



# Connect

MARCH 2015

A publication of the Association of Zoos & Aquariums

## Shrouded in Mystery

Understanding the  
Conservation Status of Sharks

**DISPELLING MYTHS**  
Engaging People in Learning  
About Sharks

**SAWFISH RECOVERY**  
Is a Mythical Fish Recovering?

**LOVE THEM OR HATE THEM**  
Sharks are Both Feared  
and Fascinating



*S H R O U D E D I N*  
*MYSTERY*

Understanding the Conservation Status of Sharks

BY LANCE FRAZER

*"Sharks are beautiful creatures," noted marine biologist and explorer Sylvia Earle once said, "and if you're lucky enough to see lots of them that means you're in a healthy ocean. You should be afraid if you're in the ocean and don't see sharks." If Earle was right, we have cause to be concerned.*

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species™ indicates that 181 of the 1,041 species of sharks and rays (known, along with skates and chimaeras, as Chondrichthyan) are threatened with extinction<sup>1</sup>, but the number could be even higher. According to Dr. Nick Dulvy, lead author on the IUCN Shark Specialist Group's (SSG) study Extinction risk and conservation of the world's sharks and rays, "249 species are either threatened or predicted to be threatened," said Dulvy. "We've also found that at least 28 species have gone locally or regionally extinct."

### No Clear Numbers

Many researchers agree the situation is precarious, even if there is disagreement over the exact numbers. A 2013 paper<sup>2</sup> said the IUCN results seem "conservative." An earlier study<sup>3</sup> discussed alarming collapses of shark species in the northwest Atlantic Ocean, while a 2005 rebuttal<sup>4</sup> pointed out a need for these studies to be more scientifically sound.

Further complicating population status assessments is that nearly one-half of the 1,041 species of the sharks, rays and chimaera species assessed by the IUCN were deemed "Data Deficient," which "doesn't mean no data," Dulvy explains. "It can mean that your data is on the wrong scale; for example, only covering one part of a species' range, or for example, the wrong kind of information such as range information but not information on abundance."

"Or, it can be a lack of research—more people want to study the big animals, like white sharks. Not as many are interested in, say, the skates and rays, which, for some species, we know very little about and are under fishery exploitation," said National Oceanic and Atmospheric Administration (NOAA) Research Fisheries

Biologist Dr. John Carlson. "You could argue that focusing attention on the big, glamorous animals takes away funding from researching lesser-known populations, but it also attracts more people's attention to the overall situation."

Another area of uncertainty surrounds the commercial take of sharks. The number of sharks killed each year in commercial fisheries is generally approximated at around 100 million, but estimates range from 63 million to nearly 300 million<sup>2</sup>. When looking specifically at the shark fin trade, Dr. Shelley Clarke, whose PhD study on Hong Kong's shark fin market is considered by Dulvy to be the "gold standard," calculated that the fins of 38 million sharks/year (1996-2000) ended up in the market, representing about 1.7 million tonnes/year. However, the United Nations Food and Agriculture Organization (FAO) statistics for the same period range from 0.39 million tonnes to 0.60 million tonnes annually, although FAO's data are generally considered to underestimate the actual situation since not all fishing nations belong to FAO and reporting is voluntary.

### Biology Versus Threats

Sharks and rays are vulnerable to over-exploitation because they grow slowly, are generally very slow to mature, their pregnancies can last years and they commonly produce few young, sometimes only one or two pups every other year or so<sup>6</sup>.

"Years ago, we caught a Greenland shark," remembers Ripley's Entertainment Vice President of Husbandry Joe Choromanski. "This was a female ... according to what we could estimate, about 100 years old. And yet, she was not sexually mature. That's an extreme example, but that gives you the idea of the odds facing shark and ray populations when they are depleted."

Commercial over-exploitation is regarded as the greatest threat to the world's shark and ray populations. Sharks and rays are caught for their fins, meat, liver oil and more. Sharks are sometimes caught whole but are often finned, an inhumane practice outlawed in many countries which involves removing the fins from the still-living shark and discarding the animal to die<sup>5</sup>.

