



# Currents



## Satellite Tracking Kemp's Ridley Sea Turtles in the Gulf of Mexico

By Rosalie Rossi, Division of Sea Turtle Science and Recovery

KEMP'S RIDLEY (*Lepidochelys kempii*) is the most endangered sea turtle species in the world. Females nest mainly at Rancho Nuevo, Tamaulipas, Mexico; however, nests are also found in the U.S. with over half of those located at Padre Island National Seashore (PAIS). For more than three decades, the National Park Service at PAIS has participated in international recovery efforts for this species. Part of these efforts includes studying offshore water habitat use of the Kemp's ridley.

During the past 18 years, PAIS has been using satellite telemetry to understand migratory patterns and habitat use of adult Kemp's ridleys. From 1997-2014, 89 satellite transmitters were deployed on Kemp's ridleys found at PAIS after nesting. The majority of turtles migrated to the northern Gulf of Mexico, mainly off the coast of Louisiana in areas that were near the shore and in shallow water (Shaver et al. 2013). Adult female Kemp's ridleys migrate after nesting to foraging areas that provide food, specifically crabs (Shaver et al. 2013). Conversely, adult males captured and satellite tracked in waters near Rancho Nuevo remain close to the nesting beach year-round (Shaver et al. 2005). Several of the tracked females stopped at multiple foraging areas while traveling northward; however, most migrated directly to their final foraging site (Shaver et al. 2013). Many turtles exhibited foraging area fidelity, meaning they returned to the same areas in different years (Shaver et al. 2013).



A Kemp's ridley sea turtle outfitted with a satellite transmitter. NPS photo.

Satellite tracking research gives us an in-depth look into the movements of females during their seasonal nesting period and post-nesting migration. The waters off of Padre Island National Seashore are an important migration route for the population, as many females migrate northward after nesting in Mexico (Shaver and Rubio 2008). Knowledge of where Kemp's ridley foraging hotspots are located is important in determining where to direct further research and protection. Sea turtles face many threats to their marine environment including oil and gas exploration and development, offshore construction, and commercial fisheries (Shaver et al. 2013). Padre Island National Seashore will continue to research their habitats in order to better protect this species against threats.

To view maps of the tracking research conducted by Padre Island National Seashore visit: [www.seaturtle.org](http://www.seaturtle.org) under the "Padre Island National Seashore Kemp's Ridley Tracking 2014," "Rancho Nuevo, Mexico Kemp's Ridley Tracking 2014," and "Veracruz, Mexico Kemp's Ridley Tracking 2014" tracking programs.

#### Literature cited:

Shaver, D.J., B.A. Schroeder, R.A. Byles, P.M. Burchfield, J. Peña, R. Marquez, and H.J. Martinez. 2005. Movements and home ranges of adult male Kemp's ridley sea turtles (*Lepidochelys kempii*) in the Gulf of Mexico investigated by satellite telemetry. *Chelonian Conservation and Biology* 4(4):817-827.

Shaver, D.J. and C. Rubio. 2008. Post-nesting movement of wild and head-started Kemp's ridley sea turtles *Lepidochelys kempii* in the Gulf of Mexico. *Endangered Species Research* 4:43-55.

Shaver, D.J., K.M. Hart, I. Fujisaki, C. Rubio, A.R. Sartain, J. Peña, P.M. Burchfield, D.G. Gamez, and J. Ortiz. 2013. Foraging area fidelity for Kemp's ridleys in the Gulf of Mexico. *Ecology and Evolution* 3(7): 2002-2012.

### Padre Island National Seashore

#### OPERATING HOURS

Beaches - open year round

Campgrounds - open year round, no reservations

Bird Island Basin - open year round

Malaquite Visitor Center - open 9 am - 5 pm daily. Closed Dec. 25

Island Gift Shop - call 361-949-9368 for current hours

Worldwinds Windsurfing - call 361-949-7472 for current hours

#### CONTACT US

Mailing Address:  
P.O. Box 181300  
Corpus Christi, TX 78480

Physical Address:  
20420 Park Rd 22  
Corpus Christi, TX 78418

Park Information:  
(361)949-8069

Park Website:  
[www.nps.gov/pais](http://www.nps.gov/pais)

Weather & Beach Conditions:  
(361)949-8175

Sea Turtle Hatchling Hotline:  
(361)949-7163

Park Facebook:  
[facebook.com/nps.pais](https://facebook.com/nps.pais)

Sea Turtle Project Facebook:  
[facebook.com/nps.pais.seaturtles](https://facebook.com/nps.pais.seaturtles)



An aerial view of the Laguna Madre. NPS photo.

