INT. J. BIOL. BIOTECH., 22 (2): 383-390, 2025.

ANALYSIS OF ABNORMALITIES IN THREE WILD-CAUGHT MARINE FISH SPECIES

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ABSTRACT

Fish hold significant importance both commercially and as a food source. Overall, fish make up 50% of all vertebrate species. However, reports on abnormalities in wild-caught marine fish from Pakistani waters are scarce.

During routine fishing, fishermen caught three types of deformed fish and provided them for study. Based on their morphological characteristics, we identified the species as *Sphyraena jello* (Cuvier, 1829), *Planiliza parsia* (Hamilton, 1822), and *Pampus argenteus* (Euphrasen, 1788). Further examinations, including X-ray imaging, were conducted and compared with normal wild specimens.

The aim of this study is to highlight the presence of abnormalities in fish populations along our coastal waters. X-ray imaging revealed that the deformities in *S. jello* and *P. parsia* were more severe and potentially lethal compared to those in *P. argenteus.* These abnormalities could affect mobility, speed, and feeding efficiency. The possible causes of such deformities may include predatory attacks or environmental factors.

Key-words: Marine Fishes, Abnormality, Morphological analysis, X- ray image

INTRODUCTION

Pakistan's coastline extends from Sindh to Baluchistan and includes an Exclusive Economic Zone (EEZ). It supports a diverse range of economically important species, particularly fish. Among vertebrates, fish contribute 50% of the region's biodiversity. Fish and fisheries are essential sources of food and economic stability for humans (Ghouri *et al*., 2020) and play a crucial role in the economies and livelihoods of many communities.

Sphyraena jello, commonly known as the Banded Barracuda, is notorious for its aggressive predatory behavior, earning it the nickname "tiger of marine waters." As a top predator, it plays a significant role in maintaining marine biodiversity (Friedlander and de Martini, 2002). To date, 29 species of barracuda have been reported worldwide, with nine species identified in Indian waters and eight in Pakistani marine waters (Eschmeyer and Fong, 2013; Abdussamad *et al*., 2015; Psomadakis *et al*., 2015).

Planiliza parsia, belonging to the family Mugilidae, is commonly known as the Goldspot Mullet. It inhabits the shallow waters of the Arabian Sea, including Pakistani marine waters. It is highly valued for its taste and nutritional benefits (Rayhan Khan *et al*., 2021).

Pampus argenteus, commonly known as butterfish or silver pomfret, is found in the marine waters of the Middle East, South Asia, and Southeast Asia. It is a benthopelagic species (Pauly *et al*., 2000).

Abnormalities in fish have been documented for decades (Al-Hassan, 1983, 1985; Sinderman, 1990; Brown and Nuñez, 1998; Jawad, 2002, 2014). Potential causes of these abnormalities include unfavorable environmental conditions, habitat pollution (Jawad, 2014), or injuries sustained during aggressive predation. In commercially significant fish species, morphological deformities are a serious concern, as they reduce market value and make affected individuals undesirable to consumers, resulting in financial losses for fishermen. Therefore, it is crucial to conduct thorough research on the causes of such abnormalities to determine whether they pose a threat to market sustainability or public health. If these deformities are linked to chemical pollution, they could present serious risks to human health. Regular monitoring and research are essential to identify and address potential threats to public health.

Reports of fish anomalies have been documented for years, drawing researchers' attention to the causes of these abnormalities (Orlov, 2011; Rutkayová *et al*., 2016; Jawad *et al*., 2018). Skeletal deformities in fish are often observed in early life stages due to unfavorable environmental conditions (Lemly, 1993). Fishermen frequently

encounter such abnormalities during fishing and trawling activities. Researchers use various techniques to analyze these deformities, including X-ray imaging, double staining, and computed tomography (Boglione and Costa, 2011; Ortiz-Delgado *et al*., 2014). X-ray imaging is particularly effective in identifying skeletal anamolies in fish (Korkut *et al*., 2009; Boursaki *et al*., 2019).

