CHAPTER I

INTRODUCTION

GENERAL INTRODUCTION

PROLOGUE

Production from a fishery is dependent to a large extent on the gears and devices employed for fishing (Lagler, 1978). Various kinds of locally made gears and indigenous methods are in use for capturing different kinds of fishes. Exploitation of fisheries in the lakes (beels) was insignificant initially, fishing being done by the settlers around the beels purely on a subsistence level. Later, these activities develop into small-scale fisheries, though initially catches were not satisfactory. Although in Assam fishing is considered as a low category profession, it is the principal way of earning livelihood of the fishermen of the surrounding beels. But the catches in most of the cases are insufficient against the total operational cost mainly due to the lack of sufficient knowledge on the gear from the economic point of view. Moreover, skill gained by the fishermen in riverine fisheries were no longer appropriate for the changed hydrological conditions of beels which are a special kind of water bodies having high depth, slower water exchange, specific hydrological conditions and different fish fauna.

Fishing in the beel fisheries of Assam is more common by unconventional methods than by seining, gilling or dragging (Yadav, et al., 1981). The frequency of use of different gears and methods for fishing are observed to vary in different seasons. The common fishing gears used in different beels of Assam for commercial purposes may be grouped under the following types taking into consideration the mode of operation and capture effected: - fishing without gear, wounding gears, stupefying methods, hooks and line fishing, fishing traps, bag nets with fixed mouth, dragged gears, seine nets, surrounding nets, dip or lift nets, falling nets and gill nets.

The indigenous fishing methods employed in the beel fisheries of Assam may be mentioned as *Katal* fishing, *Banas* fishing, *Khati-Dori* fishing, *Bheta* fishing and *Tik-Tiki Khedani* fishing.

As far as the fisheries potential is concerned nature endowed Assam with myriads of wetlands, which are having prime importance in pisciculture, agriculture and so on. Beel fisheries in Assam covers 0.12 million hectares, which is about 80% of the total lentic area of Assam. As per the statistics of the Department of Revenue, Govt. of Assam, there are 1392 floodplain wetlands in the State of Assam with a total surface area ca. 1.0 lakh ha. (As per *Assam Remote Sensing Application Center* the number of wetlands in Assam is 3513). Under almost unmanaged and underdeveloped conditions the beels produce about 100 Kg/ha/year (Adhikari et al., 1986) whereas the production in some developed Indian reservoirs is only 79 Kg/ha/year (Jhingran, 1982). The production from the beel fishery is mainly dependent on the availability of the fish species auto stocking from rivers during flood. There are a number of works have been worked out on the ichthyospecies in different parts of the world. In India also much work have been done on fish and fishery biology. Perhaps the earliest work on fishery biology was done by Day (1875-78). The other important works are of Motwani and David (1957), Mishra (1976), Jhingran (1980), and Menon (1987).

The river Brahmaputra with its large number of hill streams affords a lucrative field for various limnological and ichthyologic studies in Assam. Scientific studies in Assam fishes were first made by John Mc Clelland (1839) who described 138 ichthyospecies from India including Assam. Robinson (1841) gave a descriptive account of Assam fish fauna and recorded 74 fish species. In the following years some casual reports on Assam fishes had been made by Muller and Troschel (1845), Peter (1861), Gunther (1864, 68), Playfair (1878), Bevan (1877), Fransis Day (1889). Many workers carried out an account of fish fauna of Assam in the following years such as De (1910), Hora (1921,24), and Hora and Mukherjee (1935). Further record about the exploitation on the fish fauna of Assam can be obtained from the works of

Hora and Gupta (1941), Menon (1952), and Sehgal (1956,59). Like wise more works had been done by Motwani et al. (1962), Dey (1965, 1967a, 1967b, 1975 and 1984).

Table-1.1 reveals that the beel fisheries of Assam have not less than 54 fish species, which are belongs to 21 families. Moreover, the beel fisheries also contain non-Piscean species, such as Macrobrachium sp., which also affect the economy of the beel fisheries to a considerable extent. Among the Piscean families Cyprinidae comprises of maximum species (32 species) followed by Bagridae (6 species). Other families contain 1 – 4 species each. Thus, the family Cyprinidae has a major role in the productivity of the beel fisheries of Assam. In earlier works though Hamilton (1822) reported only 16 species, Day (1889) listed 109 species in the beel fisheries of Assam.

