags are inserted in one end of the shaft. (3) One end of the rod is heated to become red hot and with help of a big pincer, the pointed end of the spear head is inserted into the bamboo/ wooden shaft. (4) The polythene is heated by the red-hot iron and melt. The pointed iron head makes its entry into the bamboo/ wooden shaft when the iron piece is still hot. It melts the polythene and partially burn the bamboo head. Once the molten polythene dries, it gives binding strength to the joint. (5) Some people also use lac or M-seal in place of polythene now-a-days. (6) Finally, the iron ring is fitted at the end of the bamboo / wood where the rod is already inserted. This ring gives additional strength and the bamboo is not split.
Target fish species:	Jong is used to catch Kuchia fish (*Monopterus cuchia*) hidden in burrows. It is a specialized gear targeted for only one species of fish.
Water bodies used in:	Kuchia fishes hide in muddy burrows near the beel. It is used only in kuchia hiding places.
Modus operandi:	The operator holds the shaft in hand and insert the pointed end into the burrow of Kuchia fish.
Use in commercial fishery:	It is mostly used by the artisanal fishers for household consumption of fishes. Most of the Kuchia landed in the market now a days comes from culture fishery. Only occasionally this gear is used in commercial fishery.

4.3.2. Hook and Line:

Hook and lines are in use from time immemorial in India. Barbed iron hooks are tied to nylon threads and submerged in water with help of a float or the thread is tied to a bamboo pole or a long thick rope. A bait is fitted in the hook and when the fish engulf the bait, the barbed hook pierce its mouth part and the fish gets entangled. The studies on hook and lines also began quite early in India. Evidence of it is found in the works of Homell, 1924. Several workers have described about the indigenous fishing lines used in India. Four different types of hook and lines were found during this study –

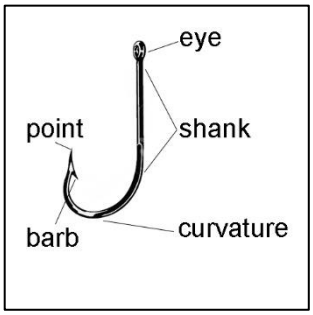
4.3.2.1. Sip Boroshi:

Local name:	Sip Boroshi
English name (if any):	Simple hand line
Geographical distribution (within the study area):	Entire range of the study area
General description:	A barbed iron hook is tied to one end of a nylon threads. The other end of the thread is tied to a bamboo stick. A cork / rubber float is tied in between.

Fig: 4.3.7: Fishermen using Sip Boroshi in group

Raw materials used:
(1) A barbed iron fishing hook
(2) A nylon thread
(3) A cork / rubber float
(4) A long bamboo stick

Fabrication of the gear:



(1) Barbed iron fishing hooks are available in the market in different size and shape. A standard hook, as shown in the figure, has a loop called eye of the hook. Next elongated part of the hook is called a shank. The shank bends into a curvature and finally ends at a pointed tip with a barb. A hook may vary in size from 1 cm to 4 cm depending in the size of the target fish.

(2) A nylon thread is inserted into the eye of the hook and tied tightly.

(3) Other end of the thread is tied to the bamboo stick. The length and thickness of the bamboo stick varies depending on the target fish. If a small fish is targeted, a thin bamboo stick is sufficient. But, for larger fishes, especially in rivers, a thick and long bamboo stick is used.

(4) A cork or rubber float is tied in the thread. The size of the float also varies depending on the size of the targeted fish. For smaller fishes, float is small. The distance of the float from the hook depends on the depth of the water body and the expected depth at which the targeted fish species is normally found.

Target fish species: All types of fishes that eats baits.

Water bodies used in: Clear water bodies without much aquatic vegetation. It may include lotic water bodies like rivers and hill streams and lentic water bodies like beels, ponds etc. Hand line is not suitable for muddy or very shallow water bodies.

Modus operandi: A bait is fitted in the hook and it is submerged in water with help of the float. When fishes eat the bait, the float moves, and the operator/fisherman pulls the bamboo stick. The sharp barb of the hook pierces the mouth parts and the fish gets entangled in the hook.

Use in commercial fishery: Not used in commercial fishery.

Special observation: Baits for vegetarian fishes normally include mould of wheat flour (Aata or maida). For non-vegetarian fishes larvae of

wasps, bees, gundhy bug and small tadpole/ frogs area used. For big fishiterian fishes, small fishes are also used as a bait

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4.3.2.2. Doliowa Boroshi:

Local name:	Doliowa boroshi
English name (if any):	Throwing hand line/ Pole line
Geographical distribution (within the study area):	Entire range of the study area
General description:	A barbed iron hook is tied to one end of a nylon threads. The other end of the thread is tied to a bamboo pole. Unlike sip boroshi (simple handline), no float is used in a pole line. The depth of the hook is decided by tying the thread of the line longer or shorter in the pole.

Fig: 4.3.8: A fisherman using a doliowa boroshi in Brahmaputra river in Goalpara

Raw materials used:	(1) A barbed iron fishing hook (2) A nylon thread (3) A bamboo pole (optional)
Fabrication of the gear:	(1) As mentioned in hand line, barbed iron fishing hooks are available in the market in different size and shape. A hook appropriate for the targeted fish species is selected. Size may vary in size from 1 cm to 4 cm depending in the size of the target fish.

	(2) A nylon thread is inserted into the eye of the hook and tied tightly. (3) Other end of the thread is open. While using the gear, either the fisherman holds this end or tie it to the bamboo pole. A sturdy bamboo pole is taken so that the fish cannot take the pole away after being entangled. If a small fish is targeted, a thin bamboo pole can be used. But, for larger fishes, especially in rivers, a thick and sturdy bamboo pole is used.
Target fish species:	All types of fishes that eats baits.
Water bodies used in:	Clear water bodies without much aquatic vegetation. It may include lotic water bodies like rivers and hill streams and lentic water bodies like beels, ponds etc. Not suitable for muddy or very shallow water bodies.
Modus operandi:	A bait is fitted in the hook and is thrown into water away from the fishermen. The fisherman either holds the thread at hand and wait for a fish to engulf the bait or a bamboo pole is fixed at the bottom of the waterbody and the boroshi is tied to it. The boroshi tied to bamboo pole is left for long time. The thread is tied to the pole at appropriate height to adjust the height of the hook. In the morning, or at mid night, fishermen inspect the line to check whether any fish is caught.
Use in commercial fishery:	It is used in both artisanal and commercial fishery.
Special observation:	Since it is left over night, softer baits like wheat flour (Aata or maida) are not used. For non-vegetarian fishes, larvae of wasps, bees, gundhy bug and small tadpole/ frogs area used. For big fishiterian fishes, small fishes are also used as a bait

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4.3.2.3. Dol Boroshi:

Local name:	Dol Boroshi
English name (if any):	Long line
Geographical distribution (within the study area):	Entire range of the study area
General description:	A barbed iron hook is tied to one end of a nylon threads. The other end of the thread is tied to a rope. Many such lines are tied to the rope in a series. There is no float. The depth of the hook is maintained by maintaining the length of the threads. In some long lines, hooks are hung at different depths so that different varieties of fishes can be targeted. The rope with many hung lines is tied to two fixed bamboo/ wooden poles.

Fig: 4.3.9: A dol boroshi tied to poles and hung into river

Raw materials used:	(1) A barbed iron fishing hook (2) A nylon thread (3) A long rope (4) Two bamboo/ wooden poles
Fabrication of the gear:	(1) As mentioned in hand line, barbed iron fishing hooks are available in the market in different size and shape. A hook appropriate for the targeted fish species is selected. Size may vary in size from 1 cm to 4 cm depending in the size of the target fish.

	(2) A nylon thread is inserted into the eye of the hook and tied tightly. (3) Other end of the thread is tied to a rope. (4) Many such lines are tied to the same rope in a series. (5) Two sturdy bamboo poles are fixed at a desired distance. (6) The rope having many lines is tied to the two poles at the two ends.
Target fish species:	All types of fishes that eats baits.
Water bodies used in:	Clear water bodies without much aquatic vegetation. It may include lotic water bodies like rivers and hill streams and lentic water bodies like beels, ponds etc. Not suitable for muddy or very shallow water bodies.
Modus operandi:	A bait is fitted to each of the hooks and the hooks are submerged in water by tying the rope to the bamboo poles at appropriate height. The long line is laid and left overnight. In the morning, or at mid night, fishermen inspect the line to check whether any fish is caught.
Use in commercial fishery:	It is used in commercial fishery.
Special observation:	Since it is left over night, softer baits like wheat flour (Aata or maida) are not used. For non-vegetarian fishes, larvae of wasps, bees, gundhy bug and small tadpole/ frogs area used. For big fishiterian fishes, small fishes are also used as a bait.

4.3.2.4. Hazari Boroshi:

Local name:	Hazari Boroshi
English name (if any):	Long line
Geographical distribution (within the study area):	Entire range of the study area mostly in Brahmaputra and other rivers

General description: A barbed iron hook is tied to one end of a nylon threads. The other end of the thread is tied to a rope. Many such lines are tied to the rope in a series at about 4 inches interval. There is no float. The depth of the hook is maintained by maintaining the length of the threads. In some long lines, hooks are hung at different depths so that different varieties of fishes can be targeted. The rope with many hung lines are tied to two fixed bamboo/ wooden poles.

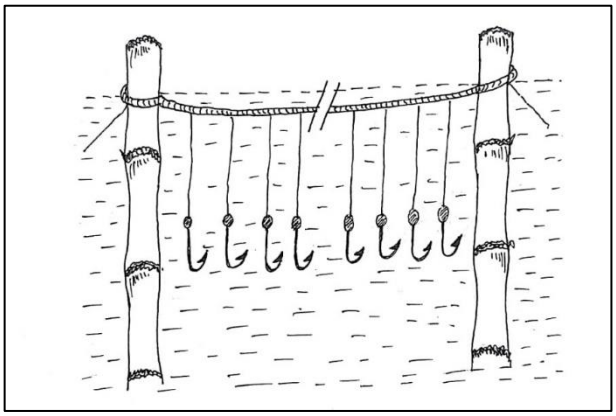

Fig: 4.3.10: Hazari Boroshi (A part is shown in the drawing)

Raw materials used:
(1) A barbed iron fishing hook
(2) A nylon thread
(3) A long rope
(4) Two bamboo/ wooden poles

Fabrication of the gear:
(1) As mentioned in hand line, barbed iron fishing hooks are available in the market in different size and shape. A hook appropriate for the targeted fish species is selected. Size may vary in size from 1 cm to 4 cm depending in the size of the target fish.
(2) A nylon thread is inserted into the eye of the hook and tied tightly.
(3) Other end of the thread is tied to a rope.
(4) Many such lines are tied to the same rope in a series.
(5) Two sturdy bamboo poles are fixed at a desired distance.

	(6) The rope having many lines is tied to the two poles at the two ends.
Target fish species:	Medium and large fishes.
Water bodies used in:	Clear water bodies without much aquatic vegetation. It may include lotic water bodies like rivers and hill streams and lentic water bodies like beels, ponds etc. Not suitable for muddy or very shallow water bodies.
Modus operandi:	No bait is fitted to the hooks and the hooks are submerged in water by tying the rope to the bamboo poles at appropriate height. The hazari boroshi is laid and left overnight. In the morning, or at mid night, fishermen inspect the line to check whether any fish is caught.
Use in commercial fishery:	It is used in commercial fishery.
Special observation:	No bait is used in Hazari boroshi. The distance between the hooks are only about 4 inches, whereas the distance in Dol boroshi is about 8-12 inches

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4.3.3. Traps, Maze and Barricade:

It is a category of fishing in which the targeted fish is trapped inside a device. Generally, in lotic water, the flow of water and barricades are used to drive the fish to a particular direction and ultimately trap it. In lentic water, barriers and artificial shelters are created where the fish enters and get trapped. Brandt, A. (1984) described traps, maze and barricades in his book *Fish catching methods of the world*. Homell (1924), Faruqui and Sahai (1943) and Job and Pantulu (1953) studied traps in India. Saxena (1964) studied the fishing nets and traps in Ganga river system. Joseph and Narayanan (1965) studied traps, maze and barricades of the Brahmaputra valley. Alam (1997) traps, maze and barricades in Bangladesh. Specific reference of their use in flood plains is got from Yadava, Choudhury and Kolekar (1981). Specific use in North East related studied have been done by Bhattacharjya, Manna and

Choudhury (2004), Das, N C (2013) Dutta, Das, and Kar (2016), Gurumanyu and Choudhury (2009). Yadav et.al. (1981) did two separate studies on *Katal* fishing and use of *Banas.*

4.3.3.1. Khoka/ Thoha/ Sorha:

Local name:	Khoka / Thoha / Sorha
English name (if any):	-
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is a gear made by splitting a bamboo into a funnel shape and weaving a mesh with bamboo wires (tomal).
Raw materials used:	(1) Bamboo: Preferably jaati baah (*Bambusa tulda*) (2) Iron wire/ bamboo wire/ plastic wire
Fabrication of the gear:	A piece of bamboo measuring about 1.5 m is taken. One end of the bamboo is split into 12-16 thin parts. Then, with help of wire it is weaved into a funnel shaped structure.

Fig: 4.3.11: A Thoha is laid on river bed

Target fish species:	Small fishes living in flowing water
Water bodies used in:	Hill streams, small river, water logged field (with support of earthen bundh)
Modus operandi:	The funnel shapes gear is placed against water current. Fishes enter the funnel and can't go out.
Use in commercial fishery:	It is used in artisanal fishery and not in commercial fishery.

4.3.3.2. Chunga:

Local name:	Chunga
English name (if any):	-
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is a hollow piece of bamboo of about 0.6 m length with one closed end and one open end.
Raw materials used:	(1) Bamboo: Preferably bhaluka baah (*Bambusa balcooa*)
Fabrication of the gear:	A piece of mature bamboo from a node to node is taken. Normally the piece of bamboo is selected so that the node to node distance is maximum. A hole is made in one end of the node. The other end remains closed. In some cases, both the nodes are kept, and a hole is made at the middle bamboo.
Target fish species:	Live fishes living in muddy water.
Water bodies used in:	Shallow, muddy water, i.e. peat land, marshes, shallow areas of beels and ponds.
Modus operandi:	The Chunga is placed at the bottom of the water body. Fishes use the chunga as a hide. When water level recedes, the chunga is lifted and fishes are trapped.

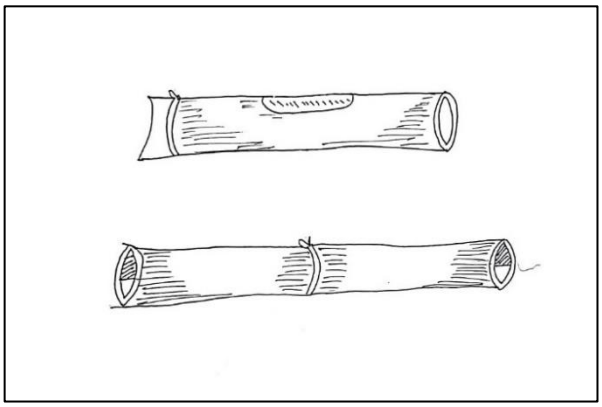

Fig: 4.3.12: Two different types of Chunga

Use in commercial fishery:	It is used in artisanal fishery and occasionally used in commercial fishery.

4.3.3.3. Katal:

Local name:	Katal
English name (if any):	-
Geographical distribution (within the study area):	In major beels
General description:	Aquatic vegetation (mostly water hyacinth) of about 10 to 20 m diameter in circular fashion is encircled with help of bamboo poles and ber jaal.

Fig: 4.3.13: Fishermen using boat to harvest a Katal in Deeporbeel

Raw materials used:	(1) Bamboo poles: Preferably Kota baah (*Bambusa bambos*), Jaati baah (*Bambusa tulda*) and Tarai baah (*Melocanna baccifera*). (2) A ber jaal
Fabrication of the gear:	Katal is more a methodology than a gear. Bamboo poles are used to afix the aquatic vegetation in one location so that wind can't move it.
Target fish species:	All types of fishes that live under aquatic vegetation, especially fishes that can survive in low oxygen
Water bodies used in:	Large beels
Modus operandi:	Bamboo poles are used to afix the aquatic vegetation in one location so that wind can't move it. Aquatic vegetation thus given a form of a circular floating blanket over the water. This is called Katal. Fishes take shelter under the Katal. At

	the time of harvesting, a ber jaal is used to encircle the Katal, so that no fish can escape.
Use in commercial fishery:	It is used in commercial beel fishery.

4.3.3.4. Bana:

Local name:	Bana
English name (if any):	Bamboo barricade
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is a bamboo mat like structure weaved with thin bamboo sticks and nylon thread
Raw materials used:	(1) Bamboo: Preferably jaati baah (*Bambusa tulda*) (2) Nylon thread
Fabrication of the gear:	(1) A piece of mature bamboo measuring from 60 cm to 150 cm is taken and split into think sticks of about 1.5 to 3 cm circumference. (2) With help of nylon thread, the sticks are weaved into a mat. The height of the stick becomes the width of the mat and length is decided depending on the use of the bana.
Target fish species:	All type of fishes.
Water bodies used in:	All type of fresh water bodies, especially in small river, streams and in beels.
Modus operandi:	Bana is used for various puposes and the modus operandi for each purpose is different – (1) It is used as a barricade so that fishes can't escape the waterbody whereas water can flow through it. During floods, it is used to encircle pond fishery so that reared fishes can't escape the pond. (2) It is used to form a leading path so that fishes travel in a guided path and are led to a dip net or trap net or any other gear.

(3) In water logged field, bana is used as a barricade on both sides of other traps like sepa and juluki

(4) In large shallow water bodies like beels, bana is used to create partition so that fishes from one side can't move to the other.

	
Fig: 4.3.14. Bana used as partition in Deeporbeel	**Fig: 4.3.15 Bana used as barrier around a Sepa**

Use in commercial fishery: It is used in both artisanal fishery and commercial fishery.

4.3.3.5. Sepa:

Local name: Sepa

English name (if any): Pot gear

Geographical distribution (within the study area): Entire range of the study area

General description: It is a gear made by bamboo sticks weaved into a spindle shaped pot.

Raw materials used: (1) Bamboo: Preferably jaati baah (*Bambusa tulda*)

(2) Iron wire/ bamboo wire/ plastic wire

Fabrication of the gear: (1) Mature bamboo of about 1.2 m to 1.8 m length is sliced into thin sticks of about 1.8 to 3 cm circumference.

(2) With help of nylon threads, the sticks are weaved into a spindle shaped pot. The central part of the pot is about 30 cm to 50 cm in diameter. Both the end tappers. One end is sealed with the thread. The other end has a mouth through which a

hand can be inserted. This mouth is kept clogged with cloth or vegetation during the operation and used to take out fishes, when the gear is lifted to harvest the fish.

(3) at the central region of the gear, there is a valve like entrance, through which fishes can enter, but can't go out.

Fig: 4.3.16: Sepa

Target fish species:	Small fishes living in flowing water and in water logged fields
Water bodies used in:	Small streams, water logged field
Modus operandi:	The sepa is placed against current of water in such a way that there is protective barricade in form of a bana or an earthen dam around the sepa. Water can flow through the sepa, fishes follow the flow of water and enter the sepa through the entrance. At periodic interval, the sepa is lifted and the fishes trapped are taken out through the mouth. While placing the sepa, the mouth is clogged with cloth / vegetation
Use in commercial fishery:	It is mostly used in artisanal fishery and occasionally seen to be used in commercial fishery.

4.3.3.6. Dui mukhia sepa:

Local name:	Dui mukhia Sepa
English name (if any):	Double entrance pot gear
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is a gear made by bamboo sticks weaved into a spindle shaped pot. Very similar to sepa, but in this there are two entrance opening in two different directions
Raw materials used:	(1) Bamboo: Preferably jaati baah (*Bambusa tulda*) (2) Iron wire/ bamboo wire/ plastic wire
Fabrication of the gear:	(1) Mature bamboo of about 1.2 m to 1.8 m length is sliced into thin sticks of about 1.8 to 3 cm circumference. (2) With help of nylon threads, the sticks are weaved into a spindle shaped pot. The central part of the pot is about 30 cm to 50 cm in diameter. Both the end tappers. One end is sealed with the thread. The other end has a mouth through which a hand can be inserted. This mouth is kept clogged with cloth or vegetation during the operation and used to take out fishes, when the gear is lifted to harvest the fish. (3) at the central region of the gear, there are two valves like entrances, opening into opposite directions through which fishes can enter the gear, but can't go out.
Target fish species:	Small fishes living in flowing water and in water logged fields
Water bodies used in:	Small streams, water logged field
Modus operandi:	The dui mukhia sepa is placed in water logged field in such a way that there is protective barricade in form of a bana or an earthen dam at the central line (cross section line) of the sepa. Water can flow through the sepa, fishes enter the sepa from both sides through the entrances. At periodic interval, the sepa is lifted and the fishes trapped are taken out through

the mouth. While placing the sepa, the mouth is clogged with cloth / vegetation.

