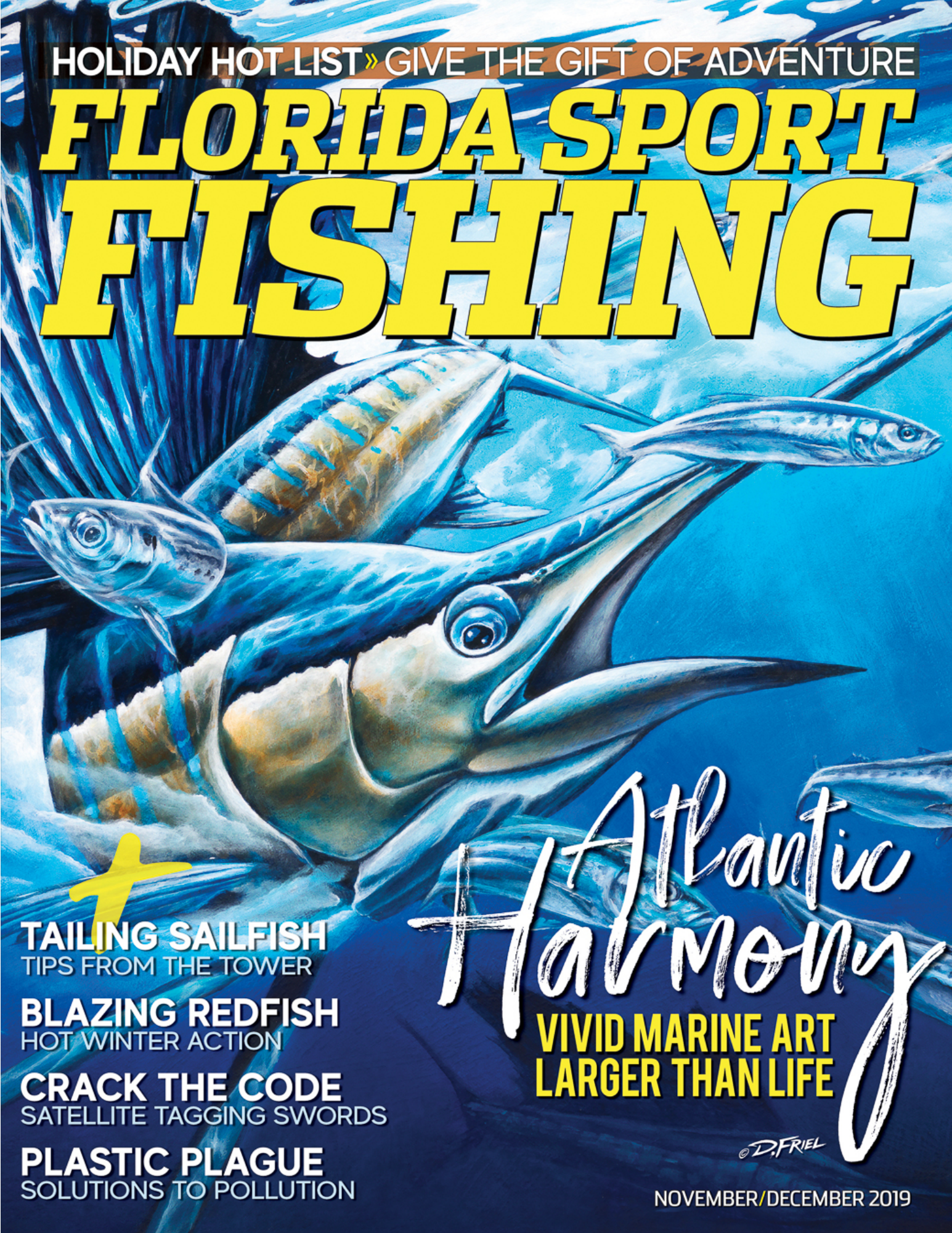
HOLIDAY HOT LIST » GIVE THE GIFT OF ADVENTURE

