Texas Shores

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CONSERVATION EFFORT in Texas pays off

Hundreds of Kemp's ridley hatchlings head to the water off a Mexican nesting beach.

HECTOR CHENGE ALVAREZ, COURTESY OF GUARDIANS FOR LIFE 2010

DIRECTOR'S MESSAGE

Texas Shores magazine last took a look at sea turtles during the summer of 1986 (Vol. 19, No. 2), with the introduction to that issue proclaiming, "Now is the time for turtles at Texas Shores." The issue focused on the clash between the state's large shrimp industry and environmentalists over the use of Turtle Excluder Devices (TEDs), and the struggles of the nearly extinct Kemp's ridley sea turtle. Looking back now at the controversy over saving an industry and/or the sea turtles it imperiled, it did seem like "mission impossible."

Fast forward 32 years, and the industry and the turtles both survived. Many key events and conservation efforts contributed to saving the Kemp's ridley from extinction. Most notable were the combination of long-term protection of nesting beaches, requiring TEDs on shrimp fishing vessels in U.S. and Mexican waters, seasonal and spatial closures to shrimp fishing in critical areas, and the successful imprinting and head-start experiment to reintroduce Kemp's ridleys to Padre Island National Seashore. Collectively, these actions led to a significant increase in the number of Kemp's ridleys in Mexico and Texas.

Texas Sea Grant played a decisive role in developing a partnership with the Texas shrimp fishery in the 1980s to help moderate the tensions among industry, the federal government and environmental non-governmental organizations. The hostilities were known to many as the "TED Wars." Texas Sea Grant professor Gary Graham proved critical to this tumultuous time in our history. Graham led a large team of extension professionals in the most successful extension, engagement and outreach program ever developed by Texas Sea Grant: to teach shrimp fishermen how to install and operate TEDs. It was not smooth sailing by any stretch of the imagination. But Graham's honest-broker approach and keen ability to communicate with fishermen helped an industry adjust its practices and come into compliance with federal regulations.

Texas Sea Grant also was instrumental in funding sea turtle research resulting in significant discoveries that, put into practice, improved sea turtle conservation efforts in Texas and beyond. Sea turtle imprinting cues tested and demonstrated in the lab were many years later verified in the field when Kemp's ridleys imprinted to Padre Island National Seashore as hatchlings returned to nest as adults. These imprinted turtles still return to Padre Island, where their eggs are protected during incubation and the offspring are placed on the beach to crawl down to the Gulf of Mexico waters during public releases that rival rock concerts. This Texas nesting colony is as important today as it was back in the late 1970s when the stewards of our natural resources dreamed of new approaches to save a species on the verge of extinction.

So much has changed since the summer of 1986. The TED Wars are a distant memory for many of us who lived through them. I never imagined that someday I would see a person dressed in a shrimp costume, sitting next to a person dressed in a sea turtle costume, in warm embrace while attending an event sponsored by the Texas shrimp industry to raise money for sea turtle conservation. This was inconceivable 32 years ago.

Equally astonishing is the return of sea turtles to Texas shores and coastal waters in greater numbers than I could have ever imagined when I first began studying them in the early 1980s. The recovery of the Kemp's ridley, a veritable Gulf icon, makes a compelling case study of what can be achieved when people, industry, institutions, states and countries work together toward common goals to restore our natural resources. I hope you enjoy this issue as we highlight conservation successes, the people who enabled them, current threats, and the extraordinary resilience of sea turtles. Now truly is the time for turtles at Texas Shores.

Pamela T. Plotkin, Ph.D.

Director, Texas Sea Grant College Program

Texas Shores

Sea Turtles in Texas

GUEST EDITOR:
Melissa Gaskill

GRAPHIC DESIGNER:
Vicky Nelson, TTI

CONTRIBUTORS:
Damond Benningfield
Eva Frederick
Melissa Gaskill
Evelyn Moreno
Emily Moskal

TEXAS SEA GRANT DIRECTOR:
Dr. Pamela Plotkin

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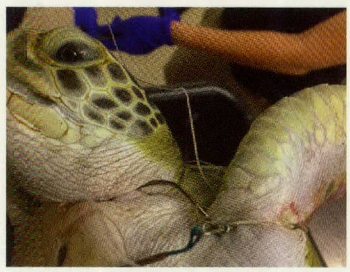

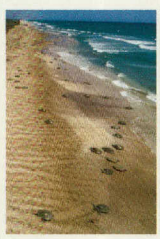

Cover image: A nesting arribada in Mexico in May 2018. Photo by Javier Montaño Cuevas and Erika Navarro Ang.

Courtesy of Gladys Porter Zoo and the University of Alabama at Birmingham.

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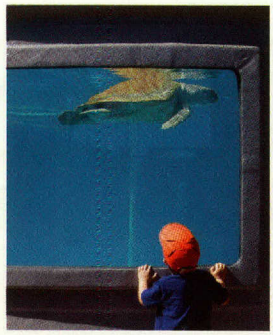
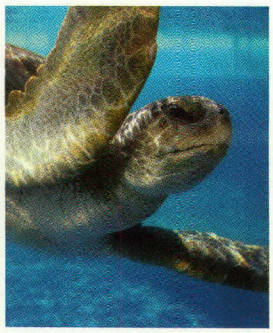
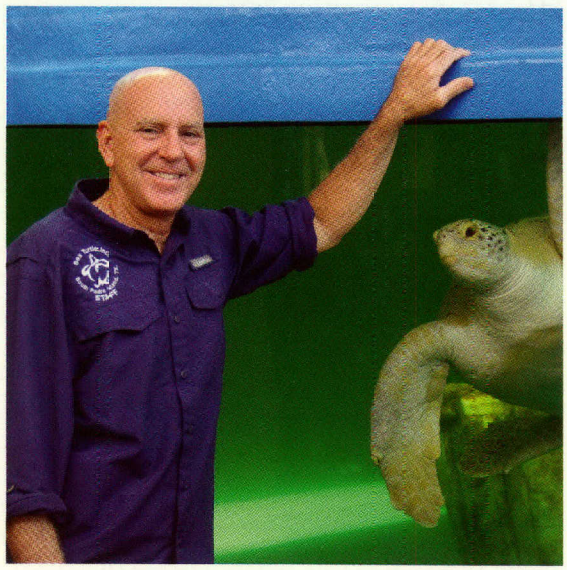
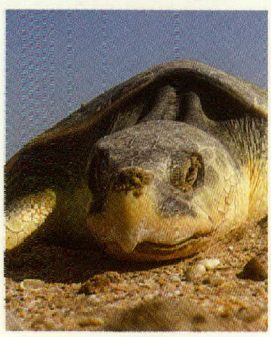
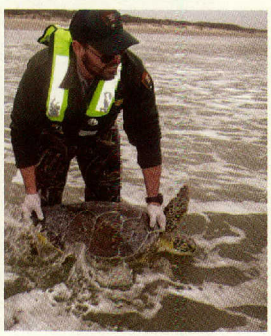










CONSERVATION EFFORT in Texas pays off

BY MELISSA GASKILL

The Kemp's ridley sea turtle ranks as one of wildlife conservation's great successes. While still critically endangered, the species increased from having fewer than 1,000 nests in 1985 to more than 20,000 in 2017, including a record 353 nests in Texas.

This good news represents the payoff from intensive, long-term conservation efforts, including protection of nesting beaches, improved fishing practices, and public education and outreach. It also involved cooperation by federal, state and local agencies in the United States and Mexico, along with non-governmental organizations, industry and the public.

Protecting nesting beaches is a critical part of protecting Kemp's ridleys, says Donna Shaver, Ph.D., chief of sea turtle science at Padre Island National Seashore. The marine reptiles nest in only a few specific areas, and threats to their survival concentrate in those same locations.

Beach protection is straightforward but laborious and time consuming, Shaver says. Simply having staff and volunteers around decreases the danger from poaching, predation, and vehicles driving on the beach. Placing eggs in protected areas — either fenced corrals on the beach or indoor incubation facilities — increases protection from these threats, as well as from nest flooding or washout by high tides and tropical storms. These protective practices have increased survival rates for eggs and, thus, the number of hatchlings.

The next step is protecting hatchlings as they journey down the beach to the sea, which gives them a better chance of getting to the water than those making the trip on their own. For example, in Mexico during the 2007 season, biologists calculated an 80 percent emergence success for more than 3,000 nests left in place on the beach, with roughly 66 percent of hatchlings making it to the water. Almost 100 percent make it when they are provided protection.

"Conservation programs essentially eliminated land-based predation and made sure all ridley hatchlings made it as far as the water," says Patrick Burchfield, director of the Gladys Porter Zoo in Brownsville. As more hatchlings reach the water, more survive to adulthood and eventually return to nest.

That accounts for the record 353 Kemp's ridley nests counted in Texas in 2017. Of those, 219 were recorded at the Seashore, the highest annual number by far.

The number of green sea turtles in Texas has significantly increased as well, as shown by data on the number of turtles that strand, or are found washed ashore or floating, either dead or in a weakened condition. Those data come from the Sea Turtle Stranding and Salvage Network, a national network of volunteers that began documenting strandings in the United States in 1980. Shaver, Texas coordinator for the network, says the number of greens continues to increase, with numbers way up compared with 10 years ago.

"The first year we saw a big jump in greens was 2007," she says. "Most are not from Texas because the number nesting here is still low."

Shaver is part of a team that determined most green sea turtles in Texas come from Mexico. The team includes scientists from the University of Georgia, the Marine Mammal and Turtle Division at the National Oceanic and Atmospheric Administration (NOAA) Southwest Fisheries Science Center, the University of Central

NATIONAL PARK SERVICE PHOTO

Preparing eggs to take into the Padre Island National Seashore incubation facility.

A female Kemp's ridley sea turtle returning to sea after nesting.

NATIONAL PARK SERVICE PHOTO

Florida, the University of Miami, and the Gladys Porter Zoo. The team's analysis of genetic samples and simulation of ocean currents suggest that about 70 percent of the Texas population of greens originates in the western Gulf of Mexico and most of the rest from Quintana Roo on the Yucatan Peninsula. These results, reported in a 2015 paper in the *Journal of Experimental Marine Biology and Ecology*, also identified a western Gulf of Mexico green sea turtle population in the Mexican state of Tamaulipas discrete from that in the northern Greater Caribbean.

"That means protection of Tamaulipas nesting beaches accounts for much of the increase in Texas green sea turtles," Shaver points out. Mexico's steps to protect sea turtles include prohibiting take of all marine turtle species, and declaring the Rancho Nuevo nesting beaches, in Tamaulipas about 200 miles south of the Texas border, a Natural Reservation in 1977 and a Sanctuary in 2002. Sea turtles are well known for their long-distance travels, and juvenile greens from Mexico rookeries find important nursery habitat in Texas. Adults hang around for the seagrass and algae found along the shore.

Loggerhead, hawksbill and leatherback sea turtles also live in the Gulf of Mexico but in much smaller numbers. Typically, scientists record no more than six loggerhead nests on the Texas coast each year. Since conservation efforts began, only one hawksbill and one leatherback nest have been confirmed in Texas.

The second element of sea turtle conservation success — protecting them in the marine environment — proves even more complex. Research by Shaver and scientists at the U.S. Geological Survey, NOAA, the University of Florida, the Gladys Porter Zoo, and Acuario de Veracruz in Mexico found that waters near the western Gulf shore are critical habitat for Kemp's ridleys. Up to half of all adult females of this species spend weeks or months there during nesting season, and most of the adult male turtles remain in the western Gulf yearround.

Shrimp trawlers and oil and gas platforms operate in those same waters and present a threat to survival of the species. Beginning in 1990, closing certain areas to shrimping and increasing use of a Turtle Excluder Device (TED) for shrimp trawls led to significant reduction in the number of turtles killed.

