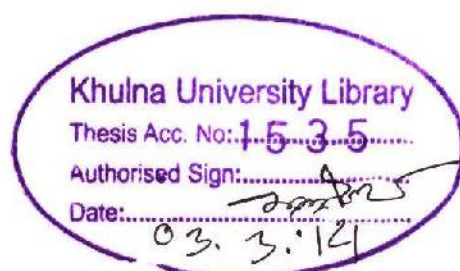


**OBSERVATION ON INLAND CAPTURE FISHERY OF
ABHAYNAGAR UPAZILA, JESSORE**



SUMAIYA MOMOTAZ



Fisheries and Marine Resource Technology Discipline

Khulna University

Khulna, Bangladesh

July, 2011

OBSERVATION ON INLAND CAPTURE FISHERY OF ABHAYNAGAR UPAZILA, JESSORE

A Thesis

By

Sumaiya Momotaz

Examination Roll No: MS-090617

Session: 2008-2009



A thesis submitted in partial fulfillment of the requirements for the degree of Masters of
Science in Fisheries and Marine Resource Technology Discipline

Master of Science in Aquaculture

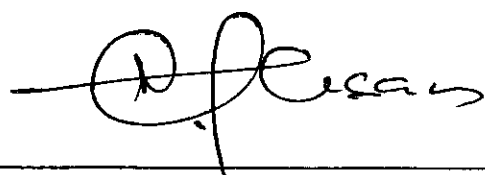
Khulna University

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**OBSERVATION ON INLAND CAPTURE FISHERY OF ABHAYNAGAR
UPAZILA, JESSORE**

**Approved as to the style and content
By**



Professor Dr. Md. Nazmul Ahsan

Head

**Fisheries and Marine Resource Technology Discipline
Khulna University, Khulna, Bangladesh**

July, 2011

Declaration

OBSERVATION ON INLAND CAPTURE FISHERY OF ABHAYNAGAR UPAZILA, JESSORE

The results presented in the thesis with the above mentioned title are entirely of the candidate's own investigations and no part of the results has been accepted for any degree nor is it being concurrently submitted for any degree.



(Signature of the candidate)

Sumaiya Momotaz

Examination Roll No: MS-090617

Session: 2008-2009



(Signature of the supervisor)

Momotaz Khanom

Associate Professor

Fisheries and Marine Resource Technology Discipline

Khulna University, Khulna, Bangladesh

July, 2011

DEDICATED TO

MY BELOVED PARENTS

Acknowledgement

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Sumaiya Momotaz

Khulna University

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Abstract

The survey was conducted at Abhaynagar Upazila of Jessore district. The total water area of Abhaynagar Upazila is 8969.41 ha. Different types of carp, SRS, SIS were found in Abhaynagar Upazila. The highest fishermen were involved in September to January with a highest amount of catching fish. About 40% people depend on capture fishery. The people of Abhaynagar Upazila consume Puti, Shing, Koi, Tengra in all season. In the study area it was found to use various types of crafts and gears including seven types of trap, five types of craft, five types of net, seven types of hook namely Box trap, Topa, Basket trap, Polo, Puti bair, Koi doughier, Khadom, Dingi nouka, Bhesal dingi, Donga, Vela, Patam nauka, Thela jal, Dhormo jal, Seine net, Khapla jal, Push net, Chip borsi, Dao borsi were used for fishing in the study area. In the study area, about 60% fishermen use Tana jal, Khapla jal. The fishermen captured Chingri, Puti, Bain, Taki and other species are 25, 20, 15, 10 and 30% respectively during harvesting. In Abhaynagar Upazila, some fishermen catch fish from October to February. They are categorized as seasonal fishermen. Winter season is suitable for collection of fish. About 60% fish are captured in this season. About 40% fishermen were observed to expend for catching 5 trips and only 10% of them 3 trips per day and night. About 20% fisherman catch fishes 5 hours in day and night. There are 4 sanctuary in Abhaynagar Upazila. It was observed that about 70% fisherman's sold fish several times to the market in Noapara and Phultala. Now-a-days, some species such as Koi, Royna, Shing, Gutum, Bale etc. are endangered. The fisherman can play a vital role to protect this endangered species. They should collect this species from another beel and release this species in beel of Abhaynagar Upazila. There was a range of prohibited fishing methods and there were certain restrictions.

Table of Contents

Acknowledgement	i
Abstract	ii
Table of contents	iii
List of tables	vi
List of figures	vii
List of abbreviations	viii
Chapter 1	
Introduction	1-7
1.1. Background of the study	1
1.2. Hypothesis setting	7
1.2. Objective of the study	7
Chapter 2	Review of literature
Chapter 3	Materials and Methods
3.0. Materials and methods	14
3.1. Conceptualization	14
3.2. Study area	15
3.3. Selection of the study area	16
3.4. Sample size	16
3.5. Reconnaissance survey	16
3.6. Indicator used	17
3.7. Questionnaire survey	18
3.8. Preparation of questionnaire	18
3.8.1. Questionnaire testing	18
3.8.2. Questionnaire finalizing	18
3.9. Sources of data	18
3.9.1. Primary sources	18
3.9.2. Secondary sources	19
3.9.3. Data interpretation	19
3.9.4. Data analysis	19
Chapter 4	Results
4.1. A study on inland capture fishery	20
4.1.1. Water area	20
4.1.2. Catch composition	21

4.1.2.1. List of SRS	21
4.1.2.2. List of endangered SRS and extinct SRS	22
4.1.2.3. List of SIS	23
4.1.2.4. List of Carp in Abaynagar upazila	25
4.1.3. Production	25
4.1.3.1. Production from capture fish in beel	25
4.1.3.2. Production from capture fish in canal	26
4.1.3.3. Production from capture fish in river	27
4.1.3.4. Catching effort from capture fish	28
4.1.4.1. Income of fishermen	29
4.1.5. Consuming season in Abhaynagar Upazila	30
4.1.6. Utilization of inland capture fish	31
4.1.7. Collection of categories of inland capture fish	32
4.1.8. Seasonal collection from inland capture fish	33
4.1.9. Classifications of fishermen	33
4.2. Fishing trips and fishing time	34
4.3. CPUE	35
4.4. Craft and Gears used to catch inland capture fish	36
4.4.1. Fishing craft	36
4.4.2. Fishing traps	37
4.4.3. Fishing net	38
4.4.4. Fishing hook	39
4.5. Management system	40
4.5.1. Conservation	41
4.5.2. Sanctuaries	41
4.5.3. Breeding season	41
4.6. Marketing system	43
4.6.1. Primary markets	43
4.6.2. Secondary markets	44
4.6.3. Higher secondary markets	44
4.6.4. Final consuming market	44
4.7. Marketing place of inland capture fish	44

	4.8. Storage and packaging materials	45
	4.9. Transportation system	45
Chapter 5	Discussion	46-50
Chapter 6	Problems and Recommendations	51-53
Chapter 7	Conclusion	54-56
Chapter 8	References	57-60
	Appendices	61-65

List of Tables

Sl. No.	Title	Page No.
Table-1	Inland water body of Abhaynagar Upazila	20
Table-2	List of SRS in Abhaynagar Upazila	22
Table-3	List of endangered and extinct SRS	23
Table-4	List of SIS in Abhaynagar Upazila	24
Table-5	List of Carp in Abhaynagar Upazila	25
Table-6	Production from capture fish	29
Table-7	Income of fishermen from inland capture fish	30
Table-8	Consuming season in Abhaynagar Upazila	30
Table-9	Classifications of fishermen according to season	34
Table-10	Fishing trips	35
Table-11	Fishing time	35
Table-12	Catch rates (CPUE)	36
Table-13	Utilization of craft to capture inland fish	37
Table-14	Utilization of trap to capture inland fish	38
Table-15	Utilization of net to capture inland fish	39
Table-16	Utilization of hook to capture inland fish	40
Table-17	Breeding period of fish	42

List of Figure

Figure No.	Title	Page
Fig-1	Map of Abhaynagar Upazila	15
Fig-2	Mean Production of capture fish in beel	26
Fig-3	Mean production of capture fish in canal	27
Fig-4	Mean Production of capture fish in river	28
Fig-5	Utilization of inland capture fish	31
Fig-6	Collection of different categories of inland capture fish	32
Fig-7	Seasonal collection from inland capture fish	33
Fig-8	Marketing channel of Abhaynagar Upazila	43
Fig-9	Marketing places of inland capture fish	45

List of abbreviation

SIS- Small Indigenous Species

SRS-Self Recruiting Species

DOF - Department of Fisheries.

FAO- Food and Agricultural Organization.

NGO- Non Government Organization.

CPUE-Catch Per Unit Effort.



CHAPTER ONE

INTRODUCTION

Chapter 1

Introduction

1.1. Background of the study

Bangladesh is an agro- based riverine country. It is endowed with a vast tract of water bodies in the form of rivers, canal, depressions, reservoir kaptai lake, ox-bow lakes, ponds, tanks, seasonally flooded areas and Bay of Bengal. It is situated in the sub-tropical region covering an area of 1, 47,570 sq. km. The small-scale fisheries of developing countries play a vital role by supplying the most of the fish used for direct human consumption and also by providing a large number of people with a relatively low-cost and nutritious food. Fish is often the cheapest form of an animal protein available.

Fish and fisheries play an important role in the flourishing of social and economic life. The inland fishery of Bangladesh is one of the most productive resources on the world. The fisheries resources of Bangladesh represents about one percent of the total world fish catch. The main two divisions of the Bangladesh Fisheries sub-sector are the inland and marine fisheries. Of the total inland waters of 4.3 million hectares, 65.3 per cent are flood plain, 3.8 per cent are ponds and 3.2 per cent are coastal farms (FAO, 1997).

The three great rivers Ganga/Padma, JamunalBrahamputra and the Meghna along with 7000 rivers and stream cover 22,155km length. In addition to the regular inland waters, a large part of the country remains seasonally submerged for 3-4 month during monsoon. Bangladesh's rivers and other inland waterbodies are the habitats of 260 indigenous fish (Gopalganj has Beel 901 ha, Pond 2681ha and Boar 110 ha. The total fish production of Gopalganj was 16,614 MT in which Pond 7851 MT, Flood Plan 7825 MT, River 395 MT, Beel 358MT and Boar 79 MT (DOF, 2009).

