FISHING TECHNOLOGIES AND ASSOCIATED CULTURE OF COMMUNITIES IN SOUTH-WESTERN ASSAM

By

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A THESIS
SUBMITTED
IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN NORTH EAST INDIA STUDIES

TO

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AIRPORT ROAD, AZARA
GUWAHATI-781 017
ASSAM-INDIA
SEPTEMBER 2019

CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

Findings of the study are summarised and discussed below that are arranged according to the five objectives of the study. Based on the findings, recommendations have been put forwarded along with the discussions.

5.1.WATER SPREAD AREA

5.1.1. Discussion:

The total water spread area in the study district is 76876 ha, which is about 10% of the total wetlands area of the state. 18.21% of the total area of Goalpara district is wetlands, which, apart from the Brahmaputra, includes – 4 major tributaries Jinari, Jinjiram, Krishnai, and Dudhnai and 3 major wetlands namely Urpad, Hasila and Kumri beels. All the four hill-streams are rain fed and are flooded during the rains. Urpad beel receives water from the catchment of Ajgar Hill, Fofonga Hill and Chandamari Pahar Kata Hill. Hasila beel receives water from the catchment of Pancharatna Hill. Kumri receives water from the catchment of Pancharatna and Paglatek hills. 10.05% of the total area of Kamrup and Kamrup Metro districts is wetlands, which, apart from the Brahmaputra, includes – 9 rivers namely Puthimari, Bornoi, Nona, Kulsi, Pagladiya, Kalajal, Digaru, Bharalu, and Kapili river and 4 beels namely Chandubi, Deepor, Sapdola, and Silshako beel. All the Southern tributaries are

rain fed and the Northern Tributaries are both rainfed and snow fed from the Himalayan Glaciers. Deepor beel receives water from the catchment of Rani hills and Assam Engineering College Hill. Chandubi received water from the catchment of the West Khasi hills.

Type of wetland influences the fish composition, fishing gears and culture of the fishing families in the following ways –

- Different types of waterbodies shelter different types of fishes.
- Hill streams offer different zones depending on the gradient, topography and velocity of water.
- Fish composition vary depending on the depth of waterbody, velocity of water, floor texture of the water body, and correspondingly types of fishing gears and methods also vary.
- Not only the fishing gears, even the types of boats used in different waterbodies by the fishermen are different depending on the nature of the waterbody.
- Different types of waterbodies also offer different bioresources. Thus, the bioresource dependence of the fringe communities also vary from waterbody type to type.
- Wetland type also influence the diurnal calendar of the fishermen and the ladies of the fishing families. Eg. Fishermen living near Brahmaputra river and large beels like Deporbeel go for fishing in the night, while the fishermen living in the smaller stream and beels fish only in the day time.
- Larger wetlands offer better plankton composition, which in turn attract diverse aquatic fauna including migratory water fowls. Waterfowl's excreta in turn fertilizes the wetlands and helps in increase in fish productivity.

All the major beels in the area, i.e. Deeporbeel, Chandubi beel, Urpad beel and Kumri Beel are elephant water-holes. Elephants uproot the aquatic vegetation and help in oxygenation of the waterbody. Many wetlands in the study area are facing serious conservation problems, including encroachment, pollution, siltation, poisoning, electric fishing etc. Due to massive deforestation in the upper reaches in the Garo Hills in the South and Bhutan in the North, all the hill streams now-a-days witness flash flood during the rains. Due to deforestation, the soil on the hills have become lose and with rains, sand or red mud comes down. This sand

or red mud is raising the river bed and filling all cracks and crevices at the river floor. As a result, the breeding grounds of the torrential hill stream fishes are shrinking, and fish population is declining. Beels in this area are also gradually becoming shallow. Beels are the breeding grounds of many commercially important fishes including the major carps. Anthropogenic pressure, including pollution, encroachment, habitat fragmentation of the wetlands are also increasing.

5.1.2. Recommendations:

1. Water quality of all the major wetlands in the study area should be immediately tested by the Pollution Control Board.
2. Habitat restoration projects should be immediately initiated in Deepor beel, Urpad beel, Hasila beel, Silsako beel and Kumri beel.
3. Boundaries of all the wetlands should be immediately demarcated and all type of encroachments should be evicted.
4. Urpad beel along with the Ajgar Hill Reserve Forest should be declared as a Community Conserved Sanctuary to protect the habitat, fishes, waterfowl and the elephants.
5. Part of the River Brahmaputra should be declared as a sanctuary for fishes and a no fishing zone.
6. Further research should be done on –
    a. Bioresources dependence on the wetlands should be studied in detail
    b. Relationship between elephants, waterfowl and fish productivity should be studied

