

# Shark Tales

SATELLITE TAGS REVEAL HIDDEN WORLD OF OCEAN'S LARGEST FISH *by Gwendolyn Schanker*

MIT-WHOI graduate student Camrin Braun (right) uses satellite tags to track the long-mysterious movements of sharks in the deep ocean.

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Like many of his fellow millennials, Camrin Braun often starts his day by going online to see what his friends are up to. But instead of checking in on Twitter or Facebook, he's tracking updates from blue and mako sharks swimming in the middle of the ocean.

Braun and the sharks he studies—Johnny, Oscar, and Roland, among others—have a curious relationship. They met in the fall of 2015, with Braun kneeling on the deck of a boat off the coast of Nantucket, holding down each of the 300-pound animals as he carefully attached a high-tech tag onto their dorsal fins. They spent only a few moments together, but Braun now knows intimate details of the sharks' daily lives, and he's followed them as they've traveled up to 10,000 miles across the North Atlantic since October.

The tags record the sharks' movements as well as the conditions of the seawater they are swimming through. When the tags relay their data via satellite back to Braun's laptop, he gets some of the world's first views into where sharks go and what they are doing. The sharks themselves also act as scouts: They provide insights into an ocean frontier where they routinely travel, but Braun can't.

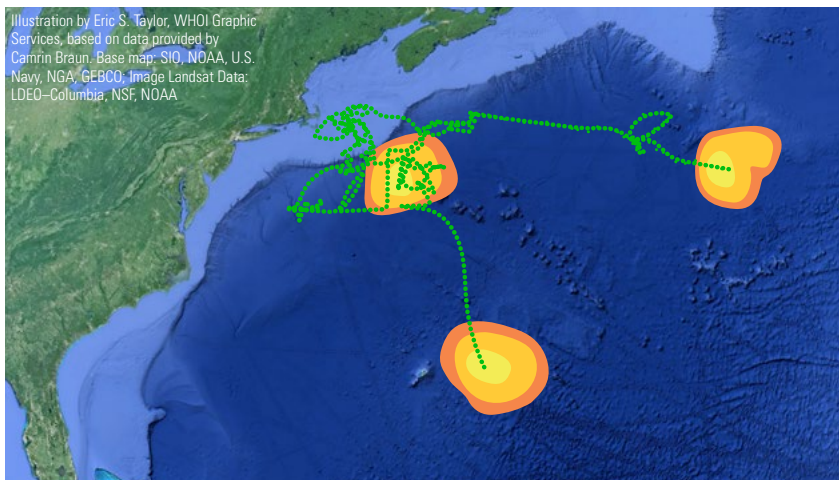
"It's baffling that we know so little about the ocean's biggest and most

important animals," said Braun, a graduate student in the MIT-WHOI Joint Program in Oceanography.

There are more than 500 species of sharks, many of which are endangered, largely because of overfishing. As predators at the top of the food chain, sharks play a key role in maintaining biological diversity in the marine ecosystem.

"We don't know where sharks move or why, where they mate, or where they have pups," said Woods Hole Oceanographic Institution (WHOI) biologist Simon Thorrold, Braun's Ph.D. advisor. "Without that knowledge, it's impossible to

Data relayed by satellite from tags attached to sharks' dorsal fins reveal that some animals swim thousands of miles over the course of a few months.





Sam Payet



know where to implement marine protected areas to conserve them or how to devise sustainable fisheries management strategies for sharks.”

### **An underwater buffet**

“Human observation is limited to a tiny sliver at the very surface of the ocean, and beyond that, we don’t know what’s happening,” Braun said. Fortunately, the satellite tag technology that Braun is using is letting scientists in on sharks’ hidden lives throughout the breadth and depth of the ocean.

Following the movements of Johnny, Oscar, and Roland, Braun has found that sharks can dive thousands of feet daily through the ocean’s photic zone, where light gets through, to the colder, deeper, darker mesopelagic zone. Their travel pattern coincides with a phenomenon in the ocean known as the deep scattering layer.

