



Policy Forums

Beyond fear: a new paradigm to manage shark recovery in Brazilian marine protected areas



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HIGHLIGHTS

- Shark recovery in Brazilian Marine Protected Areas has concerned managers.
- Shark culling has been proposed and scientific-diving banned after incidents.
- Decisions should not be based on fear but grounded in scientific research.
- Both conservation goals and economic benefits can be achieved with shark recovery.

GRAPHICAL ABSTRACT



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ABSTRACT

Shark populations have declined worldwide, and conservation measures have been necessary for their recovery and maintenance in natural areas. Despite efforts to protect sharks in marine sanctuaries and managed areas, the apparent recovery of shark populations in Brazilian Marine Protected Areas has sparked controversy after two incidents involving shark bites. Shark culling has been proposed in one of the most iconic Marine National Parks, and scientific diving has been forbidden at a Marine Sanctuary where a long-term ecological program that lasted 10 years had to be halted. We herein argue for a science-based approach for shark management and conservation in Brazil, better connecting conservation goals with economic benefits.

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Sharks may play important ecological roles in marine ecosystems worldwide, with pristine environments often characterized by high abundance of sharks (Sandin and Zgliczynski, 2015; Mourier et al., 2016). Despite their important roles in marine systems, sharks are increasingly threatened by human activities. They are particularly vulnerable to habitat degradation and overfishing because of their life history characteristics, such as slow growth

and late maturity (Simpfendorfer et al., 2023). These anthropogenic impacts have led to a rapid decline in shark populations and as a consequence many species are now functionally extinct and endangered at local scales (MacNeil et al., 2020; Dulvy et al., 2021). In response to this crisis, numerous conservation measures, including fishing regulations, shark sanctuaries, and Marine Protected Areas (MPAs), have been implemented across the globe (Ward-Paige and Worm, 2017). However, the recovery of shark populations in some areas has sparked controversy and led to proposals for drastic measures, such as shark culling (Carlson et al., 2019). In this context, this paper aims to argue for a more informed, science-based approach

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to shark conservation in Brazilian MPAs, emphasizing the need for decisions to be guided by scientific research and evidence, and aligned with both conservation goals and potential economic benefits.

In Brazil, spatial and fishing regulations have been created to protect sharks and other marine animals. For instance, some no-take MPAs have been established in the late 1970s and 1980s, and more recently, the International Commission for the Conservation of Atlantic Tunas has recommended prohibitions and limits for catching different shark species, and the Brazilian red list of endangered species is currently protecting over 30 shark species (Ordinance MMA 354, 2023). This effort is necessary for the recovery of endangered species, especially in remote and isolated islands, where populations are even more vulnerable to local extinction; and fishing has historically impacted insular shark populations in Brazil (Pinheiro et al., 2010; Luiz and Edwards, 2011). These conservation initiatives seem to be succeeding and there is evidence of sharks' recovery in at least some areas, making Brazilian oceanic islands some of the healthiest ecosystems in the country's ocean (Pimentel et al., 2019; Morais et al., 2017). However, the ongoing recovery of shark populations in Brazil has recently sparked a significant controversy. Shark recovery has not been seen favorably by local stakeholders, authorities and sectors of the Brazilian government as a response to isolated incidents involving shark bites.

Fernando de Noronha Archipelago is a populated location situated 345 km from the continent and easily reached by plane and ships. A Marine National Park created in 1987 surrounds about 70% of the archipelago's coast and shallow waters, and the economic benefits from the intense ecotourism activities depend on the healthy status of its coastal reefs. Despite the many smaller incidents with lemon sharks that have been reported in the region, an incident experienced in 2022, the second involving tiger shark since 2015, has stirred up a storm of debate. Both incidents occurred in the same site inside the National Park: Sueste Bay, which is suggested by local fishers to be used by sharks as a feeding ground (authors pers. comm.). The incident has led to destructive proposals, including the possibility of shark culling in one of the most iconic Marine National Parks in Brazil. Being a shark hotspot, this would affect many more species than those involved in incidents, entailing potentially significant consequences in the region's marine ecosystem. This proposal, while seemingly preposterous, is not without precedent. An already implemented project allowing sardine fishing inside the Marine National Park has set a concerning example (Reis-Filho et al., 2022). These proposals, coupled with the potential for similar future initiatives, pose a significant threat to the management and preservation of MPAs in Brazil. They undermine conservation efforts and contradict the primary goals of these areas, which include the protection and recovery of shark populations.