To determine where and when to restrict shrimping activity, the Texas Parks and Wildlife Department (TPWD) analyzed stranding and nesting data. From Corpus Christi Fish Pass to the Texas-Mexico border, TPWD closes to shrimping waters out to 5 nautical miles from Dec. 1 to July 15, the latter date subject to change by the department. Historically, that time frame has accounted for 68 percent of annual turtle strandings but less than 3 percent of the total Texas shrimp landings by weight. Once the seasonal closure went into effect, nesting numbers shot up.

The restrictions on shrimping represented a compromise, says Shaver, who favors a look at extending the seasonal closure farther offshore and establishing a similar in-water protected zone off the primary nesting beaches in Mexico.

Implementing widespread use of TEDs took a more concerted effort and involved an even larger cast of players, including Texas Sea Grant, which became involved in the 1980s.

"Texas Shrimp Association president Ralph Rayburn came to me and said, we need to start working on this," recalls former Sea Grant marine fisheries specialist Gary Graham. "The National Marine Fisheries Service had tested different devices and settled on a trap door design that was quite heavy. I got on boats, pulled the gear, and collected data on shrimp loss and potential sea turtle encounters. It became clear that we needed a better mousetrap.

"Come to find out, nearshore fishing boats around Matagorda Bay had come up with a device to deal with huge problems with cabbagehead [jellyfish]. I got on a research boat off Cape Canaveral [Fla.], a place where we knew there were sea turtles, and pulled one net with a device and one without. It worked well enough to provide proof of concept" for the device.

Intensive, long-term conservation efforts have helped sea turtle populations increase in Texas and brought the Kemp's ridley back from the brink of extinction.

Starting with an idea from the fishing community made things easier, Graham says, as did a collaborative relationship between Texas Sea Grant and the National Marine Fisheries Service. Still, it took time and many improvements for TEDs to become widely accepted.

Graham and Cameron County coastal and marine resources agent Tony Reisinger spent countless hours helping shrimpers correctly install and operate TEDs. "The devices are only effective if made, installed and operated correctly," says Graham. "So, we've been there to show them correct installation, operation and maintenance.

"What we found most effective is one-on-one contact," he says. "Meet a fisherman on his boat, with his gear, and show him that this net will get rid of sea turtles and help retain your catch. It evolved into trust where we could get on the boats." Sea Grant now issues a proof of inspection to boats in compliance with TED regulations and offers on-the-spot assistance to help those not in compliance.

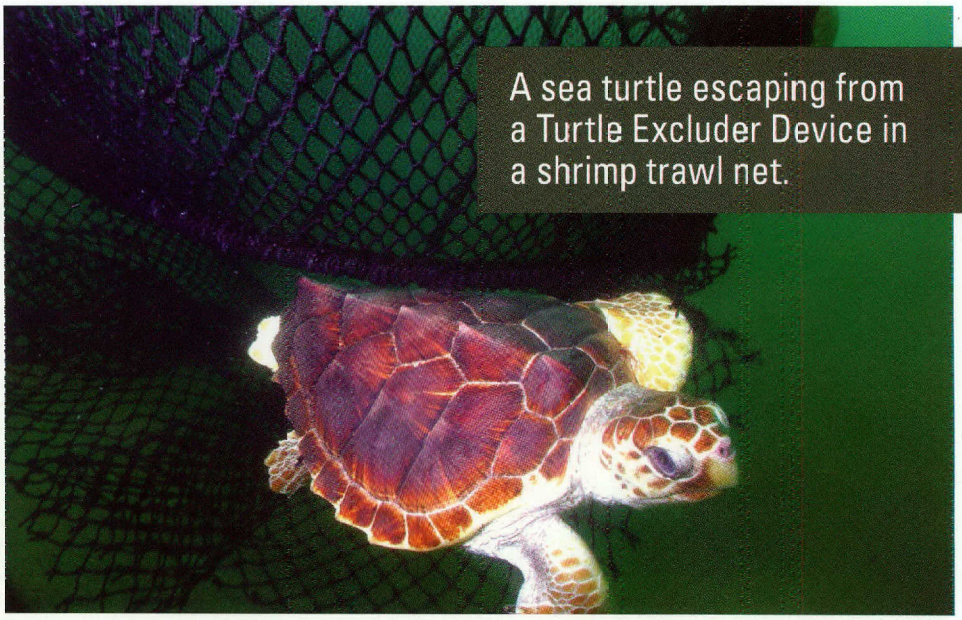
According to the Kemp's Ridley Stock Assessment Project, prior to wider use of TEDs in 1989, shrimp trawls killed an estimated 2,051 ridleys a year, about three-fourths of the total annual mortality. In 2009, despite an exponential increase in the ridley population, shrimp trawls caused only an estimated 25 percent of annual deaths of the turtles. That suggests that the number of turtles killed by shrimp trawls decreased 68 percent from 1989 to 2009, largely because of TEDs and fishing closures. By 2012, the number had fallen farther, with shrimp trawls accounting for an estimated 20 percent of total ridley deaths.

International collaboration proved key for protecting the turtles in the water, just as it had for protecting nesting beaches. Mexico mandated the use of TEDs in the Gulf of Mexico and the Caribbean in 1993. In 1997, it required their use along the Pacific, Gulf of Mexico, and Caribbean coasts. Mexico also prohibits longline shark fishing in a 3-mile buffer zone off the six beaches in Tamaulipas from March through June and the five beaches of Veracruz from March through August, overlapping with the sea turtle nesting season.

Educating the public about its role in sea turtle protection represents another important element of their conservation. Some of the important messages, according to Shaver, are: "Don't discard trash in the water. Be cognizant of your boat prop. Don't discard fishing line. Don't throw your hook in where you see turtles swimming around.

"Education is part of everybody's project," she says. "We talk about it at the National Seashore. Mission-Aransas National Estuarine Research Reserve talks about it. Sea Grant talks about it. We all have to; it's going to take all of us working together."

Intensive, long-term conservation efforts have helped sea turtle populations increase in Texas and brought the Kemp's ridley back from the brink of extinction. Much work remains to be done (read more about ongoing threats elsewhere in this issue), but continuing collaboration and the significant progress so far provide much hope.



A sea turtle escaping from a Turtle Excluder Device in a shrimp trawl net.

NOAA FISHERIES, SEFSC, HARVESTING SYSTEMS UNIT

BETHANY AUGLIERE

Tumors caused by fibropapillomatosis, a herpes virus, on a green sea turtle.

Continuing Challenges

Despite substantial progress, sea turtle species in Texas and beyond still face significant threats

BY DAMOND BENNINGFIELD

In the spring and summer of 2010, sea turtle experts began seeing a new affliction on Texas beaches: growths on the heads, flippers and shells of green sea turtles. The cauliflower-like tumors grew up to 4 inches wide, some making it difficult for the turtles to see or eat.

Researchers identified the cause as fibropapillomatosis (FP), a herpes virus previously seen in Florida and in several other countries. "When I worked in Florida, it was very common," says Tim Tristan, a veterinarian and executive director of Texas Sealife Center, an animal rescue and rehabilitation group in Corpus Christi. "When I moved to Texas, it was nonexistent. But since 2010, it's grown exponentially — from nothing to hundreds of cases a year."

The virus is one of many threats facing sea turtles in Texas and elsewhere. Some directly result from run-ins with people and their things, including becoming entangled in fishing lines and being struck by boats. Other threats appear to come not from direct contact with people but from climate change, including more frequent cold-stun events and even a shift in the ratio of male to female hatchlings.

"There are many different threats to different species of sea turtles, throughout their lifespan and throughout their range," says Donna Shaver, Ph.D., chief of the National Park Service's Division of Sea Turtle Science and Recovery at Padre Island National Seashore. "The threats are both natural and from human causes. It's estimated that only one of every 400 eggs that hatch will survive to adulthood. It's a tough life for a sea turtle."

Shaver is the leader of efforts to protect sea turtles along the Texas coast. Those efforts include volunteers working during the summer nesting season to dig up the

eggs of endangered Kemp's ridley and other sea turtle species to incubate and hatch in protected labs. When the hatchlings begin to wave their flippers, they're carried to the beach for release, protecting them from predators and overeager gawkers until they reach the water. And groups all along the coast rescue sick and injured turtles and nurse them back to health.

These efforts have helped boost sea turtle populations. Yet the increasing numbers create a greater risk of injury from human activities. "Fisheries' interactions are one of the most significant threats," Shaver says. "Turtle Excluder Devices have improved the situation with the shrimping industry, but we still have a problem with the turtles getting caught in long-lines that are out in the open ocean. They take the bait, or they get tangled in the lines. It can be quite dangerous."

Turtles also become caught on hooks used by recreational anglers, and discarded fishing line can entangle them, causing injury or drowning. The Texas Parks and Wildlife Department operates a program to recapture used fishing lines, and Texas Sea Grant coordinates a program that places receptacles for discarded lines on many Texas beaches. People can volunteer to sponsor a bin and empty it as needed.

Boat injuries are another problem. "As the turtles surface, boaters aren't able to see them," Tristan says. "The boat and turtle collide, and, obviously, turtles don't do so well with that. We've seen some pretty severe head wounds from those collisions. We had one turtle, Mathilda, who lost her right eye and fractured her jaw. And we see where propellers have cut into turtle shells. We have a turtle now where a CT scan showed several vertebrae were broken. He can't maneuver around properly because of that."

Direct turtle-to-human interactions can harm the turtles as well, even when people simply want to admire them. "People get real excited when they see turtles, and they rush up and touch them," says Christopher Marshall, a marine biologist at Texas A&M University at Galveston. "But the sea turtles get spooked quite easily. They might even abandon their nesting and go back to the ocean."

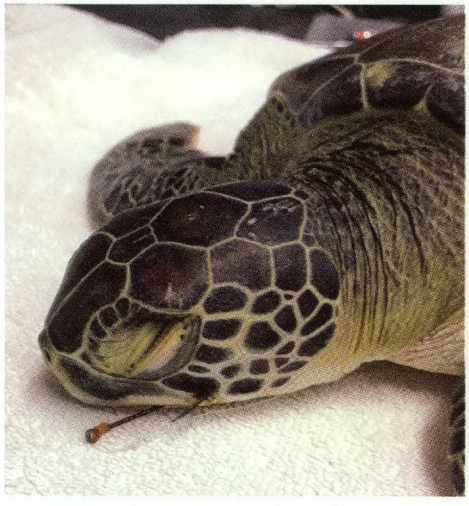
1 OF EVERY 400
eggs that hatch will survive to adulthood

One of the biggest threats, though, comes from plastics. A 2015 study estimated that, in 2010 alone, between 5.3 million and 14 million tons of plastic trash washed into the oceans worldwide. The volume has continued rising since then, most experts say. Plastic bags, water bottles, cups, six-pack beverage rings and other detritus can entangle sea turtles, hobbling or even drowning them.

This trash can break apart into tiny blobs, known as microplastics. Some of the blobs look like small sea creatures, while others are so tiny that sea turtles can't even see them. These bits of debris can settle on turtle feeding grounds, especially seagrass beds in shallow bays and estuaries where juveniles often feed. In Texas, experts say, the problem is most pronounced along the upper coast, although sea turtles suffer from plastic exposure just about everywhere.

"We see a lot of turtles ingesting bits of plastic," says Tristan. "We have turtles come in that are very skinny. We rehydrate them and put them on medications. And while they're getting rehabbed, they start passing plastic."

"Some sea turtles consume jellyfish, and plastic bags look like that," adds Marshall. "When they eat the plastic, it creates a mechanical blockage in the GI tract, and that makes them strand. There are lots of chemicals in the plastics, too, so they get a huge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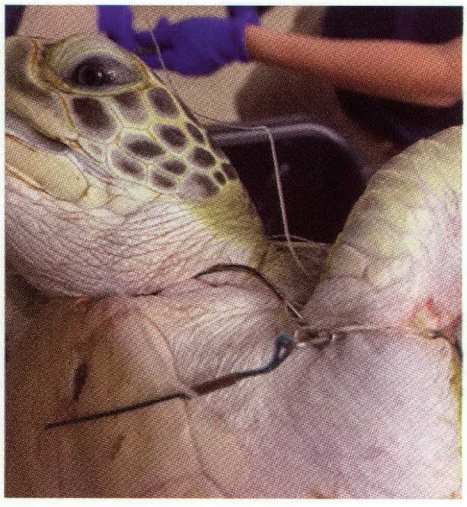

TEXAS STATE AQUARIUM


SEA TURTLE INC.