## Saltier than the Sea

By Lindsay Galland, Division of Interpretation and Education

PADRE ISLAND IS BORDERED on its west side by one of the world's saltiest coastal ecosystems. The Laguna Madre is one of five hypersaline coastal waterways in the world. Its salinity content can range from 1.5 to nearly 3 times that of the nearby Gulf of Mexico. Despite this, it is a crucial habitat for many species and a highly productive fishery. Human activities of yesterday and today have both helped and hindered this valuable ecosystem.

Covering more than six hundred square miles, or 384,000 acres, the Laguna Madre represents nearly 20% of all protected coastal waterways in Texas. Surrounded on both sides by large expanses of protected or minimally used lands, it is also among the most pristine of Texas coasts. Over 4,000 years ago, the Rio Grande brought substantial fresh water into the southern portion of the Laguna Madre, reducing its salinity. Today the once mighty Rio Grande, siphoned off at many points for human activities, is a mere trickle, and the Laguna Madre is without significant freshwater input. Rainfall in the area averages 29 inches a year, while evaporation averages about 62 inches a year; this imbalance results in super salty water as the water evaporates and the salt is left behind. During periods of severe drought the salinity can exceed 100 parts per thousand (ppt). The ocean averages about 35 ppt; brine water is anything over 80 ppt. However, a large thunderstorm can bring Laguna Madre salinity levels back down to a tolerable level; between 40-50 ppt is considered optimal.

In the 1940s the Laguna Madre was changed forever with the construction of the Gulf Intracoastal Waterway (GIWW). This deep, wide trench was dug down the entire length of the Laguna Madre, parallel to the coast, to enable barges to navigate up and down this otherwise shallow bay. Prior to construction of this channel, periodic flushings brought about by hurricanes and large storms were the primary mechanisms that reduced salinity levels in the Laguna Madre. But the GIWW permanently introduced lower saline ocean water into the hypersaline Laguna, allowing for year round growth of sea grasses. Today the Laguna Madre contains one tenth of the world's seagrass species and 79% of sea grass populations in Texas. With 61% of the bottom of the Laguna vegetated, these grasses make up the base of the system's food web. Not much eats the live grass aside from sea turtles and migrating ducks. But after the grass dies and begins to decompose, the food web explodes. Dead seagrasses are broken down by bacteria, fungi, and benthic invertebrates; these are eaten by larger invertebrates and fish, which are in turn eaten by larger fish, birds, and other predators. These provide food for even larger predators, including humans. Seagrasses not only provide food for the smallest of creatures, but also provide shelter and protection to fish fry and serve as an aquatic nursery.

The Laguna Madre is of incredible importance to the state's commercial fisheries, providing 40%-51% of the catch. About 70 species of fish rely on it for some portion of their life. Many are saline sensitive but move into the bay and feed on the wealth of larger invertebrates and smaller fish during periods of lower salinity. Because this requires tremendous osmoregulatory abilities, fish species that regularly depend on the Laguna do not compete against each other as much as they compete against the extreme environment.

However, human interaction changes the equation. The GIWW brings in less salty water, keeping salinity at levels a majority of species can tolerate; but the repeated dredging

required to maintain this channel that nature tries to fill back in also stirs up sediments and fine matter. The resulting turbid water prevents life-giving light from reaching seagrasses and can cause the death of seagrass beds. As boats move through the shallow Laguna, their propellers scar seagrass beds and their wakes erode and widen those scars. The wake from boats also erodes the banks of the Laguna Madre, which are composed of very fine sediments easily moved by wind and water. This eroded sediment drifts into the water and can stay suspended, further diminishing light penetration.

