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Deformity in *Priacanthus hamrur* (Forsskal, 1775) in Trawl Landings from South West Coast of India

Paras Nath Jha*, Renjith, R.K., Chinnadurai, S. and Remesan, M.P.

ICAR-Central Institute of Fisheries Technology, Matsyapuri P.O., Willingdon Island, Cochin-682029, India
**Email: parasincof@gmail.com*

Abstract

During operation of experimental off bottom trawl net at a depth of 32-35 m, a deformed specimen of *Priacanthus hamrur* (Forsskal, 1775) was caught on board fisheries research vessel (R.V. Matsyakumari-II) of Indian Council of Agricultural Research-Central Institute of Fisheries Technology (ICAR-CIFT), from the south west coast of India. Collected specimen was carefully examined and morphometric/meristic counts were recorded. The examined-specimen revealed presence of morphological and anatomical anomalies. Normal specimens were also collected from same haul for morphometric/meristic comparison with deformed fish. The radiograph, which is usually employed to determine the extent and cause of the deformity showed a deformity on caudal peduncle near caudal fin. This was due to the deformed upper lobe of hypural complex, whereas lower hypural and parhypural complex were fully formed. Except in the caudal peduncle region; morphometric, meristic and osteological characters were found alike to the normal specimen and the deformity on the caudal peduncle, did not affect the growth of the fish. Deformity of bulls eye is being reported first time from south west coast of India.

Keywords: Morphological/anatomical anomaly, Bulls eye, Eastern Arabian Sea

1. Introduction

Priacanthus hamrur (Forsskal, 1775), commonly known as "bulls' eye", is a marine perch belonging to the family Priacanthidae which comprises 18 species. Geographic distribution of this group comprises of Indo-Pacific region with one species confined to the Eastern Pacific and two to the Atlantic Ocean (Starnes, 1988). Literature reveals about the prevalence of several types of deformity and abnormalities in wild fishes (Boglione *et al*., 2006; Jawad and Hosie, 2007; Jawad and Oktoner, 2007; Koumoundouros, 2008; Al-Mamry *et. al.*, 2010; Jawad and Al-Mamry, 2012). Absence of tail or its compression is a type of deformity in farmed as well as wild fishes (Lemly, 1993, Honma, 1994). However, occurrence of deformity or absence of tail is rare in wild fish stock (Divanach *et al.*, 1996). Several authors reported extreme skeletal deformities in wild fishes (Matsuoka 1987; Boglione *et al*., 2006). Skeletal deformities normally starts during early stages of life which is mainly caused by unfavourable environmental conditions (Sfakianakis *et al.*, 2004; 2006), substandard water quality *viz.* pollutants, (Bengtsson, 1979; 1988; Lemly, 1993) lack of nutrition, inbreeding depression, genetic mutation (Ishikawa, 1990), epigenetic aspects (Tave *et al.*, 1983; Gjerde *et al.*, 2005; Fjelldal *et al*., 2009) and abnormal hydrological conditions (temperature, light intensity, salinity, pH, oxygen concentrations, hydrodynamic conditions etc.) and external or internal parasites (Chatain, 1994; Gavaia *et al.*, 2009). Different types of spinal deformities such as scoliosis, lordosis, kyphosi and ankylosis were already observed and reported in both cultured and wild population of many species (Divanach *et al.*, 1997; Afonso *et al.*, 2000; Kranenbarg *et al.*, 2005; Jawad, 2014; Jawad and Liu, 2015; Jha *et al.*, 2017). The reason for different types of deformities and anomalies are has been detailed in several literatures (Divananch *et al.*, 1996; Jawad *et al.*, 2013; Jawad and Liu, 2015). Normally it is supposed that majority of deformities are linked with genetic reasons and heritable in nature, but most of them are non-heritable and acute or chronic disease is major cause (Tave, 1993). Some deformities abnormalities are severe that it affects the wellbeing of the fishes, while others may not be critical to survival (Ershov, 2008). It has been already reported that deformities are relatively rare in wild condition (Gavaia *et al*., 2009), and could affect growth and survival of fish (Bogutskaya *et al.*, 2011). Evidences also state that congenital deformity may not affect growth and physiology in fishes (Renjith *et al.*, 2018). The competition for food in wild is at greater extent and in this situation the small fishes are vulnerable to get preyed by predatory fishes. Injury by predator also one of the important factors for deformity (Gunter and Ward, 1961) as well as environmental disturbances and fishing gear interaction (Grady *et al.*, 1992). Once fish gets injured and survived there are more chances for predation by predatory fishes. Deformed fish(s) are present in most of the fish stocks/ population which could be revealed only after detailed morphometric and meristic examination. In farmed condition deformity is quite common. Afonso *et al*., (2000) reported 39 deformed species out of 11,640 nos. of *Sparus aurata* (gilthead sea bream) in hatchery population. About 80% of *Sparus aurata* under intensive culture system were reported deformed (Verhaegen *et al.*, 2007). Some of the studies on tilapia population have also indicated deformity in population. Guilherme (1992) reported 48% fin deformity in farmed *Oreochromis niloticus*. Eissa *et al.* (2009) also found 2.7% and 1.6% deformity in *O. Niloticus* at two farms situated at Egypt.

