

SOLVING THE

# “RIDLEY RIDDLE”

By CARL SAFINA and BRYAN WALLACE





# “And who can tell what the ridley is?”

—Archie Carr, *The Windward Road* (1956)

Back in the 1950s, the “riddle of the ridley turtle” stumped renowned sea turtle biologist Archie Carr. Where did that name come from? And where, indeed, did the turtles come from? Fishermen in the Caribbean and the northern Atlantic Ocean regularly found odd juvenile turtles. And some scientists thought the “bastard turtles” were hybrids of loggerheads and greens, because—as far as they knew—no one had ever seen such turtles breeding. Even after years of searching, Archie detected only inconclusive suggestions of Kemp’s ridleys nesting, concepts based on a few carapaces nailed to walls of local restaurants in Mexico. It proved ... well, it proved nothing.

The mothers of “bastard turtles” were finally apprehended in the now-famous 1947 home movie footage shot by Mexican rancher and engineer Andrés Herrera in Tamaulipas, Mexico. One sunny June day, his lens clearly captured a vast swarm of Kemp’s ridley females busily churning up sand, laying eggs, and climbing over each other on their way to and from the surf. Herrera did not realize the significance of having more than 40,000 Kemp’s ridley turtles starring in his home movie. The film’s existence—and the turtles’ nesting—remained unknown by scientists for another 15 years, until Henry Hildebrand stumbled upon it and showed it to Archie Carr, who was still searching for a nesting site. When he finally saw the film, a captivated and delighted Archie realized that part of the “ridley riddle”—the “where do they nest” part—was solved, with the exciting discovery of a large population. Despite this breakthrough, plenty of ridley riddles remain, not only for the Kemp’s ridley, but also for its close cousin, the olive ridley.

Only the two ridley (*Lepidochelys*) sea turtle species stage the synchronized mass nesting captured by the Herrera film. The nesting events are called *arribadas* or *arribazones*, Spanish for “arrivals.” Flotillas of gravid females—sometimes tens of thousands—wait for days or even a couple of weeks and then launch a perfectly timed amphibious invasion of certain sandy beaches. The multiday frenzy of crawling, digging, and egg laying is among nature’s most impressive wildlife spectacles. Although it seems hard to miss swarms of nesting sea turtles, historic records of arribadas are sparse; despite many records of green sea turtles dating back to Columbus’s travels, arribadas seem to have gone largely unnoticed (at least by scientists) until the past few decades.

Of the two *Lepidochelys*, Kemp’s ridleys (*L. kempii*) inhabit the western portion of the northern Atlantic Ocean. Their major arribada site is on the Gulf of Mexico at Rancho Nuevo, Mexico (see map on page 34). Olive ridleys (*L. olivacea*) ply the tropical and warm-temperate southern Atlantic, Pacific, and Indian oceans. The arribada rookery at



AT RIGHT: Olive ridleys spend most of their lives in the open ocean, feeding on a wide variety of invertebrates and soft-bodied organisms and occasionally acting as “rest stops” for seabirds taking a break from flying. However, this high-seas lifestyle comes with risks; sea turtles are often captured accidentally in fishing gear, especially pelagic longlines and trawls. © TUI DE ROY / MINDEN PICTURES PREVIOUS SPREAD: Synchronous mass nesting of olive (and Kemp’s) ridleys resembles an amphibious invasion of an unsuspecting strip of sandy beach. For several nights, thousands of female sea turtles crawl to and from the ocean, over and under each other, in an egg-laying frenzy. How sea turtles coordinate those events is still poorly understood. © DOUG PERRINE / SEAPICS.COM FOLLOWING PAGE: An olive ridley hatchling makes its way to the sea in Baja California, Mexico, forced to overcome not only stones and other beach debris, but also many hungry predators. © BRIAN J. HUTCHINSON

Escobilla, in western Mexico, suffered years of egg and turtle harvesting in the 1960s and 1970s, but today is the largest in the world, having increased to more than a million nesters per season (see map on pages 32–33). Their major arribada sites are along the American Pacific coast, eastern India, and (formerly) the Guianas.

The two species seem to have begun their taxonomic separation after climatic events a few million years ago caused extirpations that left populations isolated from one another. Olive ridleys usually nest at night like most sea turtles, though arribadas sometimes carry on through daylight hours. Kemp's ridleys regularly nest during daylight. In addition to arribadas, the two species share the trademark "ridley dance" in which a nesting female rocks from side to side using her body to tamp sand atop her nest. At some sites, the thumping sound earned olive ridleys the Spanish nickname *carpinteras*.