The bottom sediments or "spoil" dredged up during the creation and maintenance of the GIWW have been piled along the side and transformed into small islands, some of which have become vegetated. Nesting birds use these spoil islands during breeding season as they are close to large quantities of food and isolated from would-be predators. Migrating birds also use the islands as a rest stop during their long migrations or as a safe overnight spot. These islands, however, are temporary, slowly eroding back into the Laguna.

The shallow waters of the Laguna Madre are a unique and productive environment. Because of the extremes a large variety of animals are able to call the Laguna home, both residents and part-time visitors. From a topsy-turvy food web that starts with the decomposers comes a hugely productive and valuable fishery where human activities have had both a positive and negative impact on the ecosystem.



Red Knot. Photo by Chad Doolen.

## A Traveler of Epic Proportions

By Lindsay Galland and Jody Mays, Division of Interpretation and Education

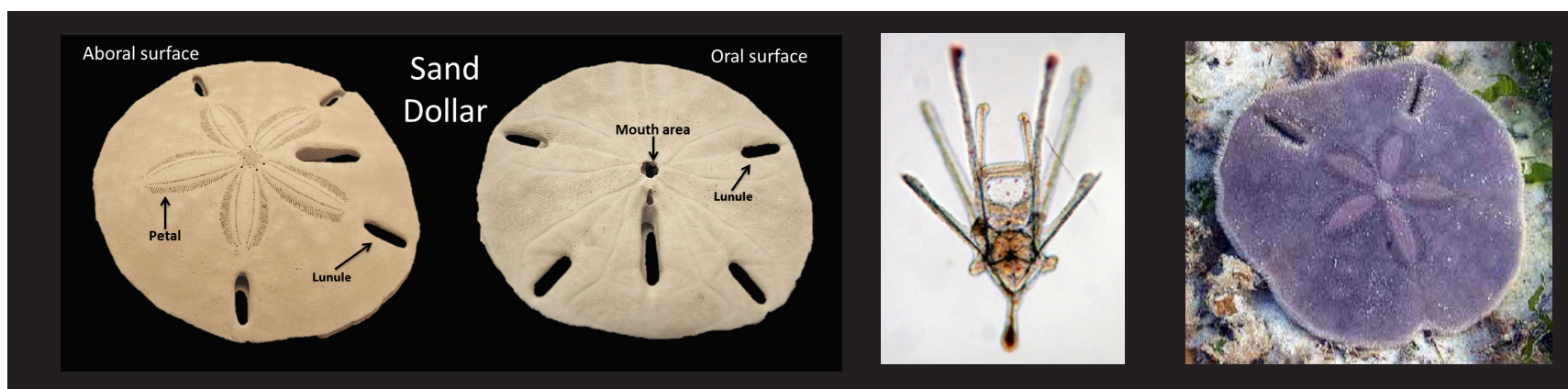
THE RED KNOT (*Calidris canutus*) may be small, but it is a traveler of epic proportions. Each year, this robin-sized shorebird makes an astonishing journey from South America to the edge of the Arctic Circle and back again, a distance of more than 9,000 miles each way. It is an amazing feat and one of the longest migrations of any bird in the world.

Red Knots spend the winter near the southern tip of South America, in places like Tierra del Fuego. There they stay warm and fatten up on tiny crustaceans found in the sand and surf at prime feeding grounds. They will need all that energy for their 9,000-mile trip. Just before spring arrives, they must head north to nesting grounds found near the edge of the Arctic Circle. It is a treacherous undertaking that some will not survive.

Segments of the journey require nonstop flying for days over open water, with nowhere to land or feed. As they travel, these exhausted birds depend on several important places en route where they can rest, find shelter, and refuel. One of these places is Padre Island. The island may be the first land these birds see after traversing the Gulf of Mexico, and it provides a critical place for them to land, rest, and find the food they will need to survive the rest of their journey. Those that make it to the nesting grounds will reproduce. After nesting season is over and the weather turns cold, these birds must make their way south again to survive. Young birds hatched just weeks earlier risk this dangerous trek for the first time, crossing thousands of miles to wintering grounds they have never seen.