Chanda Beel stretches into the Gopalganj Sadar Thana, Muksudpur Thana and Kashiani Thana occupying an area of 10,873 hectares. Lying in the flood plain of the Madhumati and Kumar Rivers, Chanda Beel is one of the highest and noted water bodies of the country. It is well known for its rich reserve of fish and other aquatic life resources and plants. There are 55 species of fish and 3 species of prawn in the Chanda Beel. Among them, 30 species including the Chital, Kalibaush, Tatkini and Air are disappearing rapidly. (Gain, 2002).

According to the 1991 population census, 10,398 families live in the Chanda Beel area most of whom live on agriculture and fisheries (Gain, 2002).

Fisheries resources play a vital role in the development of the country and supply about 58% animal protein of our meal. About 3.74% GDP (Gross Domestic Product), 12% total foreign exchange and about 11 million people are engaged in the exploitation and conservation of fish and fisheries product (DoF, 2009).

There are about 12.80 lac people are engaged in fishing activities in our country. The numbers of inland and marine fishermen are 7.70 lac and 5.10 lac respectively. The number of total fish farmers is 30.80 lac (DoF, 2008).

Inland open water bodies, where capture fishing is mainly carried out, comprise rivers and estuaries, beels (small lakes, low-lying depressions, permanent bodies of floodplain water, or bodies of water created by rains or floods that may or may not dry up in the dry season; in the wet season, baors or shallow lakes may be formed as smaller water bodies. (Alam, 2001).

An inland fishery is also a source of livelihood to many of the rural poor. However, increasing competition on the use of water resources and high population growth in countries of major river basins has elevated pressures on the distribution of these resources and reduction in fisheries production.

In addition, fish protein has an enhancing effect on the bioavailability of minerals in a meal. In Bangladesh, where anemia and vitamin A deficiency have remained unchanged during the last three decades and persist to be major public health problems (DoF, 2008).

In Jessore region most of the fish farmers are poor and they are interested to produce maximum output. Farmers are not increased to use improved technology by investing a large amount of money and in addition there is also lack of other facilities.

Fisheries resources fulfill the requirements of animal's protein. It also creates the employment facilities of the poor people and helps to earn valuable foreign currency. So, fisheries resources have a great importance to our economy. Inland fisheries contribute to millions of people in terms of food security as well as a source of protein to the rural poor in Asia.

Inland open water capture fisheries and the marine waters of the Bay of Bengal contribute the lion's share of the total fish production in Bangladesh. Better biological management techniques in these waters, stricter implementation of all rules, ordinances etc. to ensure natural productivity; need to establish sanctuaries and Jatka conservation, are all necessary.

However, the increase in fish production is mainly attributable to the rise in production from inland culture fisheries, particularly from pond aquaculture and shrimp farms, and catch from the artisanal marine fishery. On the other hand, the area and production from inland capture fisheries has declined over time.

Production of fresh water fish can be increased by making the best utilization of the existing inland resources through modern and scientific method of fishing and marketing. But the ultimate consumers have to depend on an efficient fishing system and marketing activities by fishermen are very important for successfully utilization of fisheries resources of our country (Sarower *et al.*, 2009).

Bangladesh has the reputation of being very rich in inland open water capture fisheries production. A large number of fish and prawns could be captured by men, women, and children at their door steps during the monsoon season, when all the low-lying areas of the country remained under flood water. As a result of the plentiful availability of inland-water fish production, fish constituted the second most important component of the Bengali's diet next to rice. Bengali people have been known to be made up of 'rice and fish' (Ali, 1997).

For centuries, the people living in the region that is now Bangladesh have depended on wild aquatic resources for their diets and economic security. Lying in the floodplain delta of the Ganges, Brahmaputra, and Meghna rivers, the country has rich and diverse inland aquatic environments that support more than 300 inland species of fish and prawns (Rahman 1989; Rainboth 1990).

Seasonally inundated floodlands and beels account for roughly three-quarters of the inland open-water fish catch, with rivers accounting for the remainder. In the 1980s, it was estimated that 75% of rural families practiced seasonal consumption fishing, and that about two million Bangladeshis were engaged in commercial fishing and associated activities. Fish accounted for roughly three percent of the gross domestic product, and more than eleven percent of the country's export earnings (World Bank 1991, 1-3). Rural families consume fish an average of 3.5 days per week (Minkin *et al.*, 1997), and more than 70 percent of animal protein in the diet comes from fish (Institute of Nutrition and Food Science, 1983).

The area of Abhaynagar Upazila is 247.19 sq.km. There are 125 villages and 8 unions in Abhaynagar Upazila. About 2, 32,280 people live here and the numbers of fisherman are 2,070. Depend on capture fishery are 930. There are four rivers in Abhaynagar Upazila. They are-Bhairab, Sri river,Taka river and Mojudnagre river. The area of the river is 80.08 ha total production is 4.87 Mt. There are 28 canals in Abhaynagar Upazila. The area of the canal is 184.89ha and production is 30.12 kg/ha.

Capture fisheries in both inland and marine waters, and aquaculture in both freshwater and brackish water have raised concerns for the long-term sustainability and integrity of the aquatic environment. Fishing activities have led to perpetual overfishing, discard of a large quantity of by-catch, habitat destruction and ecosystem modifications (Hall, 1999). Over exploitation of fisheries resources has posed the greatest environmental threat to the world, especially to the fish habitat and species diversity (World Bank, 2004).

1.2. Hypothesis setting

Unregulated harvesting of fish is one of the major problems. Prohibited gear use hampers the production of fish. Capture of egg carrying fish is one of the major points. For the overall planning, and development and implementation in fisheries sector, it is necessary to have the sound knowledge about the proper harvesting of fish.

In fact income earning activities is an outcome of proper management which is affected by the community environment. The contribution of fishermen in different sector is affected by village and economy so in this respect, this study is very much important.

The production is possible to increase through proper management. Mainly inland capture fish collection is much benefited.

1.3. Objective of the study

- ✦ To investigate inland capture fishery in Abhaynagar Upazila.

**CHAPTER
TWO**

REVIEW OF LITERATURE

Chapter 2

Review of Literature

Lorenzen *et al.* (2003) reported that fish species diversity in Vietnam is estimated at 1,200 species. Others reported that there are over 1,500 species of freshwater fish in Vietnam, referring it as one of the most productive and biologically diverse fisheries in the world. Many studies have indicated that fish ecology of the Mekong River Basin is highly correlated to, and influenced by, the morphological and hydrological characteristics of the basin.

The gross value of fisheries output is estimated at around US\$48 million, contributing to GDP with approximately 4% from commercial fisheries and another 2% by subsistence fisheries (Lorenzen *etal*, 2003).

However, Phonvisay (2002) believed that fisheries account for about 8% of national GDP in Lao PDR. The LARREC Medium Term Plan 2000-2005 estimated that the value of total annual aquatic production to be in the range of US\$ 66 million, exclusive aquatic plants. Current capture fisheries production is estimated at 30,035 Mt. Capture fisheries contribute to 40.4% of fisheries production in the country. Out of this, 63% is from the Mekong River and its tributaries, 18% from irrigation and reservoir, and 10% each from reservoirs and swamps and wetlands.

Pawaputanon (2003) highlighted that the constraints of inland fisheries information collection in Thailand include the lack of basic up-to-date data, accuracy of data collected, lack of scientific data collection protocols to be used in the country, information is piecemeal and scattered in the country which make comparison and analysis difficult to be conducted, and difficulty in conducting surveys in large ecosystems due to research budget constraints.

The gross income from production from the floodplains was BDT10,742 to BDT28,543/ha with a net income of BDT5226 to BDT16,314/ha . The benefit cost ratio (BCR) for Beel Mail was 2.65, Kalmina Beel 2.78, and Angraer Beel 1.71. Fish culture in all the seasonal floodplains is profitable under the present set of management arrangements. The mean fish production as achieved from the floodplains under the project is higher than the national average of 254 kg/ha from the floodplains (FRSS, 2007).

Recent studies indicate that there are good prospects for enhancement of fish production in the floodplains through improved management. There are opportunities to use floodplains for fish culture by providing enclosures in parts of this floodwater, and stocking fingerlings in addition to the non-stocked fish. Fish culture in seasonal floodplains, by stocking of fingerlings and application of feeds and fertilizers on a regular basis, has been established in the central part of Bangladesh. In Daudkandi, Comilla district, increases in fish production and income earnings have been achieved. These activities, however, were not community-based and were largely implemented by a company that sold shares to the beneficiaries.

Capture fisheries in both inland and marine waters, and aquaculture in both freshwater and brackish water have raised concerns for the long-term sustainability and integrity of the aquatic environment. Fishing activities have led to perpetual overfishing, discard of a large quantity of by-catch, habitat destruction and ecosystem modifications (Hall, 1999). Overexploitation of fisheries resources has posed the greatest environmental threat to the world, especially to the fish habitat and species diversity (World Bank, 2004).

For centuries, the people living in the region that is now Bangladesh have depended on wild aquatic resources for their diets and economic security. Lying in the floodplain delta of the Ganges, Brahmaputra, and Meghna rivers the country has rich and diverse inland aquatic environments that support more than 300 inland species of fish and prawns (Rahman 1989; Rainboth 1990).

Hussain (2010) reported that aquatic biodiversity is under severe stress all over the world. An estimated 39% of all freshwater species of the global aquatic ecosystem are extinct, endangered, or vulnerable. Recent environmental modifications, water quality degradation and fishing pressure have increased the vulnerability of fish genetic resources in Bangladesh. As a result, many fish species of floodplains, rivers and estuaries have become threatened and endangered. Alteration of aquatic ecosystems has direct and indirect adverse effects on fish flora and fauna through their reproduction, migration and survival. Adverse environmental conditions can affect natural reproduction of populations and ultimately hinder recruitment in stocks from spawning.

