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RECORD OF SOME DEFORMED SPECIMENS OF *CIRRHINUS MRIGALA* (Ham-buch.) FROM RIVER TAWI IN JAMMU CITY

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ABSTRACT
Three adult truncated specimens of *Cirrhinus mrigala* were noticed among the fish collections made by fishermen from river Tawi, in Jammu city area, and have been described. Radiological analysis has revealed various types of vertebral column anomalies viz dome, trough, lordosis and kyphosis; irregular vertebral column, and ankylosis and kyphosis. These anomalous fishes have aberrant intestinal coiling and aberrations in air bladder lobes. Possible causes of deformities in the present case are most probably due to rising water pollution in river Tawi in the Jammu city and its downstream area.

INTRODUCTION

Among wild *Cirrhinus mirgala* deformities though rare have earlier been reported by Banerji and Singh (1978) and Narejo *et al*. (2007) and Amitabh and Firoz (2010). However, there is no report of any abberent fish from natural waters of Jammu regions. During the study of fish fauna of river Tawi, three deformed specimens of *Cirrhinus mrigala* were observed among the collections made by fishermen from Jammu city area and have been reported for the first time among wild populations. Occurrence of these abnormal specimens in river Tawi indicates water quality degradation and is a serious concern.

MATERIALS AND METHODS

Deformed specimens of *Cirrhinus mrigala* were purchased from fishermen collecting fishes from river Tawi, downstream in Jammu city, and analysed for morphological aberrations. These fishes were radiographed using a medical X ray system (digital 300 MA X-ray machine at 10 MAS/43-47KVP for 0.25 sec.)

RESULTS

Three adult deformed specimens of *Cirrhinus mrigala* seen among collections made by fishermen from river Tawi are described below.

***Cirrhinus mrigala* showing irregular truncated body with a bulge and depression on left and right side.**

Contrarory to the streamlined body of normal fish, body of this aberrant specimen of *C. mrigala*, measuring 25.2 cm and weighing 300g, is truncated and post dorsally irregular with a bulge and a depression on lateral sides. Placement of dorsal fin is more towards the caudal fin base than the snout. In a normal fish dorsal fin origin is more towards the snout than the caudal fin base, longest pectoral fin falls short of pelvic origin and the longest pelvic fin falls short of anal fin origin and anal fin falls short of caudal fin base. In this aberrant fish longest pelvic fin ray extends anal aperture and anal fin ray almost extends caudal fin base. Lateral line is irregular and follows the body shape.

Radiological analysis has revealed 35 and 37 vertebrae in normal and abnormal fish, respectively (Fig.1 and Fig. 2). In a normal fish, streamlined vertebral column follows the body shape with normal vertebral thickness, intervertebral spaces, ribs, neural and haemal spines, urostyle and caudal bones. In this aberrant fish vertebral column is deformed and is described as below:

Vertebral column is dorsally curved between 1^{st} -13^{th} vertebrae. Intervertebral spaces reduced. Neural spines between 6^{th}-10^{th} vertebrae thick.

Vertebral column forms a dome between 14^{th}-20^{th} vertebrae. Vertebrae short and opaque and intervertebral spaces reduced. 19^{th} and 20^{th} vertebrae fused and form an opaque mass (ankylosis)

Posteriorly, vertebral column upto 26^{th} vertebrae, along with posterior side of dome between 17^{th} -20^{th} vertebrae, forms a trough. Intervertebral spaces reduced and neural spines attenuated.

Vertebral column upto 32^{nd} vertebrae, along with 23^{rd} -25^{th}

vertebrae, form a kyphosis ( ). Intervertebral spaces are highly reduced.

Posteriorly, vertebral column upto 37th vertebrae, urostyle and caudal bones are directed upward and along with anterior 26th -32nd vertebrae form a lordosis (V). Intervertebral spaces are reduced.

Urostyle and caudal bones not clear.

In a normal fish air bladder is bilobed. Anterior lobe is oval and posterior lobe elongated (Fig.1). In this aberrant fish, anterior air bladder lobe is small and bulbous and posterior lobe is not clear.

X-ray analysis in a normal fish has revealed long transverse intestinal lobes. In this aberrant fish, intestinal lobes are short and clustered.

