

A DEVASTATING DELICACY

How a bowl of soup may **FIN-ish** off entire species of sharks.



Dr. Mahmood Shivji displaying dried, basking shark pectoral fins found at a fish dealer.
Photo by D. Chapman, GHRI.

Text By David Wilkinson

In what has to be one of the greatest ironies of all time – and perhaps one of the most tragic as well – human beings are poised to wipe out dozens of species of sharks across the globe.

In order to meet an insatiable demand for shark fins, teeth, jaws, cartilage and other body parts, commercial exploitation is depleting shark populations worldwide faster than the sharks can reproduce. This extensive exploitation has garnered international attention as a sense of urgency has taken hold

Guy Harvey - Scientist, artist, diver, conservationist, angler, adventurer...



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regarding the health of shark populations and the drastic effects removal of these apex predators is having on marine ecosystems as a whole.

However, exciting new research from the talented scientists at the Guy Harvey Research Institute (GHRI) at Nova Southeastern University Oceanographic Center, Florida has led to the development of a tool for combating this potentially disastrous scenario. Dr. Mahmood Shivji, a conservation geneticist and Director of the GHRI, has developed a relatively quick and simple process for identifying shark species from their DNA.

This new procedure will allow scientists and fisheries managers to identify which species of sharks are most affected by commercial fishing, which in turn will allow them to make recommendations for establishing quotas so that depleted populations can recover.

“Sharks are being supplied to the fin trade by over 80 countries and no one is keeping track of which species are being exploited the most to supply the burgeoning market demand,” said Shivji. “Without this information, there are widespread concerns that some species are potentially being fished out of existence.”

IDENTIFYING THE PROBLEM

Despite the images of the man-eating killing machines featured in movies and bad pulp fiction, sharks actually pose very little threat to mankind. In fact, the total number of unprovoked shark attacks worldwide typically totals less than a hundred each year, with fatal attacks usually in the single digits. Contrast those numbers with the estimated 100 to 150 million sharks that are slaughtered each year by commercial fisherman and it quickly becomes apparent that our almost instinctual fear of sharks is completely unfounded and, to some degree, irrational.

The devastation inflicted upon shark populations is due mainly to the demand for certain shark parts, particularly the fins. For centuries, shark fins have been a delicacy in Asia, but the massive

As global shark populations have plummeted, prices for their fins have risen to astronomical levels. A single, large shark fin from a species such as the basking shark can be worth upwards of \$10,000 when sold wholesale at a market. Individual bowls of shark fin soup, which often contain only small pieces of a fin, sell for \$70 to \$150 at trendy restaurants, depending on the geographic location and the species of the shark.

Shark fin soup is commonly served in ceremonial contexts such as weddings and birthdays, although many people consume the soup solely for its purported medicinal benefits. Proponents of shark fin soup attribute almost magical qualities to the concoction, believing among other things that it improves digestion, increases energy, enhances sexual function and cures cancer.



Students analyzing shark DNA in the lab. Photo by M. Shivji

overharvesting of sharks took off in the 1980's when shark fin soup became popular in many upscale restaurants in places like Hong Kong, Singapore and San Francisco.

“Shark populations worldwide are being overexploited and annihilated at an alarming rate,” said Dr. Guy Harvey, world-renowned marine life artist and marine biologist and co-founder of the GHRI. “Estimates put shark populations worldwide at 30% of the level they were at only two decades ago. Sharks grow and mature very slowly, are long-lived animals and produce few offspring, so they are especially susceptible to the effects of overfishing.”

Most health experts, however, agree that the drying and bleaching process used in preparing shark fin soup removes what little nutritional value the fins have, as well as most of the taste. And, due to the high levels of mercury found in many sharks, the soup may actually be harmful when consumed in quantities or over long periods of time.

Just as alarming as the devastating effects the global fin trade is having on shark populations around the world is the horrific manner in which most of the sharks are being killed. “Due to low demand for shark meat, fishermen are harvesting only the fins,” Harvey explains. “They cut the fins off the shark and throw



the shark overboard, still alive, where it drowns or dies of starvation because it can no longer swim.”

This process, known as “finning”, also hinders the efforts of researchers to track which sharks are most affected by overharvesting. Harvey adds, “Previously, monitoring the various shark species that were being targeted was extremely difficult because there was no reliable way to identify the sharks once they were brought to the market. All we had were fins, which are very similar in shape and coloration for many species. Now, with Dr. Shivji’s DNA analysis, we can identify the sharks even if we have only a small piece of flesh.”

DEVELOPING A SOLUTION

In order to improve shark management and conservation worldwide, Dr. Shivji and his graduate students at the GHRI developed a DNA test that can rapidly distinguish different species of sharks. The researchers first identified short segments of DNA that are specific to a particular species of shark, such as a great white or shortfin mako. Then, they created a set of primers, or synthetic DNA, for each species that matched the species-specific DNA strands. When a sample from an unknown shark is mixed with a set of primers, the DNA from the sample will bond to a species-specific primer, providing a type of fingerprint that identifies the type of shark from which the sample was taken.

Presently, the test can be applied to 26 different species, including the shortfin mako, great white, great hammerhead, scalloped hammerhead, sandbar, dusky and silky shark. Dr. Shivji is currently creating primers for other species as well. “Eventually, we plan to have genetic identification markers for all of the 40-45

shark species suspected of being present in the global fin trade,” Shivji said.

This new procedure has proven to be highly reliable and is so sensitive that it can identify the DNA of a particular species from a sample even when the shark fin has been ground up and mixed with other product, such as in a shark cartilage pill.

