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# Occurrence of hyperostosis in leatherjacket, *Oligoplites saurus* (Bloch and Schneider, 1801) from Brazilian coastal waters

[*Ocorrência de hiperostose na guaivira, Oligoplites saurus (Bloch and Schneider, 1801) de águas costeiras brasileiras*]

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## ABSTRACT

Hyperostotic bones occur in several families of marine teleosts, however there are few reports on its development in fish from Brazilian waters. The present study identified the occurrence of hyperostosis in specimens of Leatherjacket fish *Oligoplites saurus*, an important commercial species, using radiographic images. Biometric measurements of four specimens were performed and the affected bones were detected in different levels and regions of the skeleton: Supraoccipital, Pterygiophores, Cleithrum, Hemal Spines and Neural Spines. Bones with hyperostosis represented up to 7% of the weight of the eviscerated fish. The pattern found was consistent with previous reports in the literature for other species of the genus *Oligoplites*, this being the first report of hyperostosis for *O. saurus*.

Keywords: osteology, swollen bones, carangidae, marine teleosts

## RESUMO

*Ossos hiperostóticos ocorrem em diversas famílias de teleósteos marinhos, entretanto poucos relatos sobre seu desenvolvimento são descritos para peixes de águas brasileiras. O presente estudo identificou a ocorrência de hiperostose em espécimes de guaivira* Oligoplites saurus, *uma importante espécie comercial, por análises de imagens radiográficas. Foram realizadas medidas biométricas de quatro espécimes, e os ossos afetados foram detectados, em diferentes graus e regiões do esqueleto: supraoccipital, pterigióforos, cleitro, espinho hemal e espinho neural. Ossos com hiperostose chegaram a representar até 7% do peso do peixe eviscerado. O padrão encontrado foi consistente com os relatos prévios na literatura para outras espécies do gênero Oligoplites, sendo este o primeiro relato de hiperostose para* O. saurus.

*Palavras-chave: osteologia, ossos inchados, carangidae, teleósteos marinhos*

## INTRODUCTION

Hyperostosis is defined as periosteal new bone formation that results in a rounded and spongy aspect of the bone causing its thickening and consequent deformation and also are known as "swollen bones" (Olsen, 1971; Gauldie and Czochanska, 1990; Meunier *et al*., 2010). Several families of marine teleosts with hyperostotic bones have been described (Smith-Vaniz *et al*., 1995), however the causes for the occurrence of the condition have not been elucidated. The identification of hyperostotic bones is more elevated in certain families and the Carangidae family has the highest number of described species presenting this condition (Smith-Vaniz *et al*., 1995; Chanet, 2018). Genera such as *Seriola* Cuvier, 1816, *Selene* Lacépède, 1802, and *Caranx*, Lacépède, 1801 reveal that the condition is commonly found in different genus of the family (Smith-Vaniz *et al*., 1995; Smith-Vaniz and Carpenter, 2007; Rapisarda *et al*., 2008; Tuna *et al*., 2021), despite these organisms are

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present in diverse geographic locations and environments (Menezes *et al*., 2003).

The Carangidae family has several species of fish of commercial importance, both for fishing and for aquaculture (Katsuragawa and Matsuura, 1992; Smith-Vaniz, 2003). The Leatherjacket *Oligoplites saurus* is a coastal pelagic fish commonly found in bays and estuaries (Cervigón *et al*., 1992) of the Carangidae family. It occurs in the Western Atlantic, from the United States to Uruguay, is usually caught by artisanal fishermen and sold fresh (Smith-Vaniz, 2003).

Despite its commercial relevance, there are few studies that describe the presence of hyperostosis in marine teleosts. The present study reports the occurrence of hyperostosis identified in specimens of *Oligoplites saurus* captured in Sepetiba Bay on the Brazilian coast. To the best of our knowledge, it is the first description of hyperostosis for the species, being an important report for the study of this condition in the Carangidae family, the most commonly family described with the condition.

## MATERIAL AND METHODS

Four specimens of Leatherjacket fish were acquired from artisanal fishermen in Sepetiba Bay, Rio de Janeiro, Brazil. The fish were identified, sexed and biometric measurements were performed: total length (TL, in mm), standard length (SL, in mm), total weight (TW, in grams) and eviscerated weight (EVW, in grams). The specimens were radiographed with the portable x-ray unit model Porta 100HF equipment (Job Corporation) at 0.8 meters from the animal, using the voltage of 62KV and 2.0 mAs. After identification of hyperostosis, the radiographic images were processed using the software VXvue (XVUE Ltd, Artemis, Greece). The affected bone structures were separated from the skeleton and boiled in hot water to remove remnants of muscle tissue. Hyperostotic bones were measured and weighed on an analytical scale to calculate the percentage of bone weight in relation to eviscerated weight.