Besides the availability of the fish species in the beels, in order to manage fisheries intelligently it is necessary to have some knowledge on types and effectiveness of fishing gears. There is a great divergence in the efficiency of different forms of gears in their adaptability to certain conditions and their desirability from the standpoint of conservation. Though it would take several volumes to describe the various types of fishing gears and their modifications, it is obvious that cooperatively few types take the major share of the catch. Pilot survey of the present project shows that most of the gears are not at all effective in the sense that the benefit yields are insufficient to cover the cost. Hence a detailed study of the indigenous gear is felt necessary. The findings of the study will go in a long way in improving productivity of the gears and consequently the economic condition of the fishermen. With this motive this research has been initiated.

RESEARCH QUESTIONS

There are different types of fishing gears used in the beel fisheries of Assam and each gear has different catching efficiencies. Some gears are seasonal and some of them are used throughout the year. The effectiveness of gears may vary according to season also. Moreover, there are various types of fishing methods are found in the beel fisheries of Assam. These facts lead to frame question – 1.

Question – 1. ***What are the different types of gears and fishing methods commonly used in different seasons in the various beels of Assam and the level of CPGH of each type of gear use?***

There are different types of fishing gears used in the beel fisheries of Assam for commercial purposes. But it is evident that all the gears are not economically feasible equally. This leads to frame the question – 2.

Question –2. ***What are the types of gear that are economically effective to recover all the cost including the opportunity cost of labor ?***

There are a variety of meshes are found in different gears. It is a fact that the efficiency of gear depends on the mesh size that also determines the type of fish species sought. This leads to frame question – 3.

Question – 3. ***What are the different mesh sizes of gears commonly used in different beels of Assam and the level of CPGH of mesh sizes of the gears used?***

Fishing gears in Assam have a long tradition and are evolved to meet the ecological aspects of fishery and behavioral traits of fishes. This leads to frame question – 4.

Question – 4. ***How much traditional the gears of Assam are which are being in use in different beels?***

RESEARCH HYPOTHESES

Hypothesis - I

The various past works on the effectiveness of gears and methods have found different gears and methods to be effective in the different beels/lakes/reservoirs. For example, Yadav, 1981 have found *Katal* fishing as the most effective one in Dhir beel (Assam); Dey et al., 1989 found *Dori* (trap) as the most effective in sone beel (Assam); Amarasinghe et al., 1992 found gill netting is the only regular fishing method in both Minneria and Kaudulla reservoir in Sri Lanka. Like wise, Znamensky, 1967; Sulochanan, 1968 and Naidu et al., 1972 reported the superiority of frame nets (gill nets) over other gears. These findings have led to the following research hypothesis.

H_0: ***The level of effectiveness of gears varies across the different beels of Assam – i.e., if one type of gear is effective in a particular beel, the same may not be effective in the other beels. As such the types of species available, their density and the hydrological condition of the beel influence the level of effectiveness.***

H_1: ***The level of effectiveness of various gears remains same in all the beels under study.***

Hypothesis – II

Studies on mesh size selectivity were also conducted by George et al., 1979 and Khan, 1980 and they determined the mesh size based on it's retaining capacity. Khan et al., conducted a thorough study on mesh size in Hirakud reservoirs (India) and revealed that simple gill net of mesh size 25 – 30mm and frame net ranging from 75 to 105mm are highly suited of the capture of G. chapra, O. cotio cotio, E. vacha and S. silondia, L. fibriatus, C. mrigala and C. catla respectively. Moreover, the Government of Assam has suggested some recommendation on the mesh size of encircling gears and gill nets vide Assam Fisheries Rule, 1953 (Phukan, 2001)

These assume that the same recommendation should work for the beel fisheries of Assam. This has led the following research hypothesis.

H_0: ***The recommended mesh sizes of different gears are the most effective one for the beel fisheries of Assam and there is no significant variation in the level of effectiveness across the different beels of Assam.***

H_1: ***The mesh sizes other than the recommended one are the most effective for the beel fisheries of Assam and the level of effectiveness varies from beel to beel.***

ORDER OF PRESENTATION

With the introductory chapter i.e. Chapter – 1 (which includes about fishing gears, floodplain wetlands, fish species diversity in the beels of Assam, research questions, research hypotheses, order of presentation and relevance of the present work) the thesis contains eight chapters.

Chapter –2 describes the methodology needed to examine the research questions and to test assumed hypothesis. It also outlines the pilot survey, data collection method, analysis of data and technique employed, explanation of the economic terms, sample size and period of the present research work.

Chapter –3 highlights the types of gears used in the beel fisheries of Assam and the types of gears used in different seasons. Different types of indigenous fishing techniques have also been described in this chapter (*Research Question 1*).