Fig: 4.3.17: A fisherman setting a duimukhia sepa

Use in commercial fishery: It is mostly used in artisanal fishery and occasionally seen to be used in commercial fishery.

4.3.3.7. Dingori / Dingora:

Local name:	Dingori/ Dingora
English name (if any):	-
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is a gear made by bamboo sticks weaved into a pot with one rounded side and one rectangular side. It is similar to sepa in function, but in there are two entrance opening in two different directions
Raw materials used:	(1) Bamboo: Preferably jaati baah (*Bambusa tulda*) (2) Iron wire/ bamboo wire/ plastic wire
Fabrication of the gear:	(1) Mature bamboo of about 1.5 m to 2.0 m length is sliced into thin sticks of about 1.8 to 3 cm circumference. (2) With help of nylon threads, the sticks are weaved into a pot. It has one rounded side and one rectangular side.

(3) at the central region of the gear, there are two valves like entrances, opening into opposite directions through which fishes can enter the gear, but can't go out.

Depending on wehre it is used and the depth of the water body, a dingori can be as small as 60 cm in height and also be as tall as a full-grown human being

Fig: 4.3.18: Dingoris ready to be set in the field

Target fish species:	Small and medium fishes living in flowing water and in water logged fields
Water bodies used in:	Small streams, water logged field
Modus operandi:	The dingori is placed in water logged field / flowing water in such a way that there is protective barricade in form of a bana or an earthen dam at the central line (cross section line) of the gear. Water can flow through the dingori, fishes enter the dingori from both sides through the entrances. At periodic interval, the dingori is lifted and the fishes trapped are taken out.
Use in commercial fishery:	It is mostly used in artisanal fishery and occasionally seen to be used in commercial fishery.

4.3.3.8. Baagha:

Local name:	Bagha

English name (if any): -

Geographical distribution (within the study area): Boko, Singra area

General description: It is a gear made by bamboo sticks weaved into a cylindrical box of equal diameter from tip to tip. Unlike sepa, its entrance is long from tip to tip. Fishes can enter through the entrance but can't escape. Just inside the entrance, there is a layer of bamboo mat that acts as the protective barrier for fishes to escape once they enter the bagha. Normally, the size is very big, almost the size of a full-grown human being and even bigger.

Fig: 4.3.19: A Bagha in Boko area

Raw materials used: (1) Bamboo: Preferably jaati baah (*Bambusa tulda*)
(2) Iron wire/ plastic wire

Fabrication of the gear: (1) Mature bamboo of about 2.0 m length is sliced into thin sticks of about 2 to 3 cm circumference.
(2) With help of nylon / jute threads, the sticks are weaved into a cylindrical pot. The diameter of the cylinder is same throughout its length.
(3) the entrance is like an elongated grove from tip to tip. Smaller bamboo sticks are arranged in a 'V' shape so that fishes can make an entry into the cylinder.
(4) just below the V-shaped rows of bamboo, a layer of bamboo mat is fixed so that the fishes find it as a barrier if they want to come out of the cylinder.

Target fish species: Small and medium fishes living in flowing water and in water logged fields

Water bodies used in:	Small streams, water logged field
Modus operandi:	Depending on the depth of the water, the bagha is placed in water logged field / flowing water either vertically. Water can flow through the bagha. Fishes enter the bagha through the elongated entrance. At periodic interval, the bagah is lifted and the fishes trapped are taken out.
Use in commercial fishery:	It is mostly used in artisanal fishery and occasionally seen to be used in commercial fishery.

4.3.3.9. Juluki / Jurkha:

Local name:	Juluki / Jurkha
English name (if any):	Pot gear
Geographical distribution (within the study area):	Entire range of the study area
General description:	It is a gear made by bamboo sticks weaved into a drum shaped pot with a narrow open end at the top and a slightly wider open end at the bottom. It is very similar to Polo
Raw materials used:	(1) Bamboo: Preferably jaati baah (*Bambusa tulda*) (2) Iron wire/ bamboo wire/ plastic wire
Fabrication of the gear:	(1) Mature bamboo of about 60 cm m to 1 m length is sliced into thin sticks of about 1.5 to 2.5 cm circumference. (2) With help of nylon threads, the sticks are weaved into a drum shaped pot. (3) Like polo, it has a narrow opening at the top rimed with bamboo beats (sometime also with rubber to get a better grip) The top opening is about 15 cm in diameter and the bottom opening in about 25 to 30 cm in diameter

Fig: 4.3.20: A Juluki

Target fish species:	Small fishes living in water logged fields / muddy water
Water bodies used in:	Mostly used in water logged field and muddy water
Modus operandi:	The Juluki operation is very similar to that of Polo. It is lifted by hand and placed on a suspected place of fish presence. Then with the other hand, fishes caught inside are taken out through the top opening.
Use in commercial fishery:	It is mostly used in artisanal fishery.

4.3.3.10. Kharbandh:

Local name:	Kharbandh
English name (if any):	-
Geographical distribution (within the study area):	Deepor beel wetland
General description:	Kharbandh is a typical bana arrangement stacked one over the other to lead fishes in a channel gradually upward from the water. It is seen in Deepor beel's confluence with Khanajan canal. Bamboo poles are fixed on both banks of the canal in 'V' shape in such a way that the banas gradually become narrower from the beel into the canal. Fishes moving from the beel to the canal are thus guided by the bana to a narrower strip where they are caught.
Raw materials used:	(1) Bamboo: Preferably jaati baah (*Bambusa tulda*) (2) Nylon thread
Fabrication of the gear:	(1) Mature bamboo of different length are split into think sticks of about 1.8 to 3 cm circumference. (2) With help of nylon thread, the sticks are weaved into mats. One end of the mat is wider and gradually it narrows down to give a trapezoid shape. (3) Bamboo poles (thick) are fixed on both sides of the canal.

(4) transverse bamboo poles (thinner than the fixed one) are tied from pole to pole at gradually upward elevation from the beel side to the canal side.

(5) Banas are laid over the transvers poles on layers

(6) Ater laying all the layers of the banas, one end of the transverse bamboos is opened so that with help of the lose end, the banas can be lifted

Fig: 4.3.21: A small Kharbadh at Deeporbeel

Target fish species:	Small and medium fishes. Most commonly caught fish is Koroti (*Gudusia chapra*).
Water bodies used in:	Was recorded only in Deepor beel.
Modus operandi:	The gear is fixed at the confluence of Khanajan canal and Deeporbeel throughout the season. Fishes enter the first level of the gear and gradually go higher to the next level and after a few banas, they reach at the surface of water. At that level, fishermen can see the fishes and with help of the loose end of the transvers poles, they guide the fishes or propel the fishes to further height where they are taken out of water.
Use in commercial fishery:	It is used in commercial fishery.

4.3.3.11. Trap net:

Local name:	-
English name (if any):	Trap net
Geographical distribution (within the study area):	Only found in Goalpara district
General description:	It is a cylindrical net with two wings on either sides of the mouth of the cylinder. The closed end is narrow and pointed. It is fixed against water current in rivers with help of bamboo poles. It has very small mesh size.
Raw materials used:	(1) Nylon cloth (2) Bamboo pole (2) Jute rope
Fabrication of the gear:	(1) Nylon cloth is used to stich a cylindrical net with a narrow pointed blocked end and a wide-open end. (2) To maintain the diameter of the cylindrical part at almost same from mouth to about 3/4th of the net, bamboo rings are used (3) Nylon cloth is used to add two wings on either sides of the mouth that guides the fishes towards the main net.

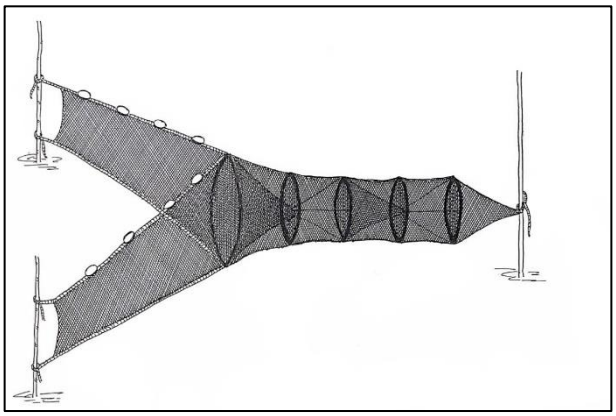

Fig: 4.3.22: Trap net of fyke net

Target fish species:	All type of fishes.

Water bodies used in:	Found to be operated in Brahmaputra river (near the bank, not in the middle of the river)
Modus operandi:	Trap net is fixed against the water current with help of bamboo poles in the shallow water of river near the bank. On one side, the bank of the river act as the leading barrier, on the other side long bamboo bana or long ber jaal is affixed to lead fishes to the wings of the trap net. With the water current, fishes enter the main cylindrical part of the net. Then, the fishermen lift the pointed side of the net and take out the fish.
Use in commercial fishery:	It is used in commercial fishery.

4.3.4. Entangling gears:

Two types of gears were found during the study that entangle the fishes in their gill region. The ones with smaller mesh sizes are known locally as Laangi jaal and the ones with larger mesh size to catch large fishes are known as the Faasi jaal. There are different Laangi jaals to catch different size of small fishes. In English, both *Langi jaal* and *Faasi jaal* are known as Gill nets. Gill netting is one of the oldest forms of net fishing. The mesh size of a gill net is critical as it does two functions – selecting the fish to be entangled and entangling the fish. The mesh size of the gillnet is kept slightly smaller than the maximum girth of the fish aimed to be caught. Once the fish pushes its head into the mesh, it gets stuck. Due to the body girth, it can't go forward and due to the operculum, it can't go backward. Thus, it gets entangled in the net. Fish is generally entangled just behind the gills (or operculum), hence, these nets are popularly known as gill nets. The principle behind gill netting has not changed over the years.

Different authors including Homell (1924) and Brandt (1984) have studied Gill nets, their operation and effectiveness in different parts of the world. Faruqui and Sahai (1943), Saxena (1964), Joseph and Narayanan (1965), Yadava et.al. (1981) studied Gill nets in different aquatic ecosystems in India. Alam et.al (1997) studied gill nets in Bangladesh. Kar and Dey (1991), Bhattacharjya et.al (2004), Gurumanyu and Choudhury (2009), Das (2013) and Dutta, Das, and Kar (2016) studied gill nets in the North East and Assam. Brandt (1984) has

classified gill nets into 3 types: Set gillnets, floating gillnets and drifting gill nets. Two types of set gill nets were found in the study area -

4.3.4.1. Langi jaal:

Local name:	Laangi jaal
English name (if any):	Gill net
Geographical distribution (within the study area):	Entire range of this study
General description:	Laangi jaals are the small mesh sized gill nets with about 150 mm to 220 mm diameter mesh size. The top line of the net is lined with floats and the bottom line is lined with loads made of earthen beads or lead beads.
Raw materials used:	(1) Nylon thread for the net weaving (2) Float – rubber / cork / Thermocol (3) earthen bead or lead bead as load (4) Bamboo poles
Fabrication of the gear:	(1) Nylon thread is taken and a net of small mesh size of about 150 mm to 220 mm diameter is weaved. All mesh size is same. Breadth and length of the net is decided depending on the water body where it is to be operated. (2) The top lining is fitted with a thick nylon rope and floats (3) The bottom line is fitted with the loads so that the net remains vertical against the flow of water (4) Depending on the fish species to be caught, the mesh sizes vary. The most commonly used laangi jaal are – a. **Puthi laangi** – used for catching *Puntius spp.* and fishes of similar size b. **Koi laangi** – used for catching *Anabas testudineus* and fishes of similar size. It has slightly larger mesh size than Puthi laangi

	
Fig: 4.3.23: Laying of a Laangi jaal	**Fig: 4.3.24: Harvesting of a Laangi jaal**

Target fish species: Small fishes

Water bodies used in: Streams, wetlands, ponds, water logged fields

Modus operandi: The net is fixed with the bamboo poles on both sides. The float line on top and the load line at the bottom keeps the net vertical. It is placed on the movement way of fishes. Fishes try to cross the net and push the head into the net. They get entangled between the operculum and the dorsal fin where the girth of the fish is maximum. Net is periodically inspected, and fishes are taken out by hand picking one by one.

Use in commercial fishery: It is used both in artisanal fishery and commercial fishery.

4.3.4.2. Fasi jaal:

Local name: Fasi jaal

English name (if any): Gill net

Geographical distribution (within the study area): Entire range of this study

General description: Faasi jaals are the large mesh sized gill nets with about 4 cm to 6 cm diameter mesh size. The top line of the net is lined with floats and the bottom line is lined with loads made of earthen beads or lead beads. Threads used are thicker than that of Laangi jaal

Raw materials used: (1) Nylon thread for the net weaving. Threads used are thicker than that of Laangi jaal

(2) Float – rubber / cork / Thermocol

(3) Earthen bead or lead bead as load

(4) Bamboo poles

Fabrication of the gear: (1) Nylon thread is taken and a net of large mesh size of about 4 cm to 6 cm diameter is weaved. All mesh sizes are same. Breadth and length of the net is decided depending on the water body where it is to be operated.

(2) The top lining is fitted with a thick nylon rope and floats

(3) The bottom line is fitted with the loads so that the net remains vertical against the flow of water

(4) Mesh sizes vary with the fish species to be caught.

Fig: 4.3.25: Faasi jaal (central one)

Fig: 4.3.26: Laying a Faasi jaal

Target fish species: Medium to large fishes (eg. Chitala and Aari)

Water bodies used in: Rivers and large beels

Modus operandi: The net is fixed with the bamboo poles on both sides. The float line on top and the load line at the bottom keeps the net vertical. It is placed on the movement way of fishes. Fishes try to cross the net and push the head into the net. They get entangled between the operculum and the dorsal fin where the girth of the fish is maximum. Net is periodically inspected, and fishes are taken out by hand picking one by one.

Use in commercial fishery: It is used mostly for commercial fishery.

4.3.5. Encircling gears:

The meaning of the word ‘Encircle’ means to surround or to circle around. As the meaning suggest, this category of gears encircle the targeted fishes either from the top or from the sides. In the entangling nets, we found that the nets are fixed and left for fishes to be passively caught / entangled in the net. This category of devices is all operated in real time and fishes are actively caught by the fishermen. Four types of encircling gears were found during the study –

4.3.5.1. Asara jaal/ Khewali jaal:

Local name:	Asara jaal/ Khewali jaal
English name (if any):	Cast net
Geographical distribution (within the study area):	Entire range of this study
General description:	As the name suggest, it is a circular net that is cast/ thrown by hand to encircle an area of water and fishes underneath are caught. It is made out of nylon threads and iron beads. Mesh size is small.
Raw materials used:	(1) Nylon thread to weave the net (2) Jute rope (3) Iron beads as loads
Fabrication of the gear:	(1) A circular net of small mesh size is weaved (2) A strong rope is tied at the centre of the net (3) heavy iron beads of about 1.5 to 2 cm size are attached at about 10 to 15 cm interval at the entire circumference of the net.
Target fish species:	All type of fishes
Water bodies used in:	Rivers, small streams, beel, pond
Modus operandi:	The fishermen cast the net in such a manner that it opens in a circular manner and falls on water to cover an area equivalent to the net’s own area. Immediately after casting, the iron beads, due to the heavy weight sinks to the bottom. Thus, all the fishes underneath are encircled and caught in

the net. Then, with help of the rope, the net is slowly pulled so that the area gradually reduces, and the net is dragged out of water. The heavy iron beads cause the net to close. The operator can cast the net from the bank of the water body or from a knee-deep water depth or from a boat / bhur.

Fig: 4.3.27: Operation of cast net from a bhur

Fig: 4.3.28: Operation of a cast net from bank

Fig: 4.3.29: Operation of cast net from a boat

Fig: 4.3.30: Operation of cast net from water

Fig: 4.3.31: Weaving of cast net

Fig: 4.3.32: Fitting iron beads in a cast net

Use in commercial fishery: It is used both in artisanal and commercial fishery

Special observation: It requires thorough practice to cast the net. If the timing and thrust is not synced, then the net doesn't open properly, and the full circle is not obtained. Also, while puling the net, if it

is pulled too fast, fishes escape from the bottom. Another important point is to avoid areas with very rough bottom or rocky bottom or with aquatic vegetation. Chances of fishes escaping increases if the bottom is very rough or if there are aquatic vegetations.

4.3.5.2. Polo:

Local name:	Polo
English name (if any):	Pot gear
Geographical distribution (within the study area):	Entire range of this study
General description:	It is bamboo basket of dome shape. The bottom of the gear has a wide opening of 60 to 120 cm diameter and the top of the gear has a smaller opening of about 10 – 12 cm diameter. Height of the gear is about 60 to 90 cm.
Raw materials used:	(1) Bamboo – preferably jaati baah (*Bambusa tulda*) (2) Cane / plastic wire
Fabrication of the gear:	(1) Bamboo sticks of about 60 – 90 cm length and 6 mm to 12 mm diameter are made (2) With help of cane or plastic wire, the sticks are moulded like a dome keeping the top opening of about 10- 12 cm diameter and bottom opening of about 60-120 cm diameter. (3) The top opening mouth is made thick with bamboo rings and weaving with cane/ plastic wire. Some also weave this part with thin jute rope.

Fig: 4.3.33: Fisherman with a Polo in Urpad

Fig: 4.3.34: Polo being used in Deeporbeel

Target fish species:	Small and medium fishes.
Water bodies used in:	Beel, pond, Marshes, Peatland
Modus operandi:	The operator lifts the polo and place over the place where s/he is expecting fishes. Then, s/he insert a hand through the top opening and search for the fishes caught inside. Fish is handpicked in live condition
Use in commercial fishery:	It is used mostly in artisanal fishery
Special observation:	Fishermen normally operates it in shallow water, where s/he can already assume the presence of fishes. If they doubt the presence of any venomous fish like Singi (*Heteropneustes fossilis*), they don't insert hand into the polo. Depending on the depth of the water, polos of different height are used.

4.3.5.3. Clap net:

Local name:	Hilsa jaal
English name (if any):	Clap net
Geographical distribution (within the study area):	In Goalpara and Kamrup Metro district (Brahmaputra river)
General description:	It is a ladies purse shaped net with a wide mouth guarded by two horizontal bamboo. It is kept submerged several meters

under water in mid current water of Brahmaputra and operated from a boat that floats just over the net.

Raw materials used: (1) Nylon thread for weaving the net

(2) Four long pieces of bamboo (*Bambusa balcooa* or *Bambusa tulda*)

(3) Nylon rope / Jute rope

Fabrication of the gear: The net is stitched like a horizontally laid ladies purse with a wide opening. The opening of the net is fitted with two long pieces of bamboo. Both the ends of the bamboo pieces are tied together, and the middle part is kept loose. Each of these two horizontal pieces of bamboo are fixed with a vertical piece of bamboo that can be operated from a boat floating over the net. The length of the vertical pieces of the bamboo depends on the targeted depth of the net at which it is placed.

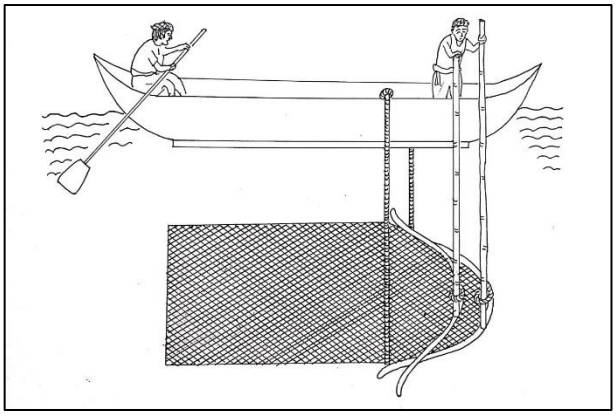

Fig: 4.3.35: A clap net diagrame

Target fish species: This net is used to target only the shoals of Ilish fish (*Tenualosa ilisha*). Thus it is a specialized net with restricted distribution.

Water bodies used in: Brahmaputra river

Modus operandi: The net is placed several feet under water with help of two vertically placed bamboo that are controlled from a boat. The boat is kept floating just above the net. In most cases, the net is operated about 10 to 30 meters away from the bank and the

boat is fixed with help of bamboo pole. The net mouth is fitted with two pieces of horizontal bamboo that acts like jaws. The jaws of the mouth can be opened and closed with help of the vertical bamboo from the boat. Fishermen estimate a time during the breeding season of Ilish fish when they demonstrate an anadromous migration from salt water Bay of Bengal to Fresh water Brahmaputra. Shoals of Ilish enter Brahmaputra river and migrate as far east upto Kaziranga National park. The migration happens several meters under water. The height varies with water temperature, rain, disturbance on the surface etc. The net is placed against the current at an appropriate height to fall on the migratory route of Ilish. Mouth of the net is kept open for a long time, especially in the night. Once the operator feels that fishes have entered the net, he closes the net mouth with help of the bamboo. This function resemble as if the jaws of the net 'Clap'. Hence, the name Clap net is given.

