CHAPTER ONE

INTRODUCTION

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The fishery of edible crustaceans, inhabiting in the freshwater as well as brackish and marine water is one of the most important aspects of fishery biology. The crustacean fisheries are of great significance in Indian water. These fisheries constitute 11.84% of the total marine landings on the West coast and 1.14 % of the landings on the East coast of India (Ling, 1969). Prawns, lobsters and crabs are included under aquatic crustaceans. The prawns, the fragile crustaceans are the most important of all crustaceans from Indian water and maximum works have been done in regard to the biology and fishery of prawns of economic importance in abroad. These contribute to the major bulk (90%) of the crustaceans fishery and about 17% of the total marine landings.

Among the crustacean fisheries, crab fisheries and prawn fisheries have gained much attention now-a days and maximum works have been done in regards to the biology and fishery of prawn for economic importance (Correia & Cordeiro 1981; Coelho *et al.* 1982, Valenti 1985, Magalheas 1985, Labao *et al.* 1986, and Valenti *et al.* 1987 & 1989). In the recent year, Prawns have come to occupy a pre- eminent position in the fisheries complex in this country and giving India a special status among the important prawn

producing countries like USA, Japan, China, Brazil, Hongkong, Sri Lanka and Malayasia (Ling, 1969)

Due to indiscriminate killing of berried female during monsoon, the recruitment of *Macrobrachium* fry to inland open water of the country is declining every year. Smith *et al.* (1978) reported that the environmental condition may affect sex determination and forms the development of females. Freshwater prawns have been a neglected resource in India. Till recently with the development of an export market and considerable price rise, the value of large prawns are now being realized and there is a growing interest in the establishment of hatcheries and systematic culture for increasing production of both for internal consumption and export market. Location of prawn seed collection centre along various rivers have helped in their transportation in pond and tanks in near by areas and almost all over the country. But in northern and north-western region in India these are not naturally distributed (Tripathi, 1990).

The freshwater prawns being comparatively slow moving, are exploited on an intensive scale and the landings include both ripe and berried females. It is feared that indiscriminate exploitation of berried female will adversely affect the prawn stock in the lake. Hence a closed period for fishing coinciding with the peak breeding season may bring about favourable impact on fishing (Rao, 1990).

Prawn fishery of India with an annual catch of over 1,00,000 tons is second only to USA and account for 18% of the world production. Flourishing trade of exporting prawn population to Myanmar and Malayasia from earlier times and frozen & canned prawns to USA and Japan in recent years has made Indian prawns as major foreign exchange earner. Export earning from them have shown a steady increase from Rs. 115/ million in 1961 to Rs. 330/ million in 1970. In Indian out of a total production of 7,343.68 mt. of fresh water prawn production. The total production of 127.58 mt. of prawns, in India had an estimated whole sale value MS 1623350 in 1989. In this country, production of *Macrobrachium* decreased from 67.1 mt. in 1984 to low of 5mt. in 1987, after which it increased again to 68.2 mt. in 1988 and 127.8 mt. in 1989. Brackish water shrimp production increased steadily from 60 mt. in 1984 to 2070 mt. in 1989 (Raman 1967, kurup *et al.*, 1989 and Singh *et al* 1990). The commercial farming of *Macrobrachium* has become popular in several parts of the world. The global production of *Macrobrachium* through culture is estimated at 20,000 tones/year forming 6% of the world prawn production through aquaculture and the major share being contributed by Thailand (New, 1988). The tendency to favour penaeid shrimp culture or *Macrobrachium* culture is apparent from the fact that, in 1984, *Macrobrachium* production, comprised 52.8% of total shrimp and prawn production while in 1989 its share was only 5.8%. There are indication, however of a slight shift back to *Macrobrachium* production possibly because

