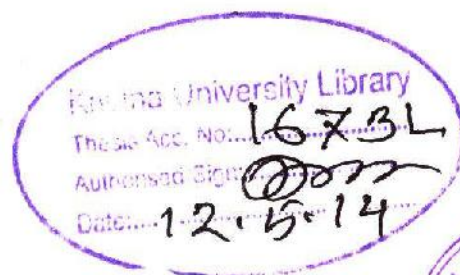


STUDY ON PRESENT FISHERIES STATUS OF CHALAN BEEL IN NATORE



BY

Md. Ibta Hazuz Zaman

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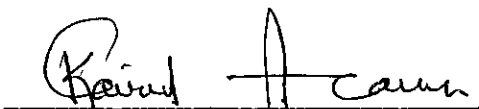
**The project thesis submitted to the Fisheries and Marine Resource
Technology Discipline in partial fulfillment of the requirements for
the Degree of
Master of Science
In
Fisheries and Marine Resource Technology**

JULY, 2003

STUDY ON PRESENT FISHERIES STATUS OF CHALAN BEEL IN NATORE

Approved as to style and content

By

A handwritten signature in black ink, appearing to read 'Khairul Azam', is written over a horizontal line.

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DECLARATION

The results in this project thesis are entirely the candidate's own investigation and no part of the results has been accepted for any degree, nor it is being concurrently submitted for any degree.

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DEDICATED
TO
MY BELOVED PARENT

ACKNOWLEDGEMENT

All glorification and indebtedness go to the supreme power, Almighty ALLAH, for being able to pursue my study and to complete the project work.

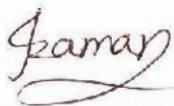
I would like to express my deepest sense of gratitude and respect to my respected supervisor, Dr. Khandaker Anisul Huq, Associate Professor of Fisheries and Marine Resource Technology Discipline, Khulna University, for his careful, sincere and systematic supervision and guidance to complete the study, otherwise it would be too tough to complete the project work within the stipulated period.

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Md. Ibta Hazuz Zaman

July 30, 2003



ABSTRACT

The study was carried out to evaluate the present fishery status of Chalan beel in Natore. It was conducted from August 2002 to July 2003 in Chalan beel floodplain. The investigation was designed with the assessment of water quality, fish species composition, fishing systems, marketing profile of the study area. There were considerable fluctuation in transparency and water depth but no considerable fluctuation in temperature, D.O. and pH. The highest water depth was found highest level 3.76 m. in August 2002 whereas the lowest level was .378 m. in April 2003. In Chalan beel, water transparency was highest 27.5 cm. in October 2002 and lowest was 12.5 cm. in June 2003. The maximum water temperature was 31.7° C in July 2003 and the minimum was 18.6° C in January 2003. The dissolved oxygen of water was recorded as highest level of 5.78 in January 2003 and lowest level was 4.48 in March 2003. The water pH was measured to be 8.4 at maximum level in August 2002 and the minimum level was 7.1 in March and April 2003. Great diversity with regard to species composition was seen. A total 84 species of fish and 3 species of shrimps were identified. A total 5 types of crafts and 37 types of fishing gear were found to be presently used in the floodplains. In the study area, the marketing channel was associated with primary market, secondary market, higher secondary market and distribution market. In the market, the fish was landed at peak level in November whereas the down season was ranged from March to April. In the preservation system, fish was iced and dried. It was observed that most of this beel had considerable coverage of paddy and therefore is dominated with a detritus food chain. The extent and length of flooding was found to govern the limno-biology of flood plains, but the habitat diversity was also important factor determining beel productivity. Chalan beel floodplain fishery is regarded as an important source of food and income for poor fishermen and farmers.

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LIST OF ABBREVIATION

BARC	Bangladesh Agricultural Research Council
BCAS	Bangladesh Center for Advanced Studies
CFSD	Center For Sustainable Development
Cm	Centimeter
DO	Dissolved Oxygen
DOF	Department of Fisheries
FCD	Flood Control and Drainage
FCDI	Flood Control Drainage and Irrigation
HYVt a	High Yielding Variety transplanted amon
IRRI	International Rice Research
Kg	Kilogram
Tem	Temperature
TFO	Thana Fisheries Officer
TFP	Third Fisheries Project

CHAPTER ONE

INTRODUCTION

1.0 INTRODUCTION

1.1 Background of the study

Bangladesh possesses a wide range of fish, prawn and turtle inhabiting in its extensive inland open water. Inland water fish and prawn resources were in the past, so plentiful that these gave rise to various local adages relating fish to the food habit and lifestyle of the Bengali people. One such adage is mache-bhate Bengali meaning "a Bengali is made up of fish and rice only." This adage implies that fish was plentiful and catch was easy and comfortable. This day of this adage is now a legend of the past. Since about the mid-nineteen fifties, scarcity of fish started becoming discernible. The inland open water capture fish production started to decline in both quantity and species diversity. In sixty decade 80% of the total production of fishes come from inland open water fishery but now it is 39% (DoF, 2002). The production of fish in 1998-1999 was decreased to 75 thousand tons (The daily Janakantha, 1999). A man needs 43.30grams protein everyday in which animal protein contributes 15g (DoF, 1995). Approximately 80% of the animal protein gets from fish flesh because of poor production high price rate of egg and meat in our country (Rubbi Et. al., 1987).

Situated in deltaic plain of the three rivers system-the Ganges, the Brahmaputra and the Meghna and many other rivers Bangladesh are very rich in inland capture fish production. The total area available for inland fisheries is 49.20 Lac hectares, with rivers comprising 10.31 Lac ha, 28.33 Lac ha floods plain and 1.14 Lac ha of beel (DoF, 2002). Chalan beel is the most reputed of the beels in the south-west region spreading over the district of Naogaon, Natore, Pabna, Sirajganj and Bogra. Some of the beels in the Chalan beel complex are Halti, Piprul, Purbamadhynagar, Sonapatila, Ghugudaha and Kuralia. The beel is situated at 24°7" to 24°35" north latitude and 89°10" to 89°35" east longitude of equator. The Chalan beel complex, according to Rashid (1991), was a sort of a lake covering an area of 109,000 ha but, by 1909, the area under water was reduced to only 8,500 ha. The water of Chalan beel was not stagnant it was flowing like river water so the name of this beel is Chalan beel. By observing the place, shape and nature it can be said that Chalan beel is the mixing area of north Bengal rivers. The vast area and dangerous nature of Chalan beel create fear to the people from the very beginning. Once

Introduction

upon a time Chalan beel was in the sea. Time to time sea has moved away and gave birth of Chalan beel. With the exception of the Lalpur thana situated on the padma, most of the Natore zilla is swampy depression, water logged and abounding in marshes, the largest of which is the chalan beel. In past, Chalan beel was in the river of Ganges and Brahmaputra. Time to time this bee has risen by deposition of silt. It was stated that Towards the east the marshes increase in number and size until they marge in the great Chalan on the district boundary. Chalan beel is in fact a great reservoir for the surplus water supply of the whole surrounding country. It has open connections with the river the water courses, which here lose their identity and during the rain it swells till it covers a total area of about 120 sq. miles.

The rivers Atrai, Boral, Nandakuja, Gumani, Beshani, Vadrabati, Karatoa are passed through the Chalan beel. Now Nandakuja and Gumani rivers are flowing by the northern side of Gurudaspur, Chachkoir and Kachikata divided Chalan beel into two parts. The northern side of Chalan beel is made up by the north side of Gurudaspur, Shingra, Taras, Raigang thana and five unions of Ullapara. Southern side of Chalan beel is made up Chaumohor, Baraigram thanas and south side of Gurudaspur. (Hamid, 1967).

But now Chalan beel is not only a water area but also a resource of people. Moreover, some historical spots are spread here. Time to time Chalan beel is now vanishing by siltation and also its history is faded away. Many villages are established on newly arisen island. In Natore fishes of Chalan beel portion are used to be caught practically by most of the people, particularly those living in rural areas. A large number of fish and prawn could be caught by men, women and children at their door steps during the monsoon season. In dry season many types of paddy like Irri, Amon, Boro etc. are planted. So Chalan beel is very important to the villagers for fish, agriculture and other plants. This area is affected by situated mismanagement of culture, harvesting, preservation, transportation, marketing and lastly negligence of government and ignorance of people. For these reasons expected or possible production is not gained. With proper use of Chalan beel the condition of the people will be improved.

1.2 Objectives of the study

The principal objective of the present study is to know the present fisheries status of Chalan beel area of Natore district. The specific objectives were following.

- 1) To observe the physico-chemical parameters of Chalan beel.
- 2) To know the present status of species composition of Chalan beel, fishing methods, fishing crafts and fishing gears used in Chalan beel.
- 3) To know the marketing system (Marketing channels, fish landing, prices variation, transportation system, fish preservation method) of Chalan beel fisheries in Natore district.

1.3 Justification of the study

The focus of economic development is entirely dependent on her natural resources, as Bangladesh is not industrially developed. The world fishery makes major contribution to human nutrition as well as social and economic progress. The production of inland open water fishery is 6.89 lack tons which is 38.68% of the total fish production (Matsaya pakhkha, 2002). In dry season fishes are caught by digging Kua and also this time paddy is planted so there is a chance of integrated fish-paddy culture. Fishes of Chalan beel are mainly available in rainy season and paddy is cultivated in dry season. If proper management is taken, then these can be found round the year.

The people of Chalan beel do not earn expected amount due to lack of technology and its distribution to the fishermen from higher sector on different spheres. The resources of Chalan beel would be the tremendous wheel of improving the socio-economic status of the stakeholders. With considering the community development, it needs to assess the resource profile of Chalan beel. Evaluating the fishery status would be the key factors of designing the development strategy. Subsequently, water qualities, fish diversity, fishing method, marketing system are mandatory issues. Encouraging the local people to use the resource at sustainable level in compliance with assessing the present fishery condition and problems existed is also effective strategy for the development of community livelihood and consequently the resource would be the road to national economic upliftment.

1.3 Limitation of the study

- Time allocation of the study was insufficient to collect data and relevant information.
- The answer of all questions was not found.
- Journey by traditional boat in rural area was very time consuming and during my working time most of the fishermen was busy in their occupation also was a problem.
- Published papers on such beel fishery are very scanty.
- Allocated funds for this study was very limited.

2014年11月14日，在“2014年中国（上海）国际进口博览会”开幕式上，习近平主席宣布，中国将举办2018年世界人工智能大会。

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2.0 REVIEW OF LITERATURE

A very few works has been done on the title "The present fishery status of Chalan beel" directly. Therefore, some related works (directly or indirectly) has been discussed in this chapter.

Probably over a thousand beel exist in Bangladesh (Rashid, 1991). The beels are suitable in the floodplains and the delta basin. The habitat of the inland fishes are the major rivers, tributaries, distributaries, haors, baors and beels which found the floodplain of Bangladesh and cover an area of 54,86,609 ha (Karim, 1978). These water ways are the breeding and raring grounds for the fish.

For the sufficient growth and productivity of fishes, physio-chemical characters of water are very important and necessary factors. Alam *et. al.* (1985) found that the growth rate of silver carp was directly related to the limnological parameters of the pond, which were favorable for fish life.

The physio-chemical factors of water are temperature, transparency, depth, turbidity, pH, dissolved oxygen and they are seasonally fluctuated. The temperature and transparency are very high in summer. The fluctuation of pH value is very small throughout the year and other factors also vary from season to season (Alabaster, 1982).

Goolish and Adelman (1984) recorded maximum growth rate at 30 °C temperature of juvenile common carp. They also observed that the temperature of natural inland waters in the temperate regions generally varies between 0 °C and 30 °C, the maximum values occurring particularly in shallow waters in summer and the minimum exceptionally fall below zero in winter. Ali *et. al.* (1982) observed temperature range of 20.5-36.5 °C throughout the period of investigation in fresh water ponds which are favorable for pond fish culture.

Durve and Bal (1961) reported the lowest temperature of water during winter and the highest temperature during summer in their study in the Kelwa backwater and adjoining sea near Bombay. The highest temperature on all the ponds during the month of July to

August and the lowest during the months of December to January (Lakshmanan *et al.*, 1971).

Dissolved oxygen is the most considerable water quality parameter. With out oxygen, all living organisms get died or affected severely. For the growth of aquatic organisms including fish, DO plays an important role and their metabolic activities is also affected (Albester, 1982). Bhuyan (1970) is of opinion that and dissolved oxygen from 5.0 to 7.0 mg/L is required for high production. Dissolved oxygen 7.2-10.5 mg/L is suitable for fish production (Ali *et. al.*, 1982).

Dewan (1973) investigated into the ecology in a Mymensingh lake (Bangladesh Agricultural University Campus). He observed higher oxygen concentration during winter and lower oxygen concentration during monsoon. He pointed out that the dissolved oxygen bears an inverse relationship with temperature and a direct relationship with pH.

pH is a most important and essential factor of the water and for the fish production. All the aquatic organisms including fish have a well determinate limit of pH tolerance. Mostly of the metabolic and physiological activities are influenced by the pH value (Rafiq, 1995). Ali *et. al.* (1982) observed pH range of 7.5-9.5 throughout the period of investigation in a fresh water pond which are favorable for pond fish culture. pH above 7.0 is suitable for fish production (Bhuyan, 1970).

Verma (1969) made an investigation on a tropical impoundment in India. He observed the highest values of pH during summer and lowest values of the same during winter. Heavy influx of water decreases the pH values.

The water bodies in the world are the tremendous habitat of various types of fauna. The water planet is profoundly rich in biodiversity. Fish composition claims the contribution of the biodiversity of water. In waters, there are various types of fish species among which some are identified and some are not. Fish diversity plays a significant role in the productivity of water body. It is essential to assess the fish composition in a water body (Khan, 1993).

From ancient period, fish has been used as a food source of human. The fish commodity has been considered for domestic consumption and as trade commodity. Fish are marketed by the fishermen and fish farmers. And the fishermen and fish farmer sell their catch to wholesale traders, commission agent and retail traders (Fruzzetti, 1990).

The supply of fish depends upon the season, a number of fishermen engaged in fishing and their fishing method. The fishermen during fishing use various types of fishing gears and crafts. The types of fishing gear used changes with seasons, according to flooding condition, target species and sizes of species. Except a few types of fishing gear which has a specific target species, most of them are for the multiple species purpose. Generally the fishermen use all conceivable types of fishing gear, ranging from bare hand to sophisticated seine and gill nets to catch fish. A type of fishing gear may have different names in different regions. Some are after the names of target species of fish. Moreover, the fishermen use the fishing crafts considering the availability and their capability (Tsai and Ali, 1997).