From x-ray analysis it is clear that morphological aberrations are due to vertebral column abnormalities viz dome, ankylosis, trough, kyphosis and lordosis

***Cirrhinus mrigala* showing postdorsally truncated body with a bulge on left side and depression on right side.**

This aberrant specimens of *C. mrigala*, measuring 31.7cm and weighing 470 g, was recognised by postdorsally truncated body, mid dorsal dome, a bulge on left side and a depression on right side. Origin of dorsal fin is more towards the caudal fin base than the snout, longest pectoral fin ray reaches almost pelvic fin ray and latter extends anal fin origin. The longest anal fin ray extends beyond caudal fin base. On the contrary, in a normal fish, dorsal fin origin is more towards the snout than the caudal fin base, longest pectoral fin ray falls short of pelvic fin origin, longest pelvic fin ray falls short of anal fin origin and longest anal fin ray falls short of caudal fin base. Lateral line follows the pattern of body shape.

There are 35 and 37 amphiceolous vertebrae, respectively, in the normal and abnormal fish, as reavealed by X-ray examination (Figs1and 3). Anteriorly, vertebral column upto first five vertebrae, after complex one, and posteriorly between 32nd -37th vertebrae normal, in this aberrant fish. Vertebral column between 6th -31st vertebrae is irregular with domes and troughs and various vertebrae are undifferentiated and opaque (ankylosis). Urostyle and caudal bones normal.

In a normal fish air bladder is bilobed. Anterior lobe is large and oval and posterior lobe is long and posteriorly elongated. In the deformed fish, anterior lobe of air bladder is swollen and posterior lobe attenuated.

X-ray analysis has also revealed that in this deformed fish, intestine is truncated and form a coiled mass.

From radiograph analysis it is clear that postdorsally truncated body with a bulge and a depression is the result of spiral structure of vertebral column and reduced vertebral thickness and intervertebral spaces.

***Cirrhinus mrigala* showing truncated body with a dome in the dorsal fin area.**

Measuring 28.4cm and weighing 350g this aberrant specimen of *Cirrhinus mrigala* was recognised by truncated body and a dorsal dome. Dorsal fin is located more towards caudal fin base than the snout. Whereas in a normal fish, dorsal fin origin is more towards the snout than the caudal fin base. Pectoral fin placement is like a normal fish. Longest pelvic fin ray in this aberrant fish reaches almost anal aperture and the longest anal fin ray extends the caudal fin base.

X-ray analysis has revealed the presence of 35 vertebrae in both normal and abnormal fish. In deformed fish vertebral column shows kyphosis between 12th – 21st vertebrae. Vertebrae not well differentiated and overlapping, intervertebral thickness and intervertebral spaces reduced and neural and haemal spines are degenerated.

In a normal fish air bladder is bilobed. Anterior lobe is large and oval and posterior lobe is elongated. In this deformed fish anterior lobe of air bladder is short and posterior attenuated. Intestine lobes are truncated.

From X- ray analysis it is clear that a truncated body with dorsal dome is due to vertebral column kyphosis between 12th -25th vertebrae.

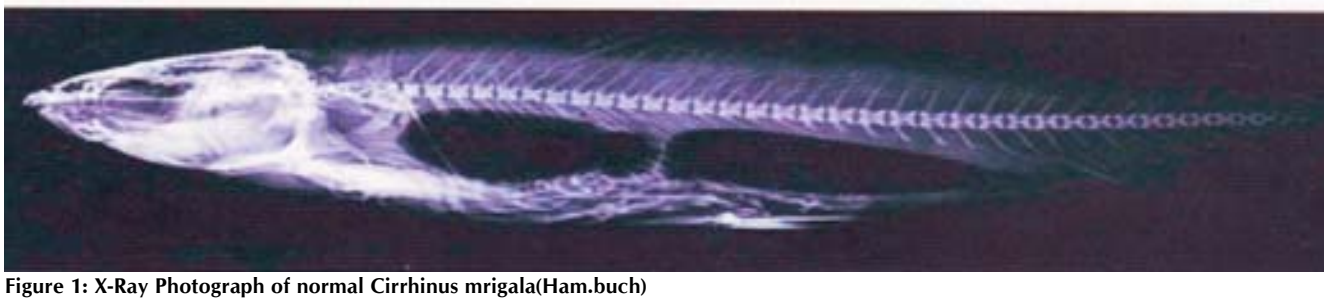

Figure 1: X-Ray Photograph of normal Cirrhinus mrigala(Ham.buch)

