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SKELETAL MALFORMATIONS AMONG THE *CLARIAS* SPECIES FROM FISH MONGERS IN EKITI STATE.

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ABSTRACT
Clarias species purchased from fish mongers from Ado – Ekiti, Ikun Ekiti, Itapaji – Ekiti Nigeria were examined for possible deformities in any part of their body. A total number of 360, 140, and 40 fish samples were from Ado – Ekiti, Ikun – Ekiti, and Itapaji – Ekiti respectively. Deformities of various types were observed only from Ado – Ekiti collection. The deformities observed are malformed mouth, big head, stumpy body, and multiple vertebral deformities. The possible cause (s) of the deformities may be as a result of stress, pollution from human activities or other factors such as poor nutrition, hereditary, diseases, etc. but these causes has not been properly determined.

KEYWORDS: *Clarias gariepinus,* Wild, Skeletal Malformation, Fish mongers, Ekiti State

INTRODUCTION

Spinal deformities in natural and reared fish populations are relatively well described and many reports have been published on different fish species (Endo and Iwatsuki, 1998, and Fagbuaro *et al*. 2006). In wild fishes, the visible abnormalities are usually encountered through fish activities, and scientific studies. Capturing of deformed fish in more or less polluted environment is common and often deformities are used as indicators of water pollution (Bengtosson 1979). When the level of deformities is high and exists in different age classes, it could be a sign of significant ecosystem changes or genetic changes of population. High incidence of deformities in fishes could influence the concerned species. Vertebral deformities like scoliosis (abnormal lateral curvature), lordosis (excessive inward curvature), kyphosis (excessive outward curvature) and ankylosis (abnormal stiffening and immobility of joint due to fusion of bones), though rare, but have been recorded for many species of teleosts (Dawson, 1964, 1966, 1971, 1976). The cause(s) of these have been ascribed to hazardous effects of environmental contamination, scarcity of nutrients, oxygen deficiency, sudden changes in temperature, water current, mutation, inbreeding, parasitic infestation, and mechanic trauma, attack from predators etc.(Amitabh and Firoz 2010, Fagbuaro 2009).

Clarias species are freshwater catfish characterized by their ability to utilize atmospheric air and walk on land for several hundred meters using their pectoral spines (Teugels, 1996). *Clarias* species are present from Africa to Southeast Asia where they are frequently exploited by fishermen and are produced in farms. Essential source of proteins from animal origin, they have gained a major economic importance (Legendre, 1992). *Clarias* are exposed to many physical and chemical variations, from human activities, temperature and salinity changes, to pollination especially the threatened ecosystems. This paper describes skeletal of malformations among the *Clarias* species collected from fish mongers in three different locations in Ekiti State. Nigeria.

MATERIALS AND METHODS

Adult specimen of *Clarias,* showing signs of abnormalities were skeletal from the pool of collection from fish mongers in Ado – Ekiti , Ikun – Ekiti, and Itapaji – Ekiti, Ekiti – State Nigeria. Sample sites were visited five times between July 2010 and march 2011. A total number of 360, 140, and 40 samples were collected and examined for deformities from Ado – Ekiti, Ikun – Ekiti, and Itapaji – Ekiti respectively. The fish were transported to the Zoology Department Undergraduate laboratory, Ekiti State University, Ado – Ekiti, immediately after collection, the samples with similar deformities were isolated and pooled together for further studies. The samples were then sorted to sexes and measured for their weight (g) and length (cm). The fish samples with deformities were later grouped together and photograph for easy study and comparison.

RESULTS

Various types of deformity were observed on the fish body immediately after collection from the fish mongers. The following features were observed in the abnormal species.

The big head species: The head appeared larger in comparison to the normal fish. The big head appeared to be as of ossification and compression of bones. The compression of bones occurred at the posterior region of the head (Fig 1A),

Mouth deformity: The mouth region of the normal fish is usually flattened (Fig 1C) but the species with the malformed mouth had depression on both lower and upper parts of the mouth to form angle with the body orientation. The U – shape feature makes the mouth to reduce in size or wideness (Fig. 1B and 1D).

Deformed caudal region: The posterior region of the body and the anterior bend sideway and make an angle of about 90^0 with the body orientation (Fig 2A)

Stumpy body: Is believed to be as a result of abdominal ossification of the trunk vertebrae. Deformed fish were shortened along the anterior – posterior axis, more deep bodied with shortened trunk compared to a normal fish (Fig. 2C). The posterior region of the trunk of the affected fish appeared compressed and many of the vertebrae were believed to have been fused (Fig.2C). The deformity makes the body of the affected fish rough and showing curvatures up to about 45^0 in relation to body orientation.

Multiple vertebral deformities: Vertebral deformities such as scoliosis (abnormal lateral curvature), lordosis (excessive inward curvature) and kyphosis (excessive inward curvature) were observed on a particular deformed fish (Fig.2B).

