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ANOMALIES IN SOME FRESHWATER FISHES OF JAMMU (J AND K)

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ABSTRACT
In the present study six abnormal specimens of three different species of fish were noticed in a collection made from Ranjit Sagar reservoir built on river Ravi at Basholi (J and K) which included 4 deformed specimen of *Cirrihinus mrigala*, 1 aberrant specimen of *Catla catla* and 1 abnormal specimen of *Labeo rohita*. The deformities in these fish were studied through radiographic examinations. During the study it was discovered that all these deformities in the collected fish specimens are probably due to developmental error.

INTRODUCTION

Scanty records of fish teratology in wild population dates back to late 19th and early 20th century. The notable contributions in this field of fishery biology are given by Day (1878). Rare occurrence of fish anomalies in 20th century were due to the optimal environmental conditions of different water bodies but recent studies made in India and abroad, however have revealed comparatively rise in incidence of abnormalities in wild as well as cultured fishes. In India aquatic pollution has already attained serious dimensions where about 70% of water is polluted. Some pollutants may even reach higher trophic level through biomagnification. In certain cases, abnormalities are such that it is very difficult to identify them correctly and this leads to creation of new Taxa (Devadoss, 1983). Day (1878) has given a description of malformed specimen of *Gymnura poecilura* and *Ceratoptera cherenbergi* which is a typical example of this type of anomaly.

Jammu and Kashmir state support a very rich and diverse fish fauna of oriental and palarctic origin, due to variable ecological characteristics of lotic and lentic water bodies. Valenciennes (1840, 1842), Day (1878), Silas (1960), Das and Subla (1963, 1964) have studied fish fauna of Kashmir and reported about 45 fish specimen inhabiting Kashmir water bodies.

From Jammu province, 114 fish species have been reported by Das and Nath (1971), Jyoti and Gupta (1978), Malhotra *et al*. (1975, 1980), Guglani (2000).

Various records of fish teratology of commercially important fresh water fishes like *Catla catla, Cirhinus mrigla* and *Labeo rohita* inhabiting lotic and lentic water bodies of Jammu province are provided by Dutta *et al*. (1995, 1997, 1999, 2002, 2003, 2005 and 2006), Verma (1998), Bala (1999), Sharma (1999), Gulgani (2000), Gupta *et al*. (2002), Khan (2001) and Trishala (2001).

As far as fish teratology of Kashmir fish is concerned, except for reports by Dutta *et al*. (1995 and 1999) and Ara (2002), there is no record available on this aspect of fish biology.

The objective of this study is to add to the existing knowledge on fish teratology from this part of the country.

MATERIALS AND METHODS

Study area

The Ranjit Sagar reservoir bunded by Thein Dam is part of a hydroelectric project constructed by the Government of Punjab on the Ravi River in the state of Punjab. The project is situated near Pathankot city in Pathankot District of the state of Punjab. Although the dam is built by Punjab government the reservoir water is mainly confined to J and K state. The project is used for both irrigation purposes and power generation. It has an installed capacity of 600 Megawatt. During the limno-biotic survey of Ranjit Sagar reservoir, some deformed specimens of *Cirrihinus mrigala* as well as a solitary specimen of *Labeo rohita* and *Catla catla* were seen and have been described in the present work.

Methodology

Morphological examination

Fresh fish specimens were examined grossly for morphological abnormalities. Notable morphological deformities were photographed with Digital Camera and fish was preserved in 10% neutral buffered formalin.

Morphometric examination

A total of 27 morphometric measurements were recorded for each Fish (Table 1).

Radiological examination

These deformed specimens were examined by radiography using Fuji Green Base Film with SOFTEX CMB-2 at 10 milliamps and 50kv for 0.25 sec. For comparison, normal fish specimen was also radiographed.

RESULTS AND DISCUSSION

In the present study six abnormal specimens of three different species of fish were noticed in collection made from Ranjit Sagar reservoir, Basholi.

First species, *Cirrihinus mrigala* was studied for deformities. Figs. 1a and 1b represent photograph and X-Ray photo of normal specimen of *Cirrihinus mrigala* respectively.

1st specimen of *Cirrihinus mrigala* was recognized by the absence of caudal region including caudal fin (Fig. 2a). An X-Ray examination revealed that deformity is due to upward turning of vertebral column from 27th to 32nd vertebrae, forming a compact hook like mass. Caudal peduncle including caudal fin is absent (Fig. 2b).