5.2.FISH DIVERSITY AND CONSERVATION

5.2.1. Discussion:

Order-wise taxonomic distribution of fishes

Total 90 species of fishes have been recorded from the study area during the study. Interestingly, 91% of the species belong to only 3 orders – Cypriniformes (45%),

Siluriformes (26%) and Perciformes (20%). The following table 5.1 and Fig 5.1. summarises the order-wise distribution of the 90 species found during the study –

Table: 5.1: Orderwise distribution of the fish species identified

Order	Code	No. of species	Percentage
Osteoglossiformes	OST	2	2%
Anguilliformes	ANG	1	1%
Clupeiformes	CLU	3	3%
Cypriniformes	CYP	40	45%
Siluriformes	SIL	23	26%
Beloniformes	BEL	1	1%
Synbranchiformes	SYN	1	1%
Perciformes	PER	18	20%
Tetraodontiformes	TET	1	1%

This data can be graphically presented as below -

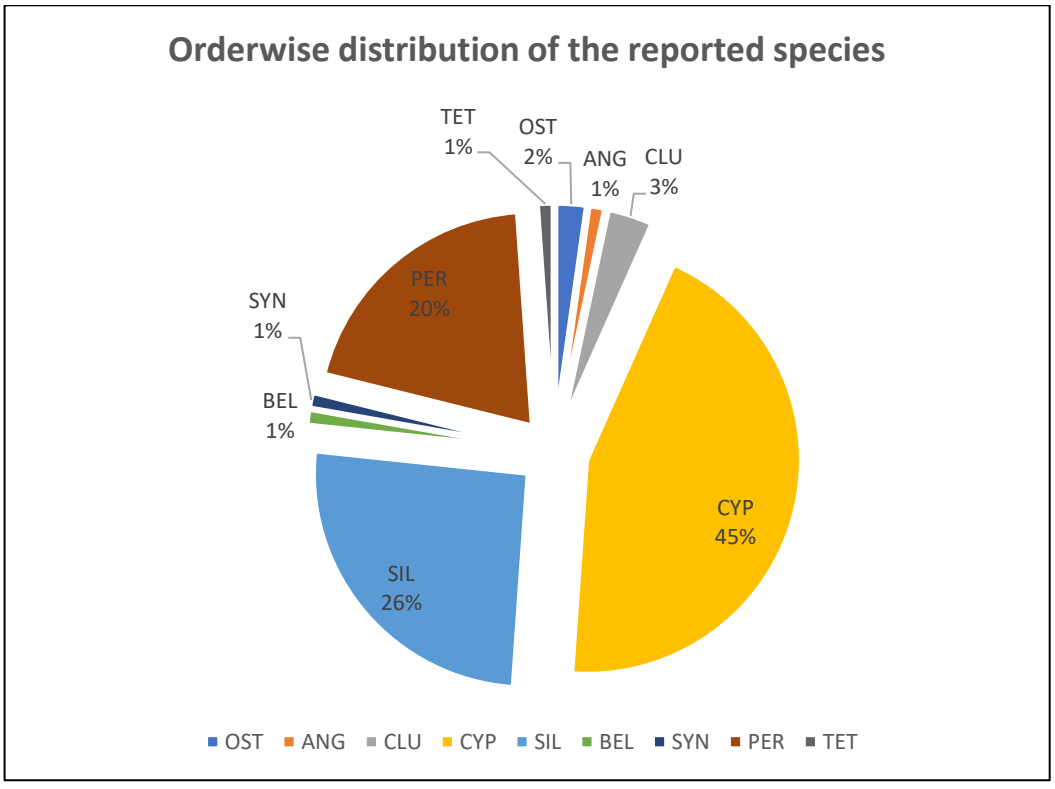

Fig: 5.1: Orderwise distribution of the fish species identified

Commercial value of fishes

If we look at the commercial values of the fishes, out of the 90 species recorded, 28 species are major food species, 30 species are minor food species, 25 species can be sold both as minor food species and decorative species, 4 species have only decorative value and they are not sold as food fish, and 2 major food species are also used as decorative species. There is only one species that has no commercial value. For planning any development programme for the fishing communities, these commercial values should be kept in mind. If proper investment can be done in the propagation of the high value fishes, it will give better economic return. On the other hand, from biodiversity point of view, some projects should be initiated to conserve the economically less important species.

