INTRODUCTION

Gouramis, commonly known as anabantids or labyrinth fish, belong to the suborder Anabantoidei under Family Belontidae. These fish are characterized primarily by an organ called the labyrinth organ, located next to the gill cavities and is made up of folded membranes mounted on a bony frame. This delicate tissue has a high concentration of blood vessels and functions like a terrestrial lung. The lung like labyrinth organ helps the fishes to extract oxygen from air and enable them to live in oxygen poor waters. Some labyrinth fish are important food fish and many others are popular as aquarium fish. The labyrinth organ is formed by vascularized expansion of the epibranchial bone of the first gill arch and used for respiration in air. However, labyrinth fish are not born with functional labyrinth organs. The development of the organ is gradual and most labyrinth fish breathe entirely with their gills and develop the labyrinth organs when they grow older (Pinter, 1986).

According to Pinter (1986), the scientific classification of Trichogaster (gourami) given as Order: Perciformes, Suborder: Anabantoidei, Families (i) Anabantidae (climbing gouramis), (ii) Helostomatidae (kissing gouramis) and (iii) Osphronemidae (gouramis). The common Indian gourami (Trichogaster fasciata, T. labiosa, T. lalia and T. sota) comes under the family Osphronemidae (gouramis). The name Trichogaster used to be used for the genus of larger south-east Asian gouramis now called Trichopodus. This genus name comes from the Greek: thrix (hair) and gaster (belly), a reference to the thread-like pelvic fins that contain taste cells at the tips. The genus Trichogaster was formerly called Colisa. However, it was revised by
recent taxonomic studies (Froese & Pauly 2011). There are 16 general and 50 species of *Trichogaster* were distributed over Asian subcontinent (Pakistan, Nepal, Bangladesh, upper Myanmar etc.) and Central Africa (Degani et al., 1992; Alfred, 1962). All these species are also widely found in north-east India, Uttarakhand, Uttar Pradesh, Bihar and West Bengal.

Gouramis (*Trichogaster*) are the great masters in the art of using the fins, the ventral fin is as long as the fish itself and one of the quaintest sights in an aquarium to watch the little fish send out the fins forwards, backwards or downwards (Kyle, 1993). Most of the specimens are found in large river, estuaries, tanks, ditches, rice fields and ponds. It is a rather shy and very hardy species; it breeds easily and adapts well to life in common aquaria.

*Trichogaster fasciata* was described by Bloch & Schneider (1801) as *Colisa fasciatus*, *Colisa fasciata*, *Trichogaster fasciatus* and *Polyacanthus fasciatus*. Hamilton (1822) described as *Trichopodus colisa*, *Trichopodus bejeus*, and *Trichopodus cotra*. Cuvier & Valenciennes (1831) described as *Colisa fasciatus*, *Polyacanthus fasciatus*, *Trichogaster fasciatus*, *Trichogaster fasciata*, and *Colisa vulgaris* and as *Colisa ponticeriana*. Again Bloch & Schneider (1801) described *Trichogaster* fasciatus from Tranquebar. Later Menon (1999) treated it under the genus *Polyacanthus*. But Topfer & Schindler (2009) and Tan & Kottelat (2009) again treated it under the genus *Trichogaster*. The common names of *T. fasciata* as banded gourami, giant gourami, rainbow gourami, striped gourami and *Khalihana* in Assamese.

*Trichogaster labiosa* was first described by Day (1877) as *Trichogaster labiosus*, *Colisa labiosa*, *Colisa labiosus* and *Trichogaster labiosa* (Thick lipped gourami). The species name was changed from labiosus back to labiosa in accordance
with the ICZN (International Code of Zoological Nomenclature). Given that this is a very recent reclassification, the subject species will be frequently encountered as either *Colisa or labiosa*. *Trichogaster lalia* and *Trichogaster sota* was described by Hamilton (1822) as *Colisa lalia, Colisa lalius, Trichogaster lalius, Trichopodus lalius, Trichogaster lalia, Polyacanthus lalius, Trichogaster chuna, Trichopodus chuna, Polyacanthus sota, Colisa chuna, Colisa sota, Trichopodus sota* and again Cuvier (1831) described *Trichogaster lalia* as *Colisa unicolor*.