In Bangladesh, food intake is closely linked to local food production and fish intake is dependent on fisheries from the local water bodies. Rice is the main crop and the major food of the rural poor, contributing the major part of energy and protein. Nutrients such as vitamin A, vitamin C, calcium, iron and zinc which are not found in rice or found only in small quantities must be supplied by other commonly consumed foods, such as nutrient dense vegetables and fish. Small indigenous fish species (SIS), since they are eaten whole contribute to the intakes of essential nutrients, especially calcium. Some SIS have high contents of vitamin A and can play an important role in increasing vitamin A intakes. Thus, human nutrition can be greatly improved in rural Bangladeshi by ensuring the protection and enhancement of fish production, accessibility of fish to the rural poor and fish consumption, especially of nutrient dense SIS. (Thilsted, 2003)

During 1995–2004, the total fish production of the country increased from 1,172,868 tonnes to 2,102,026 tonnes. Of the total fish production (2003–04), 35% came from inland open water capture; 21% from marine capture and 44% from aquaculture (DoF, 2006).

Catches from open waters are declining due to over-exploitation and degradation of fish habitats all over the world including Bangladesh. Fish production from inland open waters of Bangladesh has declined due to massive construction of flood control structures, over-exploitation, abstraction of water for irrigation, intensive agriculture and development activities, pollution, destruction of mangrove forests, etc. (Hoq, 2006).

Ali (1997) reported that Bangladesh has the reputation of being very rich in inland openwater capture fisheries production. A large number of fish and prawns could be captured by men, women, and children at their doorsteps during the monsoon season, when all the low-lying areas of the country remained under floodwater.

Seasonally inundated floodlands and beels (perennial water bodies) account for roughly three-quarters of the inland open-water fish catch, with rivers accounting for the remainder. In the 1980s, it was estimated that 75% of rural families practiced seasonal consumption fishing, and that about two million Bangladeshis were engaged in commercial fishing and associated activities. Fish accounted for roughly three percent of the gross domestic product, and more than eleven percent of the country's export earnings. The fact that inland fisheries production is underestimated does not mean that the fisheries are in good condition. There are consistent published and anecdotal reports that most riverine fisheries in the region are in decline. For example, since 2000 fishing bans have been imposed in different sections of the Yangtze River, PR China during certain times of the year to make provision for the different spawning periods of the major fish species ((World Bank, 1991).

During the 1950s and 1960s, capture fish production in Asia increased by an average of 6 percent per annum but this declined to 3 percent during the 1970s and 1990s (FAO, 2006). In contrast to the declining growth in capture fisheries, aquaculture in the region has been growing rapidly, by about 10 percent per year during the 1950s and 1960s to 9 percent during the 1970s and 1980s and over 11 percent since 1990s (FAO, 2006).

➤ In Asia alone, aquaculture production growth boomed from 5.1 percent of total fish production in 1950 to 46 percent in 2003. It is easily one of the fastest growing food-producing sectors in the region, with production tripling from 11.8 million tonnes in 1990 to 40.1 million tonnes in 2003. The steady growth of aquaculture production has been billed as a means of taking up the production slack in capture fisheries for many of the developing Asian countries.

➤ Fish producers are classified into capture fishers and aquaculture farmers. The former refers to persons who harvest from natural fish stocks, whether marine or inland, under open (or nominally restricted) access rights. The latter refers to persons who culture fish either in freshwater or brackish water ponds and cages, which are operated with full private ownership/rights. A grey area is culture-based inland fisheries, in which the natural productivity of the aquatic ecosystem is utilized, though fishers need to acquire access rights (to community tanks, ponds and reservoirs). In this system, fingerlings are stocked in communal ponds and fish harvesting is done collectively or individually (FAO, 2006).

Chapter Two

MATERIALS AND METHODS

Chapter 3

Materials and Methods

3.0. Materials and methods

Methodology is identical to a research or study model by a researcher in a particular study including basic knowledge related to the subject and research method. Methodology reveals the entire process that will be followed for the completion of the study successfully. An appropriate and systematic methodology is always expected in every study. It helps to organize the experiences, observations, analysis of data and information and their logical interpretation through a systematic process to achieve the ultimate goal of the research. It is very difficult to explore data from only direct field survey. Proper working procedure helps to capture the right things at right periods and finally fulfill the objectives. It prevents the encroachment and haphazardness. The following sections describe the sequential order of the thesis, on how the research has done scientifically. It prevents the encroachment and haphazardness.

3.1. Conceptualization

To conduct a research work it is necessary to build up a wide concept of the different issues of the research. This work is achieved by:

- Communicating with resource person
- Review of literature

By communicating with resource person and studying various journals, books, seminar papers, reports, magazines, review papers which focus on the issues related to the research problem, the concept of the different aspects of the research work was developed. I have been reviewed various reports, newspapers, information from internet, various reports.

3.2. Study area

The study was conducted in Abhaynagar upazila under Jessore district.

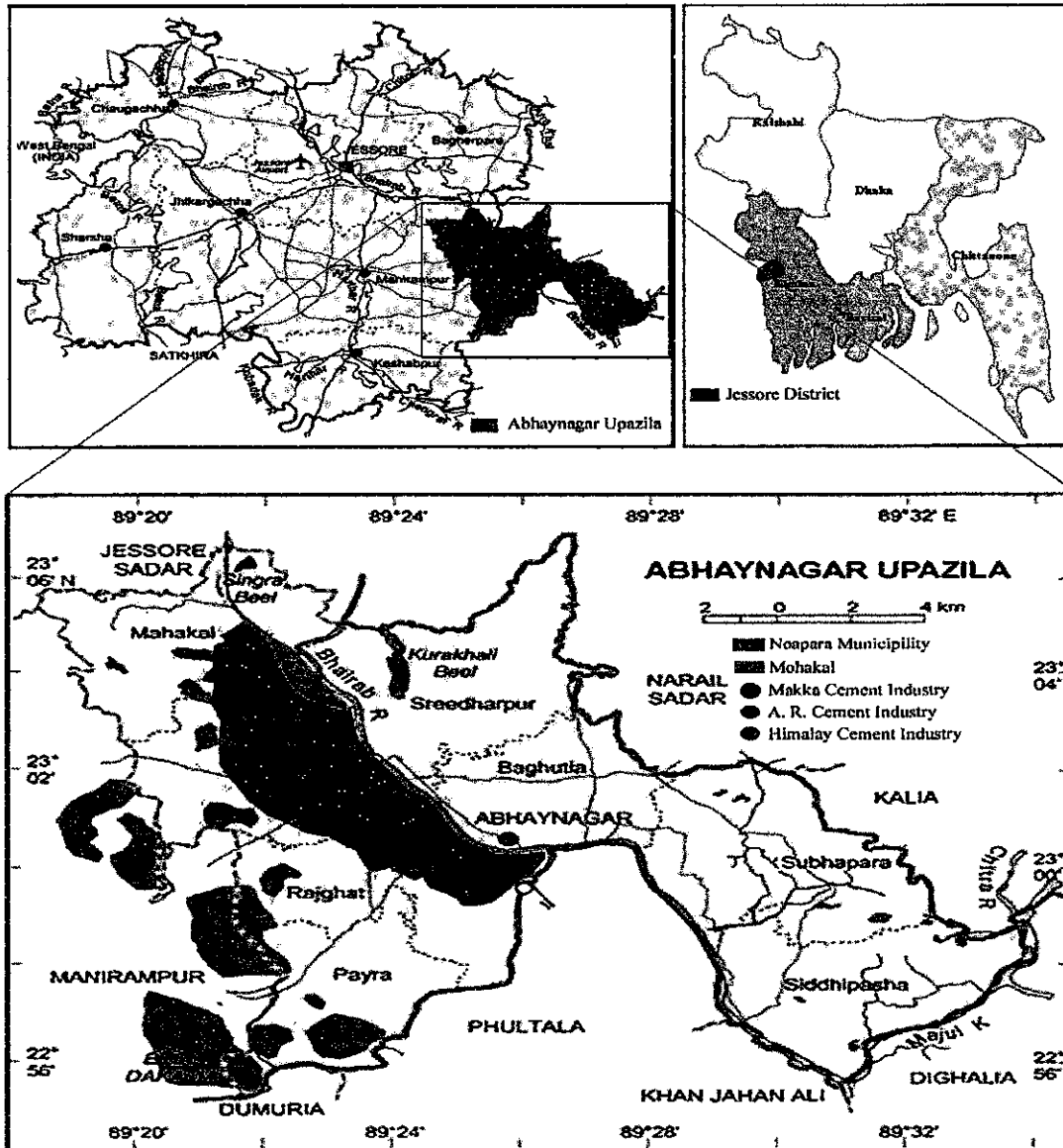


Fig.-1: Map of Abhaynagar Upazila

3.3. Selection of the study area

The study was conducted at Abhaynagar upazila under Jessore district. The study was conducted for a period of seven months from September, 2010 to March, 2011. The data was collected randomly from 7 villages. Five villages were collected from Shuvorara Union and two villages were collected from Noapara Municipality.

Union and Municipality	Name of Village
Shuvorara Union	Hidia
	Ranagati
	Basuari
	Labugati
	Nauli
Noapara Municipality	Rajghat
	Gazipur

3.4. Sample size

In the study area, the sample size was 50.

3.5. Reconnaissance survey

A reconnaissance survey was concluded in the study area to understand the existing condition / situation. Through the field visits, overall land use pattern, UFO in Abhaynagar upazila and other necessary information were collected from the local people to prepare the final questionnaire. The reconnaissance visit also helped to visualize the overall status of the inland capture fish.

3.6. Indicators used in the study area

- Water Area
- Catch composition
- List of SRS
- List of endangered SRS and extinct SRS
- List of SIS
- List of Carp
- Production from capture fish in beel
- Production from capture fish in canal
- Production from capture fish in river
- Classifications of fishermen
- Income from inland capture fish
- Marketing place of inland capture fish
- Collection of different categories of inland capture fish
- Seasonal collection from inland capture fish
- Income of fishermen
- Consuming season in Abhaynagar Upazila
- Fishing trips and fishing time
- CPUE
- Fishing craft
- Fishing trap
- Fishing net
- Fishing hook
- Management system
- Causes to reduce of inland capture fishery
- Marketing system
- Storage and packaging materials
- Transportation system

3.7. Questionnaire survey

This method of data collection is quite popular, particularly in case of big enquiries. It is being adapted by research work and public organization. This method of collecting data involves vibration of oral-verbal stimuli and reply in terms of oral-verbal response. It can be used through personal interviews. This method can be used for collection of primary data.