One of these Red Knots, an individual banded in 1995 with band B95, has been spotted repeatedly over the years both in the Arctic Circle and in South America. Over its lifetime, this little bird, aptly named Moon Bird, has literally traveled the distance it would take to go from the earth to the moon and halfway back again. Its amazing story is the subject of a book entitled [Moon Bird: A Year on the Wind with the Great Survivor B95](#) by Phillip Hoose.

Sadly, Red Knot populations have plummeted in the years since Moon Bird was banded. Over 80% of the world's population is now gone. Both human actions and environmental factors have contributed to this collapse. As a result, the Red Knot has recently been listed as a federally threatened species. Researchers are banding more of these birds to learn how to prevent their extinction. You can help by reporting banded birds to [bandedbirds.org](#). Together we can keep this little world traveler going for many years to come.



Sand dollar anatomy. NPS photo. Urchin larva photo by Otto Larink, creative commons. Live sand dollar, creative commons.

## A True Lucky Dollar

By William “Buzz” Botts, Division of Interpretation and Education

IT WOULD BE DIFFICULT TO FIND any sea shell with as much potent symbolism as the sand dollar (*Mellita quinquiesperforata*). Christians view it as symbolic of the story of Christ. Early European-Americans saw it as a reminder of a silver dollar coin, and hence the name. For many others, finding a sand dollar embodies memories of good times at the coast shared with friends and family. No matter what meaning the beach comber attaches to the shell, if sand dollars (or keyhole urchins, as they are also called) could share their thoughts, they might say they symbolize good luck because it takes an unbelievable amount of it for them to survive.

They live in an underwater world fraught with challenges and danger. It is those many struggles they must overcome that can help us better understand the answer to a question commonly asked by park visitors: “where have all of the sand dollars gone?”

Sand dollars begin life with a ritual as old as life itself. The adults gather in shallow water in the spring and early summer. Concentrations of up to 16 sand dollars per square foot have been documented during this practice! While you can’t tell it to look at them, they have two distinct sexes. When water conditions, tides, the lunar cycle, and some other factors known only to sand dollars are just right to suit them, the females begin to release millions of eggs into the water. The shedding of the eggs triggers the sperm release from the males. Both release the gametes out of the top of the shell from tiny little holes found at the tips of the star-like feature in the center of the disk. At this point the first bit of good fortune is needed since the currents quickly scatter the eggs and the male gametes must encounter and fertilize an egg or else they drift away and never develop.

For the fortunate thousands of eggs that do get fertilized, the life cycle of the developing embryos is surprisingly complex. The larvae go through several metamorphic stages that are as impressive, if not more so, than the life cycle of a butterfly. The fertilized larvae make the first change by developing into tiny swimming larvae. The odds of growing up aren’t good for baby sand dollars. Smaller than the head of a pin, the larvae drift in the ocean and are easy prey for virtually anything with a mouth! These swimming larvae are covered with tiny hair like projections called cilia that help them move as they drift about in the sea water as plankton. The cilia also help the tiny embryos capture plankton for food.

Sand dollars do have one remarkable way of increasing their survival chances. In 2008 biologists learned that certain species of sand dollar larvae, when exposed to mucus from predatory fish, immediately clone themselves as a mechanism of self-defense. The larvae responded to the threat of predation by detecting the mucus rather than waiting for actual predator attacks. By acting like Dr. Evil from the “Austin Powers” movies, the trick allows them to double their numbers, while halving their size and thus become more difficult for predators to spot! The process caused the original larvae to shrink in size from about 300 microns (about one-hundredth of an inch) to about half that size, and their newly cloned larvae were even smaller. The end result is that the original larva and the “Mini Me” larva may both survive, thus increasing the species’ chance of survival.

If the trick succeeds and the larvae avoid being eaten, after four to six weeks of feeding on even tinier organisms than themselves, they metamorphose into young keyhole urchins that will grow into adults on the ocean floor. One of the threats to small, young sand dollars is being swept ashore onto the beach where they may be eaten by gulls or die in the hot sun. To avoid those hazards, young sand dollars actually eat sand which they hold in their gut as a form of anchor! The five slits that go through the shell (called “lunules”) serve to help hide the animal since sand filters up through the holes. They also decrease lift created by wave action and help hold the sand dollar down on the sea floor where it searches for food at night.