The average retail price for processed shark fins is \$100/kilogram (dried fin) and an estimated global value of the fin trade ranges from \$400 million to \$550 million<sup>7</sup>. The total trade in shark parts (e.g. meat, skin, teeth, liver, cartilage, oils, fins) is valued at \$1 billion/year<sup>8</sup>. In 2008, 85 countries were involved in exporting shark fins to Hong Kong with the top ten countries being Spain (2,646,442 kg), Singapore (1,201,236 kg), Taiwan (990,664 kg), Indonesia (681,012 kg), United Arab Emirates (511,197 kg), Costa Rica (327,385 kg), United States of America (251,310 kg), Yemen (226,738 kg), Mexico (216,833 kg) and Brazil (200,732 kg)<sup>9</sup>.

However, overfishing is just the biggest threat, not the only one. "There's barely a species living in shallow water that isn't being touched by





*A nurse shark.*

climate change,” said Dulvy. “And when you talk about sharks and rays that live close to shore, or even in freshwater, then habitat degradation and environmental pollution also negatively impact their population.”

### **A Global Problem**

While many countries, including the United States, have laws in place to protect sharks, there are no effective, legally-binding global agreements on shark fisheries, quota systems or regulatory agreements currently implemented with adequate compliance and enforcement. With more than 70 percent of the Earth’s surface covered by oceans, it’s an enormous realm where politics and biology collide.

“On land, if you want to save a frog in one country, you change the legislation in that country,” said Dulvy. “If you have two countries, you have twice the work. In the ocean, where we estimate 28 percent of these species move through at least 18 different jurisdictions, the problem multiplies beyond control.”

Often, there’s simply too much ocean and too few researchers. In 2012, Rima

Jabado, founder of the Gulf Elasmobranch Project, was a doctoral student working in the Arabian/Persian Gulf, the Gulf of Oman and the Arabian Sea. She was taking genetic samples of sharks to provide data on which conservation decisions can be based.

“The problem is that I’m the only one doing research,” she said in an October 2012 blog<sup>11</sup>. “We know shark populations are depleting around the world, so we are racing against time to see what is going on.”

The United Arab Emirates banned finning in 1999 and has banned shark fishing from February through the end of June every year, but the Gulf region remains a resource for the shark fin export industry, with civil and political unrest in parts of the region adding an extra layer of difficulty. Dr. Jabado said that more than 80 percent of the 126 Emirati fishermen she spoke with confirmed that shark numbers were down throughout the area and that those being caught were significantly smaller than in the past. She also reported that more than 45 percent of the species traded in the region are at high risk of global extinction.

“My perspective hasn’t changed,” said Jabado recently. “I think the shark situation is still deteriorating rapidly in the region, and urgent action is needed. While governments in the region have taken several steps in the right direction with new regulatory legislation, there is still very little targeted research on sharks and rays and there remains a lack of capacity for enforcing all new legislation.”

Jabado said the United Arab Emirates’ Ministry of Environment and Water banned all exports and re-exports of shark products from the Emirates. “It will be important to monitor the trade numbers in



*Sharks for sale in a Dubai fish market.*

*"Sharks and rays are vulnerable to over-exploitation because they grow slowly, are generally very slow to mature, their pregnancies can last years and they commonly produce few young, sometimes only one or two pups every other year or so."*

2015-2016 to see if this legislation has made a difference," Jabado said.

She also points out that several countries in the region signed the Convention on Migratory Species (CMS) Sharks Memorandum of Understanding this year, showing their commitment to working together on the conservation of migratory sharks and rays.

In November 2014, 21 species of sharks and rays were added to the CMS Appendices, signifying their precarious situation. A few months earlier, seven shark and ray species, including two species of manta rays and three species of hammerhead sharks, were granted international protection through their listing in Appendix II of the Convention on International Trade in Endangered Species (CITES).

In the United States, only the scalloped hammerhead shark is listed as endangered

or threatened under the U.S. Endangered Species Act. Other sharks (e.g. dusky, porbeagle, sand tiger) are listed as species of special concern but are afforded no special regulatory provisions. At present, NOAA has closed the 2015 commercial fishery for the porbeagle shark since the fishery exceeded quotas in 2014 by almost twice the limit. However, the fishery remains open for other sharks, including blacktip, hammerhead and blue sharks.

With respect to finning, the United States prohibited the practice with a federal law in 2000, and further strengthened the ban in 2010 with the Shark Conservation Act. The Act stipulates that all sharks must have their fins naturally attached when landed on shore, except for one species, the smooth dogfish. Some states also allow fin removal of spiny dogfish. These loopholes in U.S. legislation create opportunities for illegal finning as some shark species can be passed off as dogfish.