The objective of this study was to identify the presence of deformities in marine fish. Abnormalities were observed in three species *Sphyraena jello*, *Planiliza parsia* and *Pampus argenteus* collected from Pasni, Baluchistan. This study focused on the types of deformities and their possible causes. The findings will serve as a valuable reference for future research.

MATERIALS AND METHODS

Collection

Samples of three fish species (*Planiliza parsia*, *Sphyraena jello* and *Pampus argenteus*) were collected from Pasni, Baluchistan, and transported to the laboratory at the Centre of Excellence in Marine Biology, University of Karachi, for experiments. The fish identified using standard identification keys like Bianchi, (1985), and fish base. The fishes were photographed for documentation.

X-ray Imaging Analysis

Both healthy and abnormal fish were subjected to X-ray imaging, and the X-ray photographs were carefully examined. Healthy fish were used as controls for comparison.

RESULTS

Individuals from three species (*Planiliza parsia*, *Sphyraena jello* and *Pampus argenteus*) were found to be injured.

S. jello

The X-ray images revealed that the barracuda had a fracture in its vertebral column, which may have affected the nerve cord. However, the fracture has healed, with the adjacent vertebrae reconnecting, so no definitive conclusions regarding the nerve cord can be drawn from this experiment (Fig. 1).

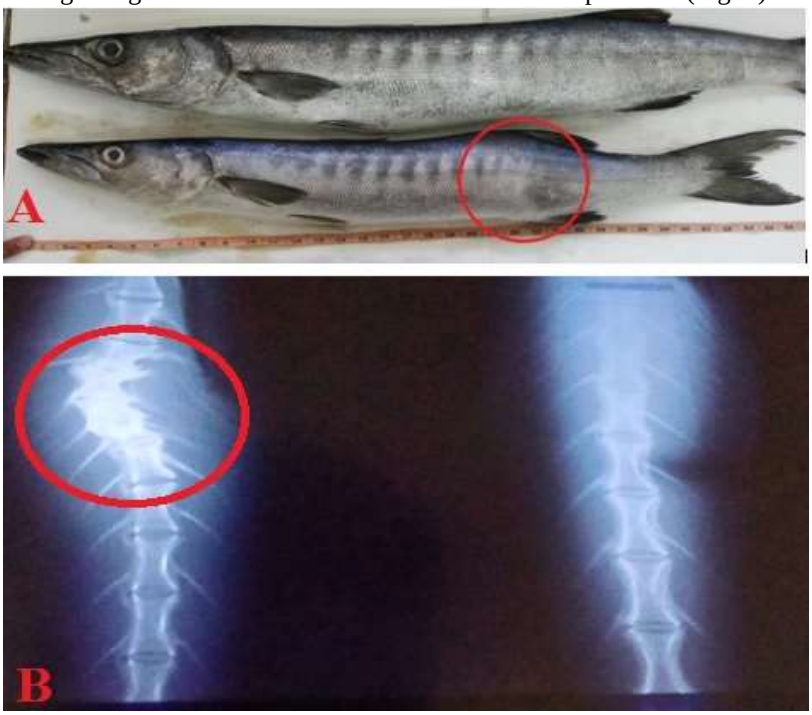

Fig 1. A- Showing the normal and deformed skeleton, B. Showing the X- ray image of normal and deformed skeleton of *Sphyraena jello.* Red circle indicating the deformed

