SHARK STOPPERS!

TECHNOLOGY OFFERS NEW HOPE IN THE EFFORT TO DETER SHARKS FROM EATING HOOKED FISH.

BY JIM HENDRICKS

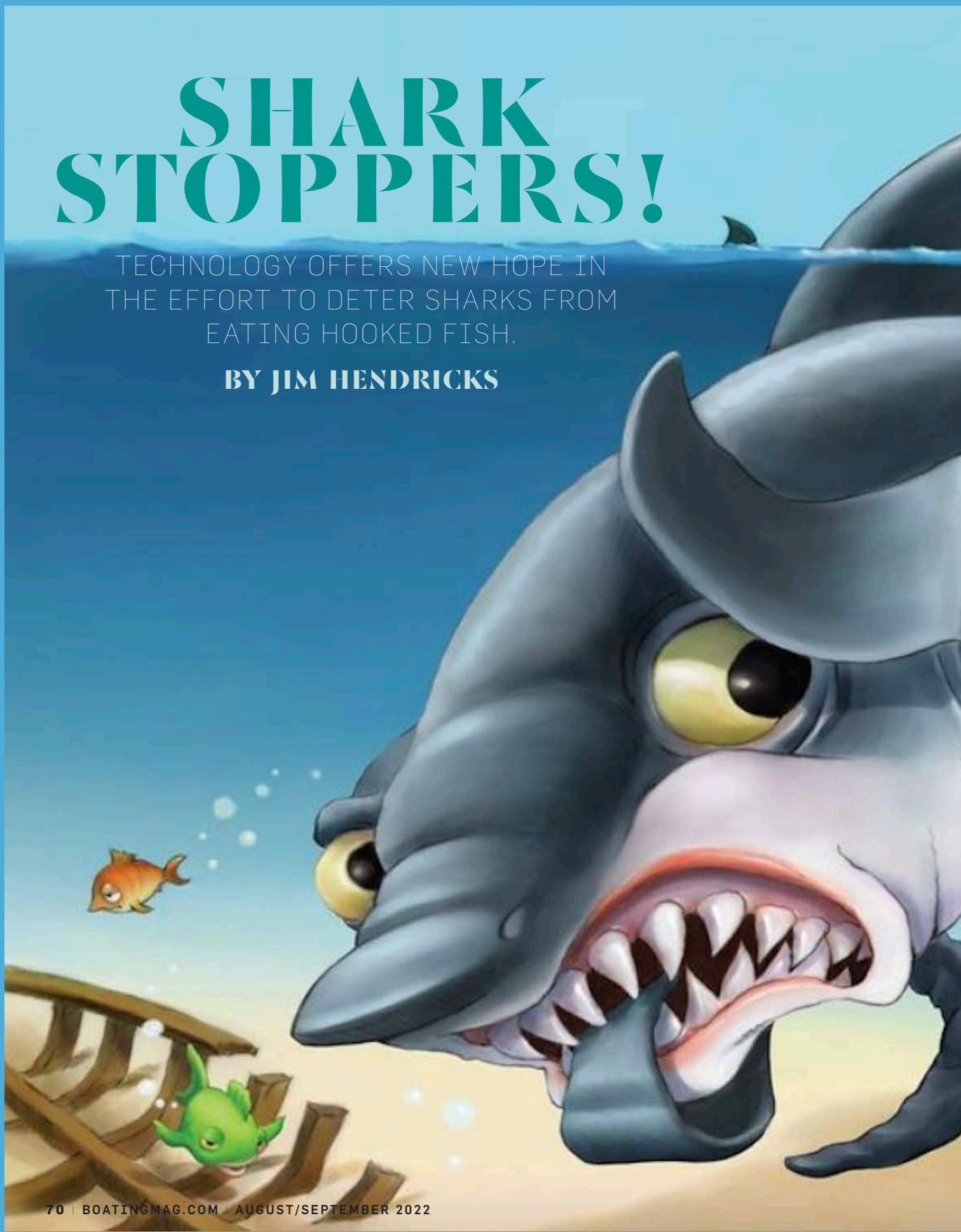

ILLUSTRATION: STEVE HAEFELE

Nathan Garrison found his calling amid two personal traumas.

In the spring of 2006, one of his best friends suffered a shark attack while surfing at Folly Beach, South Carolina. His friend's injuries were severe, but he survived and made a full recovery.

A few years later, one of Garrison's neighbors fell victim to a shark while surfing off the coast of Santa Barbara, California. Sadly, he succumbed to his injuries.

Few people know anyone involved in a shark attack, let alone two people, and these life events left Garrison recoiling and rethinking his career as a video content creator. His subsequent introspection led him to change course.