Table1. Shows the sex ratio and the mean body weight of females and males *Clarias* species collected from Ado – Ekiti, Ikun – Ekiti, and Itapaji – Ekiti. Out of the 540 table size fish collected 360 fish samples were collected from Ado – Ekiti, 140 from Ikun – Ekiti, and 40 individuals from Itapaji – Ekiti, the mean body weight of the fish ranged from 186 grammes to 236 grammes in both sexes.

Table 1: Sex ratio (number of females/ number of males) and mean body weight of females and males *Clarias* species collected from Ado – Ekiti, Ikun – Ekiti, and Itapaji – Ekiti.

Location	No of fish collected	Sex ratio	Body weight (g)	
			Female's	Males
Ado – Ekiti	360	1: 2	208	221
Ikun – Ekiti	140	1:1.2	186	210
Itapaji – Ekiti	40	1:8	235	205

DISCUSSION

Vertebral anomalies have been found in various kinds of fish stocks and wild populations. Vertebral deformities manifested themselves in various forms as dorso – ventral flexures (lordosis), lateral flexures (scoliosis), or backward spinal curvature (kyphosis), and are reported in many marine and fresh water fishes. Among the species reported on are batch of bream, *Abramis brama* (L) from Holland (Bucke 1974), *Barbus Sharpeyi*, *Barbus luteus*, *Barbus xanthopterus*, *Aphanius dispar*, and *Pampus argenteus* from Iran and United Arab Emirate (Al – Hassan, 1982); Mullets from New Zealand, *Mugi l cephalus* (Jawad, 2004) and Turkey *Liza abu* (Jawad and Oktener, 2007), Gobies, *Gobius niger* from Portugal (Antunes and LopesDa Cunha ,2002). *Zosterisesser ophiocephalus* (Dulcic, 2004), Cyprinid fish, *Garra variabilis* Heckel and *Carpoeta damascina* Val from Turkey (Dagli, 2008), India Carp *Cirrhinus mrigala* (Ham), (Amitabh and Firoz , 2010) and other fish species belonging to different taxonomic group in different part of the world.

Vertebral deformity: One of the most serious pathological effects on fishes may result from damages of eggs, embryo, larva, or cyto – toxic effects on different life stage of fish. Various authors had discussed the possible association of the skeletal deformities and environmental stress.(Villenuve et al. 2005 and Boglione et al. 2006) Incidences of vertebral deformities are more frequent in younger fishes as compared to older ones which may be attributed to high mortality of deformed fish at early stages. In some species, the deformed fish does not live to

grow old but in this species deformed one survived to the table size. Vertebral deformities may affect the biology of the affected fish indirectly through inhibiting its free movement (Jawad, 2004) .For example *Cyprinus Carpio* with spinal deformity either swim upside down or side ward and its growth is show compared to a normal ones. (Al – Harbi, 2001). Similar behaviour was observed in a pike, *Esox lucius* L with abnormal spinal cord (Wunder, 1978). Average length and weight of abnormal fish have been found to be substantially lower than that of normal fish, probably due to their inability to feed normally and to compete with the normal ones for food and other adequate resources (Al – Harbi 2004).

Several researchers have identified various factors for the different types of vertebral abnormalities. Pollutants have been considered to be responsible for deformities of different parts of the body of fish. (Subba 2004). Parasitic infestations and mechanical trauma contamination, oxygen deficiency, water current, salinity, sudden change in temperature, toxic chemicals, hereditary (Jawad and Oktener 2007). Also skeletal disorder which is as a result of complex mixture of vertebral and spinal malformations in larvae and juvenile fish have been linked to a poorly understood relationship between nutrition, environment and genetic factors (Lall and Lewis – Mc Crea, 2007).Other factors such as waste water from households was found to be responsible for curvature of spine in pike – perch (*Lucioperia sandra* L.) ,inadequacy of the key nutrients such as calcium, phosphorous in the pathogenesis of skeletal deformities, vitamins, lipids and nutrient interaction were implicated in the vertebral deformation in fish species (Lall and Lewis – McCrea 2007, Agrawal and Mahajan 1980). Experimental avitammosis C causes retarded growth and high mortality associated with vertebra deformations, lordosis, scoliosis, and haematopathological changes in *C. mrigala* (Agrawal and Mahajan, 1980). In this present case, the status of the mutation could not be determined since the fish samples were collected directly from the middleman who could not disclose the type (s) of feed used in nursing the fish. Malformation of vertebrae is sometimes resulted from severe curvature of the vertebral column from poor balance of lateral muscles (Komada and Moyer, 1983). Honghien *et al* (1977) reported in newly hatched larvae of *Clarias*, exposed to toxic levels of Malathion, the deformed notochord from uncontrolled contractions of body musculature that causes vertebral deformity. Amitabh and Firoz Ahmed (2010) reported that poor lateral muscle moving the 4 precaudal trunk vertebrae caused the Indian Carp. *C. mrigala* to bend towards left when the muscles immediately posterior to these developed to compensate for the bending and the process resulted in a loop formation on the right side of the caudal vertebrae. The process described could apply to what resulted in the condition of species in fig.3C. Although,this type of vertebral anomaly in *Labeo rohita*, an Indian carp that was attributed to have mechanical injury at an early stage of the development caused by some violence followed by irregular calcification (Kapoor and Sarkar 1955).