The controversy extends to another remote oceanic island: St. Peter and St. Paul's Archipelago a small group of islets situated 1100 km from the continent and where only four research and military people are allowed to stay at a time. The Secretariat of the Interministerial Commission for the Resources of the Sea (SECIRM) manages the research station, built in the archipelago in 1998. SECIRM pays large fishing boats to transport researchers to the archipelago, and they are allowed to remain there fishing all year long. Here, fishing activities have led to the decline of the local population of Galapagos' sharks to the point of local extinction a few years ago (Luiz and Edwards, 2011), and probably affects the behavior of pelagic shark species, which are attracted to the bait aggregation that is formed by the intense flashlight beams emitted by the boats. However, since 2012, fishing regulations, including a ban on longlines, have prohibited the capture of sharks around the archipelago (Pinheiro et al., 2020). These regulations became stricter as a larger MPA, which includes a sanctuary, was estab-

lished in 2018 (Giglio et al., 2018). Although sharks are very rarely sighted underwater close to the reefs of the archipelago (Pinheiro et al., 2020), SECIRM prohibited all scientific diving activities in the area and the existent long-term underwater monitoring program came to a halt. They argue that there is a significant shark recovery in place, posing a life-threatening risk for the scientists studying the system by diving. It seems that panic driven by the isolated incidents in Fernando de Noronha is causing the authorities to take even more drastic measures at St. Peter and St. Paul's Archipelago, which are affecting ecosystem monitoring, including that of many endemic species. These controversies highlight a disconnection between the goals of MPAs and the reactions to the desired outcomes of conservation initiatives. They also underscore the need for a more informed, science-based approach to managing shark recovery in Brazilian MPAs.

Shark population recovery is among the main goals of conservation initiatives, and scientific research offers valuable tools to assess the outcomes of regulations and ecological progression of MPAs. The prohibition of scientific diving and proposals for shark culling have been made without considering any scientific evidence or reasonable criteria. Shark attacks to divers are exceedingly rare, despite shark diving being very popular and generating millions of dollars in revenue (Gallagher and Hammerschlag, 2011; Huveneers et al., 2017). Shark culling does not necessarily control the number of shark bites (Wetherbee et al., 1994) and has the potential to catch a high diversity of undesired and endangered species (Borsa et al., 2023). Relocation seems more effective in decreasing shark incidents, but this strategy needs to be continuous and involves high bycatch rates and costs (Hazin and Afonso, 2013). Fishing has always represented a conservation threat for oceanic islands and marine reserves around the world. Some examples show that a few months of unregulated fishing eliminates density and biomass gains accumulated over many years of marine protection (Russ and Alcalá, 1996). Therefore, the lack of surveillance and monitoring could quickly reverse the progress made by conservation efforts and monetary investment in the past few decades in Brazil.

The controversies surrounding shark recovery in Brazil's MPAs highlight the urgent need for new strategies and solutions. These solutions should be grounded in scientific research and aim to align conservation goals with potential economic benefits. First, there is a need for studies to assess the reasons behind recurrent shark incidents. Understanding shark behavior, habitat use, and abundance could provide insights into why these incidents are occurring and how they can be prevented. This knowledge could then be used to implement no-entry zones (ecosystem approach) or safety measures and guidelines (educational approach) for activities in areas with higher probabilities for shark attacks (e.g., shark feeding grounds). Second, the potential for further incentives for sustainable activities such as shark diving tourism should be explored. These activities not only have economic benefits (Gallagher and Hammerschlag, 2011; Huveneers et al., 2017) but can also contribute to the conservation efforts by raising awareness and appreciation for sharks (Vianna et al., 2018). Third, the immediate resumption of scientific diving and long-term underwater monitoring programs in research stations is crucial. Interaction between sharks and SCUBA divers are rare, and the activities that were recently stopped provide valuable data that can help assess the outcomes of conservation initiatives and the ecological progression of MPAs. If areas with greater risks are mapped and use regulations well enforced, the risks associated with shark encounters are minimal and should not be a reason for prohibiting diving and beachgoing. Scientific divers are well trained to collect ecological data even in the presence of sharks. Moreover, many scientists expect to dive in the presence of sharks when they visit preserved environments. The quick resumption of scientific diving in a research station that was built to support long-term ecological

studies funded by the Brazilian Government is extremely important to allow the continued monitoring of this unique area. Finally, the proposal of shark culling in Fernando de Noronha should be reconsidered. Instead of resorting to such drastic measures, efforts should be made to coexist with the recovering shark populations by evaluating the possibility of sustainable activities that are beneficial for both the marine ecosystems and the local communities (Aburto-Oropeza et al., 2011).

In conclusion, the recovery of shark populations in Brazil's MPAs represents a conservation success but also presents challenges that require science-based solutions. Proposals such as shark culling and the prohibition of scientific diving lack scientific support and could undermine conservation efforts. Instead, understanding shark behavior, promoting sustainable activities like shark diving, and resuming scientific diving and monitoring programs are crucial. Since sharks and humans co-exist in other MPAs in Brazil, these unwarranted mitigation actions may spread in the future if applied here. Therefore, a paradigm shift is needed towards an approach that aligns conservation goals with economic benefits.

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