Commercial values of the fishes can be summarized in the following table 5.2 and Fig 5.2 -

Table 5.2: Commercial value summary

Non commercial	**1**
Major food	**28**
Decorative	**4**
Minor food	**30**
Major food cum decorative	**2**
Minor food cum decorative	**25**

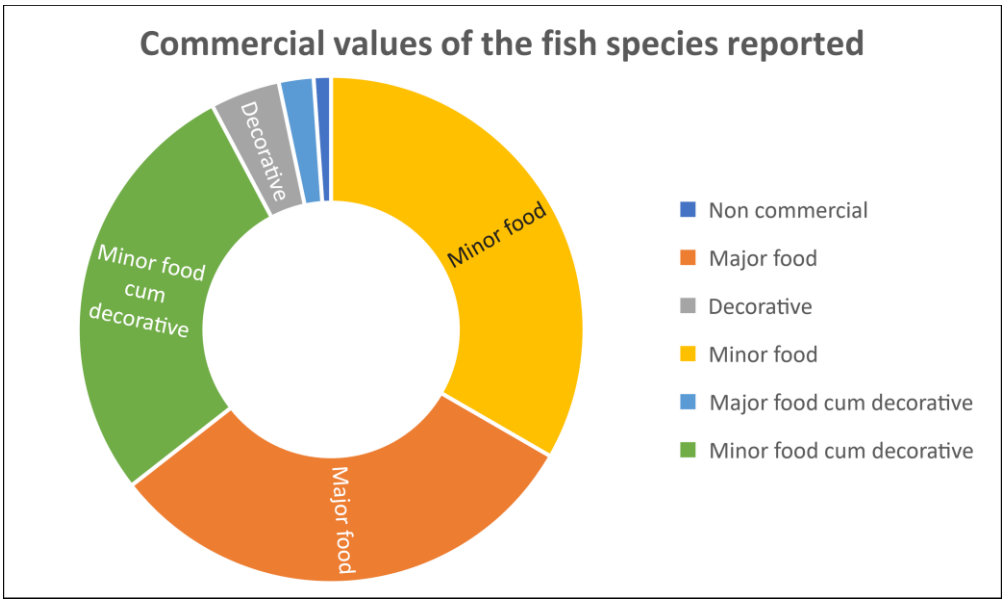

Fig: 5.2: Commercial values of the fish species reported

Species in culture fishery

Culture fishery is gradually picking up in the area at commercial scale. Traditionally this area was not a major culture fishery zone. Fresh water fishery was mostly confined to capture fishery in Brahmaputra, its tributaries and beels. Rivers and large beels under Fishery Department are leased out. People used to have community ponds and household ponds, but fish rearing was mostly done for household consumption or consumption within the village. Fish culture for large scale commercial exploitation has picked up in the past two decades. 30 fishermen who are engaged in culture fishery of different species were interviewed and their preference of species for culture was studied. According to them, the preference of the species depends on the following factors –

1. Market price it fetches per kilogram of fish
2. Market demand for the fish
3. Growth time taken till it attains the marketable size
4. Virulence – whether the fish is susceptible to diseases or draught
5. Type of pond required – eg. Cuchia farming requires a specific type of well like cemented tank with mud in it.
6. Type of food needed. Eg. If the fishermen have banana farm, they prefer to grow grass carp, as banana leaves are freely available. If there are slaughter houses nearby, they prefer to grow Magur.
7. Return to investment in monetary terms (input-output ratio)

Following are the most popular species used for culture fishery according to the survey –

1. *Labeo rohita*
2. *Gibelion catla*
3. *Cirrhinus mrigala*
4. *Cyprinus carpio*
5. *Ctenopharyngodon idella*
6. *Hypophthalmichthys molitrix*
7. *Labeo bata*
8. *Labeo gonius*
9. *Clarias batrachus*

10. Heteropneustes fossilis

11. Monopterus cuchia

12. Chitala chitala

Some fishermen have recently started growing Kawoi (*Anabas testudineus*). But, it's commercial viability in the area is still not established.

The preference of fish species for culture has been analyses in the following radar graph–