The tiny stiff hairs that cover the body of this animal when it is alive serve several functions. They allow the sand dollar to move along at the very slow pace of  $\frac{6}{10}$  of an inch per minute! When it detects edible plant or animal particles in the sand, the hairs on the bottom—called feet or “podia”—serve as small suction devices that grasp the food and shuffle it along until it reaches the mouth, which is located right in the middle on the underside of the animal. Inside the mouth are features that some people describe as five little white doves. Those features likened to symbols of peace actually comprise a highly efficient grinding mechanism called an “Aristotle’s lantern”. It functions like teeth to pulverize the food particles for digestion. The tiny muscles attached to the Aristotle’s lantern and the self-sharpening teeth make the grinding and pre-digestive system of the sand dollar one of the true mechanical wonders of the animal kingdom.

As small sand dollars grow, they are under constant threat by predators such as flounder that prey upon them. Unfortunately, some people also take advantage of sand dollars by wading out into the surf and collecting live specimens during the spring and early summer when the animals are gathering for spawning. This is illegal at Padre Island National Seashore, and it is unethical. Plus killing them for souvenirs before they spawn puts even more downward pressure on the population resulting in even fewer sand dollars washing ashore once their life cycle is complete. Yet another issue is some areas of the Gulf, particularly along the Louisiana coast where the Mississippi River outflow enters the Gulf of Mexico, are the dead zones that result from the excess nutrients and pollutants pouring into the sea. The final results of those pollutants are vast areas that are devoid of oxygen by summer’s end. Slow moving animals such as sand dollars may be unable to move quickly enough at their slow pace to escape the oxygen free areas. With so many things to overcome it is small wonder so few sand dollars complete their life cycle. Those that do complete it live up to ten years, and are truly lucky dollars indeed.

Padre Island  
National  
Seashore

**HEALTH &  
SAFETY**

**IN CASE OF  
EMERGENCY  
DIAL 911**

**First Aid and  
Medical  
Emergencies:**

Contact a ranger immediately or go to the First Aid station at Malaquite Visitor Center.

**Nearest hospital:**  
Bay Area Medical Center at the corner of South Padre Island Drive and Rodd Field, 24 miles away.

**Jellyfish and Portugese man-of-war** may be present any time of year. Some have a painful sting. Apply vinegar and meat tenderizer, or HOT water, to the affected area. Seek medical attention if needed.

**Swimming:**  
Use caution and never swim alone. No lifeguards are present. Rip tides can occur. If caught in a rip tide, swim parallel to the beach until free.

**Stingrays** may be present, resting on the sandy bottom. They can inflict a very painful wound. Avoid stepping on them when in the water by shuffling your feet to scare them away.

**Hiking and Walking:**  
Use sunblock and wear clothing for the weather. Drink lots of water. Watch for rattlesnakes in grasslands, dunes, and mudflats.

**Lost and Found** is located at Malaquite Visitor Center.



Volunteer Karl Vermace. NPS photo.



## Volunteering

By Lee McDowell, Division of Interpretation and Education

DO YOU HAVE A PASSION for the outdoors or for conserving the environment? If the answer is yes, we would love for you to share your talents with others as a park volunteer. The assistance of volunteers is critical in helping national parks complete their mission, which is to preserve unimpaired the natural and cultural resources and values for the enjoyment, education, and inspiration of this and future generations.

Volunteers perform a variety of duties at Padre Island National Seashore, depending on volunteer interests and skills and park needs. Some assist the Sea Turtle Science and Recovery Division with sea turtle patrols during nesting season or with cold stunned sea turtles in the winter. Others provide assistance and information to visitors at the Visitor Center. Volunteers present interpretive and educational programs to school groups and the public; assist the Facilities Management Division with special projects; and serve as campground hosts. Some assist the Resources Management Division with field work or preservation efforts. Others help keep our beaches beautiful by picking up marine debris along the shoreline. Without volunteers, many park programs could not be accomplished.

Those interested in volunteering who reside in the local commuting area and who are able to commit to volunteering on a regular basis are encouraged to apply. Local volunteers are welcome year-round, but are particularly needed from April to November.

