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# Overfishing drives over one-third of all sharks and rays toward a global extinction crisis

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## Abstract

The scale and drivers of marine biodiversity loss are being revealed by the International Union for Conservation of Nature (IUCN) Red List assessment process. We present the first global reassessment of 1,199 species in Class Chondrichthyes—sharks, rays, and chimeras. The first global assessment (in 2014) concluded that one-quarter (24%) of species were threatened. Now, 391 (32.6%) species are threatened with extinction. When this percentage of threat is applied to Data Deficient species, more than one-third (37.5%) of chondrichthyans are estimated to be threatened, with much of this change resulting from new information. Three species are Critically Endangered (Possibly Extinct), representing possibly the first global marine fish extinctions due to overfishing. Consequently, the chondrichthyan extinction rate is potentially 25 extinctions per million species years, comparable to that of terrestrial vertebrates. Overfishing is the universal threat affecting all 391 threatened species and is the sole threat for 67.3% of species and interacts with three other threats for the remaining third: loss and degradation of habitat (31.2% of threatened species), climate change (10.2%), and pollution (6.9%). Species are disproportionately threatened in tropical and subtropical coastal waters. Science-based limits on fishing, effective marine protected areas, and approaches that reduce or eliminate fishing mortality are urgently needed to minimize mortality of threatened species and ensure sustainable catch and trade of others. Immediate action is essential to prevent further extinctions and protect the potential for food security and ecosystem functions provided by this iconic lineage of predators.

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This new study presents the first global reassessment of 1,199 species in Class Chondrichthyes:



SHARKS

CHIMERAS

RAYS

ALERT

Three species are **Critically Endangered (Possibly Extinct)**

representing possibly the **first global marine fish extinctions** due to overfishing



Torpedo suessii

Unolobus javanicus

Carcharhinus obsoletus

\*species not seen in &gt;80 years

Overfishing drives over one-third of all sharks and rays toward a global **extinction crisis**

Results showed that:

**391 (32.6%) species are threatened with extinction**

When including Data Deficient species, more than one-third (37.5%) of chondrichthyan species are estimated to be threatened

Overfishing is the universal threat affecting all 391 threatened species

and is the sole threat for 67.3% of species



The depletion of these species has been driven by continuing demand for human food

LOSS AND DEGRADATION OF HABITAT

31.2% of threatened species

POLLUTION

6.9% of threatened species

and interacts with three other threats for the remaining third

CLIMATE CHANGE

10.2% of threatened species

Species are disproportionately threatened in tropical and subtropical coastal waters

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## Summary

Human activity, like overfishing, habitat destruction, climate change, and pollution, has directly effected our ocean for centuries. This has impacted the ecosystems and organisms that live there, increasing extinction risk for many. Chondrichthyes, the class comprising of sharks, rays, and chimeras, are an evolutionarily distinct group that has been immune to mass extinctions in their 420 million year history, but are not immune to the impact of human activity. Unfortunately, during a global population evaluation in 2014, referred to as the IUCN Red List of Threatened Species assessment, it was reported that at least 17.4% of 1,041 species were threatened, while a trait-based model predicted one-quarter of all species were threatened with extinction. The results of this assessment provided us a deeper understanding of the crisis and it led to the enactment of more fishing regulations and trade restrictions, which unfortunately only covers some of the more threatened species. The scientists contributing to this paper set out to reevaluate the status of populations of Chondrichthyan species. In the first global reassessment, they found more than double the amount of threatened species. While accounting for species that are data deficient, they found 37.5% of species to be threatened with extinction. Three species in particular, the Lost Shark, Java Stingaree, Red Sea Torpedo, may be the first global marine extinction due to overfishing. They found that we must halt and reverse population declines and minimize the extinction risk to protect marine biodiversity. This requires policy action, targeted enforcement, educational programs, initiatives to reduce the incentives of retaining catches, and tools to reduce the mortality of endangered species. In order to protect vulnerable, near threatened, and species of least concern from being at high risk, there must be fishing limits enacted to manage the fishery in a sustainable way. We need to enact effective fishing regulation in order to reduce the catch to sustainable limits and protect our endangered sharks, rays, and chimeras.



# Check Your Understanding

How might management techniques differ between species that are critically endangered versus those that are vulnerable to extinction?

Why are Chondrichthyes, a group that has survived five mass extinctions, now threatened with extinction?

How does environmental justice come into play in regards to shark conservation and management regulations?

What are some challenges of enacting new policies to protect threatened species?

Did you know....  
Between 2014 and 2021, the level of data deficiency has been reduced by approximately one-third.

## Glossary of Key Terms

- Chondrichthyes-** a class of fishes that includes those with a cartilaginous skeleton.
- Species richness** - the number of species within a defined region.
- Overfishing-** the act of taking out too many fish and other marine animals from the ocean.
- Fisheries Management-** management used to produce sustainable biological, environmental and socioeconomic benefits from renewable aquatic resources.
- Extinction risk-** the difference between the current number of species and the future number of species equates to species' extinctions.