



SHARK HEALTH

CONSERVATION GENETICS IN ACTION

Securing a future for sharks by understanding their present and past diversity



By Gary J. Wood from Toronto, ON, Canada - Hammerhead Shark, CC BY-SA 2.0Wikimedia

SHARKS IN DANGER

Sharks have inhabited our oceans since well before the dinosaurs. Despite this incredible example of evolutionary success, today we find many of the world's shark species in peril, with ~ 100 million sharks killed annually (many just for their fins) and with at least a third of the 465 species of sharks now vulnerable to extinction. Losing these top predators will have important consequences for ocean ecosystems.

FACTORS IMPLICATED IN SHARK DECLINES

A major driver of global shark exploitation has been the fin trade, with additional pressure coming from the global trade in shark meat, which has increased steadily since 2000. The decline of large sharks in response to even moderate fishing pressure is linked to their low reproductive rates.

High exploitation rates, accelerating habitat loss and changing oceanographic conditions (including acidification related to climate change) have led to concerns about the trajectories of shark populations in general, and of the large sharks in particular, given their critically important role as top predators.

OUR GOALS AND THE ROLE OF GENETICS

Our work leverages modern genomic technologies, new analytical approaches in the field of population genomics, and our extensive collection of shark biopsy fin clips to provide a detailed picture of global shark population structure, diversity, and dynamics. We are gaining an unprecedented picture of historical population dynamics for a group of animals representing one of the planet's longest surviving vertebrate lineages, in the context of both a long history of climatic fluctuation as well as more recent changes brought about by over-fishing.

SHARKS AND CLIMATE CHANGE

Understanding the capacity of wild animals to respond to climate change is critical for predicting future population dynamics, and for implementing conservation management strategies. This is as true for sharks as it is for any other species group, with the added significance of the potential cascade of impacts that changes in shark populations may have on other aspects of marine ecosystems.

Understanding how shark populations have responded in the past to fluctuations in climate might well provide insights into how they will cope in the future. Different species of sharks may not respond similarly: several shark species, for example, are able to maintain some of their organs at temperatures above ambient.

Comparing the impacts of changing climate on shark species with such endothermic abilities versus those without will help discern whether marine species with different thermoregulatory capabilities will respond differently to future fluctuations in ocean temperatures.

THE WORLD'S MOST VULNERABLE SHARKS

Our genetics work also provides important actionable information for the management of threatened species of large-bodied sharks by identifying population-specific genetic markers that can be used to forensically track the origins of fins found in trade, and by identifying those genetically distinct shark populations of highest vulnerability to help prioritize protection efforts.



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