

White sharks found to migrate across the Pacific Ocean

By Environmental News Network
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The largest and most powerful predator in the sea, the great white shark, has been tracked by satellite and found to travel across vast stretches of open ocean.

Scientists studying white sharks along the California coast have long believed that they spend most of their lives close to shore, pursuing seals and sea lions.

But a newly published study by six California scientists from three institutions has documented the migrations of six sharks, including a male tagged along the Central California coast, who swam thousands of miles to the warm waters off Hawaii.

The study, "Expanded Ecological Niche for White Sharks," appears in the Jan. 3 issue of the scientific journal *Nature*.

To monitor long-distance migrations, the researchers attached pop-up satellite archival tags to the backs of six adult white sharks near seal rookeries in California between 1999 and 2000. The electronic tags recorded data every two minutes on water depth, temperature, and light.

"The migrations and environmental preferences of white sharks have remained elusive," observed Barbara Block, the Charles and Elizabeth Prothro Professor of Biological Sciences at Stanford's Hopkins Marine Station in Pacific Grove, Calif.

"Until this study," said Block, "white sharks had only been tracked for a few days around seal colonies. With the advent of new electronic tagging technology, we can now track their movement, depth, and temperature preferences over many weeks and months."

Block and Andre Boustany of the Tuna Research and Conservation Center — a joint project of Stanford University and the Monterey Bay Aquarium — were joined in the research by Peter Pyle and Scot Anderson of the Point Reyes Bird Observatory in Stinson Beach, Calif., as well as biologists Burney Le Boeuf and Scott Davis of the Institute of Marine Sciences at the University of California-Santa Cruz.

"I was shocked by the results," said Le Boeuf. "Going into this, what we expected was that white sharks were just coastal animals that breed in Southern California, then migrate a few hundred miles north to feed on seals. But it turns out they've got a life at sea, and when they're in the open ocean, they're diving very deep at times."

"Light-level data allow you to calculate when sunrise and sunset occurs," said PRBO biologist Pyle, who has been studying white sharks for 15 years. "From the light data, we can calculate the longitude and latitude of the fish on Earth."

Each tag was programmed to detach from the animal on a specific date, then pop up to the surface, where the data were transmitted via the Argos satellite system to computers at Hopkins Marine Station.

A marine hunter captured in the book and motion picture *Jaws*, the white shark (*Carcharodon carcharias*) is the world's largest predatory fish, reaching 21 feet in length and weighing up to 4,800 pounds.

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Article questions

Name: _____

Date: _____ Period: _____

1. What is the title of the research paper that this article is based on?
2. How did scientists monitor migrations?
3. What else can be monitored other than location?

Satellite data indicate that sharks spend at least five months in the open ocean, "suggesting that it could be an important period in the life history of white sharks in the North Pacific," conclude the authors.

The team is currently working on new shark studies at Año Nuevo and the Farallones islands. "We see the same sharks return to the Farallones again and again," said Pyle. "Males come back yearly, but females return every other year, which means they may be going farther afield than males as part of a two-year breeding cycle. So long-range data on females will be of particular interest."

In November 2000, Block and her colleagues launched the Tagging of Pacific Pelagics (TOPP), a major research initiative whose objective is to complete the first comprehensive analysis of marine life in the Pacific using electronic tagging technology.

As part of the global Census of Marine Life, TOPP's international research team plans to electronically monitor up to 4,000 fish, birds, mammals, and large squid.

TOPP scientists are working with engineers to develop even more sophisticated electronic tags that increase the amount of information sent back to researchers. The scientists will launch a pilot program in the next two years to tag salmon, blue and white sharks, albatross, bluefin tuna, elephant seals, blue whales, and squid.

"This is coming at an important time, as white sharks, along with many open-ocean animals, require increased protection from international fisheries," said Block. "The first step in protecting their future on Earth is knowing where they go."

The six sharks tagged during the study, four males and two females, ranged in size from 11 to 15 feet. All six were tagged in the fall: four near Southeast Farallon Island, a national wildlife refuge about 30 miles west of San Francisco, and two near Año Nuevo Island about 55 miles to the south. The sharks are easy to tag because they are attracted to the numerous elephant seals who congregate on these islands.

Data showed that, while near shore, tagged sharks rarely dove more than 90 feet below the surface. "The surprise came in winter when four sharks tracked for longer durations all headed offshore into the central and eastern Pacific," said Block.

One male migrated from the Farallones to the Hawaiian island of Kahoolawe some 2,280 miles to the west, traveling at a minimum speed of 43 miles per day. The shark stayed in Hawaiian waters the entire winter and spring.

In November, this male shark returned to the Farallones, giving Pyle, Anderson, and Boustany the opportunity to attach another pop-up tag on his back. The tag is programmed to record data for nine months and could answer some of the questions about the shark's round-trip migration.

"White sharks have only rarely been reported in recent times in Hawaii," said Block, "but ancient cultures had tools that were made from white shark teeth, so it's clear they have been around the islands for some time."

Three other tagged sharks, two females and a male, migrated to a subtropical region of the eastern Pacific hundreds of miles west of Baja California. The three sharks remained in the open ocean for several months, never venturing near any coastline.

"What they were doing out there is a mystery," noted Le Boeuf. "Since they were hunting for seals when tagged, such a long migration suggests a possible rendezvous for mating or a move to feed on different prey."

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4. How were the tags recaptured?
5. How big does a great white get?
6. How far did the sharks migrate?
7. Why did the sharks migrate?
8. What does TOPP stand for?