
Climate Change Corrodes Shark Skin

06/01/2020

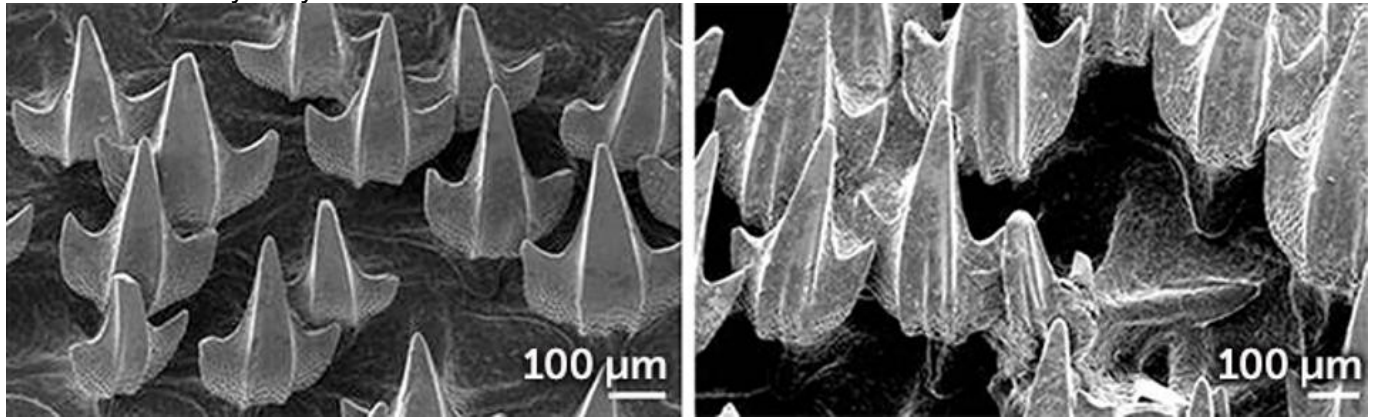


We've heard it before that sharks have repeatedly survived mass extinctions... surely, they should be able to survive the one our planet seems to currently be undergoing, right? Although they have been around since the dinosaurs, it seems sharks are facing their most fearsome foe yet: climate change.

After destroying their habitats, overfishing, and hunting them, humans have caused shark numbers to decline at a staggering rate. In a study published in the journal <https://www.nature.com/articles/s41598-019-54795-7> > *Scientific Reports*, researchers show that prolonged exposure to acidified water corrodes shark's skin. Shark skin is not like ours; it's made up of thousands of little scales, called dermal denticles, that have a makeup like teeth. While some can be seen by the naked eye, the impact acidic water has on dermal denticles can only be seen via electron microscope. But how acidic are we talking about? Currently our oceans average a pH of 8.1, which is apparently 25 percent more acidic than in pre-industrial times. For this research, the scientists kept puffadder shysharks (*Haploblepharus edwardsii*) in tanks of 7.3 pH water. Why this specific number? According to one estimate, ocean water could be this acidic by the year 2300.

"It's probably not going to be an average for the ocean, even in 2300," Luiz Rocha, curator of fishes at the California Academy of Sciences, told Wired. "Unless instead of slowing down, we continue racking up the amount of greenhouse gases that we're dumping in the atmosphere. If it drops to 7.3, we are doomed. Everything is going to fall apart, not just sharks."

Climate change will have an enormously varied impact on the world's oceans. Overall, some changes that can be expected include increased warming, a decrease in pH levels, decreases in dissolved oxygen (leading to more 'dead spots' of very low oxygen), and changes in salinity. For highly mobile animals such as sharks, it's harder to study how these changes will impact them. Already we are seeing shifts in their swimming behavior and changes to migratory patterns, food availability and altered brain development are all predicted to occur if things continue the way they are.



Scanning electron micrographs show that the denticles of puffadder shysharks kept in pH 7.3 water ... [+]

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But not all sharks are migratory. Some, like this slender benthic catshark, stay in one spot. Puffadder shysharks are endemic to the coast of South Africa, preferring the cold waters here to scavenge on crustaceans, polychaetes and small fishes. Camouflaged due to their sandy color and reddish saddles with dark and white spots, they tend to be seen as pests by local fishermen due to them eating bait off their hooks. While seen as a nuisance to some, they were a great study species since they have such a restricted range! The experiments, done in a lab, were carried out for nine weeks where after the researchers looked at the puffadder's dermal denticles. On average, a quarter of the denticles on the sharks in acidic water were damaged, compared to 9.2 percent on the controls. "Damaged denticles may impact their ability to hunt or escape," study co-author Lutz Auerswald, biologist at Stellenbosch University in South Africa, told Wired. "In addition, since sharks' teeth are from the same material, corrosion may impact hunting and feeding."

Ocean acidification is a major, but often less understood, concern for sharks. In fact, all sharks and their relatives (rays, skates, and chimaeras) have teeth and denticles made from this same material that seems to be vulnerable in increasingly acidic water. While done in a lab and only on one species, the results are still troubling. Our oceans may not get this acidic in the near future, but it's just another hurdle for these animals to overcome. Currently they face more pressing threats such as overfishing and bycatch, habitat destruction, and even shark finning. But climate change shouldn't be ignored. "The rate of climate change is very fast compared to previous changes," says Auerswald. "Most likely, shark species will feel the impact differently and some may not be able to cope, whereas others may have the potential to adapt."