3.8. Preparation of questionnaire

3.8.1. Questionnaire testing

Questionnaire preparation is important part of the study. First, a draft questionnaire was prepared and tested on UFO in Abhaynagar upazila and local people and the requirement of the questionnaire was reviewed. The questionnaire contains some basic information of inland capture fishery. After testing the questionnaire in the field, necessary modifications were done to prepare final questionnaire.

3.8.2. Questionnaire finalizing

Questionnaire was prepared according to objective of the study so that they can fill up the requirements of primary data and secondary data.

3.9. Sources of data

3.9.1. Primary sources

The primary data were collected through questionnaire survey. Data were collected both by physically observation and interview with fisherman. Relevant primary data were collected from various sources and various ways. The prime tools for primary data collection were

questionnaire, and field observation to fulfill the objectives of the study. Several types of survey were conducted for the primary data collection.

3.9.2. Secondary sources

Further relevant information was collected from relevant books. The secondary data were collected from book, thesis paper, Journal.

- Upazila fisheries office in Abhaynagar upazila
- Seminar Library, URP Discipline, Khulna University
- Seminar Library, FMRT Discipline, Khulna University
- Central library, Khulna University, Khulna

3.9.3. Data interpretation

The secondary data collected from the Upazila office. The secondary sources were interpreted and processed for the analysis of the study.

3.9.4. Data analysis

All the collected information were accumulated and analyzed. The data were then presented in graphs, figures and tables. All the data were analyzed by using Microsoft Excel, MS Word. Descriptive statistics such as frequency distribution cross tabulation, Pie chart, Bar chart etc.

CHAPTER FOR

RESULTS

Chapter 4

RESULTS

4.1. A study on inland capture fishery

Inland capture fish contribute to millions of people in terms of food security as well as a source of protein to the rural poor in Abhaynagar Upazila. The most familiar villages namely Labugati, Hidia, Basuari, Ranagati, Gazipur, Rajghat, Nauli were selected in the study area. A detail analysis were made on the following parameters and presented in this section.

4.1.1. Water Area

In Abhaynagar Upazila, has great potential for culture of aquatic resources in its large number of fresh water rivers, inland water bodies etc. The inland capture fisheries sector such as river, beel, canal, baor. In Table-1 the highest area of water body is beel and the amount is 8606.47 ha and the lowest area of fishing ground is river and the area is 80.08 ha.

Table-1: Inland water body of Abhaynagar Upazila.

Water body	Water area (ha)
River	80.08
Beel	8606.47
Canal	184.49
Baor	98.37
Total	8969.41

4.1.2. Catch composition

In the study area harvesting, catching of brood fishes, use of current jal, gher preparation in the beel, closing the migratory route of fishes, use of current jal or pata to the swimming place of fish etc are major cause of extinct in and endangered of our native fishes. In the study area, SRS, SIS, carp were found. Among these species, some fish species such as Koi, Tengra, Royna, Gutum were endangered and extinct; those species are not available now but used to be available earlier and rest of them were not available in the capture fishery area of Abhaynagar Upazila.

4.1.2.1. List of SRS

In chanda beel, various types of SRS are found such as Guchi bain, Kholesa, Bale, Jat puti etc. the species such as Puti, Taki, Tengra, Chingri etc. are abundant in Labugati canal. Puti is the common catch in almost all of the species. In Table-2 shows Bain is very popular and attractive species. It is exported from Abhaynagar Upazila to Australia, Middle East. It earns a lot of foreign exchange.

Until recently, the inland fisheries sector had taken back stage in fisheries development plans, particularly so given the emphasis being placed on aquaculture development. Different types of SRS found in Abhaynagar Upazila.



Table-2: List of SRS in Abhaynagar Upazila.

Local name	Scientific name
Mola	<i>Amblypharyngodon mola</i>
Taki	<i>Channa punctatus</i>
Kakila	<i>Xenotodon cancila</i>
Royna	<i>Nandus nandus</i>
Dela	<i>Osteobrama cotia cotia</i>
Jat puti	<i>Puntius sophore</i>
Tit puti	<i>Puntius ticto</i>
Gutum	<i>Lepidocephalus guntea</i>
Koi	<i>Anabus testudineus</i>
Shing	<i>Heteropneustes fossilis</i>
Tengra	<i>Mystus tengra</i>
Tara bain	<i>Macrogathus aculeatus</i>
Guchi bain	<i>Mastacembelus panculas</i>
Khoilsa	<i>Colisa fasciata</i>
Magur	<i>Clarias batrachus</i>
Bale	<i>Glosogobius giuris</i>
Small Pabda	<i>Ompok pabda</i>
Choto chingri	<i>Metapenaeus sp.</i>
Cuichaya	<i>Amphipnous cuchia</i>

4.1.2.2. List of endangered SRS and extinct SRS

The endanger SRS are Koi, Shing, Gutum, Pabda, Royna etc. The common endangered SRS are Shing, Bale etc. In table 3 shows catch rate of Koi, Shing Bale are decreasing day by day. The extinct SRS are Royna, Gutum, Pabda etc. Sanctuary can play a vital role to save this extinct

SRS. Different types of endanger SRS and extinct SRS of Abhaynagar Upazila are given in Table-3.

Table-3: List of endangered and extinct SRS

List of endangered SRS		List of extinct SRS	
Local name	Scientific name	Local name	Scientific name
Koi	<i>Anabus testudineus</i>	Small Pabda	<i>Ompok pabda</i>
Royna	<i>Nandus nandus</i>	Royna	<i>Nandus nandus</i>
Shing	<i>Heteropneustes fossilis</i>	Gutum	<i>Lepidocephalus guntea</i>
Gutum	<i>Lepidocephalus guntea</i>		
Pabda	<i>Ompok pabda</i>		
Bale	<i>Glosogobius giuris</i>		

4.1.2.3. List of SIS

Different types of SIS found in Abhaynagar Upazila. SIS such as Koi, Kholesa, Puti, plays an important role in poverty alleviation and nutritional security. In Abhaynagar Upazila, the availability of species are Napit Koi, Magur, Tit puti. In Table-4 shows Tit Puti, Jat Puti, Chanda is available in the study area. The Bhairab is one of the major sources of Choto Chingri, Guchi Bain, Taki, Bale etc.

Table-4: List of SIS in Abhaynagar Upazila

Local name	Scientific name
Mola	<i>Amblypharyngodon mola</i>
Taki	<i>Channa punctatus</i>
Kakila	<i>Xenotodon cancila</i>
Royna	<i>Nandus nandus</i>
Dela	<i>Osteobrama cotia cotia</i>
Jat puti	<i>Puntius sophore</i>
Tit puti	<i>Puntius ticto</i>
Gutum	<i>Lepidocephalus guntea</i>
Koi	<i>Anabus testudineus</i>
Shing	<i>Heteropneustes fossilis</i>
Tengra	<i>Mystus tengra</i>
Tara bain	<i>Macrognathus aculeatus</i>
Guchi bain	<i>Mastacembelus panculas</i>
Kholsa	<i>Colisa fasciata</i>
Magur	<i>Clarias batrachus</i>
Bale	<i>Glosogobius giuris</i>
Small Pabda	<i>Ompok pabo</i>
Napit Koi	<i>Badis badis</i>
Choto chingri	<i>Metapenaeus sp.</i>
Chanda	<i>Chanda nama</i>

4.1.2.4. List of Carp in Abhaynagar Upazila

Different types of carp are found in Abhaynagar Upazila. Day by day these carp species are decreasing. Brood fish capture is one of the major problems. Once upon a time, Abhaynagar Upazila was full of carp species. Now-a-days carp species are not available in Bhairab River.

Table 5 shows the major carp species in the study area.

Table-5: List of Carp in Abhaynagar Upazila

Local name	Scientific name
Rui	<i>Labeo rohita</i>
Catla	<i>Catla catla</i>
Mrigal	<i>Cirrhinus cirrhosus</i>

4.1.3. Production

Fish production, from both capture fisheries and aquaculture, is higher in Abhaynagar Upazila than in other Upazila of Jessore.

4.1.3.1. Production from capture fish in beel

There are 28 beels in Abhaynagar Upazila. The productive beel in Abhaynagar Upazila are Barandi, Kadaria, Mothurapur, Vurvuria, Zhinra etc. In Fig.-3 shows the production was 1450.45 mt. in 2005 and in 2010, the production is 1203.06 MT. The production varies from 2005-2010. Day by day this production is decreasing. The following graphs show production of fish in beel.

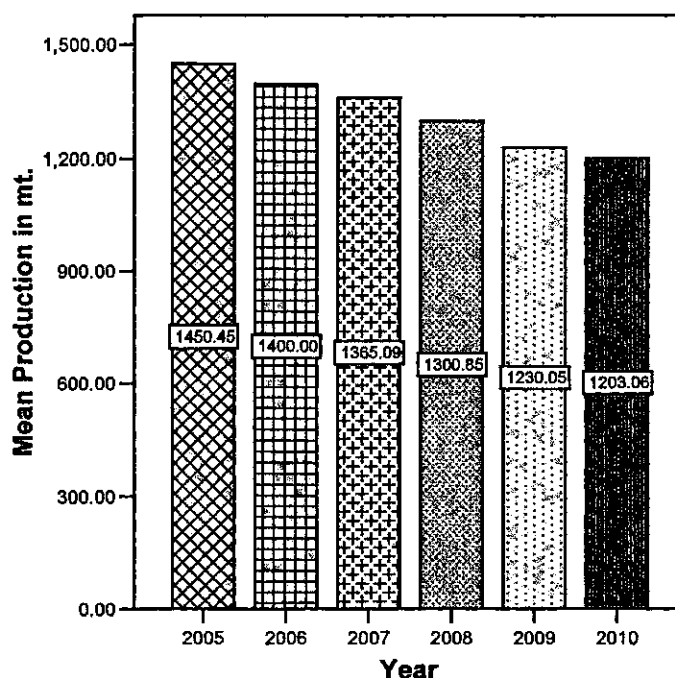


Fig-2: Mean Production of capture fish in beel

Source: Abhaynagar Upazila Fisheries Office (2010)

4.1.3.2. Production from capture fish in canal

Although inland fish production is undoubtedly important in Abhaynagar Upazila, its increasing contribution to the fish supplies is masked by the substantial increases in aquaculture production, increasing production from inland fisheries is not confined to Jessore. There has also been a relatively recent upsurge in Abhaynagar Upazila in inland fish production in particularly from reservoirs. This apparent increase in production also reflects an improved assessment of the real participation of rural people in inland fisheries and their consumption of inland fishery products.

