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Rethinking use and trade of pelagic sharks from Brazil

R.R. Barreto[a,f,*], H. Bornatowski[b], F.S. Motta[c,d], J. Santander-Neto[e,f], G.M.S. Vianna[1], R. Lessa[f]

[a] Centro Nacional de Pesquisa e Conservação da Biodiversidade Marinha do Sudeste e Sul do Brasil (CEPSUL/ICMBio), Brazil
[b] Centro de Estudos do Mar, Universidade Federal do Paraná, Pontal do Paraná, Brazil
[c] Laboratório de Ecologia e Conservação Marinha, Instituto do Mar, Universidade Federal de São Paulo (UNIFESP), Brazil
[d] Laboratório de Pesquisa de Elasmobrânquios, Universidade Estadual Paulista, Campus do Litoral Paulista, São Vicente, Brazil
[e] Instituto Federal de Educação, Ciência e Tecnologia do Espírito Santo, Piúma, Espírito Santo, Brazil
[f] Laboratorio de Dinamica de Populacoes Marinhas (DIMAR), Departamento de Pesca e Aquicultura (DEPAq), Universidade Federal Rural de Pernambuco, Brazil

ABSTRACT

Brazil currently ranks as the 11th producer and 1st importer of shark meat around the world. Data available from the FAO software FishStatJ along with data from regional sources, such as governmental bulletins, scientific papers, gray literature and internet were revisited to identify the main issues surrounding pelagic shark fisheries, trade and consumption in the largest country in South America. Among the main findings, it was noted that Brazil has not properly collected fishery statistics since 2007, that many species of threatened sharks are freely landed and traded even though it is prohibited by local legislation and/or international recommendations (regional fisheries management organizations). The blue shark (*Prionace glauca*) is the most frequently recorded shark in the official bulletins and is currently a locally targeted species. Additionally, the significant imports of this species from 23 other countries that also provide fins for Asia has drawn attention in recent decades. Regarding consumption, shark is considered to be low-value seafood compared to more common fish, such as groupers and snappers, and most Brazilians actually do not know that they are eating sharks. At present, the proportion of threatened elasmobranchs (in which sharks are included) in Brazil (33%, of 145 species) exceeds the global rate identified for the group (25%), and, until the present moment, no measure related to the management of species has been implemented. As advice, Brazil urgently needs to restructure its fishery information collection systems, management strategies and to tighten sanitary and labeling regulations for the marketing of fish.

1. Introduction

Sharks are characterized by a peculiar life history, such as late sexual maturity, low fecundity, slow growth, site fidelity, and the formation of reproductive aggregations, which are features that make them susceptible to human impacts and prevent their recovery after shifts in mortality rates [63]. In commercially exploited species, or those incidentally caught, these traits have been associated with overexploitation and an elevated risk of extinction [60]. Because of a full global market with an increased demand for shark products (fins and meat, [25] plus high levels of unregulated bycatch and IUU (Illegal, Unreported and Unregulated Fishing), [75], the International Union for Conservation of Nature (IUCN) considers sharks among the most threatened vertebrates on earth [13,24,43,46].

Large oceanic sharks, as the blue shark (*Prionace glauca*), shortfin mako (*Isurus oxyrinchus*), white-tip shark (*Carcharhinus longimanus*) and others, are highly migratory species that have no direct relation to the sea floor, spending most of their life cycle in the open ocean, being susceptible to multiple fishing fleets [29]. According to the literature, these species are doubly in jeopardy because of their large body size and because of the high value of their body parts (fins) in international markets [30,53].

Shark fins are among the most expensive seafood types in the world used to make a soup that is a symbol of wealth and luxury in Chinese communities established in different parts of the world [69]. As has been observed for terrestrial vertebrates with similar life history traits that are victims of the illegal wildlife trade—such as tigers prized for their penises and rhinos prized for their horns—the high value of fins increases fishing even if the species is threatened and/or rare [53]. According to the IUCN, among the 16 main species of highly migratory sharks, 14 are facing a heightened risk of extinction (i.e., “Threatened” or “Near Threatened”), with fin trade as the main threat [29,30].

* Corresponding author at: Centro Nacional de Pesquisa e Conservação da Biodiversidade Marinha do Sudeste e Sul do Brasil (CEPSUL/ICMBio), Brazil.
E-mail address: rodrigorpbarreto@gmail.com (R.R. Barreto).
[1] G.M.S. Viannaa is an independent researcher.

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In response to the first shark population declines and the low taxonomic resolution, or even low rate of inclusion in fishery statistical reports, since the mid-1990s, regional fisheries management organizations (RFMOs) have implemented initiatives to ban finning and improve data reports (Appendix S1). Currently, the Food and Agriculture Organization of the United Nations (FAO) reports industrial and small-scale fleets worldwide as being suppliers of the international market for shark fins, while the meat of the same captured sharks is increasingly being diverted along separate channels to meet the demand in growing markets, especially in Brazil [25].

While this combination (bans on finning + growing markets) is seen as positive—contributing to better resolution in fisheries data and also incentivizing the full use of captured sharks, avoiding the waste of carcasses and offering diversified protein for the increasing demand for food—the number of sustainable fisheries in this group worldwide is still low and may occur only in specific areas of the USA, Canada and Australia (countries with a robust investment in management infrastructure) for some small and medium-sized species [23,68], whose life history tends to be more flexible than that of large sharks [71]. Moreover, most pelagic sharks are highly migratory and wide-ranging, requiring international engagement to properly monitor and manage fisheries.