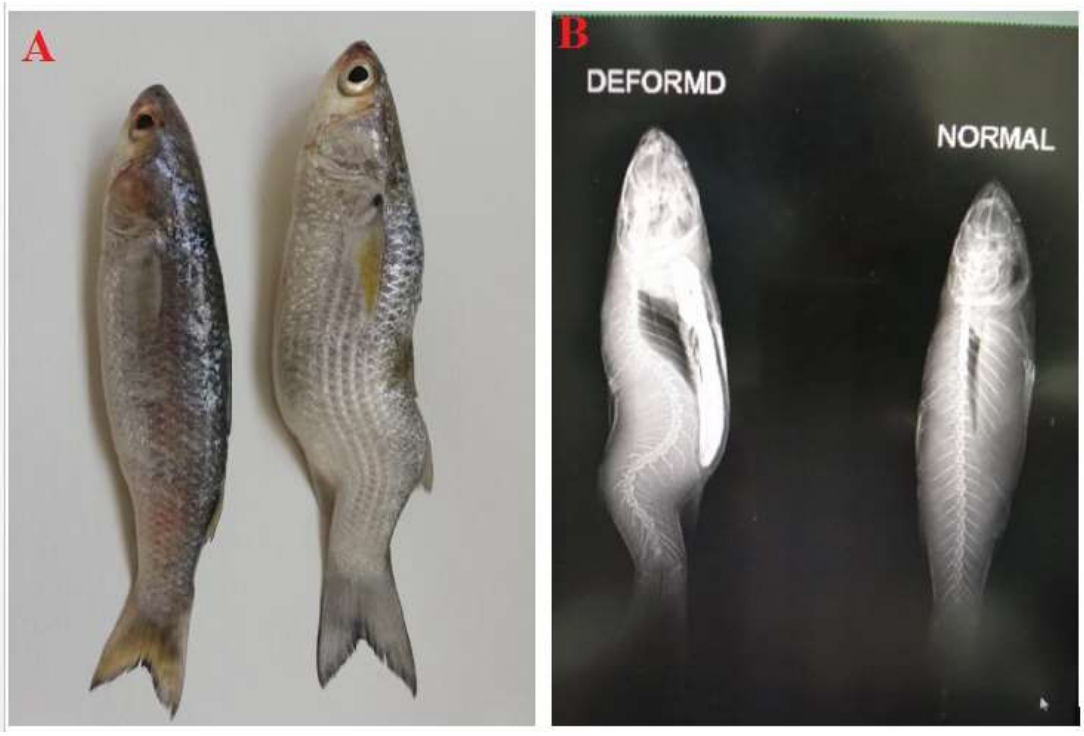

Fig.2. Deformed and Normal vertebral column of *Liza parsia*

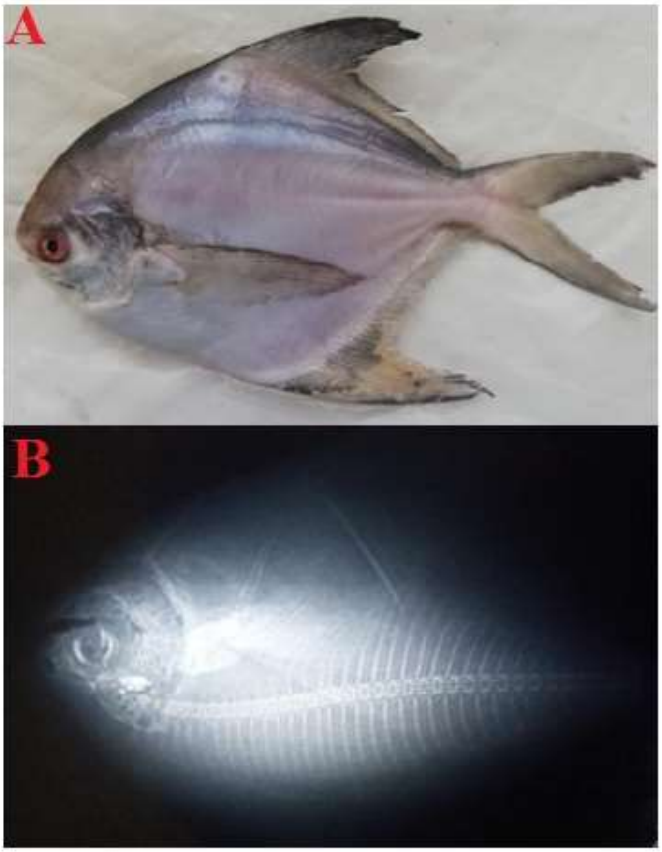

Fig 3. A and B are showing the normal individual of *Pampus argenteus* captured in coastal area at Pasni.

