Forbes

DNA To The Rescue: How Researchers Are Finding Illegal Shark Fins

Melissa Cristina Márquez Contributor ⓘ
Science
I write about sharks and the people who work with them

Another shipment has come, and you watch as the boats are boarded and searched. You notice specks of blood in the corners of the vessel and wonder just what is waiting inside the freezers and fridges. As you walk into a fridge, you are stunned to see it lined from the floor to the ceiling with fins. Now comes the hard part... identifying them all.

Hammerhead Shark in Tiger Beach, Bahamas. Hammerheads are one of the most sought-after sharks due to the hefty price their fins go for. GETTY

For customs and other agents who inspect traded animal products, it can be hard to identify the animal a certain product came from. That is especially true for sharks, as some experts even have trouble telling species apart. Although a fin-ID guide came out from CITES to help agents out, it still left some ambiguity about whether it was correctly identified or not. Now, a group of conservationists and researchers funded by Paul G. Allen Philanthropies have developed, tested and launched a rapid DNA testing tool that removes any doubt and allows them to make meaningful on-the-ground decisions.

Sharks were of particular focus for this tool due to the IUCN Red List of Threatened Species Red List reporting that 31% of sharks and rays are threatened with extinction. Many species of sharks are slow growing, meaning they take years to be sexually mature and then only produce a small number of pups (baby sharks). They are seen as bycatch in some fisheries, but many are primarily fished because of their fins and the pretty price some people are willing to pay to make shark fin soup, an Asian luxury dish. According to Paul G. Allen Family foundation representatives, roughly between one-third and one-half of the annual global shark fin trade passes through Hong Kong Special Administrative Region (SAR), making effective implementation of the CITES listings for sharks in the fin trade (such as large hammerheads, threshers, oceanic whitetips, and silky sharks) particularly important.

A team of researchers have banded together to develop a quick way to provide DNA identification of animal products. Photo by D IEGO CARDEÑOSA MSC., STONYBROOK UNIVERSITY

When nations agree to protect threatened or endangered species, their ability to enforce those commitments can be limited. Many countries still allow the sale of certain shark fins, specifically those not listed as protected by the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES). So how do officials determine whether or not a shipment of shark fins is “okay” vs “not okay”? Well, it all comes down to the person doing the inspecting. This isn’t a process that has been automated, and it all depends on an inspection agent’s ability to visually identify the fins in the shipments they are inspecting. As we know with anything that humans are involved in, there is the chance of a huge margin of error.

Their inspections until now were based on visual identification of these large shipments, and any positive identifications of illegal CITES-listed species subsequently validated by DNA testing... the only problem is, this

was done months later in a government forensics laboratory. By that time the shipment was no longer at the port! Earlier this year, a protocol for the rapid DNA testing tool was published in Scientific Reports, and not only helps out those countries who import or export shark fins but any country looking to accurately identify animal products through DNA. While some may think this sort of tool would only be accessible to those countries with more money, the tool is also inexpensive ($0.94 USD per sample) and boasts how fast it produces results and how it is easy to use. Delivering DNA-backed ID's in less than four hours thanks to a multiplex real-time PCR protocol, the researchers also developed a step-by-step guide to use the Shark DNA Toolkit being used during training sessions today!

Lead researcher Diego Cardeñosa shows authorities in Peru how to use new cost-effective DNA Toolkit. ALEJANDRA WATANABE, OCEANA PERU

"Dr. Demian Chapman, the lead scientist at Florida International University and his PhD candidates and research assistants, Diego Cardeñosa and Jessica Quinlan, developed and tested the approach in the

laboratory over the course of approximately 10 months. With assistance from local collaborator Stan Shea of Bloom Association, Cardeñosa then field-tested and validated the protocol in Hong Kong SAR, working closely with authorities there. Since late 2014, Hong Kong SAR has confiscated over five metric tons of illegally traded CITES-listed shark fins," said a representative of the Paul G. Allen Family Foundation over e-mail.

Of course, the officials using the tool need to have at least one voucher DNA sample from a CITES-listed shark species in order to identify the fins you have in front of you. But, since the Shark DNA Toolkit uses species-specific primers, it detects nine of the 12 shark CITES-listed species without the need for a reference database or internet access. Researchers involved in the project stress that the new tool will not replace traditional visual identification guides, since "visual identification will always be the first option to identify unprocessed fins of some species," but agree that visual ID-ing has its limitations. The Paul G. Allen Family Foundation commented: "The Shark DNA Toolkit can be used with processed, degraded or visually unidentifiable shark products that constitute the majority of products in trade. The Paul G. Allen Family Foundation, along with the Shark Conservation Fund, is currently supporting efforts to help countries meet their CITES obligations, including training to learn and apply genetic and visual identification tools, such as the ones found here."

It is already stationed in one of the shark-trading capitals in the world, but there could be some hiccups implementing it elsewhere. “While the protocol is freely available and designed to be easy to use by people not formally trained in DNA sampling, one of the barriers that this project could face is that enforcement agents are not aware of any of the identification tools available to them to help meet their CITES obligations. Other barriers could be the cost of the thermal cycler and reagents and potential lack of political will to tackle the trade of illegal wildlife products,” explained a representative of the Paul G. Allen Family Foundation.

So yes, processing that large shipment of floor-to-ceiling shark fins is going to take some time. But with this handy tool, you can bet rest assured you will be correctly identifying all of those fins — and helping stop illegal activity at the same time!