FLORIDA SPORT FISHING



Atlantic Harmony

VIVID MARINE ART LARGER THAN LIFE

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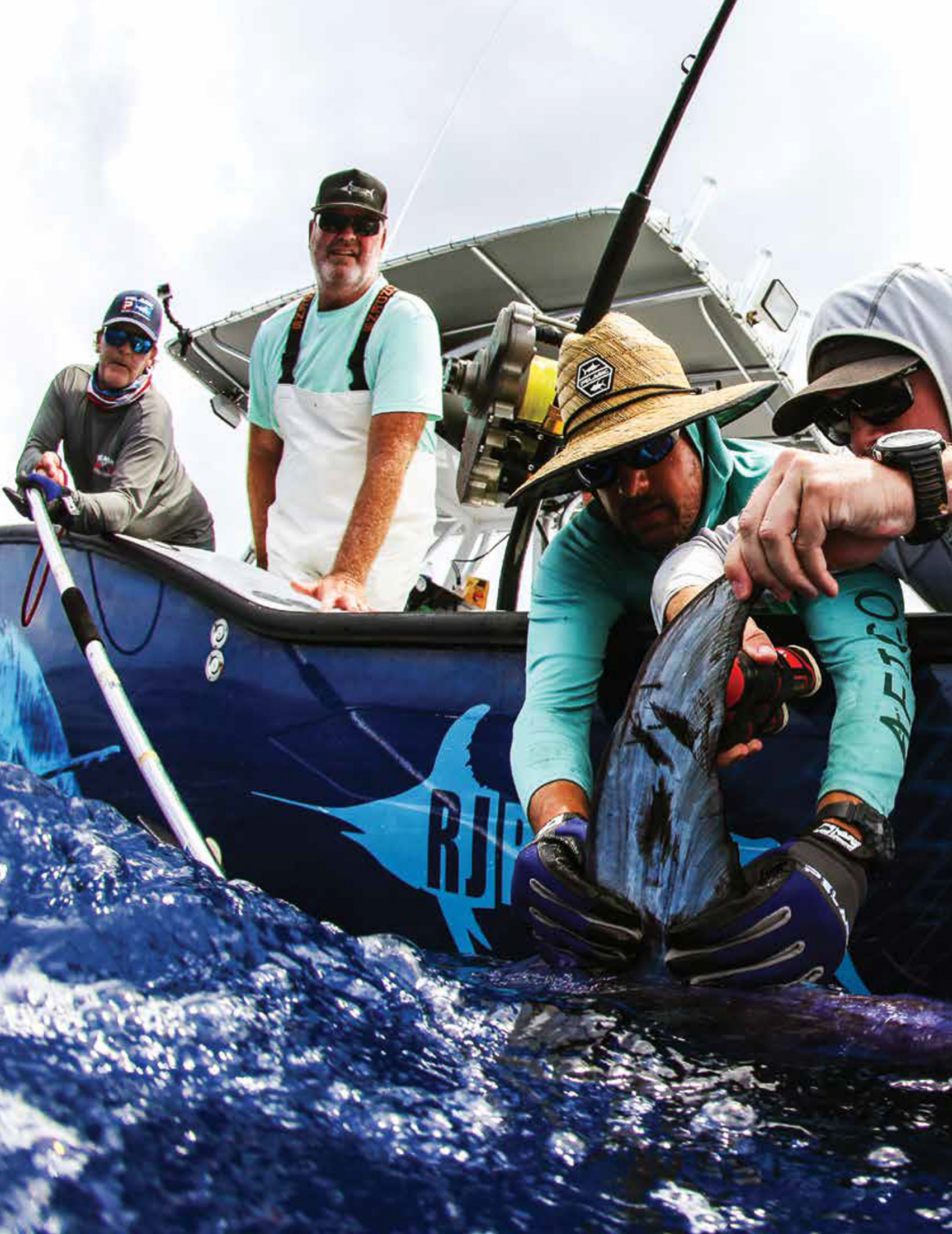
TAILING SAILFISH
TIPS FROM THE TOWER

