CHAPTER 1
INTRODUCTION

The Northeastern region with its diversified lotic and lentic water bodies are considered as the global hotspot for fish bio-diversity. Out of the approximately 806 fish species inhabiting fresh waters of India (Talwar and Jhingran, 1991), the Northeast is reported by 266 species (recorded and reported) belonging to 114 genera under 38 families and 10 orders (Sen, 2000) out of which 196 fish species occurring in Northeast have potential ornamental value (Dey, 2001).

Ornamental fishes may be defined as fishes, which are reared as pets and not for consumption (Anon, 2001). Conventionally as well as technically, ornamental fishes are smaller in size, attractively coloured with majestic movement exposure in the aquarium. However, non-colourful fish will also receive ornamental status if they exhibit peculiar body morphology, strange locomotive deportment and rare occurrences (Dey, 1984).

Keeping attractive colourful fishes as pets in aquaria or garden pools are an age-old hobby, which originated with keeping of gold fish in glass bowl in China several hundred years ago. It was during 17th century that gold fish was introduced to several countries and became popular in England and Scotland. The first public display aquarium was opened at Regent Park in England in 1853.
In India, the hobby of keeping ornamental fishes as pets is of quite recent origin with the opening of the Taraporevala aquarium in Mumbai in 1951. In Northeastern region, aquarium keeping as a hobby got a boost with the setting up of first aquarium shop in Guwahati around 1977 at Gauhati Nursery. In recent years, there has been an insatiable demand for newer unique or bizarre shaped fishes by overseas hobbyists, which may not be beautiful in the conventional sense. Presently ornamental fish keeping has emerged as the second most popular hobby next to photography. What started as a hobby has now expanded into a booming international trade valued at US $150 billion (Bartly, 2000).

The U.S.A. is the largest market for ornamental fish import followed by Japan and Germany. The South East Asian countries contribute about 69% of the total world production of ornamental fishes. Singapore is the largest exporter. In the oriental region Sri Lanka has already progressed on producing ornamental freshwater fishes where it has now developed into a thriving industry offering profits and employment to many.

India's present overall trade in ornamental fish has crossed Rs 150 million. Export of ornamental fishes from India accounted for Rs. 226.00 lakh during the year 2000 (Palanisamy, 2003). The ornamental fish trade is although growing almost continuously, our contribution to the global trade is insignificant (0.007%). However, it may be possible for India to capture at least 10% of the market by utilizing its vast indigenous stock of fish species and unemployed trained manpower. (Vijayakumar, 2001).

In addition to the export market, the domestic demand for ornamental fishes has been estimated to be of Rs. 10.00 crore per year. The demand is increasing at the rate of 20% per year (Vijayakumar, 2001) offering enough scope for development of ornamental fish breeding and rearing on a commercial scale. Kolkata, Mumbai and Chennai have emerged as the pioneer breeding centers of India.
The export of indigenous ornamental fishes from the country are mainly confined to freshwater varieties and is limited to the fishes from the Northeastern states (85%) and a few bred varieties of exotic species (Swain et al, 2003).

In India, especially Northeastern region, a number of fish species exists in natural water bodies, which have a good ornamental value due to their beautiful colour, shape, manageable size, hardness, compatibility and longevity. Survey in the wholesale market at Hatibagan in Kolkata and information from exporters revealed that a large group of indigenous fish has increasing demand in overseas market like Japan and the Middle East. Although its price at the collecting site is nominal, the ultimate price is quite high so, there is a scope of developing the trade with varieties of indigenous fish species (Mahaputra et al, 2003).

Culture and breeding of indigenous fresh water ornamental fish species (OFS) of North Eastern Region (NER) is very little known due to lack of awareness and interest among the fish farmers. Among the 196 OFS of NER, the exporter of Kolkata and Chennai through some local suppliers exports nearly 27 OFS from NER. These OFS are all traded on wild caught and none venture for their culture and breeding. Therefore, the population of these valuable ichthyo-species is gradually declining due to over exploitations from their natural stock. The commercial organized export of freshwater OFS of NER depends primarily on assured and adequate supply as and when demand arises which is possible only through the mass breeding technique.

Notable contributions have been made by Mills (1990); Sands (1986); Kelly (1987), Nelson (1994); Riel and Baensch (1996), Vinci (1998) towards cataloging and recording the worldwide distribution of tropical freshwater ornamental fishes.