The fact that inland fisheries production is underestimated does not mean that the fisheries are in good condition. The area of the canal is 184.89 ha In Fig.-3 shows catching effort is 30.12 kg

PERha. The productive canal in Abhaynaga Upazila are Degholia, Rajapur, Ichamoti, Barendy etc.

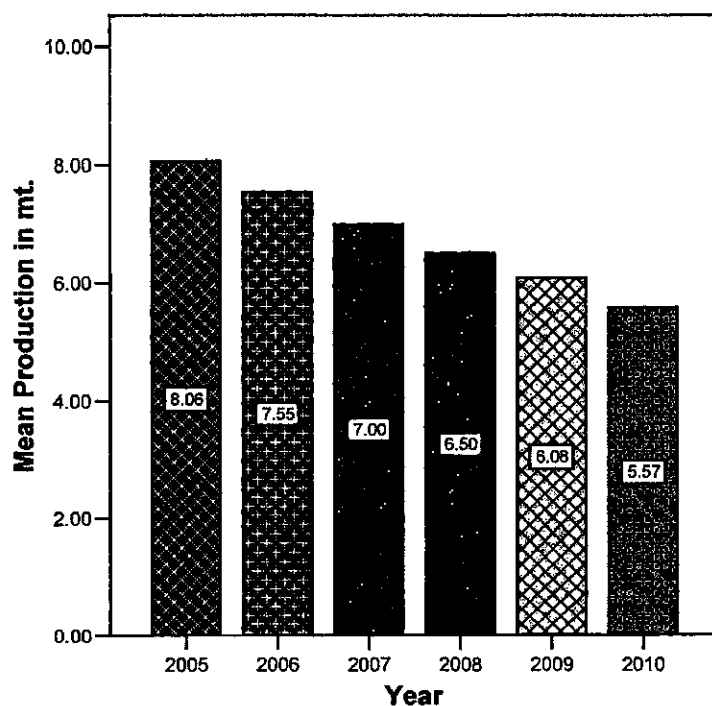


Fig-3: Mean production of capture fish in canal

Source: Abhaynagar Upazila Fisheries Office (2010)

4.1.3.3. Production from capture fish in river

About 2, 32,280 people live in Abhaynaga Upazila and the numbers of fisherman are 2,070. Depend on capture fishery are 930. There are four rivers in Abhaynagar Upazila. They are- Bhairab, Sri river, Taka river and Mojudnagre river. The area of the river is 80.08 ha and total production is 4.87 MT.

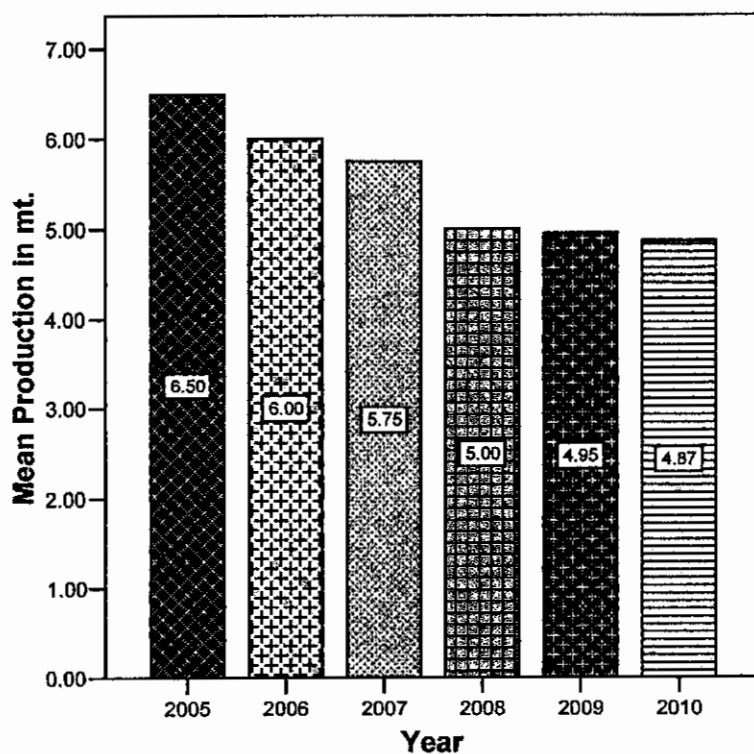


Fig-4: Mean Production of capture fish in river

Source: Abhaynagar Upazila Fisheries Office (2010)

4.1.3.4. Catching effort from capture fish

In the study area, in Table-6 shows the highest production from capture fish is 250 kg per day in Shuvorara Union and lowest production from capture fish is 100 kg per day in Noapara Municipality. The average production from fish of Shuvorara Union is 187.5 kg.

Table-6: Production from capture fish in Abhaynagar Upazila

Union and Municipality	Production (Kg/day)	No.of fishermen	Average(kg./day)	Percentages of fishermen(%)
Shuvorara	250	20		40
Union	100	15	187.5	30
	200	5		10
Noapara Municipality	100	10	100	20

4.1.4. Income of fishermen

SRS, SIS and inland capture fish collection occasionally undertake a variety of fishery and non-fishery related activities, which constitute a substantial part of their annual income. These income-augmenting opportunities, however, are very limited. There are very limited options for non-fishery related activities such as net making, wall painter, day labor in the hatchery, day labor in agricultural field, rickshaw pullar.

From the interviews, it was found that the highest income of the fish 1200 Tk per day in Shuvorara Union. About 5 % fishermen earn 1200 Tk per day from the income of fishery activity. It revealed that the families under the study spent more money when their income was more and spent less when their income was also less. About 20 % fishermen earn 200 TK per day in season in Noapara Municipality.

Table-7: Income of fishermen from inland capture fish

Union and Municipality	Income (TK./day)	Percentage (%) of fishermen	Number of fisherman	Average (TK./day)
Shuvorara Union	400	24	12	560
	500	20	10	
	450	16	8	
	1200	10	5	
	300	10	5	
Noapara Municipality	200	20	10	200

4.1.5. Consuming season in Abhaynagar Upazila

The people of Abhaynagar Upazila consume Puti, Shing, Koi, Tengra in all season. In Table -8 shows more consuming season from winter to early summer. In this season the people consume Puti, Taki, Shing, Tengra, Koi, Bain.

Table-8: Consuming season in Abhaynagar Upazila

From winter to early summer	Last summer to rainy season	Last rain to early winter	All season
Taki	Taki	Taki	Taki
Puti	Puti	Puti	Puti
Shing	Shing	Koi	Shing
Tengra	Tengra	Kholsa	Koi
Koi	-	-	Tengra

4.1.6. Utilization of inland capture fish

In Abhaynagar Upazila, most of the fishermen are poor. After harvesting, the fisherman utilizes 80% fish for selling purpose and rest amount use for consumption and drying purposes. In my study area, about 5% fish are used for consuming purpose. In winter season, the light of sun helps to dry fish for the purpose of long time preservation. At that time, humidity and rain are low.

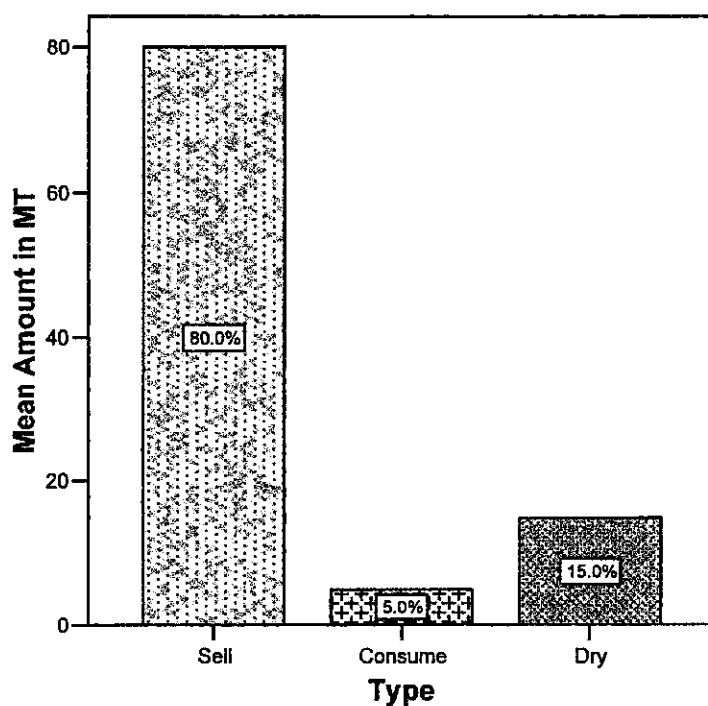


Fig-5: Utilization of inland capture fish

4.1.7. Collection of different categories of inland capture fish

The fishermen captured Chingri, Puti, Bain, Taki and other species are 25, 20, 15, 10 and 30% respectively during harvesting. In Fig.-6 shows highest captured species is Chingri. Most of the beel, canal, river of Abhaynagar Upazila is full of all kinds of captured fish such as Mola, Puti, Taki, Bale, Choto chingri.

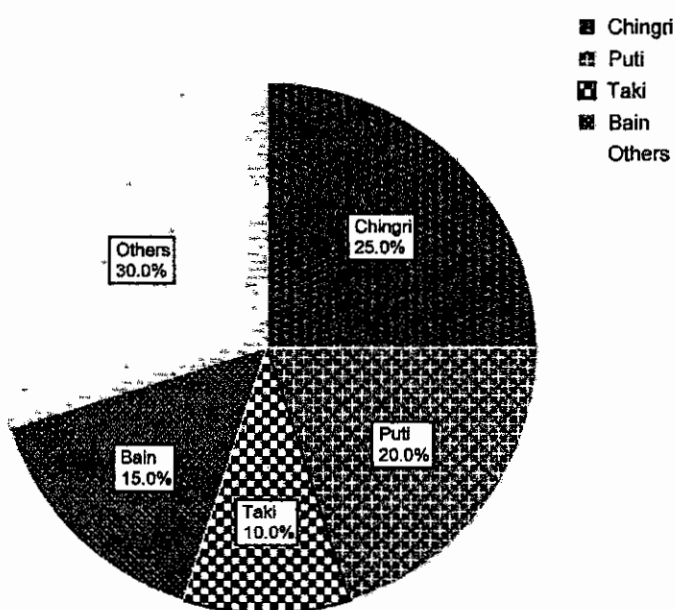


Fig.-6: Collection of different categories of inland capture fish

Source: Abhaynagar Upazila Fisheries Office (2010)

4.1.8. Seasonal collection from inland capture fish

Winter season is suitable for collection of fish. About 60% fish are collected in this season. The fisherman captured lowest amount of fish in rainy season. In this season, they collect 10% fish. Some fishermen catch 30% fish in summer season.