Now a days fish is a highly profitable commodity with respect to trade. The increase in trade is estimated by a growing population, particularly urban population. Generally fish are sold in local and regional markets as well as are distributed throughout the country. The fish trade is influenced by the investment system. The poor fishermen have to borrow money from the advance giver. The landing system, preservation method and marketing system affects the fish trade. The fish trade is also influenced by the fishery status of the water body. The marketing channel indicates the status and potentiality of fish trade of a region (Tsai and Ali, 1997).

CHAPTER THREE

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MATERIALS AND METHODS

3.0 MATERIALS AND METHODS

3.1 Selection of the study area

Chalan beel is the largest beel in Bangladesh. The study was conducted in Chalan beel area of Natore sadar thana, Shingra thana and Gurudaspur thana. These are very important areas for fish catching and selling. The fishermen were selected randomly from each thana.

3.2 Questionnaire preparation

To conduct the present study questionnaires were made as per requirement. Interview schedules were used to collect various information i.e. name of the fish, seasonal abundance of various species of fish, fishing methods, description of Craft and Gears, method of fish preservation, transporting system of fish, their marketing channels etc. Questionnaire was made by discussing with my supervisor and each questionnaire sheet was used for each fisherman.

3.3 Collection of data from fisheries related people

Some interviews were taken from the fishermen, beparies, aratdars, wholesalers, retailers, peoples of sutki khola, farmers. Data were collected both from primary and secondary sources. Primary data were collected through questionnaire survey. Secondary sources for further information about Chalan beel were taken throw following sources;

- Bangladesh center for advance studies.
- BARC, Dhaka.
- Aquaculture Department of Dhaka University.
- Zoology and aquaculture department of Rajshahi University.
- D.O.F of Natore.
- T.F.O of Natore sadore thana and Shingra thana
- University press Limited.
- Centre For Sustainable Development (CFSD)
- Water Development Board.
- Many other experienced person on Chalan beel.

3.4 Time schedule for the study

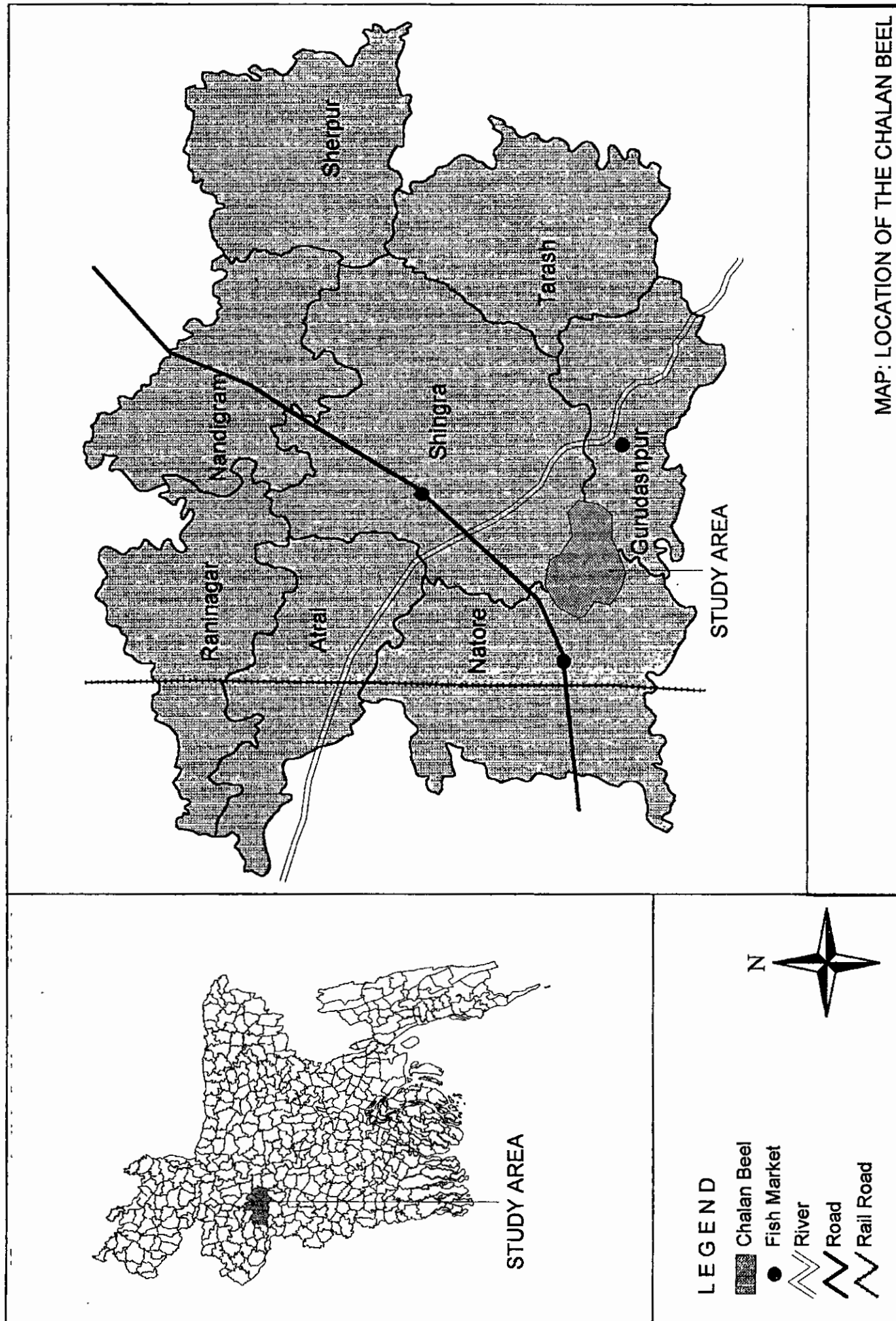
During the study period the samples were collected in a systematic way from August 2002 to July 2003. All sites were visited once in a month, starting at the first week of August 2002 and continuing until the end of July 2003. On the first sampling day data were collected from Haldi beel and bazaar of Haldi beel area of Natore sadar. On the second day from shingra beel area and shingra fish market and on the third day from beel area of Gurudushpur and Gurudaspur fish market. This process of collection data was repeated in a cyclic way. All available data were collected on the separate answer script. Also other related answers were taken on note book.

3.5 Procedure of data collection

- a) Data on water quality such as pH measured by digital pH meter, D.O. measured by digital D.O. meter, light penetration by secchidisk, water depth and temperature were measured during the study period on the spot.
- b) The types of soil in different area of Chalan beel are mentioned. Various crops which are planted in the dry season were identified by the help of the literature e.g. "Chalan beeler iti katha." (M.A. Hamid T.K.) and also observed in the related months. The problem and prospect of culturing crop in dry season are discussed with farmers. The method of crop culture are obtained from farmer thought. The process of crop rotation were observed.
- c) Craft and gear uses for fish catching, their trapping methods were observed in the beel area, also by discussing with fishermen on the spot. The preservation methods of gear were also discussed with the fishermen.
- d) The fish and fisheries species were identified preliminary on the spot where fishing is done and also from the retail fish market and landing centre. Which fishes were difficult to identification there local name were collected. Taxonomic studies were made on the basis of the local name accepted Bengali name the collected specimens.

e) Marketing channel and prices of fishes collected by visiting three markets in Haldi bill market, Shingra thana market and gurudashpur market. The interview was taken from different fishermen and intermediaries such as baparies, Aratdars, wholesalers etc. In the present study, the marketing margin has been computed by comparing the prices of fish in different months. The preserving methods of fishes in market and during transportation were also discussed with the sales person. Problems and prospects of the markets were also discussed.

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CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 RESULTS AND DISCUSSION

4.1 Physico-chemical parameters of Chalan beel in Natore

The data and results presented here are the detailed limnology of the Chalan beel studied from August 2002 to July 2003.

4.1.1 Water temperature

Water temperature is very essential physico chemical parameter for fish growth as well as all aquatic organism. Water temperature ranged from 20.5 to 36.5° C is ideal for fish growth (Ali *et.al.*, 1982). It is proved that metabolism as well as fish growth increases if temperature increases. So fish growth is high in hot weather than in cold weather. The average temperature from March to September, the climate is dry and relatively cold from November to February. The maximum temperature was 31.7° C in July, 2002, the minimum temperature was 18.6° C in January, 2002 during the study period (Table-1 and Fig-1). Temperature increase at day and falls at night everyday. Water temperature varied 2-3° C less than the atmospheric temperature.

4.1.2 Water depth

During the dry season the water level of the beel become low. During the investigation period, the lowest water level was recorded 0.378 meter in April, 2003 period (Table-2 and Fig-2). The water level increases over June to September. During the study period the water level height was recorded 3.76 meter in August 2002, and post – monsoon month from November to April the water level become decreases and at that time the certain part of the beel dried up.

4.1.3 Transparency

Light is also a very essential for natural food growth such as phytoplankton, algae, under water emergent plant etc. In beel area fish and all other fisheries species mainly depend on natural food. So light is a very important factor for fish growth. Light penetration (Transparency) in water body can be measured secchidisc procedure. In Chalan beel the natural food abundance is comparatively less than other water bodies. Generally 30 cm.

Results and Discussion

secchi disk depth indicates good growth of natural food (Mondol, 2002). During study period highest secchidisk measured was 27.5 cm. in October 2002 and lowest was 12.5 in Jun 2003 period (Table-4 and Fig-3).

4.1.4 Dissolved Oxygen (D.O.)

D.O. level 5-7 ppm is satisfactory for fish growth (Bhuya, 1970). Dissolved oxygen level was found always satisfactory level in Chalan beel. But it was found high in rainy season and low in dry season. During study period highest dissolve oxygen level was 5.78 ppm in January 2003 and the lowest dissolve oxygen level was 4.48 in March, 2003 period (Table-4 and Fig-4). The dissolve oxygen level was slightly higher in day time than in night.

4.1.5 pH

pH level is also a most important and essential factor of the water. The entire aquatic organisms including fish have a well determine tolerance of pH level .It is from 6.5 to 9. Most fishes and aquatic organism prefer ph ranged from 7.5 to 9.5 (Ali *et al.*, 1982). Also there is an interaction between soil pH and water pH. So soil pH of beel area should be good if we want satisfactory level of pH in water. Mostly of the metabolic and physiological activities are influenced by the pH value. The highest pH was recorded 8.4 by digital pH meter in the month of August 2002 and the lowest pH was measured 7.1 in the month of March and April 2003 period (Table-5 and Fig-5).

4.1.6 Soil condition

The soil types of Chalan beel are not same condition in all area. The Beaghat and Taras thana of north Chalan beel is white clay, silt and muddy soil. Nimgachi of Raigong thana to north-west region's soil is yellowish to purple red. The half part of Dhaminagor and Sonakhara unions' soil is reddish. Chatmohor, Borigram and Gurudaspur thana of south Chalan beel is generally loam, some are muddy and across the river side is sandy soil.

Table1: Monthly average water-temperature of Chalan beel from August, 2002 to July, 2003.

Month	Water-temperature ($^{\circ}\text{C}$)
January	18.6
February.	23.4
March.	29.6
April.	31.7
May.	30
June.	30.5
July.	31.7
August.	30.1
September.	29.3
October.	26.05
November.	25.8
December.	21.5

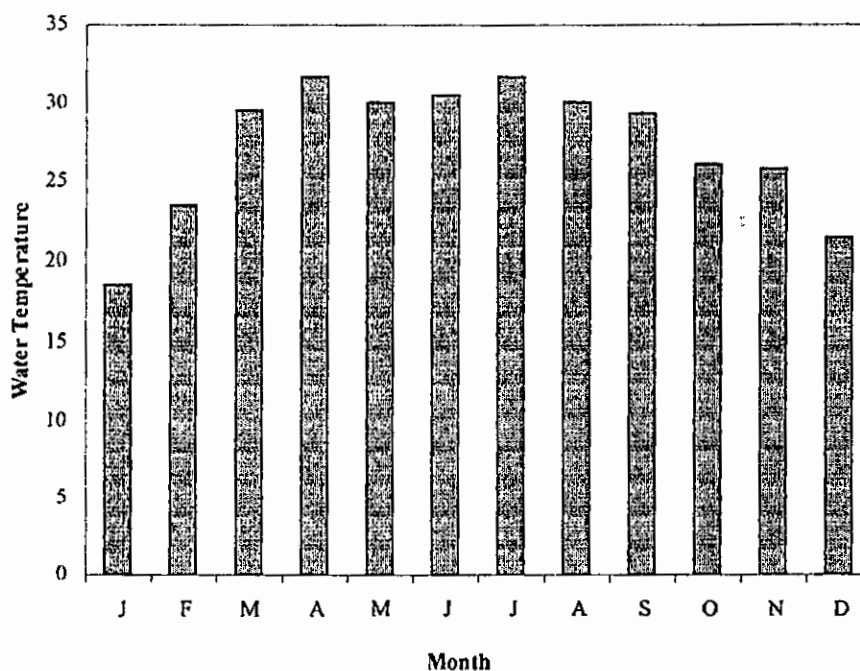


Fig 1: Monthly average water temperature

Table 2: Monthly average water-depth of Chalan beel from August, 2002 to July, 2003.

Month.	Water-depth (M)
January.	1.021
February.	0.747
March.	0.41
April.	0.378
May.	0.56
June.	0.91
July.	1.95
August.	3.76
September.	3.5
October.	3.7
November.	3.021
December.	2.075

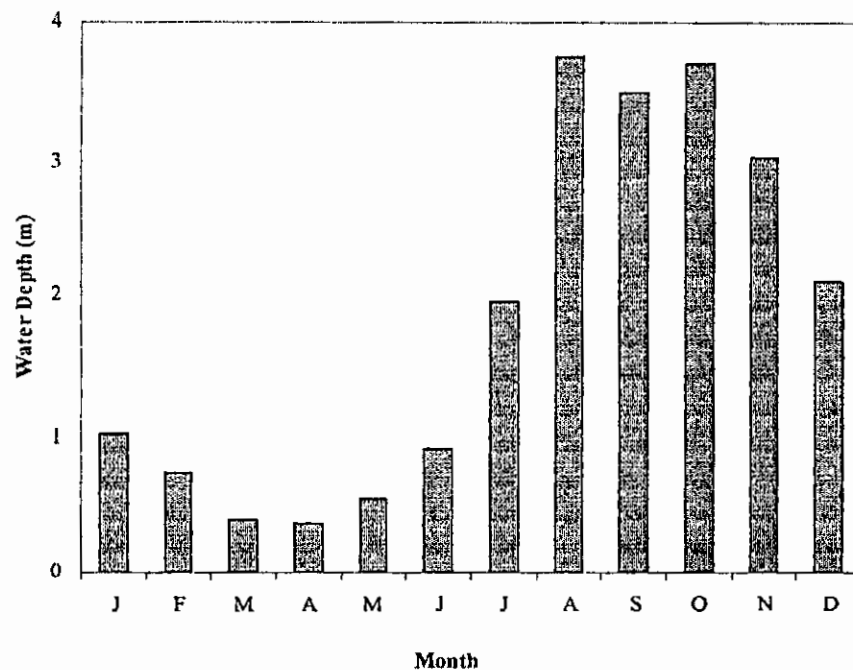


Fig 2: Average monthly water Depth of Chalan Beel

Table 3: Monthly average Transparency of Chalan beel from August, 2002 to July, 2003.