2nd specimen of *Cirrihinus mrigala* was recognized by a truncated body and a dorsal hump and a vertebral 'wedge' in the dorsal fin region (Fig. 3a). An X-Ray examination has revealed that deformity has arisen due to the formation of wedge like structure from 12th to 20th vertebrae in a dorsal fin region due to which post dorsal of body is reduced

in length (Fig. 3b).

3rd specimen of *Cirrihinus mrigala* was recognized by the truncated post anal body as a result of which post anal length of the body is reduced (Fig. 4a). An X-Ray examination has revealed that deformity has resulted due to the formation of a dome from 23rd to 28th vertebrae and two depressions from 29th to 35th and from 36th to 44th vertebrae (Fig. 4b).

4th specimen of *Cirrihinus mrigala* was recognized by the deformed body with dorsal arc and an anal bulge on the ventral side (Fig. 5a). An X-Ray examination has revealed that deformity has resulted into reduced inter-vertebral spaces between 4th to 5th and 12th to 17th vertebrae. Moreover, vertebrae are fused together and have a diffused shapes and structures (Fig. 5b).

Table 1: Comparison of morphological features of abnormal and normal specimen different specimen

S. No.	Characteristic feature (all values in cm)	*Cirrihinus mrigala* (Specimen-1)		*Cirrihinus mrigala* (Specimen-2)		*Cirrihinus mrigala* (Specimen-3)		*Cirrihinus mrigala* (Specimen-2)		*Catla catla*		*Labeo rohita*	
		N	A	N	A	N	A	N	A	N	A	N	A
1.	Head length in total body length	5.30	4.28	5.30	4.50	5.30	4.54	5.30	4.75	4.50	2.60	4.26	4.51
2.	Head length in standard body length	4.42	3.44	4.42	3.52	4.42	3.67	4.42	3.75	3.52	1.74	3.45	3.52
3.	Eye diameter in head length	5.36	5.6	5.36	5.18	5.36	6.63	5.36	5.54	5.18	8.8	6.14	7.6
4.	Head height in head length	1.47	1.55	1.47	1.5	1.47	1.58	1.47	1.60	1.5	1.40	1.36	1.42
5.	Pre-ocular length in head length	3.10	2.94	3.10	3.56	3.10	3.17	3.10	3.05	3.56	3.12	2.81	2.70
6.	Post-ocular length in head length	1.73	1.75	1.73	1.78	1.73	1.78	1.73	3.48	1.78	1.53	1.33	1.75
7.	Body height in total body length	4.53	4.21	4.53	3.61	4.53	4.48	4.53	5.08	3.38	2.50	4.42	4.16
8.	Body height in standard body length	3.78	3.38	3.78	2.83	3.78	3.62	3.78	4.01	2.83	1.67	3.58	3.25
9.	Pre-dorsal length in total body length	2.52	2.14	2.52	2.31	2.52	2.44	2.52	2.54	2.31	2.38	2.53	2.65
10.	Pre-dorsal length in standard body length	2.10	1.72	2.10	1.81	2.10	1.97	2.10	2.00	1.31	1.59	2.05	2.06
11.	Post dorsal length in total body length	2.18	3.03	2.18	2.3	2.18	2.33	2.18	2.01	2.3	2.16	2.49	2.26
12.	Post dorsal length in standard body length	1.82	2.44	1.82	1.82	1.82	1.88	1.82	1.59	1.82	1.44	2.02	1.77
13.	Pre-anal length in total body length	1.65	1.26	1.65	1.48	1.65	1.68	1.65	1.58	1.48	1.93	1.6	1.59
14.	Pre-anal length in standard body length	1.35	1.02	1.35	1.16	1.35	1.32	1.35	1.25	1.16	1.29	1.29	1.24
15.	Post anal length in total body length	2.58	4.61	2.58	2.12	2.58	2.53	2.58	2.63	2.12	2.09	2.69	2.66
16.	Post anal length in standard body length	2.15	3.71	2.15	1.66	2.15	2.0	2.15	2.08	1.66	1.39	2.18	2.08
17.	Height of caudal peduncle in standard length	9.20	Caudal absent	9.20	8.5	9.20	9.4	9.20	10.3	8.8	7.90	8.95	18.04
18.	Length of dorsal fin in total length	7.6	Caudal absent	7.6	6.7	7.6	7.6	7.6	8.17	6.7	5.28	7.24	14.09
19.	Length of dorsal fin in standard length	3.81	3.52	3.81	3.47	3.81	5.35	3.81	5.44	3.47	2.94	3.74	3.67
20.	Length of pectoral fin in total length	3.18	2.83	3.18	2.71	3.18	4.32	3.18	4.32	2.17	1.96	3.03	2.87
21.	Length of pectoral fin in standard length	5.69	4.8	5.69	5.97	5.69	5.26	5.69	5.67	5.97	4.77	4.26	5.7
22.	Length of pelvic fin in total length	4.75	3.86	4.75	4.67	4.75	4.25	4.75	4.65	4.67	3.18	3.45	4.48
23.	Length of pelvic fin in standard length	6.80	5.71	6.80	6.76	6.80	6.93	6.80	6.71	6.76	4.51	6.12	6.9
24.	Length of anal fin in total length	5.67	4.59	5.67	5.28	5.67	4.45	5.67	5.63	5.28	3.18	4.95	5.6
25.	Length of anal fin in standard length	6.38	5.40	6.38	5.97	6.38	8.09	6.38	6.2	6.04	6.4	7.34	6.3
26.	Length of caudal fin in total length	5.32	5.07	5.32	4.67	5.32	6.5	5.32	4.60	4.56	4.3	5.94	5.2
27.	Length of caudal fin in standard length	6.0	Caudal absent	6.0	4.58	6.0	5.18	6.0	3.60	4.50	3.01	5.24	4.56

