*By Glenn Hodges*
*Photographs by Brian Skerry*

**I saw *Jaws* the summer it came out, in 1975. I was nine years old, and I still remember how the theater erupted when Brody finally killed the monster shark. I absolutely loved the movie, and that night I dreamed of a shark swimming up through the toilet bowl and coming after me down the hall.**

My experience paralleled America's. We loved *Jaws,* and we became paranoid about sharks. I grew up in the water at my grandparents' house on the Connecticut shore, and though I kept swimming after *Jaws,* it was always with the vague fear that teeth could tug on my leg at any moment. My sister, two years younger, was so traumatized by the movie that she'd go into the water only at low tide. Never mind that there'd been only two shark bites on the Connecticut coast since 1900. Facts are never as salient as feelings.

So when I got this assignment, I decided to do what I'd never wanted to do: swim with sharks. I would take scuba lessons and go to a place in the Bahamas known as Tiger Beach, where I'd dive with tiger sharks, the species responsible for more recorded attacks on humans than any shark except the great white. It would be my first dive after getting certified—which means it would be my first dive anywhere other than a swimming pool or a quarry in Maryland—and it would be without a cage. Most people who got wind of this plan thought I was either very brave or very stupid.

But I just wanted to puncture an illusion. The people who know sharks intimately tend to be the least afraid of them, and no one gets closer to sharks than divers. The divers who

Tiger sharks in the protected waters of the Bahamas are relatively safe, but tigers rarely stay in one place for long. Their migrations often put them in the crosshairs of commercial fishermen. Though more than 70 shark species are in worse shape than tiger sharks, conservationists still classify them as "near threatened."

run operations at Tiger Beach speak lovingly of the tiger sharks there, the way people talk about their children or their pets. They give them nicknames and light up when they talk about their personality quirks. In their eyes these sharks aren't man-eaters any more than dogs are. (In fact, they are demonstrably less man-eating: In 2015 there were 34 human fatalities from dog attacks in the United States but just six fatalities from shark attacks worldwide.)

The business of puncturing illusions is tricky, though, because reality is rarely one simple thing or its simple opposite. The day before my first dive at Tiger Beach, news came from Hawaii that a man had been attacked by a tiger shark so relentless that the man was able to escape only by pulling out the shark's eyeball. The man's feet were mangled, and one foot had to be amputated. (His name is Tony Lee, and I spoke to him a month after the attack. He says he doesn't think he actually pulled out the whole eyeball, he likely just ruptured it, but it was certainly what made the shark let go. The punch-the-shark-in-the-nose defense? All that got Lee was a fistful of bloody knuckles.) It was one of three attacks off Oahu that month alone and part of an

unsettling spike in attacks in recent years that has led Hawaii to commission a study of tiger sharks' movement patterns.

But here it is important to stress that tiger sharks are not relevant just because of how many people they bite. As apex predators, they act as a crucial balancing force in ocean ecosystems, constraining the behavior of animals like sea turtles. As such, they are essential to the health of sea grass ecosystems, which are habitat to a wide array of marine wildlife.

Furthermore, tiger sharks' role in ocean ecosystems is likely to increase with climate change. If the planet and its oceans continue to warm, some species will be winners and others will be losers, and tiger sharks are likely to be winners. They love warm water, they eat almost anything, and they have large litters of pups. (The small litter size of many other shark species makes them especially vulnerable to overfishing.) Put together, these characteristics make tigers one of the hardiest shark species. They are also among the largest: Mature females can exceed 18 feet and weigh more than 1,200 pounds. Only great whites and a few other shark species are larger. So that's the fuller explanation for my foray to Tiger Beach: I wanted to get to know the sharks that may increasingly populate our seas.

