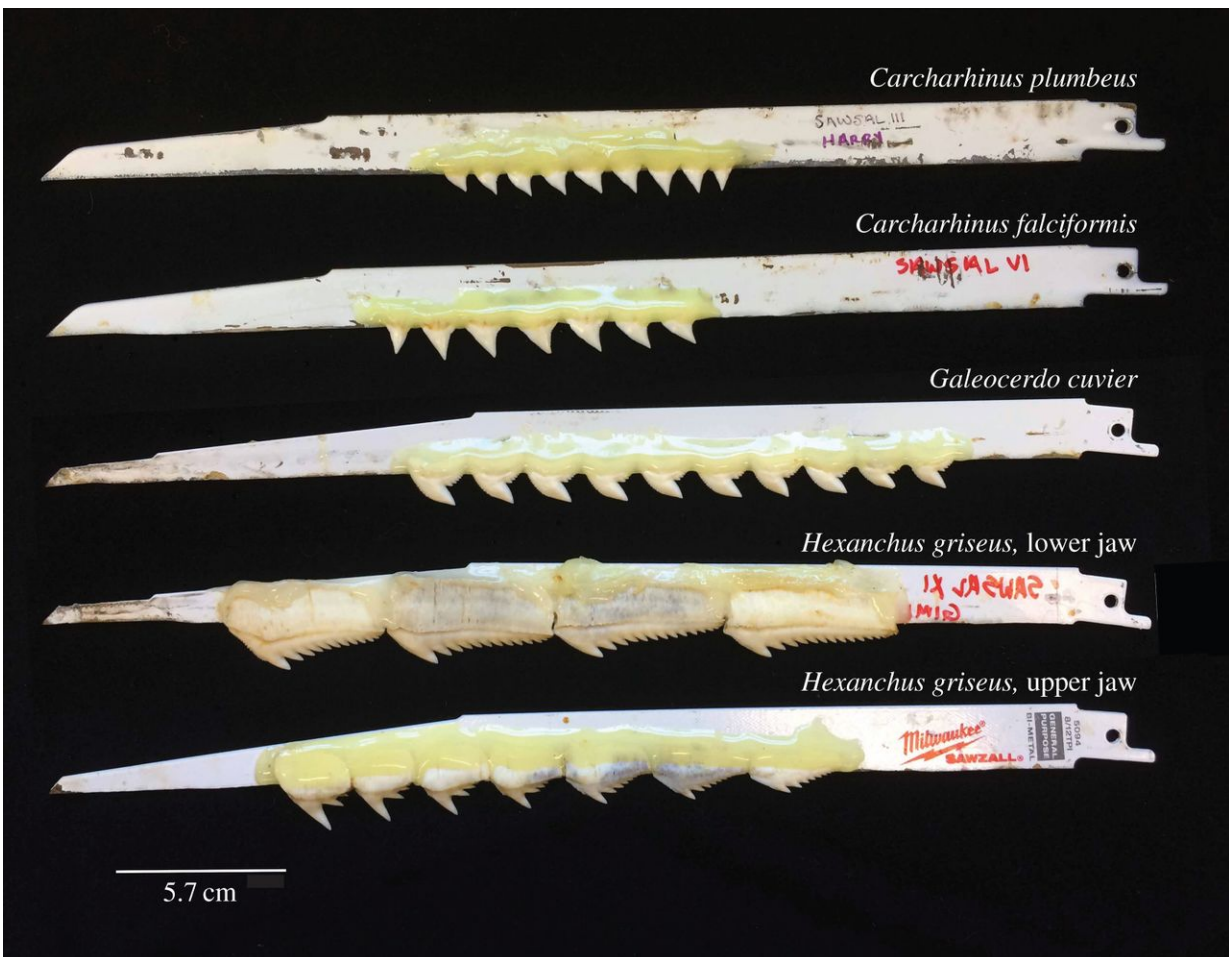


How do shark teeth bite? Reciprocating saw, glue provide answers

September 8 2016, by Michelle Ma



Shark teeth were attached to reciprocating saw blades using epoxy. Credit: University of Washington

Sharks have a big reputation for their teeth.

The ocean predators use their buzz saw mouths to efficiently dismantle [prey](#), ranging from marine mammals and [sea turtles](#) to seabirds and—as Hollywood likes to remind us—an occasional human.

There are more than 400 species of sharks in the world and each has a unique tooth shape. Some are simple triangles, while others are deeply notched or spear-shaped. But despite this variety, scientists haven't detected a difference in how different shark teeth cut and poke tissue.

A recent University of Washington study sought to understand why shark teeth are shaped differently and what biological advantages various shapes have by testing their performance under realistic conditions. The results appeared in August in the journal *Royal Society Open Science*.