Finding arribadas is difficult because one must be in the right place at the right time. Likewise, counting participants is very difficult because of the staggering multitudes of females. How *do* you count

thousands and thousands of turtles crawling in different directions over a beach? Researchers have experimented with various methods, but drawbacks to most methods and lack of uniformity have hampered attempts to produce sound estimates of olive ridley populations. The Kemp's ridleys' arribada, much diminished since the time of Herrera's film, remains small. Kemp's ridleys are still recovering from near extinction caused mainly by drowning in shrimp nets. A turnaround began when the United States required shrimp nets to contain turtle escape devices.

An international team has developed an elegant "strip transect in time," an instantaneous count method that produces estimates of nesting ridleys that can be compared among beaches. Researchers using this approach are generating robust estimates of arribada populations at different sites around the world and can monitor population trends and status. For example, scientists now know that the arribadas at Nancite Beach in northwestern Costa Rica have greatly diminished in recent years, but that the arribadas less than 200 kilometers south at Ostional Beach have been stable or are even increasing.

So much for asking "Where?" and "How many?" What about the riddle of "Why?" Why arribadas and not solitary nesting, like all other sea turtle species? Even many individual ridleys nest solitarily. Why do *tens of thousands* of gravid females (and amorous males) congregate at a handful of specific nesting sites? One would expect obvious advantages for overwhelming predators, given the sheer numbers of nesting turtles, eggs, and hatchlings associated with arribadas. However, arribada beaches often feature abysmal hatching success because of females digging up each others' nests, as well as nests afflicted by fungus, ants, beetles, and other predators. Yet when one arribada is *not followed* by another mass nesting, hatching success can indeed be very high, producing massive hordes of hatchlings two months later.

Intriguingly, it's beginning to seem that arribadas may occur in oscillating long-term cycles. Arribadas likely build for decades, then decline, as the pendulum swings from a situation favoring mass nesting that saturates predators' appetites to one in which diseases and predators build up at arribada sites, eventually conspiring to severely suppress turtle success. For individual turtles, the advantage shifts from mass nesting to solitary nesting—*maybe*. This idea works theoretically. But until researchers thoroughly test several hypotheses, mass nesting—the behavior that defines ridley turtles more than anything else—will continue to be the main ridley riddle.

Archie solved one "riddle of the ridleys" (with some help), but he left much for us to discover. If ridleys maintain their admirable punctuality, and if we can let them maintain or restore their awe-inspiring abundance, then we face a happy challenge. Even small turtles harbor big secrets.

In *The Windward Road* (1956, Knopf), Archie Carr wrote, "It is the sea that holds the great mysteries." It still does. Indeed, it does. ■

**We thank Alberto Abreu, Pam Plotkin, Kartik Shanker, Roldán Valverde, René Marquez, and Rod Mast for very helpful comments.**



Visit [www.SeaTurtleStatus.org](http://www.SeaTurtleStatus.org) for an interactive, multimedia timeline of the Kemp's ridley's recovery.



# Gahirmatha

## THE BEACH BEYOND THE FOREST

By KARTIK SHANKER

Late one afternoon in India, we crossed from Gahirmatha Beach to a small sandbar no more than 1 kilometer (0.6 mile) long and 100 meters (328.1 feet) across. Climbing over the dune, we were greeted by the sight of several thousand olive ridleys—carapaces awash in the afternoon glow—engrossed in a nesting ritual they had been performing for millions of years.

This beach was first noticed in 1974, when Robert Bustard visited the mangrove forests of Bhitarkanika—in Orissa on the east coast of India—in search of saltwater crocodiles. In passing, he heard of a beach where thousands of turtles arrived each winter. The following year, he returned with a group of young and enthusiastic biologists. Every night, they walked up and down a beach carpeted with ridleys, lantern in one hand and paintbrush in another, marking each turtle. They counted 150,000 turtles in just a few nights. Some of the biologists became besotted with sea turtles; others were traumatized and swore off turtles for life.