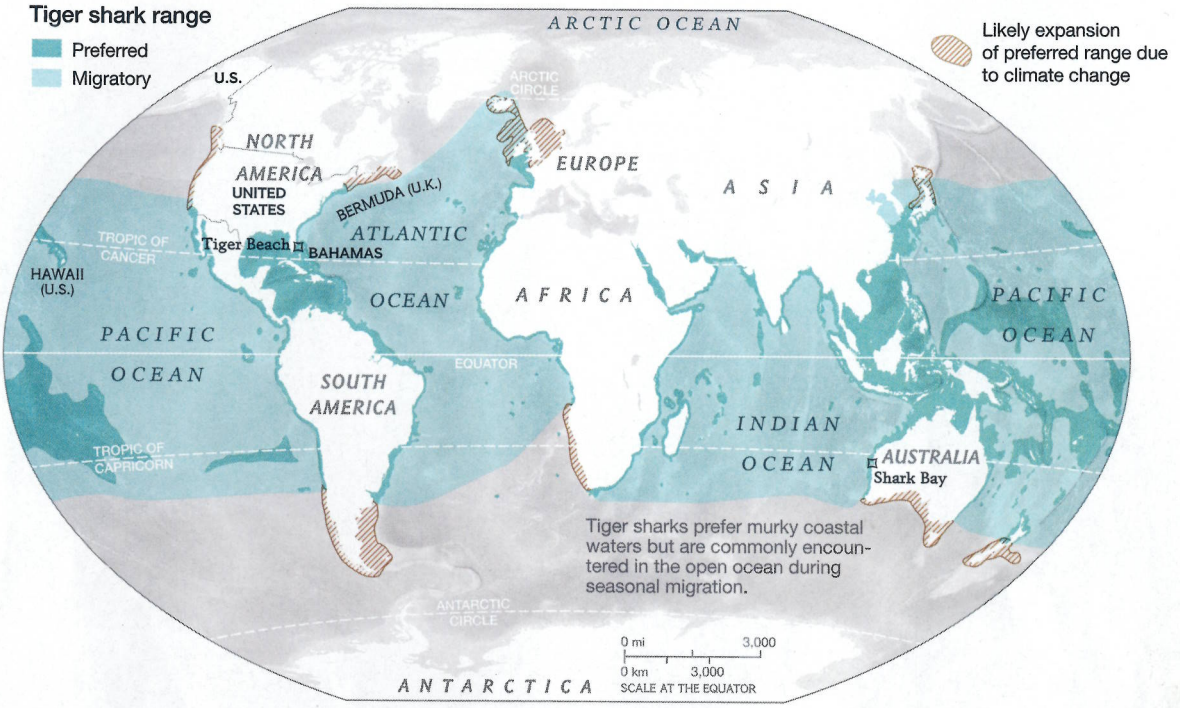
TIGER BEACH is not actually a beach. It's a shallow bank about 25 miles north of Grand Bahama Island, a patchwork of sand, sea grass, and coral reef that began attracting divers about a decade ago. It's prime habitat for tiger sharks and has ideal conditions for viewing them. The water is 20 to 45 feet deep and usually crystal clear. You strap on a bunch of weight, sink to the bottom, and watch the sharks go by.

As easy as the diving is from a technical standpoint, though, it's usually something divers work up to. My fellow divers had hundreds of dives under their belt, and on the two-hour boat ride to the site the morning of our first dive, they kept saying things to remind me of this. (Things like, "Wow, I can't believe this is your first dive," and "Seriously, I really can't believe this is your first dive.")

But all that chatter stopped when we got to the site and our dive operators, Vincent and Debra Canabal, started tossing bloody chunks of fish overboard. Almost immediately the water filled with Caribbean reef sharks—dozens of them, mostly five-to-seven-footers, swarming and fighting over the fish bits. Then lemon sharks—a little longer and thinner than the reef sharks—appeared here and there, and at last Vin spotted a huge dark silhouette. "Tiger!" he yelled, pointing. He rushed to suit up and then jumped in with a crate of mackerel to begin feeding the shark on the seafloor—in part to occupy it while the rest of us entered the water, and in part to make sure it wasn't too hungry when we did. And all of this was OK with me—the divers' comments, the swarming sharks, my first giant stride into the water—until I reached the bottom and immediately had to fend off the first tiger shark I'd ever laid eyes on, all 800 pounds of it.

**At the time I wasn't sure if the shark loved me like a pal or loved me like a pizza. I was like an overzealous ninja with the three-foot pole I carried to keep the sharks at arm's length.**

The way Debbie described it later, this was just "Sophie" being curious and friendly. "She loooved you," Debbie said again and again, because of all the attention Sophie paid me during the dive (really, she was all over me). At the time I wasn't sure if Sophie loved me like a pal or loved me like a pizza, and I was like an overzealous ninja with the three-foot plastic pole I carried to keep the sharks at arm's length. But after




watching how Vin and Debbie handled them over the next week's dives—caressing them after feeding them a fish, steering them gently away when it was time for them to move on—it became easy to see the sharks in a very benign light. Not once did they make a sudden or aggressive move toward anyone; they moved slowly and deliberately, swimming in large loops and then coming on a glide path to the feeding box, and I felt surprisingly safe in their presence. This is not an exaggeration: The taxi ride from the Freeport airport felt more dangerous than diving with these sharks did.

