

Technology provides insight into the hunting behavior of white sharks

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A metal clamp containing data logging package was placed onto front dorsal fins of white sharks. Credit: Yuuki Watanabe, the National Institute of Polar Research, Japan

White sharks are top predators in the marine environment, but unlike their terrestrial counterparts, very little is known about their predatory activity underwater, with current knowledge limited to surface predation events. Now, a team of international scientists has used video- and data-logging technology to shed new light on predator-prey interactions of these mighty sea creatures.

Their findings were published on July 4, 2019 in *Marine Ecology Progress Series*.

The [white shark](#) is an iconic species found in surface- and deep-waters in all major oceans of the world. With a lifespan that can stretch 70 years or more, these formidable predators can reach over six meters (20 feet) in size when fully mature. They prey on marine mammals, such as seals, as well as fish, and are responsible for more [shark bites](#) on humans than any other shark.

"Their breaching behavior—where they jump out of the water to catch seals—observed in South Africa, is especially famous, and has attracted the attention of a lot of people, including scientists," said Yuuki Watanabe, associate professor in marine biology at the National Institute of Polar Research in Japan and lead author of the study.

"Although breaching behavior can be seen from boats and is well studied, what happens underwater is mostly unknown," Watanabe added. "Moreover, in other aggregation sites of white sharks, including our study site in Australia, breaching behavior is rarely seen, suggesting that different hunting strategies are employed by these sharks."

To gain a better understanding of the strategies white sharks use to scout and hunt their prey, the researchers needed to dive deeper—literally. "That's why we decided to attach [video cameras](#) and other sensors to white sharks to directly observe their underwater hunting behavior on

seals," explained Watanabe, who has been engaged in biologging research for many years and has made unique discoveries about the ecology of marine life.

The international research team, including Watanabe and his colleague Charlie Huveneers (associated professor at Flinders University in Australia), lured sharks to their research boat by throwing 'chum' into the shark inhabited waters off Neptune Islands Marine Park in Australia. Chum, a fishy bait mixture consisting of fish blood and flesh, is very effective at attracting sharks due to their highly developed sense of smell.

Using a deployment pole, metal clamps containing a data logging package were placed onto the front edge of the dorsal fins of eight white sharks. The data loggers included an accelerometer that recorded swim speed, depth and water temperature at one second intervals. It also recorded triaxial acceleration (measurements of body movement across three perpendicular axis) at shorter intervals. The data-logging package fitted onto three of the sharks also contained a tiny video camera, which recorded video footage for six hours at pre-programmed intervals. After 1-2 days, the data logger packages detached from the shark and were located and recovered on the surface using radio signals. The researchers then analyzed the accelerometer records and linked them to the video footage.

Acceleration data recorded by these devices allowed researchers to distinguish behavioral patterns while the animals were out of view by measuring tailbeat movement frequency.

"We obtained video footage showing how a white shark chased a seal in the water. In Japanese, we say 'seeing is worth of a thousand words.' This is also the case for ecological studies of marine animals," said Watanabe.

The video footage showed one of the sharks attacking a seal. During this event, the attached data logger recorded intensive swimming action with a rapid burst in lateral acceleration, tailbeat frequency and swim speed. After analyzing 150 hours of recorded acceleration data, the researchers identified seven potential predation events at various depths ranging from the surface to a depth of 53 meters (174 feet). These predation events occurred both at nighttime and during the twilight hours of dawn and dusk, which partially contrasts with the breaching behavior observed by white sharks hunting seals in South African coastal waters that primarily occurs at dawn and dusk.

These findings suggest that white sharks do not only prey on seals on the surface (attacking from below after searching for a seal silhouetted against the surface, illuminated by the sunlight shining from above) with the momentum of their upward thrust causing them to leap into the air in a breaching motion, as observed in South Africa. At the study site in Australia, sharks also actively search and pursue seals in deeper waters, and this predatory activity is not limited to dawn and dusk but rather also occurs at night, suggesting that white sharks do not depend on vision to locate and hunt their prey.

The researchers would like to get more footage of seal-hunting behavior of sharks to understand variations. "It appears that hunting strategies of white sharks in South Africa are very different to those in Australia, and we would like to understand what kinds of factors (biological or non-biological) are driving the difference," he explained.

More information: YY Watanabe et al, Hunting behaviour of white sharks recorded by animal-borne accelerometers and cameras, *Marine Ecology Progress Series* (2019). [DOI: 10.3354/meps12981](https://doi.org/10.3354/meps12981)

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