Bustard announced to the world that they had discovered the world's largest rookery, signaling the beginning of sea turtle biology and conservation in Orissa. However, Bustard and his young Indian students were not, by far, the first to visit. Local communities had used the eggs for decades, if not centuries. They had paid revenues to the local landlord and the government to collect the eggs for use



A field team weighs an olive ridley in Gahirmatha, state of Orissa, India. © BIVASH PANDAV

as cattle feed. Even earlier, in 1708, Captain Alexander Hamilton, traveling between Japan and the Cape of Good Hope, South Africa, had reported—in his book *A New Account of the East Indies*—that “[b]etween Cunnaca and Balasore Rivers there is one continuous Sandy Bay, where prodigious Number of Sea Tortoises resort to lay their Eggs....”

Sadly, the rookeries in Orissa are better known today as mass graveyards, with thousands of dead turtles washed ashore each year after drowning in fishing nets. Coastal development and ports threaten the beaches and the turtles. Conservation in Orissa has had its ups and downs, and conservationists and local communities continue fighting to preserve this extraordinary phenomenon as part of their natural heritage.

## SWOT Feature Maps

### GLOBAL BIOGEOGRAPHY OF OLIVE RIDLEY AND KEMP'S RIDLEY TURTLES

The centerpiece maps on the following pages display the global biogeography of olive ridley (*Lepidochelys olivacea*) and Kemp's ridley (*Lepidochelys kempii*) turtles. These maps show the large differences in nesting abundance between solitary and arribada sites, as well as the different geographic distributions of these closely related species, as discussed in the Special Feature.

In the maps, relative abundances of nesting rookeries are displayed by site for the most recent available year or season of data. Nesting abundances are reported in number of clutches. We converted data reported in number of crawls, using 74 percent nesting success (number of crawls that result in successful clutches for solitary nesting).<sup>1</sup> We converted data reported as number of nesting females using 3.1 clutches per female for Kemp's ridleys,<sup>2</sup> or regionally appropriate conversion factors for olive ridleys (between 1.4 and 3 clutches per female<sup>3</sup>). Altogether, the map displays 445 nesting sites (402 for olive ridleys, 43 for Kemp's ridleys) from more than 100 different data providers and references worldwide. Please see the SWOT Data Contributors section (pages 47–52) for more information.

In addition to the nesting abundance estimates, the maps exhibit some other exciting features. We have included the global distributions (based on multiple data types, including telemetry, tag-returns, strandings, and sightings), and satellite telemetry

data (number of turtle locations for the ridleys in a given area) for both species, as well as known genetic stocks (based on mitochondrial DNA) of olive ridleys (Kemp's ridleys all belong to the same genetic stock).

Following are a few notes to aid in interpretation of the maps. Small numbers are data record numbers, which refer to the citations on pages 47–52, while numbers in larger, bold font indicate map insets. Satellite telemetry data for Kemp's ridleys include adult females and males, as well as juvenile turtles, and satellite telemetry data for olive ridleys include adult females and males. Original data sources used to construct all layers are cited in the SWOT Data Contributors section (pages 47–52).