Chapter - 4 discusses about the cost and return analysis of fishing gears and *katal* fishing (an indigenous fish device of Assam). In this chapter the economic feasibility

of different gears have been evaluated with the help of some economic indicators (*Research question 2*).

Chapter – 5 describes about the different mesh sizes of fishing gears along with the level of CPGH (*Research Question 3*).

Question number 4 is answered in the chapter – 6. It highlights about the tradition of the gears, which are being in used since a long time in the beel fisheries of Assam (*Research Question 4*).

Chapter – 7 identifies the feasible gears in different beels of Assam which are considered under the present research work (*Research Hypothesis 1*).

Chapter – 8 discusses about the mesh sizes of the fishing gears, which were found most effective in the beel fisheries of Assam (*Research Hypothesis 2*).

RELEVANCE OF THE RESEARCH WORK

Due to lack of proper knowledge on economical and financial matter regarding the fishing gears which are in use in the beel fisheries of Assam, fishermen community, who depends solely on fishing in the beel fisheries have to face a poor return against the capital investment and the costs of operation. Till date no sincere effort has been made by concerned authority or academicians related to fish and fishery to evaluate the types of fishing gears used in different beel fisheries of Assam, cost and return analysis of different fishing gears which are used extensively for the commercial purposes, effectiveness of mesh sizes of different gears, traditional status of gear etc.

In the present study an attempt has been made to unearth valuable information on the financial aspects of the fishing tradition. The discussion on the types of gears and some indigenous fishing methods would describe about the different types of gear (chapter – 3), which have been recorded from the survey of 55 numbers of beel and some of the indigenous fishing devices, which are in practice in most of the beels. The analysis presented in chapter – 4 would enable the decision makers and the fishermen community as a whole to gather knowledge on the costs and return analysis about different types of gears and *Katal fishing*.

The analysis presented in chapter- 5 provides detailed information on different mesh sizes of fishing gears along with their CPGH.

Ecological aspects of fishery and behavioral traits of fishes are two major criteria for evolving suitable fishing methods. The beel fishermen community of Assam, by their age long experiences have developed a wide array of fishing gears and methods. Considering these facts chapter – 6 discusses about the traditional aspects of different fishing gears and methods.

The level of effectiveness of fishing gears varies across the different beels of Assam. It means if one type of gear is effective in a particular beel the same may not be effective in the other beels. The hypothesis I provides evidences on this fact in chapter - 7.

Finally, the role of mesh size of a gear can't be ignored regarding the effectiveness of gears. Chapter – 8 provides evidence that mesh sizes other than the recommended one may also be effective in the beel fisheries of Assam.

Thus, the study has provided many scopes for further study which would enable decision makers, other concerned authorities in particular and fishermen community as a whole to take appropriate measures to use the gears and fishing technique which

are economically feasible so as to get more benefit against the costs incurred for the installation and operation of the gear.

Table- 1.1 Ichthyospecies of the Beel Fisheries of Assam

Sl. Nos.	Family	Species
1	Cyprinidae	*Catla catla*
		Cirrihina mrigala
		Cirrihina reba
		Labeo rohita
		Labeo bata
		Labeo calbasu
		Labeo gonius
		Labeo bata
		Cyprinus carpio
		Ctenopharyngodon idella
		Hypophthelmichthys molitrix
		Salmostoma bacaila
		Puntius sophore
		Puntius phutonio
		Puntius conchonius
		Puntius ticto
		Puntius sarana
		Oreichthys casualis
		Perosiosoma elenga
		Perosiosoma rasbora
		Perosiosoma daniconius
		Amblypheryngodon mola
		Salmostoma bacaila
		Brachidanio rerio
		Danio davario
		Esomus barbetus
		Esomus danrica
		Chela laubuca

		Chela atpar
		Aspidoparia morar
		Aspidoparia joya
		Rohtee cotio
2	**Notopteridae**	*Notopterus chitala*
		Notopterus notopterus
3	**Bagridae**	*Aorichthys seenghala*
		Mystus tengra
		Mystus vittatus
		Mystus cavasius
		Mystus bleekeri
		Rita rita
4	**Mugilidae**	*Sicamugil cascasia*
		Rhinomugil corsula
5	**Siluridae**	*Wallago attu*
		Ompok pabo
		Ompok bimaculatus
6	**Ophiocephalidae**	*Channa punctatus*
		Channa striatus
		Channa marulius
		Channa orientalis
7	**Schilbeidae**	*Clupisoma garua*
		Pseudotropius atherionoides
		Eutropiichthys vacha
8	**Saccobranchidae**	*Heteropneutus fossilis*
9	**Claridae**	*Clarius batrachus*