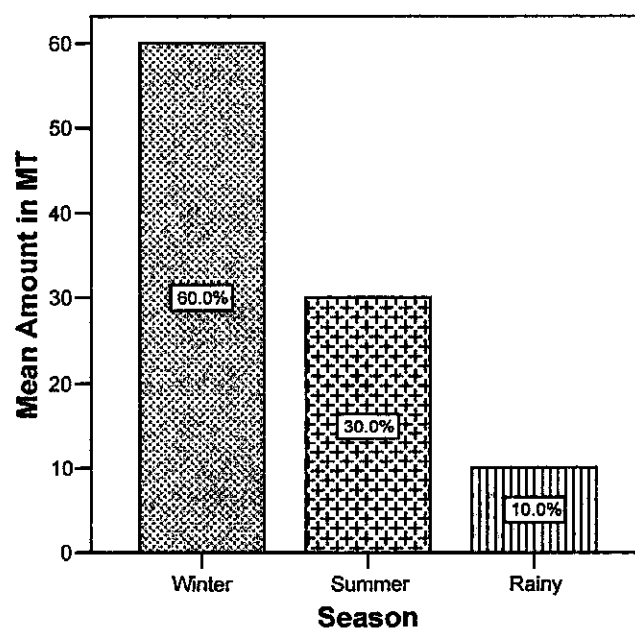


Fig-7: Seasonal collection from inland capture fish

4.1.9. Classification of fishermen

As aquaculture production can be increased to a considerable extent, properly planned and managed development of it should be able to contribute considerably to an increase in protein food supplies at affordable prices. By improving the physical well-being and quality of life of the rural poor through fisheries production, their productivity level and ability to contribute to the national economy can be increased.

In Table-9 shows, some fishermen catch fish from October to February. They are categorized as seasonal fishermen. Part-time fishermen mean those fishermen are engaged to catch fish as a hobby. Year round fishermen are those fishermen are engaged to catch fish all the year round.

Table-9: Classifications of fishermen according to season

Classification	Catching time	Instrument	Yearly amount(kg)	Distribution
Seasonal fishermen	Oct-Feb.	Jakijal, Trap	2000	Consume (8%) sell (90%), gift (2%)
Part-time fishermen	Oct-Dec.	Trap, Fash jal	500	Consume (90%), gift (10%)
Year round fishermen	Year round	Line, Fash jal	4,000	Consume (8%), Sell (90%), gift (2%)

Source: Abhaynagar Upazila Fisheries Office (2010)

4.2. Fishing trips and fishing time

The fisherman catch fishes all the day and night. In Table -10 about 40% fishermen's catch rate 5 trips per day and night. Only 10% of the fisherman catches fishes 3 trips per day and night. As

In Table -11, the fishermen catch fishes all the day. About 20% fisherman catch fishes 5 hour in day and night.

Table-10: Fishing trips

Shuvorara Union and Noapara Municipality	Trips/day	Frequency of fisherman	Percentages of fisherman (%)	Average trips of fishermen
Shuvorara Union	3	5	10	3.6
	5	20	40	
	2	15	30	
Noapara Municipality	2	10	20	2

Table-11: Fishing time

Shuvorara Union and Noapara Municipality	Time (hour/ day)	Frequency of fisherman	Percentages of fisherman (%)	Average time of fishermen (hour)
Shuvorara Union	4	5	10	5.3
	6	20	40	
	5	15	30	
Noapara Municipality	5	10	20	5

4.3. CPUE

CPUE means catch per unit effort (kg/ha/yr). The fisherman catch fishes all the day and night.

In Shuvorara Union, the average catch rate of fishermen is 737.37. In Noapara Municipality, the average catch rate of fishermen is 725. In Table-13 shows about 50% fishermen's catch rate per ha per year is 725 kg.

Table-13: Catch rates (CPUE)

Shuvorara Union and Noapara Municipality	Catch rate (kg/ha/yr)	Frequency of fisherman	Percentages of fisherman (%)	Average catch rate of fishermen (kg/ ha/yr)
Shuvorara Union	750	15	30	737.37
	725	25	50	
Noapara Municipality	750	5	10	725
	700	5	10	

4.4. Craft and Gears used to catch inland capture fish

Normally craft means vessel that is usually use for transport in fisheries and catching Purpose. All the instruments or equipments or other accessories that are used for catching or harvesting fish are known as gear. e.g. - Various types net, hook, harpoon etc. Various types of fishing craft were found to operate in the water bodies where most of the craft were traditional and few of them were unique.

4.4.1. Fishing craft

Various types of craft are used in Abhaynagar Upazila. In Table-13 shows Dingi nouka, Bhesal dingi, Donga, Vela, Patam nauka are utilize in the study area. Donga is the common fishing craft in the study area.

Table-13: Utilization of craft to capture inland fish

Types of craft	Place	Number of fishermen involved	Catch composition
Dingi nouka	Bhairah river	15	Puti , Taki, Koi,
Bheshal dinghi	Bhairah river	8	Puti , Taki, Koi, Rui, Catla, Mrigal
Donga	Chanda beel, Ichamoti canal	20	Puti , Taki, Koi, Rui, Catla, Mrigal
Vela	Chanda beel, Ichamoti canal	05	Puti , Taki, Koi, Rui, Catla, Mrigal
Patam Nauka	Bhairah river	2	Puti , Taki, Koi, Rui, Catla, Mrigal

4.4.2. Fishing traps

Fishing traps were used more extensively continued till the end of fishing season. Fishing traps were used mainly at shallow depth area to catch small size fishes by nonprofessionals to catch mainly for family consumption and by regular fishermen for their livelihood. Particulars of different types of trap, fishing period, number of fishermen. In Table 14 shows Box trap, Topa, Basket trap, Polo, Puti bair, Koi doughier, Khadom are utilize in the study area

Table-14: Utilization of trap to capture inland fish

Types of trap	Place	Number of fishermen involved	Catch composition
Box trap	Barandi and Chanda beel, Ichamoti canal	5	Tengra, Puti, Shing, Koi
Topa	Barandi and Chanda beel	15	Tengra, Puti, Shing Koi
Basket trap	Barandi and Chanda beel	5	Tengra, Puti, Shing, Koi
Polo	Chanda beel	10	Tengra, Puti, Shing Koi
Puti bair	Barandi and Chanda beel	1	Taki, Puti, Koi
Koi Doughier	Barandi and Chanda beel	4	Taki, Puti, Koi, Chingri, Bale
Khadom	Barandi and Chanda beel	10	Taki, Bain

4.4.3. Fishing net

In Table 15 shows Thela jal, Dhormo jal, Seine net, Khapla jal, Push net are utilize in the study area. About 30% fishermen use Khapla jal to capture fish in the study area.

Table-15: Utilization of net to capture inland fish

Types of net	Fishing place	Number of fishermen involved	Catch composition
Small thela jal	Chanda beel, Ichamoti canal.	10	Taki, Puti, Koi, Chingri, Bale.
Dhormo jal	Bhairab river, Chanda beel, Ichamoti canal	5	Puti, Kholisha, Baim, Tangra, Chanda.
Seine net	Bhairab river, Ichamoti canal	10	Chanda, Puti, Tangra, Rui, Mrigal, Catla, Koi, Bele, Maya, Taki.
Khapla jal	Bhairab river, Chanda beel, Ichamoti canal	15	Puti, Kholisha, Baim, Tangra, Chanda.
Push net	Bhairab river, Chanda beel, Ichamoti canal	10	Puti, Veda, Tepa, Chanda, Small Chingri, Bele.

4.4.4. Fishing hook

In the study area, fishing was found starting from early monsoon with some hook, line and spear. In Table -16 chip borsi is used by 30 fishermen and catch composition is Puti, Tengra, Koi, Shol, Bele. It is used in Bhairab river, Chanda beel, Ichamoti canal. Dhap borsi is used by 20 fishermen and catch composition is Puti, Tengra, Koi, Taki, Shol, Gozar, Bele, Shing.

Table-16: Utilization of hook to capture inland fish

Types of Hook	Fishing place	Number of fishermen involved	Catch composition
Chip borsi	Bhairab river, Chanda beel, Ichamoti canal	30	Puti, Tengra, Koi, Shol, Bele,
Dhap borsi	Bhairab river, Chanda beel, Ichamoti canal	20	Puti, Tengra, Koi, Taki, Shol, Gozar, Bele, Shing

4.5. Management system

The auction system, which sells off annual use-rights for fishing grounds, is a major component of fisheries management in Abhaynagar Upazila. It was largely the responsibility of the Ministry of Land, which is seen as consistent with the revenue collection function of that Ministry. Current leasing policy requires that Fishermen's Associations or Cooperatives should receive priority in the allocation of use-rights at auctions. However, the intention of this instruction founders on two grounds. First, Fishermen's Associations are often fake - little more than a list of names provided by a powerful individual. Second, the recent changes in the system, from open bids to sealed bids, make the monitoring of prioritization of Fishermen's Associations impossible.

4.5.1. Conservation

The recommendations of the investigation were the subject of dispute, especially those regarding the creation of "reserves". The reserves were places where fishing was prohibited, except for the taking of predatory fish. These sites were intended to be "an annual source of natural stock for replenishing leased fisheries. Similarly, increasing consumption was attributed to greater access to the inland fishery catch due to improvements in transportation and preservation. There was still no evidence, however, that the inland fisheries catch was actually declining. As a result, the reserves degenerated into open-access fisheries, thereby denying the government revenue. The fishing methods were, in some cases, the same as those employed when the fisheries were leased, however, there was a range of prohibited fishing methods and there were certain restrictions that related to migrations of fish.