A = Abnormal (deformed specimen); N = Normal specimen

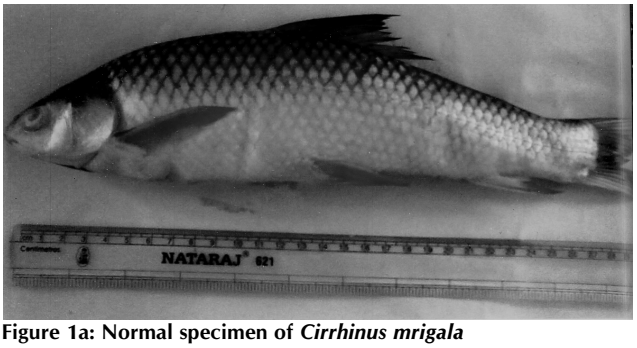

Figure 1a: Normal specimen of *Cirrhinus mrigala*

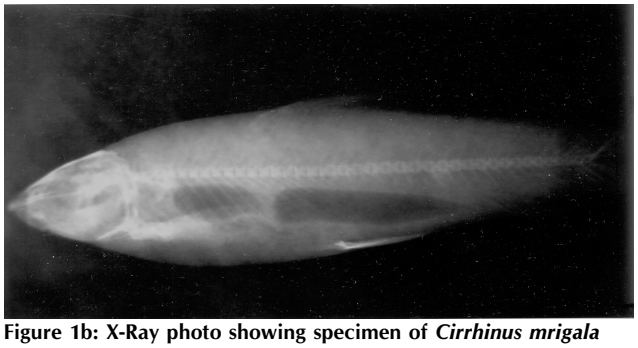

Figure 1b: X-Ray photo showing specimen of *Cirrhinus mrigala*

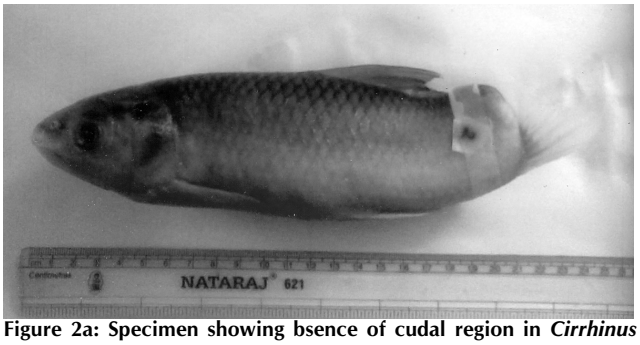

Figure 2a: Specimen showing bsence of cudal region in *Cirrhinus mrigala*

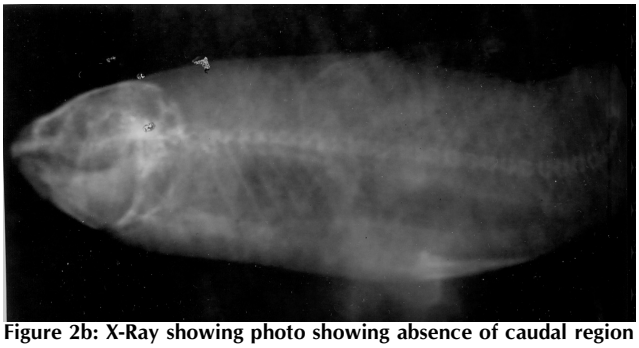

Figure 2b: X-Ray showing photo showing absence of caudal region in *Cirrhinus mrigala*

Second species *Catla catla* was studied for observing deformities. Figs. 6a and 6b represents a photograph and X-ray photo of a normal specimen of *Catla catla* respectively. A single aberrant specimen of *Catla catla* was recognized by the truncated body with a dorsal hump, as a result of which body has acquired short, truncated and compressed form (Fig. 7a). An X-Ray examination has revealed that