Myers (1923a) incorrectly assumed the type species earlier assigned for *Trichogaster* and consequently established *Trichogaster* as the true genus in place of *Trichopodus* for the larger gourami species. Colisa was then selected as the genus for the small (dwarf) species previously assigned to *Trichogaster*. Talwar & Jhingran (1991), later, put all the four species i.e., *Trichogaster fasciata, Trichogaster labiosa, Trichogaster lalia, Trichogaster sota* etc. under the genus Colisa. Derijst (1997) pointed out the error of the assumed type species by Myers (1923b). Britz (2004) obsoleted the name *Colisa*, but its popularity continued in the literature. Again, Viswanath et al. (2007) treated *fasciata, lalia* and *sota* under the genus *Polyacanthus* and *labiosa* under *Trichogaster*. Topfer (2008) and Rossmann (2008) thoroughly investigated the issue and recommended renaming of the species. Topfer & Schindler (2009) established *Trichopodus* as a currently valid genus of Osphronemidae, which includes the four large gourami species, *Trichopodus trichopterus, T. leerii, T. microlepis* and *T. cantoris*. The *Colisa* species reverted back to the genus *Trichogaster* as *Trichogaster chuna, T. fasciata, T. labiosa, T. lalius, and T. bejeus*. The species names of this genus were also corrected grammatically in accordance with the rules of the ICZN (Schindler 2009). The California Academy of Sciences-Ichthyology has adopted the afore-mentioned revisions. Topfer & Schindler (2009)
and Tan & Kottelat (2009) established the currently valid genus of Belontidae, which include *T. fasciata, T. labiosa, T. lalia, T. sota*. A recent revision made by Topfer & Schindler (2009) treated the four species under the genus *Trichogaster*.

Morphometric characters are continuous characters describing aspects of body shape. Morphometric variation provides a basis for stock structure and for studying short-term, environmentally induced variation and thus perhaps more applicable for fisheries management (Begg *et al.* 1999). Morphometric differences are seen within a species and even within different sexes of a species due to interactive genetic and environmental effects (Cadrin, 2000). There are many well documented morphometric studies that provide evidence for stock discrimination (Turan, 2000; Pakkasmaa & Piironen, 2001; Turan *et al.*, 2004). Traditional measurement tended to concentrated along the body axis with only sampling from depth, breath and most measurements were taken from the head. The knowledge of exact genetically controlled and environmentally controlled characters is essential for the identification of species of a genus and the populations within a species (Gandotra *et al.*, 2008).

The study of mathematical relationship between length-weight of fish is an important prerequisite in fishery management. In fisheries research, this relationship are important for the estimation of weights where only length data are available and as an index of the condition factor gonadal development of the fish (LeCren, 1951; Pauly, 1993, Petrakis & Stregiou, 1995; Goncalves *et al.*, 1997, Haimovici & Velasco, 2000) It mainly deals with to know the variations in expected weight from the known length groups, which are in turn, the indications of fatness, breeding and feeding state and their suitability to the environment. Further, length and weight measurements in conjunction with age data facilitates assessment on the stock
composition, age at maturity, life span, mortality, growth and production (Beyer, 1987; Bolger & Connoly, 1989; King, 1996a and b; Diaz et al., 2000).

In fisheries research, the condition factor (K) is used in order to compare the ‘condition’, ‘fatness’ or well being of fish and it is based on the hypothesis that heavier fish of a given length are in better condition (Bagenal & Tesch, 1978). Condition factor is also a useful index for the monitoring of feeding intensity, age and growth rates in fish (Oni et al., 1983). The condition factor has been used as an index of growth and feeding intensity (Fagade, 1979). Basic information such as knowledge on parameters that relate weight to length of fish is scanty even though it is of great importance in studies on the evaluation of fish stocks and fisheries biology (Entsu-Mensah et al., 1995; Vazzoler, 1996).

For successful fish farming and aquaculture practice, a thorough knowledge about the food and feeding habit is necessary. As the nature of food depend to a great extent upon the nature of environment. Food is the basic prerequisite for growth, development, survival and all organisms. It plays an important role in the migration, growth and spawning behaviour of the fish. As the nature of food depends to a great extent upon the nature of environment, the problem is interesting from specific, as well as ecological point of view (Bhuiyan et al., 2006). The study of the food and feeding habits of freshwater fish species is a subject of continuous research because it constitutes the basis for the development of a successful fisheries management programme on fish.