4.5.2. Sanctuaries

Sanctuaries are demarcated with red flags, accompanied by a signboard declaring that fishing is completely banned in the sanctuary. There are 4 sanctuaries in Abhaynagar Upazila. It is demarcated with red flags and filled with branches or tree roots as fish shelter and keep no fishing possible. Recently government will launched one sanctuary in Abhaynagar Upazila.

4.5.3. Breeding season

In the study area, different types of species are found such as consume Puti, Shing, Koi, Tengra, Kholesa, Magur, Mola. In Table 17 shows breeding season of bain (June to November), Magur (May –July), Koi (April-June) Shing (May –July).

Table-17: Breeding month of fish

Species	April	May	June	July	August	September	October	November
Puti		♫					♫	
Koi	♫	♫	♫					
Kholesa	♫							
Mola		♫			♫		♫	
Dhela		♫	♫	♫				
Magur		♫	♫	♫				
Shing		♫	♫	♫				
Bain			♫	♫	♫	♫	♫	♫

Indicate ♫-Breeding month

Source: Abhaynagar Upazila Fisheries Office (2010)

4.6. Marketing system

The process by which the product is transferred from production level to consumer level is called marketing channel. The marketing channel of Abhaynagar Upazila are shown in Fig.-8.

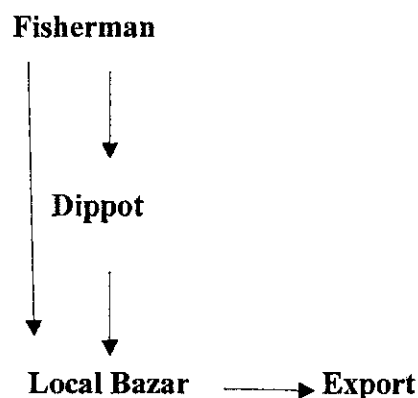


Fig.-8: Marketing channel of Abhaynagar Upazila

It has already been pointed out that the actual fishermen and fish farmers do not get proper prices for their harvests due to a complex marketing system and the very dominant role of middlemen in it. There are four distinct tiers in the marketing system in Abhaynagar Upazila namely-

4.6.1. Primary markets

These are located near the points where the fish are caught. The moneylenders or money lender-cum-wholesalers (Aratdar) procure the fish from the fishermen, generally through their henchmen, at predetermined prices. Only a part of the catch is allowed to be sold locally by local retailers. There is no problem of credit, as it can be easily obtained as trade finance from the nearest bank by affluent money lenders.

4.6.2. Secondary markets

The fish collectors at the primary markets bring the fish/shrimp to the landing ghats (jetties) in important commercial centres which are well-connected by river, road and/or rail transport. The dominant player in these markets is known as beparis (large traders).

4.6.3. Higher secondary markets

In these markets the beparis sell the fish to large wholesalers (paikers) through the local aratdars (commission agents). All the players in these markets can easily access institutional credit as trade finance.

4.6.4. Final consuming market

In this market, the big wholesalers sell their fish to the retailers who, in turn, either sell at permanent stalls in local markets or peddle it to homes on their heads or in rickshaw vans equipped with ice boxes.

4.7. Marketing place of inland capture fish

It was observed that about 70 % fishermen have sold fish several times to the market in Noapara and Phultala. This point was relevant to the point of pattern of fish. Some fishermen sold their fish to the market and others sold these to the aratdar. Some fishermen sold their fish to the dippot, arot, and dadonder. If any fisherman would take loan from dadonder they would give fish to the dadonder instead of return their loan. It was the system of taken dadon/loan from dadonder. In this system the fisherman would not get their appropriate price of fish.

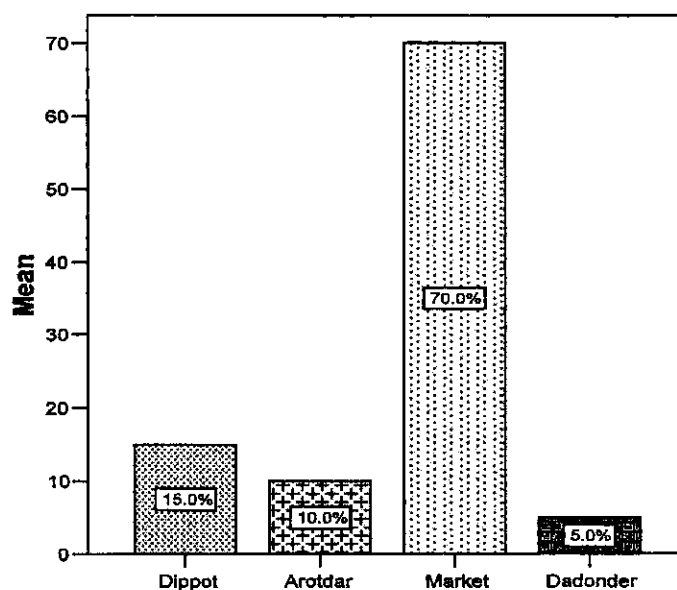


Fig.-9: Marketing places of inland capture fish

4.8. Storage and Packaging materials

The storage materials used by the fishermen were quite unsatisfactory due to the lack of proper knowledge about it. Most of the fishermen were used nylon bags, bamboo basket and nylon net as storage materials. They were not used ice or any other preservative materials.

Packaging materials include bamboo baskets, wooden boxes, oil drums (for live fish), plastic bags, jute bags and other local materials. Modern plastic or metal fish boxes, which can be cleaned and sterilized, are not used at all. Other natural materials such as hogla leaves, banana leaves and water hyacinths are used to provide protection and insulation, with or without ice.

4.9. Transportation system

Most of the fishermen were used boat and van for short distance transportation. They also used truck, bus for long distance transportation.

CHAPTER

FIVE

DISCUSSION

Chapter 5

Discussion

The study was conducted to observe the inland capture fishery of Abhaynagar Upazila in Jessore district. Fifty households were randomly collected. Wide ranges of data were selected from the study for analysis of inland capture fishery of Abhaynagar Upazila in Jessore district.

Ara *et al.* (2009) reported that total of 44 different species of fish, 3 species of prawn were found in beel Dakatia. Among these species, 9 fish species were exotic, those were not so available in capture fishery area except Tilapia and Nilotica, 13 fish species are available in capture area, 22 fish species were endangered, those species are not available now but used to be available earlier and rest of them were not available in the capture fishery area of Beel Dakatia.

Gain (2002) reported that the total of 55 species of fish and 3 species of prawn in the Chanda Beel. Among them, 30 species including the Chital, Kalibaush, Fatkini and Air are disappearing rapidly. He suspected that indigenous species Sorputi, Aleng and Bamosh are already extinct.

In the study area, various types of SRS are found such as Guchi bain, Kholesa bale, Jat puti etc. Some species such as Puti, Taki, Tengra, Chingri etc. are abundant in Labugati canal. Puti is the common catch in almost all of the species. In Table 3 shows catch rate of Koi, Shing Bale are decreasing day by day. The extinct SRS are Royna, Gutum, Pabda etc. In Abhaynagar Upazila, the availability of species are Napit Koi, Magur, Titputi. In Table 4 shows Tit puti, Jat puti, Chanda is available in the study area.

Ahmed (1983) reported that two types of markets exist for fish in Bangladesh: (a) local markets in the vicinity of fishing village, and (b) consumer markets away from the fishing areas. In my study area, there are primary, secondary, local bazar and export market.

FAO (2006) reported that in Asia alone, aquaculture production growth boomed from 5.1 % of total fish production in 1950 to 46 % in 2003. It is easily one of the fastest growing food-producing sectors in the region, with production tripling from 11.8 million tonnes in 1990 to 40.1 million tonnes in 2003. The steady growth of aquaculture production has been billed as a means of taking up the production slack in capture fisheries for many of the developing Asian countries. Up to about the 1990s, river and floodplain fish production showed a decline, and the relative contribution of open-water fisheries to total inland fish production decreased from 63% in 1983-1984 to 47 % in 1995 -1996.

In the study area, the decline in river and floodplain fisheries has been attributed to a number of causes, the most important being overfishing and reduction of fishing by residues. The inland capture fishery are decreasing due to several factors- Natural breeding spot are decreasing in open water such as beel, canal baribad. Alteration of aquatic ecosystems has direct and indirect adverse effects on fish flora and fauna through their reproduction and survival. Adverse environmental conditions can affect natural reproduction of populations and ultimately hinder recruitment in stocks from spawning. Recent environmental modifications, water quality degradation and fishing pressure have increases the vulnerability of fish genetic resources in Abhaynagar Upazila. Constructing embankments and other flood control devices is also unavoidable.

In my study area the highest production from capture fish is 250 kg per day in Shuvorara Union and lowest production from capture fish is 100 kg per day in Noapara Municipality. The average production in Shuvorara Union is 187.5 kg.

A total of 257 species of fish have so far been recorded in the freshwaters of Bangladesh. It is estimated that about 200 of these species are truly freshwater forms and the rest are estuarine and marine forms that enter rivers and other freshwater areas during certain periods of their lives. With the exception of a few, most of the 257 species are available in the impounded water bodies. However, at present, only major Indian carps, such as Catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigala (*Cirrhinus cirrhosus*) and Kalbasha (*Labeo calbasu*), along with exotic carps such as Silver carp (*Hypophthalmichthys molitrix*), Grass carp (*Ctenopharyngodon idellus*) and Common carp (*Cyprinus carpio*) are commonly cultured in a polyculture system in ponds. The other two Chinese carps, Bighead carp (*Aristichthys nobilis*) and Black carp (*Mylopharyngodon piceus*) are also cultivated, but to a lesser extent. Very recently, African catfish (*Magur*), and freshwater prawn (*Macrobrachium rosenbergii*) have received considerable response from aqua farmers. There are some other species, too, which are occasionally cultured. (FAO, 2006)

In my result, various types of SRS, SIS and other species was observed.

Sarower *et al.* (2009) reported that catches for seine net, drag net, cast net, current net and push net were 20, 17, 14, 13 and 7 species, respectively and bamboo traps, hooks and lines and ghuni were 6, 5 and 4 species, respectively. Hossain (1998) recorded 14 species, 6 species and 7 species of fishes in the old Brahmaputra river in the catches of current net, push net and hook and line respectively.