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2. Materials and Methods

A single deformed specimen of *Priacanthus hamrur* (Forsskal, 1775) was collected on board fisheries research vessel (R.V Matsyakumari-II) of ICAR-CIFT from the south-western coast of Arabian Sea (off Kollam) while experimental fishing using bottom trawl during January 2018 (09°47.359'N; 076° 06.207'E, Depth: 32-35 m). Collected specimen was carefully examined for presence of parasites, amputations and other morphological anomalies. Deformity was observed on caudal peduncle (Fig. 1). Normal specimen was also collected from same haul for comparative study based on morphometric and meristic traits. The specimen was following standard FAO fish identification manual. For more insight of the study the radiograph of a normal specimen as well as the deformed specimen was obtained to determine the extent of the deformity (Fig. 2 & 3). Morphometric characters were measured using a digital vernier calliper with accuracy of 0.1 mm. Morphometric and meristic traits of both, deformed and normal fish of same stock, were recorded separately and compared.

3. Results and Discussion

The present study details about the deformity of caudal fin observed in *Priacanthus hamrur* (Forsskal, 1775), which was collected during experimental fishing using bottom trawl . The morphological examination revealed absence of the upper lobe of caudal fin and there was slight upward growth of soft rays of lower caudal fin. Percentage of deformation for different fins and base length of fin was calculated on the basis of standard length of deformed fish. It was observed that 31.66, 20.83, 31.25, 16.66, 31.66, 30.00, 5.41, 33.45, 30.86, 23.04 and 10.53% deformity extent for the 1st dorsal fin base length, 2nd dorsal fin base length, pre dorsal fin length, post dorsal fin length, pre pectoral fin length, pre pelvic fin, pectoral fin base length, max body depth, head length, head depth and for eye diameter, respectively. Comparision of morphometric measurements and meristic counts (Table 1) of deformed and normal specimens (Table 2) were based on percentage in standard length. Detailed analysis of radiograph shown that the upper lobe of hypural complex was deformed whereas lower hypural and parhypural complex was fully formed. Preural centrum and urostyle was found intact with a underdeveloped upper hypural complex which signifies extensive damage at early life stage (Fig. 3). The radiograph of deformed specimen shows the complete recovery from possible early stage predation. Hence, it is presumed that attack by predator, probably at an early stage might have led to such type of deformity.

The deformity affects physiology of fishes directly as it affects swimming movements (Sadler 1990). Mouth and skeletal deformity may affect biological fuctions including growth (Noble *et al.*, 2012) . However, in present case no significant variation was observed between normal and deformed fish which indicates that the deformity has not affected growth Such deformity may not alter the nutritional quality of fish; however, the deformity could lead to reduce market demand due to aesthetic concern (Afonso *et al.*, 2000; Castro *et al.*, 2008).

Record of deformities encountered while fishing can be used as an indicator for stress, pollution and unfavourable surroundings (Bengtsson, 1979). Generally, farmed fishes, especially those raised in contaminated water show morphological, histological or parasitic types of abnormalities and this could be used as a biomarker (Sindermann, 1979; Parente *et al.*, 2004; Guilherme *et al.*, 2008; Sun *et al.*, 2009). Some chemicals can alter physiological process inside body which is reported to be the potential cause of undeveloped body part. The agricultural runoff contains persistent organic pollutants such as the pesticide DDT, which is one of the major causes of skeletal deformities in fishes (Bengtson *et al.*, 1985). flounders caught in urban and industrial sites of New Zeeland showed reduced health with lesions in liver (Wilson 1999). Deformity and undeveloped fin cause less hydrodynamic stability, which alter the function of tail and leads to reduced swimming performance as well as increase chance of predation and starvation (Jawad, 2004). Deformity in caudal fin may also adversely affect

Fig. 1. Photograph showing normal and deformed species of *Priacanthus hamrur* (Forsskal, 1775)

Table 1. Comparative morphometric and meristic characters of normal and deformed *Priacanthus hamrur* (Forsskal, 1775)