Month.	Transparency (cm)
January.	19
February.	17
March.	16.5
April.	15.5
May.	14.5
June.	12.5
July.	15.5
August.	17.5
September.	21.25
October.	27.5
November.	20
December	25.25

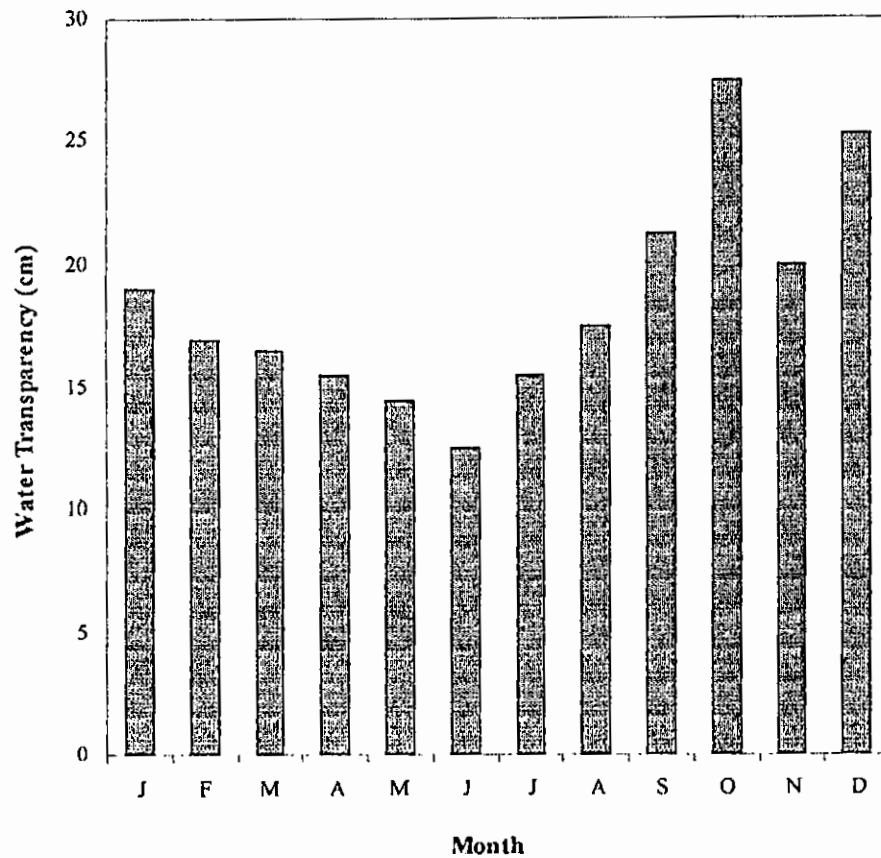


Fig-3: Monthly average Transparency of Chalan beel

Table 4: Monthly average DO of Chalan beel from August, 2002 to July, 2003.

Month	DO (ppm)
January.	5.78
February	5.74
March	4.48
April	4.62
May	5.42
June	5.35
July	5.38
August	5.60
September	5.4
October	5.30
November	5.25
December	5.28

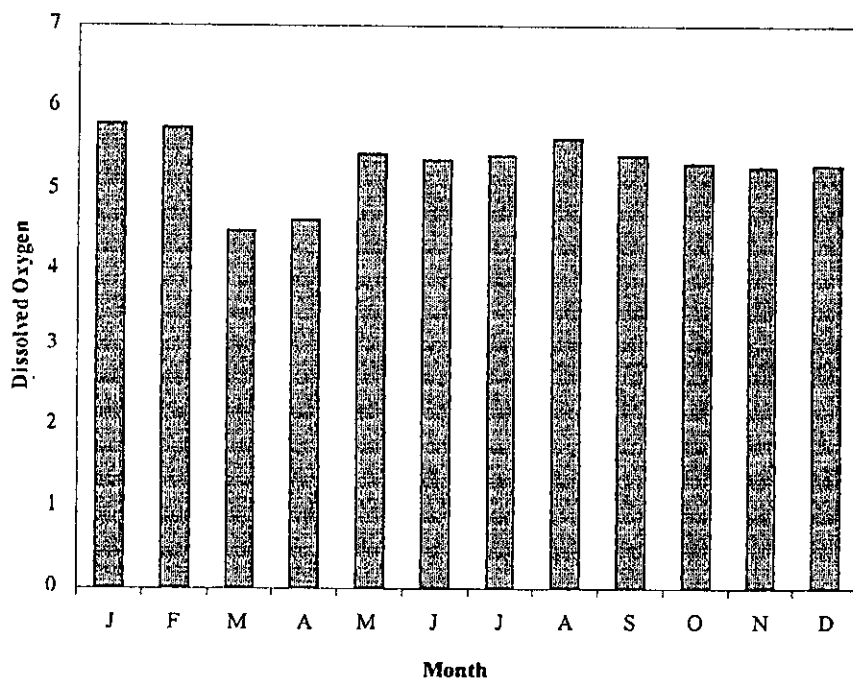
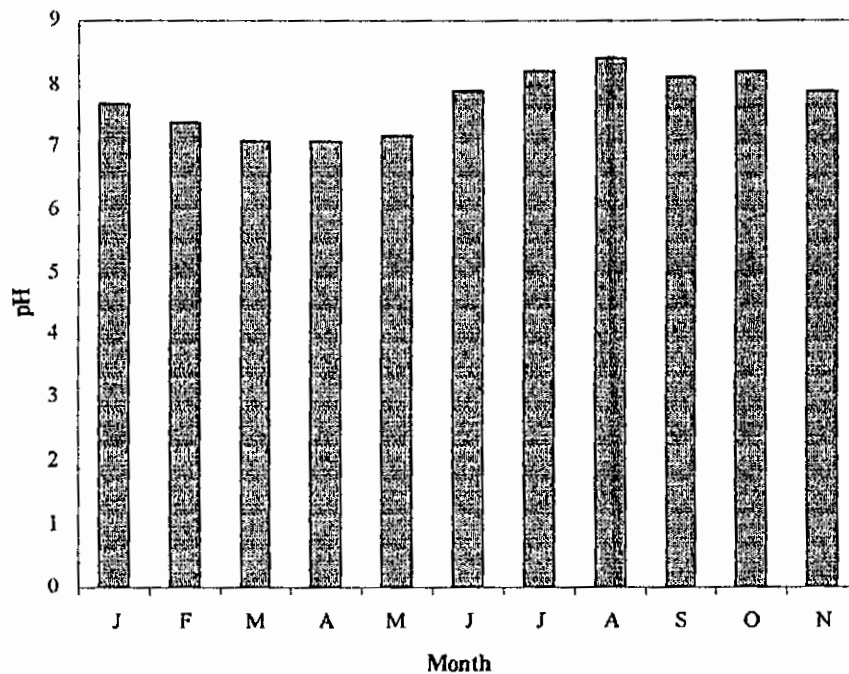


Fig-4: Monthly averages DO of Chalan beel.

Table 5: Monthly average pH of Chalan beel from August, 2002 to July, 2003.

Month.	pH
January.	7.7
February	7.4
March	7.1
April	7.1
May	7.2
June	7.9
July	8.2
August	8.4
September	8.1
October	8.2
November	7.9
December	7.9

**Fig-5: Monthly average pH of Chalan beel.**

4.1.7 Agricultural uses of the Chalan beel and its adjacent area

The Chalan beel is used for many purposes. Mainly various types of IRRI are cultivated in Chalan beel period (Table-6 and Photograph-1). These are planted from December to January and harvest is done from May to June. Some Boro is also cultivated. 75% of the total production of paddy in North-west Region grows here (Bardhan, 2000). Good quality paddy production was 20-25 mounds per bigha and lower quality production was 15-20 mound per bigha. When the water level become low then other grains (e.g. mustard oil, sugarcane, wheat, etc.) are cultivated a little amount on the high land. All the year the water of flood drowned the crops. So if canal is dug in Chalan beel area the river water passed through the canal and it will not hamper the crops. Also this water will be remained in canal during dry season and can be used for fish culture and irrigation purpose. The water of Chalan beel is used for irrigation, domestic animal drinking during rainy season. The beel is also used as water way during the rainy season. Mechanized and different types of country boats were found as a transport during that time. The boatmen earn a little amount like living from hand to mouth. The mechanized boat earn 150-200 TK day and manual boat earn 40-50 TK day. In winter, the beel becomes dried and the farmers used the beel for winter cropping.

Table 6: Cropping pattern of the Chalan beel and its adjacent area.

Name of crops.	Planting time.	Harvesting time.
IRRI (B.R.4)	December to January.	May to June.
IRRI (B.R.14)	"	"
IRRI (B.R.26)	"	"
IRRI (B.R.28)	"	"
IRRI (B.R.36)	"	"
Mustard oil.	October.	March.
Wheat.	November.	March.
Sugarcane.	April.	July.

4.2 Present fisheries status of Chalan beel

Fish and fisheries items are very important food source for man. For this purpose fishermen use various method of fishing from prehistoric times and now fishing methods have been modified. Fishing means to capture fish by any ways. Chalan beel is the land of depression in the vicinity of rivers such as Atrai, Boral, Nandakuja, Beshani, Vadraboti, Korotoa etc. During the monsoon season, the river water over flows and spills over the Chalan beel, enabling them to store excess water during the flooding season. Excess water is stored for 4-6 months a year. The Chalan beel is also used, as the seasonal abode, by large number of fish, prawn, turtle, mussel and other aquatic animals of these, fish and prawn are the most important aquatic living resources essential for the people residing in and around the Chalan beel. People use all conceivable types of fishing gear, ranging from bare hand to sophisticated seine and gill nets to catch fish and prawn. During the period from August 2002 to July 2003, a monthly field survey was conducted in Chalan beel to examine the fishing gear used, their methods. Many local residents used to fishing in the monsoon season and practiced agriculture in the dry season (Ali *et. al.*, 1982).

4. 2.1 Species composition

A marked seasonal flood regime has a profound effect upon the ecology, biology and behavior of the fishes including factors such as growth, breeding, oxygen requirement and behavior. Diet is also closely related to fluctuating water levels.

During the wet season, the floodplain environment offers a dramatically increased living space and availability of resources. Changes in hydrology are probably important stimuli to life-cycles. Dissolved oxygen concentrations and pH values are particularly important in determining the distribution of fishes and constant changing conditions in relation to the rise and fall of floods drastically alters the faunal composition.

For a majority of fish species, rising water levels with the main channel are associated with upstream migrations towards the floodplain area in order to avoid unfavorable conditions or to exploit more favorable ones. Most spawning activity of migratory species occurs during the flood season. During high-water, the flooded lands yield a rich and varied food supply. For all fishes, this is a period of great abundance of food and growth.

Results and Discussion

The development of young fishes is extremely rapid and eggs tend to hatch relatively quickly.

There are about 266 species of fishes present in the inland water bodies (Rahman, 1974) and 475 species are recorded from the marine water (FFYP) of which 65 species are exported commercially (Hossain, 1970). A total of 12-15 culturable species of exotic fishes have been introduced in Bangladesh.

During the study period, a total of 84 different species of fish and 3 species of prawns were identified. Most of fishes are commercially important that are outstanding carps and fishes. The local name, scientific name, abundance, seasonal availability and breeding season of the identified fish species are given in table 7 and 8.

Table-7: List of prawn in Chalan beel , Natore.

SL. No.	Local Name	Scientific Name	Abundance	Seasonal Availability	Breeding Season
1	Golda chingri	<i>Macrobrachium Malcomsonii</i>	Few	Whole	December – February
2	Beel chingri	<i>M daganum</i>	Common	Whole	December – February
3	Gura chingri	<i>M lamarre</i>	Very common	Whole	May-June

Results and Discussion

Table-8: List of fishes of the Chalan Beel at Natore.

SL. No.	Local Name	Scientific Name	Abundance	Seasonal Availability	Breeding Season
1	Chanda	<i>Chanda nama</i>	Very common	Whole	March - October
2	Lal Chanda	<i>Chanda ranga</i>	Common	Whole	March - October
3	Chanda	<i>Chanda beculis</i>	Very common	Whole	March - October
4	Telapia	<i>Oreochromis mossambica</i>	Rare	Few	Whole
5	Nilotica	<i>Oreochromis nilotica</i>	Rare	Few	whole
6	Bele	<i>Glossogobius giuris</i>	Very common	Whole	March - October
7	Koi	<i>Anabas testudineus</i>	Common	Whole	June-July
8	Khailsha	<i>Colisa fasciatus</i>	Common	Whole	June-October
9	Khailsha	<i>Colisa lalius</i>	Common	Whole	June-October
10	Korsola	<i>Rhinomugi corsula</i>	Few	Whole	
11	Tara baim	<i>Macrognathus acuteatus</i>	Common	Whole	
12	Sal baim	<i>Mastacembelus armatus</i>	Common	Whole	April-July
13	Guchi baim	<i>M. puncalus</i>	Common	Whole	April-July
14	Ilish	<i>Hilsa ilisha</i>	Few	Rainy season	August-December
15	Katchki	<i>Corica saborna</i>	Common	Whole	
16	Chital	<i>Notopterus chitala</i>	Rare	Whole	April-July
17	Foli	<i>Notopterus notopterus</i>	Few	whole	May-July
18	Phasa	<i>Setipinna phasa</i>	Rare	Whole	February-March