▼ In my result, winter season is suitable for collection of fish. About 60% fish are collected in this season. The fisherman captured lowest amount of fish in rainy season. In this season, they collect 10% fish. Some fishermen catch 30% fish in summer season.

▼ Dey *et al.* (2005) pointed out that fish consumption varies widely between economic groups. As income increases, the per capita annual fish consumption will also consistently increase. In my result, after harvesting, the fishermen utilize 80% fish for selling purpose and rest amount use for consumption and drying purpose.

★

C H A P T E R S I X

PROBLEMS AND RECOMMENDATIONS

Chapter 6

Problems and Recommendations

There are some problems which hinder the prospect of inland capture fishery.

Problems

- ✚ Lack of awareness about the resource
- ✚ Loose social cohesion.
- ✚ Water pollution
- ✚ Habitat rehabilitation,
- ✚ Over harvesting
- ✚ Land use conflict
- ✚ Lack of upstream water flow.
- ✚ Flood saline is another problem for decreasing of fish production.
- ✚ Land erosion and siltation development activities.

Recommendations

The following recommendations can be made to minimize the problems:

The degradation and shrinkage of the environment in general and of fish habitats in particular are highlighted repeatedly. This has put into jeopardy the sustainability of the fisheries resources, particularly in the open water capture fishery. The following are some recommendations to address this problem:

- ✚ Erection of fixed engines is prohibited in the rivers, canals, khals and beels. Any fish caught by means of such engines may be seized, removed and forfeited.

- ✚ Construction of bunds, weirs, dams and embankments or any other structure, whether temporary or permanent, in, on, across or over the rivers, canals, beels for any purpose other than irrigation and flood control are prohibited.
- ✚ Strict enforcement of regulations that prohibit the catch of the young as well as brood fish.
- ✚ Increased awareness, co-ordination and integrated multispectral planning among the various ministries overseeing fisheries and water issues to ensure that inter sectoral trade-off, natural resources management; environmental impact assessment and pollution assessment are adequately addressed.
- ✚ Appropriate legislative power and resources need to be channeled to environment-oriented departments to ensure that environmental priorities are not overridden by sectoral short term interests.
- ✚ Destruction of fish by explosives, gun or bow and arrow in inland waters or within coastal territorial waters is prohibited.
- ✚ Catching of carp (Rui, Catla, Mrigal) is prohibited in certain waters, provided that no license for catching of the above named carp fish shall be allowed for purposes other than pisciculture.
- ✚ No person is allowed to catch the following other than in pisciculture:

July-December, each year, Carp species below 23 cm.

- ✚ Forfeited fish will be disposed of by auction and the money shall be deposited in the Government accounts.



- ✚ Use of gillnet (commonly known as current net) less than 4.5 cm. mesh size is prohibited.
- ✚ Punishment and penalties for violation of rules will result in 4 months jail with labour and a maximum penalty of Tk. 500.
- ✚ Subsequent punishment and penalties for violation of rules will result in 2-12 months jail with labour and a maximum penalty of Tk. 2000.
- ✚ In special cases, a person can be arrested without a warrant.
- ✚ Establishment sanctuaries.
- ✚ Involvement of too many steps in marketing channel is a problem that demands attention for improvement of the trade.
- ✚ Off-season breeding venture should be undertaken with necessary environmental modification so that the SRS collectors could be engaged during off-season months.
- ✚ Technical support should be provided to develop the present condition of the collectors.
- ✚ Extension work is important to ensure that there is handling and quality regulation to ensure a reduction in losses and quality of product to market.

CHAPTER SEVEN

CONCLUSION

Chapter 7

Conclusion

Although Bangladesh's resources for fish production are vast, there are biological, social and economic constraints. To conserve and manage fishery resources for the benefit of the present and future generations, the resources need to be managed and exploited on a sustainable basis. Strong funding support from government and donor agencies will be needed in order to undertake future surveys, research, and training including implementation of management issues concerning preservation of aquatic ecosystems, biological conservation and improvement of fisheries as a whole in all the existing water bodies of Bangladesh.

Different types of carp, SRS, SIS were found in Abhaynagar Upazila. The highest fishermen were involved in September to January with a highest amount of catching fish. Some fishermen catch fish from October to February they are categorized as seasonal fishermen. Year round fishermen are those fishermen are engaged to catch fish all the year round.

In the study area, the highest production from capture fish is 250 kg per day in Shuvorara Union and lowest production from capture fish is 100 kg per day in Noapara Municipality. The average production from fish of Shuvorara Union is 187.5 kg. From the interviews, it was found that the highest income of the fish 1200 Tk per day in Shuvorara Union. About 5 % fishermen earn 1200 Tk per day from the income of fishery activity. The fishermen captured Chingri-25%, Puti-20%, Bain-15%, Taki-10% and other species 30% during harvesting. Winter season is suitable for collection of fish. About 60% fish are captured in this season. About 40% fishermen were

observed to expend for catching 5 trips and only 10% of them 3 trips per day and night. About 20% fisherman catch fishes 5 hours in day and night.

In the study area, it was found to use various types of crafts and gears including seven types of trap, five types of craft, five types of net, two types of hook namely Box trap, Topa, Basket trap, Polo, Puti bair, Koi doughier, Khadom, Dingi nouka, Bhesal dingi, Donga, Vela, Patam nauka, Thela jal, Dhormo jal, Seine net, Khapla jal, Push net, Chip borsi, Dao borsi were used for fishing in the study area. In the study area, about 60% fishermen use Tana jal, Khapla jal etc.

In Kasubpur beel, floating garden plays a vital role. Shusilon NGO launched this floating garden. Now-a-days, some species such as Koi, Royna, Shing, Gutum, Bale etc. are endangered. The fisherman can play a vital role to protect this endangered species. They should collect this species from another beel and release this species in beel of Abhaynagar Upazila. There was a range of prohibited fishing methods and there were certain restrictions. It is prohibited harvesting of fish in breeding season. The government can play a vital role to establish a hatchery in Abhaynagar Upazila. Concious fisheries scientist also plays a vital role by establishing a hatchery. They should establish separate hatchery Koi, Magur, Shing Pabda hatchery and release this species in beel, canal. There are some rules and regulation. The fishermen should flow this rules and regulation.

In Bangladesh there are about 1.28 million of the total population is fishermen. They play an important role in our fisheries resources. The fishermen are directly involved in fishing and marketing system. But their existing fishing and marketing system do not enough structured to carry out the sustainable fisheries development. It has been seen in the above result that most of

the gears are being used by fishermen and most of the species are caught illegally throughout the year. The Government should supply healthy fish fry to the open water prior to the rainy season. The marketing channel should be developed by Government interferences, so that the fishermen obtain their actual price of their products. There are no strict rules and regulations as well as awareness among the people in the study area. The Government should provide loan to the fishermen and established strict rules and regulations for developing the existing fishing and marketing channel practiced by fishermen.

It is most imperative that further studies should be carried in more detail in the present study area. The Fisheries and Marine Resource Technology Discipline, Khulna and Jessore University could be assets toward providing appropriate technology to improve the fisherman for protein requirement. This study would lead to the basic thought of alleviating poverty for the poorest of the poor living. Government should take necessary steps to improve the socio-economic condition of fishermen.

The paper indicates that although the total production of inland capture fisheries may not change drastically, the production by different species may have changed drastically. The other attribute revealed in this exercise is the lack of information on values of inland capture fisheries. The presence of this information would let us better understand the dependence of the rural poor on fisheries for livelihood and food security.

CHAPTER EIGHT

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Chapter 8

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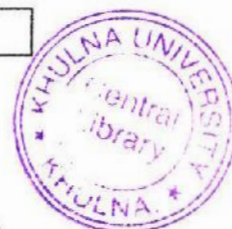
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A P P E N D I X

**Questionnaire
Photograph**

3. List of Carp
4. List of extinct SRS
5. List of SIS
6. Production from capture fish in beel
7. Production from capture fish in canal
8. Production from capture fish in river
9. Income group
10. Consuming season in Abhaynagar Upazila
11. Price of some inland capture fish
12. Utilization of inland capture fish
13. Gears used to catch inland capture fish
14. Available crafts which are used in Abhaynagar Upazila
15. Available gears which are used in Ahbhaynagar Upazila
16. Different types of nets
17. Collection of different categories of inland capture fish

18. Seasonal collection from inland capture fish
19. Marketing Place of inland capture fish
20. Classifications of fisherman
21. Number of fishing time
22. Number of fishing trips
23. Catch rates (CPUE)
24. Management system
25. Classifications of fishermen
26. Number of sanctuary in Abhaynagar Upazila
27. Marketing channel of Abhaynagar Upazila
28. Storage and Packaging materials
29. Transportation system
29. When fishermen went to catch fish
(Day-1, Night-2, Day and night-3)

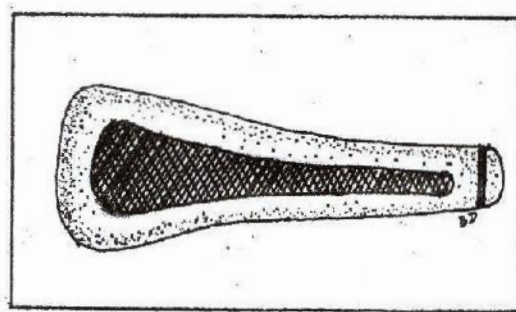


Appendix-2

Photographs



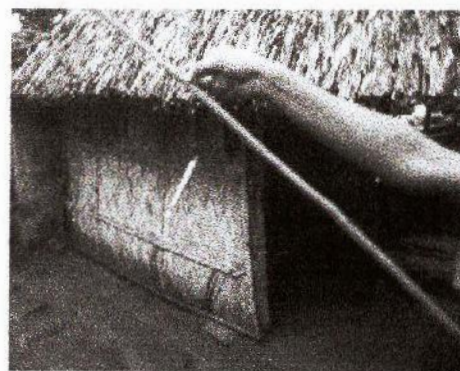
Photograph-1: Dingi Nauka



Photograph-2: Donga



Photograph-3: Vela



Photograph-4: Borsi



Photograph-5: Basket trap



Photograph-6: Shol



Photograph-7: Sanctuary



Photograph-8: Koi



Photograph-9: Bain



Photograph-10: Taki