## RESULTS

The total length (TL), standard length (SL), total weight (TW) eviscerated weight and hyperostotic bones weight (HBW) were measured for the specimens (Tab1). Hyperostotic bones were presenting in all the analyzed individuals varying the affected skeleton region as well as thickening and shape.

Table 1. Biometric measures and skeletal regions from specimens

| | Sex | SOC | RIB | CL | PT | NS | HS | TL[a] | SL[a] | TW[b] | EW[b] | HBW[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Specimen 1 | Male | X | - | X | X | X | X | 475 | 391 | 587 | 556 | 39,8 |
| Specimen 2 | Female | X | - | X | X | X | X | 460 | 375 | 595 | 565 | 34,2 |
| Specimen 3 | Female | - | - | X | X | X | X | 423 | 343 | 541 | 499 | 4,5 |
| Specimen 4 | Male | X | X | X | X | X | X | 428 | 342 | 469 | 441 | 12,7 |

Note. Supraoccipital crest (SOC), Ribs (RIB), Cleithrum (CL), Pterygiophore (PT), Neural spine (NS) and Haemal spine (HS). The occurrence of hyperostosis was marked as Presence (X) and Absence (-).
[a] Lengths measures total length (TL) and standard length (SL) were calculated in millimeters
[b]Weight measure total weight (TW), eviscerated weight (EW) and hyperostotic bone weight (HBW) were calculated in grams.

Hyperostotic dorsal pterygiophores were identified in all individuals (minimum 1, maximum 8), presenting mainly closest to the head. Hyperostosis was also diagnosed in the cleithrum (min 1, max 2), neural spines (min 0, max 11), hemal spine (min 0, max 10) and three individuals had hyperostosis in the supraoccipital region (Fig. 1).

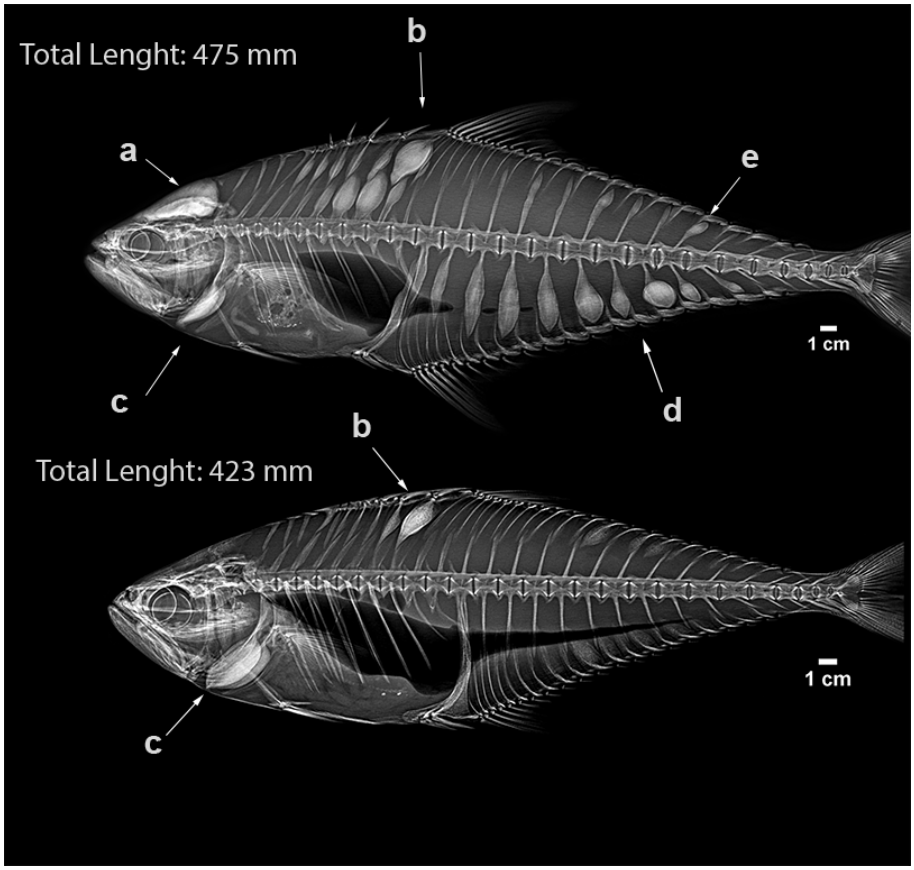


Figure 1. Radiographic image of two specimens of *Oligoplites saurus* (TL: 475 and 423 mm) showing different affected structures – A: Supraoccipital; B: Pterygiophores; C: Cleithrum; D: Hemal Spines; E: Neural Spines.

