

## CHAPTER 1 - GENERAL INTRODUCTION

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Approximately out of seven million living animal and plant species in the earth, vertebrate animals contribute approximately 80,500 numbers of species (www.currentresults.com downloaded on 15<sup>th</sup> March, 2019). Fish contribute the largest number of vertebrates which is approximately forty thousand. From the ancient period of Roman Empire to present time apart from food items ornamental fish keeping in aquarium is one of the most popular hobby throughout the world. The attractive colourful fishes of various unusual characteristics, which are kept as pets in confined water of an aquarium or a garden pool as decorative item can be called as ornamental fish as well as aquarium fish. The rarity of these small fish and their manageability makes them more preferable for being kept as pets. About 7.2 million houses in the USA and 3.2 million in the European Union have aquarium as decoration and the number is increasing day by day throughout the world (Chanda *et al.* 2011). Over 2500 species are commercially engaged in world ornamental fish industry (Dey, 2016). At present more than 100 countries involving in the direct and steady marketing of the ornamental fish (Pandey and Mandal, 2017). It is estimated that more than 2 billion live ornamental fish species are moved annually in the world. The value of global ornamental fish trade has grown significantly over the past decades and in 2014 the value reached near 347.5 million US dollar (Dey, 2016). The unit value of ornamental fish is higher than the food fish. Hence this sector offers a good opportunity for rural and urban ornapreneurs income and links them to the International trade. The ornamental fish trade has the potential to contribute

to the economic growth of state as well as country concerned and the sustainable development of aquatic resources. Ornamental fish of India contribute about 1% of the total ornamental fish trade worldwide. In the year 2014 about 69.26 tons live ornamental fish export from India having the value of Rs.566.66 crores (vikaspedia.in/agriculture/fisheries downloaded on 24 March, 2019).

Among all ornamental fish species 60% share are belonging from freshwater origin (Mahapatra *et al.*, 2015). India has enriched freshwater resources of approximately 14,500 KM in terms of rivers, canals, beels, lakes, reservoirs etc. (Mahapatra *et al.*, 2014a). Presently India represents a total of 400 freshwater ornamental fish belonging to 175 genera and 50 families (Rand and Gupta, 2017) out of which West Bengal contributed 176 fresh water indigenous ornamental fish (Mahapatra *et al.*, 2014b) that is about 44%. A total of 250 freshwater ornamental fish of the NEH region, Assam contribute the maximum number 187 species (Mahapatra *et al.*, 2004a). The rich ornamental fish diversity of the Eastern and North Eastern region have been attributed to many reasons, *viz.*, the diverse geographical conditions that results in the formation of a variety of torrential hill streams, rivers, lakes and swamps, and drainage patterns, which include the Ganga, Bhagirathi, Teesta, Damodar, Mahananda, East Kolkata Wetlands systems. About 85% of indigenous fish species are wildly collected from river, streams etc. and reared to meet the market demand (Mahapatra, 2018). Due to over exploitation and ecological degradation some species are not available frequently although earlier found as dominant species. Those threatened or rare species will bring under captive

maturation, breeding, larval rearing and grow-out culture. A good sustainable management practice can check the further extinction of these fishes from this region.