Most of the tiger sharks at Tiger Beach are habituated to divers, used to being fed and to not biting the hands that feed them. But even the ones that aren't familiar with the routine—and we had one of those during our first day diving—generally are not dangerous to divers. Tiger sharks are ambush predators, relying on stealth and surprise to catch their prey. At Tiger Beach you're not blindly paddling or swimming at the surface of the water, like most attack victims. You're down at the sharks' level, presenting yourself as something other than prey—and that makes diving with them reasonably safe.

But not safer than that. There are videos of near misses at Tiger Beach—one in which a tiger shark tries to chomp a diver's head and another in which a tiger goes after a diver's leg—and there was a fatality here in 2014, when a diver simply disappeared. Our group even had a scare when an angelfish wandered into our midst and the reef sharks and lemon sharks went into a frenzy, chasing it as it hid between people's legs. (I had my turn in the shark tornado, trying to fend off the sharks as they whipped around me and crashed into my legs, and it was as unnerving as you'd think.) Everyone, including Debbie, thought someone was going to be bitten in the melee, and there were three half-ton tiger sharks milling around that might suddenly have taken an interest in a flailing, wounded diver.

The incident was a fluke, and we were back in the water the next day. But it was the kind of fluke that reminds you that sharks are wild animals, and Tiger Beach is a wild place, and wild animals and wild places are inherently

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SOURCES: IUCN; FISHERIES AND AQUACULTURE DEPARTMENT, FAO; AQUAMAPS

unpredictable. And according to scientists who study them, tigers are especially unpredictable.

AFTER TIGER BEACH I flew to Oahu to meet Carl Meyer at the University of Hawaii to discuss his research on the recent spike in tiger shark attacks. Meyer and his team have tagged hundreds of tiger sharks with satellite tags and acoustic tracking devices, and he says they're just beginning to understand the animals.

The movements of most shark species are fairly predictable, he says. "They'll go one place during the day, and one place at night. But for the most part we don't see that with tiger sharks. They can show up any time of day or night, and they may be there one day and back the next day, or there one day and then gone for three years."

At least some of this unpredictability is likely caused by the sharks' hunting habits, he says. As ambush predators, tiger sharks rely on surprise to catch their prey, and "if you're predictable, your prey is going to adapt to that predictability. So it makes sense to suddenly appear in an area and not be there very long."

Meyer says he doesn't know why attacks in Hawaii have spiked in recent years, jumping from an average of fewer than four a year from 2000 to 2011 to almost 10 a year from 2012 to 2015. But he says he would expect to see a long-term rise in attacks because of the increasing number of people in Hawaii's waters.

As for why attacks occur mostly in the fall, he points out that's when tiger sharks come to the main islands to give birth. Female tiger sharks make a huge energy investment when they ovulate. Their eggs are "enormous"—the size of baseballs—and they can have as many as 80 pups in a litter. What that might mean—although it's a "completely untested hypothesis," he cautions—is that pregnant sharks get to the islands hungry, and this makes them even more indiscriminate eaters than usual. But the uptick in attacks in the fall, a pattern noticed by native Hawaiians for generations (surfers call it Sharktober), might also be a function of having more sharks around the islands at that time of year.

Besides Hawaii's growing human population, another possible factor is a proliferation of sea turtles. Green sea turtles received federal protection in 1978, after decades of intense exploitation. Their numbers have been increasing ever since. They're now common off Hawaii's shores and are a familiar food for tiger sharks.

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Tiger sharks and sea turtles have a long, shared history. They both hark back to the dinosaur age, and the fossil record suggests they may have evolved in tandem. With wide jaws and heavy, angled teeth that resemble old-style can openers, tiger sharks are able to crush and slice through an adult turtle's shell in a way most sharks can't. This robust morphology might help explain the tiger's famously unselective eating habits. Tires, license plates, paint cans, farm animals, unexploded munitions, a suit of armor—all these things have been found in tiger sharks' stomachs, proving they're willing to bite just about anything (apparently with minimal adverse effects). So if more turtles are sharing the water with more people, more shark bites might be the result.

But this is where the story becomes much more than just a "shark bites man" story, because the relationship between tiger sharks and sea turtles could have broad implications for the health of ocean ecosystems around the globe. On a remote part of Australia's western coast

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called Shark Bay, a research team led by Mike Heithaus of Florida International University has documented how tiger sharks prevent sea turtles and dugongs (sea cows) from overgrazing the sea grass beds that anchor the ecosystem. It's not just by eating the animals, researchers discovered. The mere presence of the sharks changes the turtles' and dugongs' habits, creating a "landscape of fear" that forces them to graze more judiciously in order to lessen their risk of being eaten.

What this means is that protecting animals like sea turtles without also protecting the predators that keep them in check could lead to degraded ocean ecosystems. "If you look at places where shark populations have declined and turtle populations are protected—places like Bermuda—it looks like those areas are having losses in their sea grass," Heithaus says.

