DISCUSSION

Among the Piscean evolutionary history Perciformes group of Actinopterygii are pretty archaic school of fishes that underwent enormous diversification in speciation in the south –east Asian countries because of the drastic changes of the major rivers cources through ages from Cretaceous to Holocene periods (Brookfield, 1998; Gregory, 1925) .

When river Ganges , Brahmaputra and Lohit were not evolved, the great rivers Irrawaddy, Tamai, Mecong, Yangtze and Tsampo underwent changes their courses several times through million of years leading to the evolutionary radiation and speciation among Perciformis group of fishes under which Nandids and Badids are included. Icthyologists throughout the world of the opinion that the maximum speciation happened among the Actinopterygian fishes in South East Asia because of the occasional changes in major riverian coarses due to tectonic plate collision between South East Tibetian plate and Indo-Burma-Arakan plates. Much later, the North-Eastern Indian plate collided with the South-Eastern Indian plate collided with the South-Eastern Tibetian plate along with Arakan Burma plate resulting in the union of Brahmaputra Lohit river with Tsampo and get separated with Irrawaddy with which it was connected for sometime (in terms of thousands of years).

These all remind us how Perciformis along with Nandids and Badids radiated throughout the whole world, (excluding North America) Mitchell, 1993; Burbank, 1992; Ruber *et al.*, 2004) for a long time *Badis* spp. were included in the family Nandidae. It

was Burlow *et al*. in 1968 who separated *Badis badis* and allied members of the genus *Badis*. From Nandidae and a new Perciform family Badidae (Burlow *et al.*,1968) was erected based on the toothed pharyngeal process on premaxillary teeth on pre-vomer, palatines and parasphenoid and precaudal vertebrate with basapophyses from 3rd or 4th vertebrae; unique ichthyoplankton stage with adhesive organ at the tip of the yolk sac.

The dwarf chameleon fish, *Badis badis* is one of the important small indigenous fish under Perciformis and family Badidae. The fish was once widely distributed in the northern part of the Indian subcontinent. Now it is also known to be native to the Ganges river system and its tributaries in Nepal Bangladesh and Bhutan *B. badis* commonly inhabits paddy fields, ponds and small streams and are found to be distributed in all the North Eastern States of India. About 50-60 years ago plenty of this fish was available in the market as common food fish collected from the natural riparian wetland habitats (Mahapatra *et al*. 2005). In order to sharp decline of this ornamental fish, large scale seed production of *B. badis* is becoming very important. The present investigation therefore, is carried out with following three objectives: 1) Study morphology, anatomy and histology of *Badis badis*, 2) To study the feeding and reproductive biology including breeding, fecundity and spawning behavior of *Badis badis*, 3) Standardizations and development of captive maturation, breeding and seed production of *Badis badis* to conserve this endanger fish (Dutta, *et al*., 2019).

Males are more colourful than females. Mature males display blue pigmentation in the fins. Adult males display bright colour with 5 pairs (10 nos.) of black strips visible on the body. Female chameleon fish (*B. Badis*) rate somewhere between drab and plain most of the time. The minimum length and weight at first maturity was 27.00 mm and 0.25 g in females. The attainment of first maturity occurs when male is 5+ months old and female is 6+ months old. The minimum number of ova produced was 116 nos. in a female having a length of 27mm and weight of 0.28 g. A maximum of 518 nos. of ova was produced by a female having a length of 29 mm and weight of 0.47 g. The average fecundity recorded was 305.3. The number of mature eggs per gram of body weight (fecundity factor) ranged from 414.3 to 1102.1 with an average of 830.8 .The gonad of the fish is small in length and slight yellowish in colour. 50% of all female specimen attaining a length of 75-85 mm and weight of 6.50-7.75 g was matured. The breeding season of the fish extends from late July to December. The GSI of gravid females ranged from 0.037 to 0.15 with the average of 0.077.

The fish prefers slightly acidic water but can tolerate slightly alkaline conditions. The temperature should be around 22-25 ° C (72-77 °F) and pH should be 6.5 – 7.5 to keep these fish healthy and active.

For captive maturation semi-natural habitat for fish were made with the help of sandy bottom, gravels, stones along with plantation of some of the ornamental plants. The water maintained soft and slightly acidic, the temperature set at 24 °C. A single pair or a group of adults can be used for breeding set up but for multiple males several number of

caves have to provided for each pair. To ensure a higher rate of success 2-3 females to each male. In early stages of spawning male closely swims with female. The male drags females into the cave. A receptive female will enter and spawning takes place with 30-100 eggs. During this time female deposit eggs and male fertilize the egg by swimming over them. The eggs hatched after 2-3 days but the fry do not become free swimming until they are 6-8 days old, and do not leave the vicinity of the cave for another week or so after that. The *Badis badis* larva is very peculiar. Before emerging egg capsule it makes a vigorous movement and pulls it out with the yolk sac and remains stand still for 3-4 days remaining attached with some hard substratum. It does feed for this period but subsists metabolically utilizing the yolk sac. At this time *Badis* larvae or Ichthyoplankton which hangs upside down and remains sedentary for few days before being free swimming young fish. Microworm is an ideal initial food, but once they are visibly swimming in the water column Artemia nauplii is used to the diet thrice daily. The growth rate is quite quick and once the larvae reach a size of 0.75 - 1 inch (2 - 2.5 cm) they moved into a larger aquarium for rearing (Mahapatra *et al.,* 2015.) 7.75 g was matured. The breeding season of the fish extend from late July to December. The GSI for the gravid females ranged from 0.037 to 0.15 with an average of 0.077.

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