

RECORDS OF THE SMALLEYE SMOOTH-HOUND *Mustelus higmani* SPRINGER & LOWE, 1963 (CHONDRICHTHYES: TRIAKIDAE) FROM MARANHÃO–BRAZIL

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ABSTRACT

The family Triakidae is composed of nine genera and 39 species. *Mustelus higmani* is a small-sized shark endemic to South America, ranging from the Venezuelan Gulf, passing through Curaçao and Trinidad, and reaching Santos in Brazil. The species inhabits waters up to 100 m in depth in areas with calcareous, sandy or muddy bottoms, being abundant in estuaries. Despite being abundant in Brazil, it is contradictory to observe that the species is rare in the coast of Maranhão State, which is part of the distribution area and contains several natural habitats. The record of *M. higmani* in Maranhão coast suggested by this paper allowed the elaboration of some arguments in order to explain the occurrence and the current conservation status of the species. The proposed arguments concern the practice of artisanal fishery in the coast of Maranhão and the negative effects of shrimp fishery and erroneous taxonomical identification.

Key Words: Northern Brazilian coast, Artisanal fishery, elasmobranchs, geographic distribution.

RESUMO

Registro de ocorrência do tubarão *Mustelus higmani* springer & lowe, 1963 (Chondrichthyes: Triakidae) no Estado do Maranhão–Brasil

A família Triakidae é formada por nove gêneros e 39 espécies. *Mustelus higmani* é um tubarão de pequeno porte endêmico da América do Sul, ocorrendo desde o Golfo da Venezuela, passando por Curaçao e Trinidad, até a cidade de Santos, no Brasil. Habitam águas de até 100m de profundidade, sob substratos calcários, de areia ou de lama e abundantes em áreas estuarinas. Apesar de ser considerada abundante em outras regiões do Brasil, esta espécie, contraditoriamente, não é comum para o estado do Maranhão mesmo fazendo parte da área de distribuição e habitat natural. O registro de *M. higmani* no estado do Maranhão apresentado no presente estudo permitiu discutir hipóteses para explicar sua ocorrência e o seu atual estado de conservação. Um dos aspectos discutidos está relacionado à pesca artesanal utilizando como petrecho de pesca redes de arrasto em alto mar ou de deriva. Outro argumento apresentado para explicar a baixa densidade de *M. higmani* aborda o efeito negativo da pesca de camarões na região. E por último, discutimos a possibilidade de identificações errôneas da espécie.

Palavras Chave: Costa norte do Brasil, Pesca artesanal, elasmobrânquios, distribuição geográfica.

The family Triakidae is composed of nine genera and 39 species divided into two subfamilies: Triakinae and Galeorhininae. The former is the most species-rich with 33 species in three genera (Nelson, 1994; Heemstra, 1997). In Brazil, the subfamily Galeorhininae is represented exclusively by *Galeorhineus galleus* (Linnaeus, 1758), whereas *Mustelus canis* (Mitchill, 1815), *M. fasciatus* (Garman, 1913), *M. higmani* Springer & Lowe 1963, *M. norrisi* Springer, 1939 and *M. schimitti* Springer, 1939 (Figueiredo, 1977; Menezes *et al.*, 2003) are known Triakinae species.

M. higmani is characterized by the fairly slender body, long snout, small eyes, molariform teeth with low and pointed cusps, dermal denticles with three points, first dorsal fin slightly larger than the second, and distal margins of the pectoral and pelvic fins with a notorious concavity (Springer & Lowe, 1963; Figueiredo, 1977; Heemstra, 1997; Leopold, 2004). The color pattern is brown to gray in the dorsum and light-colored ventrally (Figueiredo, 1977; Leopold, 2004); nevertheless, some specimens are yellow during life (Springer & Lowe, 1963).

The species is endemic to South America ranging

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from the Venezuelan Gulf, passing through Curaçao and Trinidad, and reaching Santos in Brazil (Figueiredo, 1977; Heemsta, 1997; Froese & Pauly, 2007). Cervigón (1966) reported the sympatric occurrence of *M. higmani* and *M. norrisi*, and probably of *M. canis*.

Mustelus higmani is one of the smallest species of its genus. With a sedentary behaviour, it occurs in maximum depths of 100 m on calcareous, sand and mud bottoms, being abundant in estuarine areas (Compagno, 1984; Cervigón *et al.*, 1993; Heemstra, 1997). The species has been cited as abundant in different regions of Brazil (Bezerra *et al.*, 1989; Soto, 2001). In spite of this, there are few records of this species in the shores of Maranhão State. Thus, this note examines the current status of *M. higmani* in this South American region with the goal of explaining its apparent absence in the fisheries practiced in the coast of Maranhão.

