

UC San Diego

Research Summaries

Title

An Estimate of White Sharks off Central California

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SUMMARY

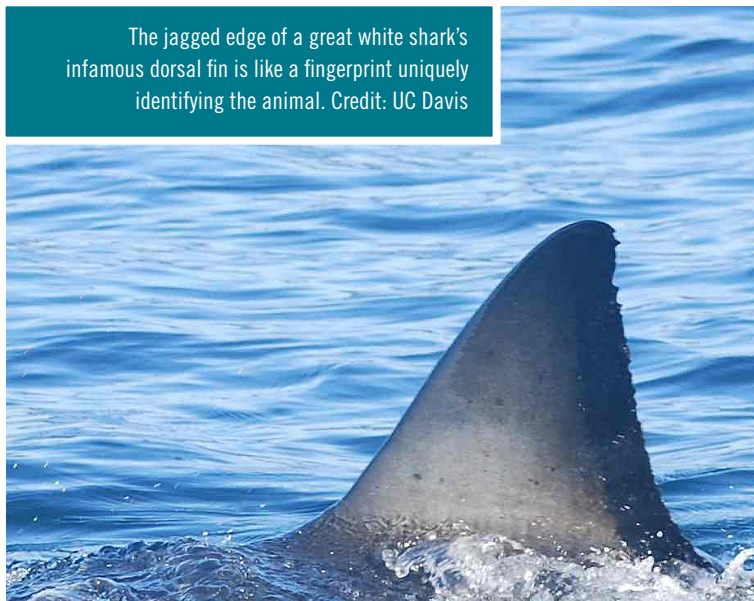
Fewer white sharks (*Carcharodon carcharias*) inhabit the northeast Pacific Ocean than scientists previously thought. The first official count of the iconic marine predator is consistent with genetic studies that have shown a low degree of genetic variability among the animals.

PROJECT

The goal of this project was to construct an estimate of the number of adult and near-adult white sharks in the northeast Pacific Ocean – one of three genetically distinct populations worldwide; the other two are centered off Australia/New Zealand and South Africa.

The northeast Pacific population is itself comprised of two sub-populations, as verified by tracking studies. One aggregates seasonally off Central California; the other, around Guadalupe Island, Mexico. The California sub-population is believed to represent more than half of the total number of sharks (adults and near adults) in the northeast Pacific.

The jagged edge of a great white shark's infamous dorsal fin is like a fingerprint uniquely identifying the animal. Credit: UC Davis

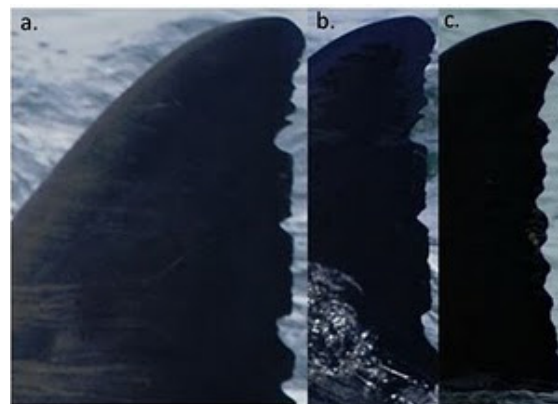


A white shark investigates a fake seal decoy used by UC Davis researchers to entice the animal within photographic range of their skiff. Credit: UC Davis

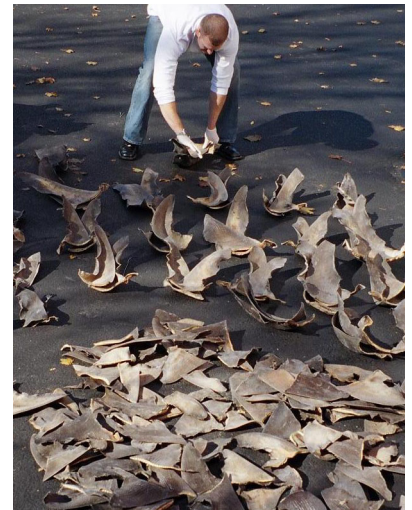
METHOD

Because it is impossible to directly enumerate the entire white shark population off California, the scientists estimated it by sampling groups of sharks at two major aggregation sites – the Farallon Islands off San Francisco and Tomales Point, near Bodega Bay.

For three consecutive years (2006-08), sharks were lured with a fake seal decoy to the sea surface and toward a small skiff, at which point a photographer took detailed shots of the animal's jagged dorsal fin, the tattered trailing edge of which serves as a fingerprint, uniquely identifying individuals. Over the course of the study period, 130 unique individuals were identified from 321 photos.



Figures a and b show the fin of the same shark in 2007 and 2008; Figure c shows a different shark in 2008, illustrating how distinctive the fin shape can be. Credit: UC Davis



Clockwise: A researcher takes photos of the dorsal fin of a great white shark. (Credit: Stanford University). A NOAA agent counts confiscated shark fins. Shark finning could push some species to extinction. (Credit: NOAA) Taylor Chapple was a UC Davis doctoral student and NOAA Fisheries/Sea Grant Population Dynamics Fellow at the time of the study. (Credit: UC Davis)

RESULTS

Using statistical techniques that are beyond the scope of this summary, scientists estimated that there were between 130 and 275 unique adult and near-adult white sharks off Central California during the study. The likelihood that there were more than 275 individual sharks is less than five percent. The best estimate of the population size was 219. This implies that the total number of adult and near/adult white sharks in the northeast Pacific could be in the range of 300 to 400.

The low number of sharks surprised the scientists, as populations of other top marine predators are substantially larger. There are, for example, about 1,145 killer whales in the northeast Pacific and 1,526 polar bears in the southern Beaufort Sea. The low abundance of white sharks is, however, consistent with genetic studies showing a low degree of genetic variability in the population, meaning that there are relatively few reproducing animals.

APPLICATIONS

Shark species around the world are in decline, in large part because of the seemingly insatiable demand for their cartilaginous fins – the key ingredient of shark fin soup, both a status symbol and delicacy in Asia.

The techniques developed in this project can be replicated to estimate abundances of other shark species in other parts of the world ocean. Such baseline population estimates are needed to monitor trends in shark populations and prioritize shark conservation efforts nationally and globally.

PUBLICATION

Chapple, T.K., S.J. Jorgensen, S.D. Anderson, P.E. Kanive, A.P. Klimley, L.W. Botsford and B.A. Block. 2011. A first estimate of white shark, *Carcharodon carcharias*, abundance off Central California. *Biol. Lett.* doi:10.1098/rsbl.2011.0124.

COLLABORATORS

NOAA Fisheries through the Partnership for Education in Marine Resource and Ecosystem Management; Gordon and Betty Moore Foundation; National Park Service’s Pacific Coast Science and Learning Center; Monterey Bay Aquarium; UC Davis Bodega Marine Laboratory, and Patricia King, a member of the Point Reyes National Seashore Association.

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