Results and Discussion

SL. No.	Local Name	Scientific Name	Abundance	Seasonal Availability	Breeding Season
19	Chapila	<i>Gudusia chapra</i>	Few	Rare	
20	Afila	<i>Gudusia variegata</i>	Few	Rare	
21	Ayre	<i>Mystus aor</i>	Rare	Whole	April-July
22	Golsha	<i>Mystus cavasius</i>	Very common	Whole	April-July
23	tengra Khatengra	<i>Mystus vittatus</i>	Common	Whole	April-August
24	Tengra	<i>Mystus tengra</i>	Very common	Whole	April-August
25	Air	<i>Mystus seenghala</i>			
26	Golsa	<i>Mystus bleekery</i>			
27	Rita	<i>Rita rita</i>			
28	Gang tengra	<i>Gangata youssoufi</i>	Rare	Whole	
29	Cenia	<i>Gangata cenia</i>			
30	Gang tengra	<i>Bagarius bagarius</i>			
31	Ghaura ghaira	<i>Clupisoma garua</i>	Few	Whole	March-July
32	Bacha	<i>Eutropiichthys vacha</i>	Common	Rare	
33	Batali	<i>Pseusleutropias antherinoides</i>	Common	Rare	
34	Baspatha	<i>Ailia coila</i>	Few	Whole	
35	Kajoli	<i>Ailiichthys punctata</i>			
36	Pangus	<i>Pangasius pangasius</i>			
37	Shing, Jiol	<i>Heteropneustes fossilis</i>	Very common	Whole	
38	Pabda	<i>Ompok pabda</i>	Few	Rare	
39	Kani pabda	<i>Ompok bimaculatus</i>			
40	Boal	<i>Wallaga attu</i>	Very common	Whole	May-August
41	Magur, Mojgur	<i>Clarias batrachas</i>	Very common	Whole	May – august
42	Gutum	<i>Lepidocephalus guntia</i>	Common	Whole	
43	Gutum	<i>Lepidocephalichthys bardmorei</i>	Rare	Whole	

Results and Discussion

SL. No.	Local Name	Scientific Name	Abundance	Seasonal Availability	Breeding Season
44	Rani	<i>Botia dario</i>	Few	Whole	
45	Rani	<i>Botia dai</i>			
46	Catal	<i>Catla catla</i>	Very common	Whole	April-July
47	Silver carp	<i>Hypophthalmichthys molitrix</i>	Very common	Whole	
48	Grass carp	<i>Ctenopharyngodon idella</i>	Common	Whole	
49	Common carp	<i>Cyprinus carpio, communis</i>	Few	Rare	
50	Mirror carp	<i>Cyprinus carpio, specularis</i>	Few	Rare	
51	Mrigal	<i>Cirrhinus mrigala</i>	Common	Whole	May-July
52	Raik	<i>Cirrhinus reba</i>	Very common	Rare	April-july
53	Kalbasu	<i>Labeo calbasu</i>	Few	Rare	April-July
54	Rui	<i>Labeo rohita</i>	Very common	Whole	April-July
55	Bata	<i>Labeo bata</i>	Very common	Whole	
56	Goina	<i>Labeo gonius</i>	Few	Whole	Jun-August
57	Bhangan	<i>Labeo boga</i>			
58	Sarputi	<i>Puntius sarana</i>	Common	Whole	April-July
59	Puti	<i>Puntius sophori</i>	Common	Rare	April-July
60	Chala puti	<i>Puntius chola</i>	Few	Whole	April-July
61	Tit puti	<i>Puntius ticto</i>	Very common	Whole	April-July
62	Thai sarputi	<i>Puntius gonionotus</i>	Few	Whole	April-July

Results and Discussion

SL. No.	Local Name	Scientific Name	Abundance	Seasonal Availability	Breeding Season
63	Puti	<i>Puntius stigma</i>			
64	Phutani puti	<i>Puntius phutunio</i>			
65	Pata chela	<i>Chela atpar</i>	Very common	Whole	
66	Chela	<i>Chela phulo</i>			
67	Gura chela	<i>Oxygaster gora</i>			
68	Narikeli chela	<i>Oxygaster bacaila</i>	Very common	whole	
69	Darkina	<i>Esomus danricus</i>	Very common	Whole	
70	Darkina	<i>Rasbora daniconius</i>	Very common	whole	April-July
71	Dankina	<i>Rasbora rasbora</i>			
72	Elong	<i>Rasbora elonga</i>			
73	Mon	<i>Rohtee cotio</i>			
74	Mola	<i>Amblypharyngodon mola</i>	Very common	Whole	April-November
75	Cheap chela	<i>Danio devario</i>			
76	Chaka	<i>Chaca chaca</i>			
77	Shoal	<i>Channa striatus</i>	Common	Whole	April-July
78	Gajar	<i>Channa marulius</i>	Common	Whole	April-June
79	Taki	<i>Channa punctatus</i>	Very common	Whole	April-October
80	Chang	<i>Channa gachua</i>	Common	Whole	April-June
81	Kakila	<i>Xenentodon cancila</i>	Common	Whole	April-June
82	Haif beaks	<i>Hamiramphus gaimardi</i>			
83	Tepa, potoka	<i>Tetraodon cutcutia</i>	Few	Whole	
84	Tepa, potoka	<i>Tetraodon potoca</i>	Few	Whole	

4.2.2 Fishing method

Most of the professional fishermen are fishing in day and night from the month of August to January. There are three categories of fishermen in the floodplain. There are

- 1) Occasional fisherman who primarily catches fish for domestic consumption,
- 2) Part time fisherman who catches fish in the flood season and sell their catches to supplement their income from farming and other vocation in the dry season
- 3) Full-time fisherman who is fully dependent on fishing for their livelihood round the year.

The fishermen in Chalan beel at Natore generally fish in the beel with various types of fishing crafts and gears period (Table-9 and Fig-8). The fishermen also use these crafts for carrying their catch. In Chalan beel, most of the fishermen use boat nouka and dingi nouka (Table-8). The fishermen use boat nouka mostly for fishing while dingi nouka is used generally for carrying fish and for long time fishing at far distance. There are 3-4 men (Partnership or with family member) in a boat for catching fish. In case of fishing gear, most of them use current jal, bhesal jal, fash jal, dharna jal, khepla jal, tana jal, ber jal, dori jal, koi jal etc. (Table-9). The fishermen also use various types of fishing traps such as vair, polo, bittc, borshi etc. The children normally use chari as their fishing crafts and borshi, polo, ghuni as their fishing gears for fishing. The maximum numbers of fishes are caught during October-November. Large size fishes are caught during September-October. During fishing they preserve live fish by keeping the fish at the bottom of the country boat with a small amount of water or net, basket with fishes kept under water or vair with fishes kept under water. They preserve fish like this process from night to next morning. Expenditure for fishing of fishermen annually is 1200-1500TK. They take Dadon from Mohazon. It is 1000 to 15000 and repay by installments. Most of the fishing gears have to break off operations after a certain period of activity, for rest and repair (Ahmed, 1953).

Kata Fishing

A comfortable habitat is made for fishes by using thorns, branches of trees, hyacinth in a certain area of water body. It locally called Kata. Various types of fishes gathered in this kata. After 2-3 months, the area is covered by net and fishes are caught. About 10- 30 moands of fishes can be harvested from this type of kata.

Results and Discussion

Table-9: Different types of fishing crafts used by the fishermen in Chalan beel.

Type of fishing crafts	% of fishermen
Boat nouka	30
Dingi nouka	40
Donga nouka	10
Vella made by Banana tree	15
Chari made of mud	5

Table-10: Different types of fishing gears used by fishermen.

Type of fishing Crafts	% of fishermen
Current Jal	10
Beshal Jal	22
Fash Jal	18
Moi Jal	8
Dharma Jal	22
Khepla Jal	30
Tana Jal	6
Ber Jal	14
Badhai Jal	8
Kochal Jal	4
Fasi Jal	6
Bua Jal	2
Komor Jal	6
Dakon Jal	4
Dori Jal	8
Thela Jal	2
Koi Jal	2
Suti Jal	2
Trap	4

4.2.3 Fishing crafts

Various types of smaller country boats are used for fishing which help to move in the beel area. The crafts are broadly classified in 5 categories found to use for fishing in the Chalan beel.

1. Boat nouka
2. Dingi nouka
3. Donga (Talgus)
4. Vella (Benana tree
5. Chari (Mud)

Various factors influencing the efficiency and sustainability of fishing crafts used in Chalan beel are size, loading capacity and preservation method (Table-11). These factors also indicate the type of crafts.

Table-11: Different types of craft, their size, capacity and preservation material.

Name of craft	Size (Feet)	Capacity (Mound)	Preservation material
Boat nouka	Length -15-20	8-12	Coalter and gab juice
	Width - 3-4		
	Height - 1.5-2		
Dingi nouka	Length -18-30	20-50	Coalter
	Width - 5-6		
	Height - 1.5-3		
Donga nouka	Length - 10-14	2-4	Coalter
	Width - 1-5		
	Height - 1		
Vella made of banan tree	Length -8-12	2-4	
	Width - 2.5-4		
	Height - 1		
Chari made of mud	Perimeter -15-20	2	
	Radius- 2-3		

4.2.4 Preservation of crafts

The crafts are used in water .So it can be easily spoiled within a short time. In maximum cases crafts are not used properly by our fishermen. After preparation of the boat it should be immediately painted by coalter or juice of Gub, which protect the boat from the damages caused by water and various aquatic organisms. During the dry season, when the crafts are not used, the fishermen drowned their boat in water (Beels, Rivers or ponds)

During the heavy drowned, the fishermen take their crafts and placed it in their home, More over tin ,wood or shola, mud are used to repairing of crafts .Coalter or juice of Gub are used as preservative.

4.2.5 Fishing gear

In Chalan beel of Chalan beel various types of gears are used for fish catching (Table-10 and Fig-9, 10, 11). Choice of gear depends on season, cost, durability and target species. Generally these gears are made and repair by fishermen themselves. Women are mainly engaged in building and repairing gears .After operation these gears are dried in sun and preserved by Gub Juice and coalter. The gears are not perfectly made for fishing as all of them are operated for certain condition of the weather and fishing grounds. The fine design and construction is of considerable importance .Such as mesh size is very important for gill nets. Also current jal is banned by Government because it catches small size Jatka (juvenile) fish. This chapter describes the types of fishing gear and their fishing methods, seasonality of uses target species in the Chalan beel.

4.2.5.1 Fishing nets

For fishing, different kinds of nets are used. Thickness, mesh size, number of twisted cords, nets float and under part of buoyancy sinkers to be used for net is very important. Though the net system fishing is prehistoric but now a days it has been improved.

4.2.5.1.1 Manufacturing of nets

Commonly nets are made of ordinary twisted cotton, cord which is composed with 3-5 wire or threads. Nets are generally prepared from silk cotton fiber (crotolarse Juncea). Various synthetic fibers are used for the making net as raw materials. Synthetic fibers are

durable and different types of synthetic fibers are used for the manufacturing of nets as follows;-

- A. Polyamide-popularly called nylon.
- B. Polyester- popularly called terylene.
- C. Polynyl chloride- widely known as plastic tetron, envilon,c.t.c.
- D. Polyacryloniferite-commonly called orlon, darvon e.t.c.(Khanna, 1980)

Floats made of cork, wood; plastic, sponge, rubber, sholla, cane are used in desired position and shape. The sinkers are attached to the under part of nets with rope. The sinkers are best made of iron and burning soil.

4.2.5.1.2 Classification of nets

From the prehistoric time nets are commonly intention for capturing fish. In our country different types of nets are used for fishing purpose. The fishing nets of Chalan beel are classified in different categories.

- A. Seine Net
- B. Push net
- C. Trawl net
- D. Gill net
- E. Cast net
- F. Lift net
- G. Block net

A. Seine Net

Seine net is a rectangular net used for encircling a stretch of water body. There are six types of seine nets used in the Chalan beel.

Ber jal

Ber jal is a local name for the seine net commonly used in flood plains, ponds and rivers. It is a rectangular net usually with floats on the head rope and weights on the ground rope. The ground rope is made of thick twisted jute fibers and the head rope is a small nylon or

polyethylene rope. Its length, depth and mesh vary with the stretch of a water body to net and the species of fish to catch. Often several pieces of the nets are stitched together. Each piece is 30m long and 4-8m wide with stretched meshes 5 to 40mm. The net is operated by 6 to 12 fishermen to encircle a water area. When two ends of the net are drawn together, the ground rope is hauled up from the center of the water body to catch fish.

There were four different mesh sizes of Ber Jal. Two large meshes, 5-20mm and 22-40mm, were used in the dry season from January to May, and a medium size meshes of 10-15mm. Locally called as Goga Jal or Ber jal, were used from December to June in Chalan beel. The large and medium meshes captured boal, mrigal, common carp, rui and other large fish.

Kochal jal

It is large net joined together by several pieces of small nets. Each piece is 50m long and 3-25m wide with meshes of 50-100mm. It has floats on the head rope but no weight on the ground rope. It is made of Nos.4-6 nylon twine. The size of the net may reach to 500m long. Two boats move apart to drop the net to enclose a water area. When the two boats meet together, the ground rope is pulled up to form a pocket. To catch fish. It takes 1 ½ hour to 2 ½ hours to complete a haul and needs 6 to 12 fishermen to operate.

Kochal jal is also called Kochal Jal in Bogra, Rajshahi, Pabna, Dhaka and Kushtia district. Jangil and Kochal in Barisal and Khulna districts, and Dora in Jessore district (Ahmad 1962). There are two types of Kochal Jal; Boro Kochal and Chhoto Kochal. The 8-25mm mesh Kochal Jal was used in the Chalan beel in the dry season from January to April to catch boal, mrigal, rui, air and small fish such as puti, tengra, pabda, chapila, raiq and bele.

Komor jal

It is a type of seine net commonly used in Katha fishing. Katha is a pile of tree branches used as fish shelter and kua fishing (Kua is a man made pond in floodplain to trap fish) during the dry season. It is known as Net Jal in the Chalan bill.

The Komor Jal is a large net of 60 m to 200m joined together by pieces of small nets. Each piece is 30m long and 3-5m wide with meshes of 12-14 mm. It is made of multifilament No.4 nylon twine. It has floats on the head rope but no weight on the ground rope. Its fishing method is similar to that of Ber Jal. In the Chalan beel it was used only in the month of January to catch common carp, pholi, boal, mrigal, catla and air. Other small fish and prawn were also captured.

Badai jal

This is a rectangular net made of very fine mesh mosquito netting. A number of pieces (each 15 m long and 5.7 m wide with mesh sizes of 2 to 5 mm) are joined together. It has a light head rope with floats and a heavy jute ground rope. In the fishing operation 6 to 12 fishermen encircle a large stretch of water body. Two or three fishermen constantly keep the head and ground rope in right position, while the other fishermen drag the net. They gradually pull the net towards the bank.

Badai Jal was used only in Chalan beel in the early dry season from December to next January. The catches were chela, punti, kanchki, chanda, chapila, kakila and small prawn. Catla rui and mrigal fingerlings were also caught.

Fasi jal

It is a rectangular net made of nylon twine. The net is also known as 'Net jal'. It is 150 m long and 3-6 m wide with meshes of 9-30 mm. It has a comparatively light head rope with foam rubber floats and a heavy jute ground rope. It is operated by 10 to 12 fishermen to encircle a large stretch of water body. Two or three fishermen constantly keep the head and ground ropes in right positions, while the other fishermen pull the net for some distances. When both ends are drawn together, they gradually haul the net to the bank.