Use in commercial fishery: It is used only in commercial fishery

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4.3.5.4. Ber jaal/ Maha jaal/ Bor jaal:

Local name: Ber jaal/ Maha jaal / Bor Jaal

English name (if any): -

Geographical distribution (within the study area): Entire range of this study

General description: As the name suggest, it is a net that is used to encircles or surround the targeted area from both sides so that fishes can't escape laterally. It is made of nylon. Like the gill nets, in Ber jaal also float and loads are used. But, unlike gill nets, here

	fishes are not entangled in the net itself, rather get encircled and then handpicked or scoped by another smaller net.
Raw materials used:	(1) Nylon thread to weave the net (2) Float – corc or rubber or thermocol (3) Load – stone / iron
Fabrication of the gear:	(1) A long net of small mesh size and about 1.5 m to 2.5 m height is weaved (2) A strong rope is tied a the top end of the net and floats are fitted with this rope. (3) heavy iron pieces or stone are used as load to keep the net in vertical position when it is dragged
Target fish species:	All type of fishes
Water bodies used in:	Rivers, small streams, beel, pond
Modus operandi:	The net is dragged from both ends to gradually encircle a targeted area. If the water level is shallow, dragging is possible by walking on the water floor. Otherwise two boats are used to drag the net. Once the net encircles all the fishes in a targeted area, fishermen get inside the encircled area and take the fishes out either by hand picking or by scooping with another smaller hand net or a saloni.

Fig: 4.3.36: Ber jaal in operation

Fig: 4.3.37: Harvest by ber jaal

Use in commercial fishery:	It is mostly used in commercial fishery.

4.3.6. Scooping gears

4.3.6.1. Dheki jaal:

Local name:	Dheki jaal
English name (if any):	Chinese dip net
Geographical distribution (within the study area):	In large beels and rivers in entire study range
General description:	It is a big sized triangular shaped net clamped at one location with help of bamboo poles.
Raw materials used:	(1) Nylon net (2) Bamboo (*Bambusa balcooa*)
Fabrication and operation of the gear:	(1) A triangular net is fixed to a 'V' shaped bamboo frame. (2) Three vertical bamboo poles are fixed to ground and made a tri-juncture one either side of the frame. (3) A horizontal bamboo is fixed from one tri-juncture to the other. Thus, the tree poles on either side become like a stand and the cross bar makes a frame. (4) The centre of gravity of the V shaped frame is taken and at that point, the frame is hung with ropes to the horizontal bamboo. The entire weight of the V-shaped frame now rests on the six poles (three on either sides of the frame) (5) the triangular net is fitted to the V -shaped frame. Note that the frame is made in such a way that it accommodates the net exactly. Two thin vertical bamboo pieces are fixed in the open side of the net to keep the net in desired fixed position. (6) Another three bamboo poles are fixed on ground at the tip of the 'V' these three poles are used to create a platform (chang) where the fishermen will sit. The narrow end of the net is kept loose and long. It is tied to one of the three poles

in the operating end. When the fishermen get on the tip of the 'V' shaped frame, the net gradually comes out of water due to the level effect. When the person comes down from the frame, the open end of the frame (along with the net goes inside water)

(7) The net is placed inside water and the person waits on the platform. Once he feels that fishes have entered the net, he gets over the tip of the V and the net comes out scooping the fishes one the net.

(8) Once the open end of the net goes up fully, the fisherman can loosen the narrow end of the net and shake the net to bring the fishes to his side.

Fig: 4.3.38: A dheki jaal (not in operation)

Fig: 4.3.39: A dheki jaal being harvested

Target fish species:	All types of fishes
Water bodies used in:	Brahmaputra, Tributaries, Deepor beel
Use in commercial fishery:	It is used in both artisanal and commercial fishery
Special observation:	Some fishermen keep the caught fishes in a Khaloi. Others make s rectangular netted enclosure in water (about 3 feet X 3 feet) just under the fisherman platform and drops all the caught fishes into this netted enclosure. Later he can collect the fishes from this small enclosure.

4.3.6.2. Haat jaal/ Jaati jaal:

Local name:	Haatjaal/ Jaatijaal
English name (if any):	Folding dip net
Geographical distribution (within the study area):	Entire range of this study
General description:	It is a medium sized square shaped net tied to two cross bars made of bamboo. Another bamboo is used as a handle of the net.
Raw materials used:	(1) Nylon net (2) Bamboo (*Bambusa tulda*) (3) Jute rope
Fabrication of the gear:	(1) Two bamboo beats of about 1X3 cm size ate taken and arranged like an 'X' in such a manner that all the arms of the X are equal. (2) The beats are tied in such a manner that when needed, these can be folded to form an 'I' shape (3) A square shaped net is attached to the tips of the four arms of the X (4) At the crossing point of the two bamboo beats, another long bamboo is tied with a rope. This bamboo is used as the handle of the net

Fig: 4.3.40: A jaati jaal laid out

Fig: 4.3.41: A jaati jaal being harvested

Target fish species:	Small fishes

Water bodies used in:	Beels, small rivers, water logged fields
Modus operandi:	(1) The net is carried to the fishing site in folded condition (2) It is unfolded and dipped in waterbody with help of the long bamboo handle
Use in commercial fishery:	It is mostly used in artisanal fishery

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4.3.6.3. Porongi jaal:

Local name:	Porongi jaal
English name (if any):	Dip net
Geographical distribution (within the study area):	Entire range of this study
General description:	It is a medium sized square shaped net (slightly larger that Jaati jaal) tied to two cross bars made of bamboo. Another bamboo is used as a handle of the net. The handle is fixed to a thick bamboo pole and operated with help of a long rope.
Raw materials used:	(1) Nylon net (2) Bamboo (*Bambusa tulda* and *Bambusa balcooa*) (3) Jute rope
Fabrication of the gear:	(1) Two bamboo beats of about 1X4 cm size are taken and arranged like an 'X' in such a manner that all the arms of the X are equal. Both the bamboo beats are inserted through a bamboo cylinder of about 6 inches and these two cylinders are placed at the middle of the beats. Thus, these cylinders are the points where the two beats cross. These cylinders give additional strength to the frame. (2) A square shaped net is attached to the tips of the four arms of the X (3) At the crossing point of the two bamboo beats, another long bamboo is tied with a rope. This bamboo is used as the handle of the net

(4) Another thick bamboo pole (mature *Bambusa balcooa*) is fixed on the ground and the handle of the net is hung from this pole almost at the 2/3rd of the handle.

(5) A thick rope is tied at the crossing point of the beats. The operator lifts & dip the net by pulling & releasing the rope.

Fig: 4.3.42: A porongi jaal laid out

Fig: 4.3.43: A porongi jaal being harvested

Target fish species:	Small and medium fishes
Water bodies used in:	Beels, Rivers, water logged fields
Modus operandi:	(1) The net is kept fixed at one site with help of the pole. (2) The operator release the rope and the net is dipped in water. (3) When the operator feels that fishes have entered the net zone, he pulls the rope and the net is lifted.
Use in commercial fishery:	It is mostly used in artisanal fishery and occasionally used in commercial fishery

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4.3.6.4. Jakoi:

Local name:	Jakoi
English name (if any):	
Geographical distribution (within the study area):	Entire range of this study

General description: It is a small sized hand operated bamboo net of pyramid shape and a handle.

Raw materials used: (1) Bamboo (*Bambusa tulda*)
(2) Cane/ Plastic wire
(3) Jute rope

Fabrication of the gear: (1) Bamboo is sliced into thin slices of 5 – 7 mm.
(2) A pyramid shaped net is weaved using the bamboo slices.
(3) The bottom of the pyramid is triangular and kept open.
(4) The open side of the net is given a triangular rim with bamboo beats of 0.5 X 2.5 cm thickness
(5) One point of the triangular rim is extended to make a thick handle of about 2 – 2.5 feet length
(6) A jute rope is tied at the two ends of the rim away from the handle.

Fig: 4.3.44: A Jakoi in use

Fig: 4.3.45: A Jakoi being harvested

Target fish species: Small fishes

Water bodies used in: Beels, peat land, pond, marshes, water logged fields

Modus operandi: (1) The operator holds the handle of the net with one hand and the rope with the other
(2) The net is used to encircle fishes in shallow water and scoop the fishes out of water.
(3) Fishes caught in the net is hand picked and transferred to a Khaloi.

Use in commercial fishery: It is mostly used in artisanal fishery.

Special observation:	Jakoi and Khaloi are almost always used together to catch and store fishes. While the fisherman or fisherwoman carries the Jakoi in hand, they tie the khaloi to their waist with a rope.

4.3.6.5. Ghoka jaal/ Henga:

Local name:	Ghoka jaal / Henga
English name (if any):	-
Geographical distribution (within the study area):	In beels and marshes of Goalapara district
General description:	It is a triangular shaped hand operated nylon net fitted in a bamboo frame and with a bamboo handle
Raw materials used:	(1) Nylon net (2) Bamboo (*Bambusa tulda/ Bambusa bambos*) (3) Plastic / iron wire
Fabrication of the gear:	(1) Three pieces of bamboo are taken without splitting. Piece one is about 3-4 feet, piece two is about 5-6 feet and piece three is about 10-12 feet long. (2) These three pieces of bamboo are tied to form a triangle a short arm of 3-4 feet and two equal longer arm of 5-6 feet length. One end of the longer bamboo piece remain elongated and it acts as the handle of the net and the triangle serves as the frame for the net. (3) The net is fixed in the triangle are without keeping any gap between the net and the frame.
Target fish species:	Small fishes
Water bodies used in:	Beels, peat land, pond, marshes, water logged fields
Modus operandi:	(1) It is operated mostly in aquatic vegetation covered areas. (2) The operator either gets into water or operates it from a boat.

(3) With help of the long handle, the net is pushed below the floating vegetation and fishes underneath the vegetation is scooped out along with the vegetation.

Fig: 4.3.46: Ghoka jaal operation from water

Fig: 4.3.47: Ghoka jaal operation from boat

Use in commercial fishery: It is mostly used in artisanal fishery.

4.3.6.6. Chaloni:

Local name: Chaloni

English name (if any): Sieve

Geographical distribution (within the study area): Entire range of this study

General description: It is a small sized hand operated bamboo net of circular shape.

Raw materials used: (1) Bamboo (*Bambusa tulda*)

(2) Cane/ Plastic / iron wire

Fabrication of the gear: (1) Bamboo is sliced into thin slices of 5 – 7 mm.

(2) A circular shaped net is weaved using the bamboo slices. Keeping very small mesh size of less than 5 mm.

(3) The edge of the bamboo net is given a rim with bamboo beats of 0.5 X 2 cm thickness

(4) A plastic/ cane wire is tied at the rim like a loop. This loop is used to hang the chaloni when it is not in use.

Target fish species:	Small fishes. Mostly live fishes
Water bodies used in:	Beels, peat land, pond, marshes, water logged fields
Modus operandi:	(1) The operator holds the chaloni with both hands and insert it inside water / mud. It is mostly used in muddy water. (2) Then in the chaloni is lifted out of water and fishes are hand picked and transferred to a Khaloi.

Fig: 4.3.48: Two fisherwomen fishing with chalonis

Use in commercial fishery:	It is mostly used in artisanal fishery.
Special observation:	Chaloni and Khaloi are almost always used together to catch and store fishes. While the fisherman or fisherwoman carries the chaloni in hand, they tie the khaloi to the waist with a rope.

4.3.7. Storage gear:

While fishing, fishermen either keep the fishes in the boat, or in a bamboo basket known as Khaloi. With the modern influence, some people have started using tin/ plastic buckets or thermocol boxes to store fishes during fishing. In this study, emphasis was given to document Khaloi as a traditional gear.

4.3.7.1. Khaloi

Local name:	Khaloi
English name (if any):	-
Geographical distribution (within the study area):	Entire range of this study
General description:	It is a bamboo basket/ pot weaved like a *lota* without the funnel. A long rope is tied to it which is used to hang the Khaloi to waist
Raw materials used:	(1) Bamboo (*Bambusa tulda*) (2) Jute rope, (3) Cane / plastic wire
Fabrication of the gear:	Bamboo is split into thin slices. The thin sliced bamboo is used to weave a Lota like pot with a wide mouth. At the neck region, a long rope is tied which is used to tie it to waist while fishing.
Target fish species:	All small and medium sized fishes
Water bodies used in:	All types of water bodies
Modus operandi:	In most cases fisherman tie it to his/ her waist or hang it from the head and fishes caught by the main gear are stored in the khaloi. Some also keep the khaloi on the boat or on the bank of the water body.

Fig: 4.3.49: A modernized khaloi

Fig: 4.3.50: A traditional khaloi

Use in commercial fishery:	Used in both artisanal and commercial fishery

Special observation:	It is not a primary fishing gear that catches the fish itself. But, it is used for storing fishes when they are used. In Bolbola area, Rabhas were seen to use coconut shell as a lid of the khaloi. Some fishermen in Goalpara area has modified the design to weave it with less effort.

4.3.8. Dewatering gear:

In shallow waterbodies, communities use different implements to remove or reduce water so that the depth of the water body is reduced and it is easier to catch the fishes using other gears or by handpicking. Communities use oil can, sauce pan, large bowls, large plates etc different materials to dewater. But, the traditionally used dewatering gear in the study area is Shiyoni. In Kamrup, it is known as Dolonga -

4.3.8.1. Shiyoni / Dolonga:

Local name:	Shiyoni/ Dolonga
English name (if any):	-
Geographical distribution (within the study area):	Entire range of this study
General description:	It is a gear to take out water from a waterbody. It has a long bamboo/ wooden handle and a flat triangular piece of tin/ bamboo mat. Traditionally it was a triangular bamboo mat, but now a days some people also use tin sheet.
Raw materials used:	(1) A long bamboo / wood of about 6 cm diameter. Kota baah (*Bambusa bambos*) is preferred. (2) A triangular piece of bamboo mat. Preferred bamboo for the mat is Jaati baah (*Bambusa tulda*).
Fabrication of the gear:	(1) Bamboo is sliced into thin slices. A triangular mat with a slight curvature is prepared

(2) All the edges of the triangle are fitted with a rim with 0.5 X 2 cm bamboo beat.

(3) The long bamboo handle is fitted to the triangular piece

Target fish species: All types of fishes living in shallow water

Water bodies used in: Shallow water logged field, shallow parts of beel/ pond / marsh etc.

Modus operandi: An earthen dam is created and water from one side of the dam is splashed with the help of Shiyoni to the other side. This results in reduction in water table in one side and it becomes easy to capture the fishes.

Fig: 4.3.51: Shiyoni being used singly

Fig: 4.3.52: Shiyoni being used in tendem

Use in commercial fishery: It is mostly used in artisanal fishery. Occasionally used in commercial fishery.

4.3.9. Fishing without gears:

This study could record 35 different types of gears used for fishing. On the other hand, there are methods in which fishes are caught without using any specific gear. Although it was not in the scope of this thesis to elaborately study those methods, a preliminary note has been made and the following methods have been recoded from the study area –

4.3.9.1. Hand picking

In shallow waterbodies, during dry season when water table recedes to less than 1 feet height, people hand pick fishes without using any gear. In Singra, Boko and Rani areas, Rabha community people were found to hand pick fishes (especially *Channa spp.*) from under aquatic vegetation in water bodies with more than 1 feet water depth.

Fig: 4.3.53: Handpicking at Singra river

4.3.9.2. Dragging of aquatic vegetation

In shallow waterbodies with thick aquatic vegetation, many fishes tend to hide amidst the aquatic vegetation. Hence, people drag the aquatic vegetation to the bank and with the vegetation fishes also land on the bank.

Fig: 4.3.54: Dragging aquatic vegetation

4.3.9.3. Beating the waterbody

In beels and water-logged field, fishermen beat the surface of the water with either a bamboo stick or any flat piece of wood/ propeller of the boat or even sometimes with a large plate. Although some objects are used to beat the water, the technique is not specifically dependent on the object, rather it is the beating of the water surface which kills the fish or drives the fish to a corner where they can be easily caught.

Fig: 4.3.55: Beating of water

4.3.9.4. Dewatering

Confined water bodies can be easily dewatered using a pump. Part of small streams (like Dudhnai river in its upper reaches near the Meghalaya Border) are dammed and the water from the dammed area gradually drains out due to the gradient of the river bed. This leaves the fishes in the dammed confined area exposed.

Fig: 4.3.56: Dewatering

4.3.9.5. Sedatives

Rabha community in Goalapara area use some plant extracts as sedatives to catch fishes. They don't use this method in stagnant water as repeated deposition of sedative in stagnant water may lead to toxic reactions. They use the extract of a particular climber plant (They refused to reveal the name of the plant) in small streams to sedate fishes. They temporarily block the flow of the water either completely or partially in the channel by earthen dam and use the sedative. Fishes float on water which they hand pick or collect using a chaloni. After sometime the fishes regain sense. They destroy the earthen dam and let water flow again in about half an hour time so that the sedative concentration is not too high.

4.3.9.6. Fish poison

It is another unsustainable method used for mass killing of fishes and it is a recent trend. Informants reported that the poison is prepared by mixing several ingredients. One dose of poison kills all types of fishes. Even fishes without commercial value or fishes with eggs or under grown fingerlings are killed. This method is also used secretly and this researcher couldn't witness it during the study. What poison is exactly used and what kind of residual effect it has on human health needs to be studied soon.

4.3.9.7. Explosives

It is a recent trend to use explosives to kill fishes at mass scale. It is detrimental for fishery as it leaves the water polluted with the explosive. Informants informed about the use of this method in Goalpara district, but it couldn't be witnessed by this researcher, because the people who use this method, use it in a secret manner.

4.3.9.8. Electrocution

Electrocution using a 12 volt battery in hill streams was witnessed in Assam Meghalaya border in Goalapara district. Two long wires are connected to the anode and cathode of the battery. With help of two long sticks, the fishermen trying to give shock to the fishes that

comes to the surface of the shallow hill streams. Communities didn't allow to take photograph.

Summary of the Fishing Gears:

The study revealed the presence of 35 fishing gears belonging to the following categories -

1. Impaling gears – 6 varieties
2. Hook and line – 4 varieties
3. Traps, Maze and Barricade – 11 varieties
4. Entangling gears – 2 varieties
5. Encircling gears – 4 varieties
6. Scooping gears – 6 varieties
7. Storage gear – 1 variety
8. Dewatering gear – 1 variety

In addition to these 35 gears, the study could also find out 8 different methods of fishing without any specific gear.