BLAZING REDFISH
HOT WINTER ACTION

CRACK THE CODE
SATELLITE TAGGING SWORDS

PLASTIC PLAGUE
SOLUTIONS TO POLLUTION

NOVEMBER/DECEMBER 2019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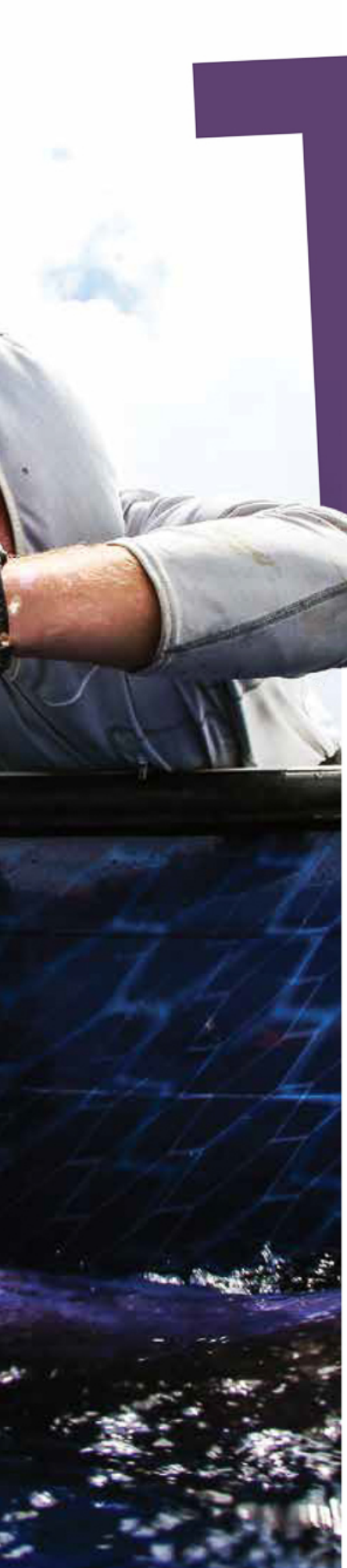

TAG TEAM

Novel Study Utilizing Satellite Telemetry Seeks to Uncover the Secrets of Swordfish

CAPTAIN STEVE DOUGHERTY

▶ ***AS ONE OF THE MOST MYSTERIOUS*** *and valiant predators encountered in the pelagic realm, swordfish have fascinated civilizations since the earliest explorers dared venturing offshore. A highly migratory species that knows few boundaries, these apex predators display a wide temperature tolerance and are capable of undertaking extensive vertical migrations. Though swordfish are notoriously challenging to study, a team from University of Washington's School of Aquatic and Fishery Sciences has set out on a unique project to uncover important knowledge about where swordfish go and why, and also underscore the importance of the ocean twilight zone as a critical biomass resource.*

As the lone member of the family Xiphiidae, these fascinating fish are uniquely equipped with physiological and morphological adaptations allowing them to successfully hunt surprisingly chilly, dark depths. Specialized gills allow for maximum oxygen extraction, with a cranial heater keeping eyes and brain warm to sharpen their vision when subjected to extremely cold temperatures. Scientists have also discovered that these superlative swimmers excrete oil from their bill to repel water and reduce drag as the fish thrusts itself forward. However, as this highly politicized fish is harvested worldwide with great fervor, major gaps in our understanding of swordfish ecology, distribution and habi-