deformity has resulted due to fusion of 1st to 6th vertebrae and 7th to 15th vertebrae which forms a dome/loop ,16th to 24th vertebrae which form a trough and 25th to 30th vertebrae forming an arc in the post dorsal region (Fig. 7b).

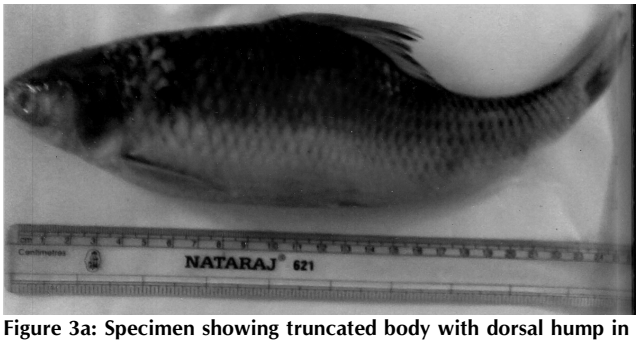

Figure 3a: Specimen showing truncated body with dorsal hump in *Cirrhinus mrigala*

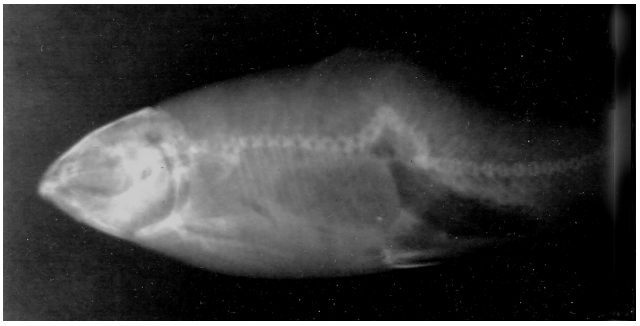

Figure 3b: X-Ray photo showing truncated body with dorsal hump in *Cirrhinus mrigala*

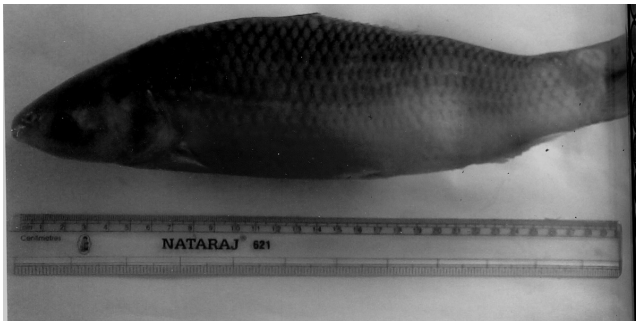

Figure 4a: Specimen showing truncated post-anal body in *Cirrhinus mrigala*

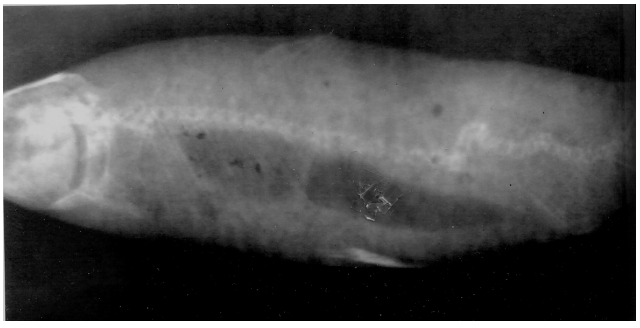

Figure 4b: X-Ray photo showing truncated post-anal body in *Cirrhinus mrigala*

Third species *i.e. Labeo rohita* was studied for deformities. Figs. 8a and 8b represent photograph and X-Ray photo of normal specimen of *Labeo rohita* respectively. A solitary