4.3.10. Country Boat: The Main Vehicle of Fishermen

Fishermen in the study area extensively use wooden country boats of varied size and design. A standard fishing boat length ranges between 15 feet to 24 feet. Boats operated in Brahmaputra are larger in size and pointed on both ends. Boats operated in wetlands are smaller in size, but have similar pointed ends like that of the ones operated in Brahmaputra. Boats operated in smaller rivers have slightly roundish ends. Boats were found to be manufactured in Goalpara region, Hajo region and Bongolaghuli (Sualkchi) region. The making of a typical fishing boat was studied in Bongolaghuli during the study period. The process is described below –

Length of the boat:	24 feet (7.315 m)
Wood variety:	Shaal (*Shorea robusta*)
Amount of wood required:	17 KB (1 KB = 3 inch X 4 inch X 12 feet = 1728 inch^3)

Approximate cost of the wood:	INR 37,400 (@INR 2200 per KB)
Total time required to make:	9 days
Man power required:	1 carpenter and 1 helper
Man days required:	9 days each for a carpenter and a helper
Approximate cost of the manpower:	INR 8100 (INR 500 X 9 days + INR 400 X 9 days)
Other raw materials needed:	(1) Diluted tar, locally known as '*Alkatara*' (2) Nail (3) Khili (both side pointed nail without head) (4) Shaal dhuna (resin) (5) Kerosene (6) Bamboo (Jaati baah) (*Bambusa tulda*) (7) Bamboo mat (Dhaari) (8) Polythene sheet
The making process:	(1) Shaal wood pieces are joined by using Khili and nail to give the pointed spindle shape of the boat. Central part is the widest. Traditionally, bamboo khilis were made to join the woods. But, now with the advent of iron khili in the market, bamboo khili making practice is gradually disappearing. (2) Transverse wooden beats of 3x2 inches girth are affixed at about 2 – 2.5 feet distance from tip to tip. These transverse beats are called 'Gura'. They act like the skeleton of the boat (3) The entire rim of the boat on both sides are fixed with another layer of beat of 1x3 inches girth. This beat layer at rim gives strength to the boat and in case of any collision, the boat doesn't break easily. (4) On both ends of the boat, a triangular piece of flat wood is fixed where the boatman can sit. This is called 'Kori' or 'Ting' of the boat. (5) All joints of the wood are sealed with a mixture of Shaal dhuna (resin) and kerosene. This mixture seals

	all gaps between the wood and thus prevent water seepage. (6) The whole boat from inside and outside is painted with diluted tar (Alkatara) Alkatara protects the boat from termite, wood borer and it doesn't allow the wood to rot easily. (7) From Gura to Gura, bamboo pieces are fixed with nail in such a manner that they form a raised platform inside the boat like a bed. This bamboo bed is called 'Jakan' (8) At the central part of the boat, a roof of about 7-10 feet length is prepared with bamboo beats and bamboo mat (dhaari). A layer of polythene sheet is goven over the dhaari layer so that rain water can't go into the roofed part of the boat. The roofed part is made because fishermen have to spend the whole night or day on the boat and the roof protects them from sunlight and rain. The roof is called 'Choi' (9) Just outside the Choi, two bamboo beats of 2x2 inches are affixed in a triangular manner. This is the place where the paddle / propeller of the boat is inserted for paddling. This is called 'Daar dhora' (10) finally the paddles of the boat are prepared using wood. The front paddle is called 'Daar'. It is about 7 feet long. The rear paddle is called 'Botha'. It is about 5-6 feet long.
Longevity of a country boat:	Depending on the rain exposure and regularilty of maintenance, a country boat last from 10 to 15 years.
Maintenance required:	Every year the boat should be painted with Alkatara and any rotten or damaged wood piece should be replaced immediately
Total cost of the boat as on 2018:	37,400 (Wood cost) + 8,100 (Labour cost) + 5000 (other materials) = INR 50,500

Fig: 4.3.57: Front side of a large fishing boat

Fig: 4.3.58: Rear side of a large fishing boat

Fig: 4.3.59: A small boat in Chandubi

Fig: 4.3.60: A small boat in Urpad beel

Fig: 4.3.61: A small boat used in Kulsi river

Fig: 4.3.62: A small boat used in Kumri beel

4.3.11. Bhur or Bhel: The Alternative Vehicle of Fishermen

Not all fishermen in the study area can afford to keep an expensive wooden country boats. The most preferred alternative to boat is a *Bhur*/ *Bhel* made out of the trunk of the banana tree. A standard Bhur/ Bhel length ranges between 7 feet to 12 feet. Bhurs are operated only in lentic water. The preparation method of a bhur is very simple and any fisherman can make it at home. The preparation method is described below –

Length of the bhur / bhel: 7 to 12 feet. Rarely seen upto 15 feet

Raw materials needed: (1) Banana plant trunk – at least 3

	(2) Bamboo beats of 1x3 inches size – 4 pieces (3) A bamboo pole of about 12- 15 feet length
Approximate cost of the materials:	Banana being a one-time fruiting plant, the discarded trunks are normally available in villages free of cost. Maximum cost may be upto INR 400 for 4 trunks. Bamboo may cost around INR 150 to INR 200
Total time required to make:	About 1 hour for 2 persons. No skilled labour required
The making process:	(1) 3 to 4 Banana trunks are cut at a desired length of about 7 – 12 feet. All leaves are discarded (2) All the banana trunks are arranged side by side without any gap between them (3) Bamboo beats of 1x3 inches girth are hammered into the banana trunks horizontally from one side to another. 4 such beats are fixed at a distance of about 2 feet. (4) Now the bhur is ready to be taken to water. It automatically floats because of its buoyancy. (5) The long bamboo pole is used to push the bhur through water.
Longevity of a country boat:	A bhur lasts maximum for about 6 months
Maintenance required:	No maintenance required except that checking the beats regularly so that the beats don't detach from the bhur.

Fig: 4.3.63: A bhur being used by a fisherman

4.3.12. Detrimental Fishing Gears and Methods Observed:

In the recent years, use of some detrimental fishing gears has become a matter of concern for the sustainability of fishery in the region. Use of small mesh sized mosquito net type ber jaal is leading to decline of fishes. This kind of jaal violates the Assam Fisheries Rule, 1958 in mesh size. All fishes including the fingerlings, fries, brood fishes and even eggs of fishes are lifted by the Mosquito net.

On the other hand, use of fish poison, explosives and electrocution is also leading to mass killing of fishes. These methods kill a lot of undesirable fishes that doesn't have good market value. Moreover, explosives and poisons render the water body polluted, thereby making the waterbody unfit for all forms of life.

4.4. RESEARCH FINDING 4: COMMUNITIES INVOLVED IN FISHING

4.4.1. Demography of the Study Area:

4.4.1.1. Demography of Goalpara District:

Total population of Goalpara district according to 2011 Census is 1,008,183. Total male population is 513,292 and total female population is 494,891. Sex ratio of the district is 964, which is better than the national average and literacy rate is 67.37%, which is higher than the national percentage. Goalpara holds 3.23% of the total population of Assam.

Major religions of the people include Islam (57.52%), Hinduism (34.51%), and Christianity (7.72%). Table 4.4.1 and Fig 4.4.1 below shows the detail population of all the religions present in the district.

Table 4.4.1: Religion-wise population details of Goalpara district –

Description	Total	Percentage
Hindu	347,878	34.51 %
Muslims	579,929	57.52 %
Christian	77,862	7.72 %
Sikh	771	0.08 %
Buddhist	194	0.02 %
Jain	477	0.05 %
Others	103	0.01 %
Not Stated	969	0.10 %

Source – Census of India, 2011

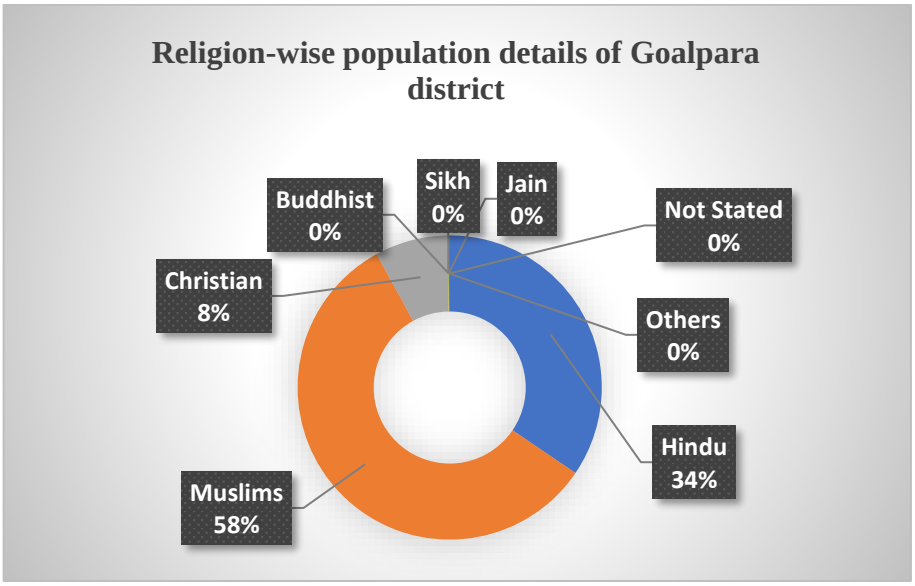

Fig 4.4.1: Religion-wise population details of Goalpara district

Total Schedule Caste population of the district is – 29,538, which is 2.93% of the total district population. Table 4.4.2 below shows the details of the Schedule Caste population in the district.

Table 4.4.2: Schedule caste population of Goalpara district

Category	Population	Percentage in total population
Male	15,192	1.51%
Female	14,346	1.42%
Total	29,538	2.93%

Source – Census of India, 2011

Total Schedule Tribe population of the district is – 1,13,401, which is 11.24% of the total district population. Table 4.4.3 below shows the details of the Schedule Caste population in the district.

Table 4.4.3: Schedule tribe population of Goalpara district

Category	Population	Percentage in total population
Male	57,300	5.68%
Female	56,101	5.56%
Total	1,13,401	11.24%

Source – Census of India, 2011

4.4.1.2. Demography of Kamrup District:

Total population of Kamrup according to 2011 Census is 1,517,542, out of which 778,461 are male and 739,081 are female. Sex ratio is 949, which is slightly better than National average. Literacy rate of the district is 75.55 %, which is higher than the national percentage. Kamrup holds 4.86% of total population of Assam.

Major religions of the people include Hinduism (57.82%), Islam (39.66%), and Christianity (2.19%). Table 4.4.4 and Fig 4.4.2 below shows the detail population of all the religions present in the district.

Table 4.4.4: Religion-wise population details of Kamrup district –

Description	Total	Percentage
Hindu	877,495	57.82 %
Muslims	601,784	39.66 %
Christian	33,297	2.19 %
Sikh	319	0.02 %
Buddhist	185	0.01 %
Jain	1,330	0.09 %
Others	55	0.00 %
Not Stated	3,077	0.20 %

Source – Census of India, 2011

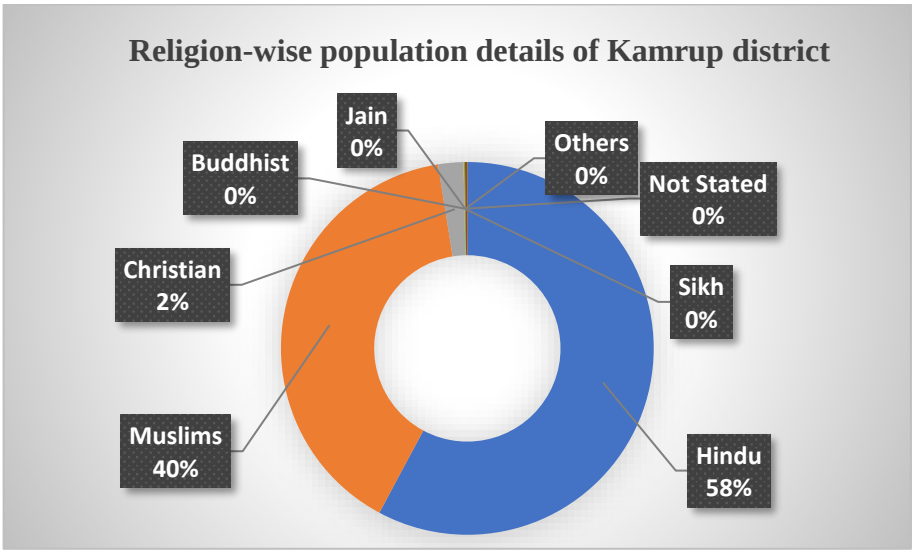

Fig 4.4.2: Religion-wise population details of Kamrup district

Total Schedule Caste population of the district is – 107,827, which is 7.11% of the total district population. Table 4.4.5 below shows the details of the Schedule Caste population in the district.

Table 4.4.5: Schedule caste population of Kamrup district

Category	Population	Percentage in total population
Male	55,237	3.64%
Female	52,590	3.47%
Total	107,827	7.11%

Source – Census of India, 2011

Total Schedule Tribe population of the district is – 182,038, which is 12.00% of the total district population. Table 4.4.6 below shows the details of the Schedule Caste population in the district.

Table 4.4.6: Schedule tribe population of Kamrup district

Category	Population	Percentage in total population
Male	92,094	6.07%
Female	89,944	5.93%
Total	182,038	12.00%

Source – Census of India, 2011

4.4.1.3. Demography of Kamrup Metro District:

Total population of Kamrup Metro according to 2011 Census[1] is 1,253,938, out of which 647,585 are male and 606,353 are female. Sex ratio is 936, which is below the National average. Literacy rate of the district is 88.71%, which is higher than the national percentage. Kamrup Metro holds 4.02% of total population of Assam.

Major religions of the people include Hinduism (84.89%), Islam (12.05%), and Christianity (1.5%). Table 4.4.7 and Fig 4.4.3 below shows the detail population of all the religions present in the district.

[1] http://www.censusindia.gov.in/pca/SearchDetails.aspx?Id=341822

Table 4.4.7: Religion-wise population details of Kamrup Metro district –

Description	Total	Percentage
Hindu	1,064,412	84.89 %
Muslims	151,071	12.05 %
Christian	18,810	1.50 %
Sikh	3,679	0.29 %
Buddhist	1,627	0.13 %
Jain	9,250	0.74 %
Others	170	0.01 %
Not Stated	4,919	0.39 %

Source – Census of India, 2011

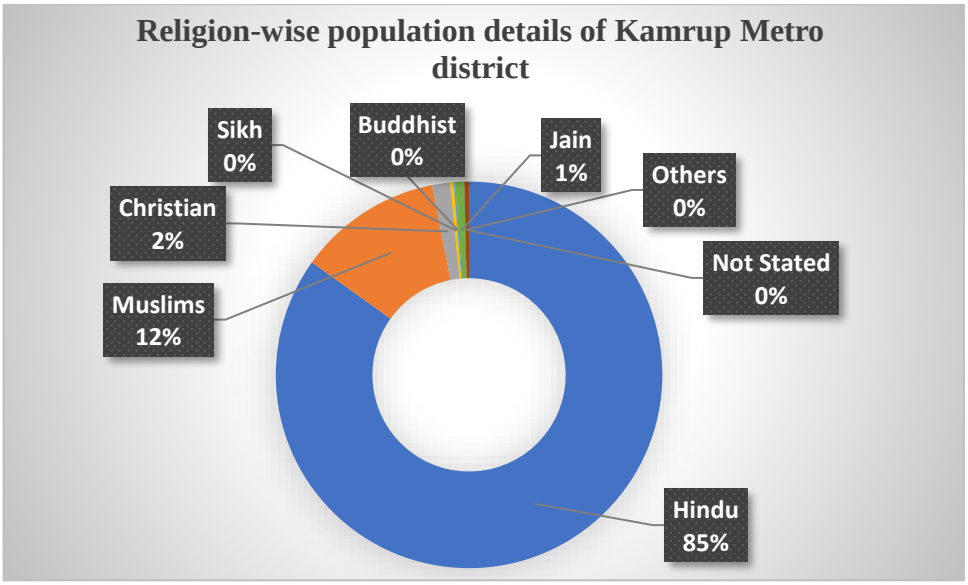

Fig 4.4.3: Religion-wise population details of Kamrup Metro district

Total Schedule Caste population of the district is – 101,789, which is 8.12% of the total district population. Table 4.4.8 below shows the details of the Schedule Caste population in the district.

Table 4.4.8: Schedule caste population of Kamrup Metro district

Category	Population	Percentage in total population
Male	52,106	4.16%
Female	49,683	3.96%
Total	101,789	8.12%

Source – Census of India, 2011

Total Schedule Tribe population of the district is – 75,121, which is 5.99% of the total district population. Table 4.4.9 below shows the details of the Schedule Caste population in the district.

Table 4.4.9: Schedule tribe population of Kamrup Metro district

Category	Population	Percentage in total population
Male	37,902	3.02%
Female	37,219	2.97%
Total	75,121	5.99%

Source – Census of India, 2011

4.4.2. Communities Involved in Fishing (Alphabetic order)

Inhabitants of Southwest Assam include three categories: tribals, non-tribals and scheduled castes. The current population of the area includes people migrated from Burma, China, Bangladesh, Nepal, and mainland of India. It demonstrates a Mongolo-Aryan culture. Communities belonging to the Mongoloid race speaks languages of the Tibeto-Burmese family. There is a marked difference between the Mongoloids and others. The tribes in the area include the Bodos, Karbi, Rabhas, Garos etc. The non-tribal groups include the Kayasthas, Kalitas etc. The scheduled castes include the Basfors, Baniyas, Dhobis, Hiras, Kaibartas, Namasudras etc. Immigration was mostly from Bengal, Bangladesh, Bihar, Uttar Pradesh, Nepal and Rajasthan although another group, known as Baganias, was brought from Bengal, Bihar, Orissa and Madhya Pradesh by the British planters to work in the tea gardens. People from Bangladesh were also settled as refugees in the region. Out of these communities, some are engaged in commercial fishing and fishing is their main livelihood.

Assamese speaking Kaibartas, Bengali speaking Kaibartas and Riparian Muslims living in river banks (known as *Maimals* in some parts of Assam) fall in this category. Another group is involved in fishing mostly for household consumption, but some members of the community have also adopted fishing as their income source. These include (Bodos, Garos, Hajongs, Kalitas, Karbis, Koch Rajbongsis, Jogi or Naths, Rabhas and Sutradhars). There are other communities in the region, who are not involved in fishing for any commercial purpose. This category includes Basfors, Baniyas, Dhobis, Hira etc. References of involvement of different communities in fishing, fish processing and fish selling are evident from the works of Dey (1984), Bordoloi, Sharma Thakur and Saikia (1987), Bordoloi and Sarma Thakur (1988), Bordoloi (1991), Dutta et.al (1992), Basumatary (2004), Sharma Thakur (2007), Deka, J. et.al. (2008), Deka, T.K. (2008), Deka, J. et.al. (2011), and Baglary (2016), Das (2018).

Following 12 communities in the study area were found to be involved in various aspects of fishing, fish processing and fish selling.

4.4.2.1. The Bodos

The Bodo or Boro are the largest indigenous tribe of Assam. The Bodos of Assam belong to the Mongoloid origin. Their physical features like snub nose, wide forehead, rounded face, less body hair, high cheek bones, slit eyes and deep brown skin colour suggests their Mongoloid origin. 'Bodo' are probably the earliest Indo Mongoloid migrants to eastern India who subsequently spread over different regions of Bengal, Assam and Tripura.

According to Grierson (2000), Bodos migrated to eastern India in the second millennium B.C. and they belong to the Assam-Burma group of the Tibeto-Burman speakers of the Sino-Tibetan speech family. Presently the Bodos are the largest plain tribe of the Brahmaputra Valley. They were earlier known as 'the Bodo-Kachari'.

The Bodos migrated in successive waves and initially moved like nomads and finally settled down at different locations in the Brahmaputra valley. Their present distribution in Assam include concentrated populations in the districts of Kokrajhar, Bongaigaon, Goalpara, Kamrup, Kamrup Metro, Barpeta, Nalbari, Darrang, Sonitpur and Nagaon of the

Brahmaputra Valley. In the neighbouring West Bengal, they are found in Jalpaiguri and Kochbehar districts. A faction of the Bodos also migrated down South to Tripura.

Bodos living near rivers and beels are involved in fishing. Some Bodos follow Hinduism and some have adopted Christianity. Fish is ingrained in the culture of Hindu Bodos. Fish is an integral part of their Annaprasana, marriage etc.

4.4.2.2. The Garos

According to Bordoloi (1991), like most North East Indian tribes, the Garos also belong to the Mangoloid race belonging to Tibeto-Burman origin. Historians believe that their original home was Western China or Tibet. Maximum concentration of the Garos are found in the East, West and South Garo Hills districts in Meghalaya. In Assam, a sizeable population is found in Goalpara, Karbi Anglong and North Cachar Hills district. Some Garo families are also found in Kamrup district and South Salmara Sub division. A faction settled in Kochbehar district of West Bengal.

The Garos are shorter in stature with round and short faces and robust muscular body. They have less body hair, dark ten complexion.

Presently most Garos have adopted Christianity. Garos living near rivers and beels are involved in fishing.

4.4.2.3. The Hajongs

Bordoloi (1991) mentions that the Hajongs are form the Mongoloi origin. Many historians believe that Hajongs were the descendants of the King Kumar Bhaskar Barman. The name ‘Hajong’ is derived from the term ‘Haj’ which refers to the inhabitants of Hajo. The total population of Hajongs is very small and they are currently distributed in a Garo Hills, NC Hills, Dima Hasao, South Salmara district and Lakhipur area of Goalpara district. Only some small factions are scattered in other parts of Assam and Bangladesh. In Bangladesh, they are found in Mymensing and Sylhet districts.

The Hajongs are physically very strong. The male member of Hajongs have dark–tan skin colour and the women are fair with long hair. They have round face. Unlike the other tribes of North East, the size of their eyes are not so small. The Hajongs are rich in cultural heritage which includes songs, dances, music, fairs, and festivals.

Hajongs are artisanal fishers. Fish is part of their regular diet and fish is an integral part of their culture.

4.4.2.4. The Kaibartas (Assamese speaking)

According to Risley (1891), the term Kaibarta was derived from two words – 'Ke' meaning water and 'Varta' meaning livelihood. Hence, Kaibarta refers to the community that derives their livelihood from Water. The Kaibartas are one of the aboriginal inhabitants of Assam. They are one of the Scheduled Castes communities as per the Constitution of India. Doley (1980) mentioned that swarms of migrants from distant regions have been coming to Assam since the beginning of human history. the Kaibartas are believed to be the descendants of the first Dravidian immigrants. In Assam they are also known as the Keots.[2] Kaibartas follow Hinduism and they follow all rituals in Shakta style. In some parts of Goalpara and Kamrup, they are locally known as 'Dom'. This nomenclature is not however same as the 'Dom' in Varanasi. Due to their association with *Nadi* (river), in parts of Goalpara, they are also known as 'Nadiyal'.

Kaibartas are the traditional fishermen and they are engaged in commercial fishing. Fish is very deeply rooted in their culture.