It was used in the Chalan beel in early dry seasons from December to February. Rui, shoal, catla and mrigal, were dominant species in the catches. Common carp, mirror carp, koi, singi, magur, taki, silver carp and other small fish are also caught.

Gamcha

It is a piece of hand woven local towel used as a seine net by women and children. It was used in the Chalan beels throughout the year for small fish and prawn.

Thela jal

Thela jal is a small triangular push net with a bamboo frame. The size of the net is 0.75-1.5 m at both sides and 0.50-1m at the front edge. The meshes are 5-10mm .It is commonly used by women and children. The operator wades in shallow water, pushing the net on the bottom or under water hyacinth, and then hauls up to catch fish. The net was used in the Chalan beel in the late monsoon season and the dry season December to July for singi, koi, kholisha, baim, and other small fish and prawn.

Dharma jal

It is a rectangular lift net of with four corners are attached to the four ends of two split bamboos handle crossing each other as arches. Occasionally, a rope is used to facilitate the manipulation of the net. The net is 3.5m by 3.5 with 5-10mm meshes. Fishermen dip the net in water and push it forward along the bottom and then abruptly lift it up. Dharma Jal was used only in day time throughout the year in shallow water area in floodplain or canal (khal) where water current is gentle .Small fish like baim kholisha, taki, punti, kakila, chapila were the major species in the catches.

Bua jal

Bua Jal is similar to Dharma Jal, except that it has a bamboo handle. The size of the net and meshes of Bua jal are identical to those of dharma jal. But its fishing operation is different. It is used in deep water. The net moves along the direction of water flow and was hauled up by pressing the end of the handle. The net was used only in Chalan beel in the monsoon season from August to November for baim, rui, koi, chapila, raiq, punti and other small fish and prawn.

B. Trawl net

Tana jal

Tana Jal is a common type of fishing gear used in floodplain of Bangladesh. It is also called Moi jal in Borisal, Faridpur, and Noakhali, district, Dalna Jal in Khulna and Sylhet districts and Tana Jal in Rajshahi district (Ahmed 1962). It is 3-6m long and 2m wide. About one third of the lower portion of the net is folded up to make a pocket along its entire length. Weights are attached on the lower edge of the pocket to keep the mouth of the pocket open. The upper part of the net has a bamboo stick to keep the net open. Two long ropes are tied to the ends of bamboo stick for trawling. This net is put on the bottom of water body and dragged towards the banks. Sometimes the net is lifted up onto the boat. A small Tana Jal is operated by single fisherman, while two fishermen are required to operate a big one. In deep water fishermen operate this net from bottom.

The net is consisted of webbings of three different mesh sizes. In the Chalan beel small meshes of 2-10mm were used from July to February, and large meshes of 12-19 mm. and 25-38mm were used from January to March. The large meshes captured boal, catla, mrigal and common carp, while the small meshes captured baim, chanda, mola, raiq, bele, te ngra, chela, punti, kanchki, chapel, gutum and kakila.

B. Gill net

The Gill net is a rectangular net with weights on the ground rope and floats on the head rope. It hangs vertically in water. Its mesh sizes vary with types and sizes of target fish. It is often set on the migration routes of fish. There are four types of gill nets used in the three floodplains.

Current jal

Current Jal is made of monofilament nylon wire. It is an extremely efficient fishing gear and has been declared illegal by the government, because of its potential capability for capturing juveniles of large fish like rui, katla, mrigal, kalibaus. A number of pieces of

the nets are joined together and set in paddy fields or an open area of floodplains. Each piece is about 10—25 m long and 0.5-1m wide.

In the Chalan Beel, the mesh sizes in use were 15-20 m, 21-30mm and 32-50 mm. Current jal with large mesh (32-50mm) were used mainly for catching common carp, catla, rui, boal, air and nets with small mesh (15-20mm) were used for singi, taki, baim, koi, and kholisha and fingerlings of common carp, rui, catla, mrigal, silver carp, air and boal. Current jal with small meshes seems to damage the fish resources of floodplain.

Koi jal

Koi Jal is a common name for the gill net used in the district of Barisal, Faridpur, Khulna, Jessore, pabna, Rajshahi, Bogra, Dinajpur, Jessore, Mymensingh. Dhaka, Sylhet, Comilla, and Noakhali for catching mainly koi fish (Ahmed 1962). The net is fabricated with nylon twine or cotton wine. Some of the net are equipped with both floats and sinkers. A single piece or a number of pieces of the nets are joined together and set between two paddy fields or along khals in floodplain. Each piece of koi jal is 15-30m long and 1-2 m wide.

Fash jal

Fash jal is a big gill net made of nylon or cotton twine equipped with floats and weights. Each piece of net is 15-30m long and 1m wide with meshes of 25-30mm and 75-80mm. A single piece or a number of pieces of the nets are joined together and set between two paddy fields or along a khal. Generally the net is set in the morning and checked every three or four.

Fash Jal was used in the Chalan beel in the late monsoon and in the beginning of the dry season from September to January. The large mesh was used in the Chalan beel for catla, boal, air, mirror carp, common carp, rui, pholi, and sar-punti.

Dakon jal

This is a gill net without float or weight. It is 25-40m long and 1m wide, and made of monofilament nylon twine. It has two different mesh sizes 30-40mm and 45-65. A number

of pieces of the nets are joined together and set in an open part of the floodplain and checked every two hours. Dakon jal was used in the Chalan beel and operated from morning to evening. The species caught were boal, common carp, catla, air and rui. Sarpunti, mrigal, kalibaus, silver carp and singi were also captured.

D. Cast net

Khepla Jal is a common cast net used in Bangladesh. It is also known as Jhaki Jal in Barisal, Faridpur and Rangpur, Khapla in Dhaka Mymensing and Tangail, Toira in Rajshahi, Pabna, and Jessore Chatki in chittagong. Dhundi in Sylhet and Bhumri and Pheka in Dinajpur (Ahmad, 1962) It is a circular net with weights along its circular edge and has a string at its apex. It is thrown by hand from boat or bank to cover a circular area of water. The net quickly sinks to the bottom and then is pulled up slowly to catch fish. It is operated by a single fisherman. It is 4.9 m in diameter and is fabricated with thick Nos. 3-5 nylon twine. The mesh sizes are 4-10mm, 11-20mm, 22-30mm and 32-38mm. in the Chalan beel. The small meshes were used throughout the year, while the large meshes were used in late monsoon and early dry season (October-December). The large meshes were mainly for catching mirror carp, catla, and rui and small meshes for taki, kholsha, baim, koi, singi, punti, tengra, chanda, chapila, bele, raiq, chela, mola, kakila, vada and small prawn.

E. Lift net

Veshal Jal is a large triangular net operated from a bamboo platform built in khal, canal or in an area with gentle flowing water in flood plain. The two bamboo poles act as fulcrum, so that when the net is lifted by applying weight on its base, its central position comes about 1.50m above the water surface.

In the fishing operation, the net is dropped into water against gentle current. The front position is in water while the conical end remains about 2m above the water surface. The net forms a conical bag under the pressure of water current. The net is kept in water for 5-20 minutes and then hauled up. A fisherman stands on the conical end of the frame transferred to a basket or hapa tied to the platform. It was 15m by 14m in Chalan beel, the front position. The fishing season was in the late monsoon season and the beginning of the dry season from September to February. Rui, catla and mrigal were the largest

species. Common carp, silver carp, grass carp, boal, soal, gazar, koi, singi, pholi, baim, taki, kholisha and small fish punti, chanda, tengra, mola or moya, chapila and prawn were also captured.

F. Block net

Shuti jal

Shuti jal is a large funnel shape block net used in khal of the Chalan beel in November and December during the water receding period. The net has a pouch and two wings. Both wings are stretched laterally against current with bamboo stakes fixed on the bottom of the khal. The size of the net varies according to the width and depth of the khal. The mesh sizes are 10-20mm for the wings, 10mm at the mouth of the net and 2mm at the posterior end of the pouch. Sometimes split bamboo fences are constructed on both sides of the khal. The net is hauled up every half or one hour. The pouch of the net is lifted onto the boat, the rope of the posterior opening is untied and the fishes are emptied. Big catches occurred at dusk and dawn. Small fish and prawn such as punti, chanda, kanchki, kakila, pabda, mola, chapila, tengra, belc and raik were dominant in the catches.

The fishing of Shuti Jal was a 24 hour operation daily by rotating the work of about 10 to 30 fishermen. Fishermen carried out fishing, sorting, drying and marketing operation. It was a group activity. Each group has a leader who managed the operation and maintained accounts of fish harvested and income from the side.

Dori jal

The net is 5-6m long and 2-3 m. wide with the mesh size of 5mm. It is rectangular in shape with a bamboo pole on each side. It is operated by two or three fishermen. The net is set in shallow water. A heavy rope is put at a distance of 10-15m from the net and dragged toward the net. When the rope comes close to the net fishermen haul up the net to catch fish. The net was used in the Chalan beel throughout the year for catching baim, pholi, taki and kholsha and other small fish and prawn.

3.2.5.2 Fish trap

Fish traps are common fishing gear of the inland fisheries. There were 8 types of traps used in the Chalan beel

Vair

Vair is a long box like trap with a door extending from its base to its apex . It is made of split bamboo sticks tied together with creeper or cane. There is a small opening at the apex for removing fish. The trap is set in shallow water in the evening and hauled up in the next morning.

There are two types of Vair used in the Chalan beel in the monsoon season and early dry season from July to January. The choto-Vair which is simply called Vair is 0.75m high, 0.5m long and 0.5m wide with 5-10mm gaps (spaces between bamboo sticks). The Boro vair is 1.25m high, 1m long and 1m wide with 20-50mm gaps. The catches included common carp, singi, boal, catla and rui.

Ghuni

This is a small trap used in floodplain in Bangladesh. It is also basket shape and made of very fine split bamboo sticks tied together with creeper. It is 0.50-0.75m high 0.50m long and 0.08-0.14m wide with 2-5mm gaps. The trap is set in shallow water during day or night. Catches consisted of small fish such as kholsa, baim and small prawn.

Polo

This is a bell shaped bamboo trap with open bottom, but has a small opening at the top. It is used throughout Bangladesh in the dry season from December to May. A fisherman presses this trap to the mud bottom in shallow water and put his hand through the top opening to search and catch fish in the trap. Usually a large group of villagers operate polo. The catches were koi, taki, sole and small fish.

Chaloon

Chaloon is a bowl shaped trap made of split bamboo sticks with the radius of 0.25-0.65m and gaps of 5mm .It is set in shallow water area of floodplain. In the Chalan beel it was used only in January for small fish and prawn.

Udra

Udra is a drum-shaped trap made of split bamboo sticks. The anterior portion is slightly wider than the posterior portion It has two trap doors lying one behind the other. It is called Udra. The trap was used in late monsoon and early dry seasons. (Water receding period) from September to January for catching prawn including giant fresh water prawn and rui, catla, mrigal and shoal.

Bitte

Bitte is a rectangular trap with a wide base and narrow apex with two or three trap doors .There is an opening at the top for removing fish .Trap is set along banks of khal in the evening and checked the next morning. Often several traps are operated together in the Chalan beel. It was used in the late monsoon season and early dry season from October to January for baim, kholisha and other small fish and prawn.

Tubo

It is a small basket-shaped trap made up of split bamboo sticks with two doors at the base There is an opening on the top for removing fish. It is 0.40m high, 0.30m long and 0.30m wide. The trap is used in paddy fields from July to January mainly for punti and kholisa. It is known as Kholshon in the Chalan beel.

Chonga

Chonga is a piece of hollow bamboo, one end of which is closed and other end open. It is set on the bottom of khal or in kua and hauled up once or twice a month to catch baim, gutun.

3.2.5.3 Hook and spear

Chhip-barshi

This is a hook tied to the terminal end of a piece of nylon or cotton twine. The other end of the twine is tied to small bamboo pole. A piece of light wood, reed or cork is tied to the twine as float. The bait used is a piece of earth-worm, rice-dough, small prawn or eggs of hornet. It is also named after its target species such as punti barshi, bele barshi, koi barshi and prawn barshi.

Chip barshi was commonly used children and women in rural villages. It was used from June to December for punti, tengra, bele and veda in the Chalan beel.

Don-borshi

Don borshi is a long line commonly used in floodplain of Bangladesh. It is also known as Hazari Barshi. Don borshi and chhara barshi (Ahmad.1962). It is several hundred feet long with hooks tied to the line at intervals. Don borshi is often set between two paddy fields by tying its both ends on two bamboo stakes. It is set in the evening and hauled up in late night or early morning. In case of day fishing, it is hauled up every 2 to 3 hours. Earthworm or small shrimp is used as bait. Don borshi was used from July to December for tengra, bele, pabda and veda in the Chalan beel.

Barsi

Barshi is a hook and line with a piece of cork, water hyacinth or light wood as float. Earthworm or small prawn is used as bait. A fisherman operates as many as 250 barshi per day. He uses a small dingi (boat) to set them in inundated paddy fields in daytime and check them at intervals of 2 to 3 hours. Barshi was used from February to April and June to October in the Chalan beel. The target species were baim and other small fish.

Chasra

Chasra is a hook and line similar to Barshi, but instead of metal hook it uses line small bent split-bamboo as hook. Grasshopper is used as bait. It is known as Chasara in the

Chalan beel. It was used in the Chalan beel in January. Koi singi boal and common carp were the main target species.

Nol-borshi

Nol barshi is a hook and line attached in the middle of a 1m to 2m long split bamboo or jute stick. Earthworm is used as bait. A fisherman may operate 50 to 500 Nol barshi. He uses a small dingi or Donga (boat) to set them in shallow Water area with one end of the stick fixed on to the bottom soil. The fisherman checks them approximately every two hours. Nol barshi is also known as Gaja barshi. It was used in Chalan beel through the year. Taki was the main target species. Singi, shoal, magur and koi were also caught.

Fulkuchi

This type of spear has a bunch of 12 to 22 sharply pointed steel wire at the end of a bamboo pole (fig).It was used from September to February mainly for shoal, rui, catla and common carp.

Jhupi

Jhupi is a spear consisting of a detachable iron fork with 5 to 13 barbed points and a bamboo handle . Sometimes a long string is tied to the free end of the handle. It was used from June to December for capturing various species of fish including common carp, boal and sol.

Konch

This type of spear has a bunch of 8 to 14 pieces of split-bamboo firmly bound together. The free end of each is attached with a piece of sharply pointed iron. Konch is thrown with a great force toward a fish to pin it down. It was used in the Chalan beel from September to November. Big fish like rui, catla, shoal, boal and common carp were the target species.

Aikra

This type of spear has a single detachable barbed point and a bamboo handle. It looks like a big hook . It was used in the Chalan beel from December to June to catch baim singi, taki and other small fish.