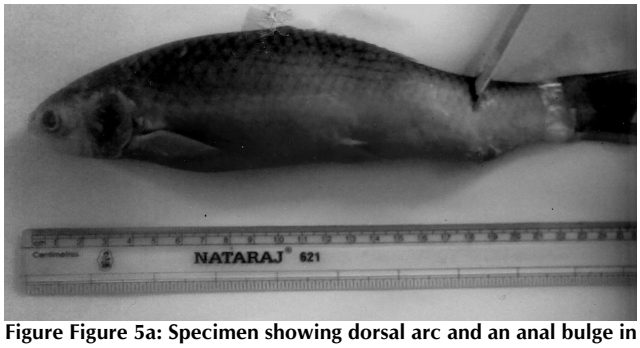

Figure Figure 5a: Specimen showing dorsal arc and an anal bulge in *Cirrhinus mrigala*

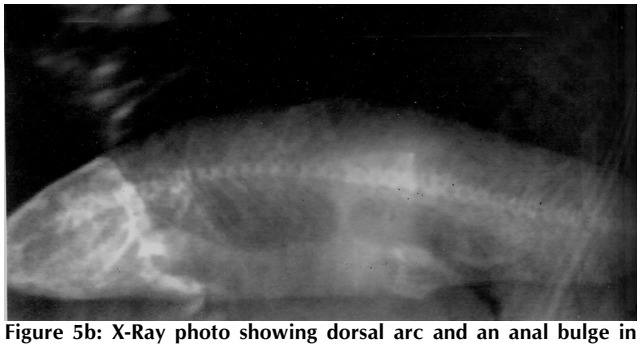

Figure 5b: X-Ray photo showing dorsal arc and an anal bulge in *Cirrhinus mrigala*

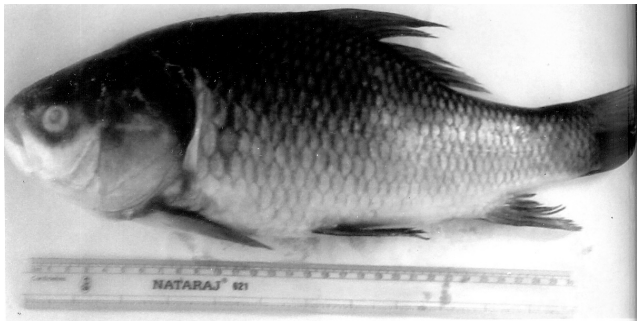

Figure 6a: Normal specimen of *Catla catla*

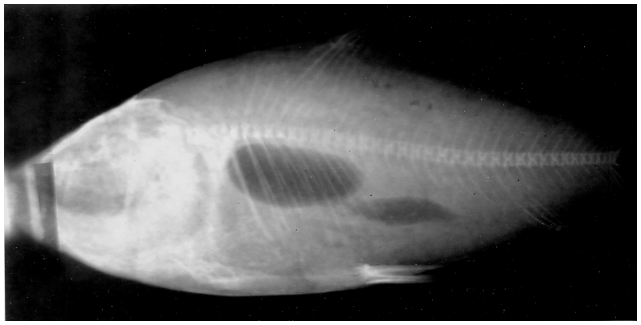

Figure 6b: Normal X-Ray photo of *Catla catla*

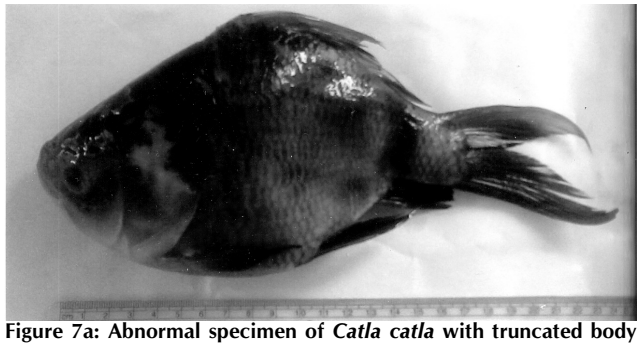

Figure 7a: Abnormal specimen of *Catla catla* with truncated body and dorsal hump