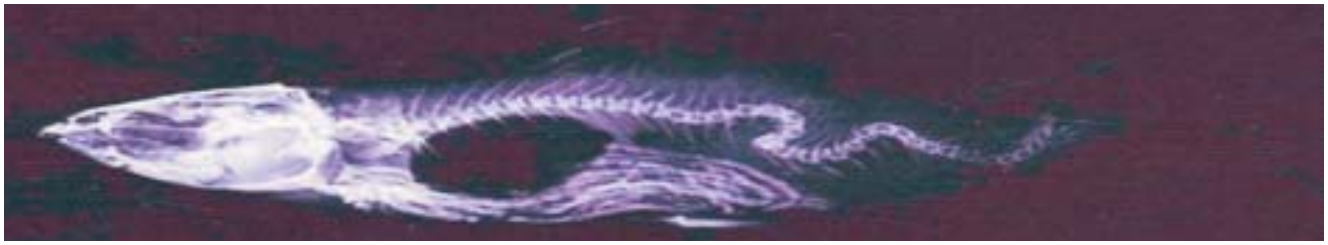

Figure 2: X-Ray Photograph of truncated specimen of Cirrhinus mrigala (Ham.buch) showing domes and troughs in vertebtral column

Figure 3: X-Ray Photograph of truncated specimen of Cirrhinus mrigala (Ham.buch) showing domes and coiled vertebral column

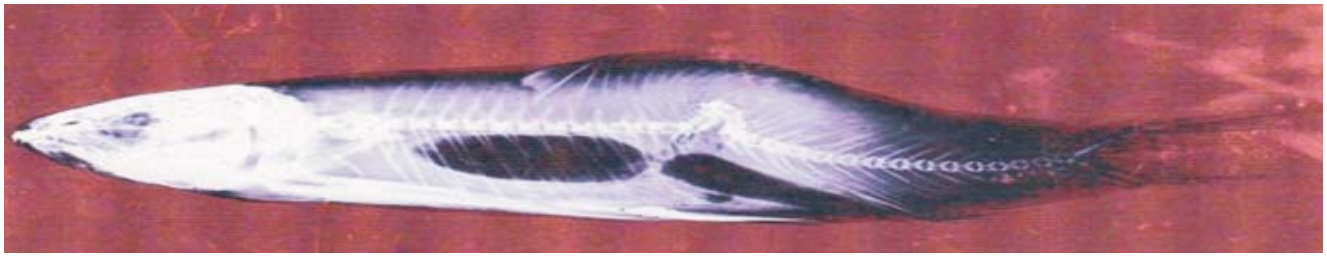

Figure 4: X-Ray Photograph of truncated specimen of Cirrhinus mrigala (Ham.buch) showing inverted V-shaped vertebral column

DISCUSSION

Teratology in wild fish is ascribed to multiple factors like currents (Chaitan, 1994; Backiel *et al.,* 1984; Dutta ,2012) temperature variations (Al- Hassan, 1992 and Wang and Tsai, 2000), salinity fluctuations (Lee and Williams, 1970), low level of oxygen and high level of free carbon dioxide (Martens *et al.,* 2006), parasitic infection (Stauth, 2004; Cunningham *et al.,* and Yokoyama *et al.,* 2005); (Longwell *et al.,* 1992; Kent *et al.,* 2004; Subba, 2004; Villeneuve *et al.,* 2005 and Linsun *et al.,*2009).

Due to turbulent flow of river Tawi, in the area of present fish sampling, narrow variation in water temperature (11.5-32 ºC) and absence of any visible record of parasitic infestation among the discussed fishes, deformities in these fishes, under discussion, canot be attributed to these factors.

Degraded water quality of river Tawi in Jammu city (transparency, 3-40cm; turbidity, 28.5-932 NTU; pH, 6.67-8.40; conductivity, 0.269-0.702 mS; total dissolved solids, 166-338 mg/l; salinity 0.2-0.9 ppt; DO, nil-8.66 mg/l; BOD, 3.6-400 mg/l; free CO_2, nil- 45 mg/l; carbonate, nil-9.55 mg/l; bicarbonate, 140.41-830.01 mg/l; chloride, 10.62-66.6 mg/l; calcium, 27.86-73.13 mg/l; magnesium, 7.5-27.35 mg/l; total hardness, 100.16-283.58 mg/l; sodium 12-49.6 mg/l; potassium 1.51-15.2 mg/l and phosphate .034-.370 mg/l) and its further downstream pollution caused by mixing of the untreated industrial effluents from Gangyal and Bari Brahamna industrial complex through Behlol nullah suggests that anomalies in these three specimens are most probably due to water pollution. A continuous monitoring of water quality and fish fauna of river Tawi, in the polluted segments of Jammu city and in the downstream section, will enable us to understand the exact cause of these anomalies.

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