## DISCUSSION

Different hypotheses related to environmental and physiological factors have been suggested (Murty, 1967; Smith-Vaniz *et al*., 1995; Chang *et al*., 2008; Meunier *et al*., 2008; Giarratana *et al*., 2012; Paig-Tran *et al*., 2016; Chanet, 2018). Despite the causes which develop this condition remaining unclear, the presence of hyperostosis possibility causes imperfections in cutting, and may develop a contamination from bacteria (Giarratana *et al*., 2012; Ramos and Faisca, 2016). The presence of hyperostosis is more frequent in larger, and consequently elderly fish (Gauldie and Czochanská, 1990; Smith-Vaniz and Carpenter, 2007; Aguilera *et al*., 2017). Considering the hypothesis regarding the worsening of the situation in ageing fish population, it is important to consider the possibility of aggravation or even an inability to process larger specimens.

The quantity of skeleton regions affected by the condition is a determining factor for the specie commercialization. Specimens of Cutlass fish – *Trichiurus lepturus* (Linnaeus, 1758) on the Brazilian coast described the unfeasibility of industrial automatic filleting processing due to the risk of damage to the equipment because the high frequency of swollen bones (Lima *et al*., 2002). Different skeletal regions with hyperostosis were described in the present work for the specie *Oligoplites saurus*. The presence of several structures affected in the vertebral column, neural and hemal spines, as the elevated number of pterygiophores made the cutting process for filleting difficult in those individuals. The high percentages of affected bone weight ranged from 1.7% to 7% related to the eviscerated weight (EW) represents a considerable portion of commercialized fish, causing a direct impact for the consumers.

The individuals analyzed in the present study have similar regions to those found for the genus *Oligoplites* (Smith-Vaniz *et al*., 1995), although the fish in the current study demonstrated affected neural spines and pleural ribs, regions that were not observed by other genera of *Oligoplites*. Despite this difference, the current date seems to corroborate the hypothesis that the hyperostosis condition is species-specific (Smith-Vaniz *et al*., 1995). The Carangidae family has several species with the presence of hyperostosis in different locations (Smith-Vaniz *et al*., 1995; Smith-Vaniz and Carpenter, 2007; Rapisarda *et al*., 2008; Tuna *et al*., 2021) demonstrating the importance of studying these species for a better understanding of hyperostosis in marine teleosts with commercial relevance specially in Brazilian waters.

## CONCLUSIONS

Despite the cause of hyperostosis remaining unclear, new descriptions are mandatory to elucidate the reasons and the consequences of this disorder. The present study is the first record of hyperostosis in different individuals of *Oligoplites saurus* from southern waters of Brazilian coast.

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## REFERENCES

AGUILERA, O.A.; ROCHA, I.; LOPES, M. *et al*. The bone degenerative processes in senile fishes from Holocene Brazilian shell mounds. *J. Fis. Dis.*, v.40, p.1869-1881, 2017.

CERVIGÓN, F.R.; CIPRIANI, W.; FISCHER, L. *et al*. *Fichas FAO de identificación de especies para los fines de la pesca*. Guía de campo de las especies comerciales marinas y de aquas salobres de la costa septentrional de Sur América. Rome: FAO, 1992. 513p.

CHANET, B. Swollen bones in jacks and relatives (Teleostei: Acanthomorphata: Carangidae). *Cybium Int. J. Ichthyol.*, v.42, p.99-103, 2018.

CHANG, M.; WANG, X.; LIU, H. *et al*. Extraordinarily thick-boned fish linked to the aridification of the Qaidam Basin (northern Tibetan Plateau). *Proc. Nat. Acad. Sci*., v.105, p.13246-13251, 2008.

GAUDANT, J.; MEUNIER, F.J. Observation d'un cas de pachyostose chez un Clupeidae fossile du Miocène terminal de l'ouest algérien, Sardina Crassa (Sauvage, 1873). *Cybium Int. J. Ichthyol*., v.20, p.169-183, 1996.

