

CHAPTER-3

MATERIALS AND METHODS

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PLAN OF STUDY:-

The work plan for the present investigation was designed to analyse the present status of Patkai wetland near Tikak Open cast mine, Margherita. The work plan describes as follows-

- i) 15 wetlands of potential significance of Margherita sub-division were surveyed.
- ii) Out of 15 potential wetlands two water bodies were selected. Patkai lake near Tikak open cast mine, Margherita was selected as experimental water body.
- iii) As a control or reference water body Mota beel of Margherita was selected .
- iv) Hydrological investigation was carried out in these wetlands.
- v) To study physico-chemical characteristics of water 22 variables were considered namely pH, Water temperature, Turbidity, Total Hardness, Dissolved oxygen, Free CO², TDS, Alkalinity, Residual chlorine, Sulphates, Chlorides and certain elements namely Mg, Ca, Fe, Co, Cu, Mn, As, Hg, Ni, Zn and Pb.
- vi) About 14 different variables were considered to study the sediment soil characteristics that includes pH, Organic matter, Available Nitrogen, Available Phosphorus and some elements like Fe, Co, Cu, Mn, As, Hg, Pb and Cr.

- vii) Plankton diversity was studied. Both phytoplankton and zooplankton were recorded.
- viii) Fish diversity was studied during the study period and compared with Mota beel.
- ix) Various Diversity indices were calculated for plankton and fish diversity.
- x) Due to presence of heavy metal which was detected in the experimental water body after preliminary investigation further ultra structural analysis was carried out on selected fish specimen, *Clarias batrachus* (Linn.) through Electron Microscopy.
- xi) Both TEM and SEM was carried out in some target tissue of the fish namely gill, liver and kidney to observe ultra structural details.
- xii) All the ultra structural alterations were showed with the help of photomicrographs.
- xiii) All the data were analyzed statistically using standard software. Data were represented in Tables, graphs.
- xiv) The present status of the Patkai lake was presented on the basis of above details and recommendations were made for its potential use and conservation.

SURVEY OF WETLAND IN MARGHERITA SUB-DIVISION

According to the Directorate of Fisheries of Assam (1997-98) there are 1,196 beels in Assam, of which 430 are registered while the remaining 766 are unregistered.

The areas covered by registered and unregistered beels are 60,250.24 and

40,603.37 hectares respectively. The total number of wetlands according to the typology at the state level shows that the most abundant type is waterlogged wetlands followed by oxbow lakes (Deka and Goswami,1992).

Tinsukia to which the Makum coal field belongs is endowed with 190 hectare of low lying area and 3845 hectare of beel fisheries (42 numbers) and swamps. In spite of these productive areas, there exist a huge gap between demand and supply of aqua –produce items for which a good amount of money has been flow out of the district for importing such consumables. Extensive swamps may be reclaimed through dewatering. Eradication of weeds and construction of dykes, turfing and provision of sluice gate, deeply silted swamps even though more expensive to reclaim are productive and can be taken for long-term basis for culturable practice (Source: Fishery Office, Margherita Development Block).

Hence , attention has been mainly drawn to see the fish diversity in the potential water bodies of Margherita , the sub –division of Tinsukia district which is selected as our study area . About 15 numbers of beels of potential significance are surveyed and the area, location and present status (general) was tabulated in Table:1. Out of these Patkaj lake present near the Tikak OCM was selected as experimental water body and detailed study of hydro-chemistry , aquatic bio-diversity was compared with the control water body, Mota beel to see its present status.