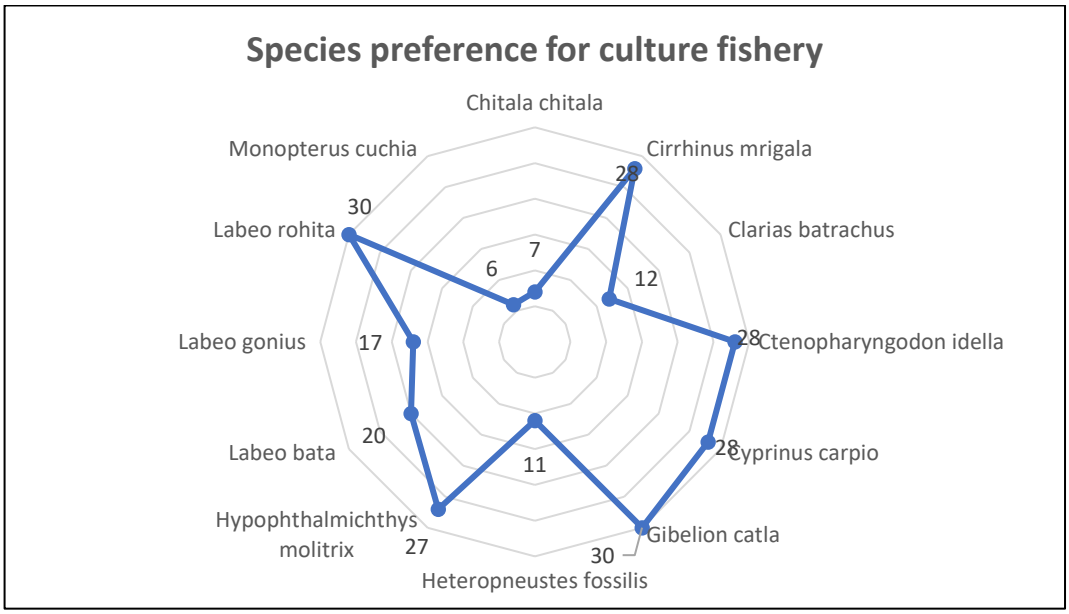

Fig: 5.3: Species preference of the fish culturist for culture fishery

Eco-hatchery: A paradigm shift in fishery

Quality and authenticity of fish seed was a major challenge for culture fishery in the area. Some youth in the study area in the recent years have started eco-hatcheries to produce high quality fish seed. They now produce pure seeds by pituitary hypophysation and using Chinese eco-hatchery.

Threat perception:

Perceived threats to the locally available fish species was recorded through an interview of key respondents. The interview tried to find out the types of threats and which are the most threatened fish in the area.

Following are the perceived threats to fishery in the area –

1. Overfishing and use of detrimental gears and methods for fishing:
    a. Nets with small mesh size
    b. Captuing of brood fishes
    c. Use of fish poison
    d. Use of Explosives
    e. Electrocution
2. Water pollution
3. Habitat destruction and change of land use
4. Invasive species
5. Climate Change

Threat perception of the respondents about the most threatened species were analysed, and findings for the top 10 species are tabulated in Table 5.3 below –

Table: 5.3: Perception of people about most threatened fishes

Fish species	**No. of respondents ranked it at high priority**
Anguilla bengalensis	281
Aspidoparia morar	234
Botia Dario	294
Chitala chitala	267
Cirrhinus reba	220
Nandus nandus	290
Puntius sarana	253
Rita rita	224
Salmophasia bacaila	208
Tetraodon cutcutia	246