Because pelagic sharks are predominantly top predators, declines in their abundance may entail impacts on marine ecosystems [34,41,61,62,72]. In the northwest Atlantic, Mediterranean and Australia, these sharks play an important role in controlling the abundance and behavior of “mesopredators”, such as smaller sharks and rays, which in turn are responsible for the control of prey occupying lower trophic levels within “food webs” [34,61]. While the need to reevaluate the effects of predator removal has been recently discussed [40], mainly for particular ecosystems [37,66], there is a consensus that marine predators should be properly managed for the maintenance of demographic persistence, density and risk-driven ecological processes [41,72].

With continental proportions (8400 km of coastline), Brazil is the fifth largest country and eighth largest economy in the world (IMF 2017), which is, in contrast, experiencing its worst phase in relation to fisheries management and, consequently, sustainability of its marine biodiversity and fisheries [1,28,64]. At the same time that its fishing management collapsed, the country became the first global shark meat importer according to FAO [25]. While domestic production is unknown [49], information on how Brazilians use sharks is poor [9,10]. In this light, the objective of the present study is to show how Brazil has contributed substantially to the consolidation of the truly global market for shark products established over the past few years. This work is timely, since Brazil are re-discussing the conservation priorities for its marine fauna and fisheries, yet there has been no dedicated national fisheries monitoring program for nearly a decade, compromising data needs for management. Our work will contribute to this effort and increase our understanding of the use and trade of highly jeopardized marine species in a data-poor region and recently identified as one of the biggest shark meat consumer globally.

2. Methods

Fishing statistics bulletins published in Brazil by the Ministry of Environment and the Ministry of Fisheries and Aquaculture-MPA were inspected along with scientific papers, gray literature and non-scientific media (newspapers and magazines) to the main fishery, trade, consumption and conservation issues pertaining to highly migratory sharks in Brazil (the fishing statistics bulletins are available at http://www.icmbio.gov.br/cepsul/acervo-digital/37-download/estatistica/111-estatistica.html). Brazilian participation in fishery production and global fishery commodities production and trade was analyzed using the software FishStatJ [33], freely available at http://www.fao.org/fishery/statistics/software/fishstatj/en#downlApp. FishStatJ provides access to several FAO datasets (production, exports, imports, re-exports), and those involving any sort of shark product coming from Brazil were selected (Appendix S2). Data on vessels/fishing modalities were analyzed using the site of the Ministry of Fishing and Aquaculture (http://sinpesq.mpa.gov.br) through the General Fishing Register (SisRGP 2015) by initially subsetting vessels registered in coastal municipalities. It is worth mentioning that registering at RGP is compulsory for getting benefits such as subsidies and credits, which makes the RGP representative of the activity. To collect information regarding progress in terms of the conservation of highly migratory sharks in Brazil, the Federal Official Gazette (http://www.icmbio.gov.br/cepsul/legislacao.html) was inspected. Hereafter, large pelagic sharks should be understood as the group of large-sized species of sharks caught in pelagic fisheries (Table 1).

Table 1
Species of highly migratory pelagic sharks and conservation status according the IUCN Red List of Threatened Species™ (global) and Instituto Chico Mendes de Conservacao da Biodiversidade (ICMBio, regional). Threatened = VU, EN and CR; Near Threatened = NT and Data Deficient = DD.

Family	Specie	Common name	IUCN	ICMBio
Lamnidae	*Isurus oxyrinchus*	Shortfin mako	VU	NT
	Isurus paucus	Longfin mako	VU	DD
	Lamna nasus	Porbeagle shark	VU	DD
Alopidae	*Alopias supercilosus*	Bigeye thresher shark	VU	VU
	Alopias vulpinus	Common thresher shark	VU	VU
Pseudocarchariidae	*Pseudocarcharias kamoharaii*	Crocodile shark	NT	DD
Sphyrnidae	*Sphyrna lewini*	Scalloped hammerhead	EN	CR
	Sphyrna zygaena	Smooth hammerhead	VU	CR
	Sphyrna mokarran	Great hammerhead	EN	EN
Carcharhinidae	*Prionace glauca*	Blue shark	NT	NT
	Carcharhinus falciformis	Silky shark	NT	NT
	Carcharhinus longimanus	Oceanic whitetip shark	VU	VU
	Carcharhinus signatus	Night shark	VU	VU
	Galeocerdo cuvier	Tiger shark	NT	NT

3. Results

3.1. Fisheries and production

Brazil (Fig. 1) is currently ranked by the FAO as the 11th shark producer globally and the 17th shark fin exporter (2nd in the South Atlantic for both). In 2007, the year of the latest national bulletin with detailed information regarding catches by species, landings of cartilaginous fishes were 5% of the total marine production in Brazil [44]. By analyzing the General Fishing Register (SisRGP 2015), we found that in 2014, 23,329 boats were licensed to fish using different types of fishing modalities in the 17 coastal states of Brazil (Appendix S3). These licenses differ from one another concerning the fishing apparatus, target species, vessel size and area of operation. In none of the modalities is any shark species targeted (Appendix S3).

Considering the licenses delivered to longlines and gillnetting vessels, some 8000 boats had interacted with pelagic sharks by 2012 (Appendix S3). This value may be grossly underestimated, since the number of illegal fishing vessels in Brazilian waters is unknown. The states with the largest number of longline licenses were Espírito Santo, Pará, Rio de Janeiro, Ceará, Rio Grande do Norte and Santa Catarina (Fig. 1), whereas the largest number of licenses for gillnets were in Santa Catarina, Maranhão, Sao Paulo and Ceará (Fig. 1).

According to FishStatJ, shark catches peaked in Brazil during the