"When you have all these different tooth shapes, there should be some functional reason. That issue was fundamentally troubling to me," said senior author Adam Summers, a UW professor of biology and of aquatic and fishery sciences. "It seemed likely what we were missing is that sharks move when they eat."

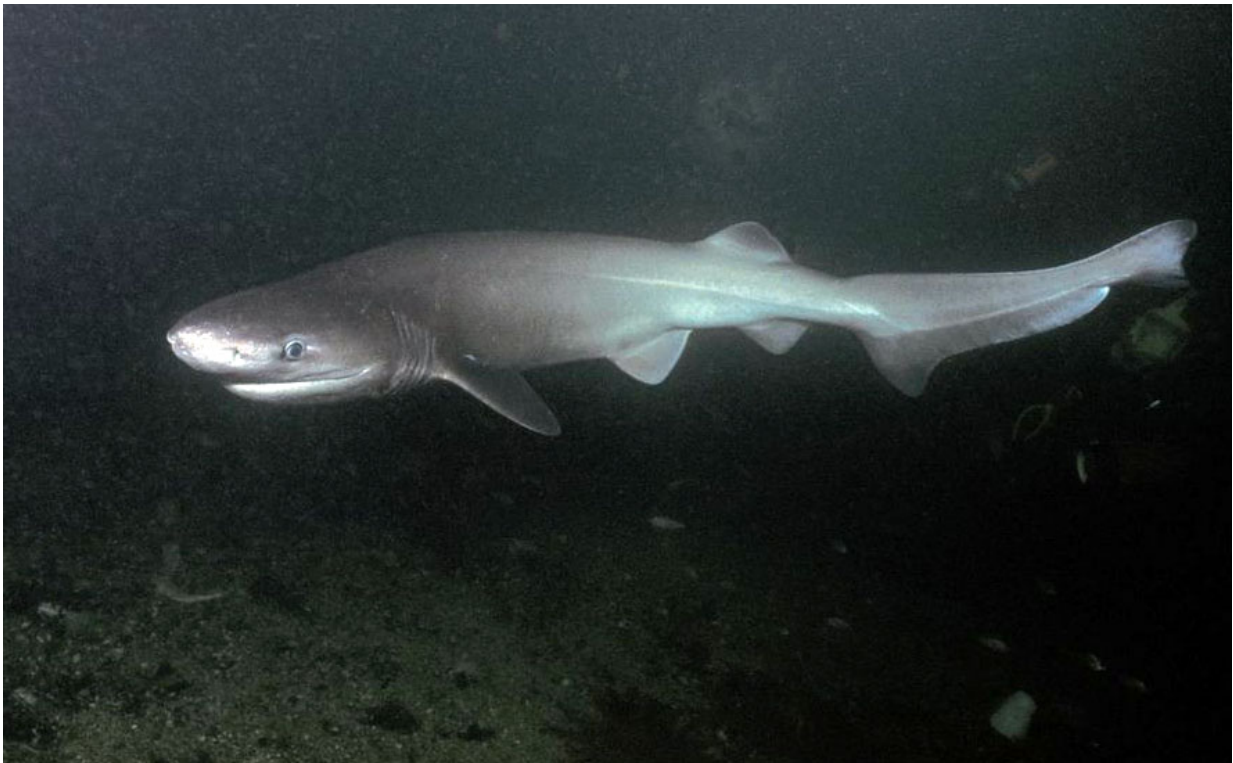
Sharks shake their heads rapidly when they bite their prey, so evaluating how teeth perform while in a side-to-side motion was critical to the study tests, which took place during a summer marine biology course at the UW's Friday Harbor Laboratories on San Juan Island.

Summers and his collaborators affixed three different types of shark teeth to the blade of a reciprocating power saw, then cut through thick slices of Alaska chum salmon at a speed that mimicked the velocity of head-shaking as a shark devours its prey.

"Sure enough, when we cut through salmon, different teeth cut

differently," Summers said. "We found a way to distinguish between this huge morphological difference we see among shark teeth in nature."

The researchers also noticed that some species' teeth dulled more quickly than others. Two kinds of teeth, belonging to tiger and silky sharks, dulled after only several passes of the saw blade over tissue, meaning that it's possible these sharks in the wild must replace their teeth every time they kill prey.