The findings were plotted on a web diagram that is presented below -

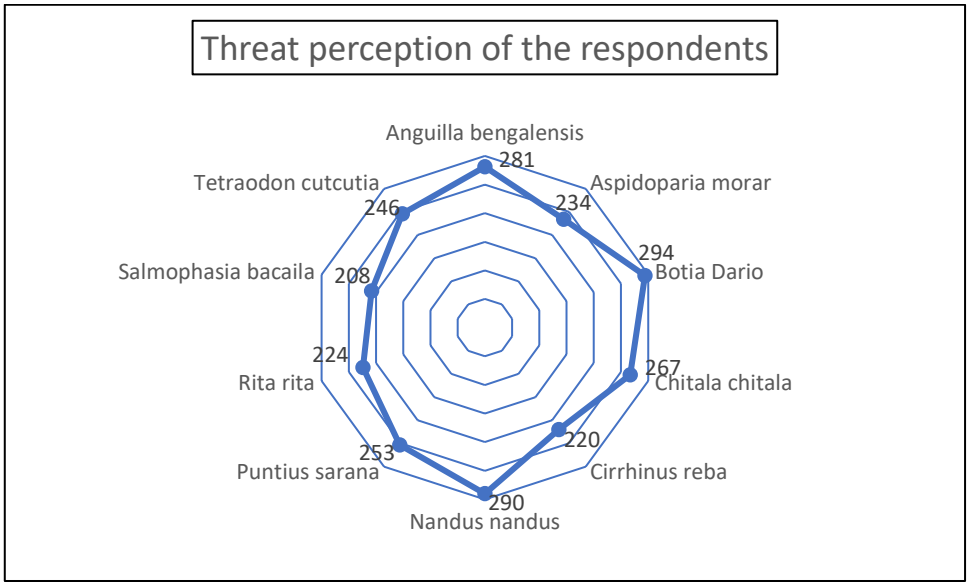

Fig: 5.4: Perception of people about most threatened fishes

5.2.2. Recommendations:

1. Adequate training and subsidy should be given to promote culture fishery in the area.
2. Eco-hatcheries should be promoted to get healthy and pure breed fishes.
3. As of now, the culture fishery is only focusing the major food fishes. But, looking at the availability of diverse decorative fishes, appropriate projects to conserve and promote decorative fishes should be taken up.
4. While taking up the culture fishery projects, species preference of the fishermen should be given due importance.
5. Culture of exotic invasive species like Thai magur, Tilapia etc. should be completely banned.
6. Further land use change in the wetlands areas should be checked and all encroachments on the banks of rivers and wetlands should evicted.
7. Projects should be taken up to produce more fish seed of indigenous species and release these seed in natural waterbodies
8. Waste water treatment should be made legally compulsory for all industries. Even the city municipal drainage should be treated before releasing to any waterbody.
9. Further in-depth research study should be done on –

    a. Threats to fishes in the area
    b. Impact of climate change on fish fauna

5.3.FISHING GEARS

5.3.1. Discussion:

The following table 5.4. summarizes all the gears and gearless fishing methods found during the study –

Table 5.4: Fishing gears and gearless fishing methods

Name of the traditional methods/ gears	Type of water body where used	Type of fish caught by the gear	Fabrication materials	Use in commercial fishing
5.1.1. Impaling gears				
1. Jaathi / Kosh (Spear)	Shallow water	Medium to large fishes	Iron spear, bamboo shaft, iron ring, old polythene bags, lac, M-seal	No
2. Jakra	Shallow water	Small fishes	Thin iron spokes, bamboo shaft, iron ring, old polythene bags, lac, M-seal	No
3. Pocha	Shallow to mid depth water	Medium to large fishes	Thick iron spokes, bamboo shaft, iron ring, old polythene bags, lac, M-seal	Occasionally
4. Dhanu-kar (Bow and Arrow)	Streams	Medium, large fishes	Bamboo, iron head of the arrow	No
5. Daao (Jora kata) (Sword)	Shallow, water logged fields	Medium size fishes	Metal daao with a wooden handle	No
6. Jong (kuchia fishing rod)	Banks of the wetlands	Kuchia fish living in digs under soil	A long pointed iron rod fitted with a wooden handle	Occasionally
5.1.2. Hook and line				
7. Sip Boroshi (Simple hand line)	Any type of water body	Fishes that eat bait	Metal hook, nylon thread, thin bamboo stick, cork floats	No
8. Doliowa boroshi (Pole lines)	Beels, Small rivers	Fishes that eat bait	Metal hook, nylon thread, thick bamboo pole, cork floats	Yes
9. Dol boroshi (Long line)	Beels, Small rivers	Fishes that eat bait	Metal hooks, nylon threads	Yes
10. Hazari boroshi (Long lines)	Beels, Small rivers	Medium to large fishes	Metal hooks, nylon threads	Yes
5.1.3. Traps, Maze and Barricade				
11. Khoka/ Thoha / Sorha	Small stream, water logged field	Small hill stream fishes	Bamboo, cane/ plastic wire	No
12. Chunga	Shallow water	Mostly Singhi and Magur	Bamboo	Occasional
13. Katal	Beel	Fishes that can survive in low oxygen and that hide under aquatic vegetation	Bamoo pole, jute ropes and nylon nets	Yes