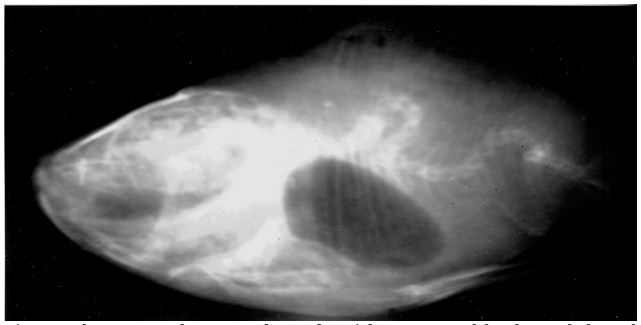

Figure 7b: X-Ray photo *Catla catla* with truncated body and dorsal hump

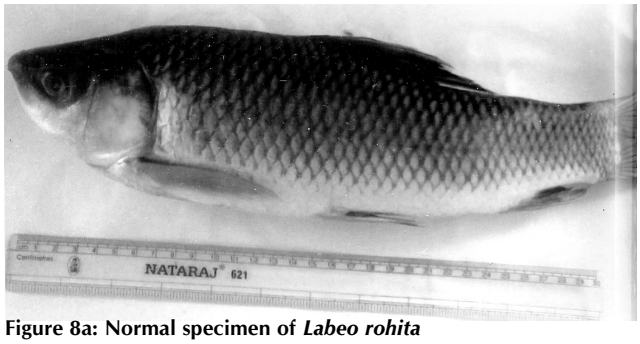

Figure 8a: Normal specimen of *Labeo rohita*

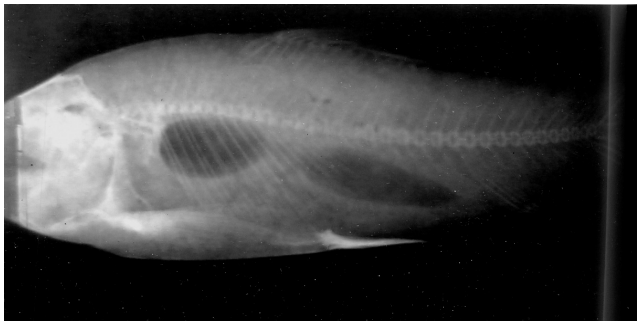

Figure 8b: X-Ray photo of a normal *Labeo rohita*

deformed specimen of *Labeo rohita* has been recognized by the deformed body with post-dorsal depression, truncated caudal region and reduced post anal scales which has been represented in Figs. 9a and 9b.

Table 1 represents the comparative analysis of various characters of the normal and abnormal specimens of the different fish species under study. All these deformities in the collected fish specimens are probably due to developmental error. 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); Gupta *et al.* (2000) in *Hypophthalmicthyes molitric;* Dutta *et al.* (2005) in *Cirrhinus mrigala* (truncated body, reduction of lower jaw);

