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RESEARCH NOTE

Vertebral deformities in hardhead catfish *Ariopsis felis* (Siluriformes: Ariidae) in the southeastern Mexico

Deformidades vertebrales en el bagre *Ariopsis felis* (Siluriformes: Ariidae) en el sureste de México

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Abstract.- On 2 July, 2014 in the docking of the Copesmar fishing cooperative in Frontera, Tabasco, Mexico, an *Ariopsis felis* specimen was captured, which displayed kyphosis and scoliosis of the vertebral column, diagnosed by high resolution X-ray. This is the first report of axial skeleton deformities in the genus *Ariopsis*.

Key words: Ariidae, *Ariopsis felis*, vertebral malformations, spinal deformity, Southeastern Mexico

INTRODUCTION

Vertebral deformities can be 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) (Fagbuaro & Oso 2011).

In natural populations, vertebral abnormalities are related sewage and industrial effluents (Lemly 1993), exposure to chemicals (Liem *et al.* 1997) and biological and physical factors such as parasitism (Yokoyama *et al.* 2004) and mechanic trauma for attack from predators (Amitabh & Firoz-Ahmed 2010). Several cases of vertebral deformities have been reported in catfish (Table 1), but until now no record of a hardhead catfish *Ariopsis felis* (Linnaeus, 1766) has been reported.

The hardhead catfish *Ariopsis felis* is a tropical benthic fish distributed in coastal waters from North Carolina to Florida and throughout the Gulf of Mexico to the Yucatán peninsula (Acero 2002). This species is generally found mostly in estuaries, through the surf zone and into near-coastal waters of the shelf and river mouths, over muddy bottoms, or at least in murky waters (Acero 2002).

The hardhead catfish is a dominant species in the coast and coastal lagoon of Tabasco and Campeche (Ayala-Pérez *et al.* 2003) and it is a one commercial fish species in Southeastern Mexico, its landings represent about 2.5-3.4% of the longline small scale fishery of Tabasco (Mendoza-Carranza *et al.* 2012). In the current fish species, the first record of vertebral deformities is presented.

MATERIALS AND METHODS

Ariopsis felis specimen was caught with a cast net 3 m in diameter and 7.6 cm mesh size during July 2, 2014 in the docking of the Copesmar fishing cooperative in Frontera, Tabasco, Mexico (18°32'12.74''N-92°39'19.98''E). This place is under great influence from the sea by proximity of the Usumacinta River mouth.

The total length (mm) and weight (g) of hardhead catfish was measured and was then frozen and transported to the laboratory. The fresh specimen (lateral and dorsal aspect) was radiographed using a medical X-ray system and the radiographs were used to evaluate the anomalies observed (vertebrae and caudal bones). The specimen was deposited in the Colección ictiológica regional de referencia UMDI Sisal under catalog number CIRR-UMDI-Sisal-355.

RESULTS AND DISCUSSION

At the posterior region of the present fish vertebral anomalies were visible immediately after capture, with the spine curved in one or more places (Fig. 1). According to X-ray radiographs (Fig. 2), 2 types of spinal deformity, kyphosis and scoliosis, were determined. The specimen with vertebral deformities has a total length of 250 mm.

Skeletal deformities can be physical and/ or environmentally induced. Physical causes can be from mechanic trauma and attack from predators (Amitabh & Firoz 2010). By environment can be by alteration of the biological processes necessary for maintaining the biochemical integrity of bone, as many organic

Table 1. Deformities reports in Siluriformes / Reportes de deformidades en Siluriformes

