Detecting season presence of sharks in the water—with eDNA

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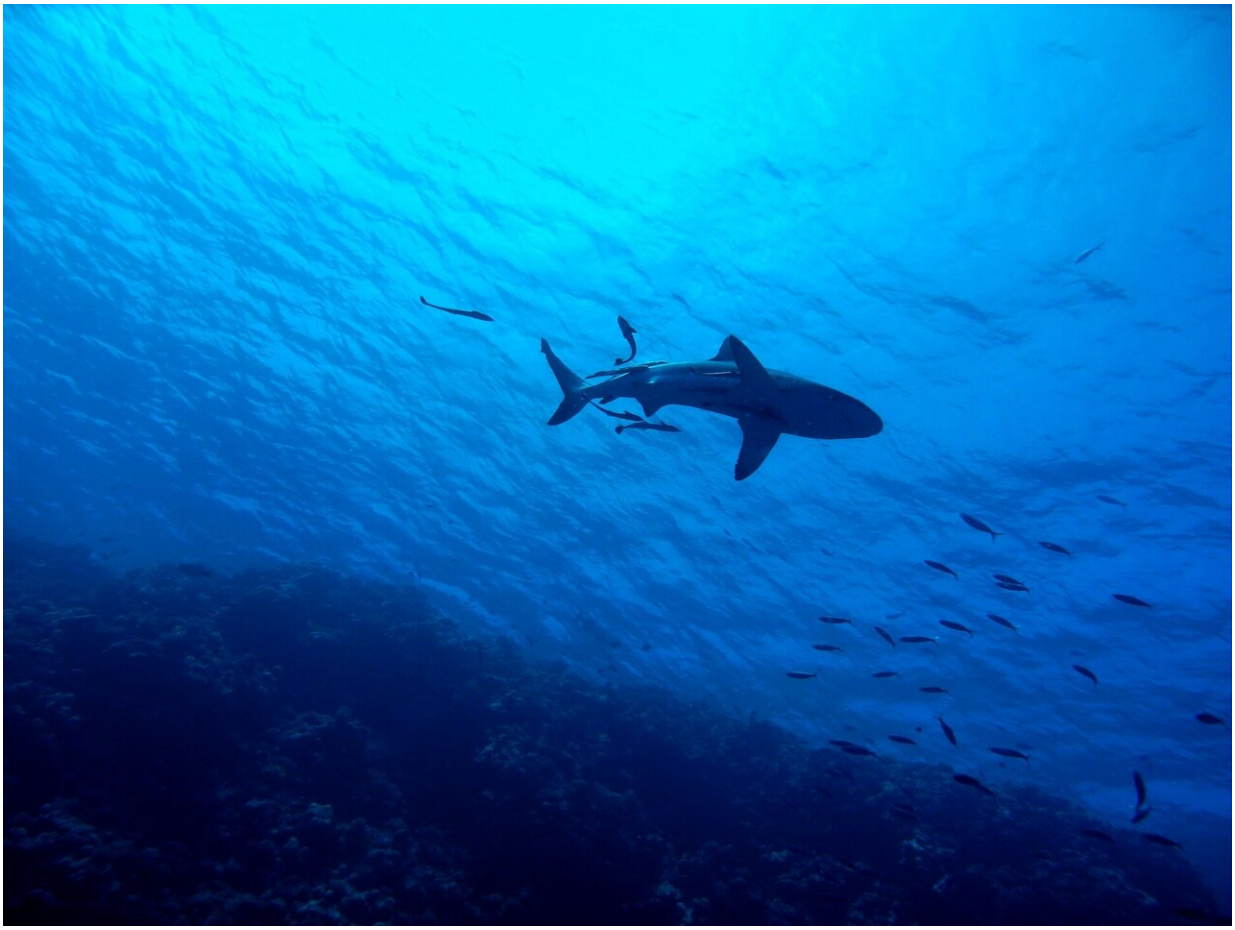

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New research reveals it's possible to detect sharks moving into an area

without actually seeing any of them. All that's needed is a couple liters of water.

People leave DNA *everywhere*. Sharks do, too. In fact, they leave a lot of *stuff* behind in the water—sloughed off skin, mucus, and, yes, even poop. Once it's left behind, the DNA released from it becomes known as environmental DNA or eDNA.

Florida International University (FIU) marine scientists Demian Chapman, Bautisse Postaire, and Judith Bakker—along with a collaborative team of researchers from New College of Florida and Havenworth Coastal Conservation—wanted to see if a spring and summer influx of blacktip sharks (*Carcharhinus limbatus*) into Florida's Terra Ceia Bay could be detected by filtering and extracting eDNA from water samples.

"Catching sharks is hard, but catching water is easy," Postaire said. "This study is an important step in the development of new methods to detect and monitor sharks."

Throughout the spring and early summer, Terra Ceia Bay—located on the west coast of Florida, at the south end of Tampa Bay—is a nursery for blacktip sharks. In the fall, they leave the safety of the shallow waters and begin to head south.

"Corresponding to this well-documented seasonal migration, we detected the presence of blacktips in 27 out of 58 water samples taken during the time sharks are known to frequent the bay," Bakker said.

"When the sharks started to leave in the fall, significantly fewer of our water samples tested positive for this species," Postaire said.

Typically, eDNA doesn't travel too far from where it is shed. It also

doesn't linger too long in the water—possibly only a few hours to a few days. So, if eDNA of a species is found, that lets scientists know the animal is or was recently in the specific area.

This information is helpful for conservation and management of different species, including the blacktips. While not threatened in the United States, blacktips are one of the top species in the global shark fin trade, which puts them at possible risk of overexploitation and population declines.

"In addition to being ecologically important, blacktip sharks are economically valuable, the dominant species in the Gulf of Mexico large coastal shark fishery. This fishery is currently incredibly well-managed but continued monitoring is critical to ensuring that these populations remain healthy," Jayne Gardiner, one of the study's co-authors from New College of Florida, said.

Since 2014, Chapman has used DNA analysis on fins and shark meat found in markets to monitor the global fin trade and determine whether international laws are protecting endangered species. He's also co-lead of Global FinPrint, an international effort supported by the Paul G. Allen Family Foundation, which recently released a groundbreaking survey revealing sharks are disappearing from the world's coral reefs.

For scientists like Chapman, eDNA is another tool to stitch together the story of what is happening to sharks in the world's oceans.

"While this is still an emerging technology with many potential pit-falls," Chapman said. "It could provide a great deal of information on the presence of sharks in certain areas, especially if it is integrated into existing shark monitoring programs."

This study was funded by the Paul G. Allen Family Foundation and the

Shark Conservation Fund. The findings were recently published in *Scientific Reports.*

More information: Bautisse D. Postaire et al. Environmental DNA detection tracks established seasonal occurrence of blacktip sharks (Carcharhinus limbatus) in a semi-enclosed subtropical bay, *Scientific Reports* (2020). DOI: 10.1038/s41598-020-68843-0

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