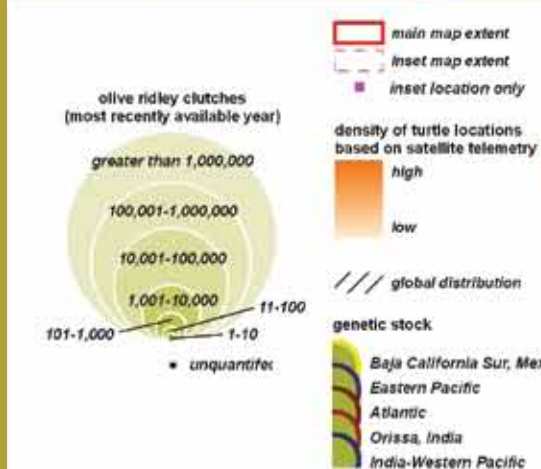
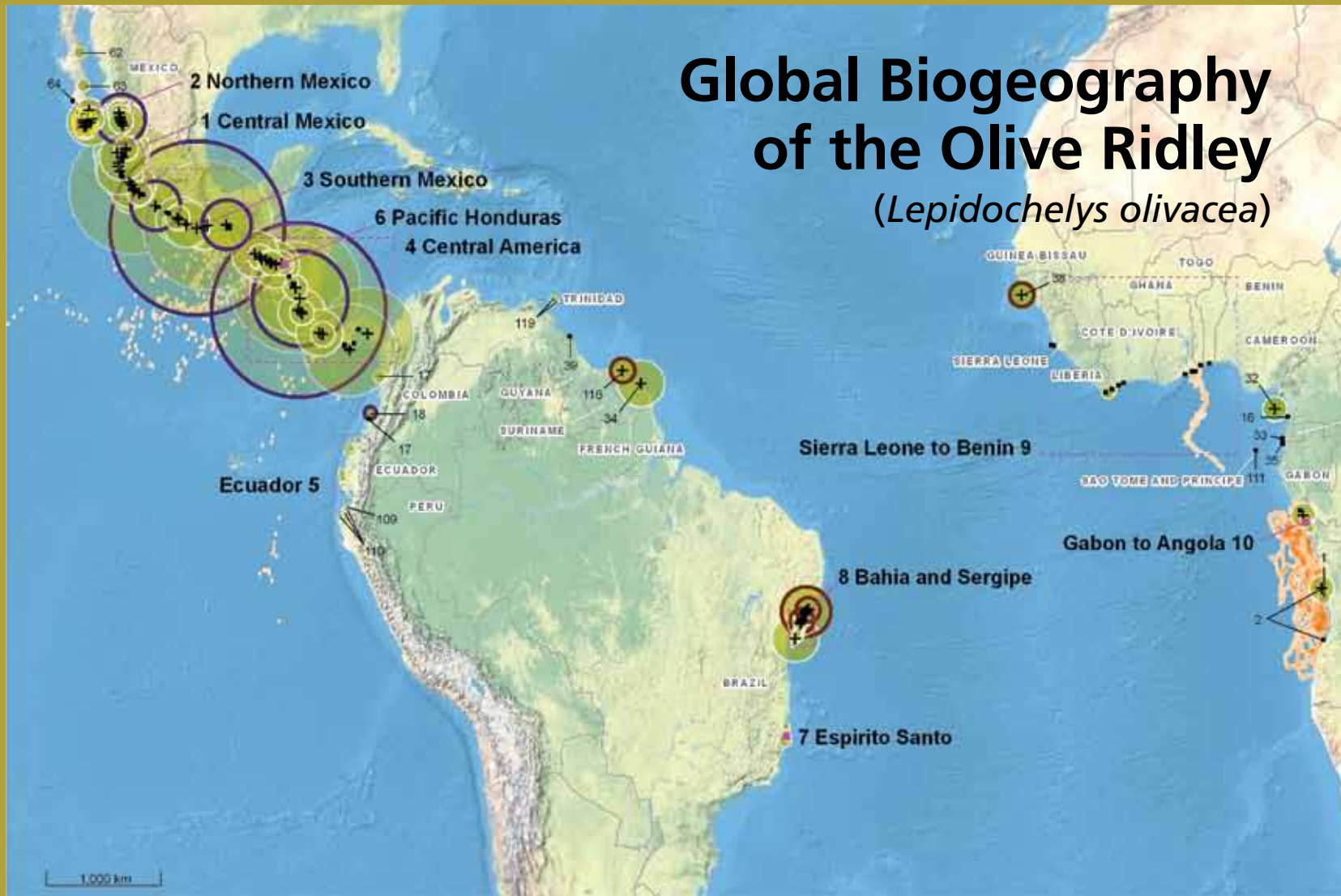
By spatially synthesizing several types of biological information, these SWOT maps are the most comprehensive presentation of biogeographical information collected on the ridley species to date.



Visit [www.SeaTurtleStatus.org](http://www.SeaTurtleStatus.org) to see SWOT's interactive map with leatherback, loggerhead, hawksbill, flatback, olive ridley, and Kemp's ridley nesting data.