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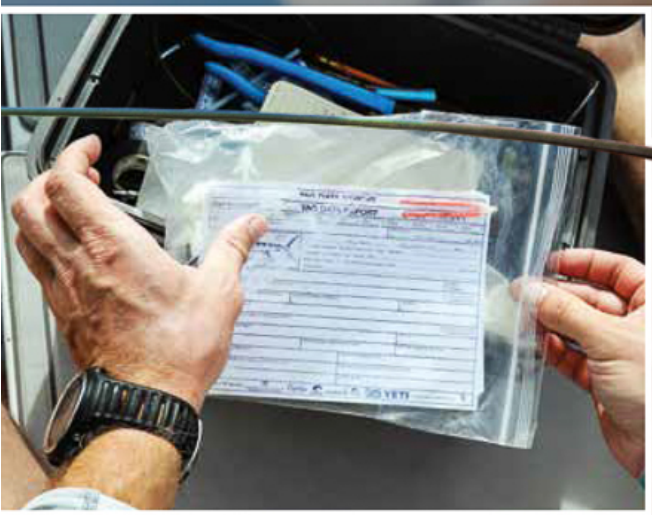
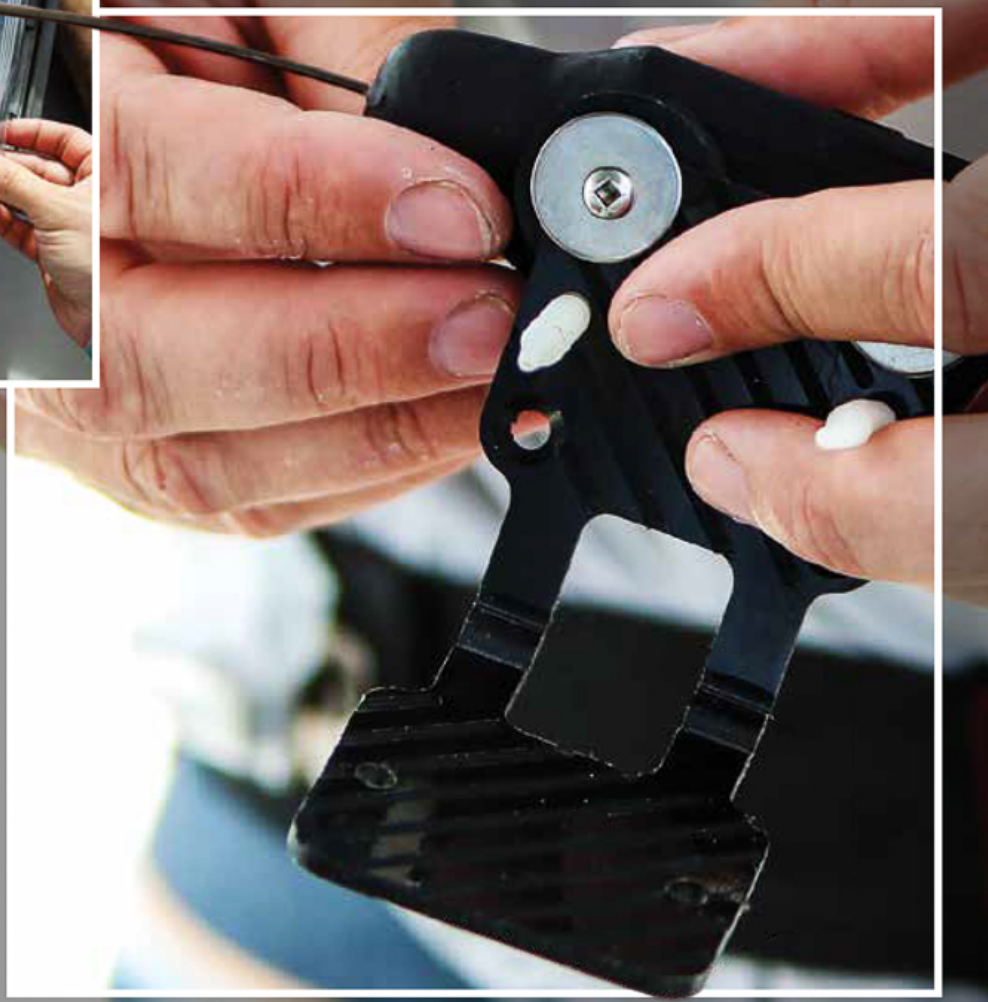
tat preferences remain. These gaps arise from a lack of data about the location and behavior of swordfish. In many regions of the world swordfish stocks are decimated or declining. Even in areas where rebuilding has occurred, such as the southeastern United States, management efforts continue to be hindered with widespread debate over stock boundaries and movement between management zones.