Sea turtles can suffer serious injury when entangled in fishing gear.

load of toxins. That can be lethal immediately, or it can have long-term effects on their health."

Public education efforts at the Seashore discourage balloon releases because sea turtles and other marine animals can ingest them or become entangled. Shaver reports another campaign to reduce use of plastic straws. Local beach and river cleanup events help keep such debris out of the ocean, and these events always need volunteers.

Changes in habitat may present even bigger threats than fishing lines and plastic bags because a warming climate raises water and sand temperatures, alters seawater chemistry, changes the patterns of currents, and affects other aspects of the marine environment.

While efforts to eliminate plastic bags and straws from stores and restaurants help reduce the amount of plastic that washes into the Gulf of Mexico, the problem won't vanish anytime soon. "We've been putting plastics into the oceans for a long time," Marshall says.

He heads a lab that studies how sea turtles and other marine animals behave and adapt to their environment. The lab recently began capturing and examining sea turtles in and around Galveston Bay, and then attaching trackers that communicate through satellites or ping a network of listening stations in the bay and its adjoining passes. "We're tracking all species, and animals of very different sizes. We're trying to understand who's there, their age, male or female, what habitat they prefer," Marshall says.

Changes in habitat may present even bigger threats than fishing lines and plastic bags because a warming climate raises water and sand temperatures, alters seawater chemistry, changes the patterns of currents, and affects other aspects of the marine environment. Warming water and shifting currents could change the food web; rising temperatures already harm coral reefs, on which several sea turtle species rely for food and shelter.

Some researchers say that climate change, along with other factors, also could have played a role in the rapid spread of FP. "There aren't enough fingers and toes to count up all the possible explanations," says Jeff George, executive director of Sea Turtle Inc., a rescue and rehab center on South Padre Island. "That's the sixty-four-thousand-dollar question, and if you Google it, you'll get 25 theories in five minutes — climate change, water treatment plants, extra nitrogen in the water, or maybe it's population driven."

Although the virus has been documented in all Texas sea turtle species, it is found primarily in greens, the most numerous species here. Recent estimates say FP affects perhaps 35 percent or more of the population, with cases more common in Laguna Madre than other parts of the coast. Juveniles, which spend time in the bays and estuaries before heading out to the deeper ocean, are more likely to develop tumors than adults. The National Park Service's Shaver notes that some researchers say part of the problem could be the significant increase in the green turtle population in recent years. More turtles means they pack more closely together, making it easier to transmit the disease, perhaps via marine leeches or other parasites.

The skein of environmental problems appears to suppress a turtle's immune system, making the animal more susceptible to the FP virus. Tumors can develop anywhere on the body, from the head and neck to the shell. Some grow so big they can snag on fishing lines and other objects in the water. And although rare, some turtles develop tumors on internal organs.

The main problems with external tumors occur when those around the eyes and mouth grow so large that a turtle can't see or feed. Tristan and other veterinarians use lasers to remove the tumors, although several surgeries over several weeks may be needed to excise all of them. Tristan has treated scores of cases, including about 70 in the first seven months of 2018. He says 97 to 99 percent of the flippered patients recover fully.

Another environmental problem can hammer thousands of turtles at once: cold stunning. Strong Texas cold fronts can chill shallow waters in a hurry. Sea turtles rely on the environment for warmth, so plunges in temperature can send the animals into a kind of shock. Without treatment, they can die.

The winter of 2017–2018 was especially nasty, with observers counting more than 3,600 afflicted turtles, almost all of them greens. "Last winter was the largest cold-stunning event recorded in the United States since the stranding network was established in the 1980s," says Shaver.

"A cold stun happens when the water temperature drops below about 50 degrees Fahrenheit," she adds. "It's more a bay phenomenon in Texas, which makes it very challenging. It's mainly the green turtles, which like to hang out in the Laguna Madre, which is especially shallow. If

SHUTTERSTOCK

it's a mild fall, then the turtles don't make any effort to leave the bays. When a strong north wind blows in, it traps the turtles, and they can't get to the Gulf."

The increase in the green turtle populations has exacerbated the problem, Marshall says. And with a changing climate, "we can expect the problem to get worse," he says.

The climate may be causing another big temperature-related problem, but in the opposite direction: too much heat. Warming beaches can kill sea turtle embryos inside the nest. Most interestingly, though, warmth changes the ratio of female to male hatchlings. On some beaches in other parts of the world, in fact, many nesting seasons now produce almost exclusively female hatchlings.

Unlike humans and many other creatures whose genetics determine their sex, the incubation temperature of the egg determines the sex of a sea turtle. "We have a saying: Hot chicks, cool dudes," says Jeanette Wyneken, a professor of biological sciences and marine laboratory director at Florida Atlantic University.

A study released in 2018 found that 99 percent of the hatchlings in one group of green turtles on Australia's Great Barrier Reef, where sand temperatures had climbed to about 85 degrees, were female. "Combining our results with temperature data shows that the...green turtle rookeries have been producing primarily females for more than two decades and that the complete feminization of this population is possible in the near future," the researchers reported.

Wyneken finds similar results on the beaches around Boca Raton, Fla., where she and her team have studied the hatchings of loggerhead turtles since 2002. Beach temperatures have climbed during that period, reaching record levels from 2015 to 2017. As the temperature climbed, so did the proportion of females: from about 67 percent during the first year of observations to almost 100 percent today. And during the hottest years, "there was a much-decreased hatching success," she says. "A larger percentage of the eggs didn't hatch, and of those that did, there was a higher level of developmental problems."

No one is quite sure just how much of a problem the high percentage of female turtles poses, though, because no one is sure what a normal male-female ratio might be. And since male sea turtles aren't monogamous, they might find more mates among the females, perhaps offsetting some of the problem, at least temporarily.

A 2015 study estimated that, in 2010 alone, between 5.3 million and 14 million tons of plastic trash washed into the oceans worldwide. The volume has continued rising since then, most experts say.

SHUTTERSTOCK

"The challenge is that it takes 20 to 30 years for some sea turtles to reach maturity," Wyneken says. "So we won't feel the impacts of what we're seeing now for another decade or more."

For now, moving sea turtle nests on the Texas coast into incubation facilities allows for temperature control. Wetting or shading nests has been used to keep temperatures down in nests kept on beaches, including at Rancho Nuevo, Mexico, the primary Kemp's ridley nesting site. Incubation facilities and protected corrals higher on the beach also protect nests from inundation by rising seas.

But such efforts treat only the symptoms of climate change; addressing the problem ultimately means reducing greenhouse gas emissions. There's also no guarantee that conservation efforts can handle increasing turtle populations in the years ahead — or even shrinking populations — without enough funding for the task. Texas sea turtles could lose existing protections even as the effects of climate change worsen.

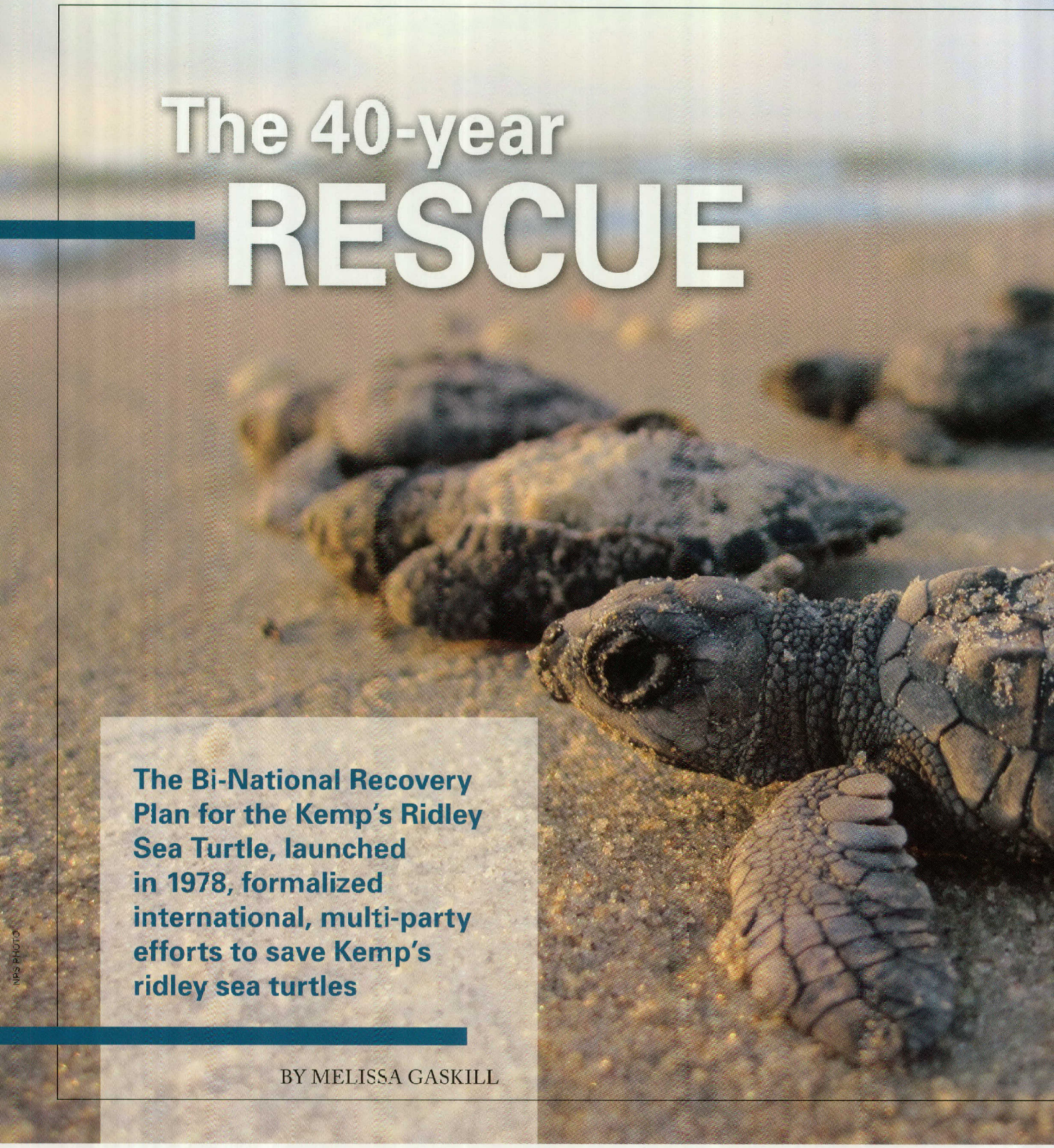
In the end, though, some experts say the greatest challenges to sea turtles aren't from fishing lines, boats or even a warming climate, but from a lack of knowledge, funding, and the political and popular will to protect these creatures.

"There are many different threats to different species of sea turtles, throughout their lifespan and throughout their range," says Donna Shaver, Ph.D., chief of the National Park Service's Division of Sea Turtle Science and Recovery at Padre Island National Seashore.

"The biggest challenge is all the unanswered questions," says Wyneken. "We need more research to know the basic biology of sea turtles. We need to step up to the plate and answer those questions so we can know how much good we're doing, and develop appropriate conservation management skills."

"I try to be optimistic," says Marshall. "These are really fascinating and robust animals. They have a really amazing ability to survive. We need the proper political environment and the proper advocacy groups and scientists working together. The sea turtle will be doing fine if we just keep at it."