Other countries around the world are implementing similar protections. Countries including Bangladesh and Gabon have announced the formation of marine sanctuaries that will help protect threatened species like the great hammerhead, manta rays and the whale shark. Following a 2013 anti-corruption campaign and pressure from environmental organizations, a 90 percent drop in the re-export sales of shark fins from Hong Kong to mainland China was reported<sup>10</sup>.

All positive steps, believe Dulvy and others, but what happens next?

"First," says Dulvy, "we need to protect the most threatened species. We have to hold the line and ensure that these species are given the highest protection.

"For vulnerable species, we need to work towards sustainable fisheries. I'm not trying to put the shark fin soup people out of business, but I'd like to see it become a sustainable industry. Am I optimistic? If this happens in a decade, it will be a miracle. But I wouldn't be doing this if I didn't believe there was reason for optimism."

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Lance Frazer is a writer based in Cameron Park, Calif.  
For full list of references, visit [www.aza.org/connectmarch2015](http://www.aza.org/connectmarch2015)





*Caribbean Reef Shark*

The background is a dark, deep blue underwater scene. At the top, there are some light blue, ethereal, cloud-like or smoke-like patterns. On the right side, a portion of a shark's tail is visible, showing a light blue and white pattern. The main title is centered in the upper half of the image.

# DISPELLING MYTHS

Engaging People in Learning About Sharks

BY KATE SILVER





**S***harks are among the most feared marine species on earth, perceived by many as vicious, man-eating predators. But in reality, sharks, which have been around for hundreds of millions of years—before dinosaurs, even—are quite vulnerable.*

Humans are far more dangerous to sharks than the reverse. One-quarter of the world's sharks and rays are threatened, according to the International Union for Conservation of Nature (IUCN), as a result of exploitation, overfishing and habitat loss, which kill an estimated 100 million sharks every year<sup>1</sup>. Alarming, nearly 50 percent of the Chondrichthyes class, which includes sharks, skates, rays and chimaeras, are classified as data deficient due to insufficient population assessments and analyses<sup>2</sup>. There is no doubt that the general public has a lot to learn about the vast array of these remarkable fish.

Association of Zoos and Aquariums (AZA)-accredited facilities play a vital role in educating the public on the importance of nearly 1,041 species of Chondrichthyes. Of these 1,041 species, 539 consist of skates and rays, which are popular in marine exhibits in AZA-accredited facilities. Through informative displays, underwater tunnels, research, interactive touch tanks and candid conversations with guests, AZA-accredited facilities have remarkable ways of engaging people in informal and formal learning.

### **Saving the Great White Sharks**

At the Monterey Bay Aquarium in Monterey, Calif., shark exhibits have proven so

popular—and profitable—over the years, that the funds have enabled the organization to fund a number of conservation efforts. In addition to its regular displays of 14 species of sharks and rays, including a ray touch tank, the Aquarium features a popular program known as Saving Great White Sharks.

From 2004 to 2011, the Aquarium exhibited six juvenile great white sharks—a true rarity, considering the sheer size, and, frankly, predator-driven appetite of the species. The first great white shark that was on display, said Aquarium Managing Director Jim Hekkers, was a juvenile caught by fishermen trolling for halibut in Southern California. The Aquarium set up a sea pen around the shark, allowing it to acclimate to having boundaries prior to transport to the Aquarium.

The juvenile shark became quite popular, drawing more than one million visitors in her six-month stay at the Aquarium. Executive Director Julie Packard referred to it as “the most powerful emissary for ocean conservation in our history.” The Aquarium released the shark back into the ocean in March 2005 and, over the next seven years, displayed five others. Each of the six sharks was tagged and released. Hekkers says that the profits gained from the unanticipated

additional attendance were applied to further build knowledge with respect to great white shark ecology and biology. For example, scientists from the Aquarium and research partners in both Northern and Southern California have tagged 49 juvenile and 191 adult great white sharks, tracking them to learn more and to shape conservation efforts.

“People come to see these amazing animals and we benefit by that,” said Hekkers. “It’s really an obligation on our part to fund research and to fund programs that will help save them.”