Those interested in volunteering who have their own RV can apply for a resident volunteer or campground host position, both of which include staying in the park on a volunteer RV site. Please keep in mind that the number of resident volunteer and host positions are limited, and at times we receive more applications than we have sites. Most applicants for RV sites are interested in positions available from December through March. If your schedule is flexible, you might consider applying for other months when sites are more likely to be available. Late fall and early spring in the park can be quite pleasant.

Volunteers are vital to the success of the National Park Service and Padre Island National Seashore. Their contributions help us fulfill our mission and goals for conservation and preservation of our nation's precious resources and heritage. If you are interested in volunteering, contact the Volunteer Coordinator (phone 361-949-8173 ext. 9429; e-mail [pais\\_visitor\\_center@nps.gov](mailto:pais_visitor_center@nps.gov)) or come by the Visitor Center. We look forward to hearing from you.

## Preserving a View into the Island's Cowboy Past

By Charles Sassine, Division of Science and Resources Management

IN JULY OF 2013 the staff of the Department of Science and Resources Management started to repair features of the Novillo bunkhouse, a historic structure from the park's cattle ranching past. The original plan was to replace the vertical wall boards and battens at the corners. The general construction style of the bunkhouse is a simple board and batten construction. The wall boards are 10 inch wide by 3 inch thick Georgia yellow pine timbers. The small gap between each wall board is covered by a 1 inch x 4 inch batten. The purpose of the batten is to keep wind and rain from blowing in between the heavy planks that make up the walls. The sheer size of the planks helps to resist damage from insects and high winds from tropical storms or hurricanes. During repairs, staff took refuge inside the bunkhouse when heavy rain interrupted the work. The bunkhouse proved to be water tight and virtually wind proof for a building originally constructed from lumber gathered on the beach, built and maintained by cowboys. This is quite a testament to the cowboys' carpenter skills.

During the initial removal of the wall boards and battens from the corners, it became obvious that damage from weathering and insects had compromised the integrity of the four massive, 15 foot by 10 inch by 12 inch beams supporting the building and floor. Additionally it was found that the piers holding up the beams were so badly deteriorated that they were collapsing under the beams. Once we discovered the extent of the deterioration we had to step back and reevaluate our objectives. To save the bunkhouse we had to systematically support the building, remove the planks from one wall at a time and replace the beams and piers on one side at a time. Many of the planks were more termite than wood and these we replaced with new southern yellow pine, which had to be milled to the unusual size of the original planks.

We do not know if the original beams and planks used to build the bunkhouse were from a large boat that wrecked on the island or from a dock or wharf that washed in after a hurricane, but we do know that very little built from wood lasts more than a decade in the harsh environment of the island, so the cowboys would have had to replace many parts of the bunkhouse over the years it was in use. The staff at Padre Island National Seashore gather lumber from the beach and follow the practices of the cowboys who worked the ranch, replacing wood that is no longer sound with what has been provided by the Gulf and only buying wood when what is needed cannot be found on the beach.

### WINTER PROGRAMS AT PADRE ISLAND NATIONAL SEASHORE

- Beach Walk - See what you discover on this 45-60 minute stroll with a ranger.
- Deck Talk - See and touch some of the strange and wonderful things found in the park during this 45 minute program.
- Plant Walk - Take a stroll and learn about the beautiful native flowers and rare coastal prairie habitat that covers much of the island.
- Birding Tour - Join us for a 2-3 hour guided driving tour to view a variety of birds. Binoculars and field guides are available for loan. Space is limited.
- Birding Class - Learn birding basics like how to select the right binoculars and where to find different species during this 45 minute program.
- Evening Program - Enjoy a starlit program on varying topics at Malaquite Campground Amphitheater.

Currents is a publication of Western National Parks Association, a non-profit partner of the park that provides support for park programs using proceeds from sales of educational books, t-shirts, hats, and other items. For more information, visit [wnpa.org](http://wnpa.org) or call 361-949-8069.

Editor and Graphic Artist: Jody Mays

Editorial Review:

- Patrick Gamman
- William Botts
- Lee McDowell
- Lindsay Galland