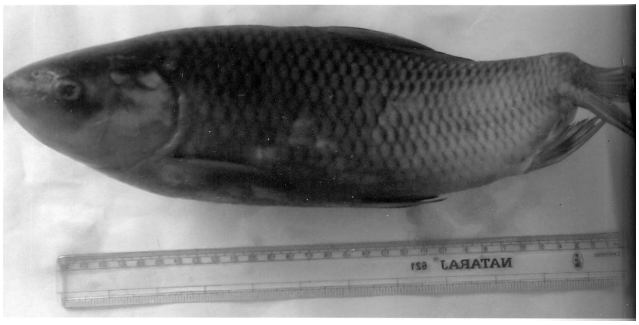

Figure 9a: Abnormal speciment of *Labeo rohita* showing deformed body

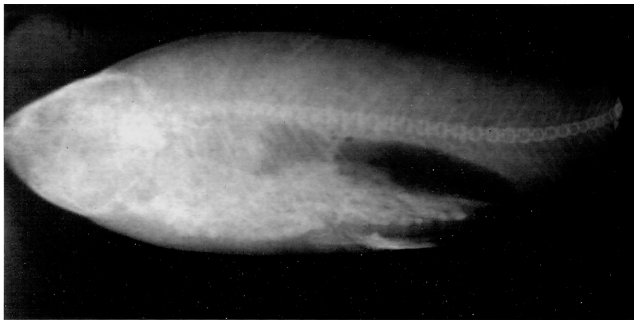

Figure 9b: X-Ray photo of *Labeo rohita* showing deformed body

Dutta *et al*. (2006a) in *Ctenopharyngodon idella*, *Eutropicthyes vacha* (short truncated body and disposition of fins). Anomalies in fish due to pollutants like chlorinated hydrocarbons, organophosphates, heavy metals have been studied by Kessabi *et al*. (2009) and Lin Sun *et al*. (2009) and due to pesticides by Dutta *et al*. (2011) in *Cirrhinus mrigala*.

From the present study, it is clear that the fish teratology is very complex and cannot be attributed to a single factor but is the result of multiple factors such as pollution, salinity fluctuations, low level of dissolved oxygen, radiation, U. V. radiation, dietary Vitamin deficiency, parasitic injection, defective embryonic development and injury etc. The presence of abnormalities in the present investigation can also be speculated by the fact that the above mentioned three species are the commercial carps and their adaptability to the altered ecosystem (reservoir) is not satisfactory which might have brought about these abnormalities. However genetic study 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.

REFERENCES

Ara, R. 2002. Anomalies in fry of rainbow trout, Salmo gairdneri gairdneri (Richardson), from Kokernag trout fish farm, Kashmir (J and K). *M. Sc. Dissertation, University of Jammu*.

Bala, N. 1999. Deformaties in some fresh water fishes *viz*. Cirrhinus mrigala (Ham.)., Labeo rohita (Ham.) and Channa punctatus (Bloch) from Jammu (J and K). *M. Sc. Dissertation, University of Jammu.*

Banerji, S. R. and Singh, M. N. 1978. Truncated specimen of *Cirrhinus mrigala*. *Matsya*. **4:** 80-82.

Das, S. M. and B. A. Subla. 1963. The Icthyofauna of Kashmir, Part-I: History, topography, origin, ecology and general distribution. *Icthyologica*. **2(1-2):** 87-106

Das, S. M. and Subla, B. A. 1964. The icthyofauna of Kashmir, Part-II: The specification of Kashmir fishes with two new records of species. *Ibid.* **3(1-2):** 57-62.

Das, S. M. and Nath, S. 1971. A revision of fishes from Jammu province, India. *Ibid.* **8:** 1-22.

Day, F. 1878. The Fishes of India, being a Natural History of the Fishes known to inhabit the seas and fresh waters of India, Burma and Cylone. Reproduced in 1958, London; Willaim Dowen and sons. p. 778.

Devadoss, P. 1983. On some specimens of abnormal elasmobracnches. *Matsya*. **9 and 10:** 186-188.

Dutta, S. P. S., Jan, N. A. and Bali, J. P. S. 1995. Multiple deformities in Salmo gairdneri gairdneri (Richardson) from Kokernag trout fish farm, Kashmir (JandK). *J. Fresh Water Biology*. **7(3):** 183-186.

Dutta, S. P. S., Sharma, K., Gupta, S. C. and Verma, M. 1997. A report on abnormal fishes inhabiting the aquatic environments of Jammu (J and K State). *Himalayan J. Environment and Zoology*. **11:** 87-92.

Dutta, S. P. S., Jan, N. A., Bali, J. P. S., Gupta, S. C. and Mahajan, A. 1999. A report on the abnormalities of fry of rainbow trout Salmo gairdneri gairdneri (Richardson) from Kokernag trout fish farm, Kashmir (J and K). *Oriental Science*. **6(1):** 9-19.

Dutta, S. P. S., Kour, H., Gupta, S. C. and Bali, J. P. S. 2002. Fishes of river Chenab, Jammu province, J&K Cold Water Fish Genetic Resources and their Conservation. *NATCON Publication:* pp.181-187.

Dutta, S. P. S., Kour, H. and Zutshi, N. 2003. Icthyofauna of river Tawi and its tributaries. *J. Aqua. Biol.* **18(2):** 61-68.