Gourami plays a significant role among the small ornamental fish. Due to their beautiful colour as well as easy maintenance the fish is very much popular to the aquarists. In the world's most beautiful freshwater fishes Gourami stands in 7<sup>th</sup> rank (Mahapatra, 2016a). The word Gourami is derived from Malayan or Javanese word 'Gurami' which means 'Carp'. Gourami is a group of freshwater Perciformes (perchlike) fishes, are the largest order of vertebrates, containing about 41% of all bony fish (Wikipedia, downloaded on 5<sup>th</sup> September, 2015). The order contains about 18 sub orders and 160 families, which is the most of any order within the vertebrates. The suborder Anabantoidei contains 3 families (Forselius, 1957). Anabantoidei suborder is characterized by the presence of a suprabranchial chamber above the gills for the air retention for breathing purpose (Britz, 1994). The labyrinth fishes are classified into four families: Anabantidae; Belontiidae; Osphronemidae and Helostomatidae (Vierke, 1988). The Osphronemidae (Greek, *osphra*, = smell + Greek, *nema* = filament) family is composed of 4 subfamily, 14 Genus and approx. 133 species and subspecies (Nelson, 1994). Certain fishes of the genera *Ctenops*, *Trichogaster*, *Helostoma*, *Colisa*, *Betta*, *Macropodus* and *Polyacanthus* have been called gourami as they are very closely taxonomically related to the true gourami *Osphronemus goramy*. Even the great Cuvier and Valenciennes in 1831 placed the tiny little *Ctenops vittatus* in the genus *Osphronemus* with the giant gouramy (Cuvier, 1831). Later it was removed but not for a great many years even though McClelland as early as 1844 had created *Ctenops* for an

Indian species (McClelland, 1844). Liem, 1965 classified *Ctenops* under Macropodinae subfamily and is closely related to genus *Trichopsis*.

Among the 152 gourami species found globally, India represents only 8 gourami species, out of which 6 species are from Osphronemidae family and 2 species described from Anabantidae family (Fish Base downloaded on 5<sup>th</sup> September, 2015). Various research works on *Trichogaster lalius*, *T. leeri*, *T. fasciatus*, *Anabas testudineus* were done by different workers at several times (Munshi *et al.*, 1986; Mitra *et al.*, 2007; Hossain *et al.*, 2015; Bhaskar *et al.*, 2015; Azrita, 2015; Saha *et al.*, 2017; Islam *et al.*, 2017; Sahu *et al.*, 2018; Sahu and Datta, 2018; Sahoo *et al.*, 2019).

Among these 8 native gourami species *Ctenops nobilis* is one of the important and valuable ornamental fish (Sahoo *et al.*, 2016). Due to their small size, they can be reared in aquarium throughout their life span and thereby this species can be regarded as a 'classified ornamental fish'. *Ctenops nobilis* is under the chocolate gourami group which belonging to three genera: *Sphaerichthys* (four species), *Parasphaerichthys* (two species) and *Ctenops* (Monotypical) (Aquarium glaser downloaded on 5<sup>th</sup> September, 2015). *Nobilis* is the only species of *Ctenops* which is recorded from India. The fish represents the largest among all chocolate gourami species. *Ctenops* is Greek ancient which means "comb eye" refers to its special anatomical structure and *nobilis* is Latin ancient which means "noble".

Among the indigenous ornamental fish, *Ctenops nobilis* is one of the most high demand aquarium fish for both local and export market (Mandal *et al.*, 2007). Price in

local market varies between Rs. 12/- to 30/- per piece (Mahapatra *et al.*, 2005) whereas the export value is 1-2 US\$ per piece (Bhattacharya *et al.*, 2015). Eco-biological information in the natural habitat of these fish is very important for successful maturation, breeding and culture under captive condition. The fish is mainly temperate region fish. As per IUCN Red List, 2010, the species currently is in near threatened condition due to habitat loss. Many ornamental fishes being exploited and exported from wild *C. nobilis* is one of them but now a days in order to decline the collection of fish, suppliers cannot meet the market demand so large scale seed production of *C. nobilis* is very important. Studies leading to domestication of the fish and breeding will help in sustained fisheries and preservation of germplasm. Indiscriminate capture of the fish from natural habitat has led to population declination.

For domestication, breeding and culture under captivity of the species detailed eco-biological information is utmost important. Keeping view on this, the present research has planned to cover some important aspects of biology of *C. nobilis* with special emphasis on morphology, age and growth, length weight relationship, condition factor, habitat preference, food and feeding habit, captive maturity, fecundity, captive breeding and seed production. The main objectives of the study are:

- ❖ **To study the morphology and anatomy of *Ctenops nobilis*.**
- ❖ **To study the feeding and reproductive biology of *Ctenops nobilis*.**
- ❖ **To study on captive maturation, breeding and larval rearing of *Ctenops nobilis*.**