Food is the main source of energy and plays an important role in determining the population levels, rate of growth and condition of fishes (Begum et al., 2008). Feeding is one of the main concerns of daily living in fishes, in which fish devotes large portion of its energy searching for food. Detailed data on the diet, feeding
ecology and trophic inter-relationship of fishes is fundamental for better understanding of fish life history including growth, breeding, migration (Bal & Rao, 1984) and the functional role of the different fishes within aquatic ecosystem (Blaber, 1997; Wootton, 1998; Hajisamae et al., 2003).

Reproductive biology of fish is essential for evaluating the commercial potentialities of its stock assessment, life history, culture practice and effective fishery management (Doha & Hye 1970; Biswas et al., 1984; Schaefer, 1996 and 1998). Spawning of fish occurs during a particular phase of the reproductive cycle and some of them breed once years while some at regular intervals throughout the year. Information of gonadal development and the spawning season of a species make subsequent studies on spawning frequency of its population easier, which is important for its management. An understanding of the early development of a fish species is also considered to be an important step for the fish culturists (Kohinoor et al., 2003).

Fecundity, one of the most important biological aspects of fish, plays a significant role to evaluate the commercial potentialities of fish stock. Fecundity of fish is an important aspect of fish biology due to its direct relation to fish production and fisheries (Pathani, 1981). In recent years fecundity studies have been considered useful in tracing the different stocks or populations of the same species of fish in different areas. Knowledge of fecundity and length at first maturity are important in the estimation of abundance and reproductive potential. It is general practice to determine the extent of sexual maturity by visual examination of the sex organs of the fish which is expressed in terms of the scale adopted by the International Council for the Exploration of the Sea (ICES). The information derived from investigation on the sex and maturity stages is used to ascertain the age and size at which the first attains sexual maturity (Johal et al., 2000).
The fishes are adopted to reproduce under most varied conditions and with these reproductive peculiarities, the structure, mode of life of their embryos, fry, fingerlings and adults are highly related (Nikolsky, 1963). The fishes are divided into several ecological groups, like the lithophils (spawning on stony ground), the psammophils (spawning on sand) and the pelagophils (spawning in water column), depending upon the nature of their breeding grounds. Fish exhibit considerable differences in their breeding behaviour. Most of them are seasonal breeder and spawn during rainy season.

Breeding of any fish is regulated by several environmental factors, such as photoperiod, temperature, rainfall and food, photoperiod has been considered as an important factor in the regulation of the reproductive cycle in as much as it varies with regularity and predictability round the year and also from year to year (Viswanatha & Sundarar, 1974). Gouramis are a popular choice with fish hobbyists and nurturing them through the breeding and birthing process is a great way to increase their joy and appreciation of the breed. Breeding gouramis can pose a challenge to the novice fish breeder but anyone with a little knowledge and determination can experience good results.

The value of the world’s wetland is increasing by receiving due attention as they contribute to a healthy environment in many ways. They mitigate floods during periods of flooding and trap suspended soils and attached nutrients. Thus, these wetlands have great value from nutritional point of view and thus, wetlands are described as ‘kidneys of the landscape’ (Mitsch & Gosselink, opcit). In addition, the wetlands provide suitable feeding and breeding areas for variety of wild life and important in supporting species diversity. Asia has 25 ‘Contracting Parties’ (25 countries) with 159 Ramsar sites, totaling about 9,860,000 hectares. Wetlands are one
of the most productive ecosystems in the world; they are next only to tropical rain forests and coral reefs in terms of their richness in biodiversity. About one third of world's wetlands are located in Asia, out of which 120 million hectares are internationally important wetlands (Sanjit, 2010).