Electronic tags have uncovered heaps of movement information across many marine taxa, but swordfish present particular tracking difficulties. While there have been tagging efforts in southern California, tags that seek to acquire real-time movements represent a new realm for swordfish in Florida. Feverishly focused on uncovering the secrets of swordfish, a team of enthusiastic oceanographers has set out to further explore the relationship between movements of pelagic fish and their environment through satellite tagging data-deficient broadbill swordfish and monitoring the three-dimensional space of the open ocean.

"We're trying to figure out how swordfish populations all over the world vary their use of the surface versus deep ocean. Wherever in the world swordfish swim, we want to know where they are in the water column. Swordfish are an integral part of the largest migration on Earth, which happens every single day. With the setting of the sun, swordfish and countless other fish, squid and crustaceans rise to the surface to feed. The sunrise signals a massive migration back to deeper water in the ocean twilight zone. However, how deep swordfish dive, and why, is still unknown. By tracking the location and movement of swordfish we can start to unlock their mysteries and also those mysteries of the uncharted depths. That's going to give us some valuable information about where all their food is. And that food source, those deep-sea animals that live in the twilight zone, is likely so incredibly important to the ocean and we literally know next to nothing about it," says Dr. Peter Gaube, Principal Oceanographer at the University of Washington.

Everyone who has fished for swordfish knows the name R.J. Boyle. At the absolute top of the game, Boyle has earned the respect of skilled and novice fishermen everywhere, continuing to go above and beyond to assist anyone who asks for guidance. While there are many great names that helped write the story of daytime swordfishing, R.J. Boyle is one of the original sword lords. Teaming up with local legend John Bassett really put the odds in our favor.





With a shared focus, science and sport fishing come together for unprecedented interactions with the gladiator of the sea.

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For anglers looking to connect with swordfish, it's hard to beat the deep canyons, trenches and holes in the Florida Straits. The concept of daytiming was refined and perfected right off our coast, with specialized baits a key to success when battling the extreme depths, raging currents and bludgeoning slash of the ocean's top predator. Watching these two experts custom craft fortified baits is like watching an artist paint a picture. Every precise stroke of the knife and stitch of the rigging needle is accomplished with purpose and finesse.

Though traditional tagging efforts often use harpoon methods, we set out to catch, tag and release swords by finessing them to the surface with a two-rod arrangement comprising a Lindgren-Pitman (*lindgren-pitman.com*) SV-1200 to control the deepest bait and a Hooker Electric (*hookerelectric.com*) Penn International 80VSW guiding the buoy fishing a bait higher in the water column.

"We came to South Florida to fish with R.J. and John because we needed a place somewhere in the world where we could reliably catch upward of 10 swordfish in four days on the water. We're just getting started with this project and goal number one was to visit a destination where we knew we could get our hands on a lot of swordfish," says

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Dr. Camrin Braun, Assistant Professor in the School of Aquatic and Fisheries Sciences at the University of Washington.

In four days of fishing the team released five swordfish, with returned data indicating 100% survivability. "The types of tags we're using include the old workhorse pop-up archival tags (PSAT) researchers have been using for decades, but we're also experimenting with Smart Position Or Temperature (SPOT) tags to see if we can achieve real-time data on swordfish movements. We've partnered with the world's leading satellite tag manufacturer, Wildlife Computers (*wildlifecomputers.com*), to build custom sensors that allow us to observe how these magnificent predators swim in three-dimensions. Using these trajectories, we will transform our understanding of swordfish migration. We're also experimenting using different attachment techniques, both on the dorsal fin and tether mounts, to optimize performance and maximize retention," continued Braun.