14. Bana	Shallow water, pond, beels	All types of shallow water fishes	Bamboo, nylon threads	Yes
15. Sepa (Pot gear)	Small streams, water logged fields	Small fishes	Bamboo, cane/ plastic wire	Occasionally
16. Duimukhia sepa (Double entrance pot gear)	Small streams, water logged fields	Small fishes	Bamboo, cane/ plastic wire	Occasionally
17. Dingora/ Dingori	Streams, beels, water logged fields	Small and medium fishes	Bamboo, cane/ plastic wire	Occasionally
18. Baagha	Streams, beels, water logged fields	Small and medium fishes	Bamboo and cane/ plastic wire	Occasionally
19. Juluki/ Jurkha	Water logged fields	Small fishes	Bamboo, plastic rope,	No
20. Kharbandh	At the confluence of Deeporbeel and Khanajan canal	Small and medium fishes	Bamboo, nylon threads	Yes
21. Trap net	Streams	All types of fishes	Nylon nets, bamboo poles	Yes
5.1.4. Entangling gears				
22. Laangijaal – (Two types – Puthilaangi and Koi laangi)	Streams, wetlands, ponds, water logged fields	Small fishes	Nylon threads, earthen load/ lead load	Yes
23. Fasi jaal	Streams, beels	Medium to large fishes	Nylon threads, earthen load/ lead load	Yes
5.1.5. Encircling gears				
24. Aacharajaal/ Khewalijaal (Cast net)	Streams, beels, ponds where the net can reach the bottom	All types of fishes	Nylon thread, lead loads, jute rope	Yes
25. Polo (Pot gear)	Shallow water body, beels, ponds, water logged fields	Medium (mostly *Channa spp, Puntius spp and Trichogaster spp*)	Bamboo, cane/ plastic wire	Occasionally
26. Clap net	Brahmaputra river	Special net for Ilish fish (*Hilsa ilisha*)	Nylon net tied to Bamboo	Yes
27. Berjaal / Mahajaal/ Bor jaal	Streams, large wetlands (It is used to drive the fishes and encircle them)	All types of fish	Nylon net, rubber float, iron beads/ stone	Yes
5.1.6. Scooping gears				
28. Dhekijaal (Chinese dip net)	River, streams, beels	All types	Nylon thread, bamboo, jute rope	Yes
29. Haatjaal/ Jaatijaal (Folding dip net)	Streams, beels, ponds, swamps, water logged fields	Small and medium sized	Nylon thread, bamboo, jute rope	No
30. Porongijaal (Dip net)	Streams, wetlands, ponds, water logged fields	Small fishes	Nylon threads, bamboo, jute rope	Occasional

31. Jakoi	Shallow water, beels, ponds,	Small	Bamboo, cane/ plastic wire	No
32. Ghoka jaal / Henga	Beels	Small and medium	Bamboo poles, nylon net	Yes
33. Chaloni (Sieve)	Water logged fields, dovas, ponds	Small fishes	Bamboo, cane/ plastic/iron wire	No
5.1.7. Storage gear				
34. Khaloi	All type of water body (It is used to store caught fish)	Small and medium	Bamboo	Yes
5.1.8. Dewatering gear				
35. Shiyoni / Dolonga	Water logged fields, small beels, marshes	Small and medium	Bamboo, tin	Occassional
5.1.9. Fishing without gears				
1. Hand picking	Water logged fields, dovas, ponds	Small and medium fishes	-	No
2. Dragging of aquatic vegetation	Marshes, Swamps, Peatlands	Small and medium fishes	-	No
3. Beating the waterbody	Beels, Marshes, Swamps, Peatlands	Small and medium fishes	-	In combination with other gears
4. Dewatering	Shallow water bodies	Small and medium fishes	-	Occasionally
5. Sedatives	Hill streams	Small hill stream fishes	-	No
6. Fish poison	Any type of waterbody	All type of fish	-	Yes
7. Explosives	Hill streams	Small and medium fishes	-	Yes
8. Electrocution	Hill streams	Medium hill stream fishes	-	Yes

Some of the critical observations are –

1. Many of the traditional fishing methods and gears are gradually put to disuse.
2. On the other hand, detrimental fishing gears and methods like poisoning, electrocution, mosquito net fishing etc are increasing day by day.
3. The leasing system of the beels have been changed. Earlier long-term lease was given and the lessee tried to conserve the waterbody because they had a long term stake on the waterbody. But, with the introduction of the short-term lease system, lessee feels less encouraged to conserve the water body. Rather their focus has shifted to profit maximization in short duration.

5.3.2. Recommendations:

1. Assam Fisheries rule should be strictly enforced so that fries and fingerlings during the breeding season can be conserved
2. Assam Fisheries rule should be amended to impose a complete ban on poisoning, electrocution and use of mosquito nets in all type of water bodies in all seasons and heavy penalty for violation should be imposed
3. Traditional gears and traditional conservation methods like protection of brood fishes etc should be promoted
4. Further studies should be done to test the efficacy of each gear vis-à-vis the modern culture fishery.

5.4.FISHING COMMUNITIES

5.4.1. Discussion:

Noteworthy that fishing is not considered an untouchable profession like many parts of the mainland India. 12 communities living in the area have been found to be involved in different fishing activities including commercial fishing, artisanal fishing, making of fishing gears, selling of fish, and fish processing.