Family	Species	Deformities	Life stages	Cause	References
Bagridae	*Mystus gulio*	Lordosis	Adult	Not determined	Marimuthu *et al*. (2000)
	Pelteobagrus fulvidraco	Lordosis	Larvae	Not determined	Huang *et al*. (2016)
Callichthyidae	*Corydoras paleatus*	Kyphosis, lordosis and scoliosis	Adult	Chemical environmental factors	Flores-Lopes & Reuss-Strenzel (2011)
Clariidae	*Clarias gariepinus*	Lordosis	Larvae	Malathion exposure	Liem *et al*. (1997)
	Clarias gariepinus	Upper jaw	Juvenile	Malathion exposure	Subba (2004)
	Clarias gariepinus	Lordosis and kyphosis	Adult	Not determined	Eissa *et al*. (2009)
	Clarias gariepinus	Lordosis and kyphosis	Adult	Various	Alarape *et al*. (2015)
	Heterobranchus longifilis	Scoliosis & kyphosis	24-week-old	Environmentally induced congenital defects	Suleiman *et al*. (2015)
Heptapteridae	*Heteropneustes fossilis*	Lordosis and scoliosis	Larvae	Malathion exposure	Srivastava & Srivastava (1990)
	Heteropneustes fossilis	Lordosis and kyphosis	Embryos	Alkylphenol polyethoxylates	Chaube *et al*. (2013)
	Rhamdia quelen	Lordosis	Embryos & larvae	Cadmium	Benaduce *et al*. (2008)
	Rhamdia quelen	Fusion compression	Larvae	Diets	Hernández *et al*. (2013)
Ictaluridae	*Ictalurus punctatus*	Lordosis	fingerlings	Vitamin C deficiency	Lim & Lovell (1978)
	Ictalurus punctatus	Lordosis and kyphosis	Adult	Selenium level	Lemly (1993)
	Ictalurus melas	Lordosis	Adult	Selenium level	Lemly (1993)
	Ictalurus furcatus				Schmitt & Orth (2015)
Loricariidae	*Pterygoplichthys pardalis*	Kyphosis and scoliosis	Adult	Plaguicides, heavy metals	Wakida-Kusunoki *et al*. (2014)
Pimelodidae	*Pseudoplatystoma coruscans*	Deformity of jaw line	Fingerlings	Vitamin C deficiency	Fujimoto *et al*. (2013)
	Pseudoplatystoma punctifer	Lordosis, kyphosis and scoliosis	Juvenile	nutritional and abiotic parameters	Estivals *et al*. (2015)

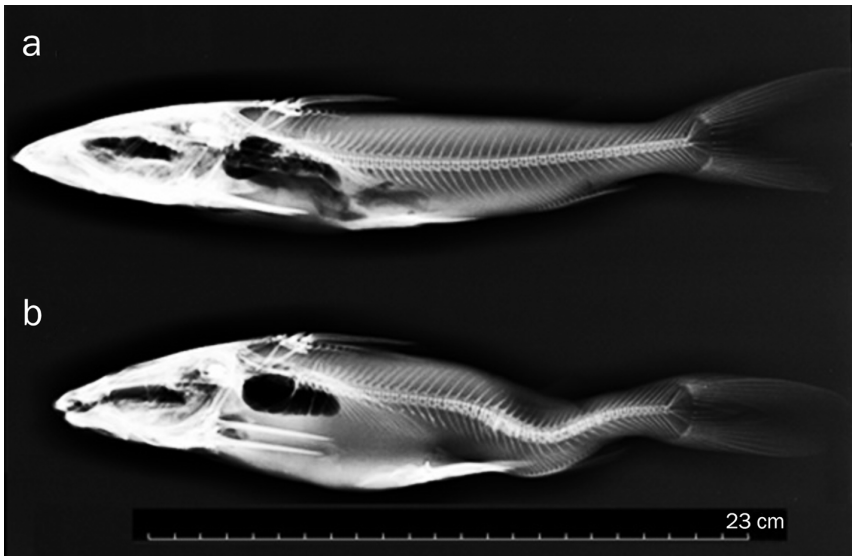

Figure 1. Lateral view X-ray radiographs of *Ariopsis felis* from Frontera, Tabasco (Mexico), a) normal and b) with kyphosis-scoliosis / Radiografías de la vista lateral de *Ariopsis felis* de Frontera, Tabasco (México), a) normal y b) con cifosis-escoliosis

Figure 2. Dorsal view X-ray radiographs of *Ariopsis felis* from Frontera, Tabasco (Mexico), a) with kyphosis-scoliosis and b) normal / Radiografías de la vista dorsal de *Ariopsis felis* de Frontera, Tabasco (México), a) con cifosis-escoliosis y b) normal

contaminants, such as organochlorines, polychlorinated biphenyls and fluorinated herbicides (Mehrle & Mayer 1975) or neuromuscular effects, which lead to deformities without a chemical change in vertebral composition as some metal such as cadmium, zinc, mercury and lead can also affect the neuromuscular system (Sauer & Watanabe 1984).

Specifically to Siluriformes, some studies mention that the causes of skeletal deformities may be the exposure to malathion and other chemicals (Srivastava & Srivastava 1990), poor immune response or fluctuations in water quality, or accidental injuries during the life cycle (Marimuthu *et al*. 2000). However, because of the isolated observations and lack of data on the aquatic environment, we cannot establish any correlation between any environmental anomalies. In the present study, perhaps no single factor could be attributed as the cause of vertebral column deformities.

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