This layer was first detected during World War II when Navy sonar operators, using newly developed technology, saw sound waves scattered by a zone in the ocean 1,000 to 1,600 feet deep. The layer seemed to move down during the day and back up at night. Further research showed that the layer was densely populated with a variety of marine organisms that migrated to deeper depths for protection when the

sun was out and back up after dark to feed on plankton in shallower waters.

The blue and mako sharks that Braun studies seem to follow this moving food source. Braun suspects that the animals spend the energy necessary to dive to the deep scattering layer because they have a guaranteed source of food there.

“My theory is that every fish that we tag, they all visit the mesopelagic region of the ocean,” he said. “It’s like this buffet that’s being set in the deep ocean. Humans don’t know what’s being served, but the sharks know.”

### **Spreading ocean awareness**

Knowing how sharks spend their lives not only helps solve mysteries of the deep ocean, it can also aid conservation efforts.

Sharks, like humans, have long life spans and few offspring at a time. That makes them highly vulnerable to both overfishing—to be made into luxury products such as shark fin soup, for example—and to climate change impacts, such as warming ocean temperatures.

Removing sharks also threatens to disrupt the entire ocean ecosystem. As apex predators, sharks consume a variety of prey, allowing some species to flourish and others to be kept in check, which in turn influences the distribution of animals fur-



ther down the food chain. The interplay maintains biodiversity and balance within the ecosystem.

The lack of basic knowledge about sharks poses a problem for protecting marine ecosystems. The blue sharks that Braun tracks are an example. Even though scientists don't fully understand the blue shark's role in the ocean ecosystem, there's essentially no cap on the number of blue sharks that can be captured.

"If you don't understand something, the last thing you should do is exploit it to its full potential," Braun said.

The information about shark movement and behavior that Braun and Thorrold are compiling will be essential for designing networks of marine protected areas, as well as for developing management policies to sustain shark fisheries.

"I think the decisions we make in the next ten years are going to influence what our oceans look like in the next two hundred years," Thorrold said. "A lot of us can't influence the global scale, but we do what we can to make a difference."

Another way to make a difference is by increasing public awareness. Recently, Braun launched a crowdfunding website to help raise money to pay for equipment and ship time to tag more sharks.

Braun has also worked with OCEARCH, a nonprofit organization whose goal is to collect data while engaging the public with shark research. During a trip to Florida aboard OCEARCH's vessel, Braun helped tag one tiger shark and spent several days searching for great white sharks. OCEARCH has an app called Global Shark Tracker, which allows anyone to track the movements of tagged sharks, including Johnny, Roland, and Oscar.

"A lot of people engage with shark movements, which has totally changed the way people look at sharks and shark science," Braun said. "It's cool that the public gets to move forward along with us."

Blue sharks like these were once abundant in the open ocean, but they have been fished without catch limits. Satellite tags like the one that WHOI biologist Simon Thorrold (inset) is holding are giving scientists an unprecedented ability to follow sharks and begin to understand their habitats and behavior. That information is essential for determining management strategies to ensure that the sharks are not overfished.

## Fast and furious

Braun grew up in Idaho, fishing in lakes and rivers during his childhood. When he was 12, he learned how to scuba dive.

"I remember that first breath that I took under water," he said. "I remember dropping below the waves. I remember this feeling of elation when I realized that I had opened the door to a lifetime of exploration."

Braun tracked whale sharks and manta rays throughout his college years, first as an undergraduate at The College of Idaho and then in a master's program at King Abdullah University of Science and Technology in Saudi Arabia, where he explored the movements of manta rays in the Red Sea.

On field days now, Braun sets his alarm for 3 a.m. Armed with his tagging equipment and a stack of pizzas, he gets to the dock in time for a 4:30 a.m. departure. He's got a checklist in his head of everything that needs to happen when they do manage to land a shark on the boat: taking blood samples and body measurements, putting a positioning tag in the dorsal fin, and attaching a depth-temperature tag to the shark's back via a dart.

"It's like a NASCAR pit crew once the shark is brought aboard the boat," Braun said.

On a day like this, Braun and his team will spend upward of fifteen hours working to get the right size and species of shark to take their bait. When they do catch a shark, the few minutes that man and animal spend together pass by in a blur.

"I was one time point in these sharks' lives," he said. But now, Johnny, Oscar, and Roland are a big part of his. ▲

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