SHORT COMMUNICATION

Teratological Evidences in Fish Fauna with reference to Water Quality of Doon Valley, Uttarakhand

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DOI: 10.18811/ijpen.v7i04.12

Abstract

Fish fauna of Doon Valley (part of District Dehradun) was explored alongwith 15 physical and chemical water quality parameters. Fish and water sampling was done of five major rivers *viz*., Baldi, Song and Suswa in the Eastern and Tons and Asan in the Western part of Doon Valley. While doing the taxonomical analysis, four teratological evidence were recorded in the fish species. Teratological manifestation with respect to furcated rostral barbel was observed in one female specimen of *Paracanthocobitis botia*, furcated maxillary barbel was seen in one specimen of *Glyptothorax pectinopterus*, forked rostral barbel in *Lepidocephalichthys guntea* and furcated caudal fin in *Heteropneustes fossilis*. The fluctuation pattern in water quality all through 3 different seasons reflected an increment pattern from summer to rainy in the parameters like depth, width, water velocity, CO_2, turbidity and TDS. The declining trend in the values of the aforesaid parameters was noticed beyond rainy months. From rainy to winters, the increment in values was noticed in DO, pH, hardness, alkalinity, BOD, nitrate and phosphate was observed. The parameters which showed increment in values from winters to summers include AT, WT, CO_2. Width, depth and WV have been the chief physical factors with wide range of variations. BOD, Hardness, NO_3^-, TDS, DO and CO_2 values seemed more important from the quality of water chemistry point of view. Seasonal variation in physical and chemical parameters have also been observed.

Keywords: Doon Valley, Fish Fauna, *Glyptothorax*, *Heteropneustes*, Teratology, Water Quality.

International Journal of Plant and Environment (2021); **ISSN:** 2454-1117 (Print), 2455-202X (Online)

Introduction

Injury-stricken or congenital deformities are not only common to the human population but also to other animals, including fishes. First figure of teratological fish was published in 1553 when Pierre Belon, a French Naturalist illustrated the head of old male Atlantic salmon with a deformed upper jaw. The second deformed fish to be figured was pug-headed carp illustrated by Guillane Rodenlet in 1555 (Gudger 1936). Dawson (1964, 1966 and 1971) and Dawson and Heal (1976) provided an extensive bibliography of fish anomalies. The said aspect has been found so interesting to the Ichthyologists. Tim and Ray-Jean (1981) examined a total of 18,361 specimens belonging to 34 species and 6 families from the Ohio River for external morphological anomalies like deformities of spinal curvature, fins, mouth, operculum, pug-headedness *etc*. In India, such studies have appeared in literature from time to time (Ovais, 1974; Sundar Singh, 1975; Rahman and Raghavan, 1976; Thakur and Kohli, 1976; Ram, 1976; Shivakumar and Bhat, 1977; Somvanshi and Bapat, 1982; Husain, 1985). Such anomalies are very common in fishes even now. During the recent investigation on fishes of Doon valley, we found such teratological evidence four fish species, which are highlighted in this communication.

Material and Methods

The fish fauna of Doon Valley (part of District Dehradun) was explored and fish sampling was carried out in five major rivers *viz*., Baldi, Song and Suswa in the East Doon Valley and Tons and Asan in the West Doon Valley. Fish samples were collected using gillnets of varying mesh sizes and sampling was performed with the help of trained fishermen on the sampling sites in the Eastern and Western part of Doon Valley, respectively. Fish samples were preserved in 10% formalin and bought to the laboratory for routine identification, meristic and morphometric analyses using available literature and taxonomic revions (Day, 1878; Jayaram, 1981, 1999; Talwar and Jhingran, 1991; Nelson, 2006; Vishawanath *et al.,* 2007). Field photographs and macrophotogrphy of specimens were taken with the help of Digital Camera. All images and specimens were closely observed and teratological evidences encountered were meticulously recorded.

The estimation of physical and chemical water quality parameters (Air Temperature, Water Temperature, Dissolved Oxygen, Carbon dioxide and pH), was done in the field by taking the help of field water and soil analysis kit. Also, the parameters which could not be analyzed in the field (like Hardness (Calcium + Magnesium), Alkalinity (as bicarbonates), Turbidity, Biological Oxygen Demand, Nitrates as total nitrogen, Phosphates as total phosphorous and Total Dissolved Solids) were analyzed in the laboratory by following standard protocol [APHA, 2005].

Results and Discussion

In the present study four teratological evidences were recorded in the fish species. Teratological manifestation with respect to

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How to cite this article: Rana, D., Gupta, S.K., Rana, R. (2021). Teratological Evidences in Fish Fauna with reference to Water Quality of Doon Valley, Uttarakhand. International Journal of Plant and Environment. 7(4), 303-305.

Conflict of interest: None

Submitted: 24/10/2021 **Accepted:** 28/11/2021 **Published:** 31/12/2021

furcated rostral barbel was observed in one female specimen of *Paracanthocobitis botia*, furcated maxillary barbel was seen in one specimen of *Glyptothorax pectinopterus*, forked rostral barbel in *Lepidocephalichthys guntea* and furcated caudal fin in *Heteropneustes fossilis*.