SITE SELECTION

SITE 1: PATKAI LAKE (Experimental Water body)

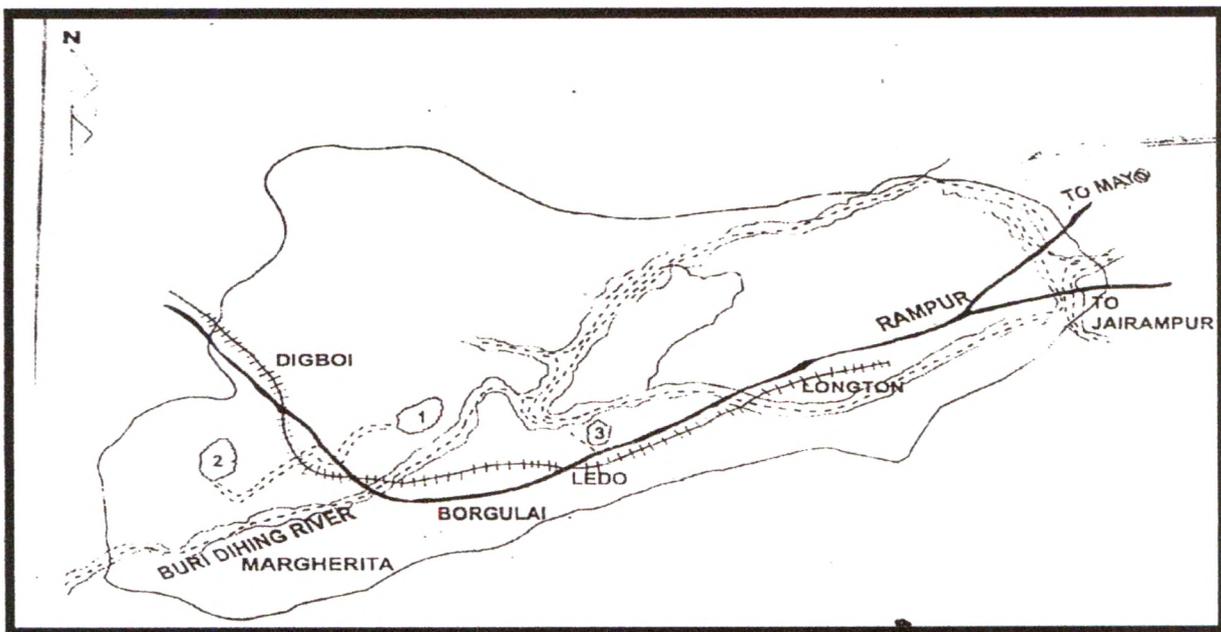
It is situated at Ledo near the Tikak OCP covering an area of 2.9 ha including plantation area of about 48,000m². It is about 5 kilometers away from the Margherita town. The average depth of the lake is about 10 feet; pH- 5.3-6.1 .It is a potential water resource as it is utilized by the local community for various purposes like drinking, bathing, washing, fishing, portable water etc.

The Patkai Lake is an artificial lake. It was previously a mining quarry which in due course of time converted to a natural water reservoir. On the basis of its geographical area and characteristic feature it is regarded as lake or beel. As it is in the belt of Patkai Hill so, it is named as Patkai Lake.

The quarry is formed before 1980. At present scenario it is a natural wetland with luxuriant growth of vegetation and harbours typical aquatic biodiversity comprising fish, prawn, frog and other animal. The lake is also visited by deers and uds which come during winter season from the forest of Patrkai belt (Source: Personal communication with Dr. Ranjit Dutta, Manager, NECFLtd. Margherita).

The landscape of Tikak hill under the Patkai range of Eastern Himalayan has been extensively disturbed in recent decades. Out of a number of factors of these disturbances, the Open Cast Project (OCP) of coal mining is the most prominent one that has been demolishing a vast area of this mega diversity hot spot since 1981. Restorative measures have been taken by the concerned authority, but

MARGHERITA DEVELOPMENT BLOCK



3 – PATKAI POND 2 – MOTA BEEL

MAP 2- STUDY AREA SHOWING THE SELECTED WATER BODIES

(Source: Margherita Development Block)

these are not enough. Numbers of projects has been implemented to recover the situation but these have been proved to be poor due to lack of adequate knowledge (Barpujari *et al.*, 2002)

SITE 2: MOTA BEEL, MARGHERITA (Control water body)

The Mota beel has an area of about 68.5 hectare. It is situated at the distance of 6 km from Margherita town. The beel is slightly curved-shaped. In the eastern side, the village Tenga Pather and Makum Killa, in the west side , the village Barua Gaon and Proja basti, in the north side- the Dibong reserve and in the south side PWD Road from Margherita towards Tinsukia are situated .