Morphometric measurements (cm)/ Meristic counts (nos.)	Normal fish (cm)	Deformed fish (cm)
Total length	28.5	25.3
Standard length	24	24.3
First Dorsal fin base length	7.6	7.8
Second dorsal fin base length	5	5.6
pre dorsal fin length	7.5	7.7
post dorsal fin length	4	4
pre pectoral fin length	7.6	7
Pectoral fin base length	1.3	1.2
pre pelvic fin length	7.2	6.7
Pre anal fin length	12	12
Anal fin base length	7.8	7.7
Eye diameter	2.5	2.56
Inter-orbital length	1.7	1.7
max body depth	7.6	7.4
Minimum body depth	1.6	2.7
head length	7.6	7.5
Head depth	6.2	5.6
Distance between orbit and upper lip	2.4	1.95
Distance between upper lip and dorsal fin	6.7	6.5
Length of longest pectoral fin ray	3.6	3.4
Length of 1st spine of dorsal fin	1.3	1.3
Length of 2nd spine of dorsal fin	1.3	1.5
Length of 10th spine of dorsal fin	2.65	3.2
Length of 1st spine of anal fin	2.1	2.15
Length of 2nd spine of anal fin	2.3	2.3
Length of 3rd spine of anal fin	2.6	2.6
Meristic count (Nos.)		
Lateral line scale	86-87	79
First dorsal fin spine	**X** 14	**X** 14
Pectoral fin rays	18	19
Pelvic fin spine	**I** 5	**I** 5
Anal fin spine	**III** 15	**III** 15
Caudal fin rays	16	Deformed
Weight (g)	298	306

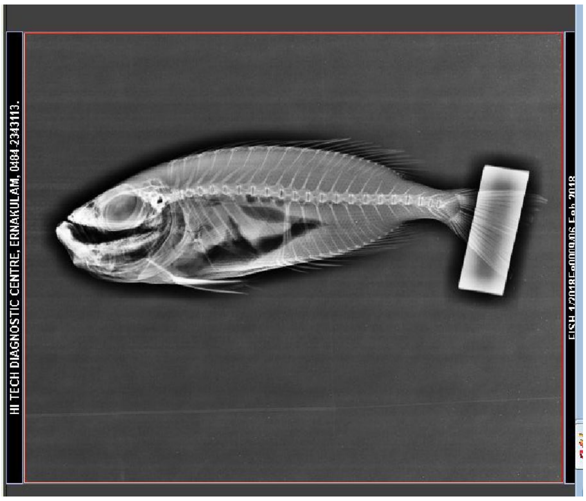

Fig. 2. Radiograph showing normal species of *Priacanthus hamrur* (Forsskal, 1775)

Fig. 3. Radiograph showing deformed species of *Priacanthus hamrur* (Forsskal, 1775)

Table 2. Morphometric comparison of (percent of standard length in cm) of normal and deformed *Priacanthus hamrur* (Forsskal, 1775)

Morphometric characters	**Normal fish** (percent of standard length)	**Deformed fish** (percent of standard length)
Standard length	-	-
First Dorsal fin base length	32.09	31.66
Second dorsal fin base length	23.04	20.83
pre dorsal fin length	31.68	31.25
post dorsal fin length	16.46	16.66
pre pectoral fin length	28.8	31.66
Pectoral fin base length	4.93	5.41
pre pelvic fin length	27.57	30
Pre anal fin length	49.38	50
Anal fin base length	31.68	32.5
Eye diameter	10.53	10.41
Inter-orbital length	6.99	7.08
max body depth	30.45	31.66
Minimum body depth	11.11	6.66
head length	30.86	31.66
Head depth	23.04	25.83
Distance between orbit and upper lip	8.02	10
Distance between upper lip and dorsal fin	26.74	27.91
Length of longest pectoral fin ray	13.99	15
Length of 1st spine of dorsal fin	5.34	5.41
Length of 2nd spine of dorsal fin	6.17	5.41
Length of 10th spine of dorsal fin	13.16	11.04
Length of 1st spine of anal fin	8.84	8.75
Length of 2nd spine of anal fin	9.46	9.58
Length of 3rd spine of anal fin	10.69	10.83

reproduction success of a particular species (De Girolamo *et al.*, 1999; Koumoundouros, 2008).

The present study described the deformity on caudal peduncle near caudal fin due to deformed upper lobe of hypural complex. Except in the caudal peduncle region; morphometric, meristic and osteological characters were found alike to the normal specimen. It is hence concluded that the deformity has no role in growth and further development processes of the specimen. The deformity was not fatal, as the collected specimens were adult enough, but the deformity might have definitely affected its swimming performance. (Powell *et al.*, 2009).

4. Conclusion

In this study, authors examined caudal deformity of *Priacanthus hamrur* (Forsskal, 1775) landed by trawl operated at south west coast of India at depth 32-35 m. The probable reason understood was deformity in upper lobe of hypural complex. Morphometric, meristic and other osteological characters were found alike with other fish of similar species and same haul, which probably of same stock. Absence of mouth and skeletal deformities were evident in ruling out any possible growth abnormalities. Hence it is concluded that in case of collected specimen deformity has no role in growth.

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