Fluctuation in water temperature is considered to be one of the causes of the spinal deformities (Al – Hassan, 1982, Wang and Tsai, 2000) as sudden change in water temperature may lead to abnormal muscle growth and spinal deformity. The towns where the fish were sampled are not exposed to variation in temperature hence it is unlikely that the vertebral abnormalities been induced by a drastic change in temperature during its larvae life or thereafter. Dissolved oxygen content of the water during spawning seasons and developmental stages may be responsible for the production of vertebral deformity. (Al –Hassan, 1992).

The vertebral shortening and anchylosis characterize a race of carp (*Cyprinus Carpio*) is determined to be hereditary (Wunder 1949) while the vertebral anchyloses in medaka is known to be hereditary and non-hereditary (Yamamoto *et al* 1963). Few studies have been carried out to observed the roles of hereditary and strain differences on the skeletal abnormality in cultured population of freshwater and marine fishes: European sea bass (*Dicentrarchus labravx*) (Bardon *et al.* 2009), *Oryzias latipes* Yamamoto *et.al.* (1963), Cyprinus Carpio L. (Al – Harbi, 2001), *Solea senegalensis* (Gavia, 2001). Vertebral abnormalities are known to occur in *C. mrigala* and *Hypothalmichthyp motitrix* due to inbreeding depression (Raj *et al*. 2004). Studies on lordotic anomalies indicated that lordosis has been reported in the guppy *Lebistes reticulation*, in Sword tail, *Xiphophorous helleri* (Rosenthal and Rosenthal 1950). The fish samples under study were not analyzed genetically hence it could not be ascertained weather the anomalies were hereditary or non – hereditable.

Mouth abnormalities of various types have been reported on European sea bass (*Dicentrarchus labrax* L.) (Barahona – Fernades 1982), common carp (*Cyprinus Carpio* L) (Al – Harbi 2001). In some deformed fishes, the head appear larger or smaller in comparison to normal fish due to ossification and comparison of bones (Al – Harbi, 2001). Other are characterized with Pugheadness, (shortening of the neurocranium) or dog heads, beak like appearance, inward bending of the lower and upper jaw as recorded in the fish under study (Al -Harbi 2001, Barahona - Fernades 1982). Jaw deformity was believed to have been caused by many factors such as

mechanical injury, nutritional deficiency, environmental condition, parasitism teratogenic substances and adverse or genetic aberration (Quigley 1995). The species with mouth malformation in this study has a very tiny mouth hence may find it difficult to feed properly. This singular reason may account for its lower weight and compared to normal one with higher weight. The deformities reported here were observed in both sexes. The exact cause of deformities could not be established because of lack of information from the fish mongers. The deformities may have been caused either by environmental disturbance, nutritional deficiency in the feeds, a genetic mutation, or a combination of the three factors. Inbreeding may likely be involved in these abnormalities in fish but in the absence of proper information no specific reason for the observed malformation can be established.

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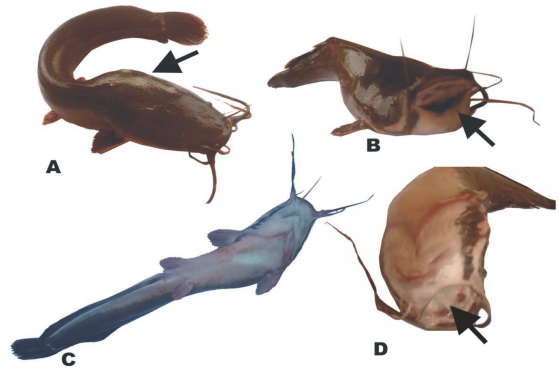
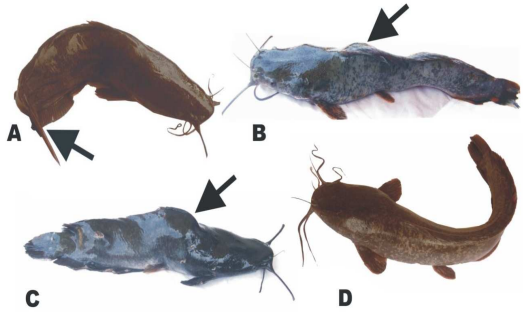


A = Big Head B = Malformed Mouth C = Normal Fish D = Malformed Mouth

Fig. 1 Observed deformities among *Clarias* spp. Obtained from fish mongers in Ekiti State.



A = Deformed tail region B =Wrinkled body C =Multiple vertebral deformities D =Normal

Fig. 2 Observed deformities among *Clarias* spp. obtained from fish mongers in Ekiti State.

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