4.3 Marketing system

The goods are service from the primary producing area and lastly it reached to the consumers. Marketing system as the business activities involved in the flow of goods and services from the point of initial production until they reach to the ultimate consumers. The marketing system consists with a market and marketing channel along with a transportation system and some storage facilities. The marketing system lies in between the producer and the final consumer i.e. the system by which the products are supplied from the producer up to the final consumption is treated as market system.

In Bangladesh, fish marketing in small fishing communities traditionally operate under private enter-prise in which the trader plays a dominant role (Nuruzzaman, 1994). This system claimed, yields for the fishermen only a low price for his fish. The level of exploitation by traders, cooperatives, associations is highly desecrated, controversial and undesirable. Apart from price and weight, the poor fishermen suffer at the hands of monopolist suppliers of ice, nets, boats and other gears.

The main problems affecting the marketing of fish in Bangladesh are the isolation of many fishing communities from their wholesale landing facilities coupled with poor transport and lack of ice; poor physical facilities for marketing of fish landing center, wholesale and retail markets; and widespread ignorance of the factors affecting fish quality and ways of over conning them. There is considerable wastage (30%) due to current traditional methods of handling and processing in Bangladesh (Azam and Rahman, 2003). These problems gave rise to substantial losses to the economy of Bangladesh. With still under production in fisheries, Bangladesh faces losses both quantitatively and qualitatively.

The new marketing techniques have been adopted so as to sell more fish. The fish marketing does not have the object of only catching and selling fish but have the wide scope for exploitation, production, distribution, preservation and transportation of fish in addition to actual sale of fish by reducing middlemen (Agarwal, 1950).

In Singapore and Philippines the fish marketing is completely in the hands of private merchants. In Sri Lanka, fish marketing is in the private hands though Government has extended some support to cooperatives.

The fish marketing system in most areas of Bangladesh including floodplains is yet to be modernized. Infrastructural facilities for handling, transportation, storage are far from satisfactory. Also marketing margin of fish is often high and fish prices are high and unstable. These suggest that there is much room for improving fish marketing, which will ultimately result in increasing satisfaction to consumers and revenues to fishermen and fish traders.

4.3.1 Location of the market

In Haldi beel of Chalan beel is located in Natore district. It can be reached by boat, road and railway. It has an area of 16,770 ha having about one hundred thousand people. Two types of fish landing centre are present, bazaar and hut. Fish landing center- Trimohoni bazaar in Haldi beel serve as both primary and secondary market. While para and gala (small market) are primary market and hut and bazaar are secondary market.

In shingra beel, Shingra (masua bazaar) fish market, Natore is very important market for fish landing and selling. This fish landing center is both for bazaar and hut (secondary market) Shingra is about 12 K.m from Natore district and Shingra fish market is situated beside the Shingra bus stand. So there is a good facility to transport fish from Shingra to various location also there is a good facility for landing fish here from various site of Chalan beel.

The fish landing centre is Chachkoir bazaar in Gurudaspur. It is about 1k.m. from Gurudaspur Bus stand. We can reach the bazaar from the bus-stand by Rickshaw or Van. The Bazar is situated beside river. The fishes come from the beel area here by truck, van, boat, trawler etc. Though it is mainly a fish market, some other commodities are also purchased here.

4.3.2 Marketing channel

Fishermen always retain portions of their daily catches for their own household consumption. The fish distribution channel is a route along which fish harvested from the floodplains is shipped to consuming area. Fish marketing is controlled by powerful marketing intermediaries. It is like a time machine that has wings of convergence (collection) and divergence (distribution). Four to five intermediaries are usually involved in the bulk marketing of fisheries products. In general, the Chalan beel fish trade involves the following 4 marketing levels.

4.3.2.1 Primary Market

Starting from the production level, the basic structure is formed by the fisherman or producer. They culture fish and catch fish from fishery resources by using minimum input and then sell their fishery product as fresh condition directly to the near by local market (bazaar, hut, para, gala, khola) to consumers or directly to the intermediaries who purchase fish from fishermen from the catching area. The little amount of fish also sold to district wholesale market by fishermen. Many of the fishermen can not go to the far market for socio-economic condition, lack of transport system and privation of preservation of fish. Agents (fish brokers) who are commonly called as (Dalal/Nikari) in local terms approach the primary fish traders (Mahajan or Aratdar cum Mohajan) in lieu of their services the agents get commission from Mahajans. A large portion of fish catches (about 46%) from the floodplains is assembled at paras and galas, primarily by fishermen (about 75%), and the rest by beparies (25%). About 31% and 7% of the fish catches from the floodplains are landed respectively, at bazaar huts by beparies, farias and fishermen, where they sell most of the fish to local consumers. A small portion of the catches (about 8%) from the floodplains is shipped directly to market outside the floodplains by passing landing centers.

4.3.2.2 Secondary market

Chalanies and paikers purchase fresh fish from fishermen and mahajans at paras and galas and ship them to outlying districts. Fish collected through different sources and places by the collector (mahajans) are brought to the near by thana (sub district) markets or fish

points which are well connected by rail, river or road links. They are permanent fish dealer and usually holding a license. At this point the products are sold to the next intermediaries, the fish traders locally known as “beparies”. With the help of commission agents (Aratdars), they control this sell points. Some time they give advance money to any middle man and fisherman to make sure of the supply of fish from them.

4.3.2.3 Higher secondary market

The traders (bepries) carry the fish to market town/city market centers by road, river or rail and sell it to the distributors (paikers) through the commission agents (aratdars). The paikers have small amount of capital investment in generally their also few in number. At this point the divergence starts and the product are scattered through the distribution channel.

4.3.2.4 Distribution market

Distributors sell their purchase to the retailers. Retailers in turn, sell their products directly to the consumer either through fixed stall in city/town markets or by vending on head or by rickshaws, vans. The retailers have small range of capital investment or sometimes without investment, because the paikers supply fish and after selling they return the price of the fish commodities. In this system, they get less benefit. In some market, the fishermen and middlemen act as a retailer depending upon the market structure or situation. They are not a large number of retailers at Shingra bazar, because the bazaar is thana town bazaar. And many fishermen came to sell their fish in the market. They sell their fish like retailer. The other two thana markets are like the Shingra market.

In the beel area, fresh fish is also assembled by beparies from fishing grounds, heats and bazaar to fish drying centre (Kholas), where sun drying is resorted. After drying shutki (dried fish) are packed and shipped to several districts in northern Bangladesh and to large cities such as Comilla, Dhaka and Sylhet in gunny bags and sacks. They are further shipped to interior parts of the country by retailers and aratdars. About 8% of the total fish production of the three floodplains is dried.

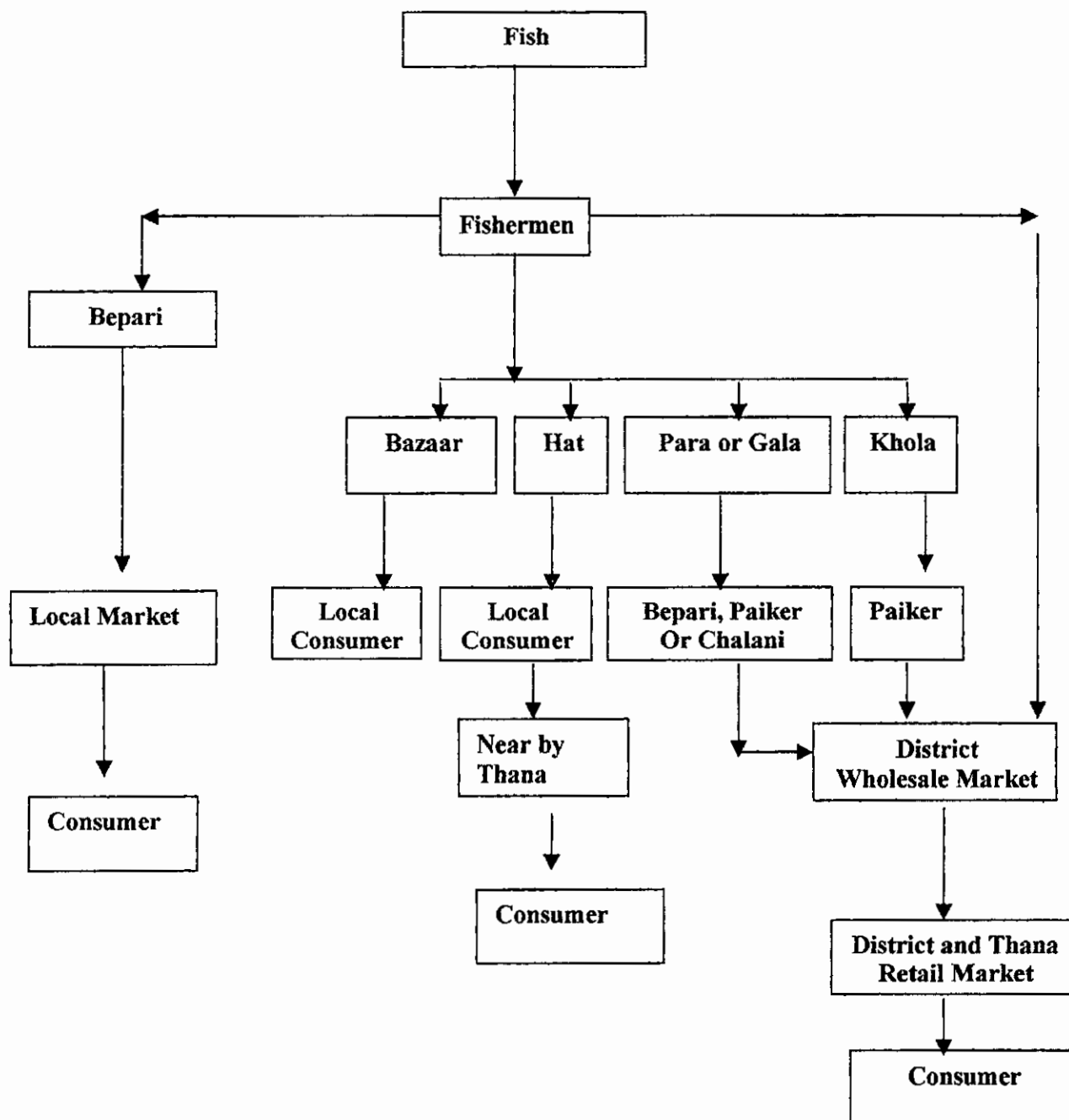


FIG-6: SCHEMATIC DIAGRAM OF MARKETING CHANNEL

4.3.3 Fish landing

The annual total landing of various types of fishes from Chalan beel in Atrai wholesale fish market were recorded as 296 Mt in October and November, 1993. Generally from March to April fish landing were low. The peak landing was found in the month of November.

Table-12: Quantities (MT) of fish marketed at different fish landing and distribution centers of the Chalan beel from October-November, 1993. (Field survey)

Fish landing and distribution centers	Quantity (MT)
Para or Gala	-
Bazar	222
Hat	17.76
Khola	20.72
Direct outside markets	35.52
Total	296

The quantity of fish landing is slightly high in Shingra fish market and same in Gurudaspur fish market. Among the various types of fishes, the landing of small fish was placed the highest (48%), the lowest was prawn (2%), carp was 33%, cat fish 12% and others was 5% (Fig-7).

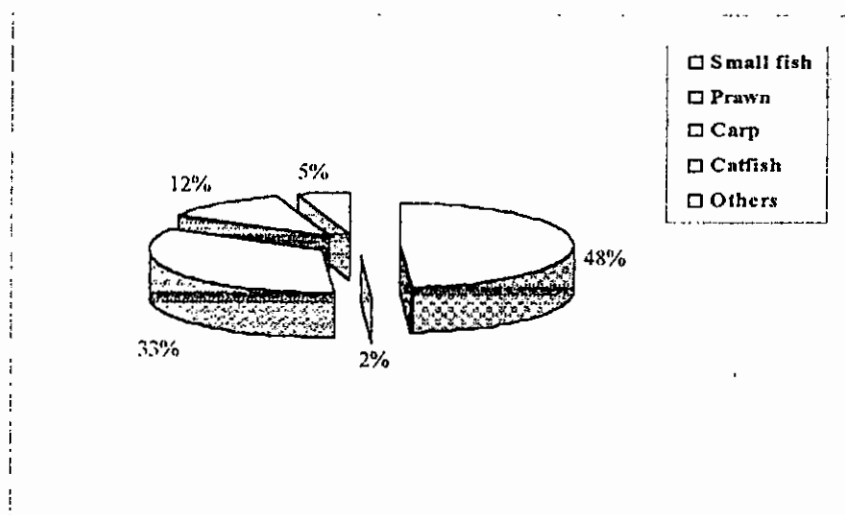


Fig-7: Annual average landing of various types of fishes

4.3.4 Preservation and Transport System

During the time from catch to transport of fishes to local market live fishes (Koi, Shing etc) are kept at the bottom of country boats with a small amount of water, while dead fishes are kept in bamboo baskets. Fresh fish is preserved in various ways for transportation depending upon local tradition, type, variety of species, distance and duration of traveling to market in Chalan beel, ice is used for fresh fish preservation for shipment to markets in Dhaka, Rajshahi, Pabna, Bogra, Dinajpour, Rangpur districts. Fish is packed with ice, wrapped by hogla (*Typha angustiflora*; a local aquatic plant) leaves and kept in empty 50-gallon steel drums. The ice is supplied from 2-25 Km distance. A piece of block ice (Pata) may weight 10 Kg (hollow inside) to 30 Kg (solid), which have a price of Tk. 25 to Tk. 65 per block. The ice block is crushed and spread between the layers of fish. Wooden boxes are used for temporary preservation of certain varieties of small (Kholisa, Puti, Kakila, Chingri) and medium size fish (Carp, Boal) at markets for a short of time destined for next shipment. Green banana leaves and old gunny bags are used for wrapping fish inside the boxes.

Big fishes such as 5-10 Kg carp fishes, large Shoal, Boal are sold whole. Small fishes such as Punt, Kholisa, Chala, Mola etc are put in lots in bamboo baskets or in baskets loads and are sold by auction or negotiation. Live fishes such as Koi, Magur and Shing are kept alive in earthen pails with water or silver pots with water. For carrying long

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distance use polythene in bamboo basket with water and are sold on the basis of their number and sizes by species. Beside these tin or drums are also used for long distance.

In the cases of short distances, rickshaw-van, bullock cart, bicycle, tempos (three wheeled automotive van), head loads boat, engine-boat are used from capture points to market. Buses and trucks are the only transporting media of fishes for long distance.

The fishes mainly came from Chalan beel for a short distance. These are transported to the long distance such as Rangpur, Dinajpur, Pabna, Bogra, Natore, Rajshahi etc.

Table-13: Fish packaging materials used in Chalan beel area.