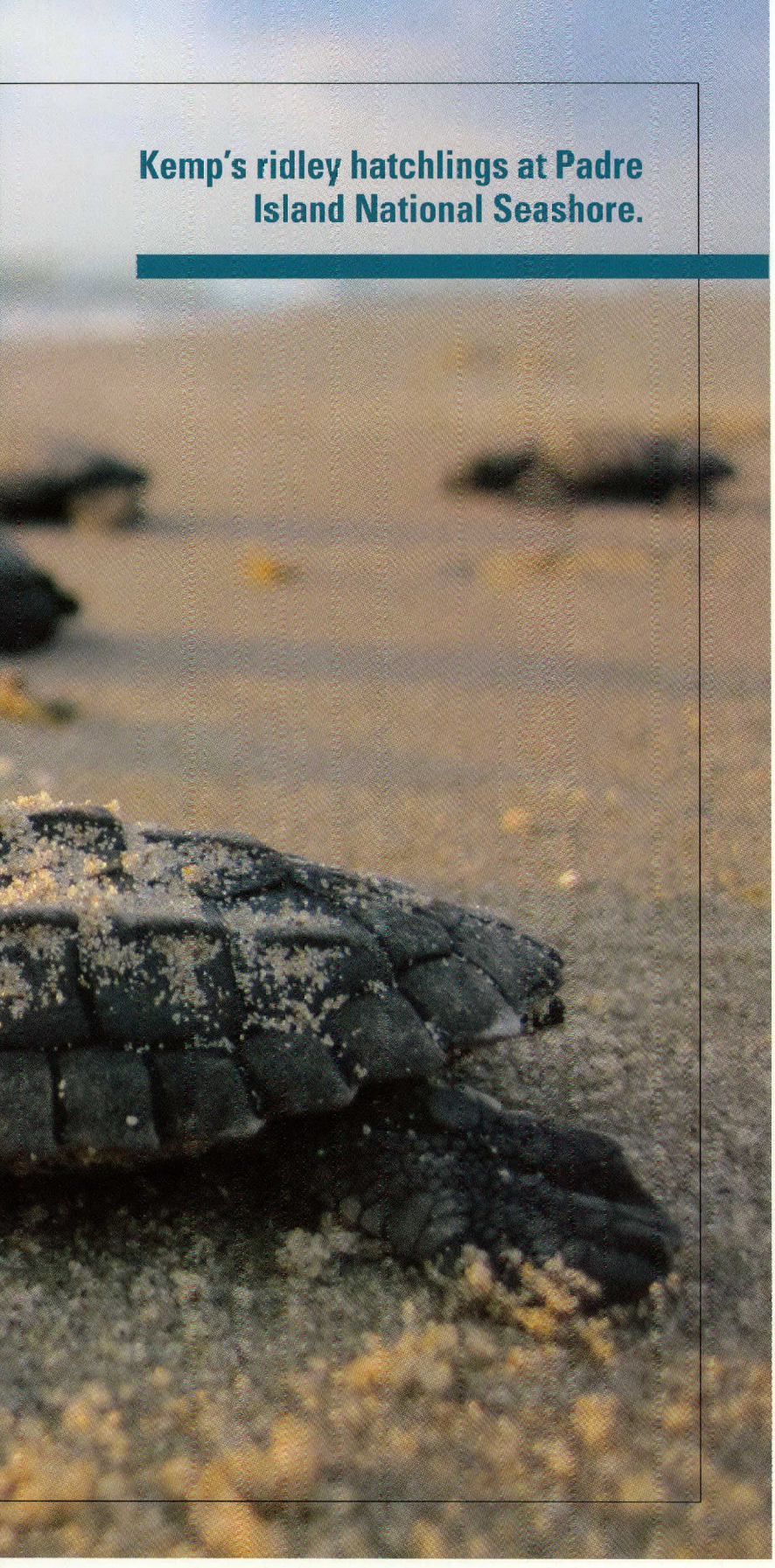
The 40-year RESCUE



The Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle, launched in 1978, formalized international, multi-party efforts to save Kemp's ridley sea turtles

BY MELISSA GASKILL

In spring of 1972, Pat Burchfield tramped through dense tropical forest near the Gulf coast in northeast Mexico, collecting snakes for the Gladys Porter Zoo in Brownsville, where he served as curator. When his guide noticed two men on a nearby beach, Burchfield hiked out to talk to them. He met Rene Marquez, a researcher at Mexico's Instituto Nacional de Pesca (INP), and Peter Pritchard, a sea turtle biologist from Florida. They were protecting Kemp's ridley sea turtle nests. Marquez and a team of biologists first visited the beach in 1967 at the behest of the Mexican government to survey the ridley population and establish a conservation effort.



Kemp's ridley hatchlings at Padre Island National Seashore.

Their chance encounter on that remote beach 200 miles south of the U.S.-Mexico border eventually led to the Brownsville zoo joining efforts to protect Mexico's nesting sea turtles and was a first step toward a binational project to reestablish nesting in Texas. Those efforts have achieved amazing progress in the quest to save the world's smallest sea turtle. (An adult Kemp's ridley is about 2 feet long and 100 pounds. In contrast, the leatherback — the largest sea turtle — can be 6 feet long and weigh up to a ton.)

The species was first named in 1880 by Samuel Garman, a herpetologist at the Harvard Museum of Comparative Zoology. Garman received descriptions and preserved specimens of the marine reptile from Richard Kemp, a businessman and amateur naturalist in Key West, Fla. Where this species nested remained a mystery until the 1961 meeting of the American Society of Ichthyologists and Herpetologists, when attendees watched a home movie made in June 1947 by Mexican rancher and businessman Andres Herrera. It showed a mass nesting of 40,000 Kemp's ridleys on a beach near the tiny town of Rancho Nuevo in Tamaulipas, Mexico.

The species' limited range and single, primary nesting beach made it particularly vulnerable to two threats: collection of eggs and incidental capture in shrimp trawls. By 1966, the largest mass nesting included only 1,317 turtles, and the next year, the Mexican government posted guards to prevent taking of eggs and turtles at Rancho Nuevo. It also dispatched Marquez and his team. During the next 20 years, the team established camps in Tamaulipas at Barra Coma, La Pesca, Tepehuajes, Rancho Nuevo, Barra del Tordo, Playa Altimira and Playa Miramar to bring ridley eggs into protective corrals.

But numbers continued to decline.

Scientists from the United States and Mexico continued to study the problem. In 1974, Robert Whistler, chief naturalist at Padre Island National Seashore, and marine scientist Henry Hildebrand hatched the idea of re-establishing nesting at the Seashore. That led to a joint effort by the U.S. National Park Service, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Texas Parks and Wildlife Department, and Mexico's INP to enable nesting at the Seashore while continuing to protect nests and hatchlings at Rancho Nuevo.

The effort, known as the Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), included transporting hundreds of ridley eggs the size of ping-pong balls from Mexico to the Seashore beginning in 1978. Sea turtles imprint on the beach where they are born, and female turtles eventually return there to nest, says Donna Shaver, Ph.D., chief of the National Park Service's division of sea turtle science and recovery. Imprinting these turtles to Padre Island and creating a second nesting area would make the species less vulnerable.

For 10 years, from 1978 to 1988, biologists collected 22,507 ridley eggs at Rancho Nuevo, incubated them at the Seashore, and allowed the hatchlings to crawl into the surf. They recaptured thousands of hatchlings there and at Rancho Nuevo and kept them in captivity for 9 to 11 months at a National

NPS STAFF PADRE ISLAND NATIONAL SEASHORE, DIVISION OF SEA TURTLE SCIENCE AND RECOVERY

Donna Shaver of Padre Island National Seashore documenting a nesting Kemp's ridley sea turtle.

HECTOR CHENGE ALVAREZ. COURTESY OF GLADYS PORTER ZOO.

A female Kemp's ridley digging her nest on a beach near Rancho Nuevo, Mexico.

In 1974, Robert Whistler, chief naturalist at Padre Island National Seashore, and marine scientist Henry Hildebrand hatched the idea of re-establishing nesting at the Seashore.

Oceanic and Atmospheric Administration fisheries lab in Galveston, a process called headstarting. To identify these head-started turtles later, biologists marked them with a living tag, a plug of lighter undershell implanted in the darker upper shell.

And yet, the number of nests at Rancho Nuevo continued to fall, with only 720 nests recorded in 1985. Clearly, protecting the beaches and nests was not enough.

The National Marine Fisheries Service estimated that thousands of juvenile and adult sea turtles were drowning in shrimp trawls each year. Kemp's ridleys generally stay near the Gulf and Atlantic coasts, both prime shrimping grounds.

Solving the trawling problem also required a bi-national, multi-party effort. "More than 20 years ago, the shrimping industry asked how they could help, and they've been helping ever since," says Burchfield, who became director of the Brownsville zoo in 2007. "Here was an industry listed as complicit in the endangered status of the turtle, helping to turn it around."

Turtle Excluder Devices have reduced sea turtle deaths in shrimp nets by as much as 97%

This effort led to development of Turtle Excluder Devices (TEDs), which use a grid to steer turtles toward an opening in the top of a trawl net while still allowing for capture of the much smaller shrimp. Use of TEDs became mandatory in U.S. Gulf of Mexico waters in 1990, and federal law now requires TEDs on most shrimp trawlers operating in U.S. Gulf and south Atlantic waters.

Thanks to continual modifications and improvement to the devices and an intensive, ongoing educational effort by Texas Sea Grant and others (see conservation success story for more details), TEDs have reduced sea turtle deaths in shrimp nets by as much as 97 percent.

Meanwhile, efforts to protect nesting sites continued. In 1986, Shaver began patrolling stretches of the Seashore every day during nesting season, searching for a head-started sea turtle returning to lay eggs. Finally, in 1996, one showed up.

HECTOR CHENGE ALVAREZ. COURTESY OF GLADYS PORTER ZOO.

A Kemp's ridley sea turtle arribada on a beach near Rancho Nuevo, Mexico.

By 2005, daily patrols covered the entire Texas shoreline for at least part of the nesting season. Today, Seashore staff and volunteers patrol North Padre Island daily from mid-April to mid-July and relocate eggs to protected incubation facilities.