The accuracy and speed of the test has also garnered interest from two federal government agencies, NOAA’s Office of Law

Enforcement and the U.S. Coast Guard, who are responsible for enforcing the nation’s fisheries regulations. In fact, the GHRI scientists have already used their research discoveries to assist NOAA’s Office of Law Enforcement with several cases involving the catch of prohibited shark species.

HOPE FOR THE FUTURE

With the availability of this new technology, scientists and conservationists can now test samples from markets to determine the true extent of the effect overharvesting is having on particular species and then develop a plan for responsible fisheries management.

“As part of our worldwide research on

shark conservation, we are working with scientists from the Pew Institute for Ocean Science, the Wildlife Conservation Society and the Hai Stiftung Shark Foundation on using our DNA tests to help characterize the global fin trade,” Shivji stated.

“Understanding the nature of this trade is critical for assessing the threat to sharks and providing much needed data for better management.”

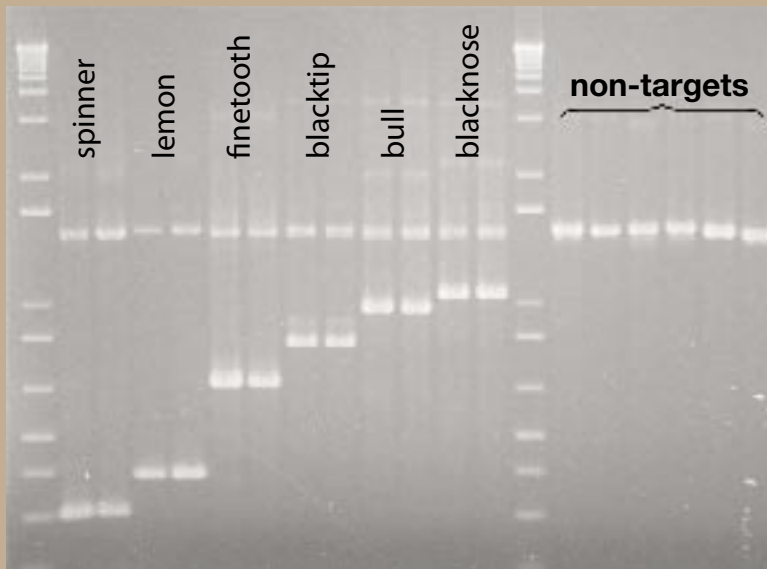
The test developed at the GHRI may also be a stepping stone to the development of a test that can distinguish between geographically distinct populations of the same species of shark, which would allow conservationists to identify which part of the world’s oceans are being overfished.

“Identifying which species are being depleted is only part of the solution,” said Harvey. “In order to fully address and correct the problem we must know the regions of the world in which the sharks are being taken. With this information, we can create regulations that not only protect particular species but also protect stocks of species in specific locations.”

Distinguishing the location from which sharks are being harvested can also aid law enforcement officials as they attempt to halt the illegal harvesting of protected species. Harvey explains, “If we can identify the fin of a great white found in a market in Asia as coming from US, Australian or South African waters, places where it is illegal to harvest great whites,

Marcy a student at GHRI, analyzing shark DNA in the lab. Photo by M. Shivji






This is an image of a DNA gel showing the shark-specific DNA fingerprints by which the fins can be identified

then we can expose the fact that these populations are still being overexploited by commercial fishermen in what is supposed to be a protected area. Armed with this information, we can then push for more stringent regulations and enforcement.”

Unfortunately, protection of these endangered species is not a priority for all countries, so regulations are difficult to enforce. “One of the biggest problems facing management of highly migratory species such as the oceanic species of sharks is that one country may enforce conservation policies where as a neighboring country does not,” Harvey said. “What is required is a regional or ocean-wide policy to conserve all highly migratory marine species.”

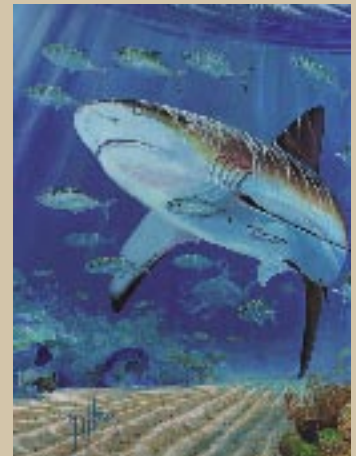
The overharvesting of sharks, and the barbaric manner in which it is done, is a global issue that will require unprecedented cooperation from governments and industries to create and enforce regulations that cover all species of sharks in all regions of the world. Stemming the senseless and needless slaughter of these great fish will also depend on altering the eating habits of the end user, the consumers of shark fin.

Public relations campaigns are currently underway in many Asian countries to educate consumers about the adverse relationship between one of their favorite delicacies and the decline of certain shark species. So, the next time you have a craving for a bowl of soup, do the sharks a favor and make it Campbell’s Chicken and Noodle. 

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Guy Harvey’s natural gift to recreate marine life has propelled him from a Professor of Marine Biology to a full time marine wildlife artist. Although encouraged to pursue his love of art more seriously, Guy opted for scientific training, earning high honors in Marine Biology at Aberdeen University in Scotland in 1977. Upon returning home to Jamaica he continued his education and obtained a Ph.D. at the University of the West Indies. The countless hours of observation required to complete his thesis on the biology and ecology of coastal pelagic species served to further increase his knowledge of the marine environment. To learn more about Guy Harvey, his art work or the Guy Harvey research Institute visit, www.guyharveyinc.com