As far as northeast region of India, Assam is gifted with many extensive water bodies locally known as beels (Jhingran & Pathak, 1987) that are the only source of fish for the poor people in the surrounding village. The resources of these wetlands are important for human nutrition and the economy as they provide a habitat for a number of aquatic flora and fauna, including migratory and indigenous birds. Fishing is the main economic activity in the beels. Beels are very rich in nutrients and have a great production potential (Baruah et al., 2000). Out of 19 Ramsar sites of India; Loktak lake and Keoladeo National Park are very important because of their richness in biodiversity and ecosystems' fragility. They are listed in the Montreux record as these wetlands need immediate conservational efforts (Sanjit et al., 2005). The ‘Loktak Lake’ of Manipur, a Ramsar site, is the largest natural freshwater lake in north-eastern India (Sanjit et al., 2005). ‘Deepr’ beel is the lone Ramsar site in the Assam and the second of its kind in north east India, after Loktak in Manipur (Bera et al., 2008).

There are around 3,500 different types of wetlands in Assam and constitutes 1.29 per cent of the total geographical area of the state. These wetlands can be classified into fresh water lakes, oxbow lakes, marshy tracts and seasonally flooded plains apart from the hundreds of riverine sandbars and islands in both Brahmaputra and Barak valleys. However, the wetlands of Assam are fast shrinking due to both natural and man-made causes. The extensive and uncontrolled growth of water hyacinth and the raising of dykes and embankments along the river banks are thought
to be the main causes of the deteriorating condition of these wetlands. Borsola beel is also one of the largest floodplain wetland in the Upper Assam. The Borsala beel is directly connected through a connecting channel with the River Brahmaputra while the Patiasola beel is not connected.

The World trade of ornamental fish is valued at about US$ 427.29 million (FAO, 1996). Currently India is only a marginal player in the global trade of ornamental fish with a market share of less than 1% of the total turnover, but it is capable of contributing to at least 10% of the world trade (Bassler, 1994). India’s overall trade presently is over Rs.150 million. Kapoor et al. (1998) described more than 170 freshwater ornamental fish in India, most of them are characterized by vibrant and attractive colors and shades to be treated as ornamental varieties having high potential in the domestic and international markets. The diversified ornamental fish fauna of Western ghat have been described by a lot of workers (Easa & Shaji, 1995; Manimekalai & Das, 1998; Remadevi & Indra, 1998; Ajithkumar et al., 1999; Raju et al., 1999). Presently many of the freshwater ornamental fishes have been recorded from Kerala and other parts of Western-ghat, which are severely threatened (Zachariah et al., 1996).

The North-eastern region of India is home to one of two biodiversity hot spots in India (Kottelat & Whitten, 1996; Myers et al., 2000) and among the eight states of the north-east, Assam has the largest number of fishes with 200 species (Mahanta et al., 2001). Of these large numbers of fishes, Biswas et al. (2007) described 93 species of fishes from this region suitable for aquarium rearing. As many as 296 fish species of fish have been described from this region so far (Viswanath et al., 2007). At the same time, the trade of indigenous ornamental fishes in the NE region is unorganized and mainly based on natural collection. The fishes are collected from the wild habitat
by local fishermen and then marketed by traders who actually control the activities. Indiscriminate exploitation from natural resources may lead to extinction of some of the rare varieties of indigenous ornamental fishes.

The common Indian gourami is represented by _T. fasciata_, _T. labiosa_, _T. lalia_ and _T. sota_ are found in the upper Brahmaputra basin of Assam and regarded as ornamental fish although these are exclusively used as food fish in Assam. As per CAMP (1998) among the species, _T. fasciata_ was included in LRnt while _T. labiosa_, _T. lalia_ and _T. sota_ were not evaluated so far. Moreover, all the fish species were high demand and price in the north-east India.

**OBJECTIVE OF THE STUDY:**

Keeping colourful and fancy fishes, popularly known as ornamental fishes, aquarium fishes, or live jewels is one of the oldest and most popular hobbies of the world. Ornamental fishes are assuming importance in recent days as stress removers. Ornamental fish breeding is an emerging sector and can be a world-scale opportunity area for fish farmers in India. The ornamental fish trade earns foreign exchange, besides serving as a source of employment to rural population. Realizing the importance of ornamental fishes and their export potentials in overseas market, the present investigations aimed to achieve the following objectives and so that conservation measures could be planned for protection of their habitat.

1. To study the habitat ecology of gourami (*Trichogaster*)

2. To study the feeding and reproductive biology of *Trichogaster*

3. To standardize the breeding techniques of *Trichogaster* under controlled condition.