On July 2002, a *M. higmani* specimen was captured during the field works of a elasmobranchs species survey in the coast of Maranhão. The catch happened between coordinates 1°17'24"S and 45°03'72"W using a bottom longline constructed with 300 Korean fish hooks, measuring approximately 300m in length, and laid over mud channels with depths varying from 20 to 90m.

The caught specimen (Figure 1) is a mature female with 530 mm SL and was identified through the works of Figueiredo (1977), Compagno (1984) and Froese & Pauly (2007). The specimen was deposited in the Fish Collection of the Oceanography and Limnology Department of the Federal University of Maranhão (Coleção de Peixes do Departamento de Oceanografia e Limnologia da Universidade Federal do Maranhão). Morphometric features are shown in Table 1.

Despite being widely distributed, there were many gaps regarding the occurrence areas of *M. higmani* in the Brazilian coast until the mid 1990's. In the early 1960's, the species was known only in the states of Amapá and Pará, being recorded in the southern Brazilian region only in 1977 (Figueiredo, 1977). In 1988, Compagno adds the states of Ceará, Pernambuco, Alagoas, Bahia and Espírito Santo states to the distribution area of *M. higmani*. Thus, the distributional data suggest the species is widely distributed throughout the Atlantic coast of South America, which was confirmed by posterior papers (Rincon *et al.*, 2000; Sampaio *et al.*, 2000; Faria *et al.*, 2000).

In contrast, there are only two confirmed records

from Maranhão State. Bezerra *et al.* (1989) published a note on shark occurrence in the north and northeastern coasts of Brazil, in which they mentioned to have seen a *M. higmani* in the waters of Maranhão. Nevertheless, it is curious to note that the author cited 2.012 individuals caught in Amapá, but he neither showed any biological or morphometric information for these specimens nor indicated the number of specimens caught in Maranhão. The lack of this information from Maranhão State suggests that either the number of sampled sharks was very low or the author only observed the species from artisanal fisheries.

The second record of *M. higmani* in the waters of Maranhão was reported by Gadig (1994), who cited 2.699 individuals from the northern/northeastern coasts, including embryos. However, like Bezerra's comments, Gadig adds no information concerning the species in Maranhão. Furthermore, the area of capture was located by this author between 2°45' to 4°47'N and 49°26' to 51°25'W, which does not correspond to the territory of Maranhão.

Others studies involving the capture of sharks were performed in the coast of Maranhão (SUDENE, 1976; Lessa, 1986, 1999; Stride, 1992; Stride *et al.*, 1992; Almeida & Vieira, 2000; Almeida *et al.*, 2006), but none of these reported the occurrence of *M. higmani* in the region.

The lack of captured species in Maranhão can be explained by the low effort employed in shark fishing. Nevertheless, this hypothesis is easily rejected, since all previously cited papers demonstrated an enormous fishery effort that does not explain the absence of *M. higmani* in the samples. However, another important factor related to fishery effort regards the equipment used. The fishery arts used were likely selective, hampering the catch of *M. higmani*. The majority of the cited works used fishing nets and other similar equipments (Lessa, 1986, 1997; Stride *et al.*, 1992; Stride, 1992; Almeida & Vieira, 2000; Almeida *et al.*, 2006), while only Bezerra *et al.* (1990), Gadig (1994) and SUDENE (1976) used longline. Apart from SUDENE (1976), records of *M. higmani* were obtained using longlines. Therefore, it seems likely that the lack of records of this species in the waters of Maranhão is related to type of fishery equipment employed.

Maranhão State has already been considered as to possess a great sustainable potential of sharks (SUDENE, 1983), based on a fishery type that was primarily artisanal,



Figure 1. Female *Mustelus higmani* with 530mm Standard Length, caught in the coastal region of Maranhão state, Brazil (Photo by N. M. Piorski)

Table 1. Morphometric data of *M. higmani* obtained in the present study and Heemstra (1997) data for comparison. The values are expressed in percentage of standard length.