4.4.2.5. The Kaibartas (Bengali speaking)

Risley (1891) mentioned that Kaibartas are a large fishing and cultivating caste of Bengal, ranked below the Nava Shakha. Nava Shakhas constitute a group of nine castes from whose hands Brahmans take water. The Dharma Shastras also enlisted them as a fishing community. Although it is difficult to trace their origin, Risley has advocated that they might

[2] Source - Wikipedia

have evolved from a stock of Dravidian community with some amount of genetic mixture with Aryans. Once upon a time, there were five princely kingdoms in Midnapore district of Bengal, where they were rulling. Later, they lost their occupation to various invaders. Later, they spread into different parts of Bengal, Bangladesh and Western Assam districts of Dhubri, Bongaigaon, Goalpara, South Salmara, Kamrup, Morigaon and Nagaon. Kaibartas are categorized into Jaliya Kaibartas and the Haliya Kaibartas. Jaliya Kaibartas are Scheduled **Caste**, but Haliya Kaibartas are not.

Kaibartas follow Hinduism and they practice rituals of Shaktas. They believe in Boli and Bidhan.

Kaibartas in South Western Assam are traditionally engaged in fishing. They are commercial fishermen engages in fishing, making of fishing gears, preparation of dry fish and fish selling.

4.4.2.6. The Kalitas

The Kalita is a Hindu ethnic group form Assam belonging to Aryan ancestry. They are mostly found in Assam and only a few families are settled outside Assam. They belong to the Kshatriya caste (Ved Prakash, 2007). According to Bakshi et.al. (1998), The Kalitas in Assam are considered next only to the Brahmins in the caste-hierarchy. They are "the non-Vedic Aryans" who are responsible for bringing Aryan culture to Assam. They have retained some Aryan culture and mingled with the Assam's local population by adopting the culture of the aboriginal groups. Choudhury (1988) has mentioned that there is evidence of Kalita kingdom in very early times as well as during the 15th-16th century. According to historians Kalitas started migrating from North and East India to Assam during the 11th century rule of Dharmapal. Presently Kalitas are spread in all the districts of Assam.

Kalitas are not traditional fishermen. But, those living near wetlands and rivers do fish for household consumption. Some families have adopted commercial fishing, making of fishing gears and pisciculture. Their culture includes many connections to fish.

4.4.2.7. The Karbis

According to Bordoloi (1987), the Karbis, is a large ethnic group of Assam who were earlier known as Mikirs. They are distributed in Karbi Anglong, Nagaon, Kamrup, Morigaon, North Cachar and Sonitpur districts of Assam. They have two divisions – those dwelling on Hills are considered as Hills tribe and those dwelling in the valley districts are considered Plain tribe. A small population is also settled in Khasi and Jayantia Hills districts of Meghalaya. They prefer calling themselves Karbis or Arlene (meaning a man). The major concentration of the Karbis is found in Karbi Anglong. Racially they belong to the Mongoloid group and linguistically to the Tibeto- Burman group. In absence of a written history, it is very difficult to trace the history of the early settlement of the Karbis.

Karbis are not traditional fishers. Some of them are artisanal fishermen. They are involved in dry fish production.

4.4.2.8. The Koch Rajbongshis

Nath (1989) in his book *History of the Koch Kingdom* has elaborated the origin and descent of Koch Rajbongshi community. Koch Rajbongshis or Koch Biharis rulled the Kamatapur dynasty from 1515. Koch (Rajbansi) population forms a major detribalized group. According to Gait (1905), Koch is a Hindu caste which received the converts to Hinduism from Kachari, Lalungs, Karbi and other tribes. Presently Koch populations are spread in Assam, West Bengal, and Meghalaya, and Kishanganj area of Bihar and certain parts of Bhutan and Nepal. Historians believe that the process of detribalisation began after Sankardeva's preaching of Vaishnavite cult. Koch dynasty was spread as far east upto Darrang and the descendents of the Royal families are still found in Mangaldoi, Beltola (Guwahati), Lakhipur (Goalpara) and Abhayapuri (Bongaigaon) areas.

Koch are culturally very rich. They are not traditionally a fishing community. They are not involved in commercial fishing. But a large section of low- and middle-income group is involved in artisanal fishery. Fish is deeply ingrained in their culture.

4.4.2.9. The Naths or Jogis

The Naths or Yogis or Katanis are found in various places of Assam. The word **Jogi** or **Yogi** means "sage" or "saint". Nath or Jogi are a Hindu sect, who probably migrated from North India and Sindh. There are Jogi populations in smaller numbers in the southern Indian states of Karnataka, Andhra Pradesh, Tamil Nadu and Kerala. In Upper Assam, many of them are known as Katanis. They are believed to be formerly weavers, drum-beater, palanquin carrier, quacker, or snake-charmer, etc. by profession. Most people of the present generation of the Yogis are agriculturists (Dutta 1978).

Jogi is a colloquial term for the "yogi", which refers to the people who practiced yoga as part of their daily rituals. Over the time, this led to the formation of a community, and subsequently was formed into a caste. They are considered as Other Backward Caste (OBC) in most states.

Naths are not traditional fishers. Some members have now adopted artisanal fishery, mostly for household consumption.

4.4.2.10. The Rabhas

Rabhas are close to the Bodos and Garos in origin. They all have Mongoloid origin. They have a round face, flat nose, prominent cheek bones, small eyes, dark brown complexion, coarse hair and scanty body hair. They have cultural and linguistic similarities with Garos. Rabha is one of the nine Scheduled Tribes in the plain districts of Assam. They are widely scattered but mostly concentrated in Goalpara, Kamrup and Darrang. Col. Wadel said that they branched out of Kacharis and adopted Hinduism. Grierson (2000) also opined that the Rabhas branched out of Kacharis. Rev Endle (1975) had shown seven ‘sub-tribes’ of the Rabhas – ‘Bitliya’, ‘Dahuriya’ ‘Koch’, ‘Maitoriya’, ‘Pati’, ‘Rangdaniya’, and ‘Sangha’. Of the seven sub-tribes the Rangdaniya, Pati and the Maitoriya are the dominant ones. Pati Rabhas have completely adopted Hindu culture, their language and have adopted an Assamese patois. In the study area, the dominant sections are – ‘Pati Rabha’ in the area spread from Guwahati to Dudhnai and ‘Dahuria’ in the Panchartna area and around.

The Rabhas are culturally very rich. Their song, dance and festivals are very famous. They are artisanal fishers but commonly seen selling fish in local Haats[3]. They also make fishing gears.

4.4.2.11. The Riparian Muslims

The Riparian Muslims or Mimals inhabiting the study area are the descendants of those immigrants who migrated to this area between the 1930s to 1960s from Mymensing district of eastern Bengal. They are mainly found to settle in the low lying areas. They have added significantly to the number of the Muslim population of the study area. Other than religion, the immigrant Muslims have not much cultural similarities with the Assamese Muslims. Many of them, who were originally cultivators, have now taken up various wage earning occupations like carpentry, masonry, rickshaw pulling, *thela* (cart) pulling, etc. A large percentage of the Riparian muslims are fishermen. They have required skills and attitude for fishing. They can efficiently swim in water, even in the Brahmaputra. They can spend the entire night on fishing boat for fishing.

They are engages in all aspects of fishery including fishing, making of fishing gears, fish processing (dry fish) and fish selling.

4.4.2.12. The Sutradhars

Ghosh and Ghosh (2000) described Sutradhar as a Hindu caste within the Vishwakarma community of India. They are also known as Suthar or Sutar. *Sutra* in sanskrit means thread (which is used to mark the course of a saw), and *dhara* means to hold. So, the literal meaning of the word *Sutradhar* is *thread-bearer*. The names *Sutar* and *Suthar* are short versions of it. The great majority of Hindu sutradhars belong to the Vaishnava sect. Vishwakarma is regarded as their main deity.

Sutradhars, according to legend, are the carpenters descended from Maya, son of Vishwakarma. According to Hindu mythology, Vishwakarma is the divine engineer of the universe. He had five children — Manu, Maya, Tvastar, Shilpi and Visvajna — and these

[3] A Haat is a local market. Normally an open air space.

are believed by the Vishwakarma community to have been the forebears of their five sub-groups, being respectively the gotras (clans) of blacksmiths, carpenters, bell metalworkers (metal casters), stonemasons and goldsmiths.

Sutradhars have very limited distribution in Assam. Within the study area, only some small factions are seen in Goalpara and Kamrup district. They are not traditional fishermen. They fish for mainly household consumption. But, selling of fish in local market is done if they have excess harvest on any day. Their culture also include fish in many aspects.

4.4.3. Socio-economic Aspects Associated with Fishing:

4.4.3.1. Other income sources of fishing families

The families engaged in fishing were asked about their other sources of income. Following sources were reported –

1. Service – Some members of the Kalitas, Rabhas, Bodos, Naths and Kaibarta (Assamese speaking) are employed in Government and Private sector jobs. Most of them are in in third or fourth grade Jobs.
2. Agriculture – Except some families belonging to Kalita, Rabha, Bodo and Nath community, most of the fishing families interviewed have less than 1 acre of land. Some are even landless. Most communities therefore are involved in small scale agriculture or they work in other's crop field. Major crops cultivated include rice and vegetables. Muslims also cultivate Jute in large quantity. Men members are involved in hard physical work like ploughing, women members are involved in plantation, pruning etc.
3. Daily wage labour – Male members of lower economic strata of most communities are engaged in daily wage works. Muslim community's ladies are also engaged as daily wage earners.
4. Shop keeping – Both male and female members belonging to all the communities are involved in keeping small neighbourhood shops.

5. Employment in small scale ventures like local shops, local small industries – Mostly male members are involved as employees in other's establishments. In Goalpara area, female members are involved in Biri making, Bamboo mat (Dhari) making and Bamboo stick making for *Murha*[4] preparation.
6. Weaving –Women members of most communities do weave cloths at home. In Bongolaghuli area, male members are also involved in weaving.
7. Some Sutradhar community males are involved as Carpenters.
8. Lower income group of the Muslim community are also involved in masonry work. They travel to urban centres like Guwahati for employment in construction sector.
9. Some male members of the Muslims fishing families are employed in Coal mines in Meghalaya.
10. In the recent time, cycle garage, plumbing, welding etc, vocations have also been adopted by some members.

4.4.3.2. Impact of fishing on family life

Families involved in artisanal fishing for household consumption are getting the nutritional benefit of free fish protein for ages. Jayanti Rabha, from Bodahapur area in her interview jokingly said, "*My husband works full day in the field and brings only rice. I go for only one-hour fishing in the morning, I bring fish for the family*". Although she said it in a lighter note, she has a point. Most of the traditional fishing involve capture fishery and they don't do the hard labour of rearing the fishes. They only go to the nearby beel or water-logged field or river and catch fish. But, with leasing out of many beels, water resources are gradually becoming scanty.

Commercial fishing requires a different level of time investment. Fishermen have to spend long hours on the boat, in most cases overnight cruises or have to spend long hours near the waterbody. This has both negative and positive effects on the society and the personal health of the fishermen. The main issues reported by the respondents are mentioned below.

[4] Murha is a type of stool made of bamboo. Some also give it a shape of a chair.

4.4.3.3. Women empowerment

Let us begin with the positive impact of fishing. As mentioned above, fishermen engaged in commercial fishing are compelled to remain away from the family for a long time in a day. As a result, the ladies in the family are empowered to take independent decisions. They take responsibility of the children and the family. We may study the positive effects under the following sub headings –

Greater mobility: For the purposes of children's education (especially dropping at school and picking up), ladies move out of the family and in most cases, they move out of their neighbourhood. This gives a greater mobility pattern among the ladies of fishermen communities than that of the other non-fishing families in the locality. This was evident in all the large fishermen villages in Deppor beel and Urpad beel areas. Noteworthy that these two are the largest beels in the study area where fishermen live in an organized manner.

Exposure to peer learning: In most instance, fishermen family ladies of current generation are either uneducated of have only done Primary schooling. Most children in the present generation are first generation learners. In many families ladies visit the schools of their ward. This give them an opportunity to interact with other ladies and also with the teachers. In Azara Keotpara LP School, the Head Teacher has provided a room to the mothers of the students. They can assemble in that room and discuss issues related to their children's education, health, school Mid Day Meal etc.

Exposure to health care: In absence of their husband or son, for any medical emergency, ladies take responsibility of taking the patient to the nearest healthcare facility. This has not only given an opportunity to the ladies to have better knowledge about the health of their children, but this has also provided an opportunity to the ladies to avail better medical facilities for themselves. During the interactions, it was felt that the ladies of fishermen families who visits the healthcare centres have better knowledge about contraceptives and menstrual hygiene management.

Family economics: The economic planning of daily shopping, groceries etc. are done by the ladies. This gradually makes them better planner, better manager. They also learn to save.

Many ladies belonging to Kaibarta community (both Assamese speaking and Bengali speaking) were found to have their own income source in form of a weaving loom, small duckery / poultry and a kitchen garden. This adds to the family income as an additional income. Women in Kumri beel and Chandubi beel area are engaged in fishing in the beel. Women in Deepor beel area are not allowed to go for fishing, but they are involved in selling of fish in the local market. But, women in Urpad beel area are neither allowed to go for fishing, nor do they sell fish.

Let us now discuss about some of the negative implications that are more or less common for all commercial fishing families -

4.4.3.4. Health implications on the fishermen

Commercial fishermen spend long hours on the boat or in the waterbody, mostly in the night. Long hours away from home results in an irregular meal routine and it also compels to eat unhealthy food. On most occasions they don't get good potable drinking water. All these result in different types of water borne diseases and gastro-intestinal disorders. The following were reported during the study period –

1. *Diarrhea,*
2. *Dysentery,*
3. *Jaundice,*
4. *Typhoid,*
5. *Worm infections,*
6. *Giardia,*
7. *Gastroenteritis,*
8. *Irritable bowel syndrome*
9. *Skin infections*

Many parts of Goalpara and Kamrup are in malaria zone. While on the boat, they rarely can take any preventive measure against mosquito bite. Thus, malaria cases were reported.

Wetlands and river banks are frequented by snakes. Especially during the night, due to darkness, fishermen can't see the snake. Hence, snake bite of fishermen is also high. The culture of celebrating Manasa[5] puja has a direct link with snake bites.

4.4.3.5. Baby sitting

When the male member of the family is away for long hours, the lady member takes more household responsibilities. If the family has a baby, s/he gets less time from the mother. In some cases, they remain unattended for long time, even up to more than an hour. Some families in Jungle para village in Urpad area have developed a system where ladies take responsibility of the children in the neighbourhood in turn. All Children of the neighbourhood are assembled at one place and one lady takes care of them while the other ladies do their household chores. This is done in turns so that everyone can complete their works and the children are also safe. This is like an unpaid creche service.

4.4.3.6. Impact on children's education

Because the father and mother both become busy, father for fishing and mother for all other household responsibilities including shopping and maintaining social contacts, children's education become neglected. Economically they are not so sound, and therefore only a few have been able to put their wards into private schools. The quality of education in the neighbourhood Government schools is not so good. Very few of their children reaches College level.

During the study, following three types of issues were also reported. But these are not common phenomenon but exceptional cases. Due to the privacy issue, names, community names and locality are not mentioned in these cases -

[5] Manasa is the Goddess of Snakes as per Hindu belief

4.4.3.7. Alcoholism and other intoxicants

Fishing compels the commercial fishers to be away from the family. Those who fish during the night, have to sleep in the day time. So, they are also cut off from the society to a great extent. This aloofness leads them to alcoholism. Also, the peer influence plays a great role in it. Apart from Alcohol, many fishermen also take other intoxicants like Biri, Cigarette and Marijuana. As a result, occurrence of cancer is also high.

4.4.3.8. Homosexuality

Fishing in the night keeps the fishermen away from their wives. When they come back home, they are tired and they need rest. Also, during that time, their female partners are busy in household activities. They spend a long hour on the boat with male fishermen. Hence, some cases of homosexuality were reported.

4.4.3.9. Polyandry

Since the husband is away from home, some cases of polyandry were also reported during the study. In the reported cases the second male partner are either from within the family or from the neighbourhood.

4.5. RESEARCH FINDING 5: FISH AS INGRAINED IN CULTURE

Sugunan (2001) reported that 90% of the population in Assam are Fishiterian. Gogoi (2001) studied the various cultural linakages of Assamese community to fish. In this study, effort was made to explore the linkage of fish to food habits, cuisines, fish drying technologies, linkage of fish to religious beliefs, festivals, ceremonies, songs, poetry, stories, proverbs, performing arts, traditional medicine, motifs, nomenclature of places and superstition.

4.5.1. Fish in Traditional Cuisines

In the study area, many traditional cuisines of fish were recorded during the study. Some of these are indigenous tribal type cuisine and not much influenced by external cuisines or spices. On the other hand, the area being close to West Bengal and Bangladesh, some cuisines show Bengal influence, especially in the use of chilli and spices. The following cuisines were elaborately studied with their ingredients and recipe –

4.5.1.1. Machor tenga:

Local name in the study area:	Machor tenga
English name (if any):	Sour fish curry
Local name in other parts of Assam:	-
Main ingredient fish species:	Any type of fish except the *Chana spp*. Channa species don't taste good in sour preparation. Hence not preferred
Other essential ingredients:	(1) Tomato /Lemon (2) Salt (3) Mustard oil (4) Cumin (5) Green chilli (6) Dry chilli (8) Mustard seeds
Optional ingredients:	(1) Coriander seeds

Time needed to cook:	20 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Remove the gut if it is a small fish or cut the fish into small pieces and wash properly (2) Fry the fish pieces in mustard oil (3) Heat a round bottom pan and put some mustard oil. (4) Add spices, mustard seed and stir fry for about 1-2 min (5) Add the main sour ingredient as mentioned above (Tomato or Lemon, whichever variety of sour is preferred) and stir fry for another minute (6) Add water and cook it till boiling. This gives a South Indian 'Rasam' type soup. (7) Add the fried fish and continue to boil for some more time till the fish becomes appropriately soft. It is ready to serve
Traditional serving style:	It is served with plain rice in lunch
Extension/ variation:	Sour preparations are also made with Monkey fruit (Thekera tenga)/ Elephant apple (Ou tenga)/ Wood sorrel (Chengeri tenga) / Roselle (Tenga mora/ Mesta tenga) / Indian sorrel (Suka shaak) etc.
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.1.2. Machor muror khaar:

Local name in the study area:	Machor muror khaar
English name (if any):	Fish head with alkali
Local name in other parts of Assam:	-
Main ingredient fish species:	Head of Rohu (*Labeo rohita*), Catla (*Gibelion catla*)

Other essential ingredients:	(1) Green Papaya (unripe) / Cucumber (2) Salt (3) Mustard oil (4) Alkali (kolakhar/ baking soda) (5) Green chilli (6) Ginger paste (7) Dry chilli
Optional ingredients:	(1) Cumin, (2) Coriander seeds
Time needed to cook:	20 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Cut the fish head into 4 pieces (2) Fry the head pieces in mustard oil (3) Add spices, ginger paste in oil and stir fry for about 2 min (3) Cut Papaya/ Cucumber into small pieces and fry on a round bottom pan and add alkali (4) Cook till the colour slightly changes (5) Add water and cook it till boiling. Let the papaya / cucumber become half boiled (6) Add the fried fish head and dry chilli and continue to boil for some more time till the bones from the fish head start coming out. It is ready to serve
Traditional serving style:	It is served with plain rice in lunch
Extension/ variation:	Normal recipe include green papaya or cucumber. But, some people also use white gourd. Some people also add Jackfruit seeds in the khar preparation.
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.1.3. Soru machor khaar:

Local name in the study area:	Soru machor khaar
English name (if any):	Small fish with alkali
Local name in other parts of Assam:	-
Main ingredient fish species:	Boriola (*Aspidoparia morar*) Puthi (*Puntius spp*), Mowa (*Amblypharyngodon mola*) or any small fish to taste
Other essential ingredients:	(1) Green Papaya (unripe) / Cucumber (2) Salt (3) Mustard oil (4) Alkali (kolakhar/ baking soda) (5) Green chilli (6) Ginger paste (7) Dry chilli
Optional ingredients:	(1) Cumin, (2) Coriander seeds
Time needed to cook:	20 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Remove the gut of the fishes and wash the fishes properly (2) Fry the fishes pieces in mustard oil (3) Add spices, ginger paste in oil and stir fry for about 2 min (3) Cut Papaya/ Cucumber into small pieces and fry on a round bottom pan and add alkali (4) Cook till the colour slightly changes (5) Add water and cook it till boiling. Let the papaya / cucumber become half boiled (6) Add the fried fish head and continue to boil for some more time till the bones from the fish head start coming out. It is ready to serve

Traditional serving style:	It is served with plain rice in lunch
Extension/ variation:	Normal recipe include green papaya or cucumber. But, some people also use white gourd. Some people also add Jackfruit seeds in the khar preparation.
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.1.4. Machor Bor