In the Bahamas, which prohibited longline fishing in 1993 and designated its waters a shark sanctuary in 2011, the marine ecosystems are relatively healthy. But the adjacent western Atlantic, which includes Bermuda, has much weaker shark protections and appears to be suffering the consequences. Neil Hammerschlag, a marine ecologist at the University of Miami who studies tiger sharks in the western Atlantic, says sea turtles there don't seem to alter their behavior in response to tiger sharks the way the turtles in Shark Bay do, and that might be because Atlantic tiger shark populations are already significantly compromised. "I do work in Florida and the Bahamas, and it's night and day. We see massive differences in the size and numbers of the sharks. They're doing well in the Bahamas, but we almost never catch them off Florida. And they're just 50 miles apart." Florida prohibited the killing of tiger sharks in its waters in 2012, but it's the only state on the eastern seaboard to have done so, and federal law allows them to be caught and killed in U.S. waters, within certain limits, by commercial and recreational fishermen.

*JAWS* ISN'T RESPONSIBLE for most of the threats tiger sharks face—coastal development, marine pollution, longline fishing, the popularity of shark fin soup—but it did create a cultural attitude that has had a remarkably long shelf life. After *Jaws,* people didn't just become paranoid about sharks; they became callous, even vengeful. In the 1970s and '80s, shark-fishing tournaments sprouted like weeds on the eastern seaboard of the U.S., and dozens of them continue, celebrating the spectacle of "monster sharks" hanging on the docks. I went to one of these tournaments last summer, and the memory that sticks is of a woman with her little boy, pointing at a mako with its bloody jaws propped open for the cameras and saying, as if to prompt him to follow suit, "Oooh, scary!"

Sharks can be scary, that's true. But I spent a couple of days on Kauai with Mike Coots, a photographer who lost half his right leg to a tiger shark while bodyboarding in 1997, when he was 18. He was soon back in the water and says he almost never thinks about sharks when he's surfing. "Hawaii is an ocean culture," he told me. "People here are in the water from the time they're in diapers. They're just not that afraid of sharks." To test that, I asked the boys playing four square in front of his house whether they were afraid of sharks, and they said, "No," like it was the stupidest question they'd ever heard. They were about the age I was when I saw *Jaws.*

Last summer, as I was planning my dive at Tiger Beach and hysteria about recent shark attacks in North Carolina was in full bloom, news broke that an 800-pound tiger shark had been caught off the South Carolina coast. *USA Today* called the shark "monstrous" and described the fishermen as "brave souls." When I got home from Hawaii, I looked at the story again. Seeing the picture of the gutted, deflated shark on the dock, I thought about how it was once the same size as Sophie, and those weren't at all the words that came to mind—for either the shark, or the men who killed it. □

Go underwater with photographer Brian Skerry to see video of tiger sharks in action at *ngm.com/Jun2016* and get a close-up look at how he captures images like the ones shown here.

## Teeth as tools

The shape, size, and arrangement of teeth in different shark species enable them to grab, kill, and consume their preferred prey.

Tiger shark

Serrated, triangular teeth can cut through the thick flesh of large prey.

Goblin shark

Needle-like teeth are good for clutching soft prey like fish and squid.

Gummy shark

Sharks with flatter teeth can crush and grind hard-shelled prey such as crabs.

Flexible jaws can adjust to a wide range of shapes, such as sea turtle shells, to allow more teeth to bite prey.



## Prey

A shark's diet depends on its species, age (adults eat a wider variety of prey), and activity level. Tiger sharks, considered the least discriminating, are known to eat sea turtles, dolphins, and even other sharks.

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Longer, thinner shapes are slower.

Bottom dwellers have flatter lobes.

Tiger shark

FERNANDO G. BAPTISTA, DAISY CHUNG, AND RYAN T. WILLIAMS, NGM STAFF; LAWSON PARKER; SHIZUKA AOKI

SOURCES: SAMUEL GRUBER, BIMINI SHARKLAB; NEIL HAMMERSCHLAG, UNIVERSITY OF MIAMI; DANIEL HUBER, UNIVERSITY OF TAMPA; PHILIP MOTTA, UNIVERSITY OF SOUTH FLORIDA; LISA WHITENACK, ALLEGHENY COLLEGE; KENNETH J. LOHMANN, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL; THEAGARTEN LINGHAM-SOLIAR, NELSON MANDELA METROPOLITAN UNIVERSITY

Above a reef deep in the Indian Ocean, a tiger shark is trailed by remoras, which conserve energy by attaching themselves to the shark and feeding off scraps of its prey and parasites on its skin.