In 2012, at age 25, in partnership with his father, David, Garrison moved forward with a plan to develop and market compact, affordable and humane products to deter sharks.

"I couldn't believe that at the time, no user-friendly solution existed to help ease our mind and offer protection from sharks," says Garrison, an avid surfer and ocean enthusiast. "That's why my father and I decided to do something about it."

The Zeppelin is designed to serve as a sinker that deters sharks once you hook a target species such as this amberjack.

After three years of research, development and testing, the first product emerged: Sharkbanz, a device designed to be worn as a wrist or ankle band to protect people from sharks. Today, many divers, ocean swimmers, paddleboarders, foil boarders, kayakers and surfers believe in and rely on Sharkbanz for safety.

Since its inception, the product line has evolved (the Sharkbanz wearable is in its second generation) and expanded to the include a new device called the Zeppelin to help resolve an issue facing Florida boating anglers: loss of hooked fish to sharks. This device is the product that we set out to observe and evaluate in the waters off the Florida Keys this past spring. But before we go there, let's look at the technology behind these products.

REPULSIVE TECHNOLOGY

History is rife with attempts to develop effective shark deterrents, ranging from chemicals and frightening sounds to clothing and surfboard decals that mimic sea snakes. Most have ultimately failed, says Eric Stroud, who holds a Ph.D. in organic chemistry. Stroud is partners with Patrick Rice, who has a Ph.D. in marine biology, in SharkDefense Technologies in Oakridge, New Jersey. The company specializes in the development of shark repellents, including the technology behind both the Sharkbanz and Zeppelin products.

Stroud and Rice stumbled across a phenomenon one day in 2004 when they accidentally dropped a magnet inside one of their lab tanks containing sharks. "The sharks changed their behavior and avoided the magnet," Stroud says. That observation led the two scientists to conduct extensive tests of magnets on sharks in the lab and in the wild. The technology worked so well that SharkDefense applied for a US patent, which was granted in 2016.

HOW IT WORKS

"Sharks possess a hierarchy of senses," Stroud says. "Like humans, they can smell, taste, hear and see, but they can also sense low-frequency vibrations through their lateral line, as well as minute electrical fields through pores in the snout known as the ampullae of Lorenzini. Alternating the magnetic fields of the magnets within the Sharkbanz and the Zeppelin is the key to deterring sharks," Stroud says.

"This interferes with the electroreceptors in the ampullae of Lorenzini," he explains. Sharks use this sense to home in when they are close to their prey.

Whether sharks find alternating magnetic fields irritating, painful or confusing is unclear, but tests and video evidence confirm that they tend to turn away from the source, be it a Sharkbanz wearable or the Zeppelin. This usually does not happen until the last seconds of the approach. The maximum effective radius of the alternating magnetic field is about 3 feet.

While magnets represent a new approach to repelling sharks, the use of electrical fields is not. Working on the same principle of interfering with a shark's electroreceptors, bursts of electrical fields provide greater range than magnets, and they have proven effective in deterring sharks, particularly great whites, Stroud says.

"Devices generating powerful electrical fields have been effectively employed on surfboards," the scientist points out. But these require batteries and can be expensive and cumbersome, while the magnetic technology in the Sharkbanz wearable and Zeppelin doesn't need batteries and is simple, compact and relatively affordable.

The patented technology used in the Sharkbanz wearable (left) and the Zeppelin (above) relies on alternating magnetic fields that are proven to interfere with electroreceptors in a shark's snout.

PHOTOS: COURTESY SHARKBANZ (3)

PHOTO: SCOTT SALYERS

EFFECTIVE RATE

"No shark repellent is perfect," Stroud says, noting that water conditions are an influencing factor. "The Zeppelin is more effective in turbid water conditions that reduce visibility for sharks.

"When they cannot see well, they rely more on electroreception, and that's when this technology works best in deterring sharks, with effective rates of 90 to 95 percent or more."

In clear waters, effectiveness declines. "That's because sharks rely more on their vision to attack as they get close," Stroud explains.

"Seventy percent effectiveness would be great in crystal-clear water, but even if it is 50 to 60 percent, that would be good," he adds, referring to the Zeppelin.

SO MANY SHARKS

Increasing numbers of sharks hunting for food around wrecks, reefs and other underwater structure have frustrated Florida boat anglers for years, including Capt. Chris Mendola, owner and operator of Farout Fishing Charters based in Key West, Florida.

"It seems like there are more sharks than ever before," says Mendola, who has fished the lower Keys for decades and often targets amberjack, cobia, grouper, king mackerel, permit, snapper and other species in these waters.