GAULDIE, R.W.; CZOCHANSKÁ, Z. Hyperostotic bones from the New Zealand snapper, Chrysophrys auratus (Sparidae). *Fish. Bull*., v.88, p.201-206, 1990

GIARRATANA, F.; RUOLO, A.; MUSCOLINO, D. *et al*. Occurrence of hyperostotic pterygiophores in the silver scabbardfish, Lepidopus caudatus (Actinopterygii: Perciformes, Trichiuridae). *Acta Ichthyol. Piscatoria*, v.42, p.233-237, 2012.

KATSURAGAWA, M.; MATSUURA, Y. Distribution and abundance of carangid larvae in the southeastern Brazilian Bight during 1975-1981. *Bol. Inst. Oceanogr.*, v.40, p.55-78, 1992.

LIMA, F.C.; SOUZA, A.P.M.; MESQUITA, E.F.M.; SOUZA, G.N.; CHINELLI, V.C.J. Osteomas in cutlass fish, Trichiurus lepturus from Niteroi, Rio de Janeiro state, Brazil. *J. Fis Dis.*, v.25, p.57-61, 2002.

MENEZES, N.A.; BUCKUP, P.A.; FIGUEIREDO, J. L. *et al*. *Catálogo das espécies de peixes marinhos do Brasil*. São Paulo: Museu de Zoologia da USP, 2003. 164p.

MEUNIER, F.J.; DESCHAMPS, M.H.; LECOMTE, F. *et al*. The skeleton of teleostean fish: Structure, development, physiology, pathology. *Bull. Soc. Zool. Fr*., v.133, p.9-32, 2008.

MEUNIER, F.J.; GAUDANT, J.; BONELLI, E. Morphological and histological study of the hyperostoses of Lepidopus albyi (Sauvage, 1870), a fossil Trichiurideae from the Tortonian (Upper Miocene) of Piedmont (Italy). *Cybium Int. J. Ichthyol*., v.34, p.293-301, 2010.

MURTY, V.S. Notes on hyperostosis in the fish Drepane punctata (Linnaeus). *J. Mar. Biol. Assoc. India*, v.9, p.323-326, 1967.

OLSEN S.J. Swollen bones in the atlantic cutlass fish Trichiurus lepturus Linnaeus. *Copeia*, v.1, p.174-175, 1971.

PAIG-TRAN, E.M.; BARRIOS, A.S.; FERRY, L.A. Presence of repeating hyperostotic bones in dorsal pterygiophores of the oarfish, Regalecus russellii. *J. Anat*., v.229, p.560-567, 2016.

RAMOS, P.; FAISCA, P. Hyperostotic bones in bronze croaker, otolithoides bi-auritus (Cantor,1849) – importance for the processing industry and consumers. *Exp. Pathol. Health Sci*., v.8,p.67-68, 2016.

RAPISARDA, G.; MACRÌ, F.; MANGANARO, M. *et al*. Iperostosi in ricciola (Seriola dumerilii) e pagro (Pagrus pagrus). [Hyperostosis ingreater amberjack (Seriola dumerilii) and common seabream (Pagrus pagrus).] *Ittiopatologia*, v.5, p.195-200, 2008.

SMITH-VANIZ, W.F. Carangidae. Jacks and scads (bumpers, pompanos, leatherjacks, amberjacks, pilotfishes, rudderfishes. In: CARPENTER, K.E. (Ed.). *FAO species identification guide for fishery purposes*. The living marine resources of the Western Central Atlantic. Bony fishes part 2 (Opistognathidae to Molidae), sea turtles and marine mammals. Rome: FAO, 2003. v.3

SMITH-VANIZ, W.F.; CARPENTER, K.E. Review of the crevalle jacks, Caranx hippos complex (Teleostei: Carangidae), with a description of a new species from West Africa. *Fish. Bull.*, v.105, p.207-233, 2007.

SMITH-VANIZ, W.F.; KAUFMAN, L.S.; GLOVACKI, J. Species-specific patterns of hyperostosis in marine teleost fishes. *Mar. Biol*., v.121, p.573-580, 1995.

TUNA, F.A.P.; CALIXTO, F.A.A.; SALOMÃO, M.C. *et al*. The presence of hyperostosis in Atlantic moonfish, Selene setapinnis (Mitchill, 1815) in the Brazilian Coast - case report. *Arq. Bras. Med. Vet. Zootec*., v.73, p.179-183, 2021.