

# Abstract

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Ornamental fish production globally is a multibillion dollar industry. India's overall ornamental fish trade was about 1.06 million US\$ during year 2009. India has recorded at least 150 commercially important ornamental fish species and trade mainly indigenous freshwater species collected from rivers. Among them, *Botia* loaches classified as aquarium fish due to their beautiful colouration, small size, bright bands, blotches, peaceful nature and hardiness can be reared and bred in aquarium throughout their life span.

*Botia almorhae* (Grey), *Botia dario* (Hamilton-Buchanan), *Botia lohachata* (Chaudhuri) and *Botia rostrata* (Gunther) were selected for present study. They are highly demanding both as an ornamental and edible fish in the Terai region of Eastern Himalaya of West Bengal, India, a "Hot Spot" for fresh water fish biodiversity. With a view to rearing and breeding of loaches in captivity, which are Vulnerable and Endangered, their conservation and ichthyofaunal diversity of river Kaljani, Cooch Behar district a study was executed during the period August 2012 to July 2015.

In the present study, for both river Kaljani and Captive study water was soft, alkaline in nature with high Dissolved Oxygen and medium productive condition. The temperature was good for growth of the fishes of Kaljani river water and Laboratory water (Captive condition). TDS, Free Carbon Dioxide and average concentrations of ammonium-nitrogen ( $0.017 \text{ mg L}^{-1}$ ), nitrite-nitrogen ( $0.009 \text{ mg L}^{-1}$ ), nitrate-nitrogen ( $0.312 \text{ mg L}^{-1}$ ) and Phosphate-phosphorous concentration in the Kaljani river and captive condition were also within normal range.

The average Gonado-somatic Index data of *Botia* species revealed to be *Botia almorhae* ( $11.96 \pm 10.29$ ), *Botia dario* ( $8.34 \pm 5.4$ ), *Botia lohachata* ( $13.86 \pm 11.50$ ) and *Botia rostrata* ( $10.29 \pm 9.01$ ). Among the *Botia* species, *Botia lohachata* had the highest GSI and *Botia rostrata* the lowest. Condition Factor or K- factor in Captive condition for

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*Botia almorhae* was 1.390, *Botia dario* was 1.788., *Botia lohachata* was 1.538 and *Botia rostrata* was 1.399. The values indicated good general condition of fish as 'K' was greater than 1.0.

Length - Weight relationship was calculated by the determination of Coefficient of Correlation (r). The Coefficient of Correlation of *Botia almorhae* was 0.811; *Botia dario*: 0.802; *Botia lohachata*: 0.753 and *Botia rostrata*: 0.936. *Botia* species indicated positive allometric growth and suggested that all fish grows in proportion to the length in Captive condition. Average fecundity of *Botia almorhae*, *Botia dario*, *Botia lohachata* and *Botia rostrata* were 18539, 22573, 18053 and 18698 respectively and fertilization rate 90.03%, 82.09 %, 95.98 % and 67.60 % respectively

Fish collected from river water were first acclimatized in aquarium and induced bred using synthetic hormone WOVA-FH at a dose of 0.025ml/fish. The latency period was 4.30 to 6.00 hours. The embryonic development studied in *Botia* species was divided into eight stages namely Zygote, Cleavage, Blastula, Gastrula, Segmentation, Pharyngula, Hatching and Early larval period. Complete adult stage was obtained within one year. After captive breeding of wild *Botia* species, F<sub>1</sub> generation of *Botia* loaches were aqua-ranched into the natural environment of the river system (River Kaljani).

Spawning behaviour was observed during the night or afternoon in absence of light. At the time of spawning, they made loud cracking sound repeatedly. Six types of breeding behaviour were observed during spawning time like a) male hitting the female on snout, b) male hitting the female fish in vent the region more frequently, c) fighting between the males, d) male chasing the female, e) male and female fish were embraced together and swam and f) Cannibalism behaviour.

In the present study, good growth was observed in Tank-D (only minced snail or bivalve flesh fed) and lowest growth rate was observed in Tank-A (fed only commercial

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fish feed). The growth rates were similar in Tank B (fed only live zooplanktons) and Tank C (fed with boiled minced meat).

The pre-spawning phase or developing phase of ovary was found to be during March to May and testis was found from April to May. Spawning phase of ovary of *Botia almorhae*, *Botia lohachata* and *Botia rostrata* were found to be during June to August and *Botia dario* was found to be during May to July. Post-spawning phase of ovary of *Botia* species was found to be during September to October. Spawning phase of testis of *Botia* species was found during May to September

Further, to confirm the *Botia* species, identification, barcoding study was done to reveal the evolutionary distances among *Botia* genus ranging from 0.002 to 0.112. The Barcode ID number of four *Botia* species was **SDP657007-17** (*Botia almorhae*), **SDP657005-17** (*Botia dario*), **SDP657002-17** (*Botia lohachata*) and **SDP657006-17** (*Botia rostrata*).

The present study permitted to study the Ichthyodiversity of river Kaljani, Cooch Behar district, West Bengal, 138 fish species were recorded which belonged to 31 families. Among the 138 species, 55 species had food value, 58 species ornamental value and 25 species both ornamental and food value. *Tenuulosa toil*, a Chinese herring, was also found at Chhat Bhelakopa (Site-4) only during monsoon. The thesis provides baseline data on biodiversity of river Kaljani which may be helpful for conservation and management of the *Botia* loaches and also useful for fish breeders, aquarium keepers.

**Keywords:** Terai region of Eastern Himalaya, River Kaljani, *Botia almorhae*, *Botia dario*, *Botia lohachata*, *Botia rostrata*, Length-weight relationship, Condition factor, Gonado-somatic Index, Captive breeding, Fecundity, Breeding behaviour, Embryonic development, Histology, Barcoding.