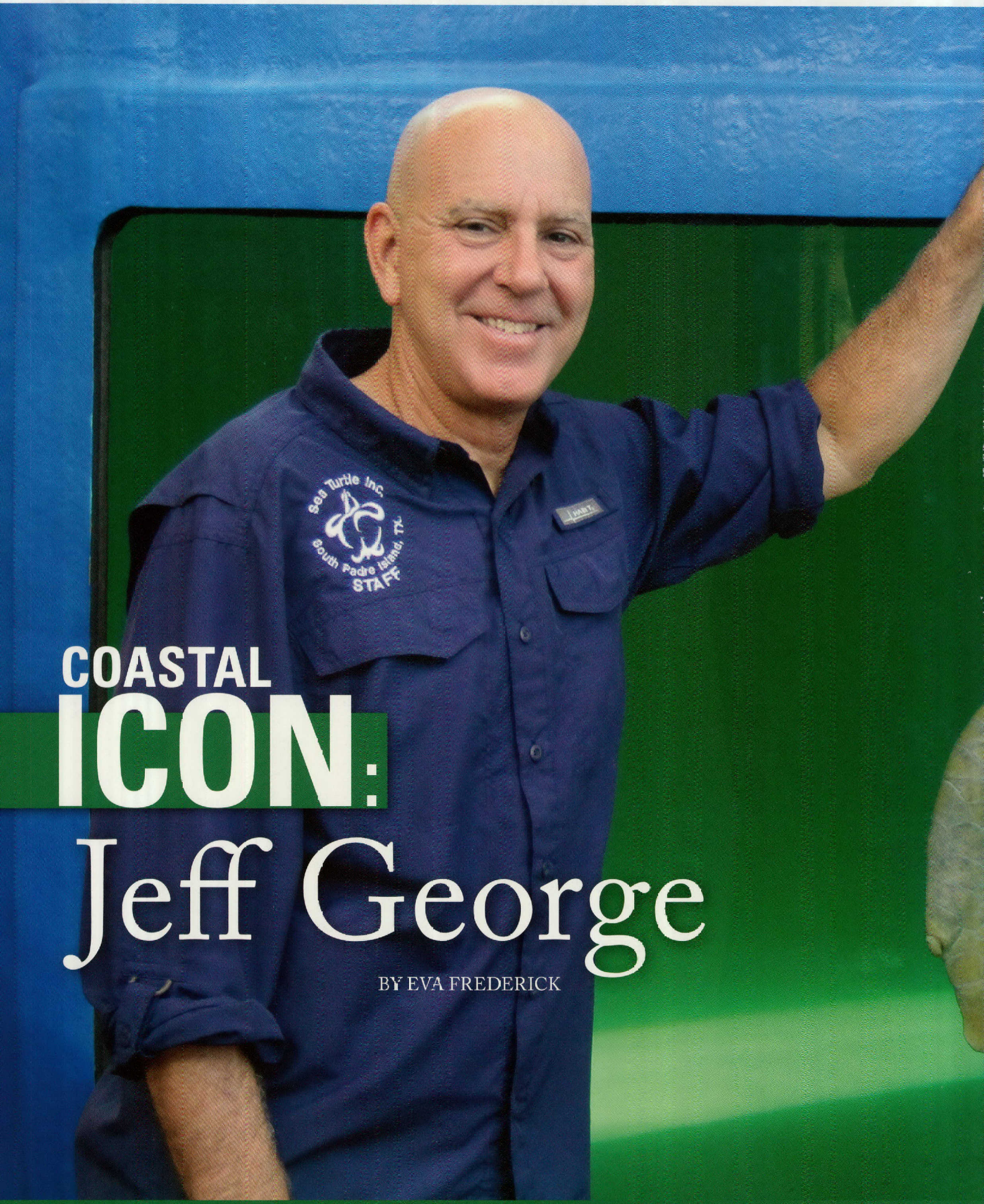
Sea Turtle Inc. began leading daily patrols of Boca Chica Beach in 1999 and on South Padre Island beginning in 2000. Patrols now also include Matagorda Island, Mustang Island, Galveston Island and Bolivar Peninsula. Initially, eggs from all nests in Texas were incubated at the Seashore, but since 2003, eggs from South Padre Island and Boca Chica Beach have been incubated in corrals on South Padre Island.

This intensive effort paid off. From the mid-1990s until 2010, the number of ridley nests increased exponentially each year, and the future of the species looked bright. Numbers declined for a few years before once again swinging upward. In 2017, biologists documented approximately 27,000 nests: 353 in Texas, 24,586 in Tamaulipas, and 2,000 in Veracruz, Mexico.

That year, the Seashore released more than 20,000 hatchlings. Thousands of people come to see those hatchling releases, both at the Seashore and on South Padre Island.

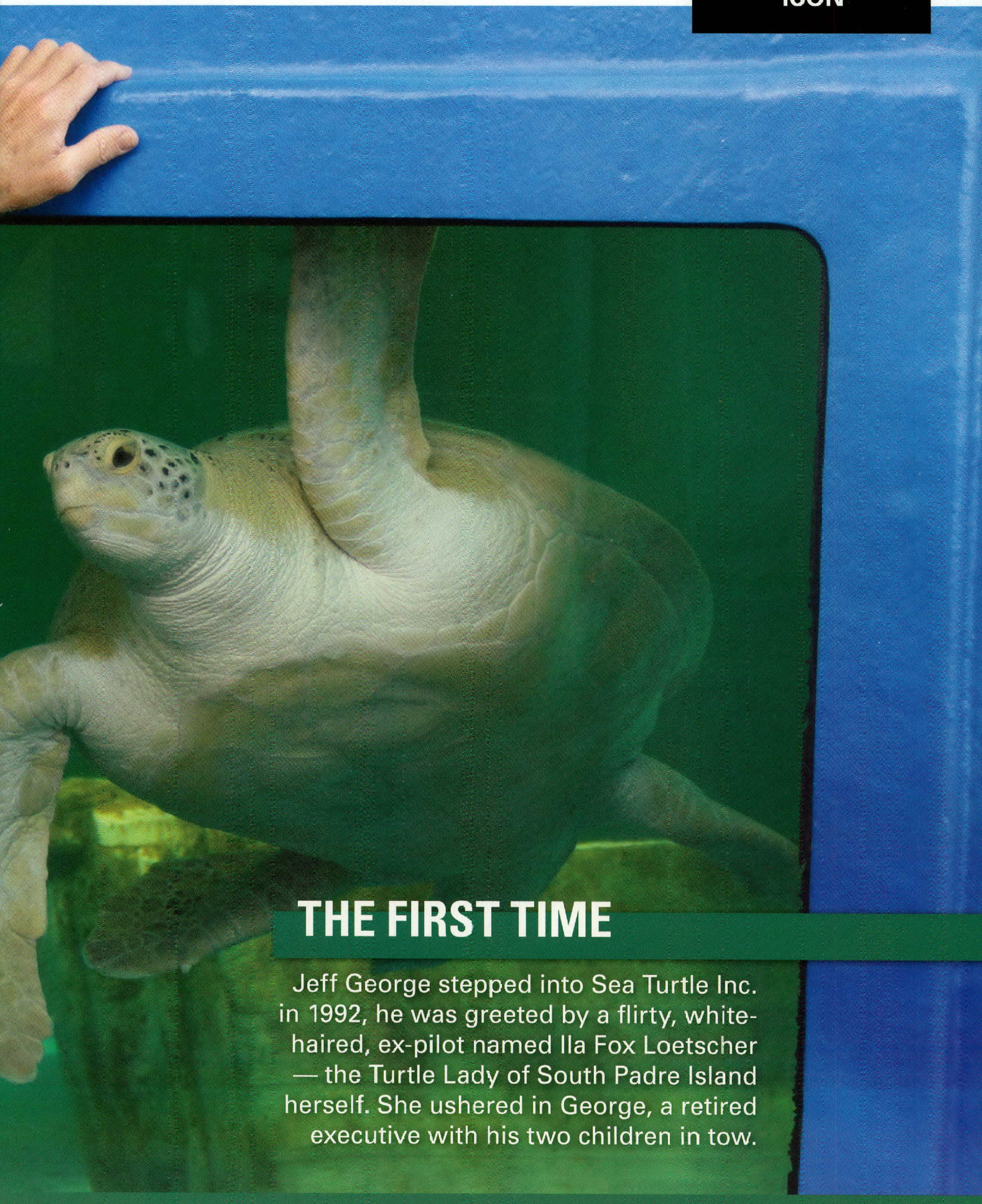
To remove the species from the federal Endangered Species list requires six years of an average of at least 40,000 female turtles nesting per season and enough hatchlings each year to maintain that population. Those who prepared the Kemp's ridley recovery plan projected that goal could be attained by 2024. But nowhere near 40,000 female ridleys nested in 2018 — the first of the required six years — so that goal now looks unattainable.

Still, 40 years of official cooperation from multiple partners saved the Kemp's ridley from almost certain extinction, and this rare sea turtle continues on the road to recovery. That's cause for celebration.



COASTAL ICON: Jeff George

BY EVA FREDERICK



THE FIRST TIME

Jeff George stepped into Sea Turtle Inc. in 1992, he was greeted by a flirty, white-haired, ex-pilot named Ila Fox Loetscher — the Turtle Lady of South Padre Island herself. She ushered in George, a retired executive with his two children in tow.

EVA FREDERICK.

Jeff George with a photo of Ila Fox Loetscher.

"It's in an old house," he says. "You go outside, and there are five little concrete tanks out there, basically 4 feet by 8 feet and only about 3 feet deep. And then there are two steps and a little stage, and this lady comes out and puts costumes on turtles and talks about the Kemp's ridley, an endangered species, for two hours a week. And now we're here."

That "here" is Sea Turtle Inc's (STI) multimillion-dollar facility across from the beach, where George now serves as executive director. His office sits just off a 30,000-square-foot education center, part of a $6 million renovation project unveiled in February 2018. In its spacious gallery, children measure themselves against life-sized turtle cutouts on the wall, and a walk-through exhibit offers a sea turtle's view of the buildup of trash in the ocean.

Out the back door, rehabilitated sea turtles — greens, Kemp's ridleys, loggerheads and more — swim in huge tanks with windows, the better for visitors to see their occupants. Across a walkway over a pond are more turtles: fish-hooked turtles, shark-bitten turtles, baby turtles and healthy turtles about to be released.

George quickly says this exponential growth from backyard hobby to multimillion-dollar rehabilitation center and tourist hotspot isn't entirely his doing. Yet his passion — and the enthusiasm he cultivates and inspires in others — is the lifeblood of an organization that has made an impressive mark on the Texas coast.

A fit, 60-something with smile lines around his eyes, George grew up landlocked in Pittsburgh, Pa., but was always fascinated by the ocean.

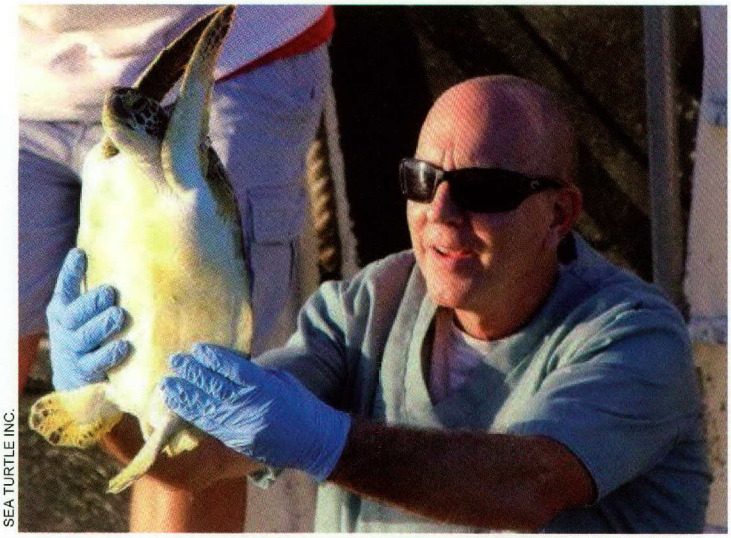
"When someone asked us what we wanted to be, other kids would say, 'I want to be a firefighter.' Well, I wanted to be an oceanographer," he says. "I didn't really understand what an oceanographer did or what a marine biologist was, but I always had that interest in the ocean."

At the University of Pittsburgh, George put his oceanography dreams behind him and studied mathematics. He loved the clean calculations and the idea of math as another language, and considered becoming an actuary when he graduated.

His first job out of college was with the U.S. Census Bureau

Jeff George

continued volunteering at Sea Turtle Inc. for eight years, gradually taking on more and more responsibilities. When founder Ila Fox Loetscher died in January 2000 at the age of 95, STI's board chose George as the obvious choice for the organization's executive director.



SEA TURTLE INC.

Jeff George releasing a cold-stunned sea turtle that recovered at STI.

— a challenging but low-paying position. By this time, he had married and started a family, so he eventually took a higher-salaried job at a nearby steel manufacturing plant.

His academic background and open-mindedness about technology provided an edge in the industry, and George moved up fast. By 1990, the mid-level executive had a wife, three children, a big house and a BMW. Then disaster struck.

That winter was frigid in Pittsburgh, and the dangerous weather caused a car crash that killed George's youngest son, two-year-old Noah Zbozny George. For the Georges, it was a wake-up call that life is short and precious. After a year of mourning and discussion, the family packed up and moved to an extreme opposite of western Pennsylvania: the Texas coast.

In South Padre, the family order shifted. George's then-wife, Denise Zbozny, a registered nurse, began working more, and he took on the role of homeschooling their two children. The curriculum required volunteer hours, and George scouted the area for organizations that could benefit from the help of two young children and their father. Of course, the volunteer work also had to support the school curriculum.

"When we looked at volunteer opportunities, Sea Turtle Inc. was right down the street, and it was pretty cool," he says. "It was two mornings a week, and it fit our homeschooling schedule — it was just coincidental."