The increase in shark numbers is largely the result of relatively recent federal and state regulations implemented to protect shark populations from overharvesting by commercial fishermen. It seems to be working, but that's bad news for anglers like Mendola who find it difficult to boat a fish before a shark bites it in half or takes it altogether.

"There have been days when we just have to stop fishing a particular wreck because sharks grab every single fish we hook," Mendola says. "It seems like a terrible waste of time and resources to keep feeding the sharks, so we just move on to another spot."

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ZEPPELIN SOLUTION

This is an issue that Garrison hopes to mitigate with the Sharkbanz Zeppelin. The 6½-ounce tubular device measures 3¾ inches in length by 1⅛ inches in diameter, with eyelets on both ends for attaching fishing lines. It is intended to replace or augment a lead sinker while bottomfishing. The company touts an effective shark deterrent range of 3 feet or more. Importantly, from an angler's point of view, it works only on sharks, and it will not affect the target species, according to Sharkbanz.

To see if and how the Zeppelin works, we joined three members of the Sharkbanz team—Garrison, Davis Mersereau and Tim Nelson—aboard Two Conchs Charters' 39-foot Yellowfin skippered by Capt. Jack Carlton. Also joining us were Carlton's son, J.C., as well as Megan Damon and Tyler Phillips.

Based in Marathon, Florida, Carlton has struggled with shark depredation for years, so he was particularly interested to test the Zeppelin, not only with the hopes it would work for his sport-fishing charters, but also to sell it in his Two Conchs tackle shop in Marathon.

The Zeppelin retails for $75. But that might be a small price to pay to catch more fish. "Sharks are a year-round issue," Carlton says. "Anglers are interested in anything that can help them boat more of the fish that they hook and keep sharks away."

RIG IT RIGHT

The Zeppelin is designed primarily for bottomfishing, and rigging is critical to its successful use, Garrison says. "We provide instructions with the Zeppelin," he says. "The main idea is to attach the Zeppelin so that it ends up within 18 to 24 inches below a hooked fish." Most sharks approach from below a hooked fish as it is being reeled upward, so the magnetic field radiating from a Zeppelin dangling

Florida anglers have grown frustrated with shark depredation, especially when it comes to sacrificing big, tasty snapper.

DIRTY DOZEN

Shark depredation plagues anglers in South Florida, the Bahamas and throughout the Caribbean. It's an age-old problem, and even served as the central theme for Ernest Hemingway's Pulitzer- and Nobel-winning 1952 novel, *The Old Man and the Sea*.

But which shark species are the greatest nuisance when it comes stealing or mutilating hooked fish? Here are the 12 biggest offenders, according to Dr. Eric Stroud of the SharkDefense laboratory in Oakridge, New Jersey.

COASTAL

1. Bull
2. Lemon
3. Hammerhead
4. Blacktip
5. Spinner
6. Sandbar
7. Caribbean reef
8. Blacknose

PELAGIC

9. Mako
10. Oceanic whitetip
11. Silky
12. Blue

During our charter aboard Two Conchs, the crew reviewed underwater video footage after each hookup to determine if sharks approached hooked fish and how they behaved as they drew near the Zeppelin.

underneath the fish helps thwart the shark attack.

The rigging on our trip was complicated by the need to include an underwater camera on the fishing line pointed downward above all of the rigging in the hopes of capturing the behavior of sharks around hooked fish. We used the compact GoFish cigar-shaped underwater camera and analyzed the footage on an onboard laptop after every hookup.

We fished a number of wrecks aboard Two Conchs in Atlantic waters ranging in depth from 120 to 250 feet. A strong Gulf Stream swept northward along the Keys, ushering in clear blue offshore waters.

DID IT WORK?

Sharkbanz claims that the Zeppelin has "exhibited [an] 84 percent reduction in hooked fish lost to sharks compared to local daily depredation averages" in research trials conducted in Western Australia. The results on our trip were not as clear-cut, but the video evidence shows that the Zeppelin definitely creates a zone sharks seem to find unpleasant.

For example, during one particular video sequence after hooking a large amberjack, a shark—a big silky shark, Carlton believes—zoomed into camera range to investigate the struggling fish. Yet it quickly turned away, seemingly repelled by the Zeppelin's magnetic field.

Minutes later, a shark—presumably the same one—darted into camera range again, cut a tight circle around the amberjack, and then turned away again. A minute or two later, however, the outcome was different. A big shark, probably the same one that investigated previously, bolted into camera range, seemingly ignoring the magnetic field, and sunk its teeth into the hooked fish, breaking the fishing line and taking off with its prize.

While the fish was ultimately lost, the video evidence makes a case for the Zeppelin. "Big amberjack are powerful fish and fights don't end quickly, and so the shark was given plenty of time and chances to overcome the unpleasant nature of the magnetic field," Carlton points out.