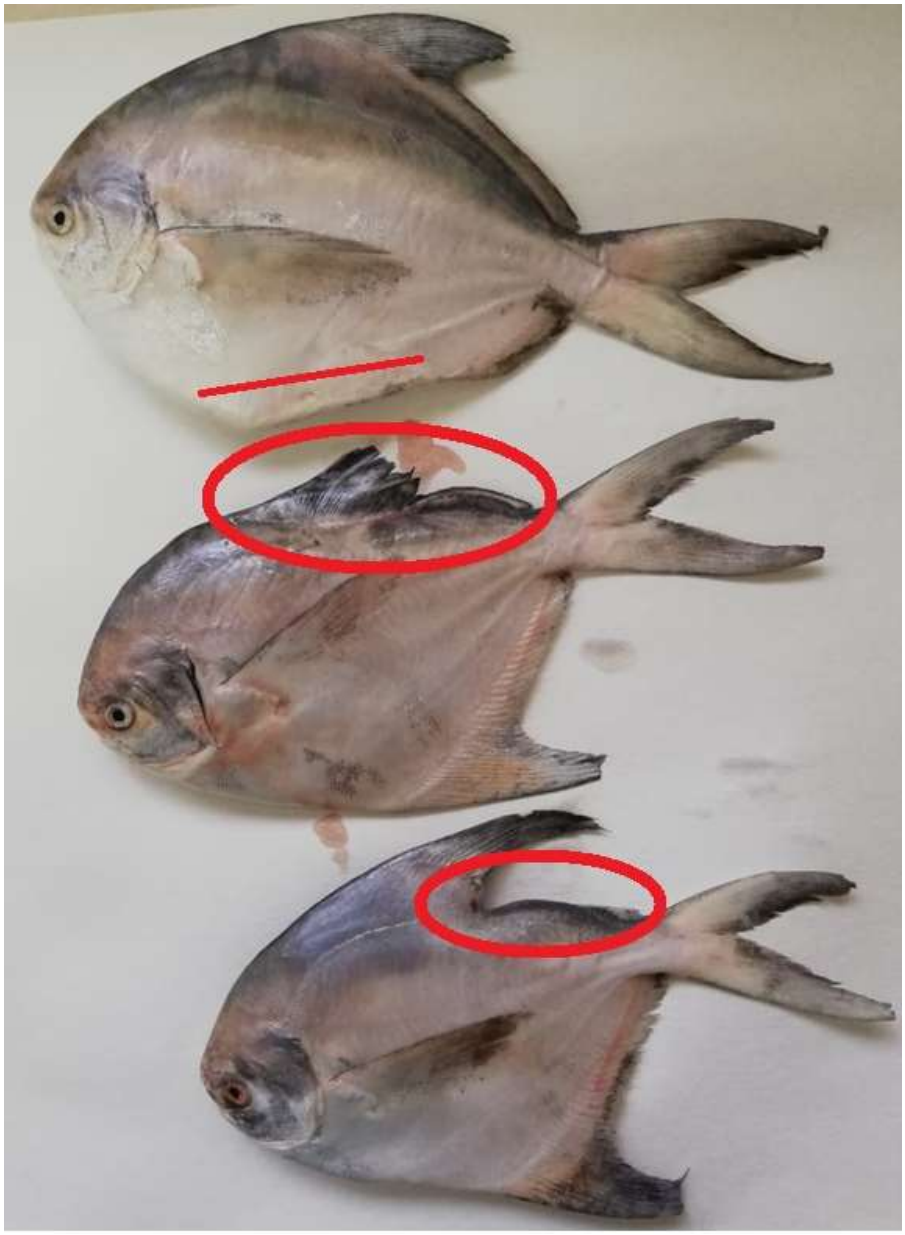

Fig 4. Showing the deformalities in *Pampus argenteus*, the red bar and circles are showing the area of abnormalities.

P. parsia

This species, an economically significant fish found in shallow coastal waters, displayed deformities in its vertebral column. These deformities were not the result of any injury but rather indicated the presence of lordosis (Fig. 2).