Tagging with PSATs is expensive but highly efficient in gathering data through depth, temperature and light levels used to estimate location. While attached, PSATs do not transmit data. However, they are programmed to detach after a specific period and float to the surface—180 days in this case. Fine-scale archived data sets are then transmitted to the ARGOS network and the fish's estimated tracks are reconstructed. For more accurate movement data, SPOT tags can track a fish's position in real-time. But these tags have limitations and can only stream data when the antenna breaks the surface, which is why the science team believes dorsal mounting is the most efficient manner of attachment. These tags feature robust nitinol antennas and are designed to have the device as high on the fin as possible to improve ARGOS transmission. SPOT tags also include a ping that can be tracked with a directional antenna and receiver.

With bright purple and silver hues, impressive acrobatic abilities and nerve shattering headshakes, the muscular broadbill is a true gladiator and an extremely challenging opponent for even the most battle-tested crews. Bringing an agitated swordfish to the boat in preparation of tagging provides a few significant obstacles. By utilizing a snooter that loops a snare around the bill, feisty fish can be controlled so the team can safely and accurately apply tags. Lower jaw fork length measurements are also obtained as the fish's weight is estimated by the experienced anglers. You'll quickly come to realize when a swordfish is resuscitated and ready to release as it thrashes its big bill boatside. While a lot of data can be gathered from a single animal, from capture to release the team's foremost focus is the safety and wellbeing of the fish.

"We're doing everything we can to release these fish in the best possible health. That's the objective of the project, but we caught a few that were deemed not eligible for release. The largest fish we set free, with an estimated weight of 320 pounds, was also the fish we felt might have the most difficulty surviving the encounter. When we first let her go, she had trouble regaining buoyancy and momentarily floated on her side. We contemplated aborting the tag if she had trouble swimming down a second time, but after pushing water through her gills she lit up and kicked off with a powerful thrust. We now know this fish is active and very much alive, which is a perfect example of how resilient these fish are and also reiterates the importance of keeping

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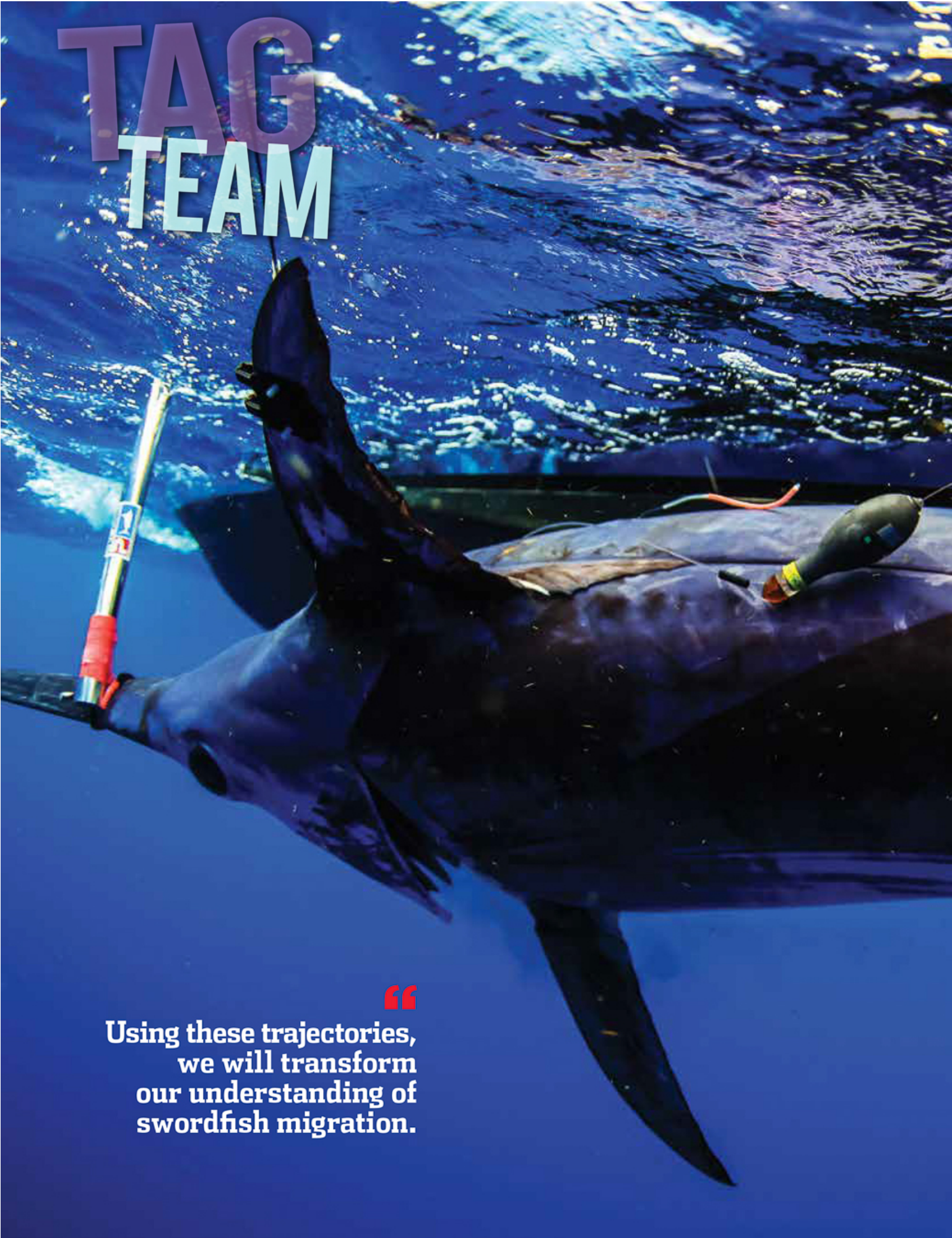