An important benefit to having popular shark programs in aquariums is the ability to help influence policy that addresses conservation threats. For example, in 2011, the Monterey Bay Aquarium Foundation and the Asian Pacific American Ocean Harmony Alliance joined The Humane Society of the United States and Humane Society International to sponsor and herald a bill that bans the possession, sale, trade and distribution of shark fins in California. The bill was signed into law on 7 October 2011 thanks to the strong voices of the public who wrote countless letters to their legislators in support of the bill. This bill was a milestone in shark conservation, which is now a leading example for other states to follow suit.

### **Shark Week**

Every summer, the South Carolina Aquarium in Charleston, S.C., hosts Shark Week, inviting the public to learn about the five species of shark living in the 385,000-gallon Great Ocean Tank. During Shark Week, visitors can enjoy various activities such as dive shows, interactive exhibits, a “sharkeology” dig and festivities such as the “Shark, Rattle, and Roll” party that highlights shark conservation with all proceeds reinvested into animal welfare and care. The Aquarium’s Shark Week does not highlight thrill-based sensationalism and hype of predator-prey dynamics.

“We’ve always seen our Shark Week as an opportunity to debunk the myths that are perpetuated about sharks and their role in the ecosystem,” said Kevin Mills, president and CEO of South Carolina Aquarium. Activities throughout the week teach people that sharks are not dangerous and shark attacks are extremely rare.



Whit McMillan, director of education at South Carolina Aquarium, says the Aquarium emphasizes to visitors that it is people entering shark habitats that lead to incidents, and with most incidents, we are in their way—the sharks are not targeting us. McMillan points out that millions of people visit South Carolina beaches every year. If sharks were targeting humans, the number of shark-related incidents per year would be higher. The International Shark Attack File of the Florida Museum of Natural History is a globally comprehensive database of shark attacks. The records for South Carolina indicate that a total of 77 shark attacks have occurred with two fatalities from the years 1837-2003, the last of which was recorded in 1852<sup>3</sup>.

“For a healthy ocean, we have to have all these creatures and we need to keep them around, even the big ones,” McMillan said.

Starting this spring, visitors to the Aquarium will get an up-close-and-personal experience with sharks when the new exhibit Shark Shallows opens. The 20,000-gallon touch tank will be home to a variety of sharks and rays with which visitors can interact. “That”, said McMillan, “is all part of the learning process. If you can touch it and make a connection with that animal, then that’s a very different experience than just seeing one.”

### Engaging Exhibits

Other aquariums develop exhibits that immerse visitors in marine environments. At Ripley’s Aquariums located in Myrtle Beach, S.C., Gatlinburg, Tenn., and Toronto, Canada, visitors promenade through a see-through tunnel more than 300 feet long as sharks, rays and other fish swim directly over their heads.

“It’s better than being a scuba diver,” said Joe Choromanski, vice president, husbandry with Ripley’s. Kids and their adult chaperones are also invited to have a slumber party in the tunnel with the Sleep with the Sharks program.

Choromanski said that the development of acrylic tanks in the 1960s changed the game for aquariums. Aquariums are now able to be more flexible and creative with designs as they can build tanks of various shapes and sizes such as bubbles, convex, concave and



*Juvenile great white shark on display at Monterey Bay Aquarium.*

© Monterey Bay Aquarium



*"The views are just amazing and stunning, and it gives the public the perspective of their size compared to the animals."*

— Joe Choromanski, vice president, husbandry with Ripley's

other configurations. "The views are just amazing and stunning, and it gives the public the perspective of their size compared to the animals," he said. In fact, Choromanski says his favorite place to be at any of the three Ripley's aquariums is in the tunnel, watching the expressions of visitors.

"When they're in the tunnel, and they're only separated by two inches of plastic with the acrylic window, they can see every pimple, every tooth of these sharks," he said. "Senior citizens become little kids again, and everybody's giggling by the time they get 20 feet into the tunnel." That level of intrigue makes it easier for the aquariums to dispel the man-eating fear of sharks and impart their main takeaway. "They really are a necessary part of the ecosystem," said Choromanski. "They're the apex predator, and without them the oceans would really be out of balance."

In fact, Ripley's works with the National Oceanic and Atmospheric Administration (NOAA) to tag and track sharks in order to learn more about them.

While state-of-the-art exhibits are a big draw for visitors to many facilities, other aquariums find that the sharks themselves are the main curiosity.