| | This study | Heemstra, 1997 |
|---|------------|----------------|
| Total length | 53,0 | |
| Upper labial fold | 1,51 | 0,8-1,8 |
| Lower labial fold | 2,06 | 1,0-1,8 |
| Mouth width | 3,77 | 5,1-7,3 |
| Mouth length | 6,94 | 2,3-3,6 |
| Orbit diameter | 2,21 | 2,2-3,4 |
| Inter-nostril | 2,87 | 2,7-3,8 |
| Snout to nostrils | 5,83 | 4,3-6,7 |
| Snout to orbit | 8,21 | 6,9-9,9 |
| Snout to upper jaw | 7,08 | 6,9-9,6 |
| Snout to 1st gill slits | 16,25 | 16-21 |
| Snout to pectoral fin (P1) | 19,23 | 19-24 |
| Snout to pelvic fin (P2) | 44,91 | 40-48 |
| Snout to 1st dorsal fin (D1) | 32,08 | 28-33 |
| Snout to 2nd dorsal fin (D2) | 63,21 | 57-63 |
| Snout to anal fin | 46,60 | 62-68 |
| D1 to D2 | 23,21 | 17-23 |
| Pelvic fins to anal fin | 22,32 | 11-18 |
| 2 nd dorsal to caudal fin | 10,13 | 8,1-12 |
| Anal fin to caudal fin | 7,74 | 6,0-9,2 |
| D1 base | 10,60 | 9,4-14 |
| D1 height | 6,79 | 6,8-11 |
| D1 to caudal fin | 42,26 | |
| D2 base | 7,91 | 7,7-11 |
| D2 height | 7,23 | 5,1-7,7 |
| D2 to caudal fin | 9,91 | 1,9-3,4 |
| Base of anal fin | 5,30 | 5,7-8,0 |
| Height of anal fin | 3,58 | 2,9-4,6 |
| Posterior margin P1 | 10,08 | 6,7-10 |
| Anterior margin P1 | 12,55 | 11-14 |
| Posterior margin P2 | 5,17 | 4,3-6,7 |
| Anterior margin P2 | 7,11 | 6,2-8,9 |
| Caudal fin length | 19,81 | |
| Pelvic fin to caudal fin | 28,55 | |
| Dorsal caudal fin lobe | 18,43 | 17-22 |
| Ventral caudal fin lobe | 19,42 | 7,1-10 |
| Width of the trunk in the pectoral fin origins | 9,42 | |
| Height of the trunk in the pectoral fin origins | 10,11 | |

corresponding to about 95% of the total fishery fleet of the state (Stride, 1992). In spite of this, there are no historical records of captures of *M. higmani*. This is explained by the predominance of artisanal fishery, which restricts the activities of fishermen to shallow waters, and also by the fact that elasmobranch fishery is rare since the main equipment employed is high sea or drifting trawl nets (Lessa, 1986; Almeida & Vieira, 2000).

On the other hand, a hypothesis to be considered in order to explain the low capture of the species is the small population size of *M. higmani* in the region. However, Gadig (1994) reported that the species is abundant in the North region, as previously described. Thus, a small population size does not make any sense in view of this data, but a reduction in stock size is plausible when analyses of other fishery activities in the coast of Maranhão are performed. Gadig (1994) and Leopold (2004) suggested a possible negative impact of shrimp fishery on *M. higmani*, since individuals of this species are common on mud channels feeding on shrimps. This behavior was

confirmed by Cortés (1999), who pointed out crustaceans as the predominant item in the diet of *M. higmani*.

Last but not least, putative erroneous identification could lead to the absence of the smalleye smooth-hound in elasmobranch lists from Maranhão state. This condition is resultant of the way that the data concerning abundance of these fishes are collected in various fishermen colonies of the region.

In view of all this, the absence of *M. higmani* in the artisanal fishery of Maranhão can be the result of various factors, including the inherent features of the fisheries practiced in the region, the harmful effects of others fishery activities and the lack of good taxonomical studies for the fishes of this region.

REFERENCES

ALMEIDA, Z.S. & VIEIRA, H. C.P. 2000. Distribuição e abundância de elasmobrânquios no litoral maranhense,

Brasil. *Pesquisa em Foco*, 8 (11): 89-103.

ALMEIDA, Z.S. DE; CASTRO, A.C.L.; PAZ, A.C.; RIBEIRO, D.; BARBOSA, N. & RAMOS, T. 2006. Diagnóstico da pesca artesanal no litoral do estado do Maranhão. p. 41-65 *In*: Isaac, V.J.; Martins, A.S.; Haimovici, M. & Andriquetto, J.M (org). *A pesca marinha e estuarina do Brasil no início do século XXI: recursos, tecnologias, aspectos socioeconômicos e institucionais*. Editora Universitária UFPA, Belém, 188p.

BEZERRA, M.A.; FURTADO-NETO, M.A.A. & GADIG, O.B. 1989. Nota sobre alguns tubarões da costa norte e nordeste do Brasil. *Anais da Sociedade Nordestina de Zoologia*, 3: 301-304.

CERVIGÓN, F. 1966. *Los peces marinos de Venezuela*. Vol.1. Estación de Investigación Marina. Fundación La Salle Ciencia Nat. Monografía, Margarita, 436p.

CERVIGÓN, F.; CIPRIANI, R.; FISHER, W.; GARIBALDI, L.; HENDRICKX, M.; LEMUS, A. J.; MÁRQUEZ, R.; POUTIERS, J. M.; ROBAINA, G. & RODRÍGUEZ, B. 1993. *Field guide to the commercial marine and brackish-water resources of the northern coast of South America*. FAO, Roma, 513p.