Form of Packing	Types of fishes carried by containers	Distance
Basket and kept at the bottom of country boat with a small amount of water	In basket dead fish are kept and live fishes (Koi, Shing, Maagur) are kept at the bottom of country boat with a small amount of water	From catching area to local market
Fish packed with ice, wrapped by hogla and kept in steel drums	Big and small dead fishes.	For long distance
Wooden boxes with banana and old gunny bags for wrapping fish inside the boxes	Small and medium sized fishes	Short distance
Silver pot, earthen pails with water	Live fishes	Long and short distances
In tin and drum with ice packing	All types of fishes	Long distance

4.3.4.1 Sun drying of fish

Sun - drying is one of the processes of preserving fish in Bangladesh including Halmi, Shingra and Gurudaspur beels. Salting or smoking is a process of fish preservation, is not seen in any one of the selected beels. There is no technology of protecting the quality of dried fish from damage of insects and damp weather. The drying is done immediately after catching of fish. The fishes are caught in night and drying start from next morning. Fishes are dried on the rack in open field during January and September. Rain and fog are the main natural obstacle during fish drying. They confirm completion of drying by assumption. The fishes are loaded in gunny bags and kept in dry places. The production of dried fishes from the three areas are about 1000 - 1200 mounds. The fish drier take dadon from Mohazon for a time and repay this money by on installment or by supplying dried fish to them. Both Paikers and Beparies are engaged in the shutki (dried fish) business. In the peak fishing season in the later part of the monsoon season, they purchase raw fish at low prices. The average price of dried fish is generally about two times higher than fresh fish depending upon their type, color, odor and taste.

4.3.5 Fish prices

In the three selected floodplains, retail prices of fishes in market in October and November were fairly good for Magur, Koi, Shing, Chital, Rui, Common Carp, sarputi, Pholi, Mirror Carp, Silver Carp, Shoal and Air. For other species the prices were low. In Chalon beel stocked, Sarputi, Common Carp, Mirror Carp, Rui, Catla, Mrigal and Silver Carp had generally low prices than those for non-stocked fish like Magur, Koi, Shing, Chital and Air but higher than Taki, Kholisha, Gazar, Kalbasu and other small non-selected varieties. It appears that stocked exotic species had reasonable prices and gradually attracted more and more consumers. Small fluctuations in the prices of Mirror Carp, Rui, Boal, Taki, Shoal and small fish were observed while fluctuations in prices of Koi, Pholi, Magur, Khoilsha and Shing were moderate to high. The fluctuations were apparently related to the supplies in markets. Demands for fish in the areas remained stable during the period. Seasonal fluctuation in fish prices in floodplains is a normal phenomenon. However, when the fluctuation is too drastic and wide, it affects adversely fishermen and consumers. When fish prices increases, it often produces a beneficial effect to fishermen but not on consumers. In contrast, the decrease in price often causes beneficial effect to the consumers but not to the fishermen. Therefore, the price

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fluctuation should be kept at the minimum possible level by maintaining fish supplies at market at a fairly constant level throughout the year. In order to achieve this, preservation at the time of abundance and sale at the time of scarcity is essential and hence appropriate measures should be taken for developing the fish preservation technology and development of fish storage facilities. Fish prices increase in double in March to April. Fishes are available from the month of June to December. During this time, fish price is normal.

Table-14: Average prices of some fishes in the Chalan beel area.

Name of the fish	Price (Tk/Kg)
Rui	60
Katla	60
Mrigal	50
Kalbasu	70
Silver Carp	36
Grass Carp	50
Punti (small)	29
Punti (medium)	40
Punti (big)	80-90
Kholsa	36
Chanda	45
Koi	180-215
Bele	46
Kachki	50
Taki	19-20
Shol	72
Guchi Baim	40-45
Boal	75
Tengra	60-65
Shing	140-150
Magur	140-150
Pabda	140-150
Tengra	60-65
Patasi	100-120
Shrimp	30-40

Table-15: Prices of Some Dried Fishes.

Name of the fish	Price (Tk/Kg)
Punti (small)	33
Punti (medium)	46
Punti (large)	90-100
Kholsa	36
Baila	46
Chanda	45
Guchi Baim	80-100
Kachki	50
Chingri	50



4.3.6 Present condition of the market

1. Often jellay (fishermen or beparies/ traders who function mostly as assemblers or infrequently as distributors in fish marketing) sell their fish in open yards or roadside places without having market places (pacca or semi-pacca shed) for auctioning, weighing, cleaning and packing. Though there is some rooms made by chatai (bamboo) places in Shingra market and some tin shaded semi-pacca places in Gurudaspur market but these are very few amount.

1. The main problem of these three markets is absence of fish preservation facilities particularly easy available of ice, improper handling and inadequate packing and preservation. There is no ice factory near these places. So, fish become uneaten condition before sold to consumers.
2. Transporting system is not fast, so maximum fishes spoil before reaching to the destiny. Most dead fishes are sold often in poor condition.
3. Lack of toilets, water supply and waste water drainage facility.
4. Absence of modern fish weighing and grading methods.

6. Lastly fishermen bring their catches directly to fish landing center (primary markets), such as para, gala, bazaar and heat and hardly move on to secondary markets. There are several reasons for this: small catches, insufficient capital for undertaking trade like middlemen, negligible experience and technical knowledge on trading, lack of market information and absence of trading cooperatives organization. When fishermen enter the secondary markets or markets outside the floodplains, they are frequently obstructed by financially strong and influential middlemen. Most fishermen are illiterate and poor. They often depend upon dadondars (village money lenders) or beparies for loans and advances for fishing or condition that the catches would have to be brought to them for disposal. Under such condition, the dadondars auction the fish brought by the fishermen and recover the money they advanced with high interests. Fishermen are unable to improve their poor living because the organized institutions like banks and NGOs do not play their role effectively to combat the harmful effects of middlemen's money lending practices. Like in other parts of Bangladesh, fish marketing in three selected areas of Chalan beel almost entirely conducted, financed and regulated by traditional, hardworking and skilled middlemen. The individual middlemen's sphere of interest may extend from fish operation to relating of fish to consumers. The middlemen undertake the strenuous tasks of assembling, sorting, and handling. Transporting, preserving, auctioning, price fixing, risk-taking and financing of the fish trade and distribution. Beparies, chalanies and paikers are main middlemen who perform these real trading functions. Aratdars facilitate the above middlemen's activities. Based on available information, the fish marketing condition in three selected floodplains is found very poor.

4.4 Past and present project works in the Chalan beel area

1. The Bangladesh Center for Advance Studies (BCAS) monitored the fish production in Chalan beel under the Third Fisheries Project (TFP) for the carp fingerling stocking program. In 1993-94, the total fingerlings stocked were 177,606 Kg while production of stocked species was 597,600 Kg.
2. Mean annual productivity (Kg/hac/year) from unregulated floodplains or beel sides outside FCD and FCDI schemes. The productivity was 68 (Kg/hac/year) in Chalan beel.
3. The Water Development Board constructed flood protection embankments, canal and regulator under Chalan Beel Project in 1977. Chalan beel is under the project. But because of wrong planning, dishonesty of the engineers and fund crisis, the people of the project area have been deprived of the facilities (The Bangladesh Observer; June 30, 2003).
4. The Water Development Board took up another plan under the name of Chalan Beel Rehabilitation Project with an expenditure of Tk.200 crore. The plan was submitted to the ministry for approval but nothing has been done in this respect (The Bangladesh Observer; June 30, 2003).
5. In 1992-93, one crore carp fingerling was released in Vadkura beel under the Third Fisheries Project (TFP).
6. In 2001-2002, fish sanctuary was made in Nondo-kuja River under the Fourth Fisheries Project (FFP).
7. In 1992 under 3rd fisheries project 140 ton of carp fishes were stocked. The production was 1,537 ton.

8. Chalan beel polder B North-west by FCD. This project was designed to exclude external river flooding and to convert seasonal wet land into drier land on which to expand the production of HYVt Amon at the expense of brood cast Amon. In practice, however, farmers chose to operate the projects for the continued production of deep water Amon by allowing the controlled entry of external river flood waters when needed.

CHAPTER FIVE

RECOMMENDATION

5.0 RECOMMENDATIONS

From the overall discussion, it is clear that there is substantial scope for Chalan Beel to increase the annual fish production as well as agricultural production. The following suggestions can be made which can provide-

- Harmful nets and traps should not be allowed in harvesting fingerling, brood fish randomly through the year in Beel.
- Over fishing must be stopped and fish sanctuary should be established in breeding area during breeding season.
- Government and Non-Government agencies, research organization, local administration and law enforcing authority should together to formulate an integrated policy to intelligently manage and conserve fisheries.
- Fisheries rules and regulations must be updated and enforced strictly at every steps of fisheries level.
- Canal should be dug and sluice gate should be established adjacent to the river properly so that water can be smoothly in and out in Beel area and there should be no water logged area during rainy season and also in dry season there should be available water in the canal so that there fishes can retain and the water can be used for irrigation purpose.
- School, college should be established in Beel area, free education and scholarship should be given to the poor people.
- There should be a good relation among people of Beel area with fishery, agriculture, animal husbandry and poultry management sector.
- Every year there is lot of property destroyed and many people die by the dacoit so administration should strictly control this rural area.
- There are few roads in Beel area and these are kacha and broken condition so no vehicle can move smoothly on these roads so road connection of beel area with town should be improved.
- There is very poor condition of health and sanitation in beel area. Many people die every year without having proper treatment so hospital should be established and there should be available advice for the poor people.

Recommendations

- Chalan beel has become small because of excess siltation. Embankments should be made properly and dredging should be done, also illegal installment should be removed.
- Licensing system should be established in lieu of leasing system and true fishermen should be given priority.
- Water pollution by any means should be minimized and existing rules and regulations on water pollution should be effectively enforced.
- Rare species can be increased by establishing fish sanctuary in their habitats, breeding areas, nursing grounds.
- Technical supports and fishing training should be provided to develop socioeconomic condition of the fishermen.
- Improvement of fish handling and shipment methods such as preservation, icing, curing in market areas.
- Provision of Governmental and banking assistance in Chalan beel area to help the poor farmer financially.
- The area and population of Chalan beel is greater than some districts. So if Chalan beel becomes district, many problems could be solved.
- It is necessary to emphasize in modernization of Chalan beel area as to utilize resource properly.

CHAPTER SIX

CONCLUSION

6.0 CONCLUSION

In this developed twenty first centuries, people are going forward by the use of available and renewable resources. Bangladesh is considered as a land of rivers. In Bangladesh, the study area, Chalan beel, is one of the most considerable and resourceful water body. The water body is associated with great bio-diversity. In Chalan beel area, there are twenty lacs people. The people of Chalan beel area are in a very low condition; they cannot cope with the day to day affairs. The people is depends directly or indirectly on this vast type of resource. Both the production of crop and fish from Chalan beel area are only one time in a year. If proper management is taken, then it is possible to get these round the year. While the resource in terms of fish and agriculture production is profound, the resources need to be managed and exploited on a sustainable basis. This needs continuous information supports through research. It needs to give the community appropriate resource such as manpower, technology, administration etc. If they get their needs, valuable out put such as crops, fishes, and overall social development might be achieved. Government has to commit long term research run by qualified manpower.

CHAPTER SEVEN

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CHAPTER EIGHT

APPENDIX

APPENDIX

Fishing pattern of fishermen, catch composition and marketing system of Chalan beel in natore districts

A. General

1. Name of the fish farmer:
2. Fish farmer's age:
3. Fish farmer's address
4. A. Village: B. union: C. Upazila: D. District:
5. Fish farmer's sex (male-1, female-2)
6. Is there any problem in your fishing?

B. Fish Harvesting

1. Pattern of fish harvesting: full ☐ partial ☐
2. Area of fishing activities (area name)
3. Pattern fishing activities: Ind. ☐ Partnership ☐ with family member ☐ others ☐
4. How many people involve with you?
5. What amount of fish you caught Kg/Day
6. What amount of expenditure in your occupation or fish harvest?
7. In what seasons maximum fish are caught
8. In what seasons large fish are caught

9. Types, Number, Size and Ownership of fishing craft.

Types	Sizes	Number	Ownership
Dingi			
Trawler			
Boat nouka			
Others			

10. Types and quantity of fish caught by different gear Kg/day

Type Gear Kg/Day

C. Processing and Preservation Method:

1. After harvesting do you use any preservatives?

Yes Type Rate

Not

2. What types of preservation done by you?

Drying	
Icing	
Others	

3. Any processing used for icing?

Yes	
Not	

5. In icing, how many days you may keep fish in fresh condition?

1	2	3	4	5	>6

6. Ice preservation is done

Seasonal	
Whole year	
Occasional	
Others	

7. Problem of ice preservation

8. Do you dry fish?

Yes	
Not	

9. Drying procedure.

--

10. Drying is done

Seasonal	
Whole year	
Occasional	
Others	

11. Dried species

Types	Quantity	Types	Quantity
Taki		Chingri	
shoal		Kholsha	
Chela		Chanda	
Puti		Koi	
Tengra		Others	

12. Chemical used by the fishermen and it's rate

Chemicals Rate

13. except chemicals, Protection methods of different spoilage/ infection

--

14. In the beginning of drying any spoilage occur and it's protective

Yes	Not	Protective
-----	-----	------------

15. Have you done any processing at the beginning of drying?

Splitting	
Gutting	
Chemical treatment	
Others	

16. After how much day of harvesting, drying is being started?

Subsequently	
One days later	
Two days later	
Three days later	
Others	

17. Where drying is done?

Open field		
On the rack		
Hanging on the rope		

18. What are the preventive measures of natural problems (rain/fog)?

19. How will you confirm that drying is completed?

20. Diseases of dried/ Shutki and its preventive measure

Disease

Measure

21. Do you know about better quality of dried fish/Shutki?

22. What is the better practice and why?

Drying	
Icing	
Quick marketing	

D. Marketing system.

1. What profit margin fishermen have?

Poor	Moderate	Good	Very good

2. Can they market the fish fresh condition and can get better profit, how?

3. Marketing channel.

4. Prices of some fishes

Name of fish

Price

6. Quantity of landing

Name

Quantity (MT)