Local name in the study area:	Machor Bor
English name (if any):	Fish kofta
Local name in other parts of Assam:	-
Main ingredient fish species:	Chital (*Chitala chitala*), Aari (*Aorichthys spp*), Rohu (*Labeo rohita*) etc
Other essential ingredients:	(1) Salt (2) Turmeric powder (3) Green chilli (4) Cinnamon (5) Black pepper powder (6) Mustard oil (7) Onion (8) Ginger
Optional ingredients:	(1) Gram powder (Besan) (2) Rice powder (Pithaguri)
Time needed to cook:	30 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Soft pieces of the fish are taken from the abdomen part (2) The fish is washed properly and the bones are removed

	(3) Onion, ginger, garlic, green chili and cinnamon paste is prepared (4) The pastes are added with the boneless fish and salt and black pepper powder are also added to the ingredients and mixed properly (5) If desired besan or pithaguri can be added at this stage (6) Small balls / Koftas are prepared from the mixture (7) Oil is heated on a pan and the fish balls are fried till golden brown. The fried balls are called bor / kofta. They are ready to serve
Extension / variation:	Some people make curry using these bor
Traditional serving style:	It is served with plain rice in the main meal or as a snacks
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.1.5. Kaldilere soru mach:

Local name in the study area:	Kaldilere soru mach
English name (if any):	Small fish with banana flower
Local name in other parts of Assam:	-
Main ingredient fish species:	Puthi (*Puntius spp*), Mowa (*Amblypharyngodon mola*) or any small fish to taste
Other essential ingredients:	(1) Salt (2) Turmeric (3) Mustard oil (4) Green chilli (5) Mustard seeds (6) Ginger paste (7) Dry chilli

	(8) Garlic paste
Optional ingredients:	(1) Bay leaf
Time needed to cook:	30 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Cut/grate the banana flower into small pieces (2) Wash the fishes properly, remove the gut and fry in mustard oil (3) Heat a pan and fry spices and ginger, garlic paste (4) Add the grated banana flower and stir fry for about 10 min on low flame (with the fire at sim). Depending on the variety of the banana flower, it may take slightly more or less time. (5) Add the bay leaf and dry chilli and continue to fry till the content becomes dark golden colour (6) The fried fish is added at this stage and mixed properly (7) Fry the mixture for some time and when the fishes are appropriately soft, it is ready to serve
Traditional serving style:	It is served with plain rice in lunch or dinner
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.1.6. Shakere soru mach:

Local name in the study area:	Shakere soru mach
English name (if any):	Small fish in green vegetable
Local name in other parts of Assam:	-
Main ingredient fish species:	Boriola (*Aspidoparia morar*) Puthi (*Puntius spp*), Mowa (*Amblypharyngodon mola*) or any small fish to taste
Other essential ingredients:	(1) Spinach – Paleng/ Laai/ Shuka etc

	(2) Salt (3) Turmeric powder (4) Mustard oil (5) Green chilli (6) Ginger paste (7) Dry chilli (8) Garlic paste
Optional ingredients:	(1) Cumin seeds (2) Coriander seeds
Time needed to cook:	20 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Cut/grate the Spinach into small pieces (2) Wash the fishes properly, remove the gut and fry in mustard oil (3) Heat a pan and fry the spices, ginger-garlic paste (4) Add the spinach leaves and stir fry for about 5-7 min on low flame (with the fire at sim). Depending on the variety of the green vegetable, it may take slightly more or less time. (5) Add cumin, coriander and dry chilli and continue to fry till the content becomes soft (6) The fried fish is added at this stage and mixed (7) Fry the mixture for some time and when the fishes are appropriately soft, it is ready to serve
Traditional serving style:	It is served with plain rice in lunch or dinner
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.1.7. Paatot diya mach:

Local name in the study area:	Paatot diya mach
English name (if any):	-
Local name in other parts of Assam:	Mach patori (Eastern Assam)

Main ingredient fish species:	Aari (*Sperata spp*), Borali (*Wallago attu*), Rita (*Rita rita*), Pangas (*Pangasius pangasius*) and other less spiny fishes. Sometimes, the belly part of Major carps are also used for this dish. Among the small fishes, Mowa (*Amblypharyngodon mola*) and puthi (*Puntius spp*) are popular.
Other essential ingredients:	(1) Salt (2) Green chilli (3) Mustard seeds (4) Coriander leaf (5) Banana leaf
Optional ingredients:	(1) Onion (2) Ginger (3) Garlic (4) Bamboo shoot
Time needed to cook:	20 mins
Fire type used:	Traditionally fire wood / dry bamboo were used Now-a-days LPG Gas, Kerosene stove and Saw dust stove are also used. In urban centres people also prepare Mach patori using microwave oven
Preparation method:	(1) Mustard and green chillies are made into paste (2) Then fish is washed properly and the mustard paste is added (3) Salt is added as per taste and marinated (4) A piece of banana leaf / Tora leaf is taken (preferably *Bhim kol*) and warm it a little (5) The marinated fish is placed on the banana leaf and wraped properly with thread/ bamboo tamal/ banana plant fibre (6) There are two different ways to cook the wrapped fish – baking on a pan or steaming in a cooking pan - (6.a) For baking, a tawa (flat pan) is heated and the wrapped fishes are placed over it. Wraps are overturned at frequent interval to avoid burning in one side.

	(6.b) For steaming, a traditional round bottom cooking pan (deksi) is filled upto 1/3rd with water. Then some bamboo sticks / a bamboo chaloni (sieve) is placed almost at the 2/3rd height of the deksi. The wrapped fish in now placed over the bamboo sticks or chaloni and steamed
Traditional serving style:	Served with boiled rice, green chilli
Any special occasion for this dish?	It is cooked in all seasons. It is a special dish for family functions or for special guests

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4.5.1.8. Mach pora:

Local name in the study area:	Mach pora
English name (if any):	Burnt fish / Smoked fish
Local name in other parts of Assam:	Pora mach / Khorika
Main ingredient fish species:	Goroi (*Channa punctatus*), Puthi (*Puntius spp*), Kawoi (*Anabus testudineus*), Bor singora (*Mystus cavasius*) and other medium sized fishes
Other essential ingredients:	(1) Salt (2) Turmeric powder (3) Mustard oil (4) Green chilli (5) Mustard seeds
Optional ingredients:	Ginger
Time needed to cook:	20 min
Fire type used:	Fire wood / bamboo / LPG Gas/ Kerosene stove / Saw dust stove
Preparation method:	(1) Scales of the scaly fishes are removed and the gut content is discarded (2) Mustard seeds, turmeric, chili, ginger etc are all made into a paste (3) the paste of spices is applied over the fishes and kept for few minutes.

	(4) Fishes are pierced by a bamboo stick of about 12 inches length. One stick may have more than one fishes
	(5) Fishes pierced in sticks are smoked over fire. Alternatively, if bamboo sticks are not available, fishes can be kept over an iron net or some closely arranged iron sticks
Traditional serving style:	The pora mach is most commonly served with fermented rice (*Poita bhaat*)
Any special occasion for this dish?	It is part of the regular diet of tribal people in the area and no special occasion is identified for this dish

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4.5.1.9. Bhapot diya Ilish:

Local name in the study area:	Bhapot diya Ilish
English name (if any):	Steamed Ilish fish
Local name in other parts of Assam:	Bhapa Ilish in Dhubri district
Main ingredient fish species:	Ilish (*Tenualosa ilisha*)
Other essential ingredients:	(1) Salt
	(2) Turmeric powder
	(3) Green chilli
	(4) Mustard seeds
	(5) Mustard oil
	(6) Onion
	(7) Ginger
Optional ingredients:	(1) Coriander leaf
	(2) Yogurt
	(3) Grated coconut
Time needed to cook:	20 min

Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation methods:	(1) Fish is cut into pieces and washed properly (2) Fish is then marinated with salt and turmeric (3) Mustard seeds are ground into paste and the green chillies are slitted (4) The fish is now marinated with the mustard paste and mustard oil (Grated coconut and yogurt may be added at this stage for marination) (5) The marinated fish is then steamed in a pan.
Traditional serving style:	It is served with plain rice
Any special occasion for this dish?	It is mostly cooked as a special dish during festivals. During south west monsoon, when Ilish migrate from Bay of Bengal into Brahmaputra for spawning, it's abundance increases in Goalpara and Kamrup region. Therefore, during this season, the frequency of consumption of this dish also increases.

4.5.1.10. Kosu paatere machor mur:

Local name in the study area:	Kosu paatere machor mur
English name (if any):	Fish head with colocasia leaves
Local name in other parts of Assam:	-
Main ingredient fish species:	Fish head of Ilish (*Tenualosa ilisha*)/ Rahu (*Labeo rohita*)/ Catla (*Gibelion catla*) fish
Other essential ingredients:	(1) Salt (2) Turmeric powder (3) Green chilli (4) Mustard seeds (5) Coriander leaf (6) Mustard oil

	(7) Onion (8) Ginger (9) Sugar
Optional ingredients:	(1) Grated coconut (modern influence)
Time needed to cook:	20 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Tender colocasia leaves are taken and washed properly and cut into small pieces (2) The leaves are then soaked in salt water for sometime (3) The leaves are then boiled in water to make soft (4) When soft, they are then taken out of water. (5) Onion, ginger and garlic paste is prepared. (6) The fish head is cut into 4 pieces and fried properly in a pan with mustard oil (7) Again in a pan little oil is heated and bay leaves and the paste are added and the fried well (8) Chilly is also fried with the bay leaves (9) Then Cumin and coriander pastes are also added and fried again (10) Grated coconut may be added at this stage (optional) (This is a modern inclusion) (11) After the ingredients are fried properly, the fried fish head is added and then salt, turmeric and little sugar are also added and fried well by sprinkling little water When fish is soft it is ready for serving
Traditional serving style:	It is served with plain rice
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.1.11. Machor muri ghonto:

Local name in the study area:	Machor muri ghonto
English name (if any):	-
Local name in other parts of Assam:	-
Main ingredient fish species:	Head of Rohu (*Labeo rohita*), Catla (*Gibelion catla*)
Other essential ingredients:	(1) Mug daal (2) Salt (3) Turmeric powder (4) Mustard oil (5) Green chilli (6) Dry chilli (7) Garlic paste
Optional ingredients:	(1) Bay leaf
Time needed to cook:	30 min
Fire type used:	Fire wood/ Bamboo fire, LPG Gas/ Kerosene stove/ Saw dust stove
Preparation method:	(1) Cut the fish head into 4 pieces (2) Fry the head pieces in mustard oil (3) Fry mug dal on a round bottom pan till it becomes golden (3) Add spices, ginger, garlic paste and stir fry 2 min (4) Add water and cook it till boiling. Let the dal become half boiled (5) Add the fried fish head, bay leaf and dry chilli and continue to boil for some more time till the bones from the fish head start coming out. It is ready to serve
Traditional serving style:	It is served with plain rice in lunch or dinner
Extension/ variation:	It can be cooked with Bottle gourd.
Any special occasion for this dish?	No special occasion recorded for this dish

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4.5.2. Dry Fish: A Tradition of Fish Preservation

Mention of fish drying is found in the famous Assamese story book '*Burhi Aair Sadhu*' by Lakshminath Bezbaruah (1911). Dutta et.al. (1992) thoroughly investigated the fish preservation methods adopted by different tribes in Assam. Muzaddadi and Basu (2012) studied the preparation of Shidal in Assam and Tripura. Preparation of dry fish is an age-old practice in the entire North East. Fishes are abundantly available during the rains, but not so plentiful during the dry season. So, people in the olden days started preparing dry fish to be consumed during the off season. Later, it became a taste and people have accepted it as delicacy. Fishes are not available in hilly areas and they import dry fish from the valleys. Thus, fish drying offers a very profitable business opportunity. This investigator explored the fish drying techniques used by the communities living in the South Western Assam -

Fig: 4.5.1: A fish vendor selling dry fish

4.5.2.1. Types of preservation

Four different types of fish drying methods were found in the study area. These are –

4.5.2.1.1. Sun-drying

For sun-drying, fishes are washed and cleaned properly with clean water so that no dirt remains. The abdomen of a large fish is cut open and the viscera is discarded. If the fish is

small, viscera can be squeezed out without having to make a big incision. In case of a large fish, the operculum and gills are also removed and cleaned with clean water. For export quality processing, Muslim fishermen treat the fishes in dilute Potash ($KMnO_4$) solution. They make a bamboo machan and spread the fishes in a thin layer and keep it under the sun for long hours. The bamboo machans were found along the banks of the waterbodies including Brahmaputra and some beels. If the quantity of fish is less, then Bamboo sieve (Chaloni) can also be used. During the entire period of sun-drying, fishes should be guarded from predators like crow, cat, dog etc. Some fishermen dry the fishes in their own courtyard. Sun dried fishes are cooked in special ways into curries.

Fig: 4.5.2: Sun-drying by Muslim fishermen

4.5.2.1.2. Smoking

For smoking, fishes are washed properly and then kept over a bamboo chaloni or bamboo basket over a souka[6]. Some people make a permanent bamboo hanging machan over the souka, which is used for smoking fish and other materials. Washing and preparatory processes are similar to sun-drying. The taste of smoked fish is different from that of sun-dried fish. Smoked fishes can be eaten as curry.

[6] Souka is a traditional type of furnace. Firewood is burned to produce heat in a souka

4.5.2.1.3. Salting

For salting, fishes are cleaned and washed in the similar way like sun-drying. Then, a thick layer of salt (Sodium chloride) (NaCl) is applied over the fish. Then, the fishes are sundried for initial drying followed by smoking for the removal of moisture. Salted fishes can be eaten as curry.

4.5.2.1.4. Shidal:

Shidal is mostly prepared by the Bengali Kaibartas and Muslim fishermen. It is a semi fermented fish preparation. Normally small fishes (i.e. Puntius spp) are put in an earthen pot called Matka or Kolsi or Koloh. Before putting the fishes, the earthen pot is smeared with oil from inside and dried properly. This oiling and drying is continued till the earthen wall of the pot is completely saturated with oil. Then fishes are kept inside the pot up to the neck of the pot. Over the fishes, powdered dry fish layer is given. Then, the mouth of the pot is covered by a banana leaf so that there is no passage for air. Then, the mouth is sealed with clay and left for several weeks. Depending on the duration of fermentation, the taste varies. Shidal fish is normally made into a paste or chutney with hot chilies.

4.5.2.2. Variety of fishes used in various processes of fish preservation:

The following table shows the name of 62 species of fishes that are used to prepare dry fish preparations –

Table: 4.5.1: Fish species used in various preservation methods

Sl. No.	Local name	Scientific name	Methods of Preservation			
			Sun drying	Smoking	Salting	Shidol
91.	Chital	*Chitala chitala*	+	+	-	-
92.	Kanduli, Foli	*Notopterus notopterus*	+	+	-	-
93.	Koroti, Korti	*Gudusia chapra*	+	+	+	+
94.	Ilish	*Tenualosa ilisha*	+	+	+	-
95.	Phasa	*Setipinna phasa*	+	+	+	-

Sl. No.	Local name	Scientific name	Methods of Preservation			
			Sun drying	Smoking	Salting	Shidol
96.	Bhokua, Catla	*Gibelion catla*	+	+	+	-
97.	Mirka	*Cirrhinus mrigala*	+	+	+	-
98.	Lachim	*Cirrhinus reba*	+	+	+	-
99.	Common carp	*Cyprinus carpio*	+	+	+	-
100.	Bhangon	*Labeo bata*	+	+	+	-
101.	Bhangon	*Labeo boga*	+	+	+	
102.	Kurhi	*Labeo gonius*	+	+	+	
103.	Rou	*Labeo rohita*	+	+	+	
104.	Puthi	*Pethia conchonius*	+	+	+	+
105.	Puthi	*Pethia phutunio*	+	+	+	+
106.	Puthi	*Puntius chola*	+	+	+	+
107.	Puthi	*Puntius puntio*	+	+	+	+
108.	Puthi	*Puntius sophore*	+	+	+	+
109.	Puthi	*Puntius terio*	+	+	+	+
110.	Puthi	*Puntius ticto*	+	+	+	+
111.	Cheni Puthi	*Systomus sarana*	+	+	+	-
112.	Selekona	*Salmostoma bacaila*	+	+	+	-
113.	Selekona	*Salmostoma phulo*	+	+	+	-
114.	Mowa	*Amblypharyngodon mola*	+	+	+	-
115.	Borolia	*Aspidoparia jaya*	+	+	+	-
116.	Borolia	*Cabdio morar*	+	+	+	-
117.	Lauputhi	*Devario devario*	+	+	+	+
118.	Dorikona	*Rasbora daniconius*	+	+	+	-
119.	Dorikona	*Rasbora rasbora*	+	+	+	-
120.	Botia	*Acanthocobitis botia*	+	+	-	-
121.	Botia	*Lepidocephalichthys guntea*	+	+	-	-
122.	Aari	*Sperata aor*	+	+	-	-
123.	Aari	*Sperata seenghala*	+	+	-	-

Sl. No.	Local name	Scientific name	Methods of Preservation			
			Sun drying	Smoking	Salting	Shidol
124.	Singora	*Mystus bleekeri*	+	+	-	-
125.	Bor Singora	*Mystus cavasius*	+	+	-	-
126.	Singora	*Mystus tengara*	+	+	-	-
127.	Singora	*Mystus vittatus*	+	+	-	-
128.	Ritha	*Rita rita*	+	+	-	-
129.	Pabho	*Ompok bimaculatus*	+	+	-	-
130.	Pabho	*Ompok pabda*	+	+	-	-
131.	Pabho	*Ompok pabo*	+	+	-	-
132.	Borali	*Wallago attu*	+	+	-	-
133.	Bahpotia, Kajoli	*Ailia coila*	+	+	-	-
134.	Neria	*Clupisoma garua*	+	+	-	-
135.	Vacha	*Eutropiichthys murius*	+	+	-	-
136.	Kajoli	*Pachypterus atherinoides*	+	+	-	-
137.	Magur	*Clarias batrachus*	+	+	-	-
138.	Singi	*Heteropneustes fossilis*	+	+	-	-
139.	Kokila	*Xenentodon cancila*	+	+	-	-
140.	Kuchia	*Monopterus cuchia*	-	-	+	-
141.	Chanda	*Chanda nama*	+	+	+	-
142.	Chanda	*Parambassis ranga*	+	+	+	-
143.	Bhetki	*Nandus nandus*	+	+	+	-
144.	Panimutura	*Glossogobius giuris*	+	+	-	-
145.	Kawoi	*Anabas testudineus*	+	+	-	-
146.	Kholixa	*Trichogaster fasciata*	+	+	+	-
147.	Kholixa	*Trichogaster lalius*	+	+	+	-
148.	Chengeli	*Channa orientalis*	+	+	+	-
149.	Goroi	*Channa punctata*	+	+	+	-
150.	Turi	*Macrognathus aral*	+	+	+	-
151.	Turi	*Macrognathus pancalus*	+	+	+	-

Sl. No.	Local name	Scientific name	Methods of Preservation			
			Sun drying	Smoking	Salting	Shidol
152.	Turi	*Mastacembelus armatus*	+	+	+	-

It can be summarily said that all the species, except *Monopterus cuchia* are used for sun-drying and smoking. Only the Puntius group and *Devario devario* are used for Shidol and the scale-less fishes are avoided for Salting.

4.5.3. Fish and Religion

Fishes have a deep-rooted influence on the religious belief of the communities living in the region, especially the Hindus. Many direct or indirect connections of fish and religion have been recorded during this study. Only the religious celebrations having direct connection to fishes are narrated below –

4.5.3.1. Matsya Avatara

Most people following Hindu religion believe in re-incarnation. They also believe that Lord Vishnu (Krishna) took birth repeatedly on earth in different forms. The first form was 'Matsya Avatara'. According to the mythological beliefs, in this incarnation, Lord Vishnu's lower part resembled a fish.

Idol of lord Vishnu are prepared with a four handed human structure above waist and a fish in the bottom part. It doesn't have legs like humans have. Instead, it has a 'Forked' tail fin which is a characteristic of a major carp. Hindus in the region believe that this Avatara of Vishnu was born in Ocean and lived in Ocean. It has four hands representing four directions (East, West, North and South). Four hands hold four different objects – Konch, Chakra, Gada and Lotus.

Fig: 4.5.3: Matsya Avatara in a Naam ghar in Sadilapur

In many Naam ghars (places of worship of the Vaishnav Hindus), Matsya Avatara idol is seen. The photograph presented here was taken from the Sadilapur naamghar, near Jalukbari in Kamrup Metro district.

Like the modern science believe that life originated in water, Hindu mythology also says that Life originated in water and Lord Vishnu himself was born in water as fish as the first form of life on earth. Unlike the North and North-West Indian Hindus believe that fish is untouchable, Hindus in Assam regard fish as a sacred creature. The influence of Matsya Avatar is one of the reasons of this acceptance.