Eventually, the shark's appetite overrode the pain, but that's enough to convince me that the Zeppelin works. From my point of view, this is akin to a pet dog that will respect an electric fence most of the time, but ignore it if the enticement to go through it is strong enough.

> "Sharks are a year-round issue. Anglers are interested in anything that can help them boat more of the fish that they hook and keep sharks away."

CONVINCING EXPERIENCE

"I think the Zeppelin will make a big difference on bottom species such as snappers that don't fight as hard as amberjack," Carlton says. "We can bring a mutton snapper to the boat a lot faster, and that gives the shark much less time to overcome the magnetic field."

Stroud points to another mitigating factor. "In our testing, we found that cameras affect the Zeppelin's magnetic field," he reveals. "The camera introduces magnetic interference that reduces the

SCAN ME

Scan this tag or visit boatingmag.com/sharkbanz-zeppelin to check out an amazing underwater video showing how sharks respond to hooked fish around the Zeppelin shark-deterrent device from Sharkbanz.

PHOTOS: JIM HENDRICKS (TOP LEFT), COURTESY SHARKBANZ

effectiveness of the deterrent. In normal angling with the Zeppelin, anglers don't usually have cameras on the fishing line, and so this won't be an issue."

Later in the day, just as we were wrapping up our trip aboard Two Conchs, guest angler Megan Damon hooked another big amberjack, one that kept her busy for close to 10 minutes before the fish was brought boatside.

Afterward, the entire crew gathered around the laptop to see if there was a shark around the fish. A quick fast-forward of the video failed to show any evidence of sharks, yet more careful examination later that evening did indeed reveal a shark. Like an apparition, it stalked Damon's amberjack in the low-lit depths some 200 feet under the boat. But as it closed in for the kill, the shark suddenly bolted away, never to return, and she landed her fish. Score one for Damon and the Zeppelin.

My time with the Sharkbanz crew had come to an end, but Garrison, Mersereau and Nelson continued to gather video evidence with captains farther north along the Florida coast. A couple of days later, I received an excited text from Garrison.

"All the pieces came together today," he wrote. "Got the craziest clips to date. Stoked to show you."

Indeed, while bottomfishing with Capt. Scott Fawcett of Off the Chain charters out of Stuart, Florida, the Zeppelin worked like a charm. While I was not there, I viewed Garrison's video evidence, and it was convincing. To watch the video evidence from our Two Conchs' trip, visit boatingmag.com/sharkbanz-zeppelin.

Video shows a shark approached this hooked amberjack (left) but turned away as it neared the Zeppelin. The device proves particularly effective after hooking smaller fish like this grouper (above).

Someone once told me that sharks don't care what or who they bite. While that might be true, the Sharkbanz Zeppelin seems to make these prehistoric creatures think twice before sinking their savage teeth into your prize catch.

JULIA CHILD'S REPELLENT RECIPE

Before the late Julia Child cooked on public television, she cooked up shark repellents for the US government. According to Dave Kindly in *The Washington Post*, Child served in the Office of Strategic Services, a forerunner to the CIA, during World War II.

Shark attacks had become a major concern, and the military turned to the OSS to find a way to protect personnel. "In 1943, Child and her coworkers tested more than 100 substances, including common poisons as well as extracts from decayed shark meat," Kindly wrote.

After a year, they hit upon "cakes" of copper acetate mixed with black dye, called Shark Chaser. The concoction was said to smell like dead sharks to other sharks. Field testing indicated 60 percent effectiveness, Kindly wrote.

Unfortunately, it ultimately did not work, says Eric Stroud, who has a Ph.D. in organic chemistry and is a partner in the New Jersey-based SharkDefense laboratories. "They were on the right track," Stroud says. "They first came up with ammonia acetate, which mimics the smell of decomposing sharks." Stroud's lab has conducted extensive research with necromones, a scent released by dead sharks and proven to repel many shark species.

However, Child and her team decided that ammonia was not enough and added copper to the formula. Because this element is a marine biocide, it seemed like a good idea. But not so, Stroud says. "This basically converted the Shark Chaser to copper acetate, which has no effect on sharks," he explains.

As to the 60 percent effectiveness? "That was mostly the result of the black dye," Stroud reveals. A big black cloud of dye seemed to intimidate or spook sharks, but only during the day and only until the ocean dispersed the dye. At night, it did not work at all. Despite all of this, Shark Chaser continued to be US military standard issue right through the Vietnam War.

PHOTOS: (FROM TOP) COURTESY SHARKBANZ; JIM HENDRICKS; SHUTTERSTOCK