P. argenteus

The silver pomfret is well-known for its delicate taste. Several deformities were observed in the individual, which may have resulted from attacks by predators such as croakers, sharks, or other species. Anomalies were noted in the ventral fin, dorsal fin, and the dorsal side of the body (Fig. 3, 4, 5 A and B).

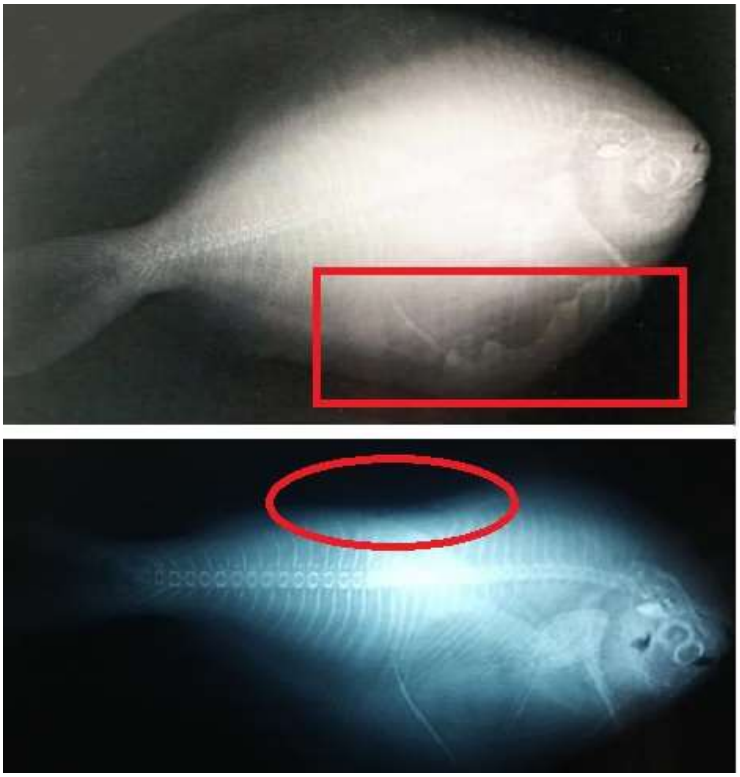

Fig. 5A. X- Ray image of *Pampus argenteus* are showing abnormalities.

