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SKELETAL ANOMALIES IN FISHES COLLECTED FROM KORANGI CREEK AND BACKWATER OF SANDSPIT ALONG THE COAST OF KARACHI

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Vertebral anomalies have been reported in *Liza carinata*, *Valamugil cunnesius* and *Therapon jarbua* from Korangi creek and *L. carinata* collected from backwaters of Sandspit. Detail examination of external morphology and X-rays of fishes showed kypholordosis and scoliosis in the vertebral column. It is presumed that these effects are results of pollutants in the coastal systems of Korangi creek and Sandspit backwaters where heavy pollutants and domestic sewage of the Karachi city is discharged untreated. This study suggests the need of effective management measures to save fisheries resources of the creeks and coastal waters.

***Key words*:** Skeletal anomalies, Fishes, Backwaters, Creeks, Karachi coast.

Introduction

Skeletal and body anomalies in fishes have been reported in numerous research works. Normally such anomalies in wild fish are caused by environmental degradation due to the direct discharge of untreated pollutants, nutritional deficiencies, physical shocks and infection at early developmental stages. Some of the studies on such anomalies are that of Douglas (1978); Hussain (1979); Ferguson (1989); Roberts and Bullock (1989); Schäperclaus (1992); Endo *et al* (1994); Al-Hassan and Shwafi (1997); Al-Hassan and El-Silini (1998), etc. Such abnormal fishes have also been reported from freshwater, creeks and mangrove areas along the coast of Karachi (Hussain 1979; Jafri *et al* 1998; Hussain and Khatoon 1998).

Present study reports the occurrence of abnormalities in five fishes. The detailed study of X-rays reveals scoliosis and kypholordosis resulting loss of hard parts (vertebrae, caudal skeleton and spines), which cause body deformation.

Materials and Methods

Five abnormal specimens were collected in gill nets during the regular fish samplings from Korangi creek area and backwaters of Sandspit area (Karachi coast, Northern Arabian Sea). The detail sampling technique is described in the final report of Pakistan Science Foundation Project no. 319 (PSF 2003). The described specimens are catalogued, *Valamugil cunnesius* two specimens no. 4001 and no. 4002 CEMB; *Liza carinata* two specimens no. 4003 and no. 4004 CEMB and one specimen of *Therapon jarbua* no. 6001 CEMB. Fishes were identified, measured, dissected, X-rayed and compared with normal specimens.

Abbreviations used: TL = Total length: measured from snout to the end of the caudal fin; SL = Standard length: measured from snout to last vertebrae; HL = Head length: measured from snout to the end of operculum; TW = Total weight: Number of vertebrae were counted on longitudinal axis from chondrocranium to urostyle.

Results and Discussion

Valamugil cunnesius. Specimen no.4001 CEMB, was caught by gill net mesh size, 38 mm, at Bakran creek, Station 82, Lat. $24^0 47' 03$N and long. $67^0 17' 46$E on 26th March 2001 at 11.00 A.M. Immature (sex not discriminated), TL 157 mm, SL 120 mm, TW 42.8 g. Dorsal fin IV, I, 8; pectoral fin I, 14; pelvic fin I, 5; anal fin III, 9. Scales in lateral series 34; head length 38.4% (41.6% normal specimen) in the SL; body depth 40.8% (48.0% normal specimen) in SL; eye diameter 9.6% (10.8% normal specimen) in head length; pre-dorsal distance 75.6% (83.2% normal specimen) in SL. The head and the anterior contour of the specimen develop a hump like appearance at the nape (Fig 1).

Meristic features of the abnormal fish show distinct difference from the normal specimen. The body depth is 48% of SL in normal specimen compared to 40.8% of SL in abnormal fish. Pre-dorsal distance is 83.2% in the normal fish compared to 75% of the SL in abnormal fish.

Radiograph. The X-ray of the abnormal fish revealed marked rotato-scoliosis of vertebrae, with degenerative changes at the

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Fig 1a. Abnormal *Valamugil cunnesius* no: 4001 CEMB; **b.** Normal *V. cunnesius.*

Fig 3. Abnormal *Valamugil cunnesius* no: 4002 CEMB.

Fig 2. Radiograph of abnormal *Valamugil cunnesius* no: 4001 CEMB.

Fig 4. Abnormal *Liza carinata* no: 4003 CEMB.

proximal and distal vertebrae in the thoracic region. The first two vertebrae do not have neural spine; the third and fourth vertebrae have weak neural spine while the normal neural spine appears in fifth neural vertebra (Fig 2).

Valamugil cunnesius. Specimen no: 4002 CEMB, was collected by gill net mesh size 38 mm from Bakran creek at St. 112, Lat. $24^0 47' 14$ N long. $67^0 17' 44$ E on October 30th, 2001 at 10.00 A.M. TL 155 mm, SL 120 mm, TW 39 gm, immature. Dorsal fin IV, I, 8; pectoral fin I, 15; pelvic fin 1, 5; anal fin no spines, has only 6 rays. Scales in lateral line series 32; head length 25%, body depth 26.6% in SL; eye diameter 6.6% in HL, pre-dorsal distance 50%; pre-pelvic distance 16.6%; pre-anal distance 72.5% in SL. Loss of three spines and pre-sence of 6 rays in anal fin, depressed caudal fin from the dorsal side and degenerated epurals in caudal are different from normal fish (Fig 3).

Radiograph. Radiograph of specimen shows degenerated epurals and dorsal caudal rays are weak. Spines present in the anal fin in normal fish are absent.

Liza carinata. Specimen no: 4003 CEMB was collected from Shun creek at St. 94, Lat. $24^0 43' 12$N and long. $67^0 12' 05$E caught by gill net mesh size 38 mm, on 28th June 2001 at 11.30 A.M.