Nature of involvement of communities in fishing activities:

The nature and degree of involvement of all the twelve communities in fish related activities were found to be not the same. The following questions were asked –

Responses received from the 384 respondents and from key informants are summarized in the following table –

Table: 5.5: Involvement of communities in fishing activities

Community engaged in fishing	For own consumption	Commercial fishing	Women in fishing/ fish selling	Makes fishing gears
The Bodos	+	-	+	+
The Garos	+	-	+	-
The Hajongs	+	-	+	+
The Kaibartas (Assamese speaking)	+	+	+	+
The Kaibartas (Bengali speaking)	+	+	+	+
The Kalitas	+	-	-	-
The Karbis	+	+	+	+
The Koch Rajbongshi	+	-	+	+
The Naths	+	-	-	-
The Rabhas	+	-	+	+
The Riparian Muslims	+	+	-	+
The Sutradhar	+	-	+	-

A comparative analysis of the women of Kaibarta community and their role in family management in Deepor beel and Urpad beel areas was done during the survey. According to the respondents, following are the tasks where they invest majority of their time –

1. Nurturing of children
2. Children's education
3. Household works
4. Act as social contact point (as the Husband has no time)
5. Act as a secondary earner of the family
6. Support to husband's profession

They were asked to budget the time of their diurnal calendar and then it was converted to a percentage score. The analysis of this data gave the following comparative table for the ladies of the Deepor beel region and Urpad beel region –

Table: 5.6: Womens' time distribution in Deepor and Urpad beel areas

Activities	Percentage of time given in the diurnal calendar	
	Deepor beel area	Urpad beel area
Nurturing children	20	18
Children's education	20	10
Household works	25	30
Social contact point	15	15
Secondary earner	8	17
Support to husband's profession	12	10
	100	100

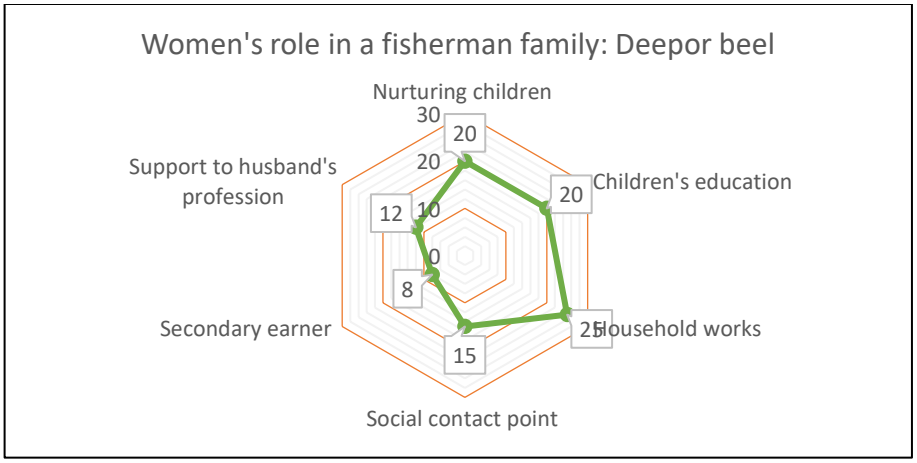

Fig: 5.5: Web diagram of women's time distribution (Deeporbeel area)

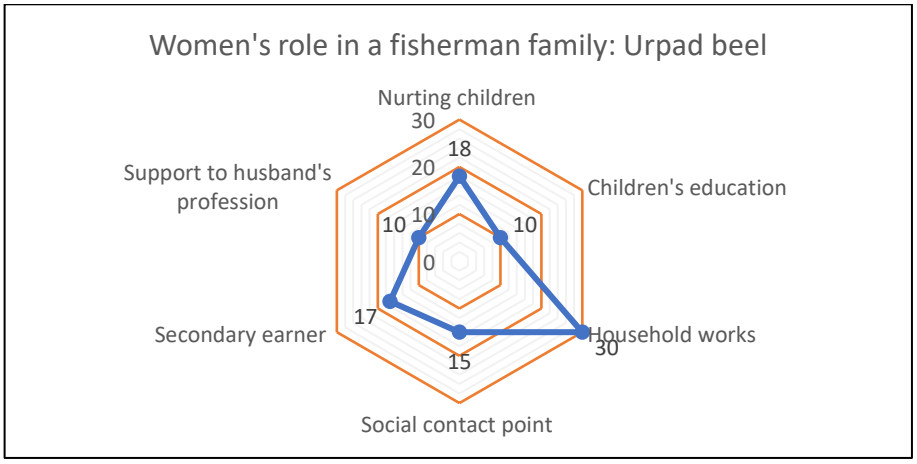

Fig: 5.6: Web diagram of women's time distribution (Urpadbeel area)

Comparison of the above two graphs shows that there is a marked difference in the time allotment by the ladies in their different responsibilities in absence of their husband. Following can be inferred from this comparison –

1. Women in both the areas give almost equal time and importance to nurturing of children.
2. Women in Deepor beel area give more time and importance to Children's education. This is partially influenced by the fact that Deepor beel is urbanized and educational facilities are available. Also, in Deepor area, many mothers go to drop their children, whereas most children in Urpad area travel to school alone. This indicates that there is a better sense of security in Urpad area.