From his perspective, though, working with the turtles turned out to be the perfect project. "Sea Turtle Inc. had very few volunteers at the time, and people were standing around the tanks asking questions like, 'What kind of turtle is that?' 'What does it eat?' 'How long does it live?' " he says. "As a parent of homeschoolers, I'm thinking, okay, here are research opportunities for my kids."

He and his son Eliot, then eight, and daughter Sarah, then six, began showing up and helping out at the gift shop or with routine tasks. While his children stuck to the required hours, George began devoting more and more of his time to the turtles. Soon, he was spending 40 hours or more each week at STI. Sarah George remembers one Thanksgiving when her father's commitment to the turtles became evident.

"He got a call that all these turtles were freezing and washing up on shore, and I remember my dad going out and helping get all the turtles in, even though it was Thanksgiving," she says. "That's how dedicated he is."

George continued volunteering for eight years, gradually taking on more and more responsibilities. When Loetscher died in January 2000 at the age of 95, STI's board chose George as the obvious choice for the organization's executive director.

Now, 18 years later, George has hired countless staff and interns, helped move Sea Turtle Inc. into a new facility not once but twice, and stays on call to move turtle nests, supervise hatchling releases, and help injured turtles.

"If somebody rings the bell that there's a turtle in trouble, Jeff responds no matter how busy he is, no matter what he is doing," says longtime friend David Cohen. "That is really the heart and soul of why he works so hard being a manager. He doesn't love being a manager, but he loves the sea turtles, and it is so obvious."

Cohen and George met more than 20 years ago when Cohen made an hour-long documentary on Sea Turtle Inc. After spending months capturing footage of George and the STI team, Cohen finished the documentary and went back to his life.

"I went through a winter [in South Padre] and I only saw Jeff once or twice, kind of casually, and I said, 'This is not okay. I like this person too much.' " Cohen says. He and George began meeting weekly, and now their once-a-week breakfasts are a ritual neither likes to miss.

The friends even worked together to prepare the vows and conduct the wedding ceremony when Cohen's son got married. George had taken an online course to become a wedding officiant to help a friend who owned a wedding venue, and found that many couples liked the idea of someone who worked with sea turtles performing their marriage on the beach.

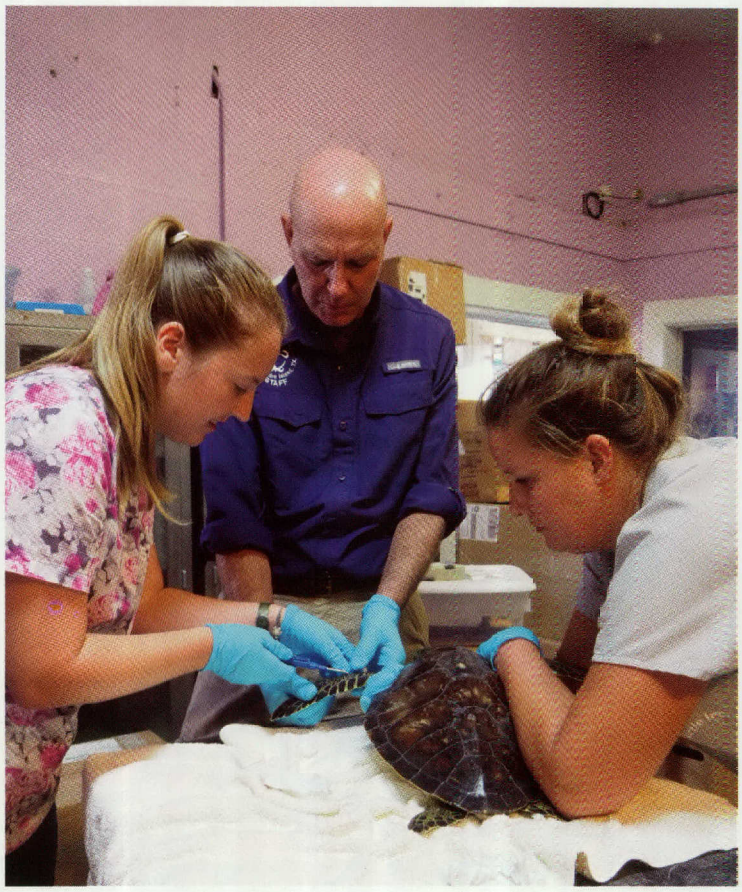
"Jeff is so smart and so sensitive to human beings and the human condition," Cohen says. "It is just amazing how many hats he can wear so effortlessly, and the number of things that are in the air at Sea Turtle Inc. at all times."

Talk to people at STI and they all make the same observations about George: his skill at business and communication, and his deep love for the turtles as well as for the people who help them.

Mary Laddis, a longtime volunteer and board member, started at STI shortly after George did. "The early days were a lot of fun," she says. "We didn't have an office or anything. We conducted business out of my guest bedroom."

It was George's foresight in starting education and internship programs, Laddis says, that helped propel STI to its current status as a tourist destination and world conservation force. "He almost single-handedly made Sea Turtle Inc. the success it is. It's been a joy working with him."

George credits the success to the team he hired.



EVA FREDERICK.

George in the STI rehab facility with 2018 intern Abby Crowder, (left) and aquarist Bailey Lucas (right).

"I think passion is what drives all of us," he says. "We don't make a lot of money. I can't pay our aquarist what she is worth. I can't pay our vet tech what she is worth. I can't pay our marketing person or our gift shop person what they're worth. But it is a cool job and they love it and they are passionate about it."

George notes that the outcome of this passion manifests among the public in small ways that add up over time.

"Are people going to make major changes in their life? Probably not," he says. "But are they going to buy a t-shirt? Yeah. Are they going to buy a membership? Yeah. Are they going to donate $1.5 million? Maybe."

Sea Turtle Inc. hires eight interns a year, and it's not uncommon for interns from years past to drop in to say hello to old friends — and new turtles. Mariana and Chris Devlin met as interns at Sea Turtle Inc. in 2010, and four years later, George flew to Mexico City to attend their big, joyful wedding. "I literally danced the heels off my shoes," he recalls.

Mariana Devlin returned to STI as conservation coordinator in 2016. "Jeff is the kind of person who leads by example," she says. "If he asks you to do something, he is going to do it with you until the end. If you are gone by 10 at night, he is going to be there until 11."

Under George's hands-on leadership, STI flourished and now sustains itself on gift shop proceeds, memberships and donations. Most of its revenue — including the $6 million spent on the new education center — comes from tourism. Sea Turtle Inc. tops TripAdvisor's list of Top things to do in South Padre.

The organization is an independent nonprofit, and George refuses to partner with or take funding from the government or educational institutions. "That way there is no pecking order," he says. "We can do whatever we want as long as it supports our mission." Next on George's agenda is a total overhaul of the sea turtle rehabilitation center. He wants it to be world-class caliber, just like the new education building, and thinks that could become a reality in 2019.

George oversees all aspects of the operation, including the rehab center, where on one recent day he gently held a turtle named Verde while the veterinarian technician administered a cold laser treatment for a fish hook wound on its front flipper. In addition to rehabilitating injured turtles, Sea Turtle Inc. recently took responsibility for relocating sea turtle nests from public beaches on South Padre Island, a task previously performed by the federal government. STI employees dig up the nests, move them to safe spaces, and monitor the offspring for record keeping and scientific work. They release thousands of hatchlings each year, and each turtle, hatchling or rescue is treated with care.

STI also funds international sea turtle conservation projects, including work-

Under George's

hands-on leadership, STI flourished and now sustains itself on gift shop proceeds, memberships and donations. Most of its revenue — including $6 million spent on a new education center — comes from tourism. Sea Turtle Inc. tops TripAdvisor's list of top things to do in South Padre.

ing with conservationists in Tamaulipas, Mexico, to protect Kemp's ridley turtles, educating local children in Guyana about conservation of leatherback turtles, and protecting nesting sea turtles and their eggs in Michoacán, Mexico.

"The legacy that I want to leave is that I helped build Sea Turtle Inc. into a world-class center, but more importantly, I want to help international conservation," George says. "We do give money away, but we have a $6.5 million facility to pay for right now, so we are limited as to what we can do. Now imagine if we have a $1 million profit every year and no debt — how many projects could half a million dollars help? Dozens."

In George's dream for STI, he can call Earl Possardt, the U.S. Fish and Wildlife Service's international sea turtle coordinator, and offer to fund sea turtle projects worldwide.

"Wouldn't it be nice to call up Earl and say, 'Earl, I've got three-hundred-thousand dollars. Which 10 projects do you want me to fund?'" George says. "That's what drives me, making us world class for the benefit of sea turtles and the benefit of my community, but also being able to leave a legacy that Sea Turtle Inc. can help others outside of Texas and outside the United States."

It takes a certain kind of person to run a conservation nonprofit. Jeff George does not have a degree in marine biology and had never run his own business when he started volunteering for Sea Turtle Inc. He had never worked with sea turtles. But from the moment he stepped into Ila Fox Loetscher's house in South Padre Island, the future of Sea Turtle Inc. — and that of thousands of turtles — was changed forever for the better.

"The legacy that I want to leave is that I helped build Sea Turtle Inc. into a world-class center, but more importantly, I want to help international conservation," George says.

BY EMILY MOSKAL

Record-breaking cold-stun season

sends conservationists to the drawing board

NATIONAL PRK SERVICE PHOTO

Cold-stunned sea turtles kept in National Park Service offices during the January 2018 event.

The winter of 2017–2018 saw record-breaking numbers of seemingly lifeless, unresponsive turtles in near-shore waters and inlets of Texas — the largest cold-stun event recorded in the state and the second largest in the country.

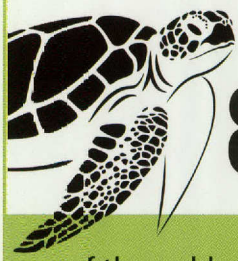
From November 2017 through the first week of March 2018, rehabilitation facilities admitted 3,668 hypothermic — or cold-stunned — green sea turtles that were rendered unable to swim or defend themselves by water temperatures below 50 degrees. These reptiles are ectothermic, meaning their body temperature depends in part on the environment. Without swift action after a cold stun, their bodies would shut down permanently.

In a bit of a twist, the increase in cold-stunned turtles may reflect a recent rise in green sea turtle numbers—in other words, a conservation success. While a cause for celebration, that increase in the population comes with a downside: more turtles needing rescue.

In addition to the sheer numbers, cold stuns present another challenge: requiring significant resources in a short amount of time. Falling temperatures quickly stun large numbers of sea turtles, and a rehab facility's ability to take them in depends on an abundance of resources available at a moment's notice.

"We have the situation where we've got a lot of work now that we didn't have, say, nine years ago," says Donna Shaver, Texas coordinator of the Sea Turtle Stranding and Salvage Network. "And we're increasing capacity, learning how to search these areas more efficiently."

Rescuers at the Texas State Aquarium in Corpus Christi received their first wave of the 2017–2018 cold stuns in mid-December, and a second wave during the New Year's holiday.



84%

of the cold-stunned turtles were found alive last winter, up from the 2009–2010 cold-stun season, when rescuers were less prepared. That winter, only 36 percent of the 466 cold-stun turtles found were alive.

"I've done a lot in my career, and that was probably the most exhausting thing I've ever done. It was 20-hour days," says Jesse Gilbert, vice president and chief operating officer of the aquarium. "We would go until 2 or 3 some mornings and turn around and the next load would be in the rescue center at 7."

After two days and a couple of loads of a hundred or so turtles, the aquarium transitioned from using five dedicated staff for the operation to rotating in 40 to 45 support staff. The Aquarium held about 1,100 turtles at the peak of the cold-stun season, taking them from the Amos Rehabilitation Keep (ARK) in Port Aransas, which had yet to recover from Hurricane Harvey before the first cold-stun event hit. Sea Turtle Inc. on South Padre Island turned its new education facility into an overflow rescue center, taking in nearly 300 cold-stunned green sea turtles.