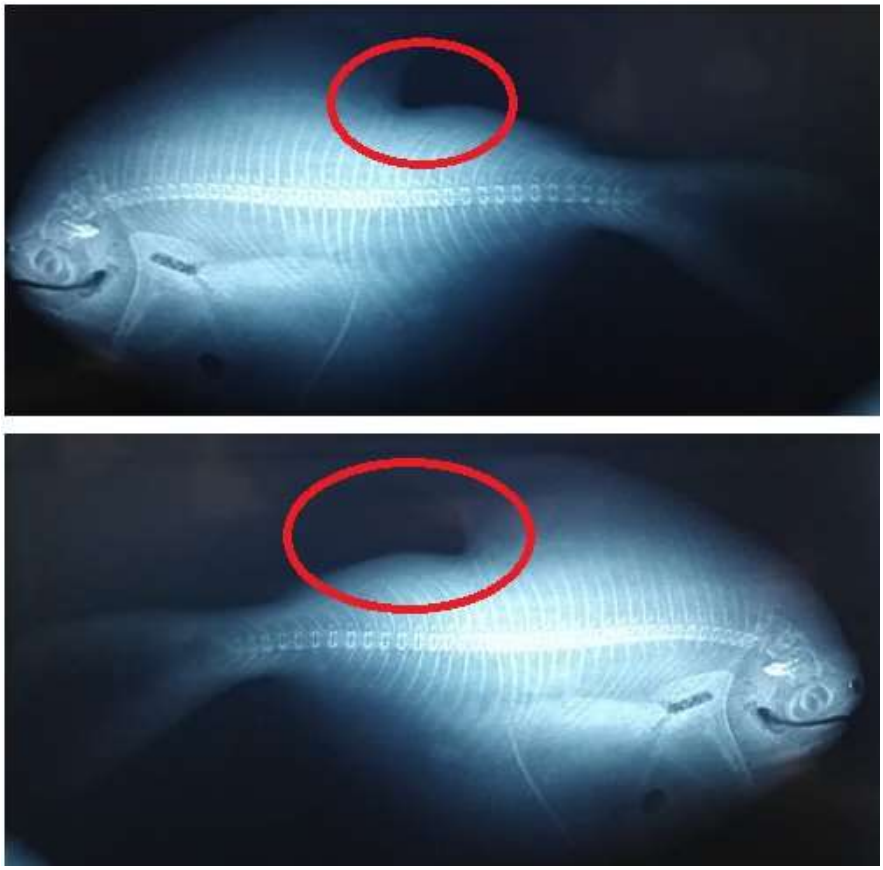

Fig. 5B. X- ray images of *Pampus argenteus.*

DISCUSSION

It has been reported that anomalies often arise during ontogenesis (Boglione *et al*., 2013). However, vertebral column deformities can also develop at later stages due to various factors, including mechanical overload or curvature of the axis (Ortiz-Delgado *et al*., 2014; Özesen, 2020). Additionally, other physical, chemical, or biological factors can contribute to anomalies under natural conditions (Tutman *et al*., 2000).

The presence of metals and hydrocarbons in the Arabian Gulf has been consistently reported over the years, affecting water, sediments, fish, and other marine organisms (Shriadah, 1999; De Mora *et al*., 2004). Deformities in fish and other marine species have also been documented (De Mora *et al*., 2004; Al-Mamry *et al*., 2010).

Fish deformities have been reported in several regions, including Kuwait (Almatar, 2010), Oman (Jawad, 2014), and Pakistan (Hussain and Khatoon, 2004), among others. These anomalies are not limited to the vertebral column; researchers have documented various issues such as malpigmentation, malformed scales, lateral line defects, uninflated swim bladders in post-larvae, and more (Beraldo and Canavese, 2011; Boglione and Costa, 2011). The causes of these deformities vary and may include genetic factors (Valverde *et al*., 2005), nutritional deficiencies (Lall *et al*., 2007), infections (Yokoyama *et al*., 2005), temperature fluctuations (Hore and Ahmad, 2010), salinity changes (Silverstone and Hammell, 2002), low dissolved oxygen levels (Alderdice *et al*., 2011), excessive CO_2 in water (Martens *et al*., 2006), or exposure to toxic substances (Sun *et al*., 2009).

Sphyraena jello

In the present study, we observed that *S. jello* had likely been attacked by a predator, after which the injury healed, resulting in disassociated vertebrae fusing together. However, we were unable to determine whether the nerve cord remained functional. Research on skeletal deformities in the genus *Sphyraena* is limited, but Jawad and Akyol (2023) reported lordo-kyphosis in the European barracuda (*S. sphyraena*).

P. parsia

The specimen we examined exhibited lordosis, similar to the anomalies reported in *Liza carinata* by Hussain and Khatoon (2004), who attributed such deformities to heavy metal contamination and other trace elements. However, we believe these skeletal deformities are more likely linked to ontogenetic disorders.

P.argenteus

The anomalies observed in silver pomfret were likely the result of predator attacks, with subsequent healing of injuries. Similar cases have been documented in previous studies (Al-Mamry *et al*., 2010).

Research on skeletal deformities in the studied fish species has received limited global attention, possibly due to the relatively low occurrence of such anomalies. However, studies indicate that certain skeletal deformities can have fatal consequences, particularly when induced by environmental factors. In contrast, accidental deformities appear to be less common. Vertebral column deformities pose a significant threat to fish survival, whereas fin anomalies, such as those observed in silver pomfret, primarily hinder movement but may not be life-threatening.

Conclusion

This study highlights the presence of natural anomalies in marine environments and emphasizes the need for continuous monitoring. The findings may serve as a reference for future environmental assessments and conservation efforts.

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(*Accepted for publication March 2025*)