TL 134 mm, SL 101 mm, TW 29.9 gm, immature male dorsal fin IV, II, 7, pectoral fin I, 14, pelvic fin I, 5, anal fin III, 9, scales in the lateral line 35.

Head length 34.65% (29.56% normal specimen) in the SL; body width 33.66% (26.95% normal specimen) in the SL; eye diameter 22.8% (23.52% normal specimen) in the HL; pre-dorsal distance 52% (59.13% normal specimen) in SL.

The head of the abnormal specimen bends down at the

anterior end with hump like elevation at the origin of the dorsal fin, which is the widest part of the body while the normal specimen is straight dorsally, progressing backwards with prominent keel or crest on the head. The widest part of the normal fish is in the middle of the body.

Meristic features of abnormal fishes show slight difference from normal specimen (Fig 4).

Radiograph. X-ray of abnormal fish shows fusion of first 2^{nd} and 3^{rd} thoracic vertebrae with loss of disc space. This loss of space may be attributed to the effect of infection during early embryonic development.

Liza carinata. Specimen no: 4004 CEMB, was collected from Chari Kund channel, backwater of Sandspit, St. 70, Lat: $24^0 50' 25$N, long: $66^0 56' 52$E, on November 21^{st}, 2001 at 11.45 A.M. by gill net mesh size 38 mm.

TL 105 mm, SL 79 mm, TW 12.5 gm, HL 28 mm; BD 28 mm; eye diameter 5 mm; immature. Dorsal fin IV, I, 8; pectoral fin 14; pelvic fin I, 5, anal fin III, 8; scales in the lateral line 37; total number of vertebrae 34; eye diameter 21.4% in HL; body width 35.4%; HL 35.4% of the SL; pre-dorsal distance 79%; pre-anal distance 79.7% of the SL. The body contour of a normal fish is straight however in the abnormal fish the dorsal and anal margins have become wavy due to the abnormal rotation of the vertebrae in longitudinal axis. The head and eyes have become prominent. Anal fin is situated at the rear end and extends slightly posterior (Fig 5).

Radiograph. Vertebral column shows continuous elevation and depression giving a wavy shape to thoracic and trunk vertebrae. At places where vertebral column has rotated, the gap at the union of two vertebrae has developed indicating

Fig 5. Abnormal *Liza carinata* no: 4004 CEMB.

Fig 7. Abnormal *Therapon jarbua* no: 6001 CEMB.

Fig 6. Radiograph of abnormal *Liza carinata* no: 4004 CEMB.

Fig 8. Radiograph of the abnormal *Therapon jarbua* no: 6001 CEMB.

loss of some anterior bones of centrum and probably has weak articulation (Fig 6).

Therapon jarbua. Specimen no: 6001 CEMB, was collected by gill net mesh size 57 mm from Port Qasim at St. 105, Lat. $24^0 46' 17$N and long. $67^0 18' 57$E, on August 23rd, 2001 at 6.30 P.M., (Fig 7).

TL 165 mm, SL 123 mm, TW 77.53 g, female spent stage, dorsal fin X. I. 10; anal fin III, 8; pectoral fin rays 13; Pectoral length 27 mm, pelvic fin I, 5 rays. Scales in the lateral series 85, HL 39.83% of SL (normal fish 35.2%); body width 62.54% (normal fish 42%); Eye diameter 4% (normal fish 2.96%); distance from snout to anal fin 76.27% (normal fish 65.91%); distance from anal to caudal fin 9.32% (normal fish 16.19%) of the total length.

The abnormal specimen differs from the normal specimen in body shape. Dorsally a deep vertical depression occurs in vertebral column at the union of 1st and 2nd dorsal fin, which further extends ventrally to the end of the anal fin. The 2nd dorsal and anal fins extend further reducing the length of caudal peduncle. The shape of anal fin differs from normal specimen in having smaller base adjusting itself with the changes that have occurred in the vertebral column. The changes in the shape of vertebrae have resulted in the wide body cavity. Abnormal specimen has large liver and even large gonads. The gonads were empty without eggs suggesting spent condition.

The abnormal fish differs from normal in having bigger eyes, large body width, distance from snout to anal fin is longer, and short caudal peduncle.

Radiograph. X-rays shows marked rotato-scoliosis of vertebral bodies with degenerative changes in the thoracic and caudal vertebrae. The first three vertebrae are degenerated and fused due to which the whole vertebral column has become wavy with two swell one at the anterior and the other at the posterior end with a depression in the middle. In the normal fish all neural spines from thoracic to trunk region are curved backwards but in the abnormal fish the neural spines of thoracic and trunk vertebrae are pointed forward and backwards (Fig 8).

Body anomalies have been reported to occur in fishes collected from the western and eastern coasts of Karachi. Mostly such abnormalities are congenital in origin often occurring in laboratory reared larvae as a result of exposure to cadmium and other chemicals found in industrial and oil pollutants (Manning 1980; Woodworth and Pascoe 1982; Barahona–Fernandes 1982). Endo *et al* (1994) have reported occurrence of kypholordis by the pathogens as *Myxobolus buri* and *M. spinacurvatura* in snappers.

Reports on the presence of heavy metals and other trace elements in waters of Karachi coast are available (Beg *et al* 1992) which can be the sources for developing such skeletal deformation. High level of copper concentration in organisms is reported for functional derangement and anatomical changes (Finlayson and Verrue 1985; Reid and McDonald 1988). Korangi creek and Sandspit backwaters from where these specimens were collected are rich with pollutants. These pollutants are composed of heavy metals that affect the nursery grounds of fishes perhaps causing infection at an early larval stage and may cause high mortality, those, which survive, may develop abnormalities. Occurrences of such abnormalities are rare and show no statistical significance.

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