of the unfavourable market condition for penaeid shrimp specially over the last couple of years (Singh and Vijiarungam, 1990). According to Santhanakrishnan and Viswakumar (2000), USA and Middle East, show good acceptability of Indian fresh water prawns from 50,000 /ha in the first 10 years of the new millennium. There may be production of at least 25,000 tones at an average production of 500kg/ha/yr. This production can generate an additional foreign exchange of Rs. 750-1000 crores. Reddy and Kohli (2000) repoted that about 20.0 million seeds of *M. malcolmsonii* and *M. rosenbergii* are collected every year and supplied to various states of the country under present status of prawn seed production. According to them, the green water help in maintenance of good water quality for juveniles growth of *Macrobrachium* species. By cultivating *M. rosenbergii* and *M. lamarrei*, in the last five years, this Inland fishery landed in the state, varies between 60,000 to 70,000 m tones with an estimated value of Rs. 18,000 to 25,000 lakhs (Vhora *et al*, 2000). Kutty *et al.* (2004) observed that *M. malcolmsonii* constitute about 10% of total farmed production of freshwater prawn in India. In Brazil, several crustacean species, known as freshwater prawns occur, where they are distributed practically through out the National territory. In several regions they are exploited economically by artisanal fishing. However, fishing has been steadily declining due to pollution, destruction of natural eco-system and over fishing (Valenti 1985 & 1990). Many freshwater prawns are abundantly found in ponds and paddy fields of

Indian sub-continent and Malaysia (Wickins, 1976). Although prawn farming has been practiced in India, from quite an old time, it has till now remained as a neglected branch of fisheries. Most of the catches are made directly from the natural environment which largely include the immature ones. In the last few years, their production decreased considerably and now the fishery departments are giving much attention for scale propagation of prawn farming in the country through scientific and technological uses. A prawn culturing factory was started by the CMFRI in September 1978 at Narakhal, Cochin.

The freshwater prawns (*Macrobrachium* spp.) occupy an important place in the export trade owing to their high market value. There is an urgent need to access to potential of this important resource from the different aquatic systems for proper planning in research and developmental programmes. Regarding the process of economic importance with fisheries of Indian coasts, rivers, beels etc. the primary information are furnished by the workers like Choprae 1949, Gopinath 1956, Anon 1962, Bhimachar 1962, Kurian 1965, Pontula 1965 and Gunapati & Subramanyam 1974, but such biological information as a help promoting the prawn fishery industry are then lacking. CMFRI investigations carried out several valuable information on the biology and fisheries of prawn having high economic status. (Kurup *et al.* 1990). The institute studies on the freshwater prawn fishery of Indian rivers and surveys were conducted to study the biology and production of prawns in the Ganga rivers (Tiwari 1949, Panikar & Menon 1958 and Mohomed 1967).

In the ponds and paddy field also works were carried out (Gopinath 1956, Raman and Memon 1963 and Subramanyam 1974)

Macrobrachium spp. inhabits the river, freshwater and brackish water areas adjacent to tidal limits (Raman 1967, George 1969, Kurian & Sebastian 1976 and Jhingran 1982). This prawn can live in fresh and brackish water, but not in sea water of very high salinity (Kurian and Sebastian 1976). It moults generally at night and moulting is completed in less than 10 minutes. It takes 2 – 6 hours to harden the shell (Kurian & Sebartian, 1976). It avoids strong illumination during day times and rests at the bottom. It prefers subdued light (Joseph *et al.* 1990).

According to Kulkarni *et al.* (2000) dams and reservoirs affect migration of *M. malcolmsonii* in the river water. *M. malcolmsonii* showed great adaption spreading out horizontally along the coastal irrigation system including shallow reservoir (Rajyalakshmi, 2000). *M. malcolmsonii* is cultured separately or along with Indian Major Carp (Kulkarni *et al.* 2000). According to Tripathi (2000), *M. malcolmsonii* can be cultured in small ponds with efficient control and skill under monoculture practice. Because of size, good taste and wide distribution, *M. malcolmsonii* is in great demand (Ahmed, 1994). *M. malcolmsonii* and *M. birmanicum choprae* attain a maximum weight of 200 gm approximately (Rajyalakshmi, 2000). According to Rajyalakshmi (2000), *M. malcolmsonii* is more or less estuarine. But most *Macrobrachium* species are estuarine dependant for their continued

recruitment to their riverine phase of life cycle. In most of the species of *Macrobrachium*, monsoons have great impact on breeding and breeding migration with availability of high oxygen content in the flowing water (Rajyalakshmi, 2000).