NATIONAL PARK SERVICE PHOTO

Cold-stunned green sea turtle found on the Texas coast in January 2018.

From November 2017 through the first week of March 2018, rehabilitation facilities admitted 3,668 hypothermic — or cold-stunned — green sea turtles.

NATIONAL PARK SERVICE PHOTO

NATIONAL PARK SERVICE PHOTO

Cameron "Mac" Purvin (left) and Donna Shaver (above) with the National Park Service's Division of Sea Turtle Science and Recovery release sea turtles that had been cold stunned in winter 2018.

STRANDED SEA TURTLES

8	230
1980	2009

The stranding network has recorded cold-stun data since 1980, when only eight green sea turtles were found stranded in Texas. The number hit 230 in 2009, and "then it really took off," says Donna Shaver, Texas coordinator of the Sea Turtle Stranding and Salvage Network.

"It's a relatively recent phenomenon," Shaver says. The stranding network has recorded cold-stun data since 1980, when only eight green sea turtles were found stranded in Texas. The number hit 230 in 2009, and "then it really took off," says Shaver.

While other species of sea turtles forage in deeper water off the Texas Gulf coast during winter, the vegetarian greens stay in shallow bays to feed on lush sea grasses. They must navigate limited outlets between barrier islands to the open Gulf of Mexico. As Shaver puts it, "They take a risk."

"When you have all of these turtles washing up and in peril, and you've already lifted 200 turtles, 10 pounds now feels like 150 pounds," says Alicia Walker, program coordinator of the ARK. Knowing that each life saved is critical for an already threatened turtle population inspires rescue workers to keep going, she says. "If I don't wake up, if I don't go, if I don't try my best, these turtles are going to die."

> Cold-stunned turtles are completely vulnerable. Their only defense is to bite or swat their flippers, says Nina Nahvi, veterinarian technician at Sea Turtle Inc., and once cold-stunned, the turtles can't move their flippers.

Cold-stunned turtles are completely vulnerable. Their only defense is to bite or swat their flippers, says Nina Nahvi, veterinarian technician at Sea Turtle Inc., and once cold-stunned, the turtles can't move their flippers.

The quicker the public reports a cold-stunned turtle and rescuers get to it, the better the outcome. For rescued turtles with no other injuries, the prognosis is usually good. Eighty-four percent of the cold-stunned turtles were found alive last winter, up from the 2009–2010 cold-stun season, when rescuers were less prepared. That winter, only 36 percent of the 466 cold-stun turtles found were alive.

When predictions call for temperatures below 50 degrees, an alert goes out to local rescue networks. Dispatchers head for areas where turtles are likely to be affected. Once at a rehab center, sea turtles are given fluids and glucose to restore their energy as they begin to warm up to room temperature. They also are weighed, measured, tagged and numbered. Rescuers move sea turtles to water tanks once they become responsive, and release them back into the wild when outside temperatures rise.

"Releasing animals back into the wild is one of the greatest feelings in the world," says Walker of the ARK. "They swim away, and you know that you've won. They're back in the wild where they belong."

Unlike sea turtles hit by boats, entangled in fishing line or nets, or that have ingested plastic bags, more than 90 percent of cold-stunned sea turtles in Texas are released after about a week.

After several particularly busy cold-stun years in a row, Texas sea turtle rescuers and rehabbers stepped up efforts to be prepared.

Sea Turtle Inc.'s new permanent resident and educational facility will continue to serve as overflow space during a cold-stun event. It offers the capability to perform x-rays and major surgeries on site. In addition, Sea Turtle Inc. offered a series of cold-stun turtle rescue trainings for the public before last winter's cold-stun season.

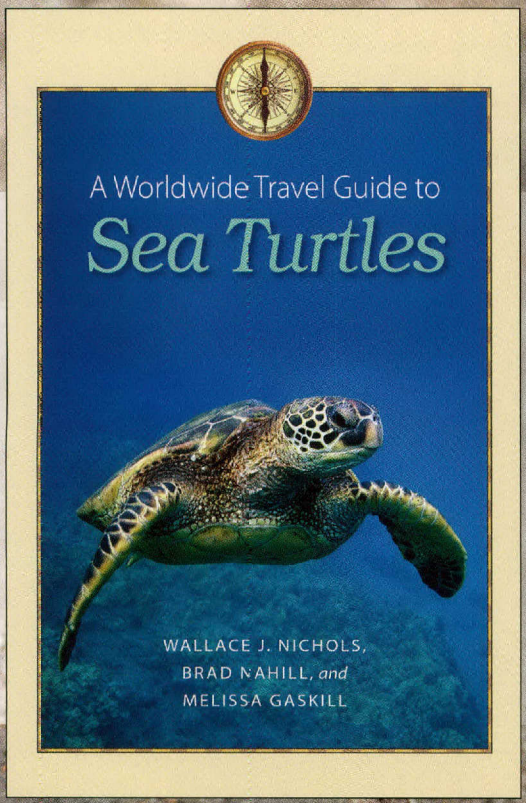
The aquarium in Corpus Christi shifted the focus of its Wildlife Rescue Center to accommodate 40 long-term patients and can provide temporary refuge for up to 1,000 cold-stun turtles. It has isolation tanks, cutting-edge surgical instruments, and different teams that specialize in veterinary record keeping and other rehab services.

The ARK, while still recovering from Hurricane Harvey, added a few tanks, including some for water birds that could be used for turtles in a pinch. The facility now can comfortably hold 400 short-term animal patients and about 75 long-term patients.

All the Texas turtle rescue facilities worked together to streamline the intake process and to focus rehabilitation on rapid recovery and release. That coordination helps ensure that facilities don't hit capacity and lowers the risk of possible disease transmission among turtles from overcrowding.

With these new measures, Texas conservationists hope to be ready for future cold-stunning events and to keep them from spelling disaster for the sea turtles.

Books of the Sea from Texas A&M University Press



A WORLDWIDE TRAVEL GUIDE TO SEA TURTLES

WALLACE J. NICHOLS, BRAD NAHILL, AND MELISSA GASKILL

A scientist, a conservationist, and a journalist come together to provide a guide to the places where people can view sea turtles and participate in authentic conservation projects. The guide covers five continents, including the South Pacific and Carribean, identifying parks, reserves, and research sites where volunteers can responsibly observe turtles in the wild, especially nesting beaches where people can see female sea turtles lay eggs and hatchlings make their harrowing journey from nest to sea.

240 pp. 31 color photos. 8 maps. Index. $25.00 flexbound

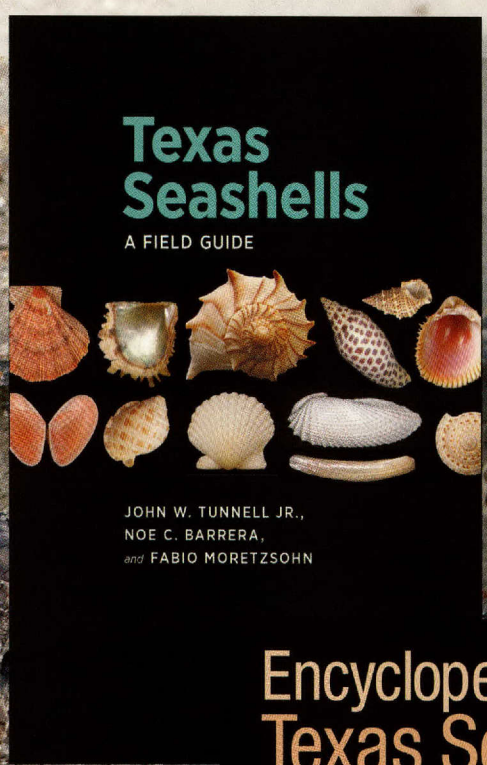
TEXAS SEASHELLS

A FIELD GUIDE

JOHN W. TUNNELL JR., NOE C. BARRERA, AND FABIO MORETZSOHN

This field guide covers three hundred of the better-known or more common seashells found on Texas coastlines, and anyone interested in identifying and collecting shells along Texas bays and Gulf coast beaches will find *Texas Seashells* an essential companion.

300 pp. 302 color photos. Table. Bib. Index. $25.00 flexbound



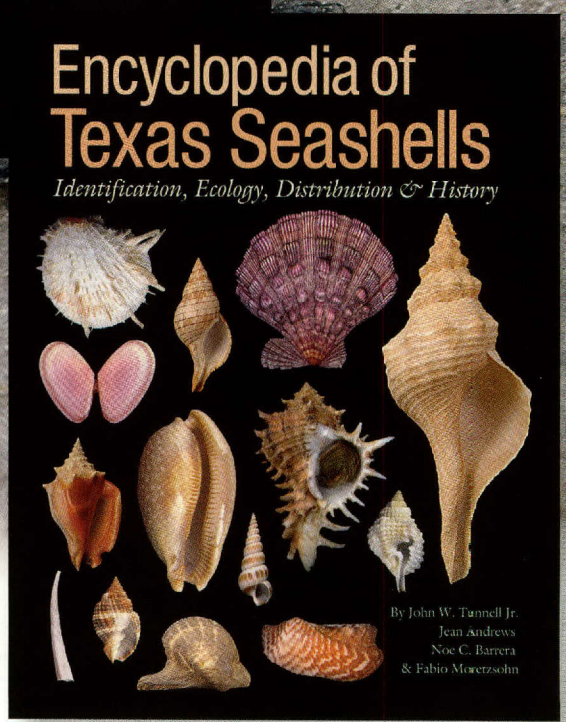
ENCYCLOPEDIA OF TEXAS SEASHELLS

IDENTIFICATION, ECOLOGY, DISTRIBUTION, AND HISTORY

JOHN W. TUNNELL JR., JEAN ANDREWS, NOE C BARRERA AND FABIO MORETZSOHN

This essentia reference book for every collector and researcher of American seashells is a complete sourcebook and up-to-date identification guide, covering an unprecedented nine hundred species of seashells and mollusks that reside in the Gulf of Mexico.

8½x11. 512 pp. 987 color, 12 b&w photos. 15 maps. 18 line art. 3 figs. 2 tables. Glossary. Bib. Index. 60.00 hardcover