4.5.3.2. Ganga Puja:

The religious belief behind the puja:

Ganga puja is celebrated by the Hindus, mostly the Kaibarta fishermen communities. Worshipers believe that Ganga is the Goddess of the waterbodies. They believe that if Ganga is satisfied, she gives good rain and fish harvest also become good. Although Ganga puja is organized by all the Kaibarta communities living in Goalpara, Kamrup and Kamrup Metro districts, time and way of celebration vary from place to place. A comparative account of Ganga puja in Urpad beel and Deepar beel areas are narrated below –

4.5.3.2.1. Ganga Puja in Urpad beel area (Maagh month):

The deity: The diety of Ganga puja is goddess Ganga. As shown in the photograph, Ganga is a female goddess clad in saree, sitting on a crocodile. The community call the crocodile as '*Makar maach*' (Hindi word for crocodile is 'Magar'. 'Makar' is a local version). The idol is locally prepared with clay, thatch and bamboo. Ganga devi looks like a lady except that it has four hands.

Hindu mythology believes that Ganga devi is the Goddess of all rivers and water bodies and her *vahana* (means of transport) is a crocodile.

Fig: 4.5.4: Goddess Ganga idol

Where is it organized?

Ganga puja is organized in many fishermen villages around Urpad beel. Two of the prominent locations are – Khagrabari and Jungle para, where it is celebrated as a major festival. Apart from these two major puja mandaps, smaller pujas are also celebrated in the area.

When is it organized?

It is organized in the Assamese / Bengali calendar month of Maagh. The first Tuesday or Saturday falling after two and half days from the day of Sankranti is selected for the puja. Following may be the scenario based on which the date is selected by the community –

Scenario 1:

If the 3rd day of Maagh is Tuesday or Saturday, then Ganga puja is organized on the 3rd Maagh.

Scenario 2:

If 1st or 2nd day of Maagh month is a Saturday, then Ganga puja is organized on the first Tuesday, which falls on 4^{th} or 5^{th} day of Maagh.

Scenario 3: If 1st or 2nd day of Maagh month is a Tuesday, then Ganga puja is organized on the first Saturday, which falls on 5th or 6th day of Maagh.

Deviation of the date from the tradition:

In some rare instances, if for some unavoidable reason, the puja can't be organized on the first available option, the community collectively decides to organize it in the next Tuesday or Saturday. Sometime, a village organize it on the first available Saturday/Tuesday as per their 2½ day rule and a nearby village organize it on the next Tuesday/Saturday.

Time of the puja:

The community members gather in the puja place (mandap) after taking bath in the morning and they help in all kinds of arrangements. Most community members observe fasting till the puja rituals are over. The chanting of mantras normally start in the afternoon and the puja is performed just before the sunset. After the chanting of the mantras, people take blessings from the priest and the festivity continues till the late evening. Offerings (prasad) of the puja is finally distributed among the villagers in the late evening around 8-9 pm.

Who performs the Puja:

The community has an appointed priest. On the day of the puja, he performs the rituals of chanting mantras on behalf of the community. Generally, the President / Secretary / Treasurer of the puja committee offers the '*Baran*' to the priest and forwards the offerings (prasads) to the Goddess on behalf of the community. *'Baran'* is the process of authorisation of the priest by a community representative. It is traditionally a male member of the community who offers the '*Baran*' to the priest. Although the idol is a female goddess, the interesting observation is that in no instance in the known past in any of the villages, the Baran or offerings has been forwarded by a lady.

Fasting:

Both the priest and the person leading the community must compulsorily be fasting until the puja rituals are over. After the puja rituals are over, all take blessings from the priest and then they can break their fast.

The Prasad (offering):

The offering to goddess Ganga is always a vegetarian cooked food and soaked gram, lentils and fruits. Normally the offering is 'Khisri'. Rice, dal and vegetables are mixed together and cooked in the same vessel to make khisri. Sometime, they also cook rice, dal and vegetables separately.

Bisarjan (Emergence) of the idol:

It is a temporary idol. After the puja is over, next morning, the idol is emerged in the wetland.

Linkage with fishing and the beel (wetland):

- The puja is organized on the bank of the beel (wetland)
- The period from the Makar Sankranti to the performance of the Ganga puja is observed as *jaal-khoti* / *paaloni* / (***non-fishing time***). Except the Ganga puja day, on other days during this non-fishing time, they can consume fish, but they don't go for fishing.
- On the day of Ganga puja, they don't eat any non-vegetarian food.
- After the Ganga puja is performed, in the evening, they mix 1 kilogram of salt with 0.25 kilogram sugar and 1 litre of milk. One representative from the community takes this mixture in a pot on his head and walk from the Puja mandap to Urpad beel wetland. He goes inside water and empties the pot into water and take bath in the beel. They believe that once the beel gets this offering, it's productivity increases and resistance of the fishes against diseases also increase.

4.5.3.2.2. Ganga Puja in Deepor beel area: (Aahar month)

Ganga puja was not traditionally organized in the Deeporbeel area until the late 1980s. In the year 1989, a severe *e-coli* bacterial infection of the fishes happened and tons of fishes died in the entire lower Assam including Deepor beel. With a belief that performing Ganga puja will help the community to get rid of the fish disease, they started organizing the Ganga puja from 1990.

The Deity:

The deity of Ganga devi worshiped in Deepor beel area is same as the diety in Urpad beel area. Hence, it is not described here again. Deity is locally prepared by an idol making community

Where is it organized? Ganga puja in Deepor beel area is organized centrally near the beel. Some families worship and offer daily puja to Ganga devi. But, the main puja celebration is common for all villages.

When is it organized? Unlike Urpad beel area, the Ganga puja in Deepor beel area is organized in the Assamese / Bengali calendar month of Aahar. Fishing in the core area of the beel is prohibited from the month of Bohag till Ganga puja. This is the breeding season of fish and as a conservation practice, community observe this period as no fishing time in the core area. For the sustenance of the fishermen families, the buffer area of the beel is kept open for fishing.

Time of the puja:

The community members gather in the puja place (mandap) after taking bath in the morning and they help in all kinds of arrangements. Most community members observe fasting till the puja rituals are over. The chanting of mantras start in the forenoon and the puja is

completed before the sunset. After the chanting of the mantras, people take blessings from the priest and the festivity continues till the late evening. Offerings (prasad) of the puja is finally distributed among the villagers in the late evening.

Who performs the Puja:

The community has an appointed priest. On the day of the puja, he performs the rituals of chanting mantras on behalf of the community. Generally, the President / Secretary of the puja committee offers the '*Baran*' to the priest and forwards the offerings (prasads) to the Goddess on behalf of the community. It is traditionally a male member of the community who offers the '*Baran*' to the priest. Mostly the fishermen Kaibarta community get involved in this puja. Other communities are also invited and welcomed in the puja.

Fasting:

Both the priest and the person leading the community must compulsorily be fasting until the puja rituals are over. After the puja rituals are over, all take blessings from the priest and then they can break their fast. Many community members also fast until the puja rituals are over. They normally break their fast by eating the prasad (offerings of the puja).

The Prasad (offering):

The offering to goddess Ganga is always a vegetarian cooked food. Normally the offering include 'Khisri' (Rice, dal and vegetables are mixed together and cooked in the same vessel to make khisri) and 'Kheer' (Rice, milk and sugar are mixed together and cooked in the same vessel to make kheer). Khisri and Kheer are the main offerings, called as *Bhog*. In addition to the *Bhog*, they also offer *Kesa prasad* that include soaked gram, lentils, coconut and fruits.

The Dunoni:

A Dun is a round shaped baboo basket commonly used in households for storing goods. It comes in various sizes. A dun-full of rice is taken over the head by the priest. Community

get together to welcome (aadori aana) the person with the dun. He moves round the local temple (Padakkhin) and then enter the temple and perform the Puja.

Fig: 4.5.5: Dunoni in Azara Keotpara

The Ojapali:

Ojapali is a traditional folk song cum dance of Assam. It is like a group debate through song and dance. There is one *Oja*, the head of the group and many *Pali*, the supporting members. It evolved from *Kathakata* tradition and is believed to be one of the oldest art forms of Assam. Ojapali is now almost restricted to Darrang district. But, to a large extent, during the Ganga puja and Manasa puja, Ojapali groups from Darrang are invited to perform in many parts of Kamrup including the Deeporbeel area.

Bisarjan (Emergence) of the idol:

It is a temporary idol. After the puja is over, next morning, the idol is emerged in the wetland.

Linkage with fishing and the beel (wetland):

- The puja is organized on the bank of the beel (wetland)

- The period from the Bohag Bihu to the performance of the Ganga puja is observed as *jaal-khoti* / *paaloni* / (***non-fishing time***). Except the Ganga puja day, on other days during this non-fishing time, they can consume fish, but they don't go for fishing.
- On the day of Ganga puja, they don't eat any non-vegetarian food.
- The day of the Ganga puja is observed as *Haal-Jaal khoti*. On this day fishing and farming are not done.

4.5.3.3. Manasa Puja / Maaroi puja / Padma puja:

The religious belief behind the puja:

Manasa puja is celebrated by the Hindus. Nabin Chandra Sarma, 1993 (edited) mentioned in *Padma Purana* that Manasa puja is celebrated in Assam by Boro-Kachari, Rabha, Hajong, Tea tribe, Koch, Kalita, Keot, Brahmin and Kayastha. Worshipers believe that Manasa is the Goddess of the snakes. They believe that if Manasa devi is satisfied, snakes don't bite people.

The Deity:

Manasa is a female Goddess. There is two versions of the diety –

A. A female Goddess with a bottom part of a snake from waist
B. A female Goddess clad in saree and guarded by a 5 headed snake from behind. It also has a swan as its means of transport (Bahana)

Fig: 4.5.6: Goddess Manasa Idol (a)

Fig: 4.5.7: Goddess Manasa Idol (b)

Fig: 4.5.8: Manasa Puja in progress in Azara Keotpara

Where is it organized? Manasa puja or Maroi puja is organized in the entire study area. Many famous Manasa temples are available in the study areas. Some renown Manasa temples include th eons located at Azara Keotpara, Bamunigaon and Rani area.

When is it organized? Manasa / Maroi puja is celebrated on the Nag Panchami tithi in the Shravan month (July – August). Nag Panchami is the Panchami tithi in the Krishna Pakshya (Dark moon fortnight). The Manasa puja starts on the Saturthi tithi and the main puja rituals are done on the Panchami.

The Ojapali:

Ojapali is a traditional folk song cum dance of Assam. It is like a group debate through song and dance. There is one *Oja*, the head of the group and many *Pali*, the supporting members. It evolved from *Kathakata* tradition and is believed to be one of the oldest art forms of Assam. Ojapali is now almost restricted to Darrang district. But, to a large extent, during the Ganga puja and Manasa puja, Ojapali groups from Darrang are invited to perform in many parts of Kamrup including the Deeporbeel area. During the Maroi puja, the Ojapali tells the story of Beula and Lakkhindar. How Beula guarded her husband Lakkhindar's body in a *Bhur* sailing through river is explained. The song also mentions that Barali fish (*Wallago attu*) consumes the knee of the dead body of Lakkhindar.

Deodhani dance:

One of the important rituals of Maroi puja is Deodhani dance. In Deodhani dance, an unmarried girl dress mekhela like a warrior with her hairs open and worship Manasa/ Maroi / Padma. She dances with the beat of Joidhol (drum) and cymbals with different foot-steps and hand gestures. She holds a sword in one hand and a shield on the other.

Fish sacrifice (Boli)

Hindu Shaktas offer live animals to God and Godesses and cut the animal into two pieces in one attempt with a Dao. This is called *Boli*. For different occasions, different animals are sacrificed. In Manasa puja. A live magur fish (*Clarius batrachus*) is sacrificed.

4.5.3.4. Bhadra Kali Puja

The religious belief behind the puja:

Hindu shaktas worship Kali. Kali is a female Goddess believed to represent power. Bhadra kali is believed to be the Good Kali who is a popular form of Goddess Durga.

The Deity is a dark coloured lady with four hands and her tongue protruding out. She holds the head of a dead man in one hand and a Kharga (a big knife) in another hand. She wears a garland of human heads and A skirt of human hands.

Where is it organized?

Kali is widely worshiped and there are many Kali temples in the entire study area. Puja is organized in these temples. Some puja committees also arrange special pandals to organize this puja.

When is it organized?

It is organized on the Saturdashi tithi night and the puja completes on the Amabasya (Complete dark moon day). In Deeporbeel area, it is organized in Jeth month.

Who organizes it?

All shakta Hindus worship Kali. There are puja committees who organizes it. Other members of the Hindu community except the Shankari's attend the puja.

Fish sacrifice (Boli)

Hindu Shaktas offer live animals to God and Godesses and cut the animal into two pieces in one attempt with a Dao. This is called *Boli*. For different occasions, different animals are sacrificed. In Manasa puja. A live magur fish (*Clarius batrachus*) is sacrificed.

Other important rituals:

Other important rituals include sacrifice of Kochu (Chana kochu) (Arum), sugar cane, komora (White gourd), pigeon (*Columba livia*) are done.
Band party – dhulia are taken as a procession through the village.
2 goats are taken in the procession. 1 used for sacrifice and it is called as ***'Boli'***. The other one is released to continue the race, it is called as ***'Bidhan'***.

Haal-jaal khoti:

The Bhadrakali puja is observed as a Haal-jaal khoti day. No fishing and farming is done on the puja day.

4.5.3.5. Baat Puja in Deepor beel area (Aahar month)

It is a unique puja celebrated in Azara Keotpara and Natun basti area on the bank of Deeporbeel by the fishing community. In this puja, community worship the road (Baat). The entire community clean all the roads in the village. Respective families clean the road and the drains in front of their household. On the road, puja is offered to Kaali and Bhagabati. Sitala mantra is chanted and Aai naam is performed. Milk kheer is prepared and offered as Prasad. Kheer is offered to the Goddess Kaali and given to the beel. It is believed that this kheer protects the beel and the fishes and the productivity of the beel increases.

Baat puja day is also a vegetarian day and in is observed as Haal- jaal khoti day. So, no fishing and farming is done on the day.

4.5.3.6. Baaykho / Khoksi puja of the Rabhas

Rabhas regard Baaykho or Khoksi as their main Goddess. Das (2018) has mentioned that Rabhas believe in a story that two sisters, *Thope* and *Nesse* were fishing. Instead of getting fish, they got a stone in their Jakoi[7]. When their father asked whether they have got fishes, they handed him the stone. He kept the stone in the store house. Next morning, he found that in place of that stone, a beautiful Goddess was sitting. In the night, he saw the Goddess in dream and learned about her. They started worshipping the Goddess. Over a period, their family became healthy and wealthy. They started believing that the wellbeing is due to the Goddess. Gradually the entire community started believing in the Goddess. They also worship the stone and call the stone as '*Tangra-Singra'*.

Every Rabha village has a Baaykho than/ temple. Each Baaykho than has Ranjumuk or Shilagram for all God and Goddesses. Normally Baaykho puja is celebrated on the Purnima[8] tithi in the month of Jeth. If Purnima tithi is not possible for some reason, then they organize it on a Sunday or Wednesday or Friday. The compulsory ingredients of the puja include one *Jakoi* and one *Khaloi*[9].

4.5.4. Fish and Festivals / Ceremonies

Fish is intricately weaved in the social fabric of almost all the communities in the region. From birth of a baby to the funeral of a person, in all important functions, fish is an integral part. This study explores all the connections of festivals and household ceremonies with fish in the following heads –

[7] Jakoi is a bamboo fishing gear. It is explained in details in Chapter 5
[8] The full moon day is called Purnima
[9] Khaloi is a bamboo fishing gear. It is explained in details in Chapter 5

4.5.4.1. Fish and birth of a baby:

Fish is believed to be auspicious by all the communities belonging to Hindu religion in the area. In Kamrup district, distribution of fish at birth of a baby in a family has been observed in many communities. Most fishing communities follow this tradition. Rabha, Bodo, Garo and Rajbongshis, don't follow it as a compulsory practice, but some families do it. Kalita, Brahmins, Nath give fishes according to their capacity. Those who can afford, give large fish, other give small fish or small quantity of fish. Fishing Muslims don't have such tradition.

4.5.4.2. Fish and the Annaprasana:

In Hindu religion, the new born is given solid food after about 7 to 9 months of birth. Normally it is done before the first tooth appears. This ritual is named as *Annaprasana*. The fishermen communities and general caste Hindus in Kamrup, Kamrup Metro and Goalpara area organize Annaprasana, normally on the 6^{th} or 8^{th} month for boys and 7^{th} or 9^{th} month for girl child. The baby normally can't eat solid foods at this stage, but it is a tradition to offer a cooked full plate meal comprising rice, dal, vegetables, fish, meat (some communities only give fish), payasam, pitha, ladoo and a sweet. Normally the maternal uncle of the baby feeds the baby with a gold ring/ coin/ spoon. Giving a cooked fish dish to the baby during Annaprasana is a compulsory practice. After the baby taste food, all invitees take their meal.

4.5.4.3. Fish and the marriages

Fish is an essential element in the marriage ceremony of all communities studied. Some families belonging to Kalita, Bengali Kaibarta in the recent past have adopted 'Anukul Dharma'. Except these families, all the other members of their communities use fish in marriage.

Among the Hindus in the area, a pre-marriage ceremony is 'Joron' or 'Telor-bhaar'. Joron is the ceremony during which, some family members and friends of the groom visit the bride's home and gift the bride with cloths, jewellery, cosmetics, sweets etc. according to

the economic ability of the groom. One of the customary practice of Joron is to gift a big fish to the bride from the groom's family. In Boro community, Joron is called as 'Biban'

In the Bengali Kaibarta marriage, the 2nd or 3rd day of marriage is celebrated as 'Bou Bhat'. On that day, the new bride is given the formal right to cook in the family kitchen. A feast is organized at the groom's family and relatives and friends of both bride and groom are invited. The bride has to cook at least one dish and serve to the guests during the 'Bou bhat'. One Fish dish is an essential item of this feast. Kalita and Nath communities also have a similar function like Bou Bhat, which is called as 'Randhon dia'. In case of Kalita and Nath, the day of 'Randhon dia' is fixed as per the convenience of the organizing family. It may not be organized essentially immediately after 2-3 days of the marriage. Till the Randhon dia programme is organized, no senior family member in groom's family eats food cooked by the bride.

Among the Rabhas, there is a practice of giving burnt *Goroi Fish* to bride and groom before the marriage. They believe that if the bride and groom eats burnt and smashed (Pitika) Goroi fish, then no one can do any black magic on them and ghost can't attack them.

4.5.4.4. Community fishing:

Community fishing on special occasions were recorded in Deepor beel (Azara, Kamrup), Satpokhili (near Chaygaon, Kamrup), Gondhmow (near Sualkuchi, Kamrup), Kumri beel (near Pancharatna, Goalpara), and Bor Pukhuri (Goalpara town). In all these locations, community fishing is done one or two days prior to Uruka of Magh Bihu. Noteworthy that Uruka is the feast organized on the eve of the Makar Sankranti, which is the last day of the month of 'Puh' or 'Poush' according to Assamese calendar.

4.5.4.5. Death of a family member and Fish

At the demise of a family member, fishing communities belonging to Hindu religion mourn for about 11-13 days and after this period of mourning, organize 'Aadya shraddha'. 'Aadya shraddha' is believed to be the purification ceremony for the family. During the mourning period, no member of the deceased's family takes any nonvegetarian food. They can't visit

any holy shrine or religious place. Normally they don't visit other families or other members in the community don't visit them during this time. The 10th day from the demise is called 'Doha' and the 'Shraddha' is observed on 11th or 13th Day. Normally the next day of Sharddha is observed as 'Matsya-Sparsa'. 'Matsya' meaning 'Fish', 'Sparsa' meaning 'touching'. On this day, the family organizes a feast for the friends and family members. According to the financial capacity of the family, they arrange the menu. But, at least one dish of fish is essential for the feast.

The Muslims in the area organize a feast for friends and family members on the 40th day from the death. This programme is called 'Chalisa'. In the Çhalisa feast, one of the dishes is essentially a fish cuisine.

4.5.5. Fish in Folklore

Traditional songs, customs, tales, sayings, dances, or art forms preserved among a community is called the folklore of that community. It is like a mirror of the community because folklore reflects the image of the community as it has evolved over the ages. Fish is embedded in every aspect of the folklore of the South Western Assam. These may be studied under the sub heads – songs, nursery rhyme, tales, proverbs, performing arts, motifs, nomenclatures and crafts -

4.5.5.1. Fish in songs –

Assam is famous for various forms of folk songs. These include –

4.5.5.1.1. Fish in Bihu songs -

There are many Bihu songs that has mention about fish species or the process of fishing. Hem Baruah (1989), in his Assamese book '*Ei gaon ei geet*' has included many Bihu song that has mention about fishes and fishing. One such example is given below –

হাঁহে হৈ চৰিমগৈ তোমাৰে পুখুৰীত,
মাছে হৈ পৰিমগৈ **জালত,**
ঘামে হৈ ওলামগৈ তোমাৰে শৰীৰত
মাখি হৈ চুমা দিম গালত

This is a love song in which the male singer says to his female partner that he will become a duck and swim in her pond, he will become a fish and entangle himself in her net, he will oose out as sweat from her body and he will become a fly and kiss her on her check.