COMPAGNO, L.J.V. 1984. *FAO Species catalogue sarks in the world. In: annotated en ilustrad catalogue of sharks species know to date*. Part. I. Hexanchiformes. FAO Fish Synop, Roma, 4 (125): 1-249p.

CORTÉS, E. 1999. Standardized diet compositions and trophic level of sharks. *Journal of Marine Science*, 56: 707-717.

FARIA, V.V.; ABREU, T.A. & NOVELLI, R. 2000. Aspectos da biologia reprodutiva de *Mustelus higmani* (Triakidae) e *Rhizoprionodon porosus* (Carcharhinidae) no litoral norte do estado do Rio de Janeiro. p.14. *Resumos da 2ª Reunião da Sociedade Brasileira de Estudos de Elasmobrânquios*. Santos, 94p.

FIGUEIREDO, J.L. 1977. *Manual dos peixes marinhos do sudoeste do Brasil. Introdução: Cações, Raias e Quimeras*. Museu de Zoologia da USP, São Paulo, 104p.

FROESE, R. & PAULY, D. 2007 (Eds.). *FishBase - World Wide Web electronic publication*, accessible at <http://www.fishbase.org>. (Accessed 04/11/2007).

GADIG, O.B.F. 1994. *Fauna de tubarões da costa norte/nordeste do Brasil (Chondrichthyes, Elasmobranchii)*. Dissertação de Mestrado, Universidade Federal da Paraíba, João Pessoa, Brasil, 230p.

HEEMSTRA, P.C. 1997. A review of the sooth-hound sharks (Genus *Mustelus*, Family Triakidae) of the Western Atlantic Ocean, with descriptions of two new species a new subspecies. *Bulletin of Marine Science*. 60 (3): 894-928.

LÉOPOLD, M. 2004. *Guide des poisons de mer de Guyane*. Ed. Ifremer, Cayena, 216p.

LESSA, R.P.T. 1986. Levantamento faunístico dos elasmobrânquios (Pisces, Chondrichthyes) do Litoral Ocidental do estado do Maranhão. *Boletim do Laboratório de Hidrobiologia*, 7: 27-41.

LESSA, R.P. 1997. Sinopse dos estudos sobre elasmobrânquios da costa Maranhão. *Boletim do Laboratório de Hidrobiologia*, 10: 19-36.

MENEZES, N.A.; BUCKUP, P.A.; FIGUEIREDO, J.L. & MOURA, R.L. (eds.). 2003. *Catálogo das espécies de peixes marinhos do Brasil*. Museu de Zoologia USP, São Paulo, 159p.

NELSON, J.S. 1994. *Fishes in the world*. 3rd ed. John Wiley & Sons, Inc., New York. 600p.

RINCON, G.; MAUÉS, R.C.S.; BRAGANÇA, A.J.M.; LESSA, R. 2000. Elasmobrânquios demersais da plataforma e talude da região norte capturados nos cruzeiros de prospecção do Npq. Paulo Moreira, Programa Revizee Score-NO. *Resumos da 2ª Reunião da Sociedade Brasileira de Estudos de Elasmobrânquios*, Santos, p.92. Disponível em <http://www.nupeccom.br/sbeel/resumos/html/92.html>. Acesso em 18/01/2006.

SAMPAIO, C.L.S.; GADIG, O.B.F.; OLAVO, G. 2000. Levantamento das espécies de peixes cartilaginosos do litoral da Bahia, Nordeste do Brasil. *Resumos da 2ª Reunião da Sociedade Brasileira de Estudos de Elasmobrânquios*. Santos, p. 59. Disponível em: <http://www.nupeccom.br/sbeel/resumos/html/59.html>. Acesso em 18/01/2006.

SOTO, J.M.R. 2001. Annotated systematic checklist and bibliography of the coastal and oceanic fauna of Brazil. I Sharks. *Mare Magnum*, 1(1): 52-120.

SPRINGER, S. & LOWE, R. 1963. A new smooth dogshark, *Mustelus higmani*, from the Equatorial Atlantic coast of South America. *Copeia*. 1963: 245-251.

STRIDE, R.K.; BATISTA, V.D.A.S. & RAPOSO, L.A.B. 1992. *Pesca experimental de tubarão com redes de emalhar no litoral maranhense*. CORSUP/EDUFMA, São Luís, 160p.

STRIDE, R.K. 1992. *Diagnóstico da pesca artesanal marinha do Estado do Maranhão*. CORSUP/EDUFMA, São Luís, 205p.

SUDENE, 1976. *Pesquisas dos Recursos Pesqueiros da Plataforma Continental Maranhense*. Séries de Estudos de Pesca, 6, Recife, 67p.

SUDENE, 1983. *Avaliação potencial de tubarões da costa NE do Brasil*. Série Estudos de Pesca, 10, Recife, 68p.