"We probably have one of the most mundane shark displays," said Dr. John Nightingale, president and chief executive officer of Vancouver Aquarium Marine Science Centre, British Columbia, Canada. At the Vancouver Aquarium, the main tank is 45,000 gallons and is home to several sharks and rays such as the black tip reef shark, zebra shark and leopard rays.

"Compared to all the walk-through tunnels and everything else you see, it's a pretty simple display," says Nightingale. And yet, it is one of the most popular. Nightingale explains the shark display has been so successful because of the level of engagement the Aquarium offers. Aquar-

ium interpreters walk around and talk to visitors about sharks. Interpreters also share educational video stories on their iPads with visitors. At posted times, visitors can watch as divers feed the sharks.

"We spend a lot of time adding something to the display by engaging people," he says.

### Entertaining and Educating

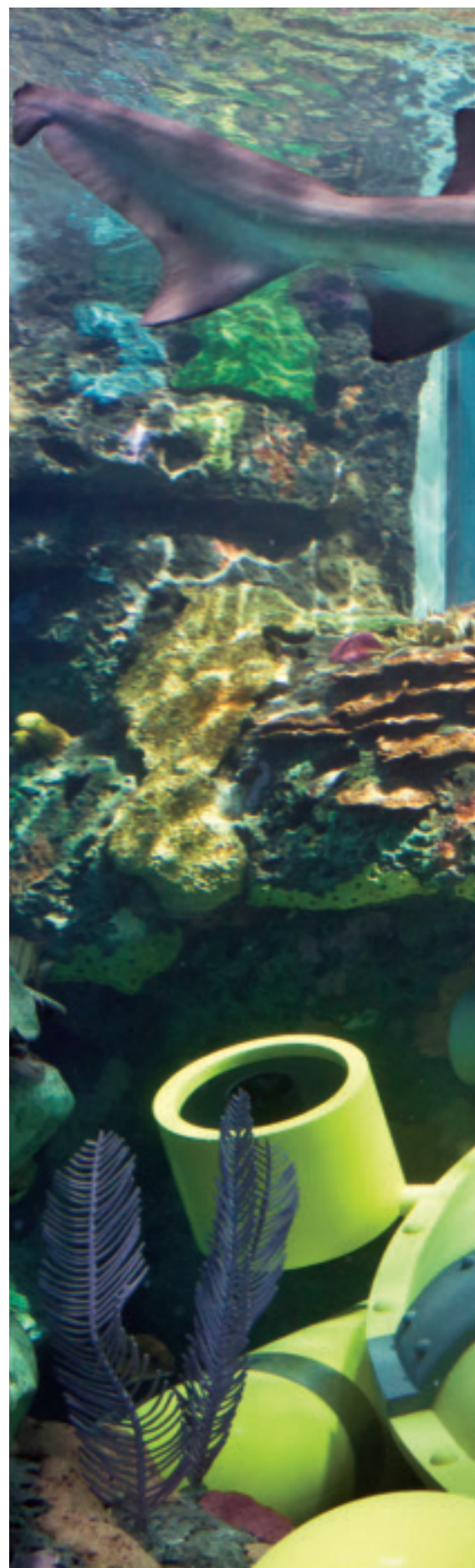
Beth Firchau, curator of fishes at the Virginia Aquarium and Marine Science Center in Virginia Beach, Va., compares sharks to the lions of Africa and tigers of India, as top predators in ecosystems keeping other species and habitats well balanced. "Sharks manage the fisheries way better than we could ever do as humans," she said.

The Aquarium holds two tanks of considerable size: 250,000 gallons and 300,000 gallons. Both tanks feature sharks including sand tiger sharks, brown sharks, nurse sharks and chain dogfish. The Aquarium also hosts a touch tank consisting of rays found along the Virginia coastline. Firchau indicates that these tanks with sharks and rays are some of the most visited areas of the Aquarium. "I think sharks are a perennial animal of interest, excitement and wonder," she explains. "I think they are the animals that we love to hate and we can't get enough of them."

Firchau says that sensationalist shows and movies have all played into that. "But," she said, "that's not necessarily a bad thing, if the Aquarium can use it to its advantage."

"If you can get people in the door because they're anticipating being entertained and you educate them along the way and have fun doing it, do you think they're going to come back? Yeah, they are," she said. "Ultimately it fits into our plan of environmental education."

Kate Silver is a writer based in Chicago, Ill. For full list of references, visit [www.aza.org/connectmarch2015](http://www.aza.org/connectmarch2015)







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