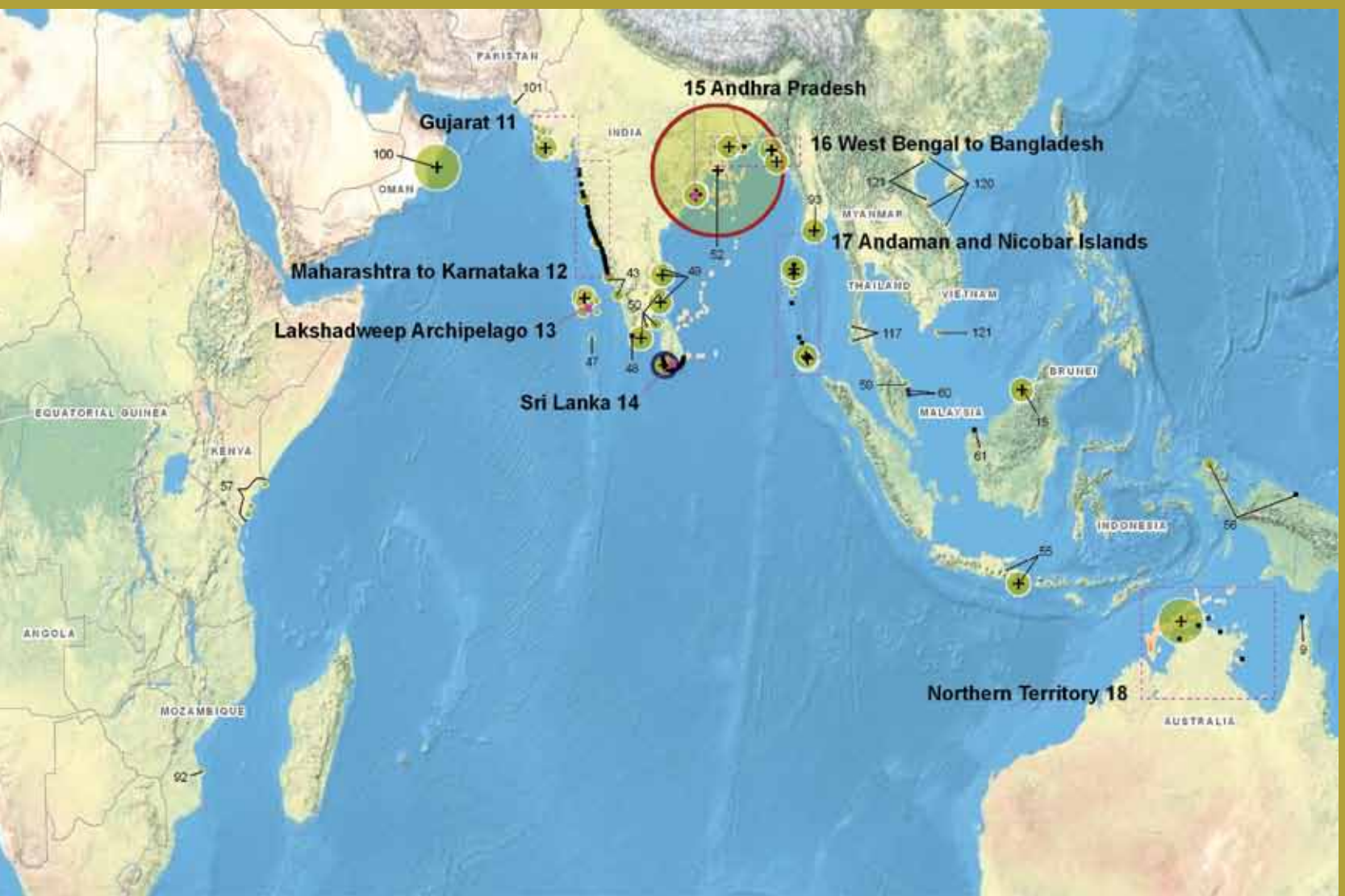
1. Tomas, J., J. Castroviejo, and J. A. Raga. 1999. Sea turtles in the South of Bioko Island (Equatorial Guinea). *Marine Turtle Newsletter* 84:4–6.
2. Rostal, D. C. 2007. Reproductive physiology of the ridley sea turtle. In P. T. Plotkin, ed. *Biology and Conservation of Ridley Sea Turtles*. Baltimore, MD, USA: The Johns Hopkins University Press.
3. van Buskirk, J., and L. B. Crowder. 1994. Life history variation in marine turtles. *Copeia* 1994(1):66–81.

# Global Biogeography of the Olive Ridley (*Lepidochelys olivacea*)



projection: Eckert IV, central meridian 60° west  
 data: The SWOT Team and reviewed literature (see end of report for citations); Natural Earth, Tom Patterson, National Park Service  
 produced in partnership with: Conservation International, OBIS-SEAMAP, and the IUCN-MTSG





