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Multiple Musculoskeletal Malformations in Fresh Water Rohu, Jammu Region

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ABSTRACT

Musculoskeletal deformities cause severe economic losses to aquaculture due to reduced market value of affected fish. Rohu is an important Indian major carp widely grown commercially as well as found widely in fresh water bodies of J&K. During present investigation we get Rohu with multiple abnormalities which include Kyphosis, lordiosis, ankylosis, pigheadedness and stumpy abdomen as well as swim bladder deformities, all these abnormalities are attributed to numerous factors. Abnormalities were so severe that it affects muscles as well as skeletal system due to fusion of vertebrae, swim bladder displacement, and underdevelopment of radial bones as well as shortening of neural spine. Morphological abnormalities were photographed and radio graphed. Exact cause can't be determined but possible etiologies were discussed.

Keywords*: Kyphosis, Lordiosis, Ankylosis, Pigheadedness, Rohu*

INTRODUCTION

Abnormalities are natural or induced and it is an irreversible deviation from a standard of quality. In some cases abnormalities are such that it is very difficult to identify them correctly and hence lead to creation of new taxa (Devadoss, 1983). Farmed fish fauna is often affected by skeletal anomalies with the incidence depending upon species, developmental stage and rearing methodology. Skeletal anomalies may arise in captivity due to both genetics as well as selection. These deformities are a major factor that downgrade hatcheries production and affect production cost, these fishes have low survival period and not preferred by consumer. These deformities are complex mixture of different bone disorder and are not well understood.

Cyprinid *Labeo rohita* (Rohu) is a native inhabitant of rivers, streams and canals of J&K moreover it is widely cultivated due to its high feed conversion ratio.

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Various works Hora (1942), Law (1944), Orska (1962), Dutta et al. (1995 & 1999), Koumoundouros et al. (1997), Issa (2008), Cunningham et al. (2005), Eissa and Moustafa (2008) and Dutta et al. (2013), Jinesh et al. (2016), Eissa et al. (2021), Dutta (2022), Wanjari et al. (2024), Mariasingarayan et al. (2024) and Khan et al. (2026) have described deformities in numerous fresh water carps of India and the skeletal abnormalities observed by them include lordiosis, scleiosis, jaw deformities, spondylolisthesis, stumpy body, pigheadedness, double fin, semi opened operculumn, crossbite and finfusion. A wide spectrum of etiology has been suggested such as genetic disorders, temperature fluctuation, low pH, parasitism, vitamin C deficiency and environmental pollution. Present study aimed to investigate the deformities in Rohu, *L. rohita* collected from fresh water body of Jammu, river Tawi.

MATERIALS AND METHODS

During present investigation only one abnormal specimen of *Labeo rohita* was obtained from a random catch of almost 200 fishes. The fishes were catch with the help of cast net and after collection they were brought to laboratory and their morphological examination, meristic examination and radiological examination were done.

1. **Morphological examination: -** Fresh specimens were analyzed for morphological abnormalities. Notable morphological deformities were photographed with Digital camera (Figure 1 and 2) and then fishes were preserved in 10%neutral buffered formalin.
2. **Meristic examination**:- In meristic examination calculation of rays and spines of paired and unpaired fins, total scales along lateral line, total vertebrae was done (table 1).
3. **Radiological examination: -** The deformed specimen was radiographed using Fugi Base Film with SOFTEX CMB-2 at 10 miliamps and 50kv for 0.25 sec (Figure 4). For comparison normal specimen was also radiographed (Figure 3).

RESULTS

The abnormal specimen so collected was observed for morphological, meristic and radiological examination and following abnormalities were observed:-

Abnormal fish has 41 scales as compared to normal 40 moreover scales were compressed in the regions where wavy pattern could be observed.

Head of abnormal fish as compared to normal is larger in size. Lower jaw is also slightly protruded outward. Disposition of dorsal and anal fin can be observed from X-ray analysis

X-Ray examination of the normal fish reveals a streamlined vertebral column with 35 amphicoelous vertebrae. In the abnormal specimen, vertebral column has 35 vertebrae and shows various anomalies, first 7 vertebrae after the complex vertebrae are normal, 8, 9 and 10 vertebrae are fused. 1-22 vertebrae are extended because of trough formed (lordosis), 23-31 vertebrae form dome and are fused (Kyphosis) but last form arc like structure but are normal (Kyphosis). Urostyle is normal

Swim Bladder also shows abnormalities due to lordosis and scoliosis of vertebral column, anterior swim bladder is enlarged and extended downwards while posterior is shortened due to presence of trough (lordiosis) in the vertebral column.

Further muscular concentration below the anterior swim bladder of abnormal specimen results into edema.