Leela Gogoi (1969), in his Assamese book '*Bihu eti somikkhya*' has included the following Bihu song -

উজাই আহিলে **মাছে** কি মগৰে
উজাই আহিলে শিহু

This gives a general description of the importance of the festival Bihu. When fishes, crocodile, and dolphin heard that Bihu is approaching – everyone have come against the current to celebrate the festival.

Another Bihu song has a mention about Pavo fish (*Ompok spp.*)

তোমাত গাল দুখনি **পাভ মাছৰ** নিচিনা
ঘোঁৰা ফানৰ নিচিনা চুলি,
ল'ম ল'ম বুলি এদিনো নল'লা
দুখনি হাতেৰে তুলি

In this song, the male singer praises his girlfriend and describes that the cheeks of his girlfriend are like a Pavo fish and her hairs are like the mane of a horse.

In the following Bihu song, the male singer compares his girlfriend with a Mali fish (*Labeo calbasu*) and Baami fish (*Mastacembelus spp*)

তোমাৰ মুখখনি **মালি মাছৰ** নিচিনা
বামি মাছৰ নিচিনা চুলি

In this song, the male singer says that the face of his girlfriend is like a Mali fish and the hairs are like Baami fish.

In the following Bihu song, the singer compares the sorrow of fishes with the sorrow of a lover

ৰঙানৈ শুকাইছে **মাছৰে** বেজাৰত
লুইতখন শুকাইছে কিয়?
মই চেনাই শুকাইছো তোমাৰে বেজাৰত
তুমি চেনাই শুকাইছা কিয়?

It says that the Ronga nadi (it's the name of a river) has dried in the sorrow of the fishes, why has the Brahmaputra dried? I am slimming in the sorrow of not getting you, why are you slimming?

শ'লে ভুমুকিয়ায়, **শালে** ভুমুকিয়ায়
চেঙাই ভুমুকিয়ায় খালত
প্ৰাণৰে ভিতৰত মনে ভুমুকিয়ায়
ৰাইজাই লাগিছে দেহত

The following Bihu song has a mention about Shaal (*Channa striatus*), Shol (*Channa marulius*) and Chenga (*Channa barca*) fishes.

It says Shol, Shaal and Chenga fishes jump in the pond and the mind jumps inside the soul. This makes the body of the singer feel restless.

In the following Bihu song, there is a mention about a fishing gear 'Polo'-

ভোগদৈ নৈতে এ, এদেহি
পল'নো বাই আছিলো এ, এদেহি
পল'ত সোমাই গ'ল এ কাছ।

একেজন ঈশ্বৰে এ, এ ভনী
তোকে মোকে স্ৰজিলে এ, এ ভনী
কিহৰনো ভাল বেয়া বাচ ?

Although a love song, this song addresses social discrimination. It says that the singer was fishing with a polo in Bhogdoi river and a turtle entered the polo.

Then he asks his girlfriend that the same God has created him and her, then why does she discriminate?

4.5.5.1.2. Fish in Bogejaari song

Majumdar, Surjya Kumar in his book *Dakkhin Kamrupor Rabha Sanskritit Abhumuki* has mentioned that Paati Rabhaas celebrate Bihu and the Bihu songs they sing is called as 'Bogejaari song'. Following is a Bogejaari song from South Kamrup area, which is also sung in Goalpara –

মান চেলেংকা টিউ টিউ হিন্দল গাছৰ ডালত তাকে দেখি **মাছ মাৰং** মুকল পাথাৰত

It says – The chelenka (a local name of a bird) calls Tiw tiw on Hindol tree… We see it and fish in the open field.

4.5.5.1.3. Fish in Goalpariya Lokgeet:

The following Goalpariya lokgeet have been recorded by Gogoi, Asomi (2001) that have mention about fishes -

মাছেৰ বসন্ত কালে কৰে উজান ভাটি মুই নাৰী একলা ঘৰে কৰুঙ কান্দা কাটি

It is a song sung by a lady whose husband is an elephant Mahaut and he has gone for hunting/ catching wild elephant. She says that during the spring, fishes migrate against current. She is alone at home, crying and waiting for her husband.

4.5.5.1.4. Fish in Kartik puja songs from Goalpara area

Dutta, Birendra Nath (1974), in his Assamese book 'Goalpariya Lokageet' has included the following song that is sung during the Kartikpuja in Goalpara region -

দুৱাৰেৰ আগে কলাৰ গাছ তাতে নদী খানি ৰে গাঙ চিলায় খাইছে **মাছ** নদীতে ধৰিয়া ৰে

In this song, a bride sings– Today there is a banana plant in front of the door. The river is flowing through that area and the Gull is eating fishes from the river. My parents have married me to a small (young) groom.

4.5.5.1.5. Fish in Maroi puja song from Goalpara region:

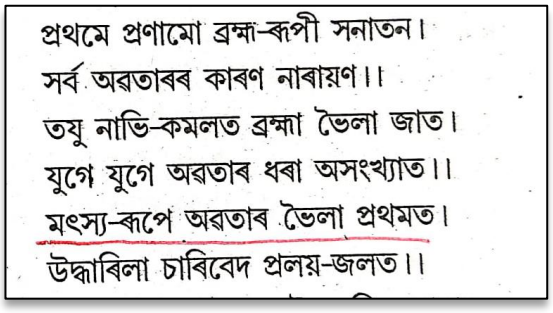
'Goalpariya Lokageet' has some songs sung during Maroi puja / Manasa Puja in Goalpara region. These are called Maroi puja songs. One such popular song in Goalapara area is -

এক পোৱা তেল আনিলুঙ ভাজা **মাছ** খাবা সিও পোৱা তেল দিলুঙ দাদুৰ মাঠাত দিবা

It says – I bought a quarter litere oil for frying fish, but I had to give the oil to Grandfather to apply on his head.

4.5.5.1.6. Fish in Krishna bandana naam

The followers of Vaishnavism in the region sings Bhakti naam. A prominent type of Bhakti naam is Krishna bandana naam. In this type of songs, disciples of Krishna sing songs praising him. Many such songs are very popular in all the three districts studied. An example is cited below from Baruah Nikunjalata's (2001) book 'Dihanaam' –


প্রথমে প্রণামো ব্রহ্ম-ৰূপী সনাতন।
সর্ব অৱতাৰৰ কাৰণ নাৰায়ণ।।
তযু নাভি-কমলত ব্রহ্মা ভৈলা জাত।
যুগে যুগে অৱতাৰ ধৰা অসংখ্যাত।।
মৎস্য-ৰূপে অৱতাৰ ভৈলা প্রথমত।
উদ্ধাৰিলা চাৰিবেদ প্রলয়-জলত।।

This says – First we pray you O Lord Krishna. You were born in different forms. Bhrahma was born from your naval. You took the first incarnation as 'Matsya' (Fish) and you saved four Vedas during the great storm.

4.5.5.1.7. Fish in Lakshmi pujar naam

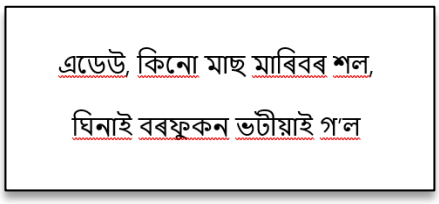
Lakshmi is the Goddess of wealth. All Hindus in the region worship Lakshmi. The Purnima after the Durga Puja in autumn is celebrated as Lakshmi Purnima. On this day people offer puja to Lakshmi devi and sing songs in her praise. Many communities offer weekly Puja on to Lakshmi devi on every Thursday. One Lakshmi puja song mentioning fishing process is given below -

জাকৈ ভালেকৰি বাবি ঐ আইদেউ
খালৈ ভালে কৰি চাবি এ
খেপিয়াই খেপিয়াই লাহেকৈ ধৰিবি
লক্ষ্মী আইক হাততে পাবি এ ।

It says operate the Jakoi carefully. See the Khaloi carefully. Hand pick the fishes with utmost care. Then you'll get Lakshmi devi in hand.

4.5.5.1.8. Fish in Malita geet

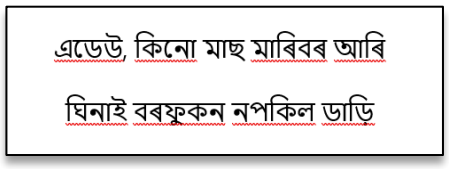
Malita songs are very popular in the area. For making the Malita songs rhythmic, names of many fishes are used. Some example are -



‘Edeu kino maach maaribor shol

Ghinai Barphukan bhatiyai gol’

Meaning, what Shol fish you catch, Barphukan went back home without catching



‘Edeu kino maach maaribor Aari

Ghinai Barphukan bhatiyai gol’

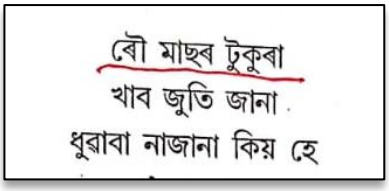
Meaning, what Aari fish you catch, Barphukan’s beards are not grey

4.5.5.1.9. Fish in Biya naam

Singing songs in marriages is an ageold culture in the region. There are different types of songs for different rituals in an Assamese marriage. Particular songs are sung during –

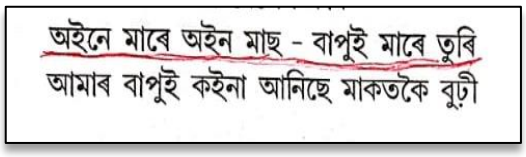
- When bride is sitting amidst all guests – Koinak majot lowa naam
- When ladies make verbal gesture called ‘Uruli’- Uruli diya naam
- When ladies go fetch water for bathing the bride/ groom - Paani tola naam
- During a function called Upanayan – Upanayanar geet
- When the bride enters Groom’s house after the marriage.

There are many such songs with mention about fish. Two examples are given below. First one is sung when the bride sits amidst all guests –



This song is a teasing song. It says to the bride – Rohu fish pieces are so tasteful. You know how to eat, but why don’t you know how to wash it.

The below one is sung when the bride enters the groom’s house. This one is also a teasing song -


অইনে মাৰে অইন মাছ - বাপুই মাৰে তুৰি
আমাৰ বাপুই কইনা আনিছে মাকতকৈ বুঢ়ী

This song teases the bride saying our groom catches Turi fish, whereas other people catches other fish. Our groom has married a bride, who is older than his mother.

4.5.5.1.10. Fish in Beula-Lakkhindar Songs

Beula-Lakkhindar songs are popular in South Kamrup. Beula and Lakkhindar story is famous in the area. Lakkhindar was biten by a snake and his wife Beula took his body on a Bhur and sailed through river with a hope that he will regain life again. During her journey through the river, she saw many types of fishes. All these are narrated in songs like the one given below –

একো একো **ডৰকিনা** ভাসে জুৰি বহু দুৰ
পাঞ্চ জোখা **মৎস** ভাসে ই তাল খাজুৰ

This song has mention about Dorikona (*Rasbora daniconius*) fish.

4.5.5.1.11. Fish in Moh kheda Songs

Moh kheda is a popular type of song in entire Assam which is sung during a group activity called Moh kheda, meaning driving away mosquito. In Goalpara district, it is called Mohoho. A populat Mohoho song in Goalpara area mentions fish -

অৰি অৰি অৰি ভাই
খৰি কাটবি দীঘল চাই
সিও খৰি একা বেকা
মাছৰ দুৱাৰত পাতলো **খোকা**

It says – lets go to cut firewood, long curved fire wood. We place the Khoka (a type of fish trapping gear) on the path of fish….. then it continues and talks about driving away mosquito and appeals all youth to join every year.

4.5.5.2. Fish related question to Bride/ groom during Assamese marriage

Asking questions to the bride/ groom is a tradition in Assamese marriage. If the bride/ groom can't reply, s/he has to pay money. Normally these questions are asked by young boys and

girls. They collect this money and have a party after the marriage celebration is over. One such question is -

কি মাছ মানুহে নাখায়?

Assamese - Ki mach manuhe nakhay?

English- Which fish is not consumed by human?

The expected answer to this question is **– Bodmach**, meaning 'A bad man'.

4.5.5.3. Fish in Assamese nursery rhyme

A very old Assamese nursery rhyme is quite popular in the south western Assam. It says -

"নাৰ বাত পাভ মাছ আৰু এটা কাছ বাৰ টকাত কিনি আনি কিয় বাৰু নাচ"

"Naro, Bato, Pavo mach
Aaru eta Kaso
Baar tokat kini aani
Kio baru naso"

Meaning - why are you dancing after buying *Naar*, *Baat*, *Pavo* fish and a turle at only 12 rupees?

4.5.5.4. Fish in tales –

The Burhi Aair Saadhu (Grand maa's tales) of Lakshminath Bezbaruah has six stories related to fishes. All these three stories are quite popular in the study area and the moral of these three stories have influenced human behaviour in the area. The three stories are –

A. **Gangatop**: This story is about Globe fish (*L. cutcutia*) a Goroi fish *(Channa punctata)*, a Sengeli *(Channa orientalis), a Bhetki* (*Nandus nandus)* and a Goroi-sirika (a young one of a Goroi fish) and their wage of war against the fishing eating animals

B. **Singora machor kahini:** This story is about a fish guarding a cow of a man and fighting with a demon. In a fight, the fish defeat the demon by its poisonous sting and the demon fulfilled all wishes of the fish and converted it into a Man.

C. **Aou Kunwori:** This story is about an elephant apple fruit and a prince who loves to fish.
D. **Chilonir Jiyekor Sadhu :** This stroy is about the daughter of a Kite. In this story, the Kites' daughter was tortured and sold to a fisherman. The fisherman engaged her to guard the dry fishes.
E. **Paneshoi:** This story has a mention about a fishing incidence in which one character of the story was fishing with a hand line (Boroshi). He was only getting Puthi fish.
F. **Kukurikona:** This story is about a night blinded son-in-law who beats his mother in-law during dinner because he couldn't see her.

These stories are very popular in the entire study area.

4.5.5.5. Fish in proverbs –

Assamese prover – "মাছৰ তেলেৰে মাছ ভাজা" (Machor telere mach bhaja) –

English – Frying of fish in fish oil

Meaning: This proverb is used to explain a situation in which one takes out work by using his/her clever ideas without having to invest anything from his or her own side.

4.5.5.6. Fish and performing arts:

In the Satriya dance, matsya avatara (Fish incarnation of lord Vishnu) has been extensively used in many acts. There is a hand gesture in satriya dance called 'Matsya Mudra'. In this mudra, the two palms of the dancer are joined together and moved slowly like a fish. Thumbs of the dancer are moved like the fish fin to depict movement in the fish.

4.5.5.7. Fish as motifs:

Fish as a motif is used in the following –

1. **Building designs**: at the entrance, on walls, on door designs, at the corners of the roof as design

2. **In weaving of *Gamosa*:** *Gamosa* is a piece of cloth measuring about 2 meters in length and about 0.6 meters in width, used as a garlanding material in Assamese tradition). Fish designs are weaved in the gamosa.
3. **In religious institutions**: Matsya avatara is engraved on the wooden doors or concrete wall of temples and naam ghar.
4. **Utensils:** Fish is also engraved in utensils (Plate, Glass, bowl), Paan bota (a special type of plate with a stand used for serving paan to guests)
5. **In dresses design**: Fish motifs are used in Mekhela sador
6. **In jewellery**: Fish motif, especially the forked tail is engraved in earing and bangles and pendant

4.5.5.8. Songs sung during fishing

Most communities go for community fishing/ group fishing. During that time, they sing together and make merry.

A Rabha fishing song is given below –

ৰিবা ৰিবা ৰিবা অ' না বোনা ৰিবা
না বোনা জুপুঙ জুপুঙ না বিজান তুপুঙ তুপুঙ
মানদায় নেমেন চিখোৱা ৰিবা ৰিবা ৰিবা

It says come all, let's go for fishing together. Fishes are jumping tupung-tupung, Let us go and catch them jupung-jupung with our Jakoi.

In Goalpara area, when people fish with Boroshi, they sing to the fish –

ধৰ **শিঙৰা** ধৰ এক খুটে তল কৰ
মাৰি দেও **ৰৰশি** বামতে আহি পৰ

Meaning – O Singra (*Mystus spp*) fish, eat my bait, take the boroshi to bottom. Then, I'll drag you to the bank.

If the fish doesn't eat the bait in the boroshi, then they sing –

গেলি তো গেলি
লগৈৰাৰ আগত কৱা যদি
বাপেৰৰ মুৰ খালি

If you want to go, go. But, don't tell your friends. If you tell them, you will eat the head of your father and brother.

In Goalpara area, another fishing song says -

মাছ মাৰং চুপুক চাপাক উঠিল পকা **শোল** **মাছ** মাৰংতে খহি পৰিল কয়াঁ নাকৰ ফুল

It says – we fish chupuk – chapak (the sound produced while operating Jakoi), a mature Shol fish (*Chann striatus*) is caught. I lost my nasal ornament while fishing.

In Norther and Eastern Kamrup area, another popular fishing song is –

পেহি ঐ পেহা, আমলখি কেহা টেকেলি পেটা গোবিন্দা, **জাল** বাওঁগৈ আহা

It says – Pehi[10] and Peha[11], goose berry is Keha[12]. Govinda has a big tummy like a round bottom pan, lets go for fishing with net.

4.5.5.9. Fish scale used for crafts

Scales of large fishes are washed properly and cleaned using soda. It becomes completely white. These scales are then dried properly. These scales are used to prepare wall hangings of different design.

4.5.6. Fish in Traditional Medicine System:

Use of Fish or its part in healing certain diseases have been recorded during this study from the South Western Assam -

- The ‘pit’ or pancrease of major carp fishes are filled with rice and kept to dry. Rice grains absorb the pancreatic juice. This acts as digestive. In case of acidity problem, one grain is swallowed with a glass of water.
- Goroi fish (*Channa punctata*) is burned, smashed (pitika) and given in weakness.
- Kuchia fish (*Monopterus cuchia*) is given in cases of weakness and blood deficiency (anaemia)

[10] Father’s sister is called Pehi in the area
[11] Pehi’s husband is called Peha
[12] Keha is the characteristic taste of gooseberry

- Kokila fish (*Xenontodon cancila*) is used to treat the pain in joints. This fish has an elongated mouth with sharp teeth like dentine structures. Lookwise it resembles a gharial (*Gavialis gangeticus*), small though. The head part with the dentine structure is dried and stored. In case of joint pains, swelling in the joints, the Kokila fish teeth are used to pin externally over the pain location. This is believed to reduce pain.
- In case of malnourished children, soup of the live fishes is given – Live fishes include – Singhi (*Heteropneustes fossilis*), Magur (*Clarias batrachus*), Kuchia (*Monopterus cuchia*)
- If children has a tendency of peeing on the bed, then 'Patimutura'/ 'Panimutura' fish (*Glossogobius giuris*) is given
- Many communities believe that Shidol, a fermented fish preparation increases resistance against Malaria.

4.5.7. Fish and Superstition

Many superstitious beliefs related fishes were also observed during the study. These include the following -

- *Jaal moni* (load of a fishing net) is hung with a black thread in the waist of a child. It is believed to protect the child from ghosts
- Rabha communities living in the Boko areas believe that if someone can steal the metal load of a fishing net (jaalor guli), then s/he gets more fish.
- Among the Rabhas, there is a practice of giving burnt *Goroi Fish* to bride and groom before the marriage. They believe that if the bride and groom eat burnt and smashed (Pitika) Goroi fish, then no one can do any black magic on them and ghost can't attack them.
- Fishermen in the area take old torn fishing net and Bogori kata (thorn of *Ziziphus jujuba*) and hung on the door so that *bhoot* (Ghost) can't enter the house
- Fish bone is worn in waist as a protection against devil eyes.
- Birendranath Dutta, 1999 reported that **Ghorapak** (a fish loving spirit) usually attack fishermen and cause fever, delirium etc

- Bodos use ‘Koroti mantra’ for curing various diseases. One of the Karoti mantra is ‘**Matsya Koroti**’
- They also believe that menstruating women must not touch any kind of fishing gear.

4.5.8. Fish and name of places:

It has been observed during this study that there are many places in Goalpara, Kamrup and Kamrup metro districts that have been named after different species of fishes. This indicates the intricate relationship of people with fishes. Some of these names are interestingly quite wide spread and were found even in many other districts of Assam and even in Bangladesh. Following place names could be recorded that are named after a fish -

- Aarimara
- Borlimari
- Borolia
- Chitalmari
- Goroimara
- Goroimari
- Jaluwa para
- Kandulimari
- Kaoimari
- Katlamara
- Keot chuba
- Keot kuchi

Fig: 4.5.9: Puthimari college

- Keotpara
- Kholsamari
- Kortimari
- Machkhowa
- Magurmara
- Nodiyal para
- Puthimari
- Rowmari
- Salmara
- Singhimari
- Solmara
- Solmari
- Tingirar chowk

Fig: 4.5.10: Signboard at Solmari, Goalpara