1. Bifurcated rostral barbel in *L. guntea* [Fig. 1(a) and (b)]

One female specimen (71 mm in TL, 59 mm in SL) exhibited teratological manifestation in the form of bifurcated rostral barbel on the right side [Fig. 1(a) and (b)]. In spite of being a teratological happening, the ratios of rostral barbels of this specimen (2 .7 in Head Length, 1.12 in Snout Length) did not show much difference from the ratios recorded for all specimens. Husain (1985) also recorded a similar anomaly in the rostral barbell in *Schistura rupecula*. Such deformities have been attributed either congenital, accidental or environmental (Tandon and Sharma, 1971; Ovais, 1974). Similarly, Dhanze and Dhanze (1990) reported an abnormal specimen of *L. guntea* with respect to asymmetrical aberration. Such disproportionate development was under the influence of some toxicant found in the water body during the course of its development. Hence, the congenital element, as also contemplated here, is inherent with the kind of conclusion drawn by Dhanze and Dhanze (1990).

2. Furcated rostral barbel in *P. botia* [Fig. 2 (a) and (b)]

Teratological manifestation with respect to furcated rostral barbel was observed in one female specimen (41 mm TL, 33 mm SL) [Fig. 2 (a) and (b)]. Husain (1985) also recorded a similar anomaly in the rostral barbel, but in *S. rupecula* who stated that the existence of such a morphological divergence could be due to congenital defects.

3. Furcated maxillary barbel in *G. pectinopterus* [Fig. 3(a) and (b)]

Teratological manifestation with respect to furcated maxillary barbel was observed in one specimen of *G. pectinopterus* (41 mm TL, 33 mm SL) [Fig. 3(a) and (b)].

4. Bifurcated caudal fin in *H. fossilis* [Fig. 4(a) and (b)]

The present material (112 mm in Total Length [TL] and 101 mm in Standard Length [SL]) is one [Fig. 4(a) and (b)] of the 55 specimens (112–183 mm in TL and 101\–165 mm in SL) collected from the swampy and marshy nitches of Suswa river at Mothronwala, Kansrao, Raiwala, in Eastern Doon Valley, a region falling under the Rajaji Tiger Reserve.

All the above specimens were well in agreement in terms of characters, meristics and morphometry with Day (1878), Jayaram (1981), Talwar and Jhingran (1991), Vishawanath (2007).

Earlier, Thakur and Munnet (1982) reported teratological manifestations in *H. fossilis* with reference to furcated maxillary and mandibular barbel and also notched anal and caudal fin. They contemplated that the deformities in the said fins were caused due to some predatory attack and accidental injuries sustained by the fish during early stages of development. Rahman and Raghavan (1976) while reporting absence of caudal fin in *Clarias batrachus*, said that it might be due to act of predation. Sathyanesan (1962) also had been of the same view while observing abnormal dorsal fin in *Labeo calbasu*.

The study of water quality parameters of the streams of Doon Valley reveals that the magnitude of different parameters is certainly related to the climate conditions, seasons and river discharge. The interplay of these parameters determines the water quality of the rivers.

The range values (minimum and maximum) along with the values of mean and standard deviation of all the parameters during the study period have been incorporated in Table 1.

The pattern of fluctuation all through 3 different seasons in streams of Eastern and Western Doon reflected an increment pattern from summer to rainy in the parameters like depth, width, water velocity, CO_2, turbidity and TDS.

The declining trend in the values of the aforesaid parameters was noticed beyond rainy months. From rainy to winters, the increment in values was noticed in DO, pH, hardness, alkalinity, BOD, nitrate and phosphate.

The parameters which showed increment in values from winters to summers include AT, WT, CO_2.

Figure 1–4: 1. Lepidocephalichthys guntea (a) Head showing bifurcated barbel. (b) Lateral View; 2. Paracanthocobitis botia (a) Head showing bifurcated barbel, (b) Lateral View; 3. Glyptothorax poctinopterus (a) Head showing bifurcated barbel (b) Lateral View; 4. Heteropneustes fossilis (a) Bifurcated caudal fin (b) Lateral View

Table 1: Water Quality of Doon Valley:

S. No.	*Water Quality Parameters*	*Minimum*	*Maximum*	*Mean (± Standard Deviation)*
1.	Depth (m)	0.09	2.55	1.184±0.61
2.	Width (m)	4.89	49.3	22.51±10.88
3.	Air Temperature (°C)	17.0	35.0	25.68±2.91
4.	Water Temperature (°C)	13.2	25.0	17.52±2.11
5.	Water velocity (m/s)	0.3	2.21	1.06±0.52
6.	Dissolved oxygen (*mg/l*)	4.4	10.4	7.50±1.40
7.	Carbon dioxide (*mg/l*)	0.89	4.57	2.15±1.19
8.	pH	6.29	8.49	7.21±0.37
9.	Hardness (*mg/l*)	61.50	1450	316.75±233.56
10.	Alkalinity (*mg/l*)	44.80	322.0	150.5(±63.09
11.	Turbidity (JTU)	2.0	811.0	159.0±253.0
12.	BOD (*ppm*)	0.11	34.8	3.18±6.15
13.	Nitrate (*ppm*)	0.10	7.84	3.78±1.94
14.	Phosphate (*ppm*)	0.0039	0.71	0.20±0.16
15.	Total Dissolved solids (*ppm*)	236.736	1243.32	410.68±207.69

Conclusion

Such anomalies can occur during the developmental stages or upon effect of certain teratogens in the environment. As these deformities are of keen interest to the taxonomists must hence be put on record for reference to the future workers.

Acknowledgement

The authors are indebted to Uttarakhand State Council for Science and Technology (U-COST) for carrying out a Major Research Project. Thanks are due to Zoological Survey of India (Northern Regional Station), Dehradun for providing identification and library facilities and to DBS (PG) College, Dehradun for providing necessary facilities.

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