With the developing interest of the people in prawns, the demand of the commodity is raised pretty high in India and abroad. Apart from being a delicacy, prawns are rich source of proteins (Hawk 1952), lipids (Folch *et al.* 1957), Carotenoid pigments (β Carotine) (Jacob, 1958), moisture and very low percentage of Non Protein Nitrogen (NPN) (Sherief *et al.*, 1990), mostly needed to cure malnutrition of human population of the world (Shaikmahmud and Magar 1957, Debrowski *et al.*, 1969, Pillay and Nair, 1973, Sriraman and Reddy, 1977, Mukundan *et al.*, 1981 and Achuthankutty and Parulekar, 1984). They contain considerable quantities of glycogen, ash (Hassid & Abraham, 1957 and Mukandan *et al.*, 1981) and free amino acid in their muscles (Sherief *et al.*, 1990) imparting their flesh a sweet taste. Moreover, body muscles are also rich source of phosphorous, calcium, magnesium, zinc and iron (Fiske & Subbarowi, 1925 and Achuthankutty & Purulekar, 1984). Fat content is low (Mukundan *et al.*, 1981). As they contain very little fat, they have become a favourite protein food for the weight conscious aristocracy.

Chanmugam *et al.*, (1983) reported the presence of 3.18% of lipids in fresh water prawn *M. rosenbergii* than in the marine shrimp, Penaeus as

1.33%. Labao *et al.* (1986), chemically analysed the proximate composition of *M. rosenbergii* like Moisture as 76.2%, Protein 20.7%, lipid 0.7% and ash 1.2%. Jain and Srivastava (2003) described that cotton seed cake, ricebran, corngluten meal, wheat bran, poultry claw, ground nut cake, soybean hull are the favourite food of many prawns. *M. lamarrie. lamarrie* and *M. dayanum* are bottom feeders which along with the food items present on the bottom, also engulf some quantities of sand and mud (Qureshi, 1994). The non specific nature of peneid immune system gets weakened due to stress such as accumulation of metabolites, poor water quality and nutritional deficiency. Various biochemical components of the body of *M. lamarrie lamarrie* was studied by Selvakumar *et al.* (2000). Geralcline *et al.* (2000) studied role of metal binding protein in *M. malcolmsonii*. Lipid nutrition is a vital area for prawn culture that has generally escaped the attention of research workers. Each component of lipid should be critically considered before formulating the prawn diets.

Thus from the standpoint of food value also, these varieties initiate for further study which may yield several new information on prawn to science. CMFRI (1978) carried out investigation and gave several valuable information on the biology and fisheries of prawn having economic status. The symposiums held at many places of the world helped to bring together a great deal of information on the prawn fisheries including those of Indian region (Silas, 1992).

The work on the freshwater prawns of Assam is very meager. Tiwari (1955) had however made casual studies on the collection of Assam prawns at ZSI museum and described some new species while Koshy (1969) and Dutta (2001) made a brief account on their population studies. It is therefore felt necessary to study this important branch of fishery in the light of regional importance having commercial value.

The present work is done with the following objectives:

i) To survey and identify the *Macrobrahium* species present in Assam.

ii) To assess the habitat, physio-chemichal parameters of water and soil and the mirco and macro vegetation required by the each variety.

iii) To study biology, taxonomy, sex-ratio, Fishing gears, Feccundity of each species in natural condition.

iv) To study the biology of four commercially viable species viz., *M. birmanicum chopreae, M. malcolmsonii, M. dayanum* and *M. assamensis* where parameters like 'Length –Weight relationsphip, Relative Gut Length (RGL) Gonado Somatic Index (GSI) and few elements viz. Cu, Zn and Fe were taken into consideration.

v) To estimate biochemical (nutritional) quality of the each species.

vi) To investigate the marketable demand and economic viability of each species.