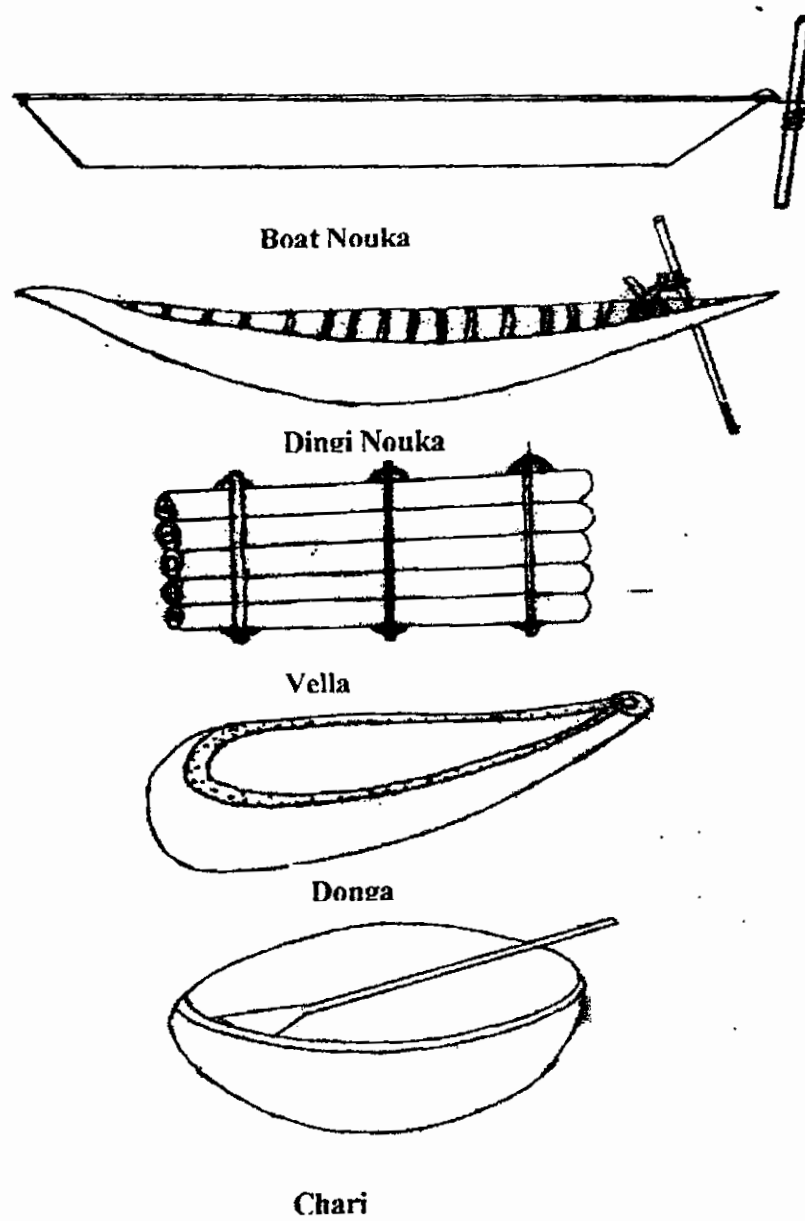
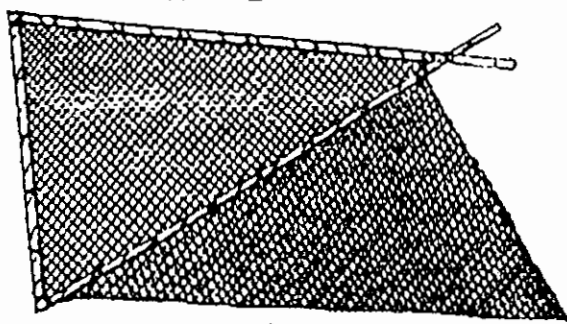
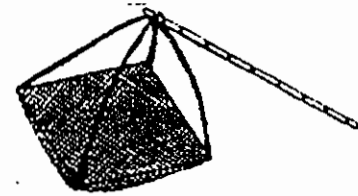


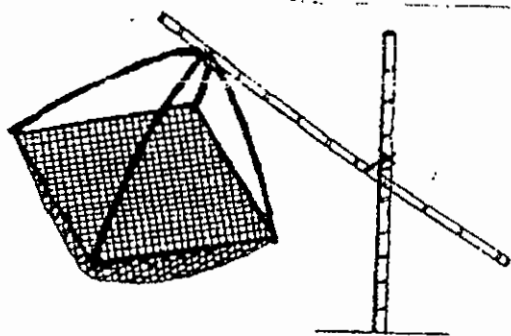
Fig- 8: Craft used for fishing in Chalan beel



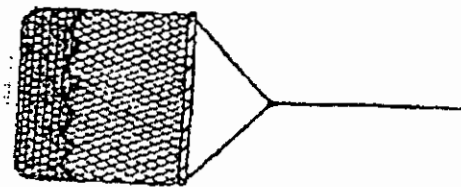
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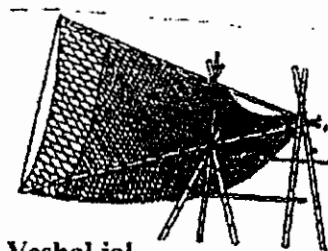
Dharma jal



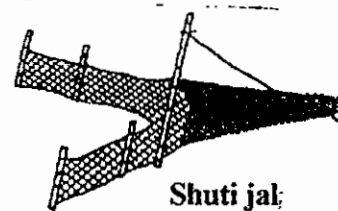
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Tana jal

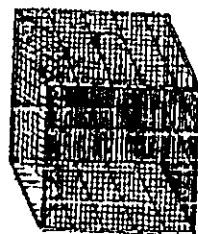


Veshal jal

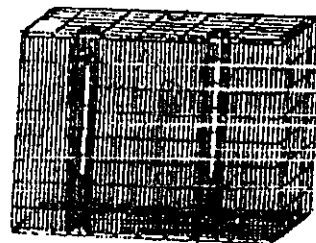


Shuti jal

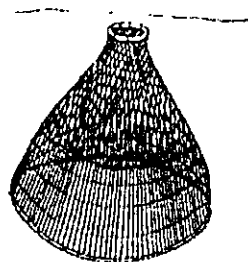
Fig- 9: Net used for fishing in Chalan beel



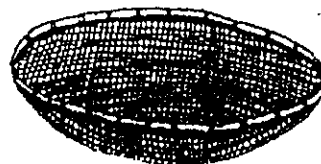
Vair



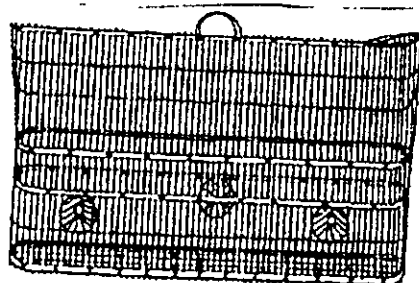
Ghuni



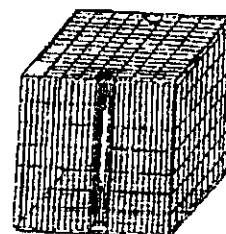
Polo



Chaloon



Bitte



Tubo

Fig- 10: Traps used for fishing in Chalan beel

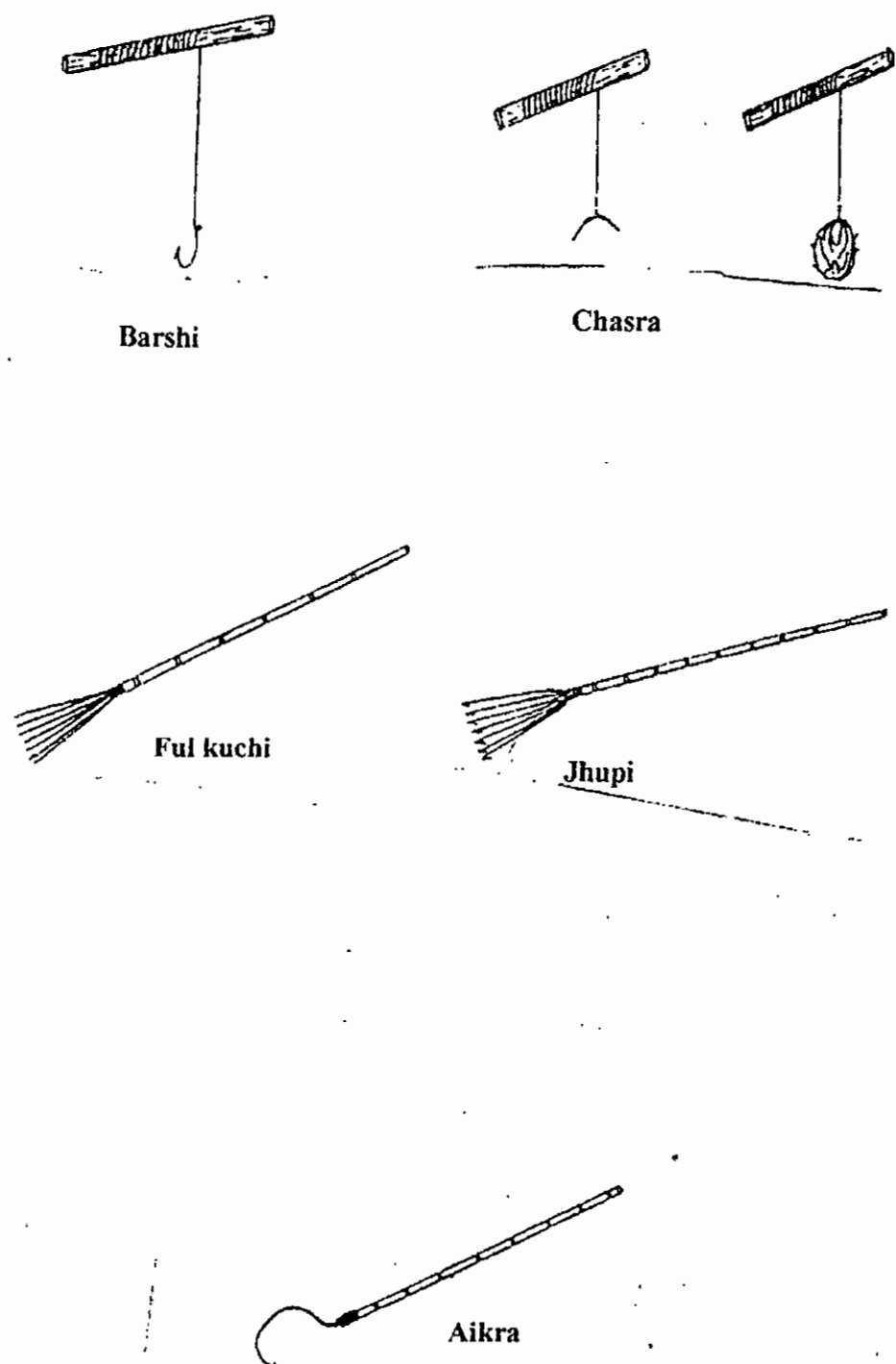


Fig- 11: Hook and spear used for fishing in Chalan beel



Photograph-1 : Paddy cultivated in Chalan beel during dry season



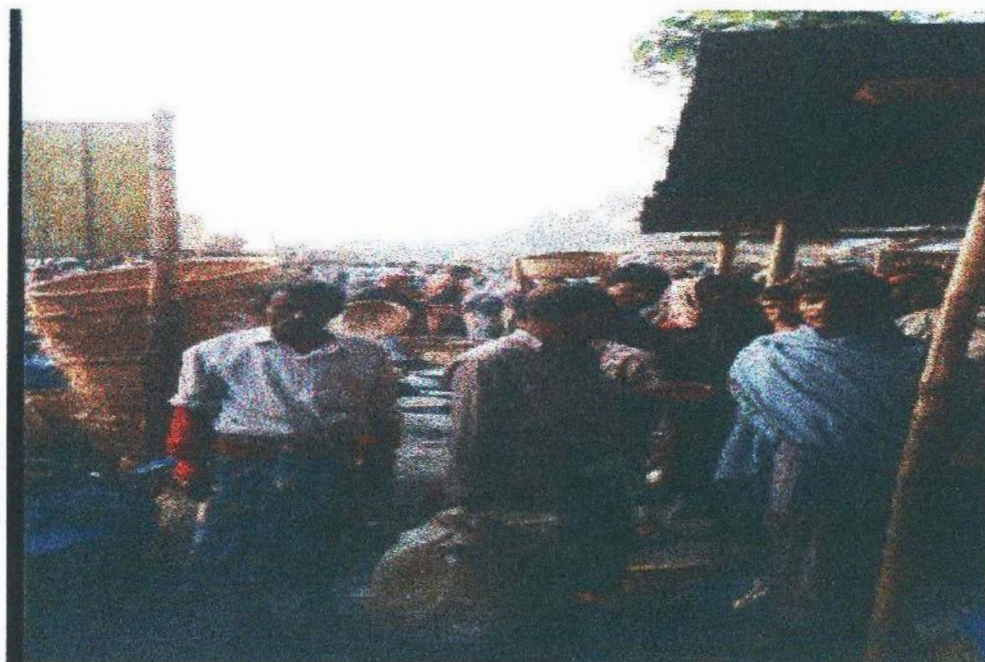
Photograph-2 : Fish caught by Shuti jal



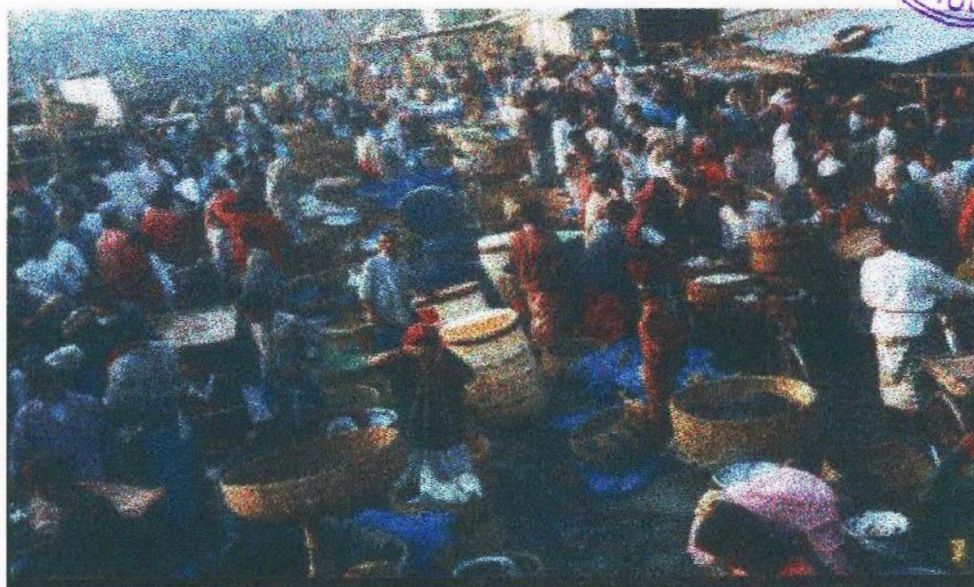
Photograph-3: Fish preserved in polythene bag with water



Photograph-4 : Fish drying process on rack



Photograph-5: Trimohoni fish market in Halti beel.



Photograph-6: Shingra fish market.