

Earth & Space

Overfishing endangers oceanic sharks and rays

by **Holly K. Kindsvater**¹ | Assistant Professor; **Nathan Pacoureau**² | Postdoctoral Research Fellow; **Nicholas K. Dulvy**² | Professor
doi.org/10.25250/thescbr.brk566

¹: Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA

²: Department of Biological Sciences, Earth to Ocean Research Group, Simon Fraser University, Burnaby, British Columbia, Canada

This Break was edited by Akira Ohkubo, Associate Editor - TheScienceBreaker

Overfishing has threatened many oceanic sharks and rays with extinction, however, there's a gap in our knowledge. Our study is the first to provide quantitative evidence for the severity of their declines. It reveals that overfishing of oceanic sharks has far outpaced effective fishery management, alarming that governments have failed to protect them.



Oceanic Whitetip Shark (Carcharhinus longimanus). It was once one of the most abundant oceanic shark species in tropical seas worldwide but is now rare in some regions.

Image credits: Andy Mann and Trevor Bacon

For humans, the ocean is vast and mysterious. The portrayal of top predators in the ocean – from krakens to Moby Dick – shows how they have historically been feared and hunted. For the true top predators – oceanic sharks and rays – mortality has increased steeply, as technology allowed humans to fish further from shore, with deadlier gear, for longer periods of time. The sustainability of these fisheries has suffered from inaction due to gaps in our knowledge about sharks and rays. In particular, we have had little consensus about the historic range, size and status of their populations and species,

hindering the policy actions that are necessary to protect them from extinction. In a new study, we provide scientific evidence that overfishing has endangered oceanic sharks and rays in modern times.

Our team started to fill the knowledge gap by assembling data on trends in shark and ray abundance from government reports, industry, and academic sources from around the world. For 18 of the oceanic species, we modelled their changes in abundance since 1970. For these species and

another 13 species without complete data on population abundance over time, we combined available data and expert knowledge. This allowed us to infer their historic and current status on the International Union for Conservation of Nature Red List (a standardized index of the global extinction risk of a species).

Our study shows that open ocean ecosystems have been fundamentally altered by the replacement of top predators with fishing fleets. The sobering conclusion is that shark and ray populations have been devastated by relentless fishing pressure, and that this tragedy has played out repeatedly in different oceans across the globe. For much of the 20th century, most sharks were caught unintentionally by fishing gears targeting tunas. In recent decades, however, sharks and rays have become increasingly valuable for their meat or products marketed for celebratory dishes or medicinal properties in Asia. For some species, we found that regional differences in population status can be explained by differences in the political will of nations to protect and rebuild shark populations. For example, the three endangered hammerhead shark species have increased in the Northwest Atlantic, despite their dire status elsewhere, partially because of protection in U.S. waters. Yet this positive example is an exception, not the rule. In the same ocean, the Shortfin Mako shark has been driven to dangerously low numbers. Two nations primarily responsible for fishing the Shortfin Mako (Spain and Portugal) agreed to stop only in early 2021.

We concluded that oceanic sharks and rays are now threatened with extinction, despite the fact they have lived in the ocean longer than almost all other vertebrates. Until our study, we did not have quantitative evidence for the severity of their declines. This gap in our knowledge has impeded the implementation of limits on their catch. The high

seas (open ocean areas that do not belong to any nation) still resemble a frontier society, where the laws of nations do not hold and measure safeguarding wildlife and human rights are scant. There are still no treaties to guide the sustainable and fair stewardship of resources extracted from the open ocean. Instead, there are a few international entities that represent the interests of nations and businesses for which the high seas hold economic or cultural value. The most prominent of these entities are the five [Regional Management Fishery Organizations](#), which are charged with managing oceanic tuna fisheries. Overfishing of sharks by tuna fleets has been suspected for decades, but actions to conserve them have been few. Even now, we don't know how intensely they are fished in some regions. In the northern Indian Ocean, where shark abundance has declined steeply in recent years, vast numbers of small boats use gillnets to catch sharks and tuna, but most of this catch is unreported.

We have been slow to recognize the true extent of human impacts on open ocean ecosystems, including overfishing, changes in water chemistry and temperature, and the prevalence of plastic pollution. These threats are diffuse, and countering their impacts will require overhauling the political and economic status quo. However, high seas fisheries are unique in that their activities can be directly linked to specific boats. This fact offers tremendous potential to implement solutions in our toolkit that we already know can be effective. Fishing can be sustainable if we invest in scientific monitoring and assessment of fish populations and produce scientific quotas and prohibitions on the catch of sharks and rays. Enforcing such measures would require bycatch reporting, observers on every boat, and traceability in seafood supply chains. The fate of oceanic fishes is not sealed, and with these tools, a brighter future is possible.