3. Household works are almost similar in both the areas. But, in Urpad areas most families keep domestic animal like cow. This takes some extra time.
4. In both areas, women have to give same amount of time for maintaining social contacts. Paying social visits, attending marriage and other functions etc are similar in both areas.
5. Women in Urpad area have better engagement in secondary income sources like weaving, poultry rearing, duck rearing etc.
6. Women in both areas also support their husband in their professional tasks, i.e. drying of fishing nets, selling of fish etc.

5.4.2. Recommendations:

1. Fishery promotion schemes should be introduced to give economic support to communities engaged in fishing activities traditionally.
2. Fishermen cooperative movement should be spread in the area in a planned way to include all fishing household belonging to any tribe or caste.
3. The Assam Fisheries Rule should be amended to give benefits to fishing households belonging to communities other than the ones listed as traditional fishermen in the Rules. Irrespective of their caste and tribe, if some household is interested in establishing or engaging in fishing, should be given all benefits.

5.5.FISH INGRAINED IN CULTURE

5.5.1. Discussion:

Traditional cuisines:

Out of the 11 traditional cuisines recorded from the study area, six are believed to be typical traditional Assamese cuisine, although the origin of these cuisines couldn't be traced. These are also commercialized as authentic Assamese cuisines by the restaurants. These include –

1. Machor tenga
2. Machor muror khaar
3. Soru machor khaar
4. Machor Bor

5. Kaldilere soru mach
6. Shakere soru mach

Two cuisines have been adapted from typical tribal cuisine. These are –

1. Paatot diya mach
2. Mach pora

Three cuisines are influenced by the Bengali dishes. These include –

1. Bhapot diya Ilish
2. Kosu paatere machor mur
3. Machor muri ghonto

Dry Fish: A Tradition of Fish Preservation

It has been found during the study that the communities living in the study area prepares four types of dry fishes – Sun-dried, Smoked, Salted and Shidal. 62 different species of fishes are used to prepare dry-fish preparations. The dry fish prepared in the area have not been properly commercially marketed.

Fish and Religion

Fish has influenced religious belief in the area in many ways. Most of these influences are found in Hindu religion. In Matsya Avatara of Vishnu, the deity is half fish and half human. Ganga Puja is worshiping of the Goddess of the water. Fishing communities begin the first fishing of the season after offering puja to goddess Ganga. Unlike other Hindu festivals this puja is not organized at a fixed universal Tithi. Different communities organize it at different times as per the local customs.

Another puja associated with fishing communities is the Manasa Puja / Maroi Puja / Padma puja. It is the worshiping of Snake Goddess. Because many fishermen while going to fishing gets snake bite, they worship Manasa. In many Hindu pujas fish (mostly a black fish symbolising the Evil forces) is sacrificed. This type of pujas include Manasa puja, Bhadra and Kali puja.

Baat puja in Deepor beel area is celebrated in which a milk dessert is prepared and offered to Goddess Kali and to the Deepor beel wetland. Communities do it as a conservation practice as they believe that this kheer increases the productivity of the beel.

Rabhas celebrate Baykho puja in which two fishing gears Jakoi and Khaloi are worshiped.

Fish is an integral part of a traditional Assamese family living in the study area. Fish is needed in Annaprasanna, marriage, Matsya sparsa and all important celebrations of Hindus as well as Muslims in the areas.

Fish is also embedded in the folklore – in Bihu songs, Goalpariya folk song, Kartik puja song, Maroi puja song, Krishna bandana songs, Lakshmi puja songs, Malita songs, Biya naam (Marriage songs) Beula Lakhindar songs, Moh kheda songs. Fish is also embedded in Assamese nursery rhymes, stories, proverbs, performing arts, and motifs. There are specific songs in Goalpara and Kamrup districts that are sung during fishing by the fishermen. Fish scales are used for making crafts. There are many places in these three districts that are named after fishes. Fish is used in traditional medicines. Some of the superstitions also include

5.5.2. Recommendations:

1. Proper packaging and marketing of the traditional dry fish of the region should be done through commercial branding.
2. A detailed documentation book covering all aspects of fish and its association with different communities in South Western Assam should be compiled.
3. Use of fishes in traditional medicines by the communities should be scientifically studied and verified.
4. A detailed scientific study should be done on the traditional fish cuisines with details of their nutritional values.