The beel is connected with the river Dehing through a small channel. The beel represents as a suitable fishery beel harbours different species of the fishes which are traditionally captured by the local people for their daily earning source. The soil of the beel is clay-loamy. The beel become heavily silted year after year. The average depth of the beel is about 2.5 m .

The total population of surrounding beel area is around 8000 nos. The main occupational and earning source is from agriculture and allied activities.

MATERIAL(FISH)

***Clarias batrachus* (Linn.) Magur**

In the present investigation *Clarias batrachus* (Linnaeus) locally known as “magur” was selected as the experimental species as it is easily available throughout the year and for the great capacity to survive in the laboratory condition. It is a fresh-

water teleost characterized by the presence of accessory respiratory organ, a bottom-dweller with hetero-omnivorous food habit. *Clarias batrachus*, which is a common fish species widely distributed in the wetlands, freshwater ponds and tanks. These are common in distribution in the plains of North Eastern India. It is considered to be delicious fish so it is in great demand and fetches more price than carps. Now-a-days it is widely used as experimental fish for biological studies on pituitary hormones and other scientific research activities (Shukla and Upadhaya, 1998).

The Systematic Position of *Clarias batrachus*

(Followed after Talwar and Jhingran, 1991)

Phylum---*Chordata*

Sub-Phylum---*Craniata*

Division---*Gnathostomata*

Super Class---*Pisces*

Class---*Teleostomi*

Sub-Class---*Actinopterygii*

Order---*Cypriniformes*

Family---*Clariidae*

Type--- *Clarias batrachus* (Linnaeus)

GENERAL MORPHOLOGY

The body of *Clarias batrachus* is elongated with laterally compressed head. The body colour is uniformly reddish-brown or greyish black. It may attain a maximum length of 45 cm. The mouth is terminal and occipital processes are angular and narrow. It has four pairs of barbels, maxillary extends beyond base of pectoral fin. Pectoral spines are strong and serrated. Dorsal fin is long-based, anal fin is also long based; occasionally they may be confluent with caudal (Srivastava, 1999).

Fin Formula : D₆₅₋₇₀; P_{1/8}; V₆; A₄₇; C₁₇; B (Shukla and Upadhaya, 1998)

METHODOLOGY: Detailed methodology for individual study was indicated in each chapter.

TABLE 1: WETLANDS OF MARGHERITA SUB-DIVISION

SI No	Name of the wetland	Area	Location	Condition
1	Rampur beel	22.5 ha	Rampur/ Jagun	Flood affected
2	Parbatipur	5.8 ha	Parbatipur/ jagun	-DO-
3	Udoipur	12.9 ha	Udoipur/lekhapani	50% area under beel
4	Phaneng	2.0 ha	Phaneng/Jagun	-Do-
5	Panchung	2.3 ha	Panchung/kumchai	90% weed
6	Longtong	13.3 ha	Kumchai	90% weed
7	Toklong	97.5 ha	Toklong/kumchai	50% weed,50% silt
8	Kambapasa	6.0 ha	Kamba gaon/kumchai	60% weed
9	Khagori	33.8 ha	Alubari/ketetong	90% weed
10	Takery	36.5 ha	Takeri/inthem	80% fishery
11	Mota	68.5 ha	Vitor powai	40% weed, fishery
12	Maiki	42.3 ha	Vitor powai	40% weed
13	Bori	6 ha	Dibong/ketetong	95% weed
14	Manasa	2 ha	Cipe gaon/ledo	Fishery
15	Patkai	2.9 ha	Ledo	Reclaimed lake

*selected water bodies