# Global Biogeography of the Kemp's Ridley

*(Lepidochelys kempii)*



Kemp's ridley clutches (most recent available year)



main map extent

inset map extent

density of turtle locations based on satellite telemetry

high

low

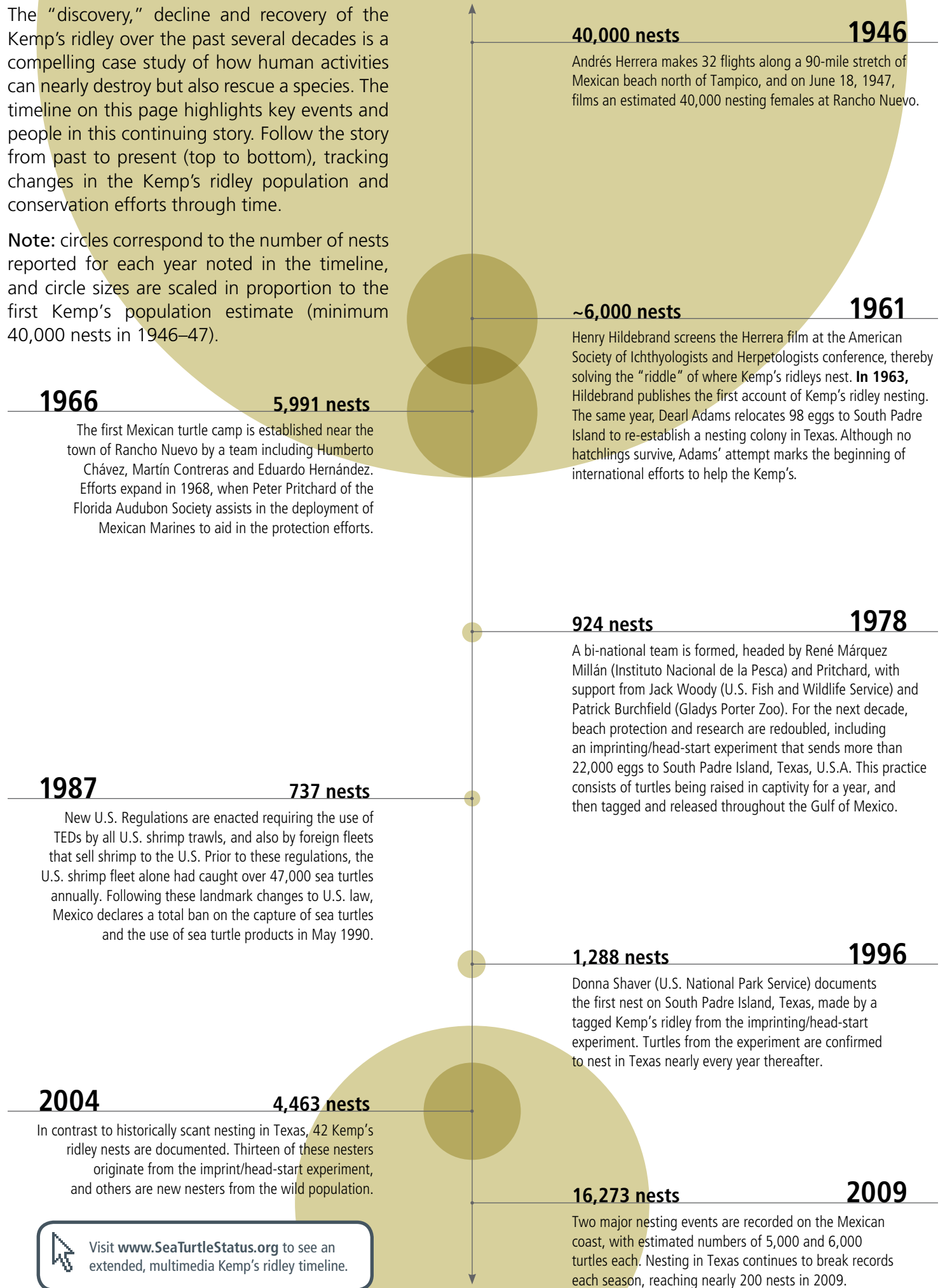
global distribution

# The Kemp's Ridley's Road to Recovery

By PATRICK BURCHFIELD, JAIME PEÑA, and RENÉ MÁRQUEZ MILLÁN

The “discovery,” decline and recovery of the Kemp's ridley over the past several decades is a compelling case study of how human activities can nearly destroy but also rescue a species. The timeline on this page highlights key events and people in this continuing story. Follow the story from past to present (top to bottom), tracking changes in the Kemp's ridley population and conservation efforts through time.

**Note:** circles correspond to the number of nests reported for each year noted in the timeline, and circle sizes are scaled in proportion to the first Kemp's population estimate (minimum 40,000 nests in 1946–47).



Visit [www.SeaTurtleStatus.org](http://www.SeaTurtleStatus.org) to see an extended, multimedia Kemp's ridley timeline.