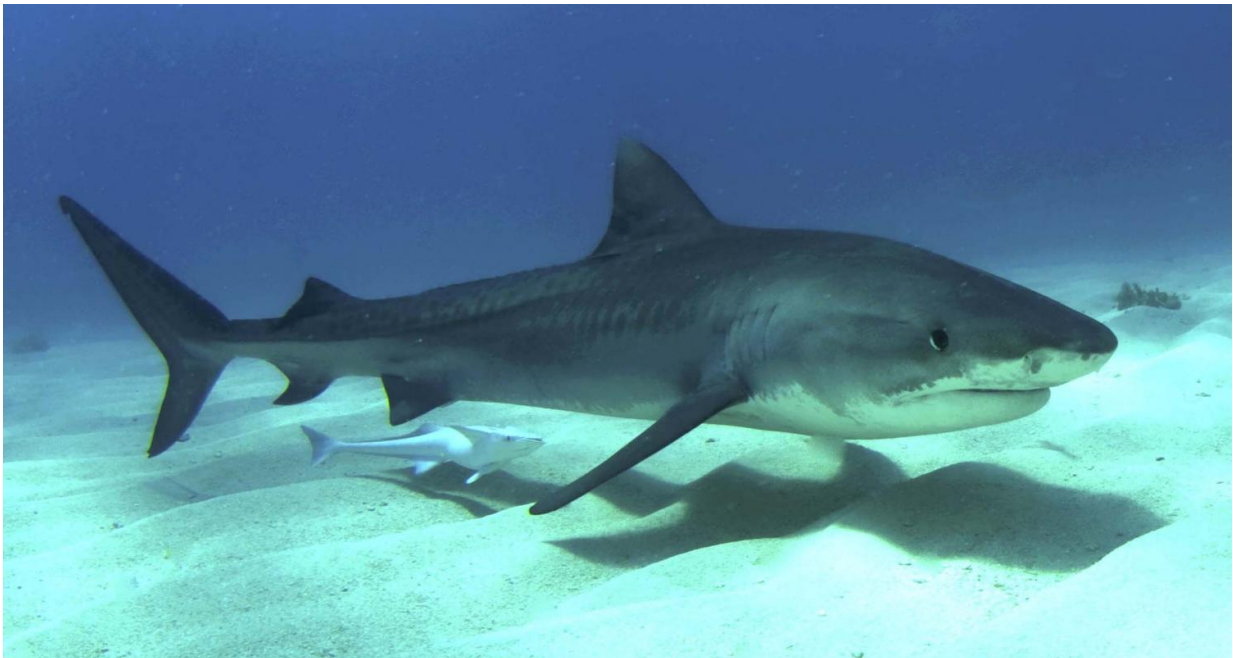
Teeth from bluntnose sixgill sharks didn't cut as well, but they also didn't dull as quickly as the other teeth. Credit: Washington Department of Fish and Wildlife

Teeth from the bluntnose sixgill shark didn't cut as well, but they also didn't dull as quickly as the other teeth.

"There's this tradeoff between sharpness and longevity of the tooth edge," Summers explained. "It looks like some sharks must replace their teeth more often, giving them a consistently sharp tool."

This might shed light on the feeding patterns of different sharks, the authors explain. For example, bluntnose sixgill sharks with duller, longer-lasting teeth might be swallowing their prey whole. Tiger sharks that eat a larger range of prey such as sea turtles, dugongs and seabirds usually bite their prey to pieces before eating it and would need sharper teeth to puncture a sea turtle's rigid shell, for example.

When tissue is punctured and twisted side-to-side as prey is during a shark attack, the prey's tissue doesn't always behave the same way. This is not unlike a child's Silly Putty that will stretch into a long, stringy piece when slowly pulled apart, but break in two when yanked at a much faster speed.



A juvenile tiger shark. Credit: Albert Kok/Wikipedia

Biological tissues behave in the same unpredictable way when pulled, prodded or strained. It was this nuance that the research team tried to capture using experiments that involved movement. They believe it's the first study of its kind for mimicking how [sharks](#) hunt and kill.

"It is really important to test biological materials at strain rates that are high enough to mimic how the predator and prey tissues would actually behave in real life," said co-author Stacy Farina, a postdoctoral researcher at Harvard University and an adjunct lecturer at Shoals Marine Laboratory. Farina was a teaching fellow at Friday Harbor Labs when the research was conducted.

The experiments for this study were designed and carried out during an intensive five-week course at Friday Harbor Labs in summer 2014. Katherine Corn, now at the University of California, Davis, used epoxy from a local hardware store to glue [shark teeth](#) to the reciprocating saw blades. The materials worked surprisingly well.

"We asked ourselves, how do we safely and effectively move these teeth back and forth quickly? The quick and dirty way was, glue them onto a power saw," Farina said. "It was a simple solution to a complicated problem."

More information: Katherine A. Corn et al, Modelling tooth–prey interactions in sharks: the importance of dynamic testing, *Royal Society Open Science* (2016). [DOI: 10.1098/rsos.160141](https://doi.org/10.1098/rsos.160141)

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