Figure 1: showing specimen of normal *Labeo rohita*

Figure 2: showing specimen of deformed *Labeo rohita*

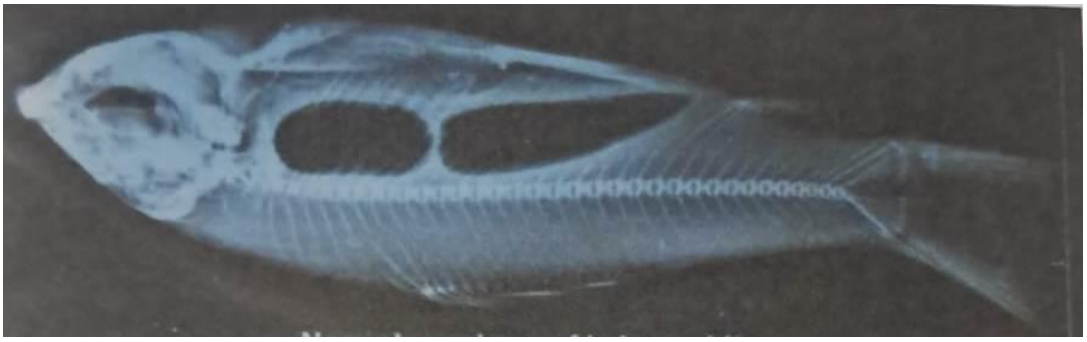

Figure 3: showing x-ray of normal *Labeo rohita*

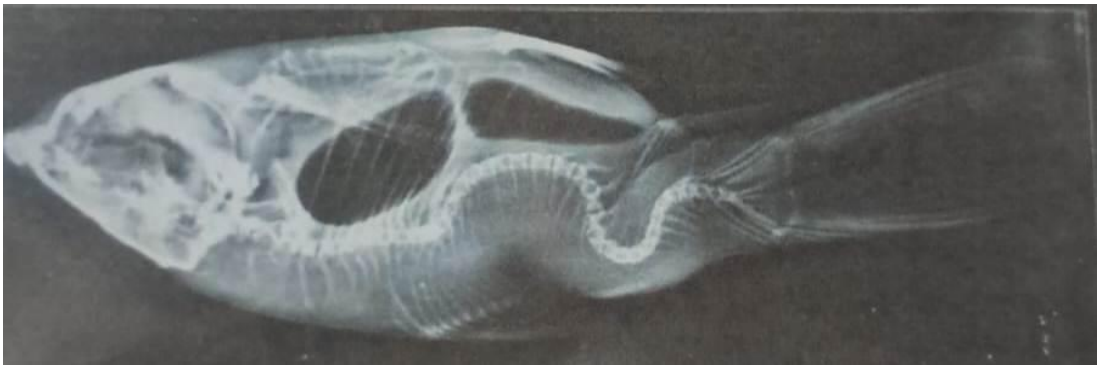

Figure 4: showing x-ray of deformed *Labeo rohita*

Table 1 showing meristic characteristics of normal and abnormal *Labeo rohita*

S.No	Fin	Normal Fish	Abnormal Fish
1	Pectoral	16	18
2	Pelvic	9	10
3	Dorsal	14	14
4	Caudal	21	22
5	Anal	7	07

DISCUSSION

The comparison of morphological features of normal and deformed specimens of species has been described earlier (large sized head, protruded head and displacement of dorsal and anal fin, variation in number of vertebrae, shape of vertebrae and swim bladder) and possible reasons for these variations is attributed to developmental error. As water of collection area was clear, free of pollutants, therefore pollution and other factors cannot be attributed for these deformities. Fish teratology due to developmental error has also been described by Gupta and Tilak (1962), in *Heteropneustes fossilis* (caudal fin deformity); Banerji and Singh (1978) in *Cirrhinus mrigala* (truncated body); Saxena and Tyagi (1978) in *Clarias batrachus* (absence of left pelvic fin); Devadoss (1983) in *Dasyastis jenkensii* (absence of pectoral fin), Dutta et al. (2005) in *Cirrhinus mrigala* (truncated body, reduction of lower jaw); Dutta et al. (2006a) in *Ctenopharyngodon idella,* Eutropicthyes vacha (short truncated body and disposition of fins), Dutta et al. (2011) in *Cirrhinus mrigala* and Bhagat et al. (2013) in *Cirrihinus mrigala*, *Catla catla* and *Labeo rohita.*

From the present study, it is clear that the fish teratology is very complex and cannot be attributed to be single factor but is the result of multiple factors such as pollution, salinity fluctuation, low level of dissolved oxygen, radiation, U.V radiation, dietary vitamin deficiency, parasitic injection, defective embryonic development and injury etc. The possible cause of fish anomalies observed in fish of present investigation seems to be development error but it was clearly witnessed that the condition is not fatal; and certainly affected mobility in some way. Hence it is preliminary to conclude their impact on reproduction and other response on environmental stress for deformed fishes. However genetic study and histopathology of these fishes would help us to find out the exact possible reasons for these errors and still further study is needed to eradicate the same so that we can commercially exploit the man made ecosystem to its full and save the further deterioration of these fishes (Hubbs, 1959: Al-Hassan, 1982, Wang & Tsai, 2000, Backiel et al., 1984; Chaitan, 1994: Divananch et al., 1997, Dutta, 2012, Johnson & Katavic, 1984: Lee & Williams, 1970: Martens et al., 2006: Jawad & Oktner, 2007 & Sun et al., 2009; Kent et al., 2004: Subba, 2004, Villeneuve et al., 2005 & Sun et al., 2009).

CONCLUSION

From above results and discussion it is concluded that although the presences of deformed or abnormal specimen of *Labeo rohita* is negligible in study area but again it is matter of concern because during last decade number of workers have been reported presence of deformed specimen of *Labeo rohita* in various lotic water bodies of Jammu including river Tawi. It is clear from above discussion that a single factor is not responsible for these skeletal deformities therefore there is need to carry out further detailed study on the same fish.

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Conflict of Interest:
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Author Contribution:
Both authors have participated in critically revising of the entire manuscript and approval of the final manuscript.

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