> **Using these trajectories, we will transform our understanding of swordfish migration.**

large pelagic species in the water with their heads submerged prior to release," says project coordinator Tony Digiulian.

The classic image of a finning swordfish has been forever engrained in our memory bank. However, fishermen in South Florida do not encounter basking swords as commonly as in cold water climates like California or in the northeast Atlantic along the Georges Bank. Despite the fact that the SPOT tag's antenna must be out of the water with clear access to the sky in order to transmit data, and the preconceived notion that swordfish in Florida do not often exhibit surface dwelling behavior, the project is already delivering a treasure trove of data on the movements of these fish. The 320-pound broadbill tagged on day one ascended to the surface mid-day less than one week after its release, sending a ping for a 15 second interval. An estimated 90 pounder released on the expedition's second day came to the surface and transmitted a signal about 60 hours after it was released. In less than one month the team received pings from all five fish at the surface, basking during the day or feeding during the night off the Florida coast.

"Soon we will be able to piece together and analyze depth and basking rates, dive duration and periodicity, and much more. It's incredibly exciting and the big picture goal for us and the reason why we study swordfish is because we're really interested in the deep ocean. We are collecting the fundamental position and dive data from these fish in order to learn about the distribution of their food, which primarily consists of mesopelagic fish, the most numerous vertebrates on Earth. The deep ocean is the last frontier and the cool thing about swordfish is that it's one of the only species in the world that spends half of its time at the surface and half of its time in the deep ocean. It's the only species that moves up and down in this manner every single day. So, it's almost a model predator that we can use to study this place that is otherwise so incredibly hard for us to access," says Braun.

Collaborating with like-minded scientists will increase the speed and rate of learning. Soon, these fish will be populated to the OCEARCH Global Tracker (*ocearch.org*) where they can be observed by the public in near real-time. The project has been more successful than any of us could have hoped and the team is gearing up for their next tagging expedition in the Red Sea.

Ultimately, it's amazing what we don't know about this incredible predator and when you're dealing with animals that are so rare, any information you add is contributing to the overall knowledge of the species. However, a larger sample size is required to help scientists have a more complete understanding. If you would like to contribute to project, please visit *gofundme.com/f/swordfishtagging*. FSF