Indeed, Dey (1984, 1995 and 2001) has been endeavoring concerted efforts, since 1984, to make the unemployed youth and the entrepreneurs of North East India aware of the importance of ornamental fish trade through his deliberations in various fora including workshop, conferences, seminars and other events organized from time to time by various organizations.

The ethological perspectives of the fishes mainly their locomotive, ingestive, agonistic and procreative behaviour have drawn the attention of various scientific workers (Gray, 1953; Tavolga, 1954; Harris, 1960; Brawn, 1961; Beukema, 1964; Milinski, 1979; Hoffman, 1980; Cole, 1982; Halliday, 1983; Lauder, 1983; Baerends, 1986; Wainwrite and Lauder, 1986; Gladstone, 1987; Houde, 1987; Bisazza and Marconato, 1988a, 1988b; Belles et al, 1990; McAdam et al, 1999 and Spears 2000)

Important contributions have also been made by Plona (1962), Anderson (1962, 1963, 1965 a and 1965 b); Kaufman (1965); Fernando and Phang (1985), Andrew (1986); Leegelt (1986); Lee (1991) and Polonski (1991) on the culture and maintenance of exotic ornamental fishes.
Further, a good many investigations have been accomplished from abroad and India (Richard, 1977a; 1977b, 1977c; Stojkovic, 1980; Giavemni, 1981; Gratzek, 1988; Varghese, 1988, Baskar, 1993 and Krishnakumar 1997) on diseases and treatment of freshwater ornamental fish species.

In recent years in South East Asia focus have been drawn towards the culture and breeding on ornamental fish. Contributions in this field are Choudhury 1962a, 1962b; Sinha, 1972; Dixit and Agarwal, 1974; David and Rahman, 1975; Chaco and Kuriyan, 1984; Barua and Mollah, 1987; Akteruzzaman et al, 1991, Abidi and Thakur, 1997; Mahapatra 1999,2004; Sarkar and Ponniah, 2000; Choudhury and Biswas, 2003 and Mitra, 2004.

Although some studies have been made in India namely by Basavaraja et al, 1988; Tekruale and Rao, 1990; Sinha, 2000; Mukhopadhyya, 2001; Saktivel and Ramathilagam; Srivastava and Swarup, 2001; Sinha et.al, 2001; Anna Mercy, 2001; Pandian et al, 2001 and Swain and Das, 2001 on the food, nutrition and rearing of some freshwater ornamental fishes, it was indeed Dey and Sarmah 2000; Sarmah and Dey (2000, 2003 and 2004); and Sarmah (2001, 2002 and 2003) who made empirical studies on the breeding of some native ornamental fish species of N.E. India hitherto remain unattended. However studies of captive breeding of OFS by the use of hormone are few (Choudhury, 1955; Lam et al, 1975 and Reddy et al, 1990).

*Nandus nandus* (Ham) is a lower risk threatened species in North Eastern India (Biswas 2004) and has become endangered in West Bengal and Bangladesh (Pal et al, 2003). According to Bhattacharjya et al (2000a) seven ornamental fishes viz. *Botia dario, Puntius gelies, Hara hara, Conta conta, Badis badis, Notopterus notopterus and Nandus nandus* caught from the wild are reportedly being exported from the state causing a decline in their wild stock rapidly. The present trend if allowed unabated, these species including *Nandus nandus* (Ham) may be completely wiped out from
nature in days to come. *Nandus nandus* (Ham) is a classified ornamental fish in the global market and its value in international market is c US $ 1.10 or Rs. 55.00 per fish (Mahapatra, 2004).

The present investigation, hitherto remained unattended, will depict a clear scenario of the fish, *Nandus nandus* (Hamilton) as an ornamental fish of North Eastern India especially on the technology of captive breeding and culture with their bionomics and early life history which in turn will lead to economic benefit for entrepreneurs and aquarists engaged in the OFS trade as well as unemployed youths for taking up freshwater ornamental fish trade and help generate income sources among the mass. Finally, as *Nandus nandus* (Ham) has a high food demand, the technology can be used for taking up its mass culture in a commercial scale.

The present investigation have been primarily aimed to the following main objectives

- To collect as many different samples of *Nandus nandus* (Ham) from different water bodies of North East India and study their systematics, sexual dimorphism and sex ratio.

- To estimate the abundance trend of the fish species in North East Indian water bodies.

- Detail investigations on its bionomics and breeding biology.

- To develop in-house breeding technology of the species to help produce mass production for the benefit of the entrepreneurs involved in ornamental fish trade in North East Region of India.