Dutta, S. P. S., Gupta, S. C., Bhat, M., Tabassum, A. and Kumar, A. 2005. Teratology studies in Cirrhinus mrigala (Ham. Buch.) a commercially important food fish inhabiting lentic environments of Birpur, Jammu. Workshop on fisheries and aquaculture in Indus river region-conservation and management of indigenous fish fauna, 21-22 Dec, 2005: PAU Campus, Ludhiana.

Dutta, S. P. S., Gupta, N. and Nissar, K. 2006a. Deformities in some commercially important food fishes of Jammu, J and K State. Souvenier and Abstracts of JandK Science Congress organized by University of Kashmir in collaboration with JandK State DST and DST GoI., 25-27 July: 70 (Abstract No Env 31).

Dutta, S. P. S., Slathia, D., Chander, G. and Kumar, H. 2011. Anomalies in *Cirrhinus mrigala*, a commercially important freshwater food fish, from Gurdaspur district of Punjab. *The Bioscan*. **6(3):** 405-411.

Gulgani, H. K. 2000. Survey and systematic analysis of fish fauna of Jammu. *Ph. D. Thesis, University of Jammu.*

Gupta, D. A. K. and Tilak, R. 1962. A note on the Deformity of *Heteropneustes Fossilis* Bloch (Heteropneusticae: Siluroidea). **12:** pp. 305-308.

Gupta, S. C., Dutta, S. P. S. and Sharma, N. 2000. A report on some morphological deformities in silver carp *Hypophthalmicthyes molitric* (Vallenciennes) inhabiting aquatic environment of Jammu (J and K). *Himalayan J. Env. and Zool*. **14:** 25-30.

Gupta, S. C., Dutta, S. P. S., Sharma, N. and Bala, N. 2002. Morphological deformities in *Cirrhinus mrigala* (Ham.) inhabiting lentic environments of Jammu. *Aquacult*. **3(2):** 149-154.

Jyoti, M. K. and Gupta, S. C. 1978. An addition to the Icthyofauna of J and K state. *Jammu University Rev*. **6:** 165-166.

Kessabi, K., Kerkani, A., Said, K. and Messaoudi, I. 2009. Involvement of cadmium bioaccumulation in spinal deformities occurance in

natural population of mediteranean killifish. *Biol. Trace Elem. Res.* **128:** 72-81.

Khan, F. A. 2001. Teratology in some fresh water fishes viz. *Puntius sarana* (Ham. Buch), *Puntius chola* (Ham.), *Cirrhinus mrigala* (Ham. Buch), *Wallago attu* (Bloch and Schn.), *Channa orientalis* (Bloch and Schn.) and *Labeo dyochelius* (Mc. Cll) inhabiting fresh water environments of Jammu. *M. Sc. Dissertation, University of Jammu.*

Lin Sun, P. L., Hawkins, W. E., Overstreet, R. M. and Brown Peterson, N. J. 2009. Morphological deformities as biomarkers in fish from contaminated rivers in Taiwan. *Int. J. Environ. Res. Public Health.* **6:** 2307-2331.

Malhotra, Y. R, Jyoti, M. K. and Dutta, S. P. S. 1975. An aid to the identification of fishes found in Jammu division of J and K State. *Jammu University Rev.* **5(8):** 50-66.

Malhotra, Y. R., Sharma, K., Sharma, C. and Gupta, P. C. 1980. Extension of some known range of fishes to Jammu (J and K), India. *Proc. 67th India, Sci. Congr. (Abstract).*

Saxena Rand, A. P. T. 1978. Teratology of pelvic fin in *Clarias batrachus*. *Matsya.* **(4):** 78–79.

Sharma, N. 1999. Deformities in some major carps viz. *Labeo rohita* (Hamilton), *Cirrhinus mrigala* (Hamilton) and *Hypophthalmicthyes molitrix* (Valenciennes) inhabiting aquatic environments of Jammu (J and K). *M.Sc. Dissertation, University of Jammu.*

Silas, E. G. 1960. Fishes from Kashmir. *J. B. N. H. S.* **57(1):** 66-77.

Trishala 2001. Deformities in some fresh water fishes viz. *Barilius bendelisis* (Ham. Buch), *Cirrhinus mrigala* (Ham. Buch), *Puntius sarana* (Ham. Buch), *Tor putitora* (Ham. Buch), *Heteropneustes fossilis* (Bloch) and *Mystus bleekeri* (Day) of Jammu District (J and K). *M.Sc. Dissertation, University of Jammu.*