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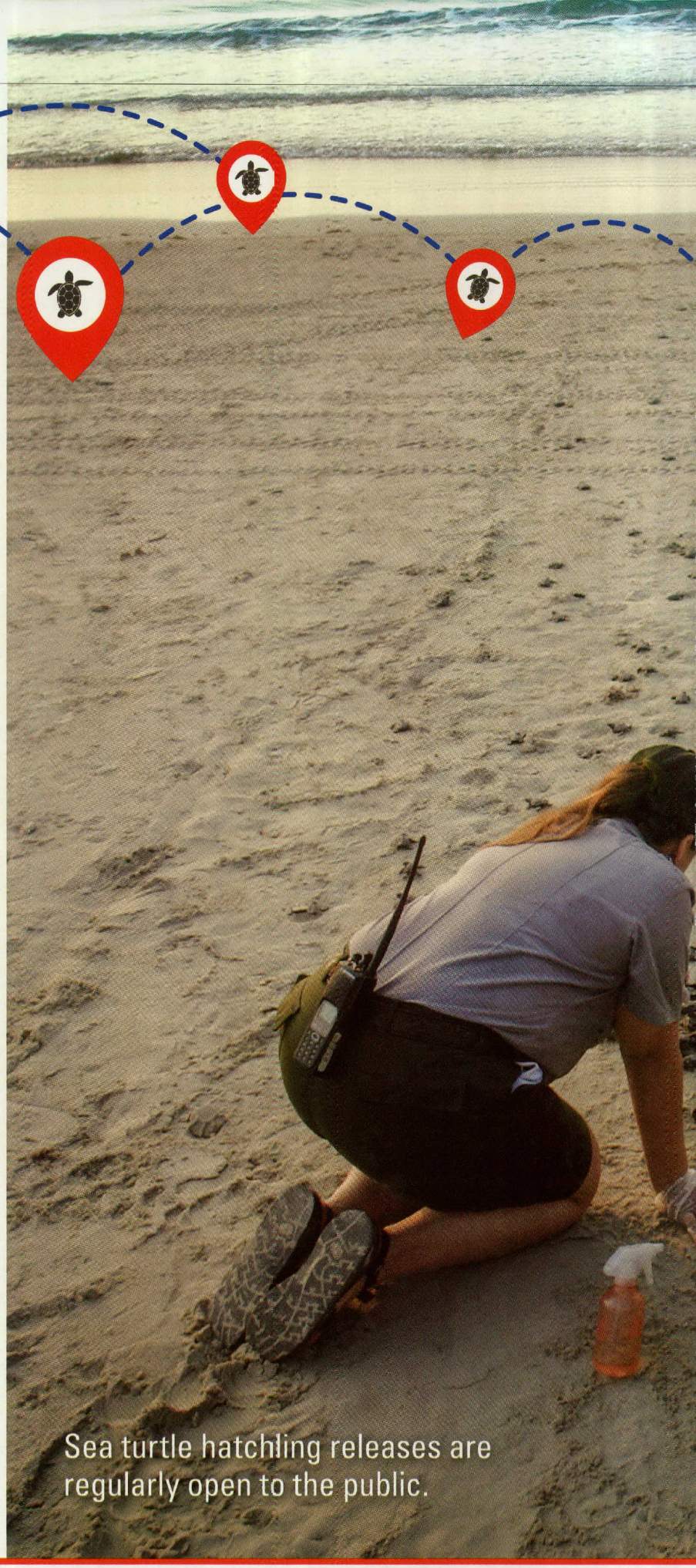
Six sea turtle species live in U.S. waters. The rich natural environment along the Texas coast provides habitat for five of them: Kemp's ridley, hawksbill, green, loggerhead and leatherback. Their presence provides a wealth of opportunities for people to learn about and interact with these marine reptiles.



Sea turtle hatchling releases are regularly open to the public.

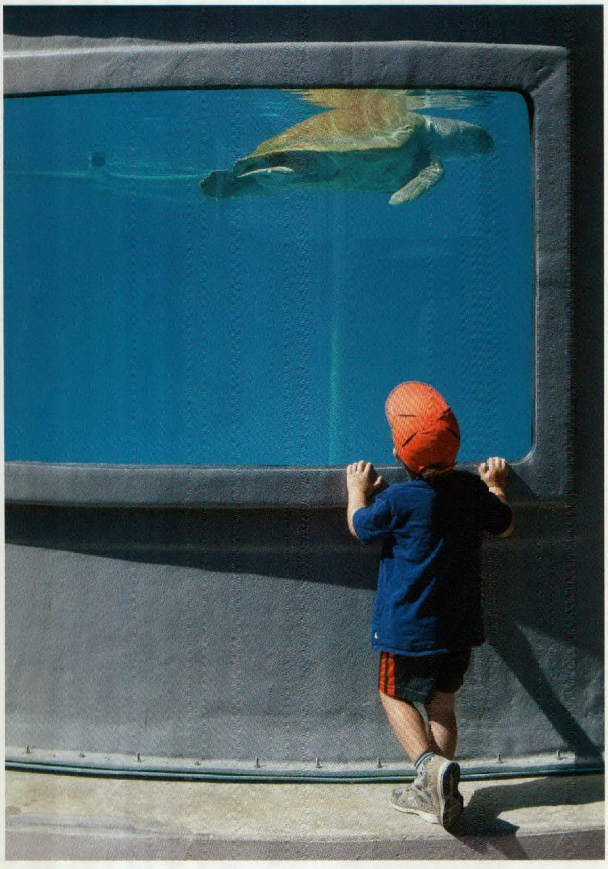
Sea turtle destinations

WHERE TO SEE SEA TURTLES

BY EVELYN MORENO

NATIONAL PARK SERVICE STAFF, PADRE ISLAND NATIONAL SEASHORE, DIVISION OF SEA TURTLE SCIENCE AND RECOVERY

NATIONAL PARK SERVICE STAFF, PADRE ISLAND NATIONAL SEASHORE, DIVISION OF SEA TURTLE SCIENCE AND RECOVERY



SOUTH PADRE ISLAND CONVENTION AND VISITORS BUREAU

A visitor and a resident at Sea Turtle Inc. in South Padre Island.

Though sea turtles spend most of their time in the water, female turtles come ashore to nest. Staff and volunteers of Sea Turtle Inc. on South Padre Island and the Padre Island National Seashore on North Padre Island patrol beaches for sea turtle nests and move eggs to fenced areas or incubation facilities. From June through August every year, both organizations hold public releases of hatchlings from these nests. Many who have attended a release say watching the tiny turtles make their way to the sea is a life-changing experience.

Sea Turtle Inc. also welcomes guests year-round to see sea turtles in its rehabilitation facility and learn about the animals' recovery process through educational presentations, tours of the facility and other activities. The organization also hosts public releases for rehabilitated sea turtles ready to return to the wild.

Despite an amazing comeback because of conservation efforts, covered in detail elsewhere in this issue, Kemp's ridley sea turtles remain critically endangered. To help raise awareness of their plight, fourth graders from Oppe Elementary School of Coastal Studies in Galveston wrote legislation in 2013 to name the Kemp's ridley the official sea turtle of Texas. The Texas Legislature approved the bill.

To continue to raise awareness, Galveston launched a public art project that placed almost 20 colorful statues of Kemp's ridleys around the island. Turtles About Town, a partnership between the nonprofit Turtle Island Restoration Network and Clay Cup Studios in Galveston, kicked off in early 2018 with an unveiling of the first statue outside Galveston City Hall. Local artists were commissioned to give each statue a unique personality. Maps of their locations are available from the network and Clay Cup.

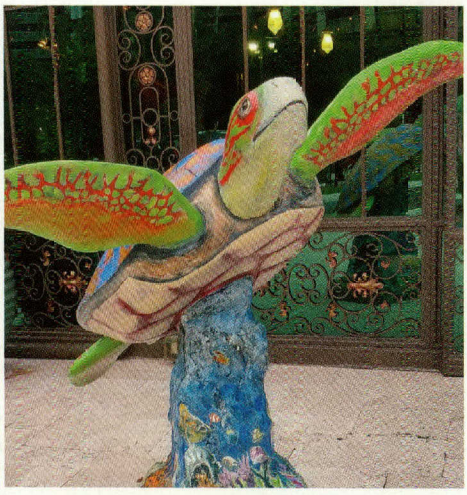
At the Texas State Aquarium in Corpus Christi, sea turtle species native to the Gulf of Mexico live

in a lagoon-like habitat known as Tortuga Cay. The aquarium holds daily "Turtle Tales" sessions during which guests can observe the turtles feeding on vegetables and learn about the importance of protecting these endangered animals.

Sea turtles also can be found inland in North Texas at the SeaLife Grapevine Aquarium's sea turtle hospital. The treatment facility includes an interactive exhibit that gives visitors a virtual experience of diagnosing a sea turtle and nursing it back to health at feeding and hydration stations. Sea turtles that cannot be released into the wild occupy display tanks, and viewing windows allow visitors to watch staff work in the hospital area.

People can spot sea turtles in their natural environment along the Texas Gulf coast as well. Year-round, green sea turtles come up for air and feed on algae around jetties such as those at Packery Channel on the southern end of Mustang Island and those in Port Aransas on its northern end and in Mustang Island State Park. Beachgoers may even find sea turtles swimming in the water alongside them.

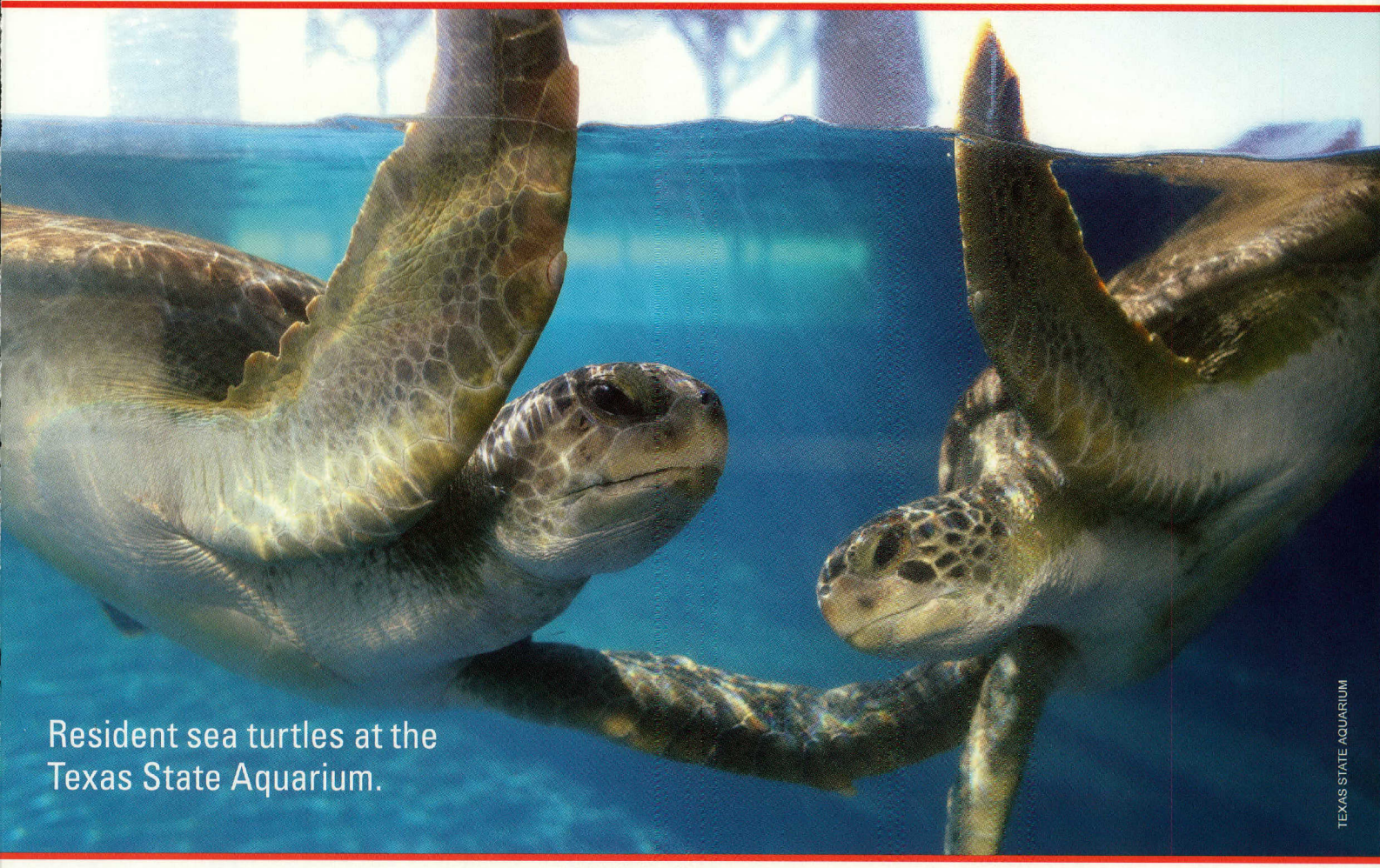
Sea turtles have lived along the Texas Gulf coast for far longer than humans. An encounter with these resilient creatures, in the wild or captivity, provides a reminder that humans have a responsibility to ensure their continued survival.



PATRICIA JAKOBI

ADRI RICHEY

The Turtles About Town project placed statues of sea turtles decorated by different artists in locations around Galveston. Top: This turtle in front of the Galveston Art League was painted by Leroy LeFlore. Bottom: This one at City Hall was painted by Gabriel Prusmack.



Resident sea turtles at the Texas State Aquarium.

TEXAS STATE AQUARIUM

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